CONTRACT DOCUMENTS

CONTRACT 2016.02

GRAY INTERCHANGE
EXIT 63
(Mile Marker 63.3)

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

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

The Maine Turnpike General Provisions are additions and alterations to the Maine Department of Transportation Standard Specifications (December 2002 Edition). See Subsection 100.1.

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	12 – KITCHEN CASEWORK	
12356	Kitchen Casework	12356 - 1 to 6
	15 - MECHANICAL	
15000	General Mechanical	15000 - 1 to 6
15250	Insulation	15250 - 1 to 8
15400	Plumbing	15400 - 1 to 4
15700	HVAC System	15700 - 1 to 15
15800	Ductwork and Accessories	15800 - 1 to 5
15900	Automatic Temperature Controls	15900 - 1 to 4
	26 - ELECTRICAL	
26000	Electrical	26000 - 1 to 36

PART IV – APPENDICES

SECTION	TITLE	PAGE
APPENDIX A -	SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION	AP - A1
APPENDIX B -	LEAD PAINT ASSESSMENT AND ASBESTOS REPORT	AP - B1
APPENDIX C -	PLAZA SAFETY REQUIREMENTS	AP - C1
APPENDIX D -	DEFINED TERMS	AP - D1
APPENDIX E -	PLAZA WORK CHECKLIST	AP - E1
APPENDIX F -	PRODUCT DATA SHEETS	AP - F1
APPENDIX G -	SIGN TEXT LAYOUT SHEETS	AP - G1

MAINE TURNPIKE AUTHORITY

MAINE TURNPIKE

CONTRACT DOCUMENTS

CONTRACT 2016.02

GRAY INTERCHANGE
EXIT 63
(Mile Marker 63.3)

NOTICE TO CONTACTORS

PROPOSAL

CONTRACT AGREEMENT

CONTRACT BOND

FINAL LIEN AND CLAIM WAIVER AND AFFIDAVIT

SPECIFICATIONS

MAINE TURNPIKE AUTHORITY

NOTICE TO CONTRACTORS

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

CONTRACT 2016.02

GRAY INTERCHANGE
EXIT 63
(Mile Marker 63.3)

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 January 22, 2016 at which time and place the Proposals will be publicly opened and read. Bids will be accepted from Contractors **pre-qualified** by the Maine Department of Transportation for Highway Projects with a bridge subcontractor pre-qualified by the Maine DOT for Bridges, a building subcontractor pre-qualified by the Maine Department of Transportation for Buildings and an electrical subcontractor pre-qualified by Maine Department of Transportation for Traffic Signal and Lighting Projects. All other bids may be rejected. This Project includes a wage determination developed by the State of Maine Department of Labor.

The work consists of highway, bridge, and toll system improvements at the Gray Interchange. These improvements include new southbound ramps and a new southbound toll plaza on the west side of the Maine Turnpike where they are proposed to intersect with Route 202 and Route 26A. The improvements include work along the Maine Turnpike, the northbound and southbound ramps, Route 202 and Route 26A. The toll plaza work includes a new toll administration building and toll plaza at the southbound ramps and reconstruction of the existing toll plaza for the northbound ramps. The proposed work and all other work incidental thereto shall be in accordance with the Plans and Specifications.

The general limits of work along the Maine Turnpike begin at Mile Marker 62.8 and continues northerly to Mile Marker 63.5. The work along Route 202 begins approximately 0.2 miles west of the intersection with Route 26A and continues easterly for approximately 0.5 miles into Gray Village. The work along Route 26A begins at the intersection with Route 202 and extends northerly for approximately 0.1 miles.

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 full size Plans** and Contract Documents may be obtained from the Authority upon payment of Two Hundred and Seventy-Five ($275.00) Dollars for each set, which payment will not be returned. **The half** size plans and Contract documents may be obtained from the Authority upon payment of Two Hundred and Twenty Five ($225.00) 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 December 2002", "Standard Details, Revision of December 2002" and "Best Management Practices for Erosion and Sediment Control", latest issue. Copies and recent updates to these publications can be downloaded at: http://www.maine.gov/mdot/contractors/publications/ .

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

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

A pre-bid conference will be held on January 7, 2016 at 1:00 p.m. at the Maine Turnpike Authority, 2360 Congress Street, Portland, Maine.

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 2016.02

GRAY INTERCHANGE
EXIT 63
(Mile Marker 63.3)

MAINE TURNPIKE AUTHORITY

PROPOSAL

CONTRACT 2016.02

GRAY INTERCHANGE
EXIT 63
(Mile Marker 63.3)

TO MAINE TURNPIKE AUTHORITY:

The work consists of highway, bridge, and toll system improvements at the Gray Interchange. These improvements include new southbound ramps and a new southbound toll plaza on the west side of the Maine Turnpike where they are proposed to intersect with Route 202 and Route 26A. The improvements include work along the Maine Turnpike, the northbound and southbound ramps, Route 202 and Route 26A. The toll plaza work includes a new toll administration building and toll plaza at the southbound ramps and reconstruction of the existing toll plaza for the northbound ramps. The proposed work and all other work incidental thereto shall be in accordance with the Plans and Specifications.

The general limits of work along the Maine Turnpike begin at Mile Marker 62.8 and continues northerly to Mile Marker 63.5. The work along Route 202 begins approximately 0.2 miles west of the intersection with Route 26A and continues easterly for approximately 0.5 miles into Gray Village. The work along Route 26A begins at the intersection with Route 202 and extends northerly for approximately 0.1 miles.

This Work will be done under a Contract known as Contract 2016.02 according to the Plans and Specifications which are on file in the office of the Maine Turnpike Authority, 2360 Congress Street, Portland, Maine.

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

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

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

SCHEDULE OF BID PRICES
CONTRACT NO. 2016.02
GRAY INTERCHANGE
(EXIT 63)
MILE MARKER 63.3

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
202.12	REMOVING EXISTING STRUCTURAL CONCRETE	Cubic Yard	160				
202.15	REMOVE MANHOLE OR CATCH BASIN	Each	9				
202.193	REMOVING EXISTING BRIDGE	Lump Sum	1				
202.202	REMOVING PAVEMENT SURFACE	Square Yard	6700				
202.2021	REMOVING PAVEMENT SURFACE - BRIDGE DECK	Square Yard	1230				
202.203	PAVEMENT BUTT JOINTS	Square Yard	890				
203.20	COMMON EXCAVATION	Cubic Yard	52670				
203.25	GRANULAR BORROW	Cubic Yard	25				
203.26	GRAVEL BORROW	Cubic Yard	75				
206.061	STRUCTURAL EARTH BELOW GRADE STRUCTURE	Cubic Yard	100				
206.082	STRUCTURAL EARTH EXCAVATION – MAJOR STRUCTURES, PLAN QUANTITY	Cubic Yard	320				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
304.09	AGGREGATE BASE COURSE - CRUSHED	Cubic Yard	5120				
304.10	AGGREGATE SUBBASE COURSE - GRAVEL	Cubic Yard	12140				
403.207	HOT MIX ASPHALT, 19.0 MM HMA	Ton	2550				
403.2083	HOT MIX ASPHALT, 12.5 MM (POLYMER MODIFIED) - RAP	Ton	2250				
403.209	HOT MIX ASPHALT 9.5 MM (INCIDENTALS)	Ton	170				
403.210	HOT MIX ASPHALT 9.5 MM	Ton	1805				
403.211	HOT MIX ASPHALT (SHIM)	Ton	1400				
403.213	HOT MIX ASPHALT, 12.5 MM BASE	Ton	3000				
409.15	BITUMINOUS TACK COAT, APPLIED	Gallon	2310				
419.30	SAWING BITUMINOUS PAVEMENT	Linear Foot	5850				
501.54	STEEL H-BEAM PILES 117 LB/FT, DELIVERED	Linear Foot	1326				
501.541	STEEL H-BEAM PILES 117 LB/FT, IN PLACE	Linear Foot	1156				
501.9	PILE TIPS	Each	34				
501.91	PILE SPLICES	Each	10				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
501.92	PILE DRIVING EQUIPMENT MOBILIZATION	Lump Sum	1				
502.261	STRUCTURAL CONCRETE, GRADE BEAMS	Cubic Yard	183				
502.262	STRUCTURAL CONCRETE, PAVEMENT SLABS	Cubic Yard	612				
502.263	STRUCTURAL CONCRETE - PLAZA ISLANDS, BUMPERS AND CURTAIN WALLS	Cubic Yard	79				
502.266	STRUCTURAL CONCRETE - PEDESTALS & FOOTINGS	Cubic Yard	3				
502.701	BRIDGE DRAIN GRATE MODIFICATION	Each	2				
503.14	EPOXY-COATED REINFORCING STEEL, FABRICATED AND DELIVERED	Pounds	129500				
503.15	EPOXY-COATED REINFORCING STEEL, PLACING	Pounds	129500				
503.18	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCING BARS, FABRICATED AND DELIVERED	Pounds	33400				
503.19	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCING BARS, PLACING	Pounds	33400				
503.9	SYNTHETIC FIBER REINFORCEMENT	Pounds	3060				
504.5	TOLL PLAZA CANOPY	Lump Sum	1				
504.61	TOLL GANTRY – 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:			
504.62	TOLL GANTRY – NORTHBOUND	Lump Sum	1				
507.0928	ALUMINUM BRIDGE RAILING - RAIL SECTION REPLACE	Linear Foot	21				
508.14	HIGH PERFORMANCE WATERPROOFING MEMBRANE	Lump Sum	1				
515.201	PIGMENTED PROTECTIVE COATING FOR CONCRETE SURFACES	Square Yard	360				
515.202	CLEAR PROTECTIVE COATING FOR CONCRETE SURFACES	Square Yard	1350				
515.23	EPOXY OVERLAY	Square Yard	72				
516.202	CLEAR PROTECTIVE COATING FOR CONCRETE SURFACES	Square Yard	520				
518.1	ABUTMENT REPAIRS	Square Foot	60				
518.2	PIER REPAIRS	Square Foot	65				
518.391	REPAIRING GRANITE CURB JOINT AND BEDDING MORTAR	Linear Foot	185				
518.392	REPAIRING CONCRETE PARAPET ELASTOMERIC JOINT SEALER	Linear Foot	340				
518.8	PARTIAL DEPTH CONCRETE DECK REPAIRS	Square Foot	550				
518.81	FULL DEPTH CONCRETE DECK REPAIRS	Square Foot	220				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
520.2211	EXPANSION JOINT MODIFICATION	EA	2				
524.4	PROTECTIVE SHIELDING - STEEL GIRDERS	SY	1060				
526.306	TEMPORARY CONCRETE BARRIER - MTA	LS	1				
526.35	PIER PROTECTION CONCRETE BARRIER	LS	1				
526.351	MEDIAN BARRIER TYPE 1 - PRECAST	LF	149				
526.361	MEDIAN BARRIER TRANSITION TYPE 1 - PRECAST	EA	2				
527.301	ENERGY ABSORBING SYSTEM (C-A-T)	EA	2				
527.342	WORK ZONE CRASH CUSHIONS - TL-2	UN	1				
527.343	WORK ZONE CRASH CUSHIONS - TL-3	UN	3				
602.3	FLOWABLE CONCRETE FILL	CY	9				
603.15	12" CULV PIPE OPTION I	LF	15				
603.155	12 INCH REINFORCED CONCRETE PIPE - CLASS III	LF	173				
603.169	15" CULV PIPE OPTION III	LF	50				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
603.17	18" CULVERT PIPE OPT I	LF	30				
603.175	18 INCH REINFORCED CONCRETE PIPE - CLASS III	LF	290				
603.19	24" CULVERT PIPE OPT I	LF	35				
603.195	24 INCH REINFORCED CONCRETE PIPE - CLASS III	LF	110				
603.2551	60" RCP CLASS IV	LF	170				
603.28	CONCRETE COLLAR FOR REINFORCED CONCRETE PIPE	EA	20				
604.072	CATCH BASIN TYPE A1-C	EA	23				
604.092	CATCH BASIN TYPE B1-C	EA	3				
604.164	REBUILDING CATCH BASIN	EA	1				
604.166	REBUILDING MANHOLE	EA	1				
604.18	ADJUST MANHOLE OR CB TO GRADE	EA	11				
604.262	CATCH BASIN TYPE B5-C	EA	6				
605.09	6" UNDERDRAIN TYPE B	LF	200				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
605.11	12" UNDERDRAIN TYPE C	LF	950				
605.12	15" UNDERDRAIN TYPE C	LF	110				
605.13	18" UNDERDRAIN TYPE C	LF	200				
605.15	24" UNDERDRAIN TYPE C	LF	160				
606.1723	BRIDGE TRANSITION - TYPE 3	EA	4				
606.24	GUARDRAIL TYPE 3D - SINGLE RAIL	LF	5400				
606.2401	GUARDRAIL TYPE 3D - DOUBLE RAIL	LF	205				
606.242	GUARDRAIL TYPE 3D - OVER 15' RADIUS	LF	165				
606.265	TERMINAL END - SINGLE RAIL	EA	1				
606.277	TERMINAL END - TRAILING END	EA	14				
606.352	REFLECTORIZED BEAM GUARDRAIL DELINEATORS	EA	405				
606.353	DELINEATOR POST	EA	70				
606.354	DELINEATOR POST - REMOVE AND RESET	EA	40				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
606.3621	GUARDRAIL ADJUST - SINGLE RAIL	LF	2500				
606.3631	GUARDRAIL - REMOVE AND DISPOSE	LF	6150				
606.64	GR - THRIE BEAM - DBL RAIL	LF	850				
606.65	GR - THRIE BEAM - SGL RAIL	LF	150				
606.701	ASYMMETRICAL THRIE BEAM TRANSITION	EA	4				
606.754	WIDEN SHOULDER FOR GUARDRAIL 350 FLARED	EA	4				
606.80	GUARDRAIL FLEAT 350 TERMINAL	EA	10				
607.09	WOVEN WIRE FENCE - METAL POSTS	LF	1500				
607.154	DRIVEWAY GATE 21 FOOT - METAL	EA	1				
607.17	CHAIN LINK FENCE - 6'	LF	490				
607.173	CHAIN LINK FENCE 6' PVC CT'D	LF	320				
607.2325	CHAIN FENCE GATE 6'X12'OPENING	EA	1				
607.26	REMOVE & STACK FENCE	LF	430				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
607.32	BRACING ASSEMBLY TYPE I - METAL POSTS	EA	7				
607.34	BRACING ASSEMBLY CHAIN LINK FENCE	EA	13				
608.08	REINFORCED CONCRETE SIDEWALK	SY	217				
609.11	VERTICAL CURB TYPE 1	LF	547				
609.12	VERT CURB TYPE 1-CIRCULAR	LF	137				
609.13	VERTICAL BRIDGE CURB TYPE 1	LF	300				
609.14	VERTICAL BRIDGE CURB TYPE 1 - CIRCULAR	LF	80				
609.191	CONCRETE CURB TYPE 2	LF	12				
609.234	TERMINAL CURB TYPE 1 - 4 FOOT	EA	5				
609.237	TERMINAL CURB TYPE 1 - 7 FT	EA	2				
609.2371	VERTICAL CURB TYPE 1 - 7 FT - CIRCULAR	EA	1				
609.26	CURB TRANSITION SECT B-TYPE 1	EA	6				
609.34	CURB TYPE 5	LF	2600				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
609.35	CURB TYPE 5 - CIRCULAR	LF	120				
610.08	PLAIN RIPRAP	CY	340				
610.18	STONE DITCH PROTECTION	CY	15				
610.181	TEMPORARY STONE CHECK DAMS	CY	35				
610.19	COBBLE GRAVEL SAND MIX	CY	47				
613.319	EROSION CONTROL BLANKET	SY	3100				
615.07	LOAM	CY	3851				
618.1301	SEEDING METHOD NUMBER 1, PLAN QUANTITY	UN	5				
618.1401	SEEDING METHOD NUMBER 2 - PLAN QUANTITY	UN	230				
618.1411	SEEDING METHOD NUMBER 3 - PLAN QUANTITY	UN	90				
619.1201	MULCH - PLAN QUANTITY	UN	315				
619.1202	TEMPORARY MULCH	LS	1				
619.1401	EROSION CONTROL MIX	CY	30				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
620.58	EROSION CONTROL GEOTEXTILE	SY	638				
621.043	EVERGREEN TR (6'-8') GP A	EA	5				
621.044	EVERGREEN TR (6'-8') GP B	EA	8				
621.248	LG DECID TR (5'-6') GP A	EA	20				
621.279	LG DECID TR (2.50"-3" CAL) GP A	EA	4				
621.408	DWF EVERGREENS (2.50'-3') GP B	EA	19				
621.536	DECID SHRUBS (12"-18") GP B	EA	4				
621.541	DECID SHRUBS (18"-24") GP B	EA	2				
621.542	DECID SHRUBS (18"-24") GP C	EA	5				
621.543	DECID SHRUBS (2'-3') GP C	EA	2				
621.552	DECID SHRUBS (3'-4') GP A	EA	7				
621.553	DECID SHRUBS (3'-4') GP B	EA	15				
621.554	DECID SHRUBS (3'-4') GP C	EA	6				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
621.8	ESTABLISHMENT PERIOD	LS	1				
622.11	TRANSPLANTING TREE	EA	1				
625.106	WATER SERVICE SUPPLY LINE (<3 IN)	LF	850				
625.107	WATER METER PIT	EA	1				
626.11	PRECAST CONCRETE JUNCTION BOX	EA	13				
626.12	36" X 24" X 36" QUAZITE JUNCTION BOX	EA	80				
626.13	48" X 36" X 48" QUAZITE JUNCTION BOX	EA	2				
626.21	METALLIC CONDUIT	LF	160				
626.22	NON-METALLIC CONDUIT	LF	5925				
626.221	NON-METALLIC CONDUIT, DIRECTIONAL BORE	LF	600				
626.222	2 INCH NON-METALLIC CONDUIT	LF	11740				
626.223	HORIZONTAL DIRECTIONAL DRILLED CONDUIT	LF	320				
626.32	30" FOUNDATION	EA	48				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
626.33	30 INCH FOUNDATION	EA	6				
626.333	48 INCH FOUNDATION	CY	15				
626.335	60 INCH FOUNDATION	CY	29				
626.35	CONTROLLER CABINET FOUNDATION	EA	6				
626.36	REMOVE OR MODIFY CONCRETE FOUNDATION	EA	18				
626.37	SPECIAL FOUNDATION	EA	1				
627.18	12" SOLID WHITE PAVEMENT MARKING	LF	3100				
627.407	REF PL WH OR YEL PAVE MARKING	SF	300				
627.68	TEMPORARY 4 INCH PAINTED PAVEMENT MARKING LINE, YELLOW OR WHITE	LF	6450				
627.681	TEMPORARY 6 INCH PAINTED PAVEMENT MARKING LINE, YELLOW OR WHITE	LF	24100				
627.730	TEMPORARY 6 INCH PAVEMENT MARKING TAPE	LF	4000				
627.731	TEMPORARY 6 INCH BLACK PAVEMENT MARKING TAPE	LF	2800				
627.733	4" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	LF	21700				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
627.744	6" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	LF	16800				
627.75	WHITE OR YELLOW PAVEMENT AND CURB MARKING	SF	1470				
627.77	REMOVING EXISTING PAVEMENT MARKINGS	SF	4100				
627.812	TEMPORARY RAISED PAVEMENT MARKINGS	EA	590				
627.94	PAVEMENT MARKING TAPE	LF	150				
629.05	HAND LABOR, STRAIGHT TIME	HR	160				
631.1	AIR COMPRESSOR (INCLUDING OPERATOR)	HR	15				
631.11	AIR TOOL (INCLUDING OPERATOR)	HR	75				
631.12	ALL PURPOSE EXCAVATOR (INC OPERATOR)	HR	75				
631.14	GRADER (INCLUDING OPERATOR)	HR	75				
631.171	TRUCK - SMALL (INCLUDING OPERATOR)	HR	75				
631.22	FRONT END LOADER (INCLUDING OPERATOR)	HR	75				
631.32	CULVERT CLEANER (INC OPERATOR)	HR	75				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
631.36	FOREMAN	HR	60				
631.5	JACKHAMMER (AIR TOOL INCLUDING OPERATOR)	HR	20				
631.51	BUCKET TRUCK	HR	20				
631.52	SCISSOR LIFT	HR	20				
631.53	ELECTRICIAN	HR	20				
631.54	ELECTRICIAN'S APPRENTICE	HR	20				
631.55	PLUMBER	HR	20				
633.01	PROPANE SERVICE TRENCH	LF	180				
633.21	PROPANE TANK SUPPORTS	EA	4				
633.31	PROPANE TANK PAD	SY	27				
633.41	PROPANE TANK RELOCATION	LS	1				
634.16	HIGHWAY LIGHTING	LS	1				
634.175	REPLACEMENT LED FIXTURE	EA	5				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
634.208	REMOVE AND RESET LIGHT STANDARD	EA	5				
634.231	CONVENTIONAL LIGHT STANDARD WITH LED FIXTURE	EA	43				
643.71	TRAFFIC SIGNAL MODIFICATIONS: US 202/ME 4/ME 115 AT I-95 NB RAMPS	LS	1				
643.71	TRAFFIC SIGNAL MODIFICATIONS: US 202/ME 4/ME 115 AT I-95 SB RAMPS/ ME 26A	LS	1				
643.71	TRAFFIC SIGNAL MODIFICATIONS: US 202/ME 4/ME 115 AT ME 115/ME 100	LS	1				
643.71	TRAFFIC SIGNAL MODIFICATIONS: US 202/ME 4 AT BROWN ST/SHAKER RD	LS	1				
643.712	LANE USE SIGNAL INSTALLATION	EA	3				
643.83	VIDEO DETECTION SYSTEM: US 202 AT NB RAMPS	LS	1				
643.83	VIDEO DETECTION SYSTEM: US 202 AT SB RAMPS	LS	1				
643.86	TRAFFIC SIGNAL LOOP DETECTOR	EA	3				
643.9	INTERCONNECT WIRE BETWEEN: SB RAMP INTERSECTION TO NB RAMP INTERSECTION	LS	1				
643.9	INTERCONNECT WIRE BETWEEN: SB RAMP INTERSECTION TO SB TOLL BUILDING	LS	1				
643.9	INTERCONNECT WIRE BETWEEN: NB RAMP INTERSECTION TO US 202 AND ME 100/ME 115	LS	1				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
643.9	INTERCONNECT WIRE BETWEEN: US 202 AND ME 100/ME 115 TO US 202 AND BROWN/SHAKER	LS	1				
643.91	MAST ARM POLE	EA	4				
643.93	STRAIN POLE	EA	1				
645.105	REMOVE AND STACK SIGN	EA	141				
645.109	REMOVE AND RESET SIGN	EA	67				
645.1091	CANOPY MOUNTED SIGN	EA	2				
645.12	OVERHEAD GUIDE SIGN: STA 613+60	LS	1				
645.12	OVERHEAD GUIDE SIGN: STA 628+17	LS	1				
645.12	OVERHEAD GUIDE SIGN: STA 204+11	LS	1				
645.12	OVERHEAD GUIDE SIGN: STA 417+03	LS	1				
645.15	CANTILEVER GUIDE SIGN: STA 608+15	LS	1				
645.15	CANTILEVER GUIDE SIGN: STA 704+09	LS	1				
645.251	ROADSIDE GUIDE SIGN, TYPE 1	SF	572				

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 1	SF	506				
645.289	STEEL H-BEAM POLES	LBS	3500				
648	INSTALL FLAGPOLE AND LIGHTING	LS	1				
650.101	DYNAMIC MESSAGE SIGN (DMS) SYSTEM: STA 601+82 RT	LS	1				
650.101	DYNAMIC MESSAGE SIGN (DMS) SYSTEM: STA 622+25 LT	LS	1				
650.101	DYNAMIC MESSAGE SIGN (DMS) SYSTEM: STA 706+65 LT	LS	1				
650.201	DMS GROUND MOUNTED CONTROL CABINET: STA 601+95 RT	EA	1				
650.201	DMS GROUND MOUNTED CONTROL CABINET: STA 622+15 LT	EA	1				
650.201	DMS GROUND MOUNTED CONTROL CABINET: STA 706+54 LT	EA	1				
650.901	DMS SOLAR POWER SYSTEM: STA 602+08 RT	LS	1				
650.901	DMS SOLAR POWER SYSTEM: STA 622+00 LT	LS	1				
650.901	DMS SOLAR POWER SYSTEM: STA 706+46 LT	LS	1				
652.312	TYPE III BARRICADES	EA	6				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
652.33	DRUM	EA	250				
652.34	CONE	EA	75				
652.35	CONSTRUCTION SIGNS	SF	2214				
652.361	MAINTENANCE OF TRAFFIC CONTROL DEVICES	LS	1				
652.38	FLAGGER	HR	470				
652.39	PORTABLE LIGHT TOWER	EA	4				
652.41	PORTABLE CHANGEABLE MESSAGE SIGN	EA	6				
652.45	TRUCK MOUNTED ATTENUATOR	CD	100	$150	00	$15,000	00
655.01	INSTALLATION OF ORT CONTROLLER CABINET	EA	1				
655.012	INSTALLATION OF CASH LANE CONTROLLER CABINET	EA	5				
655.02	DVAS MOUNT INSTALLATION	EA	6				
655.04	INSTALLATION OF SENSOR LOOPS	LS	1				
655.05	INSTALLATION OF AVI ANTENNAS	EA	10				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
655.06	INSTALLATION OF AVI READERS	EA	2				
655.07	TRAFFIC CONTROL PEDESTAL PREPARATION WORK	EA	3				
655.08	#2/0 WIRE FOR UPS	LF	2000				
655.1	#4 AWG WIRE	LF	2400				
655.101	#6 AWG WIRE	LF	1200				
655.11	#10 AWG WIRE	LF	3200				
655.12	#12 AWG WIRE	LF	14000				
655.13	#14 AWG WIRE	LF	1000				
655.14	4PR/24 (CATEGORY 5E) CABLE	LF	4500				
655.15	LMR 400 CABLE	LF	1200				
655.16	FIBER OPTIC CABLE - 6 FIBER	LF	5500				
655.17	IVIS HOMERUN LOOP CABLE (IMSA 50-2 #16)	LF	1200				
655.18	HALF DIAMOND LOOP WIRE (#16 XHHW OR XLP STRANDED WIRE)	LF	500				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
655.2021	1" SCHEDULE 80 PVC CONDUIT	LF	120				
655.203	1 1/2" SCHEDULE 80 PVC CONDUIT	LF	450				
655.2031	2" SCHEDULE 80 PVC CONDUIT	LF	2300				
655.204	3" SCHEDULE 80 PVC CONDUIT	LF	6450				
655.205	4" SCHEDULE 80 PVC CONDUIT	LF	1800				
655.2051	5" SCHEDULE 80 PVC CONDUIT	LF	1650				
655.2052	12" SCHEDULE 80 PVC CONDUIT	LF	200				
655.206	1" GALVANIZED RIGID METAL CONDUIT	LF	375				
655.207	1 1/2" GALVANIZED RIGID METAL CONDUIT	LF	140				
655.208	3" GALVANIZED RIGID METAL CONDUIT	LF	100				
655.209	1/2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	LF	50				
655.2101	1 1/2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	LF	100				
655.2102	2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	LF	100				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
655.221	TYPE A PULL BOX INSIDE	EA	6				
655.222	TYPE C PULL BOX INSIDE	EA	12				
655.223	TYPE D PULL BOX OUTDOOR	EA	3				
655.224	TYPE E PULL BOX INSIDE	EA	4				
655.225	TYPE F PULL BOX OUTSIDE	EA	7				
655.226	TYPE G PULL BOX OUTSIDE	EA	2				
655.300	12" X 12" X 6" GALVANIZED JUNCTION BOX	EA	4				
655.310	18" X 18" X 6" GALVANIZED JUNCTION BOX	EA	4				
655.420	36” X 30” X 20” NEMA 4X CABINET	EA	1				
655.630	4-INCH X 4-INCH PLASTIC NEMA 4R WIREWAY	LF	20				
655.640	6-INCH X 6-INCH PLASTIC NEMA 4R WIREWAY	LF	20				
655.710	REMOVAL OF EXISTING SELECT TOLL EQUIPMENT	LS	1				
655.800	LIGHTNING SUPPRESSION SYSTEM	LS	1				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
655.810	KEY SWITCH	EA	8				
655.820	DUPLEX RECEPTACLE	EA	8				
655.830	NEMA L5-30R RECEPTACLE	EA	4				
655.840	QUADPLEX RECEPTACLE	EA	6				
655.900	DYNAMIC MESSAGE SIGN FOR SB CANOPY - CENTER LANE	LS	1				
655.920	LED CANOPY LIGHT FIXTURE	EA	6				
655.940	NEW STAND-BY GENERATOR AND TRANSFER SWITCH	LS	1				
656.50	BALED HAY, IN PLACE	EA	170				
656.632	30 INCH TEMPORARY SILT FENCE	LF	14550				
659.10	MOBILIZATION	LS	1				
670.010	SEWAGE DISPOSAL REPLACEMENT SYSTEM	LS	1				
800.010	TOLL BUILDING	LS	1				
800.100	ELECTRICAL DEMOLITION	LS	1				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
				BROUGHT FORWARD:			
800.200	MECHANICAL DEMOLITION	LS	1.000				
800.300	TOLL PLAZA BOOTHS, CANOPY AND GANTRY DEMOLITION	LS	1.000				
800.400	NEW TOLL BOOTH INSTALLATION	LS	1.000				
800.900	GENERATOR PAD	LS	1.000				
800.910	TRANSFORMER PAD	LS	1.000				

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 duplicate.

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., 201___

Witnesses:	CONTRACTOR	
_____	_____	*(SEAL)*
_____	_____	*(SEAL)*
_____	_____	*(SEAL)*
	SURETY	
_____	_____	*(SEAL)*
_____	_____	*(SEAL)*
_____	_____	*(SEAL)*

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

FINAL LIEN AND CLAIM WAIVER AND AFFIDAVIT

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

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

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

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

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

_____
(Contractor)

By: _____

Title: _____

State of MAINE

County of _____

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

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

are true and correct upon his own knowledge and that the foregoing is his free act and deed in said capacity and the free act and deed of the above-named _____.
(Company Name)

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

(SEAL)

_____
Notary Public

My Commission Expires: _____

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART I – GENERAL PROVISIONS

(Rev. August 2011)

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART I – GENERAL PROVISIONS

(Rev. May 18, 2011)

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

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

DIVISION 100 - GENERAL PROVISIONS

100.1 Replacement of Former Standard Specifications and Details

The following paragraphs are added:

The Maine Department of Transportation Standard Specifications Revisions of 2002 as modified herein is referenced and incorporated in all Maine Turnpike Authority Construction Contracts. These Maine Turnpike General Provisions replace all previous Maine Turnpike General Provisions and are additions and alterations to the Maine Department of Transportation Standard Specifications. Maine Department of Transportation Consolidated Special Provisions or corrections, additions, and revisions to their Standard Specifications are not referenced or incorporated unless specifically included in the Contract. Applicable MaineDOT December 28, 2004 Consolidated Special Provisions, corrections, additions, and revisions have been incorporated into this document.

All references to components or employees of the Maine Department of Transportation listed in Column A shall also refer to components or employees of the Maine Turnpike Authority in Column B unless otherwise stated.

A	B
Maine Department of Transportation	Maine Turnpike Authority
Department	Authority
Commissioner	Executive Director
Contracts Engineer	Purchasing Manager
Contracts Section	Purchasing Department
Chief Engineer	Director of Engineering
Bureau of Project Development	Maine Turnpike Authority

SECTION 101 – CONTRACT INTERPRETATION

101.2 Definitions

The following definitions are added or revised:

Authority - The Maine Turnpike Authority, a body corporate and politic duly created and existing under and by virtue of an act of the Legislature of the State of Maine, Chapter 69 of the Private and Special Laws of 1941, as amended.

Award - The resolution of the Authority at an official meeting expressly authorizing the Executive Director or his designee to notify the successful Bidder that his/her Proposal has been accepted and that he/she is required to execute the Contract Agreement and to furnish satisfactory Bonds.

Environmental Information - Hazardous waste assessments, dredge material test results, boring logs, geophysical studies, and other records and reports of the environmental conditions. For a related provision, see Subsection 104.3.14, Interpretation and Interpolation.

Fabrication Engineer - The Department's representative responsible for Quality Assurance of pre-fabricated products that are produced off-site.

Geotechnical Information - Replace with the following: "Boring logs, soil reports, geotechnical design reports, ground penetrating radar evaluations, seismic refraction studies, and other records of subsurface conditions. For a related provision, see Subsection 104.3.14, Interpretation and Interpolation.

Holidays - The following are extended to include the Holiday Period:

HOLIDAY	HOLIDAY PERIOD
Martin Luther King Day	12:01 a.m. (Midnight) to 11:59 p.m. Martin Luther King Day.
President's Day	12:01 a.m. (Midnight) preceding Friday to 12:01 p.m. following Tuesday.
Easter	12:01 a.m. (Midnight) preceding Friday to 12:01 p.m. following Monday.
Memorial Day	12:01 p.m. preceding Thursday to 6:00 a.m. following Tuesday.
Labor Day	12:01 p.m. preceding Thursday to 6:00 a.m. following Tuesday.
Columbus Day	12:01 a.m. (Midnight) preceding Friday to 12:01 p.m. following Tuesday.
Veterans' Day	12:01 a.m. (Midnight) to 11:59 p.m. Veterans' Day.
Thanksgiving Day	12:01 a.m. (Midnight) preceding Wednesday to 12:01 p.m. following Monday.

Project - The following sentence is added:

All the Work to be performed under the Contract.

Solicitation - Contract proposal sent to a select list of Contractors. Solicitations do include a requirement for a bid bond. Solicitations do not need Maine Turnpike Board Approval for an award.

Turnpike - The entire toll highway, including all approaches, bridges, interchanges, toll facilities, and structures owned by the Maine Turnpike Authority, and authorized by Chapter 69, Private and Special Laws of Maine, 1941, as amended, and located on properties held in the name of the Authority.

Working Day - The Contractor shall not work during the period from 1/2-hour after sunset to 1/2-hour before sunrise, unless otherwise approved by the Resident.

If, after approval, Work is performed on a Saturday, Sunday, or a holiday, the day shall be considered a Working Day.

SECTION 102 - BIDDING

102.1.1 Basic Requirements

This Subsection is amended by the addition of the following:

To be eligible to Bid, prospective Bidders must not have been debarred or suspended from Bidding by the Authority or the Maine Department of Transportation.

102.6 Bid Guaranty

The second paragraph is deleted and replaced with the following:

No Proposal will be considered unless accompanied by a "Proposal Guaranty" in the form of an original bid bond, certified or cashier's check in favor of the Maine Turnpike Authority, in the amount of not less than five (5%) percent of the Total Amount of the Proposal, except that the amount of the check or Proposal Guaranty shall not be less than $500.00. Solicitations do not require a Bid Guaranty.

Sentence (C) of the third paragraph is deleted and not replaced.

102.7.1 Location and Time

The first paragraph is deleted and replaced with the following:

The Proposal and the Proposal Guaranty shall be enclosed in a sealed envelope furnished by the Authority for this purpose, and shall bear on the outside, the name and address of the Bidder as well as the designation of the Project as named in the Proposal form. Proposals will be received at the place and time stated in the Notice to Contractors, Solicitation, or Addendum as determined by the Authority. Proposals received after the time for opening of bids will be returned to the Bidder unopened. See also Subsection 102.11, Bid Responsiveness.

102.7.2 Effects of Signing and Delivery of Bids

Paragraph C, Certifications, is deleted and not replaced.

SECTION 103 - AWARD AND CONTRACTING

103.3.1 Notice and Information Gathering

This Subsection is deleted and replaced with the following:

The Authority will review the Bid Proposals. As a condition for Award of a Contract, the Authority may require an Apparent Successful Bidder to demonstrate to the Authority's satisfaction that the Bidder is responsible and qualified to perform the Work. If such information is required, the Authority, or the Authority’s agent, will contact the Apparent Successful Bidder and request specific information. If requested by the Apparent Successful Bidder, this request can be in writing. The Apparent Successful Bidder shall respond to the request within 24-hours (one work day) unless both parties agree in writing to extend the deadline.

103.3.2 Notice of Determination

The first paragraph is deleted and replaced with the following:

If the Authority determines that a Bidder is “Not Qualified”, the Authority or its representative will notify the Bidder in writing of its determination. The notice will set forth the specific reasons therefore to the extent practical. Such reasons may include the following:

N. Bidder has previously performed Work for the State or for the Authority in an unsatisfactory manner;

O. Bidder does not have the capacity to perform the required Work in the opinion of the Authority;

P. This Project combined with other projects committed to by the Bidder puts him in excess of his capacity in the opinion of the Authority;

Q. Reasonable grounds for believing that the Bidder is interested in more than one Proposal for the Work contemplated;

R. Developments arise which, in the opinion of the Authority, adversely affect the Bidder's responsibility; and/or,

S. Lack of qualifications as determined by the Authority.

The Maine Turnpike Authority Board or Executive Director must approve the Award of a Contract. Once approved, the Contractor will be provided with a "Notice of Award". See Subsection 103.4.

103.3.3 Appeal

"Commissioner" is replaced with "Chief Operations Officer".

The third and fourth paragraphs are deleted and replaced with the following:

Within 14 Days of Receipt of such information and arguments, the Chief Operations Officer will notify the Bidder in writing as to whether the decision of "Not Qualified" is upheld, modified, or reversed. The Chief Operations Officer's decision is final.

After a final determination of "Not Qualified" the Bidder's Bid Guaranty will be returned and the Bidder will be ineligible to bid on future MTA Contracts until the Bidder has been determined "Qualified" by the Maine Turnpike.

103.4 Notice of Award

This Subsection is deleted and replaced with the following:

Within five (5) days of the Maine Turnpike Authority Board or Executive Director approval of a Contract Award, the Authority will transmit to the successful Bidder a Notice of Award along with the Contract Documents for execution by the Contractor. The Authority has the option of notifying the successful low Bidder that the above noted material is available at the Authority for the Contractor to pick-up. The Contractor has 20 days following the Bid Opening to deliver to the Authority the signed Contract Documents, required bonds, insurance certificates, and other required information from the successful Bidder. Once these Documents are submitted to the Authority, the Authority will execute the Contract. If the Authority does not execute the Contract within 30 days of receipt of all the proper requested information, the successful Bidder may withdraw their bid without forfeiture of its Bid Guaranty or bidding eligibility. If the Authority and the successful Bidder agree in writing, an extension may be allowed.

103.5.4 Execution of Contract by Bidder

The first sentence is deleted and replaced with the following:

The properly completed and signed Contract Agreement form provided in the Contract Documents constitutes the Bidder's offer.

103.8 Execution of Contract by Department

This Subsection is deleted and replaced with the following:

The Contract will be awarded or Proposals rejected within twenty (20) days from the date of Proposal openings, except that by mutual written agreement between the Bidders and the Authority, the award may be withheld for any length of time. Any Bidder not agreeing to extend the award date shall be eliminated from the Bid List without prejudice, and their Bid Bond released.

The Contract shall not be binding until the Contract has been executed by the Authority, nor shall any Work be performed on account of the proposed Contract until the Contract has been fully executed and delivered.

SECTION 104 - GENERAL RIGHTS AND RESPONSIBILITIES

104.2.1 Furnishing of Right-of-Way

The first sentence is deleted and replaced with the following:

The Maine Turnpike Authority will secure all necessary rights to real property within the Project Limits shown on the Plans.

104.2.3 Authority of Project Manager and Resident

The following sentences are added:

The Resident is not responsible for supervising the construction Work and is not responsible for monitoring jobsite safety.

The Resident is not authorized to increase the obligation of the Authority to the Contractor, except as specifically set forth in the Specifications.

104.3.5 Duties Regarding Inspection of Work

The following paragraphs are added at the end of Paragraph A. Safe Access:

The Contractor shall furnish the Resident with every reasonable facility for ascertaining whether or not the Work is performed and the materials are furnished in accordance with the requirements and intent of the Contract. Such inspection may include mill, plant or shop inspection. If at any time before acceptance of the Work, the Resident requests it in writing, the Contractor shall remove or uncover such portion of the finished Work as directed. After examination, the Contractor shall restore said portions of the Work to the standards required by the Specifications. Should the Work exposed or examined meet the requirements of the Plans and Specifications, the uncovering or removing and the restoration of the uncovered Work shall be paid for as Extra Work except that no such payment will be made in those cases for which such removal is required by the Plans and Specifications as a part of the Work under the Project. Should the Work not meet the requirements of the Plans and Specifications, the uncovering or removing and restoration shall be at the Contractor's own expense. Any Work done or materials used without suitable supervision or inspection may be ordered to be removed and replaced by the Contractor without extra compensation.

No Work shall be done at night, on weekends, or legal holidays, without prior notice and approval of the Resident. No night Work shall be done until the Contractor has provided an adequate and sufficient source of artificial light to permit examination by the Resident of the suitability of the materials being used and the quality and character of the workmanship.

104.3.7 Laws to be Observed

This Subsection is amended by the addition of the following:

Any section of roadway open to the traveling public is a public way and subject to the applicable rules, regulations, and laws.

104.3.8 Wage Rates and Labor Laws

This Subsection is amended as follows:

A. Federal Wage Rates and Labor Laws is deleted and not replaced.

B. State Wage Rates and Labor Laws.

This Subsection is amended by the addition of the following:

This Contract is governed by the Prevailing Wage Provisions in Title 26, Chapter 15 of the Maine Revised Statutes Annotated. State Wage Rates, if applicable to the Contract, will be included in the Special Provisions.

Fair Minimum Wages

The hourly wage rate paid to laborers of the General Contractor and all Subcontractors shall not be less than the prevailing hourly rate of wages for Work of similar character in the State of Maine. The fair minimum hourly rates determined by the State of Maine Department of Labor for this Contract are included as part of this Contract.

A copy of the Wage Determination(s) shall be provided by the Contractor to all Subcontractors on the Project. In addition, the Wage Determination(s) must be kept posted at the Work site by the Contractor and by all Subcontractors at a prominent location, easily accessible by the workers. On a Project where there is no such location, a Contractor may comply with this requirement by providing each worker with a copy of the Wage Determination(s) within the first full day that the worker works on that Project. The Contractor must be able to document that each worker has received a copy of the Wage Determination(s).

Records

The Contractor and all Subcontractors shall keep an accurate record noting:

- The name and occupation of each and all laborers, workmen, and mechanics employed by them, and all independent Contractors working under Contract to them in connection to the Project;
- Number of hours worked;
- Title of the job;
- Hourly rate or other method of remuneration for the job; and,
- Actual wages or other compensation paid to each of the laborers, workmen, mechanics, and independent Contractors.

A copy of this record must be kept at the jobsite and shall be available at all reasonable hours to the inspection of the Bureau of Labor and/or the Maine Turnpike Authority, its officers and agents. These records must be preserved for a minimum of three (3) years after the completion of the Contract.

A copy of each record must be filed monthly with the Maine Turnpike Authority. This information shall be sent directly to the Maine Turnpike Authority, Director of Engineering and Building Maintenance, Attention: Wage Rate Records, 2360 Congress Street, Portland, ME 04102. The records shall note the Maine Turnpike Contract Number.

The Contractor and all Subcontractors are subject to penalties described in Title 26, Chapter 15 of the Maine Revised Statutes Annotated, for any violations of the Fair Minimum Wage Rates Policy for the State of Maine.

104.3.11 Responsibility for Property of Others

This Subsection is amended by the addition of the following:

The Contractor shall respond to all damage claims in writing, within 30 days, to the party making a damage claim. The response shall state that the Contractor accepts responsibility for the damage or outlines the reasons why the claim has been denied. If the Contractor has turned the claim over to their insurance agent or carrier, the name of the agent or carrier, along with the contact person, address and telephone information shall be included in the response to the claimant and a copy to the Authority. A standard form letter denying the claim without an explanation of the situation shall be unacceptable. A copy of the response letter shall be submitted to the Authority within the 30 day response time. The Authority shall review the response letter and will determine if the Contractor has replied in a responsive manner. If the Authority does not receive a response letter or action report from the Contractor within the 30 day response time, the Authority will determine if the Contractor is responsible for the claimed damage. If, in the absence of the Contractor's response or action report, the Authority deems the claim to be valid, the Authority will at its option pay the damage claim and deduct the amount of the claim from the Contractor. The Contractor will not be entitled to recoup these funds if their response was not transmitted within the 30 day response time. The Authority will not intervene in any claim actions where the Contractor's insurance carrier is conducting a valid, ongoing claim investigation.

104.3.14 Interpretation and Interpolation

The first sentence is change from "...and Geotechnical Information." to "...Environmental Information, and Geotechnical Information".

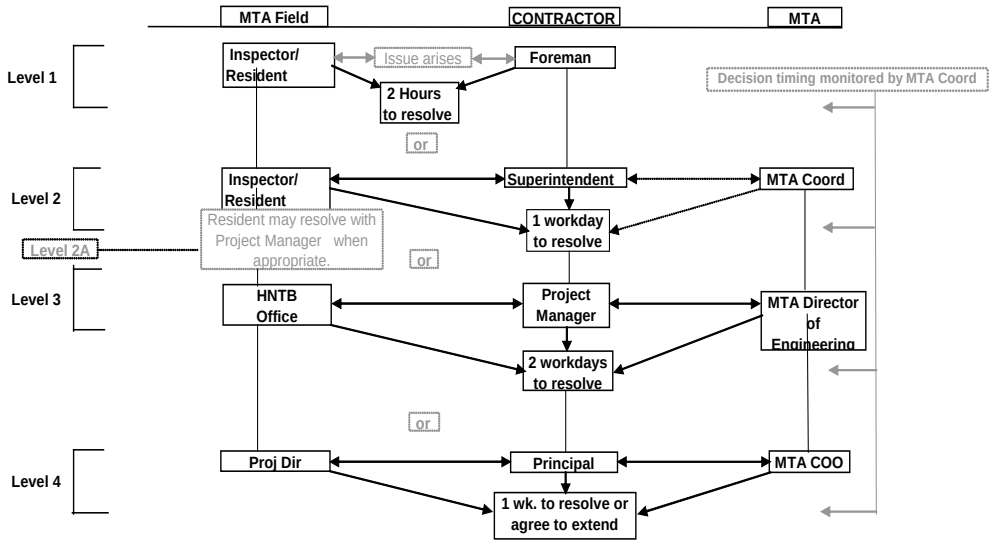
104.4.2 Preconstruction Conference

The following Matrix is added:

Project Decision Matrix

A Project "communication decision tree" will be developed mutually by the Authority and the Contractor during either the preconstruction meeting or partnering session. This Decision Matrix will clearly define, by descriptive job title and name, the respective counterparts for the Authority, and the Contractor who will be responsible for resolving issues at their respective levels of communication. Each level of communicators will be assigned a dollar magnitude of authority and a designated period of time within which all disputed issues must either be resolved or referred to the next higher level of communicators. The purpose of this Decision Matrix is to accelerate the resolution of decisions, to promote resolution at the lowest possible level, and to reduce the number of issues that become disputes.

The following is a sample of the Decision Matrix:



Level 5 **If an issue is not resolved at Level 4, the matter becomes a Dispute. Refer to Section 111**

Notes:

1) **Each project will enter names in all title boxes at Preconstruction or Partnering sessions.**
2) **Substitute names will be provided for all key decision levels.**
3) **Each decision level will be empowered with a maximum dollar guidance value.**
4) **Issues will automatically bounce up to next level if decision time limits are surpassed.**

104.4.5 Early Negotiation

The second paragraph in Part A is deleted and replaced with the following:

Such notice may not be verbal. Notice shall be in the form of a written memo with signatures representing both the Owner and Contractor or shall be in the form of meeting minutes within 14 days of the date that the issue became known. Meeting minutes shall not be valid documentation until they are accepted by the Resident and the Contractor.

Paragraph C, Additional Consideration, is deleted and not replaced. See related Subsection 104.4.2.

104.4.7 Cooperation With Other Contractors

This Subsection is amended by the addition of the following:

The Contractor shall cooperate with the Maine Turnpike Authority. The Authority reserves the right to conduct maintenance operations and to erect and remove traffic control devices as deemed necessary by the Authority or the Resident within or adjacent to the Project.

The Contractor shall note that other contracts may be awarded for Work adjacent to this Contract and these shall be considered adjacent contracts. The Contractor shall cooperate with other Contractors and the Resident so that all Work can be completed in a safe and timely manner. The Resident may direct the Contractor to revise the Work or schedule based on Work that is ongoing in the adjacent Contract. The Contractor's Superintendent or Project Manager shall attend coordination meetings with the Resident and the adjacent Contractors at least once every two weeks. All Contractors bear the full responsibility of cooperation and coordination with each other in the planning and scheduling of traffic closures, stoppages, and other construction activity. The Resident's responsibility for coordination is limited to the timely dissemination of all schedules and information submitted by adjacent Contractors. Neither the Resident, nor the Maine Turnpike Authority, shall bear any responsibility for costs resulting from a Contractor's failure to submit all information as required. Issues and concerns not presented for review and discussion at joint Contractor meetings will not later be cause for claims. This cooperation shall be completed at no additional cost to the Authority.

The Contractor working on an adjacent section may require the placement of temporary construction signs and traffic control devices within this Project area. The placement and maintenance of these devices by another Contractor shall be allowed in this Contract at no additional cost to the Authority.

104.4.10 Coordination of Bridge Closure/Bridge Width Restriction Notification

This Subsection is deleted and replaced with the following:

The Contractor shall notify the Authority a minimum of two (2) weeks prior to the date of closure/restriction with the date on which the closure/restriction will begin and the anticipated duration of the closure/restriction. The Authority will be responsible for notification to others.

104.5.9 Landscape Subcontractors

This Subsection is deleted and replaced with the following:

The Contractor shall retain only Landscape Subcontractors that are certified by the Maine Department of Transportation Environmental Office Landscape Unit.

SECTION 105 – GENERAL SCOPE OF WORK

Scope of Section

The second paragraph is deleted and replaced with the following:

This Contract is not federally funded.

105.1 Intent of the Contract

This Subsection is amended by the addition of the following:

The Plans and Specifications complement and supplement each other. Should any Work be required, which is not denoted on the Plans or in the Specifications because of an omission, but which is nevertheless necessary for the proper performance and completion of the Project, such Work shall be fully performed as if it were described and delineated. Should any misunderstanding arise as to the intent or meaning of said Plans and Specifications, refer to Subsection 104.4.4, Requests for Information.

The silence of the Specifications, Plans, or other supplemental documents as to any detail, or the apparent omission from them of a detailed description concerning any point, shall be regarded as meaning that only material and workmanship of excellent quality are to be used.

105.2.3 Joint Duty Regarding Safety

The first sentence is amended as follows:

The “Contractor’s TCP” is deleted and replaced with “Traffic Control Plan”.

This Subsection is amended by the addition of the following:

Nothing in the foregoing paragraphs shall be construed as relieving the Contractor from full responsibility for safe prosecution of the Work at all times. The Resident is not responsible for jobsite safety.

The following Subsection is added:

105.2.4.1 Lockout/Tagout Procedures

Prior to the start of Work, the Contractor and the Maine Turnpike Authority shall exchange and review the other party's Lockout/Tagout Procedures for the control of hazardous energy. If the Lockout/Tagout Procedures are similar and neither party has concerns, the two parties shall agree to abide by the procedures of the other party. Only the authorized individual who locked or tagged-out a circuit or piece of equipment is permitted to remove the lockout/tagout, except as provided for in the respective Lockout/Tagout Procedures.

Should either the Contractor or the Maine Turnpike Authority have concerns with the other party's Lockout/Tagout Procedures, the Safety Officers of the Contractor and the Maine Turnpike Authority shall meet, discuss and resolve the areas of concern. The Authority reserves the right to have the Contractor comply with the restrictions and prohibitions of the Maine Turnpike Authority's Lockout/Tagout Procedures if the Authority determines the Contractor's Lockout/Tagout Procedures are inadequate to protect the Authority's employees and patrons.

105.4.1 Maintenance During Construction

This Subsection is amended by the addition of the following:

Paved Surface - The Contractor is responsible for maintaining the existing paved shoulder, ramps, and travel lanes on the Maine Turnpike in good condition. The presence of tracked-dirt on the paved surfaces is unacceptable. The Resident shall have the sole authority to determine the acceptability of the paved surfaces. The use of stabilized construction entrances and frequent sweeping of the shoulder are the responsibility of the Contractor and shall be completed at no additional costs to the Authority.

Gravel Surface - The Contractor is responsible for maintaining gravel surfaces that are used for traffic in good condition. Potholes and wheel ruts are unacceptable. The Resident shall have the sole authority to determine the acceptability of the surfaces. Repairing the surfaces are the responsibility of the Contractor and shall be completed at no additional costs to the Authority.

Signs and Delineators - The Contractor is responsible for maintaining all mile markers, delineator, and signs including regulatory, warning, and guide signs during construction. Maintenance of signs shall mean that signs are clearly visible to motorists at the required height during construction. These items shall be kept in their existing location as long as is practicable. At no time shall any signs not be visible to the

driver. Construction material or equipment shall not obscure signs. This Work shall be accomplished at no additional cost to the Authority.

Erosion and Sedimentation Control - The Contractor shall plan their operations to protect existing Work from erosion. The Contractor is responsible for the inspection and maintenance of all erosion and sedimentation control devices until final acceptance. No payment will be made to repair failed areas if the Best Management Practices had not been utilized prior to a weather event.

105.4.3 Maintenance During Winter Construction

This Subsection is amended by the addition of the following:

The Maine Turnpike Authority will be responsible for winter maintenance including snow removal and application of salt on Maine Turnpike pavement open to traffic.

105.5.1 General Requirements

This Subsection is amended by the addition of the following:

Toll Free Passage on the Turnpike

The Contractor shall be granted free use of the turnpike for movement of vehicles, labor and equipment and for delivery of material essential to the Work. The Contractor will be issued cards with the Contract Number and Contractor Name while working on the Project. The cards shall be transferable and distributed by the Contractor to employees and vehicles working on the Project. The cards may only be used while working on the Project designated on the cards. Such free use shall be limited to the portion of the turnpike between the site of the Work and the nearest practicable exit including movement of vehicles, labor, equipment and materials from one site to another Work site. All vehicles must stop at a manned lane at the toll plazas to present the cards to the toll attendant. Vehicles without the required cards shall pay the required toll. This shall not be a reimbursable expense. The Contractor shall advise the Resident of the number of cards that are required. All cards shall be returned to the Resident at the completion of the Project. The use of the cards for toll free travel shall be revoked if the cards are misused. The Contractor shall nevertheless comply with regulations of the Authority relating to use of the turnpike and with established controls for non-revenue vehicles.

Existing Access

All existing access from local roads to the Maine Turnpike shall remain passable to emergency vehicles at all time. At no time shall construction equipment or material block these roads. Any misuse of this privilege will result in the Contractor's loss of access through these gates. The Contractor shall provide a lock and a piece of chain to link to the existing padlock on the gate allowing access to the Contractor and emergency vehicles.

Access From Local Roads

The Contractor shall not impact wetlands or streams to construct access to the Project. The Contractor may construct temporary access to the turnpike to facilitate the Project. Any damage caused to private property or local roads as a result of the access shall be repaired at the Contractor's own expense. The Contractor shall prepare a written plan outlining the proposed access.

At a minimum, the plan shall outline the following:

- Estimated number of vehicles;

- Time and duration of operation;
- Types of vehicles to use the access;
- Plans to construct a stabilized construction entrance;
- Plan to keep the local road free of tracked-mud and dust;
- Plan to control access to prevent unauthorized use;
- Restoration plan; and,
- Written permission from private property owners (if required).

The Contractor is required to retain the services of qualified flaggers to control the Contractor's operation at the local road access. Flaggers shall be present whenever construction vehicles are utilizing the access. The Contractor shall be responsible for constructing a gate across the access point to prohibit unauthorized access. The Contractor shall also construct a stabilized construction entrance in accordance with the MaineDOT Best Management Practices. All cost associated with the access including, but not necessarily limited to, the construction, restoration, flaggers, gate, and stabilized construction entrance shall be the responsibility of the Contractor. Failure to utilize flaggers will result in termination of permission to use local roads for access. Failure to keep local roads clear of tracked-mud will result in termination of permission to use local roads for access.

Construction Access

The Contractor shall construct a stabilized construction entrance in accordance with the Best Management Practices at all locations where construction vehicles will exit the mainline and/or enter the existing paved shoulder from a non-paved area. The Resident shall approve of the locations. The stabilized construction entrance shall be constructed in conjunction with the clearing activities or other early activities. Additional stabilized construction entrances may be required due to the Contractor's operations as well as site conditions. The construction and maintenance of the stabilized construction entrance shall be incidental.

Change of Direction

The Contractor will not be permitted to reverse directions (U-turns) at the toll plazas or at interchanges. All vehicles must exit the turnpike prior to reversing directions.

The Contractor shall not use the median openings on the turnpike unless the opening is located within passing lane closures on both roadways. The Contractor will be assessed a fine every time any employee of the Contractor, Subcontractor or supplier is observed using a median opening by a Resident or turnpike employee anywhere on the Maine Turnpike throughout the duration of the Contract. The fine will be deducted from monies owed to the Contractor.

The fines will be levied on a per occurrence basis as follows:

NUMBER OF OCCURRENCES	FINE
First	$100

For the second occurrence, and any occurrence thereafter, the fine is increased by $100 per each occurrence. The number of occurrences is not specific to a Contract, an individual or a vehicle, but based solely on the number of times any employee of the Contractor, Subcontractor or supplier is observed using a median opening anywhere on the Maine Turnpike. The Contractor shall be notified in writing of the violation by the Authority.

105.6 Construction Surveying

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

105.6.1 Authority Provided Services

The Authority will provide the Contractor with the description and coordinates of vertical and horizontal control points, set by the Authority, within the Project Limits, for full construction Projects and other Projects where survey control is necessary. For Projects of 1,500 feet in length, or less: The Authority will provide three points. For Projects between 1,500 and 5,000 feet in length: The Authority will provide one set of two points at each end of the Project. For Projects in excess of 5,000 feet in length: The Authority will provide one set of two points at each end of the Project, plus one additional set of two points for each mile of Project length. For non-full construction Projects and other Projects where survey control is not necessary, the Authority will not set any control points and, therefore, will not provide description and coordinates of any control points: Upon request of the Contractor, the Authority will provide the Authority's survey data management software and Survey Manual to the Contractor, or its survey Subcontractor, for the exclusive use on the Authority's Projects.

105.6.2 Contractor Provided Services

Utilizing the survey information and points provided by the Authority, described in Subsection 105.6.1, Authority Provided Services, the Contractor shall provide all additional survey layout necessary to complete the Work. This may include, but not necessarily be limited to, reestablishing all points provided by the Authority, establishing additional control points, running axis lines, providing layout and maintenance of all other lines, grades, or points, and survey quality control to ensure conformance with the Contract. The Contractor is also responsible for providing construction centerline, or close reference points, for all utility facility relocations and adjustments as necessary to complete the Work. When the Work is to connect with existing structures, the Contractor shall verify all dimensions before proceeding with the Work. The Contractor shall employ or retain competent engineering and/or surveying personnel to fulfill these responsibilities.

The Contractor must notify the Authority of any errors or inconsistencies regarding the data and layout provided by the Authority as provided by Subsection 104.3.3, Duty to Notify Department If Ambiguities Discovered.

105.6.2.1 Quality Control

The Contractor is responsible for all construction survey quality control. Construction survey quality control is generally defined as, first, performing initial field survey layout of the Work and, second, performing an independent check of the initial layout using independent survey data to assure the accuracy of the initial layout; additional iterations or checks may be required if significant discrepancies are discovered in this process. Construction survey layout quality control also requires written documentation of the layout process such that the process can be followed and repeated, if necessary, by an independent survey crew.

105.6.3 Quality Assurance

It is the Authority's prerogative to perform construction survey quality assurance. Construction survey quality assurance may or may not be performed by the Authority. Construction survey quality assurance is generally defined as an independent check of the construction survey quality control. The construction survey quality assurance process may involve physically checking the Contractor's construction survey layout using independent survey data, or may simply involve reviewing the construction survey quality control written documentation. If the Authority elects to physically check the

Contractor's survey layout, the Contractor's designated surveyor may be required to be present. The Authority will provide a minimum notice of 48-hours to the Contractor, whenever possible, if the Contractor's designated surveyor's presence is required. Any errors discovered through the quality assurance process shall be corrected by the Contractor, at no additional cost to the Authority.

105.6.4 Boundary Markers

The Contractor shall preserve and protect from damage all monuments or other points that mark the boundaries of the right-of-way or abutting parcels that are outside the area that must be disturbed in order to perform the Work. The Contractor indemnifies and holds harmless the Authority from all claims to reestablish the former location of all such monuments or points including claims arising from 14 MRSA § 7554-A. For a related provision, see Subsection 104.3.11, Responsibility for Property of Others.

105.7.1 General

The following paragraphs are added:

Within ten (10) days after the date of execution of the Contract, the Contractor shall inform the Resident in writing of the sources from which he proposes to obtain the materials required for the Project and statements of quality of these materials as hereinafter required in Subsection 106.01, Roles Regarding Quality. Information or materials not required to be incorporated in the Work within six (6) months after said date of execution, may be furnished within thirty (30) days.

Prior to the approval of the submittal, any Work done or materials ordered shall be at the Contractor's own risk. All submittals shall be stamped and signed by the Contractor verifying their approval of the Shop Drawings.

Prior to forwarding submittals to the Resident for review and approval, the Contractor shall mark the Item Number on each submittal for identification, thoroughly check the submittals for compliance with the Contract Documents, and place its stamp of approval on each sheet certifying that the Contractor has so checked each submittal. The Contractor shall certify that "This Shop Drawing has been thoroughly checked and complies with the Contract Documents and field measurements and the item fits with adjoining Work except as noted". Submittals which do not contain this stamp of approval and certification, or which are incomplete, have not been checked, have been checked only superficially, or contain numerous errors, will be returned un-reviewed by the Resident for resubmission by the Contractor. Delays in obtaining approvals, other than those caused by the Authority, are not grounds for granting an extension of time. Disclaimers by the Contractor, any Subcontractor, or supplier of responsibility for any requirements of the Contract Documents, will not be accepted by the Authority and will be deemed invalid.

The following submissions are required if applicable to the Work:

- Construction plans for access
- Project master schedule
- Updated schedules as required
- Shop Drawings
- Spill Prevention Control and Countermeasure (SPCC) Plan
- Traffic control plans
- Temporary earth support system submission
- Bridge beam or structural steel erection plan

105.7.4 Submittal Requirements

The second paragraph is deleted and replaced with the following:

For the first and subsequent submittals, the Contractor shall submit a minimum of seven (7) sets of drawings to the Resident on the size sheets required unless otherwise directed by the Resident.

105.8.1 Temporary Soil Erosion and Water Pollution Control

This Subsection is amended by the addition of the following:

Spill Prevention Control and Countermeasure (SPCC) Plan

Any areas where petroleum products, oils or hazardous materials are handled or stored will require a Spill Prevention Control and Countermeasure (SPCC) Plan. The Plan will be submitted to the Resident before construction begins for review and approval. At a minimum, the Plan shall provide the following information:

1. Name of person who is responsible for spill prevention;

2. Description of handling or storage location, noting setbacks from water bodies where relevant. Significant sand and gravel aquifers and other sensitive resources must be avoided wherever possible;

3. Description of storage and containment facilities;

4. Description of equipment and/or materials used to prevent discharges (including sorbent materials);

5. Preventative measures to minimize the possibility of a spill; and,

6. Contingency plan if spill should occur.

The approved plan must be posted at the jobsite. All personnel working in the area are required to read and be familiar with the plan.

There shall be no separate payment for preparation of a SPCC Plan acceptable to the Resident and preparation is considered incidental to the Work.

ENVIRONMENTAL STANDARDS

The Project will be performed in accordance with the MaineDOT Best Management Practices (BMP) latest issue. The Contractor shall fully comply with all erosion and sedimentation control requirements outlined in the BMP's or contained herein. Non-compliance with these requirements as determined by the Resident shall result in a financial penalty of $1,000 per day, per violation. Any fines assessed to the Maine Turnpike Authority as a result of the Contractor's non-compliance shall be paid by the Contractor. If the Contractor fails to pay, the cost of the fine will be deducted from monies due, or which may become due to the Contractor under this Contract.

In the event of conflict between these Specifications and other erosion and pollution control laws, rules or regulations of other Federal, State and local agencies, the more restrictive law, rules or regulations shall apply.

The standards as described below shall be met on the Project:

1. Temporary erosion control measures shall be maintained until the site is permanently stabilized with vegetation or other permanent control measures.

2. The Contractor will immediately take appropriate measures to prevent erosion or sedimentation from occurring or to correct any existing problems regardless of the time of year.

3. Work in wetlands is prohibited except to the minimum extent necessary for completion of the Work as detailed on the Plans. Excavated and other material shall not be stockpiled in wetlands. Haybales, silt fence or other suitable barriers shall be used, where necessary, to prevent sedimentation from eroding materials.

4. Uncured concrete shall not be placed directly into the water body. Concrete may be placed in forms and shall cure at least one (1) week prior to form removal. No washing of tools, forms, etc. shall occur in or adjacent to the water body or wetland. Any additional requirements are outlined in Subsection 107.261 of the Special Provisions.

5. Disturbance of natural resources beyond the construction limits shown on the Plans is not allowed.

6. Bare earth slopes shall be roughened to dissipate sheet flow. This shall be accomplished by "tracking" the slope perpendicular to the centerline. No bare earth shall be maintained for more than five days without surface roughening. This Work will not be measured separately for payment, but shall be incidental to the Excavation item.

7. No wheeled or tracked equipment shall be operated in the water. Equipment operating on the shore may reach into the water with a bucket or similar extension. Equipment may NOT cross streams.

8. Existing ditches shall be maintained until the new ditches are stabilized. Stone check dams shall be placed in existing ditches prior to construction as to prevent the release of sedimentation. Stone check dams shall be installed at the outlets of all existing and proposed ditches adjacent to all stream and wetlands.

9. The Contractor's operation may require the placement of temporary pipes and fill over a ditch line to provide access to the Work area. The Resident shall approve the size of the pipe. The placement and removal of the temporary access will not be measured separately for payment, but shall be incidental to the Excavation item.

105.10 Equal Opportunity and Civil Rights

105.10.1 Requirements Applicable to Federally Funded Contracts

This Subsection is deleted and not replaced.

105.10.2 Requirements Applicable to All Contracts

The following is added after Paragraph (A), Maine Code of Fair Practice and Affirmative Action, Paragraph 4).

The Maine Turnpike Authority is an equal opportunity employer and as such, requires all Contractors to pursue in good faith affirmative action programs.

THEREFORE;

The Contractor hereby agrees to the following requirements:

1. The Contractor will pursue an affirmative action program which includes procedures designed to increase the numbers of minorities, women, and handicapped at all levels and in all segments of the workforce where imbalances exist. Such a program should include an assessment of the existing situation, and the development of realistic goals for necessary actions. These goals and related procedures and timetables should not require rigid quotas but are commitments which the Contractor should make every good faith effort to achieve.

2. In connection with Contracts in excess of $250,000, the Contractor will insure contractually that all Subcontractors shall also pursue an affirmative action program meeting the above requirements. The Contractor shall also ensure contractually that all Subcontractors with Contracts in excess of $50,000 pursue an affirmative action program meeting the above requirements.

3. An affirmative action program will provide that no Contractor and/or Subcontractor will discriminate against an employee or applicant for employment because of race, color, religious creed, sex, national origin, ancestry, age, physical handicap or mental handicap unless based upon a bona fide occupational qualification. Such action shall include, but not necessarily be limited to, the following; employment, upgrading, demotions, transfers, recruitment or recruitment advertising, layoffs or terminations, rates of pay and compensation, and selection for training and apprenticeship.

Paragraph (D), Prevention of Sexual Harassment, is deleted and replaced with the following:

Contractors are responsible, under Maine State Law, for ensuring and maintaining a Work environment that is free from sexual harassment. The Contractor shall comply with all relevant provisions of Maine State Law in regard to sexual harassment including, but not necessarily limited to, 5 MRSA 4572, 26 MRSA 806-807, and the regulations of the Maine Human Rights Commission.

Subsections 105.10.2 (E), DBE Reporting Requirements, and (F), Certification of Continuing EEO Efforts, are deleted and not replaced.

105.11 Other Federal Requirements

This Subsection is deleted in its entirety and not replaced.

The following Subsection is added:

105.12 Limitations of Operations

The Contractor shall keep the existing shoulder clear of construction activity except for the period of shoulder reconstruction. The Contractor shall not park or store construction equipment, vehicles, or materials on the shoulder. Construction vehicles shall not enter the mainline travel lane until they can safely merge with the traffic in the travel lane. The construction access shall be in accordance with the details in the Plans. The Resident must approve all shoulder closures.

Existing drainage shall be maintained at all times. All ditches that discharge into wetlands shall have a series of stone check dams installed in the ditch near the outlet prior to the commencement of clearing activities in the area.

SECTION 106 – QUALITY

106.3.3 Sources

Paragraph A, General, is amended by the addition of the following:

Preference in the purchase of supplies and materials, other considerations being equal, shall be given in favor first of supplies and materials manufactured and sold within the State of Maine, and second, of supplies and materials manufactured within the United States. Materials and supplies sold outside the United States will be considered third in the preference order.

106.3.4 Storage

This Subsection is amended by the addition of the following:

The Contractor shall be responsible for the security of all storage areas. Materials and supplies that are stolen, damaged or otherwise made unacceptable while in storage shall be replaced in kind at the Contractor's own expense.

106.3.7 Sampling and Testing

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

106.6 Acceptance

All paragraphs after the first paragraph are deleted and not replaced.

106.8.3 Unauthorized Work

The following paragraphs are added:

No omission or failure on the part of the Resident to disapprove or reject any Work or material shall be taken to be an acceptance of any defective Work or material. Within the time set by the Resident, the Contractor shall remove any Work or material condemned by the Resident and shall rebuild and replace the same without extra compensation and in default thereof the removal and replacement may be done by the Authority at the expense of the Contractor; or, in case the Resident should not consider the defect of sufficient importance to require the Contractor to rebuild or replace any imperfect Work or material, he shall have power, and is hereby authorized, to make an equitable deduction from the Contract price.

Materials which do not conform to the requirements of these Specifications shall be considered as defective and will be rejected, whether in place or not, and shall be removed from the Project. No material which has been rejected, the defects of which have been corrected or removed, shall be used until approved by the Resident in writing.

SECTION 107 – TIME

The following Subsection is added:

107.1.1 Substantial Completion

An 80 percent reduction of retainage will be considered by the Authority when the Project is substantially complete. The Contractor shall include an explanation of the outstanding Work, an estimate of the cost to complete the Work, and a schedule for completing the Work. Seasonal limitations as well as warranty and establishment periods (for vegetation) shall be addressed.

107.3.1 General

This Subsection is amended as follows:

See related Subsection 101.2, Definitions: Holidays.

Work that impacts traffic may be subjected to further restrictions. See related Special Provision Section 652.

107.3.2 Night Work

This Subsection is amended by the addition of the following:

- The Maine Turnpike encourages the Contractor to construct the Project cost effectively while maintaining quality and conformance with all Federal, State and local laws. To facilitate this process, the Maine Turnpike recognizes that the Contractor may choose to construct portions of the Project at night.
- The following is a partial list of activities that would be favorably considered for night construction. The final determination of applicability by the Authority will be based on the Contractor's plan of operation. The Contractor shall demonstrate that the Work can be accomplished in conformance with the appropriate regulations.

Highway Related Work

- Installation and removal of traffic control devices (drums, concrete barrier, impact attenuators)
- Installation and removal of painted pavement markings
- Placement of pavement
- Sawcutting of pavement
- Installation and removal of guardrail

Bridge Related Work

- Delivery of materials (except oversize loads)
- Placement and removal of pier forms
- Shielding of old and new bridge
- Installation and removal of deck and diaphragm forms
- Installation and removal of overhang brackets
- Field painting and preparation of damaged paint areas
- Application of penetrating sealers
- Installation of sign panels on sign bridges

107.3.3 Sundays and Holidays

This Subsection is amended by the addition of the following:

"Saturday" is added before Sunday.

Requests to work outside of the allowable periods must be submitted in writing and approved by the Resident prior to the start of Work. Approval for Work, that in the Authority's opinion will not significantly impact traffic flow, will not be unreasonably withheld.

107.4.2 Schedule of Work Required

This Subsection is amended by the addition of the following:

No Pay Requisition will be approved for payment until the schedule requirement is fulfilled and accepted by the Maine Turnpike Authority.

In addition to the Schedule required hereinbefore, the Contractor shall submit, no later than 12:00-noon every Thursday, a detailed plan of his operations for the following week. This plan shall show the type of Work to be done and the traffic lanes that are to be impacted. This updated plan will be used by the Resident to schedule the appropriate resources and inform other interested parties of the proposed Work.

107.4.4 Schedule Revisions

This Subsection is amended by the addition of the following:

The progress of Work shall be compared against the Schedule of Work at a job meeting once every month. If the Authority determines that the Contractor's actual progress is not in substantial conformity with the Schedule of Work, then the Contractor shall submit a revised Schedule of Work to the Authority depicting the increased or decreased variations in activity durations and milestones as compared to previously submitted schedule(s). If noted in the meeting minutes, or directed in writing by the Resident, the Contractor shall submit a revised Schedule to the Authority within one week of the request. If a revised realistic Schedule is not received within one week of the request, the monthly pay requisition will be withheld. Failure to modify completion dates without a commitment to modify Project resources shall be deemed an unrealistic Schedule unless the particular activity had adequate float.

107.7.2 Schedule of Liquidated Damages

The table of liquidated damages is deleted and replaced with the following:

Original Contract Amount From More Than	Original Contract Amount up to and Including	Amount of Liquidated Damages per Calendar Day
$0	$100,000	$100
$100,000	$300,000	$200
$300,000	$500,000	$400
$500,000	$1,000,000	$575
$1,000,000	$2,000,000	$750
$2,000,000	$4,000,000	$900
$4,000,000	and more	$1,875

This Subsection is amended by the addition of the following:

At the option of the Authority, the Contractor may be held responsible for all costs incurred by the Authority which are due to any Work that remains incomplete after the time specified for the completion of the Contract, in addition to the daily calendar day charge.

107.9.1 Final Clean-up and Finishing

This Subsection is amended by the addition of the following:

No separate payment will be made for final clean-up and restoration of property, but the cost thereof shall be included in the prices bid for the various items scheduled in the Proposal.

SECTION 108 - PAYMENT

108.1 Measurement of Quantities for Payment

This Subsection is amended by the addition of the following:

The quantities in the Schedule of Items are the approximate totals. The breakdown of quantities for various locations is approximate and is for information only. No change in the bid price will be considered for changes in the actual quantities at each location except as provided for in Subsection 109.1, Changes in Quantities.

108.1.2 General Measurement Provisions

The first sentence is deleted and replaced with the following:

The Maine Turnpike Authority will utilize the U.S. Customary system for all units of measurement.

108.1.3 Provisions Relating to Certain Measurements

This Subsection is amended by the addition of the following:

No allowance will be made for surface laid over a greater area than indicated on the Plans or otherwise authorized, or for excavation removed or embankment placed beyond the slope lines shown on the cross-sections, except as otherwise specifically noted or authorized by the Resident in writing.

108.2.1 Generation of Progress Payment Estimates

The first paragraph is deleted and replaced with the following:

The Resident will make current estimates in writing once each month, on or before the date set by the Resident at the time of starting Work, or from time to time as the Work progresses. Progress payments twice per month will not be allowed. The estimate shall include all materials complete in place and the amount of Work performed in accordance with the Contract, during the preceding month or period and the value thereof figured at the unit prices contracted together with estimates of the cost of Extra Work performed during the same period. Estimates or payments will not be made, if in the opinion of the Resident, the Work is not proceeding in accordance with the provisions of the Contract. The Contractor agrees to waive all claims relating to the timing and amount of such estimates.

108.2.2 Payment

The first two sentences are deleted and replaced with the following:

The Maine Turnpike Authority will make payment within 30 days of Contractor and Resident concurrence of progress payment.

108.2.3 Mobilization Payments

The second paragraph is deleted and replaced with the following:

A. The first payment of 50 percent of the lump sum price for mobilization or five percent of the original Contract Amount, whichever is less, will be made with the first monthly estimate.

B. The second payment of 25 percent of the lump sum price for mobilization or 2.5 percent of the original Contract Amount, whichever is less, will be made following completion of 25 percent of the proposed Contract Amount.

C. The third payment of 25 percent of the lump sum price for mobilization or 2.5 percent of the original Contract Amount, whichever is less, will be made following completion of 50 percent of the proposed Contract Amount.

D. Upon substantial completion of the Work on the Project, as determined by the Resident, payment of any amount bid for mobilization in excess ten percent of the original Contract Amount will be paid.

All payments are subject to standard retainage.

Demobilization will not be measured separately for payment, but shall be incidental to Item 659.10, Mobilization.

108.3 Retainage

This Subsection is deleted and replaced with the following:

From the total of the amounts so ascertained there will be deducted an amount equivalent to 7.5 percent of the whole, to be retained by the Authority until after the completion of the entire Contract in an acceptable manner, and the balance, or a sum equivalent to 92.5 percent of the whole shall be certified by the Resident to the Authority for payment.

If it became evident, on the basis of approved progress schedules, or otherwise, that the completion date for the Contract will not be met, the Authority reserves the right to retain the amount of the liquidated damages which have apparently accumulated, in addition to 7.5 percent of the value of the Work done to date.

If at any time there shall be evidence of any lien or claim for which, if established, the Authority might become liable and which is chargeable to the Contractor, the Authority shall have the right to retain out of any payment, then due or thereafter to become due, an amount sufficient to completely indemnify the Authority against such lien or claim.

If the Contractor elects to furnish to the Authority a surety bond in the amount of twice the amount of all liens or claims pending against the Contractor, then the Authority will not exercise the aforementioned right to make retention out of payments on account of such liens or claims.

The payment of any current estimates or of any retained percentages shall in no way affect the obligations of the Contractor to repair or renew any defective parts of the construction and to be responsible for all damage due to such defect.

All material estimates and payments shall be subject to correction in subsequent partial estimates and payments and on the final estimate and payment.

108.4 Payment for Materials Obtained and Stored

The first paragraph is amended as follows:

In the second sentence, the words "...Delivered on or near the Work site at acceptable storage places." are deleted and not replaced.

108.4.1 Price Adjustment for Hot Mix Asphalt

This Subsection is deleted and replaced with the following:

For Contracts containing an excess of 5,000 tons of bituminous pavement, an asphalt price adjustment will be made for all bituminous concrete placed six (6) months after the bid date of the Contract. No asphalt price adjustment will be allowed for Contracts containing less than 5,000 tons. For Contracts containing more than 5,000 tons, no adjustment will be made for asphalt placed at any time within six months of the bid date.

Price adjustment will be based on the variance in cost for the performance-graded binder component of the hot mix asphalt. The quantity of hot mix asphalt for each pay item will be multiplied by performance graded binder given in the table below, times the difference in price in excess of ten percent between the base price and the period price of asphalt cement. Adjustments will be made upward or downward, as prices increase or decrease. The quantity of Hot Mix Asphalt will be determined from the quantity shown on the progress estimate for each pay period. The base price of performance graded binder to be used is the price per standard ton current with the bid opening date. The period price shall be determined by the Authority and shall be the price per standard ton current with the ending date of the progress estimate. The prices shall be determined by using the average N.E. Barge Price, FOB, as listed in the Asphalt Weekly Monitor.

Plant Mix B Pavement	4.0%
Hot Bituminous Pavement Grading B	4.5%
Hot Bituminous Pavement Grading C	5.5%
Hot Bituminous Pavement Grading D	5.5%
Hot Bituminous Pavement Grading E	5.5%

108.5 Right to Withhold Payment

This Subsection is amended by the addition of the following:

L. Contractor's failure to, or refusal to, remove within 24-hours after receipt of proper notice, any employee or person engaged in Work under Contract.

M. Contractor's failure to submit required schedule or schedule updates.

108.6 Taxes, Fees, Allowances, and Notices

This Subsection is amended by the addition of the following:

The Maine Turnpike Authority, an agency of the State of Maine, is exempt from payment of sales tax, under the present Maine Sales Tax Law, on any property purchased by it at retail for consumption. The Maine Tax Bureau has interpreted this to mean that all materials purchased by the Contractor which ultimately remain the property of the Maine Turnpike Authority, even though in a changed form, are not subject to the sales tax.

108.8 Final Payment

This Subsection is amended by the addition of the following:

Before final payment is made, the Contractor shall furnish to the Authority, on the forms prescribed (Sheet F-1), a sworn affidavit to the effect that no claims are pending. If such affidavit that claims have been paid cannot be given because of a dispute as to the amount or legality of such claim, the Contractor's affidavit shall clearly set out the facts as to the name, address, amount, and nature of the dispute. The Authority will review the matter and will make payment that the Authority deems is appropriate to the Contractor.

SECTION 109 – CHANGES

109.1.1 Changes Permitted

The following is added to the end of the paragraph:

There will be no adjustment to Contract Time due to an increase or decrease in quantities, compared to those estimated, except as addressed through Contract Modification(s).

109.1.2 Substantial Changes to Major Items

The following is added to the end of the paragraph:

Contract Time adjustments may be made for substantial changes to Major Items when the change affects the Critical Path, as determined by the Authority.

109.3 Extra Work

The following paragraphs are added:

No Extra Work shall be performed except pursuant to the written orders of the Resident, expressly and unmistakably indicating its intention to treat the Work described therein as Extra Work.

If the Contractor determines that Work directed by the Resident is Extra Work, he shall, within 48-hours, give written notice thereof to the Resident stating why he deems it to be Extra Work and shall furnish to the Resident daily time slips and memoranda for the purpose of affording to the Authority an opportunity to verify the Contractor's claim at the time and (if it desires to do so) cancel promptly such order, direction or requirement of the Resident.

Accordingly, the failure of the Contractor to serve such notice or to furnish such time slips and memoranda shall be deemed to be a conclusive and binding determination on his part that the direction,

order or requirement of the Resident does not involve the performance of Extra Work, and shall be deemed to be a waiver by the Contractor of all claims for additional compensation or damages by reason thereof.

Refer to related Subsections 104.4.2, Preconstruction Conference, and 109.7.5, Force Account Work.

109.4 Differing Site Conditions

109.4.1 Definition

This Subsection is amended by the addition of the following:

Paragraph (A) is the definition of Differing Site Conditions. Paragraphs (B), (C) and (D) are not all required along with Paragraph (A) to prove Differing Site Conditions. However, they will be considered by the Maine Turnpike Authority as part of the evaluation of Differing Site Conditions. See related Subsection 102.3, Examination of Documents, Site, and Other Information.

109.4.4 Investigation / Adjustment

This Subsection is amended as follows:

In the third sentence, delete the words "Subsections (A) - (E)".

109.5.1 Definitions - Types of Delays

This Subsection is amended as follows:

B. Compensable Delay -

Replace (1) with the following:

1(A) a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an Equitable Adjustment if the Project falls within the geographic boundaries prescribed under the disaster declaration.

1(B) a weather related Uncontrollable Event of such an unusually severe nature that the Contractor's critical path schedule is disrupted.

109.5.2 Entitlement to Adjustments

This Subsection is amended as follows:

A. Types of Adjustments -

Paragraph 2. is deleted and replaced with the following:

2. If a Compensable Delay 1(A), (2), or (3), the Contractor is entitled to an extension of time and an equitable adjustment as set forth in Subsection 109.7, Equitable Adjustment to Compensation. If a Compensable Delay 1(B), the Contractor is entitled to an extension of time and an equitable adjustment as set forth in Subsection 109.7, Equitable Adjustment to Compensation, except that Cost of extended jobsite overhead and time will not be allowed.

109.5.5 Documenting the Delay and Request for Adjustments

The last paragraph is deleted and replaced with the following:

The Authority may require that all cost shown in the report be certified by an accountant.

109.5.6 Decision by Program Manager

This Subsection is deleted and not replaced.

Refer to related Subsection 104.4.2, Preconstruction Conference.

109.5.7 Additional Consideration by Department

This Subsection is deleted and not replaced.

Refer to related Subsection 104.4.2, Preconstruction Conference.

109.6.1 Overview - General Requirements

This Subsection is amended by the addition of the following:

The Maine Turnpike will not participate in any costs borne by the Contractor that are not in accordance with Maine Turnpike policies. All money paid to a business or resident as compensation for impacts created by the Contractor's operation will not be reimbursed by the Authority. All Contractor costs must be documented. Monies paid by the Contractor to others must be documented by a receipt for the cost to be considered as part of the VECP. Copies of all receipts shall be submitted to the Resident.

109.7.2 Basis of Payment

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

Equitable Adjustments will be established by mutual Agreement for compensable items listed in Subsection 109.7.3, Compensable Items, based upon Unit or Lump Sum Prices. If Agreement cannot be reached, the Contractor shall accept payment on a Force Account basis as provided in Subsection 109.7.5, Force Account Work, as full and complete compensation for all Work relating to the Equitable Adjustment.

109.7.3 Compensable Items

This Subsection is deleted and replaced with the following:

The Contractor is entitled to compensation for the following items, with respect to agreed upon Unit or Lump Sum Prices:

1. Labor expenses for non-salaried workers and salaried foremen.

2. Costs for Materials.

3. A markup on the totals of Items 1 and 2 of this Subsection (109.7.3) for home office overhead and profit of the Contractor, its Subcontractors and suppliers, and any lower tier Subcontractors or suppliers, with no mark-ups on mark-ups.

4. Cost for Equipment, based on Blue Book Rates or leased rates, as set forth in Subsection 109.7.5(C), or the Contractor's Actual Costs.

5. Costs for extended jobsite overhead.

6. Time.

7. Subcontractor quoted Work, as set forth below in Subsection 109.7.5, Force Account Work.

109.7.5 Force Account Work

This Subsection is amended by the addition of the following:

C. Equipment

When the Contractor is paid for furnishing and operating equipment on an hourly or daily basis, it shall be operated as approved by the Resident in such a manner as to obtain maximum production under the prevailing conditions. The Resident may order the removal and require replacement of any unsatisfactory equipment.

The first sentence of the second paragraph, which begins: "Equipment leased...", is deleted.

The second sentence of the sixth paragraph is changed from "The Contractor may furnish..." to read "If requested by the Authority, the Contractor will produce cost data to assist the Authority in the establishment of such rental rate, including all records that are relevant to the Actual Costs including rental Receipts, acquisition costs, financing documents, lease Agreements, and maintenance and operational cost records."

The following sentence is added:

Equipment leased by the Contractor for Force Account Work and actually used on the Project will be paid for at the actual invoice amount plus 10 percent markup for administrative costs.

The following sentence is added:

F. Subcontractor Quoted Work - When accomplishing Force Account Work that utilizes Subcontractor quoted Work, the Contractor will be allowed a maximum markup of five percent for profit and overhead.

SECTION 110 - INDEMNIFICATIONS, BONDING AND INSURANCE

110.2.1 Bonds

The first three paragraphs are deleted and replaced with the following:

The Bidder to whom the Contract is awarded shall furnish a Surety Corporation Bond, satisfactory to the Authority, on the form of the Contract Bond bound herewith, as security for the faithful performance of the Work. The Contract Bond must be executed or countersigned on the part of such Surety by the Resident Agent of the Surety for the State of Maine.

The Bond shall be in an amount not less than the Total Amount bid in the Proposal and shall be maintained by the Contractor until the final payment under the Contract is made. In the event of insolvency

of the Surety, the Contractor shall forthwith furnish and maintain as above provided, other security satisfactory to the Authority.

If the Contractor is unable to continue the Work, then the completion of the Contract shall be the sole responsibility of the Surety. The Surety shall assume the role of and become the Contractor. Work shall not commence until the Authority has approved, in writing, the Subcontractor's employed by the Surety. All Work to complete the Contract will be paid for at Contract bid prices as shown on the Proposal bid sheets. All payments made by the Authority will be paid directly to the Surety who in turn will then pay the Subcontractors and suppliers. Regardless of the amounts previously paid to the Contractor as Progress Estimates for Work reported to have been put in place by the Contractor or his Subcontractors, the full Scope of the Contract Work shall be completed by the Surety and its designates for compensation not to exceed the Contract Price less the aggregate of prior payments to the Contractor.

110.2.3 Bonding for Landscape Subcontractors

This Subsection is deleted and replaced with the following:

110.2.3 Bonding for Landscape Establishment Period

The Contractor shall provide a signed, valid, and enforceable Performance, Warranty, or Maintenance Bond complying with the Contract, to the Department at Final Acceptance.

The Bond shall be in the full amount for all Pay Items for Work pursuant to Section 621, Landscape, made payable to the Maine Turnpike Authority.

The Contractor shall pay all premiums and take all other actions necessary to keep said Bond in effect for the duration of the Landscape Establishment Period as described in Special Provision 621.0036, Establishment Period. If the Surety becomes financially insolvent, ceases to be licensed or approved to do business in the State of Maine, or stops operating in the United States, the Contractor shall file new Bonds complying with this Subsection and within 10 days of the date the Contractor is notified or becomes aware of such change.

All Bonds shall be procured from a company organized and operating in the United States, licensed or approved to do business in the State of Maine by the State of Maine Department of Business Regulation, Bureau of Insurance, and listed on the latest Federal Department of the Treasury listing for "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies."

By issuing a Bond, the Surety agrees to be bound by all terms of the Contract, including those related to payment, time for performance, quality, warranties, and the Department's self help remedy as provided in Subsection 112.1, Default, to the same extent as if all terms of the Contract are contained in the Bond(s).

Regarding claims related to any obligations covered by the bond, the Surety shall provide, within 60 Days of Receipt of written notice thereof, full payment of the entire claim or written notice of all bases upon which it is denying or contesting payment. Failure of the Surety to provide such notice within the 60-day period constitutes the Surety's waiver of any right to deny or contest payment and the Surety's acknowledgment that the claim is valid and undisputed.

110.3 Insurance

This Subsection is amended by the addition of the following:

Each policy shall be signed by the President and Secretary of the insurance company and shall be countersigned by a licensed Resident Agent of the State of Maine as an authorized representative of the company.

Before Work is commenced pursuant to the Agreement, the Contractor shall file with the Authority a Certificate of Insurance, executed by an insurance company or companies satisfactory to the Authority and licensed or approved by the State of Maine Department of Business Regulation, Bureau of Insurance to do business in the State of Maine, stating that the Contractor carries insurance in accordance with the requirements of the Contract.

If at any time, any of the said policies shall be or become unsatisfactory to the Authority, the Contractor shall promptly obtain new and satisfactory policies and furnish certificates therefor as required above. All policies shall contain a valid provision or endorsement providing that the insurance company will notify the Authority in writing at least thirty (30) days prior to the termination of any policy or before any changes are made in any policies. The policy shall also indicate which exclusions have been deleted and any additional coverages.

Neither approval by the Authority, nor a failure to disapprove insurance furnished by a Contractor, shall release the Contractor of full responsibility for liability, damages and accidents as set forth herein.

No separate payment shall be made for any insurance that the Contractor may be required to carry, but all costs thereof shall be included in the prices bid for the various items scheduled in the Proposal.

The following Subsection is added:

110.3.05 Umbrella Liability

An Umbrella Liability Policy in excess of Employer's Liability, General Liability, and Automobile Liability shall be provided with a limit of $4,000,000.

110.3.2 Commercial General Liability

This Subsection is amended by the addition of the following:

Where the Work to be performed has to do with railroads, then railroad Protective Liability Insurance shall be provided, with the Maine Turnpike Authority as a named insured.

The Contractual Liability Insurance shall cover the Contractor's obligation to indemnify the Authority as provided in Subsection 110.1, Indemnification.

110.3.4 Professional Liability

The first sentence is deleted and replaced with the following:

Contractors who engage in design Work, preliminary engineering Work, and environmental consulting Work for the Authority shall maintain a Professional Liability policy for errors and omissions with a minimum limit of liability of $5,000,000. The Authority reserves the right to require increased insurance limits for certain major Projects.

110.3.5 Owner's and Contractor's Protective Liability

This Subsection is deleted and replaced with the following:

For Projects with a Contract price in excess of $500,000, an "Owner's Protective" policy in the name of the Maine Turnpike Authority, with a $5,000,000 limit, shall also be provided.

110.3.6 Builder's Risk Insurance

This Subsection is amended by the addition of the following:

The Contractor shall provide Builder's Risk Insurance if the Project requires it. This determination will be made by the Authority and shall be so stated in the Special Provisions. The insurance coverage shall be shown on a special form and provide for transient and off-premise coverage and materials intended for use at the Project site. Any exclusion related to design, materials, or workmanship shall not apply to resulting damage.

110.3.8 Administrative and General Provisions

A. Additional Insured

This paragraph is deleted and replaced with the following:

Each policy, with the exception of Workers' Compensation and Professional Liability Insurance, shall name the Authority as an additional named insured. The Maine Turnpike Authority Contract Number shall be clearly stated on each policy.

SECTION 111 - RESOLUTION OF DISPUTES

111.1.2 Escalation Process

This Subsection is deleted and replaced with the following:

To resolve Issues and Disputes, the Contractor and the Maine Turnpike Authority will develop a Decision Matrix at the preconstruction or partnering meeting. See related Subsection 104.4.2, Preconstruction Conference. If an issue is not resolved, the matter becomes a Dispute and is eligible for settlement by an Alternate Dispute Resolution (ADR) process as outlined in this Section. Either the Authority or the Contractor may request an ADR process. If a Contractor is dissatisfied with an ADR recommendation, the decision may be appealed to the MTA Executive Director. A decision by the MTA Executive Director may be appealed to either Mediation or Arbitration. All costs of ADR, including Neutral Evaluations, Dispute Review Boards (DRBs), Mediation or Arbitration shall be shared equally.

ALTERNATIVE DISPUTE RESOLUTION

Preliminary ADR:

The purpose of the optional use of ADR is to assist the consenting parties to resolve disputes in a manner that complies with the Contract, that is fair, impartial, less expensive, faster and less formal than litigation. A Project issue becomes a Dispute eligible for ADR only when mutually acceptable resolution can not be achieved within the Decision Matrix-prescribed time period at the level of the Authority's Chief Operating Officer (COO), and the Contractor's Principal.

The Contractor and the Authority shall select a mutually acceptable form of Preliminary ADR from the following options, with the preference expressed in the order of listing.

1. NEUTRAL EVALUATION: Jointly selected by the disputing parties, the Neutral would conduct a third party, neutral investigation of both sides of the dispute, resulting in the submission of a Report of Recommended Settlement to the disputing parties.

2. DISPUTE REVIEW BOARD (DRB): The parties would jointly select two to three mutually acceptable experts who would hear and weigh a presentation of positions and evidence by the parties; resulting in the issuance by the DRB of a Recommended Settlement of the matter.

Recommendations by either a Neutral or a DRB will be non-binding unless the parties mutually agree in writing at the time of process selection that such recommendations will be binding.

Appeal to the Executive Director:

If either party rejects a recommendation resulting from ADR, the Dispute may be appealed to the Executive Director of the Authority. Once a dispute has been submitted to ADR, no party shall discuss the elements of the dispute with the Executive Director.

Final ADR - Mediation or Arbitration:

At the request of the Contractor, appeal decisions rendered by the Executive Director may be appealed by the Contractor to a Final ADR process of either Mediation or Arbitration. The costs of Mediation or Arbitration shall be borne equally by the Contractor and the Authority. Decisions by either a Mediator or an Arbitrator(s) will be non-binding unless the parties mutually agree in writing at the time of process selection that such recommendations will be binding.

NOTE: It is the intent of this Specification to retain maximum flexibility for the specific procedures for either Preliminary or Final Alternative Dispute Resolution. The processes shall follow the guidelines of construction industry ADR practices in general. The Authority and the Contractor will contribute equal input to the selection of location, methods, experts and timing of such processes. When a Dispute Review Board is utilized, the Authority and the Contractor shall have equal veto power in the selection of DRB composition.

111.1.8 Commissioner Communications Before Appeal

This Subsection is deleted and not replaced.

111.2 Project Level Negotiation to 111.6 Judicial Review

These Subsections (inclusive) are deleted and not replaced.

SECTION 112 - DEFAULT AND TERMINATION

112.2 Termination

This Subsection is amended by the addition of the following:

When the Contract is terminated, the Contractor shall, if so required by the Authority, promptly remove any or all of his/her equipment and supplies from the Project site or from other property of the

Authority, failing which the Authority may remove such equipment and supplies at the expense of the Contractor.

SECTION 203 - EXCAVATION AND EMBANKMENT

203.01 Description

The following is added at the end of the last paragraph:

Unclassified bids are submitted at the sole risk of the Bidder. The Contractor shall only be entitled to compensation at the unit prices submitted for the actual quantity of Common Excavation and Rock Excavation. No additional compensation shall be considered for changes from the estimated quantities to the actual quantities regardless of the reason for the change.

203.18 Method of Measurement

The seventh paragraph is amended as follows:

Elevations for final cross sections shall be determined as shown and calculated on the Plans. Measurements shall be determined at the bottom of loam line unless otherwise noted.

SECTION 502 - STRUCTURAL CONCRETE

502.10 Forms and False Work

D. Removal of Forms and False Work

The first paragraph is amended as follows:

In the first, second, and third sentences, "forms and false work" are replaced with "forms".

502.11 Placing Concrete

G. Concrete Wearing Surface and Structural Slabs on Precast Superstructures

The last paragraph is amended as follows:

In the third sentence, replace "The temperature of the concrete shall not exceed 24°C [75°F] at the time of placement." with "The temperature of the concrete shall not exceed 24°C [75°F] at the time the concrete is placed in its final position."

502.15 Curing Concrete

The first paragraph is amended as follows:

The first sentence is replaced with: "All concrete surfaces shall be kept wet with clean, fresh water for a curing period of at least seven (7) days after concrete placing, with the exception of vertical surfaces as provided for in Subsection 502.10 (D), Removal of Forms and False Work.

The second paragraph is amended as follows:

The first two sentences are deleted.

The third paragraph is amended as follows:

The entire paragraph, which starts "When the ambient temperature....", is deleted.

The fourth paragraph is amended as follows:

Delete "approved" to now read "...continuously wet for the entire curing period…".

The fifth paragraph is amended as follows:

The second sentence is changed from "...as soon as it is possible to do so without damaging the concrete surface." to: "...as soon as possible."

The seventh paragraph is amended as follows:

The first sentence is changed from "...until the end of the curing period." to "...until the end of the curing period, except as provided for in Subsection 502.10(D), Removal of Forms and False Work."

SECTION 503 - REINFORCING STEEL

503.06 Placing and Fastening

The second paragraph is amended as follows:

The third sentence is changed from "All tack welding shall be done in accordance with Section 504, Structural Steel." to "All tack welding shall be done in accordance with AWS D1.4, Structural Welding Code - Reinforcing Steel."

SECTION 504 - STRUCTURAL STEEL

504.09 Facilities for Inspection

The following is added to the last paragraph:

Failure to comply with the above requirements will be consider to be a denial to allow access to Work by the Contractor. The Department will reject any Work done when access for inspection is denied.

504.18 Plates for Fabricated Members

The second paragraph is amended as follows:

The first sentence is changed from "…ASTM A 898/A 898 M..." to "...ASTM A 898/A 898 M or ASTM A 435/A 435 M as applicable and...".

504.31 Shop Assembly

The following is added to the last sentence:

The minimum assembly length shall include bearing centerlines of at least two substructure units.

SECTION 535 - PRECAST, PRESTRESSED CONCRETE SUPERSTRUCTURE

535.02 Materials

"Steel Strand for Concrete Reinforcement" is changed to "Steel Strand."

The following is added to the beginning of the third paragraph:

Concrete shall be Class P conforming to the requirements in this Subsection. Twenty-eight day compressive strength shall be as stated on the Plans. Coarse aggregate...

535.05 Inspection Facilities

The following is added to the last paragraph:

Failure to comply with the above requirements will be considered to be a denial to allow access to Work by the Contractor. The Department will reject any Work done when access for inspection is denied.

535.26 Lateral Post-Tensioning

The first paragraph is replaced with the following:

Overstressing strands for setting losses cannot be accomplished for chuck to chuck lengths of 7.6 m [25 feet] and less. In such instances, refer to the Plans for all materials and methods. Otherwise, post-tensioning shall be in accordance with PCI standards and shall provide the anchorage force as noted in the Plans. The applied jacking force shall be no less than 100 percent of the design jacking force.

SECTION 603 - PIPE CULVERTS AND STORM DRAINS

603.0311 Corrugated Polyethylene Pipe for Option III

Minimum Mandrel Diameter Table is replaced with the following:

Nominal Size US Customary (in)	Minimum Mandrel Diameter (in)	Nominal Size Metric (nun)	Minimum Mandrel Diameter (mm)
12	11.23	300	280.73
15	14.04	375	350.91
18	16.84	450	421.09
24	22.46	600	561.45
30	28.07	750	701.81
36	33.69	900	842.18
42	39.30	1050	982.54
48	44.92	1200	1122.90

SECTION 604 - MANHOLES, INLETS, AND CATCH BASINS

604.02 Materials

The following are added:

Tops and Traps 712.07

Corrugated Metal Units	712.08
Catch Basin and Manhole Steps	712.09

SECTION 605 - UNDERDRAINS

605.05 Underdrain Outlets

The first paragraph is amended as follows:

In the second sentence, the words "metal pipe" are deleted.

SECTION 606 - GUARDRAIL

606.02 Materials

The fourth paragraph, which reads "Retroreflective beam guardrail delineators..." is deleted and replaced with the following:

Reflectorized sheeting for Guardrail Delineators shall meet the requirements of Subsection 719.01, Reflective Sheeting. Delineators shall be fabricated from high-impact, ultraviolet and weather resistant thermoplastic.

The eighth paragraph, which reads "The sole patented supplier of multiple mailbox..." is deleted and replaced with the following:

Acceptable multiple mailbox assemblies shall be listed on the Department's Approved Products List and shall be NCHRP 350 tested and approved.

606.09 Basis of Payment

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

Butterfly-type guardrail reflectorized delineators shall be mounted on all W-beam guardrail at an interval of every 10 posts [62.5 feet] on tangents sections and every five posts [31.25 feet] on curved sections as directed by the Resident. On divided highways, the delineators shall be yellow on the left hand side and silver/white on the right hand side. On two-way roadways, the delineators shall be silver/white on the right hand side. All delineators shall have retroreflective sheeting applied to only the traffic facing side. Reflectorized guardrail delineators will not be paid for directly, but will be incidental to the guardrail items.

SECTION 615 - LOAM

615.02 Materials

This Subsection is amended as follows:

One hundred percent of the loam material must pass the two inch sieve.

Organic Content	Percent by Volume
Humus	"5% - 10%", as determined by Ignition Test

SECTION 618 - SEEDING

618.01 Description

The first sentence is amended to read:

This Work shall consist of furnishing and applying seed.

The words “and cellulose fiber mulch” are deleted from 618.01(a).

618.03 Rates of Application

The last sentence in 618.03(a) is deleted and replaced with the following:

These rates shall apply to Seeding Method 2, 3, and Crown Vetch.

In 618.03(c), "1.8 kg [4 lb]/unit." is deleted and replaced with "1.95 kg [4 lb]/unit."

618.09 Construction Method

In 618.09(a) 1, sentence two, "100 mm [four inches]" is replaced with "25 mm [one inch] (Method 1 areas) and 50 mm [two inches] (Method 2 areas)".

618.15 Temporary Seeding

The Pay Unit is changed from “Unit” to “Kg [lb]”.

SECTION 620 - GEOTEXTILES

620.03 Placement

Section (c): Replace "Non-woven" in title with "Erosion Control".

The word "Non-woven” in the first paragraph is replaced with "Woven monofilament”.

The word "Non-woven" in the second paragraph is replaced with "Erosion Control".

620.07 Shipment, Storage, Protection and Repair of Fabric

Section (a): the second sentence is replaced with the following:

Damaged geotextiles, as identified by the Resident, shall be repaired immediately.

620.09 Basis of Payment

Pay Item 620.58: "Non-woven" is replaced with "Erosion Control".

Pay Item 620.59: "Non-woven" is replaced with "Erosion Control".

SECTION 621 - LANDSCAPING

621.0036 Establishment Period

In the fourth and fifth paragraphs, "time of Final Acceptance" is replaced with "end of the period of establishment".

In the seventh paragraph, "Final Acceptance date" is replaced with “end of the period of establishment”; and "date of Final Acceptance" is replaced with "end of the period of establishment".

SECTION 626 - HIGHWAY SIGNING

626.034 Concrete Foundations

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

Pre-cast and cast-in-place foundations shall be warranted against leaning and corrosion for two years after the Project is complete. If the lean is greater than two degrees from normal or the foundation is spalling within the first two years, the Contractor shall replace the foundation at his own cost.

SECTION 639 - ENGINEERING FACILITIES

639.04 Field Offices

This Subsection is amended by the addition of the following:

The Field Office location shall be approved by the Resident and shall be provided when the Contract starts and shall remain until the Contract is complete. The Contractor shall be responsible for furnishing and maintaining electricity, heat, facsimile machine and appliances for the entire duration of the Contract, which includes periods of time which Work has been suspended.

The Contractor shall provide a plain paper (8-1/2” x 11”) fax/copier machine with a 10 page (minimum) auto document feeder, 15 page (minimum) fax memory, 50 sheet (minimum) paper capacity, and a transmission speed of six pages (minimum) per minute for the Resident's use during the Project. All maintenance and supplies shall be the responsibility of the Contractor. The fax machine shall be connected to a separate telephone line so that the fax machine operates independent of the telephone and answering machine. A total of three phone lines shall be provided by the Contractor. All of the costs associated with the above shall be the responsibility of the Contractor except for the monthly telephone charges.

The following are not required:

- Accessible route conforming to the Americans with Disabilities Act
- Wheelchair accessible toilet

639.09 Telephone

This Subsection is amended as follows:

The Contractor shall be reimbursed at cost for the monthly telephone service charges. Telephone service shall remain throughout the Contract including periods of seasonal shutdowns.

639.11 Basis of Payment

The following is added after the first paragraph:

The Contractor shall be reimbursed at cost for the monthly telephone service charges. No additional markup will be allowed. The Contractor shall submit copies of the monthly bills to the Resident for payment.

SECTION 652 - MAINTENANCE OF TRAFFIC

652.2 Materials

The first sentence in the second paragraph is replaced with the following:

All construction signs shall be fabricated with super high intensity (ASTM 4956 – Type VII) retroreflective sheeting. All construction signs and construction sign packages shall have the Type VII sheeting material. 3924 Diamond Grade fluorescent orange sheeting manufactured by 3M conforms to ASTM 4956 – Type VII.

652.2.4 Other Devices

The eighth paragraph is amended by the addition of the following:

The Portable Message Signs shall be capable of being programmed remotely by telephone, of monitoring the speed of traffic in a travel lane, and of displaying a message in response to a vehicle exceeding an allowable speed threshold. The Contractor shall submit a catalog cut to the Resident for approval, establish a cellular account so that signs may be programmed remotely and provide training for the operation of the sign to the Resident.

The portable-changeable message signs may be moved throughout the Project area as required to provide advance warning of construction operations which may impact the flow of traffic as well used during lane closures to display messages relative to the speed of traffic. The Contractor shall remove, transport and maintain the signs as directed and approved by the Resident.

The Authority will be responsible for the actual programming of the signs.

A deduction will be made from money due the Contractor for signs that fail to operate for extended periods of time.

The following Subsection is added:

652.2.5 Safety Vests

All jobsite personnel shall wear a safety vest labeled as ANSI 107-199 standard performance for Class 2 risk exposure or an equivalent.

652.3.1 Responsibility of the Department

The first paragraph is deleted and replaced with the following:

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 following sentence is added to the end of this Subsection:

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 Resident.

652.3.2 Responsibility of the Contractor

The first paragraph is amended as follows:

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 following paragraph is added:

The Contractor shall designate a supervisor to be responsible for the safe placement and maintenance of all traffic control devices. This individual shall be trained to safely install and maintain the devices. The Contractor shall submit to the Resident, in writing, documentation stating that this individual has reviewed and understands the traffic control requirements of the Contract and the Manual of Uniform Traffic Control Devices.

652.3.3 Submittal of Traffic Control Plan

This Subsection is deleted and not replaced.

652.3.4 General

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

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 the 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. The Contractor shall correct all problems or violations upon observation by the Contractor or upon notification by the Resident. Failure to correct a problem within one hour of notification during non-working hours or to respond immediately to a problem during Work hours, shall result in a penalty of $150.00 per occurrence. The Resident shall be the sole judge as to the time and response.

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 (including loading or unloading vehicles) 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 Cones and Drums. These devices shall be installed and maintained at the spacing shown on the Traffic Control Plans, or determined by the MUTCD, through the Work area.

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 or approved by the Resident.

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, unless approved by the Resident, will be prohibited.

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 following Subsection is added:

652.3.41 Local Road General Requirements

Channelization devices consisting of barricades or drums, at a maximum spacing of 50 feet, shall be used in guardrail areas when neither the existing nor the new guardrail is in place. The Contractor shall not remove guardrail until absolutely necessary for construction operations in that area. The guardrail shall be replaced as soon as possible thereafter.

All excavation areas adjacent to the roadway shall be channelized continuously in both directions for the length of the Project in all areas where the centerline strip is not effective in accordance with the latest edition of MUTCD.

Where the roadway is adjacent to an area being excavated or filled, a minimum two foot shoulder should be maintained and the effective slope of the earth excavation or fill slope, beyond the two foot shoulder, shall not be steeper than 1-1/2 horizontal to 1 vertical. The effective slope of rock excavation shall not be steeper than 1 horizontal to 1 vertical beyond the two foot shoulder. In the case of cuts over five feet deep, an earth berm or other approved barrier shall be placed between the travel lane and the excavated area. In this instance, travel speeds shall be limited by specific advisory signing to 20 miles per hour in all cases. When excavation does not leave sufficient usable widths to maintain two-way traffic as provided in

Subsection 105.4, Maintenance of Work, one-lane traffic controlled by a traffic signal or continuous flagging may be considered. Closely spaced vertical panels, drums or other channelizing devices shall be used on any of these types of areas that are left exposed for short durations.

When paving operations or shoulder grading leave a three inch or less exposed vertical face at the edge of the traveled way, channelization devices shall be placed two feet outside of the pavement at intervals not exceeding 600 feet and a 48 inch by 48 inch W8-9 "Low Shoulder" sign shall be placed at a maximum spacing of 1/2 mile. When paving operations or shoulder grading leave a three inch or grater exposed vertical face at the edge of the traveled way, the Contractor shall place shoulder material for a width of at least four feet to meet the pavement grade, and place channelizing devices as above, before the lane is opened to traffic.

652.3.5 Installation of Traffic Control Devices

The first paragraph is deleted and replaced with the following:

Portable signs shall be erected on temporary sign supports approved crashworthy devices in conformance with NCHRP 350 requirements so that the bottom is either 1) 300 mm [12 inches]; or 2) greater than 1.5 m [five feet] above the traveled way. Post-mounted signs shall be erected so the bottom is no less than 1500 mm [five feet] above the traveled way, and 2100 mm [seven feet] above the traveled way in business, commercial, and residential areas. All post-mounted signs on the turnpike mainline shall be erected so the bottom is no less than 2100 mm [seven feet] above the traveled way. Post-mounted signs must also be erected so that the sign face is in a true vertical position. All signs shall be mounted within four feet of the existing edge of pavement. All signs shall be placed so that they are not obstructed in any manner and immediately modified to ensure proper visibility if obstructed. Due to Contractor or Project staging, it may be necessary to relocate previously erected portable or post-mount signs so they are clearly visible. Signs may be mounted lower or higher to fit the situation when authorized by the Resident. Cones shall either be weighted or nailed. Tires will not be allowed as weights.

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

NHCRP 350 tested drums with tire sidewall ballasts are acceptable. 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 following is added to the end of the fifth paragraph:

The method of covering existing signs must be approved by the Resident. The use of adhesives on the sign face is prohibited.

The sixth paragraph is deleted and replaced with the following:

The Contractor shall replace damaged or missing traffic control devices with similar devices of acceptable quality.

The following paragraph is added to the end of this Subsection:

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.

652.3.6 Traffic Control

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

The minimum roadway width for local road one-way and two-way traffic, and minimum number of lanes and lane widths for the Maine Turnpike, are identified on the Project's traffic control plans and/or in Special Provision Section 652, Maintenance of Traffic (Specific Project Maintenance of Traffic).

The last sentence of the third paragraph is deleted and not replaced.

652.41 Traffic Officers

The first paragraph is deleted and replaced with the following:

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.

652.6 Night Work

The sixth and seventh paragraphs are deleted and not replaced.

The following Subsection is added:

652.61 Construction Vehicles

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, Type VII. The older type "Construction Vehicle - Do Not Follow" may be used until the end of their service life.

All vehicles used on the Project shall be equipped with amber flashing lights, visible from both front and rear, or by means of a single, approved type, revolving, flashing or strobe lights mounted so as to be visible 360 degrees. The vehicle flashing system shall be in continuous operation while the vehicle is on any part of the Project. Dump trucks and utility trucks shall have a strobe light mounted on each side of the vehicle.

652.7 Method of Measurement

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

The per unit measurement for payment of the portable–changeable message sign shall include the establishment and payment of a cellular phone account so that the portable–changeable message sign may be programmed remotely.

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

The number and locations of Flaggers will be determined by the Resident. Flaggers 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. 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.

652.8.2 Other Items

The last paragraph is deleted and replaced with the following:

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

SECTION 653 - POLYSTYRENE PLASTIC INSULATION

653.05 Placing Backfill

In the second sentence, "...shall be not less than 150 mm [six inches] loose measure." is changed to "...shall be not less than 250 mm [10 inches] loose measure."

In the third sentence "...crawler type bulldozer of not more than 390 kg/m^2 [80 lb/ft^2] ground contact pressure..." is changed to "...crawler type bulldozer of not more than 4875 kg/m^2 [2000 lb/ft^2] ground contact pressure..."

653.06 Compaction

In the final sentence "...crawler type bulldozer of not more than 390 kg/m^2 [80 lb/ft^2] ground contact pressure..." is change to "...crawler type bulldozer of not more than 4875 kg/m^2 [2000 lb/ft^2] ground contact pressure..." it]."

SECTION 656 - TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

Section 656 is deleted in its entirety and replaced with the following:

656.01 Description

This Work shall consist of providing temporary erosion control during construction in accordance with these Specifications, standard details, Best Management Practices, or as otherwise directed.

All temporary erosion control devices shall be in place and approved by the Resident prior to any embankment and excavation operations. The Contractor is responsible for repairing and replacing damaged or missing sandbags, haybales, and silt fence material. The Contractor shall maintain these devices in a clean and properly operating condition as described herein.

The Contractor is responsible for all temporary drainage and erosion control measures. The Contractor shall review his construction operations and staging to determine if additional erosion control measures are required. The Resident may also request additional erosion control measures. The cost for all erosion control devices necessary, due solely to the Contractor's construction operations and are not shown on the Plans, shall be borne solely by the Contractor. The frequency of inspection of these devices by the Contractor and the Erosion Control Compliance Officer (ECCO) shall be bi-weekly and immediately following a rainfall of greater than 1/2 inch in a 24-hour period.

In areas of ledge or frozen ground only, the Contractor may opt to furnish and install an erosion control filter berm in lieu of silt fence. The erosion control filter berm shall be a water permeable windrow of a composted bark mix to remove suspended soil particles from water moving off the site. Erosion control filter berm shall be considered an erosion control device. This material and specific application shall be submitted to the Resident for approval.

656.02 General

Baled hay shall be bales at approximately 350 by 450 by 750 mm [14 by 18 by 30 inch], or an equivalent, securely tied to form a firm bale.

Sandbags shall consist of heavy cloth or woven plastic bags, approximately 0.03 m3 [one cubic foot] capacity, filled with sand or gravel.

Dumped stone shall be a graded mixture of large and small stone with approximately 50 percent of the stones larger than 150 mm [six inch].

Flexible drainage pipe shall consist of collapsible neoprene pipe, a minimum of 12 inches in diameter or equal.

656.03 Silt Fence

(a) Posts

Either hardwood posts or steel posts shall be used.

Hardwood posts shall be straight, at least 450 mm [18 inches] longer than the height of the silt fence and at least 32 mm by 32 mm [1 inch by 1 inch].

Staples shall be of No. 9 wire.

Steel posts shall be at least 450 mm [18 inches] longer than the height of the silt fence and have the means provided for fastening wire to the fence.

(b) Wire Support Fence

If required, wire support fence shall be at least 50 mm [2 inches] higher than the height of the silt fence. Horizontal and vertical wires shall be spaced no more than 150 mm [6 inches] apart. The top and bottom wires shall be at least 10 gauge; all other wires at least 12 gauge.

(c) Silt Fence

The woven geotextile fabric and components shall be made from polypropylene, polyester, polymide or other chemically stable material and be resistant to ultraviolet radiation degradation for at least 12 months of installation. Silt retention capacity shall be no less than 75 percent. The fabric shall have a Mullen burst test of no less than 1790 kPa [260 pounds per square inch] with a maximum average sieve opening size of 850 pm to 250 pm [No. 20 to No. 60]. Roll width of the fabric shall be no less than 150 mm [6 inches] wider than the height of the fence, except fabric for boom supported floating silt fence which shall be no less than 600 mm [two feet] wider than the design width.

(d) Flotation Devices

The flotation boom and weighing devices for boom supported floating silt fence shall be sufficient to hold the fence in an approximately vertical position.

656.04 Temporary Erosion Checks

Temporary erosion checks shall be constructed in ditches and at other locations designated. Checks shall be in accordance with the Standard Detail unless otherwise directed.

Baled hay, sandbags, or both, shall be used in other areas as necessary to inhibit soil erosion.

Sediment deposits behind haybales and silt fence shall be removed when the depth of sediment reaches 50 percent of the erosion control device height.

The Contractor is also required to have on-site, at all times, 25 percent additional Contract quantities of silt fence for use as backup devices.

656.041 Erosion Control Filter Berm

The erosion control berm shall be placed uncompacted, in a windrow in locations approved by the Resident. The cross section of the berm shall be four feet wide at the base and 1-1/2 feet high at the center. The erosion control filter berm shall be removed when no longer required, as determined by the Resident, and shall be distributed over an adjacent area.

656.05 Temporary Berms

When designated, temporary barriers shall be constructed along the edge of the embankment. The barriers shall be of embankment earth material, gravel or sand as available and shaped approximately as shown in the Standard Details. The barriers shall be compacted with the wheels of construction equipment. When placed on pavement, the berms shall be constructed of asphalt grindings or other non-erodible soil material as approved by the Resident, and shaped as shown in the Standard Details.

At designated intervals, temporary slope drains shall be constructed with a crescent shaped barrier placed at each slope drain to direct the water into the inlet pipe.

656.06 Temporary Slope Drains

Collapsible pipe with corrugated metal pipe inlet shall be placed down the embankment slopes at designated locations and in accordance with the Best Management Practices.

At the outlet end of the drain, dumped stone shall be placed to prevent scoring unless otherwise directed.

656.07 Dumped Stone

Dumped stone shall be placed at designated locations and shaped to the extent necessary to spread the stone over the area and in sufficient depth to prevent soil erosion.

656.08 Silt Fence

The silt fence shall be installed at all environmentally sensitive areas as shown on the Plans or as directed. The Contractor shall have the option to provide a reinforced filter fabric or an un-reinforced filter fabric attached to a wire fence.

The fence posts shall be spaced as specified by the Resident, however, not to exceed a maximum of 2.5 m [eight feet] apart when either type of silt fence is used and be driven a minimum of 450 mm [18 inches] into the ground.

The geotextile fabric shall be secured to the post or fence by suitable staples, tie wire or hog rings in such a manner as to prevent tearing and sagging of the fabric. The bottom of the geotextile fabric shall be entrenched into the ground a minimum depth of 150 mm [six inches] to prevent water from flowing under the fence. The geotextile shall be spliced together only at support posts with a minimum 150 mm [six inches] overlap and secure post connection which prevents leakage of silt. The top of the geotextile shall be installed with a reinforced top end section.

The Contractor shall maintain the silt fence in a functional condition at all times. All deficiencies shall be immediately corrected by the Contractor. The Contractor shall make a daily inspection of the silt fences in areas where construction activity causes drainage runoff, to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed as approved or directed.

Sediment deposits shall be removed when sediments reach 50 percent of the height of the device. All sediment deposits remaining in place after the device is no longer required shall be graded to conform with the existing ground, seeded, and mulched immediately.

Geotextile fabric which has decomposed or has become ineffective and is still needed shall be replaced with material equal to the original design.

656.081 Boom Supported Floating Silt Fence

The silt fence fabric shall be securely attached to the flotation boom with a continuous weight placed the entire length of the fence to maintain the fence in a vertical submerged position from the surface of the water to the design depth.

Anchor's shall be placed at the ends of the fence, and intermediate locations if necessary, to hold the fence securely in place.

656.082 Maintenance

The erosion control devices will be cleaned, repaired, or replaced as necessary. All deficiencies shall be corrected immediately by the Contractor.

656.085 Erosion Control Compliance Officer

The Contractor shall designate an Erosion Control Compliance Officer (ECCO) on this Project who shall accompany the Resident's ECCO in the inspection of all erosion control devices. An inspection log shall be maintained by the Resident and the log shall be signed by the Resident's ECCO and the Contractor's ECCO after each inspection. Failure to comply with the erosion and sedimentation control requirements herein or as directed by the Resident's ECCO within 24-hours after the violation is noted in the inspection log, will result in the $1,000 per day per violation penalty until the violation is corrected to the satisfaction of the Resident.

656.09 Removing and Disposing

When no longer needed, material and devices for temporary erosion control shall be removed or may be left in place and dispersed over an adjacent area, as directed.

When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended.

When dispersed over adjacent areas, the material shall be scattered to the extent that it causes no unsightly conditions nor creates future maintenance problems. Dumped stone shall be dispersed or covered in such a manner that it will not interfere with future mowing operations.

656.10 Method of Measurement

Baled hay and sandbags will be measured for payment by the number of bales or bags satisfactorily placed. Dumped stone will be measured for payment by the cubic meter [cubic yard] in vehicles.

Temporary berms and temporary slope drains will be measured for payment by the meter [linear foot] measured parallel with the flow line including the pipe inlet.

Temporary silt fence will be measured by the meter [linear foot] along the gradient of the fence, end post to end post.

Boom supported floating silt fence will be measured by the meter [linear foot] not including anchorages.

Erosion control filter berm shall be measured by the linear foot.

The quantity of additional haybales and silt fence material required herein will be measured for payment only when and if they are actually put to use as additional measures on the Project as directed by the Resident. Haybales and silt fence material used for maintenance or replacement of existing devices will not be measured for payment.

The removal of silt and other material from behind the haybales and silt fence will not be measured separately for payment, but shall be incidental to the Erosion Control items.

656.11 Basis of Payment

The accepted quantity of baled hay or sandbags will be paid for at the Contract unit price each for each bale or bag which price shall be full compensation for furnishing and placing the bales or sandbags, for furnishing and driving the stakes for baled hay and for the removing and disposing of the bales, stakes and sandbags when no longer needed.

The accepted quantity of temporary berms will be paid for at the Contract unit price per meter [linear foot] of berm which price shall be full compensation for furnishing, placing and compacting material, for maintaining and for removing the berm when no longer needed.

There will be no separate payment for excavation done in the construction of temporary erosion control items under this Section and all necessary excavation shall be incidental to the Work.

The accepted quantity of dumped stone will be paid for at the Contract unit price per cubic

meter [cubic yard] which price shall be full compensation for furnishing the stone, transporting, placing and shaping. Payment for removal or for covering will be made under Item 629.05, Hand Labor, and the appropriate equipment rental items.

The accepted quantity of temporary silt fence and boom supported floating silt fence will be paid for at the Contract unit price per meter [linear foot] complete in place. Payment shall be full compensation for furnishing, installing, maintaining, for replacing deteriorated geotextile and clogged geotextile when required and for removing and disposing of the fence when no longer needed.

The accepted quantity of erosion control filter berm will be paid for at the Contract unit price per linear foot under Item 656.632, 30 Inch Temporary Silt Fence, which price shall be full compensation for furnishing, placing, and removing the erosion control filter berm.

The removal of sediments and debris that accumulate around erosion control devices, when directed by the Resident, will be paid for under the appropriate Contract items.

Cost of seeding and mulching the area after removal of the temporary silt fence will be paid for at the Contract unit prices for Item 618, Seeding, and Item 619, Mulch.

Payment will be made under:

Pay Item		Pay Unit
656.50	Baled Hay, in place	Each
656.51	Sandbag, in place	Each
656.55	Dumped Stone	Cubic Meter [Cubic Yard]
656.60	Temporary Berms	Meter [Linear Foot]
656.62	Temporary Slope Drains	Meter [Linear Foot]
656.631	375 mm [15 inch] Temporary Silt Fence	Meter [Linear Foot]
656.632	750 mm [30 inch] Temporary Silt Fence	Meter [Linear Foot]
656.64	Boom Supported Floating Silt Fence	Meter [Linear Foot]

SECTION 701 – STRUCTURAL CONCRETE RELATED MATERIALS

701.10 Fly Ash - Chemical Requirements

All references to “ASTM C311’ are changed to “ASTM C114”.

SECTION 703 - AGGREGATES

703.06 Aggregate for Base and Subbase

The first paragraph is deleted and replaced with the following:

The material shall have a minimum degradation value of 15 as determined by Washington State DOT Test Method T113, Method of Test for Determination of Degradation Value (March 2002 version), except that the reported degradation value will be the result of testing a single specimen from that portion of a sample that passes the 12.5 mm [1/2 inch] sieve and is retained on the 2.00 mm [No. 10] sieve, minus any reclaimed asphalt pavement used.

703.22 Underdrain Backfill Material

The first paragraph is amended as follows:

"...for Underdrain Type B..." is changed to "... for Underdrain Type B and C..."

SECTION 706 - NON-METALLIC PIPE

706.06 Corrugated Polyethylene Pipe for Underdrain, Option I and Option II in Culvert Pipe

The first sentence is changed from "...300 mm diameters to 900 mm" to "...300 mm diameters to 1,200 mm".

The last sentence which begins "This pipe and resins..." is deleted in its entirety and replaced with the following:

The manufacturing plants of polyethylene pipe shall be certified by the Eastern States Consortium. Polyethylene pipe shall be accepted based on third party certification by the AASHTO's National Transportation Product Evaluation Program.

SECTION 709 - REINFORCING STEEL AND WELDED STEEL WIRE FABRIC

709.03 Steel Strand

The second paragraph is changed from "...shall be 12mm [1/2 inch] AASHTO M203M/M203 (ASTM A416/A416M)..." to "...shall be 15.24 mm [0.600 inch] diameter AASHTO M203 (ASTM A416)...".

SECTION 712 - MISCELLANEOUS HIGHWAY MATERIALS

The following Subsections are added:

712.07 Tops and Traps

These metal units shall conform to the Plan dimensions and to the following Specification requirements for the designated materials:

Gray iron castings shall conform to the requirements of AASHTO M105, Class 30, unless otherwise designated.

Carbon steel castings shall conform to the requirements of AASHTO M103/M103M. Grade shall be 450-240 [65-35] unless otherwise designated.

Structural steel shall conform to the requirements of AASHTO M183/M183M or ASTM A283/A283M, Grade B or better. Galvanizing, where specified for these units, shall conform to the requirements of AASHTO M 111.

712.08 Corrugated Metal Units

The units shall conform to Plan dimensions and the metal to AASHTO M36/M36M. Bituminous coating, when specified, shall conform to AASHTO M 190 Type A.

712.09 Catch Basin and Manhole Steps

Steps for catch basins and for manholes shall conform to ASTM C478M [ASTM C478], Section 13 for either of the following material:

(a) Aluminum steps-ASTM B221M, [ASTM B21 1] Alloy 6061-T6 or 6005-T5.

(b) Reinforced plastic steps steel reinforcing bar with injection molded plastic coating copolymer polypropylene. Polypropylene shall conform to ASTM D 4101.

712.23 Flashing Lights

Flashing lights shall be power operated or battery operated as specified.

(a) Power operated flashing lights shall consist of housing, adapters, lamps, sockets, reflectors, lens, hoods and other necessary equipment designed to give clearly visible signal indications within an angle of at least 45 degrees and from three to 90 m [10 to 300 feet] under all light and atmospheric conditions.

Two circuit flasher controllers with a two-circuit filter capable of providing alternate flashing operations at the rate of not less than 50 nor more than 60 flashes per minute shall be provided.

The lamps shall be 650 lumens, 120 volt traffic signal lamps with sockets constructed to properly focus and hold the lamp firmly in position.

The housing shall have a rotateable sun visor not less than 175 nun [seven inches] in length designed to shield the lens.

Reflectors shall be of such design that light from a properly focused lamp will reflect the light rays parallel. Reflectors shall have a maximum diameter at the point of contact with the lens of approximately 200 mm [eight inches].

The lens shall consist of a round one-piece convex amber material which, when mounted, shall have a visible diameter of approximately 200 mm [eight inches]. They shall distribute light and not diffuse it. The distribution of the light shall be asymmetrical in a downward direction. The light distribution of the lens shall not be uniform, but shall consist of a small high intensity portion with narrow distribution for long distance throw and a larger low intensity portion with wide distribution for short distance throw. Lenses shall be marked to indicate the top and bottom of the lens.

(b) Battery operated flashing lights shall be self- illuminated by an electric lamp behind the lens. These lights shall also be externally illuminated by reflex reflective elements built into the lens to enable it to be seen by reflex reflection of the light from the headlights of oncoming traffic. The batteries must be entirely enclosed in a case. A locking device must secure the case. The light shall have a flash rate of not less than 50 nor more than 60 flashes per minute from minus 30°C [minus 20°F] to plus 65°C [plus 150°F]. The light shall have an on time of not less than 10 percent of the flash cycle. The light beam projected upon a surface perpendicular to the axis of the light beam shall produce a lighted rectangular projection whose minimum horizontal dimension shall be five degrees each side of the horizontal axis. The effective intensity shall not have an initial value greater than 15.0 candelas or drop below 4.0 candelas during the first 336-hours of continuous flashing. The illuminated lens shall appear to be uniformly

bright over its entire illuminated surface when viewed from any point within an angle of nine degrees each side of the vertical axis and five degrees each side of the horizontal axis. The lens shall not be less than 175 mm [seven inches] in diameter including a reflex reflector ring of 13 mm [1/2 inch] minimum width around the periphery. The lens shall be yellow in color and have a minimum relative luminous transmittance of 0.440 with a luminance of 2854° Kelvin. The lens shall be one-piece construction. The lens material shall be plastic and meet the luminous transmission requirements of this Specification. The case containing the batteries and circuitry shall be constructed of a material capable of withstanding abuse equal to or greater than 1.21 mm thick steel [No. 18 U.S. Standard Gage Steel]. The housing and the lens frame, if of metal shall be properly cleaned, degreased and pretreated to promote adhesion. It shall be given one or more coats of enamel which, when dry shall completely obscure the metal. The enamel coating shall be of such quality that when the coated case is struck a light blow with a sharp tool, the paint will not chip or crack and if scratched with a knife will not powder. The case shall be so constructed and closed as to exclude moisture that would affect the proper operation of light. The case shall have a weep hole to allow the escape of moisture from condensation. Photoelectric controls, if provided, shall keep the light operating whenever the ambient light falls below 215 lx [20 foot candles]. Each light shall be plainly marked as to the manufacturer's name and model number.

If required by the Resident, certification as to conformance to these Specifications shall be furnished based on results of tests made by an independent testing laboratory. All lights are subject to random inspection and testing. All necessary random samples shall be provided to the Resident upon request without cost to the Authority. All such samples shall be returned to the Contractor upon completion of the tests.

712.32 Copper Tubing

Copper tubing and fittings shall conform to the requirements of ASTM B88M Type A [ASTM B88, Type K] or better.

712.33 Non-metallic Pipe, Flexible

Non-metallic pipe and pipe fittings shall be acceptable flexible pipe manufactured from virgin polyethylene polymer suitable for transmitting liquids intended for human or animal consumption.

712.34 Non-metallic Pipe, Rigid

Non-metallic pipe shall be Schedule 40 polyvinylchloride (PVC) that meets the requirement of ASTM D 1785. Fittings shall be of the same material.

712.341 Metallic Pipe

Metallic pipe shall be ANSI, Standard B36. 10, Schedule 40 steel pipe conforming to the requirements of ASTM A53 Types E or S, Grade B. End plates shall be steel conforming to ASTM A36/A36M.

Both the sleeve and end plates shall be hot dip galvanized. Pipe sleeve splices shall be welded splices with full penetration weld before galvanizing.

712.35 Epoxy Resin

Epoxy resin for grouting or sealing shall consist of a mineral filled thixotropic, flexible epoxy

resin having a pot life of approximately one hour at 10°C [50°F]. The grout shall be an approved product suitable for cementing steel dowels into the preformed holes of curb inlets and adjacent curbing. The sealant shall be an approved product, light gray in color and suitable for coating the surface.

712.36 Bituminous Curb

The asphalt cement for bituminous curb shall be of the grade required for the wearing course, or shall be Viscosity Grade AC-20 meeting the current requirements of Subsection 702.01, Asphalt Cement. The aggregate shall conform to the requirements of Subsection 703.07. The coarse aggregate portion retained on the 2.36 mm [No. 8] sieve may be either crushed rock or crushed gravel.

The mineral constituents of the bituminous mixture shall be sized and graded and combined in a composite blend that will produce a stable durable curbing with an acceptable texture. Bituminous material for curb shall meet the requirements of Section 403, Hot Bituminous Pavement.

712.37 Precast Concrete Slab

Portland Cement concrete for precast slabs shall meet the requirements of Section 502, Structural Concrete, Class A.

The slabs shall be precast to the dimension shown on the Plans and cross section and in accordance with the Standard Detail Plans for Concrete Sidewalk Slab. The surface shall be finished with a float finish in accordance with Subsection 502.14(c). Lift devices of sufficient strength to hold the slab while suspended from cables shall be cast into the top or back of the slab.

712.38 Stone Slab

Stone slabs shall be of granite from an acceptable source, hard, durable, predominantly gray in color, free from seams which impair the structural integrity and be of smooth splitting character. Natural color variations characteristic of the deposit will be permitted. Exposed surfaces shall be free from drill holes or indications of drill holes. The granite slabs in any one section of backslope must be all the same finish.

The granite slabs shall be scabble dressed or sawed to an approximately true plane having no projections or depressions over 13 mm [1/2 inch] under a 600 mm [two foot] straightedge or over 25 mm [one inch] under a 1200 mm [four foot] straightedge. The arris at the intersection of the top surface and exposed front face shall be pitched so that the arris line is uniform throughout the length of the installed slabs. The sides shall be square to the exposed face unless the slabs are to be set on a radius or other special condition which requires that the joints be cut to fit, but in any case shall be so finished that when the stones are placed side by side no space more than 20 mm [3/4 inch] shall show in the joint for the full exposed height.

Lift pin holes in all sides will be allowed except on the exposed face.

SECTION 717 - ROADSIDE IMPROVEMENT MATERIAL

717.03 C. Method #3 - Roadside Mixture #3

Seed proportions are amended as follows:

Crown Vetch	25.0%
Perennial Lupine	25.0%

Red Clover	12.5%
Annual Rye	37.5%

717.05 Mulch Binder

The third sentence is amended as follows:

"Paper fiber mulch may be used as a binder at the rate of 2.3 kg/unit [5 lb/unit]."

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART II – SPECIAL PROVISIONS

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART II - SPECIAL PROVISIONS

All work shall be governed by the Maine Department of Transportation Standard Specifications, December 2002 Edition, except for that work which applies to sections of the Maine Department of Transportation Standard Specifications which are amended by the Maine Turnpike General Provisions and the following modifications, additions and deletions.

General Description of Work

The work consists of highway, bridge, and toll system improvements at the Gray Interchange. These improvements include new southbound ramps and a new southbound toll plaza on the west side of the Maine Turnpike where they are proposed to intersect with Route 202 and Route 26A. The improvements include work along the Maine Turnpike, the northbound and southbound ramps, Route 202 and Route 26A. The toll plaza work includes a new toll administration building and toll plaza at the southbound ramps and reconstruction of the existing toll plaza for the northbound ramps. The proposed work and all other work incidental thereto shall be in accordance with the Plans and Specifications.

The general limits of work along the Maine Turnpike begin at Mile Marker 62.8 and continues northerly to Mile Marker 63.5. The work along Route 202 begins approximately 0.2 miles west of the intersection with Route 26A and continues easterly for approximately 0.5 miles into Gray Village. The work along Route 26A begins at the intersection with Route 202 and extends northerly for approximately 0.1 miles.

The major components of work are listed below:

- Construction of new southbound on and off ramps
- Reconstruction and rehabilitation of the northbound on and off ramps
- New southbound ramps toll plaza and administration building
- Demolition of existing toll plaza
- Demolition of existing southbound ramps bridge
- Interconnected signal system from Gray Village to the southbound ramps intersection
- Partial deck, joint repairs and replacement of barrier membrane and pavement on the Route 202 bridge

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 – Gray Interchange Exit 63 (Mile Marker 63.3)”. 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 Definition

Holidays

The following is added after Memorial Day in the General Provisions:

Independence Day 2016	12:01 p.m. preceding Friday to 6:00 (Fourth of July) a.m. the following Tuesday.
Christmas Day 2016	12:01 p.m. preceding Friday to 6:00 a.m. the following Tuesday.
New Year's Day 2017	12:01 p.m. preceding Friday to 6:00 a.m. the following Tuesday.
Independence Day 2017 (Fourth of July)	6:00 a.m. preceding Friday to 12:01 p.m. the following Wednesday.

The below definitions are deleted and replaced with the following:

Subcontractor An individual, firm, corporation, limited liability company, partnership, joint venture, sole proprietorship, or any other entity to whom the Contractor or a Subcontractor contracts a portion of the Work. A subcontracting arrangement shall be considered to exist when a person or firm assumes an obligation through a written contract for performing part of the Work using its own Equipment and Workers, procuring its own Materials and supplies, and furnishing its own supervision with only general overall supervision being exercised by the prime Contractor or higher tier Subcontractors. Unless the context indicates otherwise, Subcontractors include suppliers, vendors, fabricators, and any other entities which contract to perform any portion of the Work.

Closeout Documentation: All documentation required by the Authority to close out the Project in accordance with all applicable contractual, statutory or regulatory requirements. These documents include, but are not necessarily limited to: an acceptable final payment requisition, a lien waiver and indemnity of the Authority against any Subcontractor liens, and certification that all persons or firms supplying work and materials to the project have been paid in full or will be paid in full immediately upon final payment.

Notice of Award: A written notice to the Contractor stating that the Contract has been executed.

Notice of Intent to Award: Written transmittal by the Authority to an Apparent Successful Bidder, following approval of an Award by the Authority's Board or Executive Director, of either of the following: (1) the Contract Documents or (2) Notice, which may be by electronic mail, that the Contract Documents are available for the bidder to pick up at the Authority. See Section 103.4 – Notice of Intent to Award

DELETE Prequalification Application

Prequalification Procedure: The current procedure and requirements observed by the MaineDOT in its prequalification of Contractors, including but not limited to the requirements contained in the

current version of the MaineDOT's Contractor's Prequalification Procedure first adopted by the MaineDOT in April 1998 and administered through the MaineDOT's Contracts Section.

Request for Proposal: The Authority's solicitation for Proposals, including the Notice to Contractors and other documentation furnished or made available to potential Proposers.

102.11 Bid Responsiveness

The following Subsections are deleted and replaced as follows:

102.11.1 Non-curable Bid Defects The Authority **WILL REJECT** Bids as non-responsive if ANY ONE of the following occurs.

A. The Bid and Bid Guaranty are not Delivered to the precise location and by the precise time set forth in the Notice to Contractors or any applicable Bid Amendment.

B. The Bidder is not eligible to Bid as set forth in Section 102.1 - Eligibility to Bid.

C. The Bid is not signed by a duly authorized representative of the Bidder.

D. A Bid Guaranty Conforming to Section 102.6 - Bid Guaranty is not submitted.

E. The unit price and bid amount is not provided or a lump sum price is not provided or is illegible as determined by the Authority.

F. The Bidder fails to indicate the Bidder's choice where the Bid Documents clearly require a choice affecting the bid amount.

G. The Bid contains any conditional or alternate Bidding language including the right to accept or reject an Award of the Contract.

H. The Bidder submits more than one Bid for the same Contract, or the Bidder and any Related Entity each submit a Bid for the same Contract.

I. The Authority has substantial evidence of collusion by the Bidder.

J. The Bidder fails to comply with any provision in the Bid Documents that expressly indicates that such non-compliance will cause Bid rejection.

K. When A plus B bidding is specified, the bid does not contain the number of Calendar Days bid to complete the work

L. The Bid is not submitted on the most current forms provided by the Authority or identical copies thereof

The Bidder will have no opportunity to cure the above Non-curable Bid Defects.

102.11.2 Curable Bid Defects Unless the Authority waives a curable Bid defect, the Bidder must cure, within the time stated in the written notice by the Authority, but not less than 24 hours, all other Bid Defects not listed in Section 102.11.1 - Non-curable Bid Defects that are identified by the Authority. Failure to cure such Defects within said time may result in forfeiture of the Bidder's Bid Guaranty. Upon such failure, the Authority may take any action in the best interests of the Authority including those set forth in Section 103.6 - Failure to Fulfill Award Conditions.

Such curable Bid Defects include, but are not limited to, the following.

A. Missing total sum of the items provided in the Schedule of Items.

B. The prices or signatures on the Bid or Bid Guaranty are not in ink or other non- erasable substance.

C. Failure to acknowledge Receipt and consideration of all Bid Amendments.

D. All other Defects that do not create a significant question as to the Bidder's total Bid amount or the Bidder's ability to complete the Work within the Contract Time or otherwise in accordance with the Contract terms, as determined by the Authority.

Bids that the Authority determines, in its sole discretion, create a significant question as to the Bidder's ability or will to complete the Work within the Contract Time or otherwise in accordance with the Contract terms will be treated as non-curable defects. Materially unbalanced bids may fall into this category, depending on the circumstances.

Contractors prequalified for the general category stated in the Notice to Contractors may be determined non-responsive by the Authority based on recent or new data provided since the last determination of prequalification for that Contractor.

If the Authority rejects a bid as non-responsive it may take any action that is in the best interests of the Authority including but not limited to those set forth in Section 103.6 - Failure to Fulfill Award Conditions.

103.3 Post-Bid Qualification

Subsections 103.3.1, and 103.3.2, and 103.3.3 are deleted and replaced with the following:

103.3.1 Prequalification Requirement for Award

If the Notice to Contractors lists a Prequalification requirement, the Apparent Successful Bidder must successfully complete the prequalification procedure as a condition of Award. The Authority may, in its sole discretion, substitute the process described in subsection 103.3.1.1 for the Prequalification Procedure, or require compliance with that process in addition to the Prequalification Procedure.

103.3.1.1 Notice and Information Gathering

The Authority will review the Bid Proposals. As a condition for Award of a Contract, the Authority may require an Apparent Successful Bidder to demonstrate to the Authority's satisfaction that the Bidder is responsible and qualified to perform the Work. The Authority may require this demonstration regardless of whether the Notice to Contractors listed a Prequalification requirement. If such information is required, the Authority, or the Authority's agent, will contact the Apparent Successful Bidder and request specific information. If requested by the Apparent Successful Bidder, this request can be in writing. The Apparent Successful Bidder shall respond to the request within 24-hours (one work day) unless both parties agree in writing to extend the deadline.

103.3.2 Notice of Determination

If the Authority determines that a Bidder is "Not Qualified", the Authority or its representative will notify the Bidder in writing of its determination. The notice will set forth the specific reasons therefore to the extent practical. Such reasons include the following:

A. Default(s) or termination(s) on past or current Contracts.

B. Failure to pay or settle all bills for labor, Materials or services on past or current Contracts.

C. Failure to provide Closeout Documentation on past or current Contracts.

D. Failure to fulfill warranty obligations on past or current Contracts.

E. Failure to comply with directives of the Department on past or current Contracts.

F. "Below Standard" performance as determined from the Authority's and/or MaineDOT's Contractor's Performance Rating process.

G. Inability of the Contractor to obtain or retain performance or Payment Bonds meeting MDOT requirements.

H. Failure to accept an Award of a Contract made by the Authority to the Contractor.

I. Making materially false, deceptive, or misleading Statements or omissions, whether or not under oath, regarding a claim on prior Contracts or on the Contractor's Prequalification Application.

J. Failure to provide information requested by the Authority pursuant to this Section 103.3.

K. Any of the reasons contained in Section 102.02 of the "Rules Regarding Debarment of Contractors", Maine Department of Transportation Register 17-229, Chapter 102 (October 2, 1985).

L. Debarment or suspension by any federal, State, or local governmental procurement agency or the Contractor's Agreement to refrain from Bidding as part of the settlement with any such agencies.

M. Other serious misconduct that the Authority reasonably determines will substantially and adversely affect the cost, quality or timeliness of Work, or the safety of Workers or the public.

N. Bidder has previously performed Work for the State or the Authority in an unsatisfactory manner.

O. Bidder does not have the capacity to perform the required Work in the opinion of the Authority.

P. This Project combined with other projects committed to by the Bidder puts him in excess of his capacity in the opinion of the Authority.

Q. Reasonable grounds for believing that the Bidder is interested in more than one Proposal for the Work contemplated.

R. Developments arise which, in the opinion of the Authority, adversely affect the Bidder's responsibility.

S. Lack of qualifications as determined by the Authority.

103.3.3 Appeal

To appeal a "Not Qualified" determination, the Bidder must Deliver a written "Request for Appeal of Qualification Determination" to the Authority's Executive Director within 48 hours of Receipt of such determination. The Executive Director will grant such Requests for Appeal unless the Authority reasonably determines that Delay of Award pending appeal is likely to cause substantial harm to the interests of the Authority. If the Request for Appeal is denied, the determination of "Not Qualified" is upheld and the Award process will proceed without the unqualified Bidder.

If the Request for Appeal is granted, the Bidder and the Chief Operations Officer must deliver to the Executive Director any information or arguments that the parties want considered within 14 Days of Receipt of a "Not Qualified" determination.

Within 14 Days of Receipt of such information and arguments, the Executive Director will notify the Bidder in writing as to whether: (A) the determination of "Not Qualified" is upheld, modified or reversed; or (B) the Executive Director elects to submit the issue to binding or non-binding alternative Dispute resolution.

After a final determination of "Not Qualified", the Bidder's Bid Guaranty will be returned and the Bidder will be ineligible for Award of future Authority Contracts until the Bidder is prequalified pursuant to the MaineDOT's Prequalification Procedure.

103.4 Notice of Award

The following sentence is added:

The Maine Turnpike Authority Board is scheduled to consider the Contract Award on January 28, 2016.

104.2.2 Furnishing of Permits

The following sentences are added:

The Contractor shall obtain the following permits:

- State Electrical and State Plumbing.

See related Subsection 105.8.2, Permit Requirements (Environmental).

104.3.11 Responsibility for Property of Others

This Subsection is deleted and replaced as follows:

The Contractor and its Subcontractors shall not enter private property outside the Project Limits without first obtaining permission from the Owners.

The Contractor shall be responsible for all damage to public or private property of any kind resulting from any act, omission, neglect, or misconduct of the Contractor and its Subcontractors. The preceding sentence includes damage to vehicles passing through the Work area.

The Contractor shall, at its sole expense, rebuild, repair, restore, or replace such damaged property and otherwise make good any losses that arise from such damage. Within fifteen (15) days of occurrence Contractor shall submit in writing to the Authority a copy of their response to the claimant. If the Contractor fails to completely remedy the damage in a timely manner, the Authority may, upon 48 hours advance written notice, rebuild, repair, restore or replace the damaged property or pay the applicable claim for damages without liability to the Authority with its own forces or with contracted forces. All costs will be deducted from amounts otherwise due the Contractor.

104.3.8 Wage Rates and Labor Laws

The fourth paragraph under Records on GP Page 7 of 53 has been amended as follows:

A copy of each record must be filed monthly with the Maine Turnpike Authority. This information shall be sent directly to the Maine Turnpike Authority, Director of Engineering and Building Maintenance, Attention: Wage Rate Records, 2360 Congress Street, Portland, ME 04102. The records shall note the Maine Turnpike Contract Number.

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

THIS DOCUMENT MUST BE CLEARLY POSTED AT THE PERTAINING STATE FUNDED PREVAILING WAGE CONSTRUCTION SITE

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

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

Title of Project -------Gray Interchange (Exit 63) 2016.02

Location of Project –Gray, Cumberland County

2016 Fair Minimum Wage Rates
Building 2 (other than 1 & 2 family homes) Cumberland County

Occupation Title	Minimum Wage	Minimum Benefit	Total	Occupation Title	Minimum Wage	Minimum Benefit	Total
Asbestos/Lead Removal Worker	$13.00	$0.51	$13.51	Insulation Installer	$19.25	$2.33	$21.58
Assembler – Metal Building	$13.63	$3.38	$17.01	Ironworker – Reinforcing	$21.00	$6.80	$27.80
Boom Truck (Truck Crane) Operator	$21.00	$2.85	$23.85	Ironworker – Structural	$23.20	$9.36	$32.56
Bricklayer	$22.00	$2.60	$24.60	Laborers (Incl. Helpers & Tenders)	$14.00	$0.34	$14.34
Bulldozer Operator	$17.63	$3.24	$20.87	Laborer – Skilled	$16.33	$1.67	$18.00
Carpenter	$22.00	$3.84	$25.84	Loader Operator – Front End	$17.21	$2.66	$19.87
Carpenter – Acoustical	$15.00	$2.68	$17.68	Mechanic – Maintenance	$20.13	$3.28	$23.14
Carpenter – Rough	$17.50	$0.75	$18.25	Mechanic – Refrigeration	$20.00	$3.66	$23.66
Cement Mason/Finisher	$17.50	$0.50	$18.00	Millwright	$23.95	$19.19	$43.14
Communication Equipment Installer	$23.99	$7.63	$31.62	Oil/Fuel Burner Servicer & Inst(licensed)	$24.43	$6.13	$30.56
Concrete Pump Operator	$24.25	$5.40	$29.65	Painter	$18.75	$0.00	$18.75
Crane Operator <15 Tons	$21.25	$2.58	$23.83	Paperhanger	$17.00	$3.16	$20.16
Crane Operator =>15 Tons	$24.50	$6.61	$31.11	Pipe/Steam/Sprinkler Fitter	$26.25	$13.84	$40.09
Crusher Plant Operator	$15.80	$3.76	$19.56	Pipe Layer	$19.33	$2.37	$21.70
Dry-Wall Applicator	$22.94	$2.63	$25.57	Plasterer	$43.93	$27.43	$71.36
Dry-Wall Taper & Finisher	$24.00	$2.82	$26.82	Plumber (Licensed)	$26.00	$3.38	$29.38
Electrician – Licensed	$25.00	$5.47	$30.47	Plumber Helper/Trainee (Licensed)	$20.29	$2.54	$22.83
Electrician Helper/Cable Puller (Licensed)	$16.49	$2.73	$19.22	Propane & Natural Gas Service & Inst.	$21.00	$3.87	$24.87
Elevator Constructor/Installer	$53.30	$33.36	$86.66	Roofer	$15.00	$1.15	$16.15
Excavator Operator	$19.06	$2.44	$21.50	Sheet Metal Worker	$20.60	$4.69	$25.29
Fence Setter	$15.25	$1.32	$16.57	Sider	$22.75	$4.33	$27.08
Flagger	$16.70	$7.95	$24.65	Stone Mason	$17.80	$0.00	$17.80
Floor Layer	$19.50	$4.51	$24.01	Tile Setter	$21.25	$4.76	$26.01
Furniture Installer/Assembler	$13.75	$0.85	$14.60	Truck Driver – Light	$15.00	$0.99	$15.99
Glazier	$20.82	$2.71	$23.53	Truck Driver – Medium	$15.00	$0.10	$15.10
Grader/Scraper Operator	$17.50	$1.04	$18.54	Truck Driver – Heavy	$14.00	$0.62	$14.62
Heating, Ventilation, Air Conditioning	$25.00	$4.59	$29.59	Truck Driver – Tractor Trailer	$16.24	$3.28	$19.52

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

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

Apprentices - The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.
Posting of Schedule - Posting of this schedule is required in accordance with 26 MRSA §1301 et. seq., by any contractor holding a State contract for construction valued at $50,000 or more and any subcontractors to such a contractor.
Appeal - Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates with the Secretary of State.

Determination No: B2-002-2016
Filing Date: December 23, 2015

Expiration Date: 12-31-2016

A true copy
Attest: Verna Eldridge
Verna Eldridge
Wage & Hour Director
Bureau of Labor Standards

BLS 424B2 (R2016)(Building 2 Cumberland)

THIS DOCUMENT MUST BE CLEARLY POSTED AT THE PERTAINING STATE FUNDED PREVAILING WAGE CONSTRUCTION SITE

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

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

Title of Project --------Gray Interchange (Exit 63) 2016.02

Location of Project –Gray, Cumberland County

2016 Fair Minimum Wage Rates
Highway & Earthwork Cumberland County

Occupation Title	Minimum Wage	Minimum Benefit	Total	Occupation Title	Minimum Wage	Minimum Benefit	Total
Asphalt Raker	$15.00	$0.00	$15.00	Ironworker – Structural	$23.20	$6.20	$29.40
Backhoe Loader Operator	$19.00	$3.03	$23.03	Laborers (Incl. Helpers & Tenders)	$14.00	$0.37	$14.37
Blaster Ordinance Handling & Explosives	$19.75	$2.02	$21.77	Laborer – Skilled	$16.00	$1.04	$17.04
Boom Truck (Truck Crane) Operator	$21.00	$2.85	$23.85	Line Erector – Power/Cable Splicer	$25.88	$5.88	$31.76
Bulldozer Operator	$18.00	$3.24	$21.24	Loader Operator – Front End	$17.25	$2.89	$20.14
Carpenter	$20.00	$1.63	$21.63	Mechanic – Maintenance	$18.50	$1.95	$20.45
Carpenter – Rough	$18.00	$1.15	$19.15	Mechanic – Refrigeration	$22.00	$3.54	$25.54
Concrete Mixing Plant Operator	$20.00	$4.46	$24.46	Painter	$18.00	$3.33	$21.33
Concrete Pump Operator	$20.00	$0.00	$20.00	Paver Operator	$18.00	$0.00	$18.00
Crane Operator <15 Tons	$18.61	$2.97	$21.58	Pipe Layer	$19.33	$2.37	$21.70
Crane Operator =>15 Tons	$24.50	$6.61	$31.11	Pump Installer	$25.00	$4.67	$29.67
Crusher Plant Operator	$16.50	$4.72	$21.22	Reclaimer Operator	$21.00	$11.34	$32.34
Driller – Rock	$19.25	$4.30	$23.55	Roller Operator – Earth	$11.75	$0.30	$12.05
Dry-Wall Applicator	$21.50	$2.63	$24.13	Roller Operator – Pavement	$17.03	$1.02	$18.05
Earth Auger Operator	$23.00	$0.00	$23.00	Screed/Wheelman	$19.00	$1.79	$20.79
Electrician – Licensed	$26.00	$13.87	$39.87	Sider	$23.00	$1.77	$24.77
Excavator Operator	$18.90	$2.32	$21.22	Stone Mason	$17.80	$0.00	$17.80
Fence Setter	$15.25	$1.32	$16.57	Truck Driver – Light	$13.50	$0.00	$13.50
Flagger	$9.00	$0.00	$9.00	Truck Driver – Medium	$16.00	$0.52	$16.52
Grader/Scraper Operator	$18.00	$1.04	$19.04	Truck Driver – Heavy	$15.00	$0.99	$15.99
Highway Worker/Guardrail Installer	$15.00	$1.16	$16.16	Truck Driver – Tractor Trailer	$16.50	$1.07	$17.57
Hot Top Plant Operator	$23.60	$9.48	$33.08	Truck Driver – Mixer (Cement)	$12.50	$4.01	$16.51

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

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

Apprentices - The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.
Posting of Schedule - Posting of this schedule is required in accordance with 26 MRSA §1301 et. seq., by any contractor holding a State contract for construction valued at $50,000 or more and any subcontractors to such a contractor.
Appeal - Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates with the Secretary of State.

Determination No: HI-003-2016
Filing Date: December 23, 2015

Expiration Date: 12-31-2016

A true copy
Attest: Verna Eldridge
Verna Eldridge
Wage & Hour Director
Bureau of Labor Standards

BLS 424B2 (R2016)(Highway/Earthwork Cumberland)

THIS DOCUMENT MUST BE CLEARLY POSTED AT THE PERTAINING STATE FUNDED PREVAILING WAGE CONSTRUCTION SITE

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

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

Title of Project --------Gray Interchange (Exit 63) 2016.02

Location of Project --Gray, Cumberland County

2016 Fair Minimum Wage Rates
Heavy and Bridge Cumberland County

Occupation Title	Minimum Wage	Minimum Benefit	Total	Occupation Title	Minimum Wage	Minimum Benefit	Total
Backhoe Loader Operator	$21.17	$2.92	$24.09	Flagger	$9.00	$0.00	$9.00
Blaster Ordinance Handling & Explosives	$21.00	$2.72	$23.72	Grader/Scraper Operator	$17.50	$1.04	$18.54
Boilermaker	$23.30	$1.30	$24.60	Ironworker – Reinforcing	$21.25	$0.00	$21.25
Bricklayer	$22.00	$1.57	$23.57	Ironworker – Structural	$24.31	$8.76	$33.07
Bulldozer Operator	$17.63	$3.24	$20.87	Laborers (Incl. Helpers & Tenders)	$16.00	$2.11	$18.11
Carpenter	$21.00	$5.76	$26.76	Laborer – Skilled	$20.00	$4.35	$24.35
Carpenter – Rough	$19.75	$4.82	$24.57	Line Erector – Power/Cable Splicer	$32.00	$6.96	$38.96
Cement Mason/Finisher	$19.71	$4.89	$24.60	Loader Operator – Front End	$17.61	$2.66	$20.27
Communication Equipment Installer	$13.99	$0.36	$14.35	Mechanic – Maintenance	$20.25	$5.61	$25.86
Comm. Transmission Erector-Microwave/ Cell	$21.00	$4.23	$25.23	Mechanic – Refrigeration	$22.00	$3.54	$25.54
Concrete Pump Operator	$21.00	$8.40	$29.40	Millwright	$24.38	$4.57	$28.95
Crane Operator =>15 Tons	$24.43	$6.15	$30.58	Painter	$17.63	$0.00	$17.63
Crusher Plant Operator	$15.80	$3.76	$19.56	Pile Driver Operator	$24.31	$7.32	$31.63
Diver	$20.00	$0.00	$20.00	Pipe/Steam/Sprinkler Fitter	$22.50	$5.73	$28.23
Driller – Rock	$20.50	$3.27	$23.77	Pipe Layer	$26.00	$11.67	$37.67
Dry-Wall Taper & Finisher	$21.00	$1.46	$22.46	Pump Installer	$25.00	$4.67	$29.67
Earth Auger Operator	$23.16	$5.33	$28.49	Truck Driver – Light	$15.00	$0.99	$15.99
Electrician – Licensed	$27.00	$15.49	$42.49	Truck Driver – Medium	$15.00	$0.10	$15.10
Electrician – Helper/Cable Puller Licensed	$16.50	$3.47	$19.97	Truck Driver – Heavy	$17.63	$2.92	$20.55
Excavator Operator	$19.06	$3.94	$23.00	Truck Driver – Tractor Trailer	$20.88	$5.71	$26.59
Fence Setter	$15.25	$1.32	$16.57				

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

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

Apprentices - The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.
Posting of Schedule - Posting of this schedule is required in accordance with 26 MRSA §1301 et. seq., by any contractor holding a State contract for construction valued at $50,000 or more and any subcontractors to such a contractor.
Appeal - Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates with the Secretary of State.

Determination No: HB-003-2016
Filing Date: December 23, 2015

Expiration Date: 12-31-2016

A true copy
Attest: Verna Eldridge
Verna Eldridge
Wage & Hour Director
Bureau of Labor Standards

BLS 424B2 (R2016)(Heavy-Bridge Cumberland)

104.4.4 Request for Information (RFI)

This Subsection is amended by the addition of the following:

RFI's shall be submitted on company letterhead or on a standard company form with a tracking number. The General Contractor shall maintain a corresponding RFI log.

RFI's may be attached to an e-mail, but shall not be in the form of an e-mail, and at a minimum, must reference the subject Plan or Specification in question.

RFI's with multiple questions may be treated as a submittal and the allowed 21 calendar days for review and response will govern.

104.4.6 Utility Coordination

This Subsection is amended by the addition of the following:

The Contractor shall build time into the schedule and permit access for Subsurface Wastewater Disposal System permit inspections. The contractor shall coordinate with the Resident so the required Building and Subsurface Wastewater Disposal System permit inspections do not impact the work progress.

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.

Central Maine Power will install new utility poles along Route 202 as depicted on the plans. It is anticipated that the work necessary to install the new poles and relocate their existing facilities will require 2 weeks and 1 day to coordinate with the Contractor on activating the power and ensuring that the lighting is working properly.

OTT Communications will require one (1) weeks to relocate their existing facilities to the new poles.

Time Warner Cable will require two (2) weeks to relocate their existing facilities to the new poles.

Central Maine Power will provide a connection for the contractor to provide power to the toll plaza and administration building.

The Gray Water District has facilities within the project limits. The contractor will extend the existing 2" water service line to behind the proposed guardrail at approximately Station 610+40 RT and install a meter pit at this location. The contractor will install the 2" water service from the meter pit to the toll plaza as shown on the plans.

Existing utilities at the site include Maine Turnpike Authority. The Authority will be responsible for contacting Dig Smart to locate their facilities. Underground and electrical and communication conduit, operated by Maine Turnpike Authority, exist within the project limits. These utilities are live and the Contractor shall coordinate construction activity with the Authority per the plans. This will involve, as part of this contract, the Contractor utilizing existing infrastructure, removing existing infrastructure, and installing new infrastructure.

The design engineer, VHB, is coordinating with CMP for the final design, construction schedule and working days for this installation.

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:

Existing utilities at the site include:

ELECTRIC (AERIAL)
Central Maine Power
740 Main Street
Lewiston, ME 04210
ATTN: Tony Martin
Anthony.Martin@cmpco.com

COMMUNICATIONS (AERIAL)
OTT Communications
56 Campus Drive
New Gloucester, ME 04260
ATTN: Jim Taplin
Jim.Taplin@ottcommunications.com

TELEPHONE/CABLE TELEVISION (AERIAL)
Time Warner Cable
118 Johnson Road
Portland, ME 04102
ATTN: Mark Pelletier
Mark.Pelletier@twcable.com

GRAY WATER DISTRICT (UNDERGROUND)
80 Shaker Road
Gray, ME 04039
ATTN: James Foster
JFoster@securespeed.net

GRAY PUBLIC WORKS (UNDERGROUND)
123 Shaker Road
Gray, ME 04039
ATTN: Steven Lavallee
SteveLavallee@graymaine.org

MAINE TURNPIKE AUTHORITY
2360 Congress Street
Portland, Maine 04102
ATTN: John Roberts
JRoberts@maineturnpike.com

MAINE DEPARTMENT OF TRANSPORTATION – SIGNALS AND LIGHTING
16 State House Station
Augusta, ME 04333
ATTN: Stephen Landry
Steven.Landry@Maine.gov

104.4.6.1 Temporary Utilities

The Contractor will be required to maintain all services and utilities to the existing facility throughout reconstruction of the existing toll plaza area. Existing services and utilities include, but are not necessarily limited to, power, telephone, water, sewer, propane, heat and site lighting. The Contractor shall be responsible for all temporary connections, service runs, relocation, disconnections, reconnections, etc. required to maintain these services due to phasing of construction and constraints of the site and work area.

Prior to start of construction, the Contractor shall submit a plan and schedule for maintaining existing services and utilities. The plan shall identify all 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 Boots, Canopy and Gantry Demolition.

104.4.7 Cooperation With Other Contractors

This Subsection is amended by the addition of the following:

The Maine Turnpike, through MTA Contract 2016.01, between Mile 54 and 64, is scheduled to receive a pavement rehabilitation in 2016.

The Maine Turnpike, through MTA Contract 2016.06, between Mile 75 and 109 is scheduled to install guide signs along the Maine Turnpike.

The Maine Department of Transportation, though MaineDOT PIN 18802.00, is scheduled to perform a pavement overlay project from 0.4 miles south of Lotts Drive in Windham and extending easterly 7.42 miles ending just east of McConkey Road on Route 4.

The Maine Turnpike, through Contract 2017.xx, between Mile 46 and 63 is scheduled to install guide signs along the Maine Turnpike.

The Gray Water District will be upgrading their 2" water line along the left side of Route 202 adjacent to the MTA Maintenance Facility (Sta. 614+00 +/- to Sta. 617+00 +/-). This proposed construction work is anticipated to be completed by March 15, 2016.

All construction Contracts associated with this work shall be considered adjacent Contracts.

104.5 Subcontracting – The following Subsections are deleted and replaced as follows:

104.5.1 Limits on Subcontracting The Contractor shall perform at least 30% of the value of the Work with its own Work force, excluding any specialty items as designated in the contract documents by the Authority.

The Contractor shall not carry the Workers of another Contractor or firm on its payroll or a Subcontractor's payroll. The Contractor shall not use any Subcontractors that are debarred from Bidding by the Federal Government or any agency of the State of Maine.

104.5.2 Contractor's Duties Regarding Subcontractors Subcontractors are solely the responsibility of the Contractor. The Contractor is responsible for assuring that its Subcontractors have sufficient skill and experience to perform the Work properly and for coordinating and managing its Subcontractors to achieve the intent of the Contract. The Contractor agrees to indemnify, defend, and hold harmless the Authority from and against all claims and causes of action arising out of any act or omission of Subcontractors, their agents, representatives, and employees. The Contractor agrees to indemnify the Authority and hold the Authority harmless from any claims asserted by its Subcontractors including any claims to recover losses allegedly suffered by a Subcontractor. Subcontracting does not alter or diminish the Contractor's obligations under the Contract. For a related provision, see Section 105.1 - Intent of the Contract.

104.5.3 Documentation Regarding Subcontracting before any Work is performed by a Subcontractor, the Contractor shall provide the Authority a list of all Subcontractors that the Contractor anticipates will be providing Work within the Project Limits. The Contractor shall continuously update the Subcontractor information and provide it to the Authority throughout the duration of the Project.

If requested the Contractor shall provide the Authority with copies of any subcontract or other document that establishes the relationship of the Contractor and any Subcontractors.

104.5.4 Discharge of Subcontractors The Authority, upon written notice to the Contractor, may require that the Contractor discharge any Subcontractor without cost or liability to the Authority. If the Authority determines that a Subcontractor's performance jeopardizes the intent of the Contract otherwise, the Authority may, but is not required, to notify the Contractor of such a determination. Such notice, or lack thereof, does not affect the Contractor's duties regarding Subcontractors. Upon Receipt of such notice, the Contractor shall take any action it determines is necessary to fulfill its obligations under the Contract. The Authority does not have any duty to take any action under this paragraph, and neither the exercise of the Authority's rights under this paragraph nor the non-exercise of those rights will relieve the Contractor of its sole responsibility for the performance of Subcontractors. For related provisions, see Sections 104.3.4 - Workers and Equipment, 104.5.2 - Contractor's Duties Regarding Subcontractors, 105.1 - Intent of the Contract, and 105.2 - Health and Safety.

104.5.5 Prompt Payment of Subcontractors

A. Pay When Paid The Contractor shall pay Subcontractors in full for all Work satisfactorily performed and Invoiced by the Subcontractor no later than 30 Days from

the date the Contractor receives payment from the Authority for such Subcontractor's Work. Contractor will ensure that its Subcontractors pay all of their ~~Sub-~~Subcontractors, including suppliers and material men, no later than 30 days from the date they receive payment from the Contractor.

B. Retainage The Contractor shall return to the Subcontractor all retainage withheld from the Subcontractor within 30 Days after the date the Subcontractor's Work is satisfactorily completed. If there is a Delay in such return of retainage, the Subcontractor may pursue all rights it may have under the claims procedure referenced in Section 104.5.6 - Subcontractor Claims for Payment.

104.5.6 Subcontractor Claims for Payment The Contractor agrees to notify all Subcontractors of the claim filing procedure of Payment and Performance bonds required by 110.2.1. The Department may use retainage and other remaining project funds to pay outstanding claims for Accepted Work.

104.5.7 Flow Down All subcontracts of the Contractor, and all lower tier subcontracts, shall contain or reference all applicable provisions of the Contract, including all safety, wage, Prompt payment, labor, environmental, and equal opportunity provisions. The Contractor indemnifies and hold harmless the Authority against any and all claims or liabilities arising from the failure to include such flow down provisions and agrees that any such claims and liabilities may be paid by the Authority using retainage, other Project funds, or as a setoff from payments otherwise due to the Contractor on this or other Contracts.

104.5.8 No Third Party Beneficiaries The Contractor and the Authority agree that this Contract is not intended to create any third-party beneficiaries or to authorize anyone not a party to the Contract to maintain an action under Contract provisions.

The following subsection is added:

105.2.4.2 Lead Paint The Contractor shall note that the existing bridge and toll structures likely contains lead based paint. A copy of the limited scope report is attached as **Appendix B**. 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 2003)

- 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 negative for asbestos containing materials. A copy of the Asbestos Containing Determination Survey report is attached as **Appendix B**. However, should during construction asbestos material is encountered, the removal and disposal of the asbestos containing materials is specified in Special Provision 202, Removing Structure and Obstructions (Removing Asbestos Containing Materials). The Contractor is advised that there may be asbestos containing materials in the existing highway lighting conduit.

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.

105.2.6 Use of Explosives

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

The use of explosives is permitted, however, prior to any blasting, the Contractor must submit a detailed blasting plan to the Resident at least three (3) weeks prior to commencing drilling and blasting operations. The blasting plan shall contain the following information:

a. Site plan with location of nearest structures and abutters. Plan shall also show the location of all private wells;

b. Plan of each blast showing hole-spacing and delay pattern;

c. Diameter and depth of each hole;

d. Amount of explosive per hole;

e. Total pounds of explosives per delay;

f. Total amount of explosives per blast;

g. Type of non-electric delays to be used;

h. Amount of stemming in each hole;

i. Type of explosive to be used;

j. Soil and rock profile in blast zone;

k. Scale distance to the nearest abutting structure;

l. Type and location of seismograph to be used;

m. Size of blasting mats and cover to be used; and,

n. Safety precautions to be followed.

After submission of the blasting plan, but prior to the start of the blasting program, the blasting Contractor shall meet with the Resident, Maine Turnpike Authority officials, State Police (turnpike barracks), and affected utility representatives. The purpose of the meeting is to advise them of their blasting plan and schedule, accept feedback on the proposed plan, and coordinate the blasting effort.

Should field conditions warrant a change in the general blasting plan, the blasting Contractor shall provide a sketch and blasting plan details based on the actual field conditions prior to the blast for inclusion in the Project records.

The following general requirements are to be adhered to:

A. Blasting permits shall be obtained by the Contractor from all local, State and Federal agencies having jurisdictions. Blasting will not be authorized by the Resident without proper permits.

   The Contractor shall comply with all applicable laws, rules, ordinances, and regulations of the Federal Government, the State of Maine, and the city or town governing the transportation, storage, handling, and the use of explosives. All labor, materials, equipment, and services necessary to make the blasting operations comply with such requirements shall be provided at no additional costs to the Authority.

   The Contractor shall obtain and pay for all permits and licenses required to complete the work of this Section.

   In case of conflict between regulations or between regulations and Specifications, the Contractor shall comply with the strictest applicable codes, regulations or Specifications.

B. Obtain the services of a qualified vibration and blasting expert to monitor the blasting. All seismographic instruments shall be capable of producing a permanent record of the information required to determine the particle velocity at any time during all phases of the blasting operation. A copy of all recording shall be furnished to the Authority within two (2) working days after a blast. Seismographic recordings shall be taken at the critical locations and additional instruments shall be furnished, located and operated as deemed necessary by the Resident.

Persons responsible for blasting shall be Licensed Blasters in the State of Maine and shall have had acceptable experience in similar excavations in rock and controlled blasting techniques.

C. Non-electric detonation systems shall be used. Electric blasting caps will not be permitted.

D. The Contractor shall conduct all blasting activity in such a manner that the peak particle velocity of ground vibration, measured at the locations of the nearest structures to the blast, does not exceed the "safe limits" recommended by the U.S. Bureau of Mines in FIGURE B of BUMINES RI 8507, as follows:

FIGURE B

BUMINES RI 8507

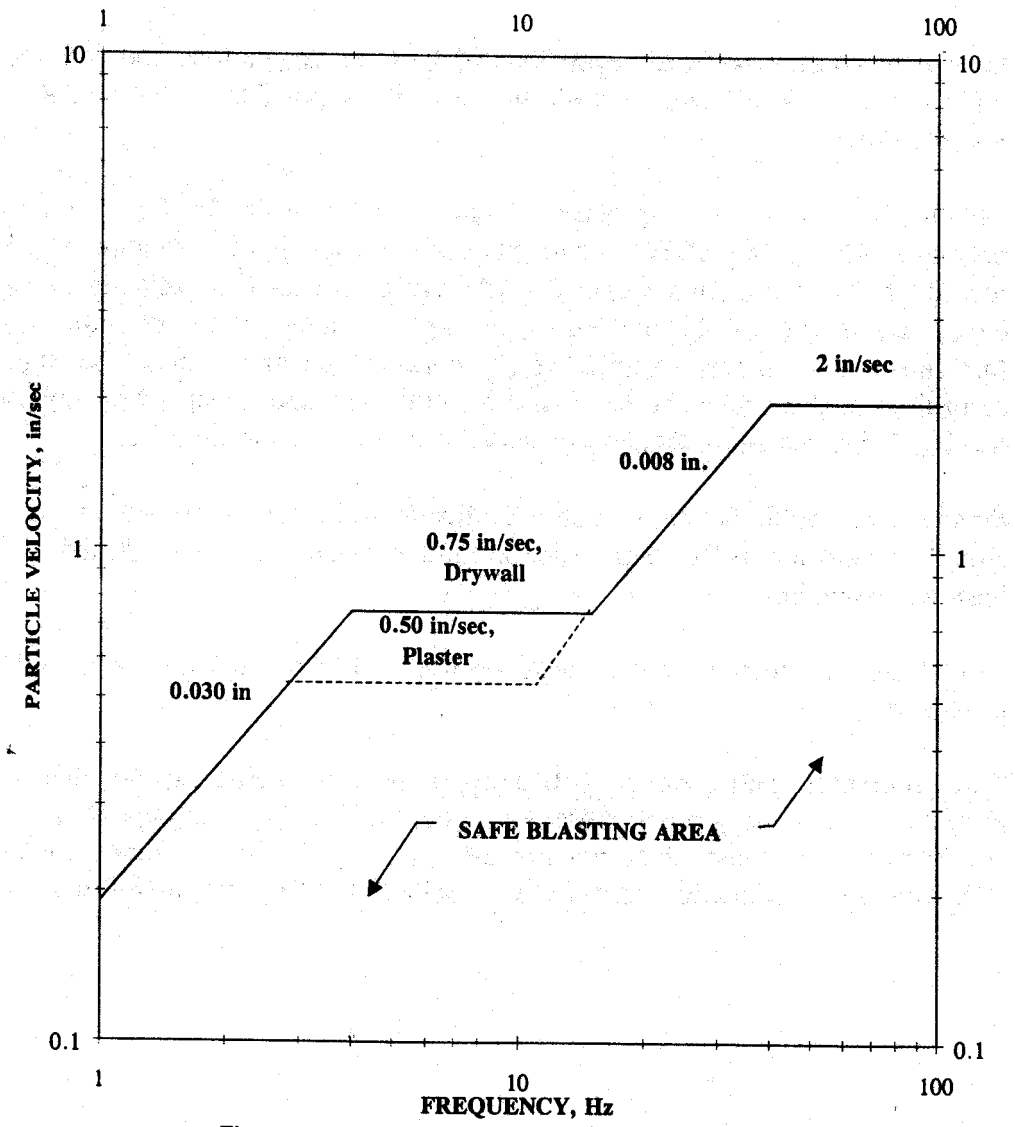


Figure B-1 - Safe levels of blasting vibration for houses using a combination of velocity and displacement

ALTERNATIVE BLASTING LEVEL CRITERIA

E. The Contractor shall conduct all blasting activity in such a manner that the peak airblast overpressure measured at the locations of the nearest above ground occupied structures to the blast (considering wind direction) does not exceed 0.014 psi.

F. Scaled distance factors permitted for various distances from blast:

Distance from blast site (ft)	Scaled distance factor to be used without seismic monitoring (ft)
0 to 300	50
300 to 5000	55
5000 and beyond	65

G. The Contractor shall advise the Resident at least five (5) working days in advance of the dates on which he proposes to perform blasting operations, providing an approximate hour for the Resident's approval. The Authority will provide police at the turnpike site, who will stop traffic in both directions while the blast is detonated. The Contractor will be responsible for obtaining the necessary permits and police officials required to close local streets during periods of blasting.

H. Safety Precautions

1. Clearing Danger Area Before Blasting - no blasting shall be permitted until ***all*** personnel in the danger area have been removed to a place of safety. A loud, audible warning system, devised and implemented by the Contractor, shall be sounded before each blast. The Contractor shall familiarize all personnel on the Project, Authority, Police Officers, Residents, and the general public with the implemented system. The danger area shall be patrolled before each blast to make certain that it has been completely cleared, and guards shall be stationed to prevent entry until the area has been cleared by the blaster following the blast.

2. Explosives shall be stored, handled and employed in accordance with Federal, State and local regulations.

3. No explosives, caps, detonators or fuses shall be stored on-site during non-working-hours.

4. Blasting mats may be used to cover the top and vertical face of all blasts in order to minimize the possibility of excessive throw of rock. The use of blasting mats is not required.

5. The Contractor is advised that the Authority's Maintenance Forces and State Police use two-way radios in the vicinity of the Project. These radios cannot be turned off during loading operations. Therefore, non-electric detonation systems shall be used. Electric blasting caps will *not* be permitted.

6. The Contractor shall be responsible for determining any other safety requirements unique to blasting operations at these particular sites so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the site.

7. No requirements of, or omissions to, require any precautions under this Contract shall be deemed to limit or impair any responsibility or obligations

assumed by the Contractor under or in connection with this Contract; and the Contractor shall at all times maintain adequate protection to safeguard the public and all persons engaged in the work, and shall take such precautions as will accomplish such end, without undue interference to the public. The Contractor shall be responsible for and pay for any damage to adjacent roadways or structures resulting from work executed under this Section.

8. The Contractor is required to secure all travelways, entrances and exits within 300 feet of the blast zone. No vehicles or pedestrians will be allowed within the 300-foot-zone until the blast is complete, all debris is cleaned from the roadways, and the site is deemed safe by the Resident.

I. General Blasting Procedures

1. The time during which explosives may be restricted to non-peak travel periods. The use of explosives is not permitted on Friday, weekends (Saturday and Sunday), holidays, on the eve of a holiday, or during non-daylight-hours unless approved in writing by the Resident. A blast may be allowed early on a Friday morning before 6:00 a.m. if it can be completed during daylight-hours. Specific allowable blasting times are outlined in the Special Provisions. In order to minimize traffic disruptions, the Contractor shall schedule blasting such that all disrupted traffic shall be cleared between any two successive blasts detonated anywhere on the Project. The Contractor will be allowed as many mainline traffic stoppages as can be cleared in the designated blasting window, provided the blast schedule can be safely coordinated. Each stoppage will be counted as one complete stoppage of mainline traffic. The Authority may withhold permission to blast if, in the opinion of the Authority, actual or anticipated traffic volumes will produce mainline or local road congestion that cannot be cleared in a reasonable amount of time. The Contractor's blasting operations shall be performed using extreme care to minimize the inconvenience and interruption to traffic and damage to the existing pavement, structures and surrounding areas.

2. The Contractor shall have sufficient equipment available on-site to clear the pavement of blast rock, if it is necessary. At a minimum, the Contractor shall have a vehicle to sweep the pavement and a half-ton pickup equipped with a plow. The blast will not be allowed to occur if this equipment is not present.

3. The Contractor shall coordinate all blasting with the Resident on-site who shall determine in advance when the charges may be set.

4. Blast hole diameter shall not be greater than three inches.

5. No free flowing, pourable or pumpable explosives shall be used unless approved by the Resident. All explosives shall be in cartridges or other semi-rigid containers.

6. Mainline traffic control during blasting periods shall be in accordance with the Plans and Specifications. All temporary signage shall be removed when the

daily blasting period is over. Traffic control signs shall meet the requirements of Section 652 and will be paid for under Item 652.35, Construction Signs. The setup and removal of signs and the coordination with State Police and local Municipalities for mainline blasting will be included for payment under Subsection 652.361, Maintenance of Traffic Control Devices.

7. Local traffic control during blasting periods shall be in accordance with MUTCD and local requirements. All temporary signage shall be removed when the daily blasting period is over. Local traffic control signs shall meet MUTCD requirements and will be measured for payment as construction signs. Providing flaggers or local police officers on local roads, if required for mainline blasting, will be measured for payment. The payment for local police will be paid as a direct cost with no markup allowed by the Contractor. Coordination with the local officials for mainline blasting will not be paid for separately, but shall be incidental to the Rock Excavation item.

8. The Contractor shall report to the Resident, in writing, all blasting complaints received by the Contractor within 24-hours of receipt. Each blast complaint report shall include the name and address of the complainant, time received, date and time of blast complained about, and a description of the circumstances which led to the complaint. Upon receipt of a written complaint alleging damage from the blasting, the Contractor's vibration and blasting consultant and/or a representative of the blaster's insurance company shall investigate the claim and a written report shall be issued to the complainant, with a copy to the Resident, of the results of the investigation and the response of the Contractor. This written report shall be received by the complainant and Resident within 15 work days of receipt of the written complaint.

9. The maximum time for which traffic may be stopped at any single time shall be eight (8) 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 eight minutes. If, due to the throw of rock onto the highway or other blasting related activities, traffic is stopped for more than eight minutes, the Contractor shall pay a penalty of $500.00 per minute for every minute traffic is stopped in excess of the eight minute limit. The penalty shall be measured separately on the northbound and southbound roadway (or eastbound and westbound roadway). Total liquidated damage shall be deducted from the next pay estimate. Whenever the volume of traffic is excessive such that a eight minute interruption would cause objectionable congestion, in the opinion of the Resident, the hours during which blasting may occur may be further restricted.

J. Pre-Blast Condition Survey

The Contractor shall provide a pre-blast survey as described below:

Prior to start of excavation (earth/rock) or blasting work, the Contractor shall conduct a pre-blast condition survey of all existing structures and conditions on the site, adjacent to the site, or in the vicinity of the site. This survey shall extend to such structures or conditions as may be affected by the Contractor's construction operations. As a minimum, condition surveys shall be performed on all structures within 500 feet of anticipated blasting areas. The Contractor is responsible for the following:

1. Coordinate activities, issue notices, obtain clearances and provide whatever photographic and secretarial assistance is necessary to accomplish the survey.

2. Give notice, in writing, to the owner of the property concerned and tenants of the property. Advise in notice, the dates on which surveys are to be made so that they may have representatives present during the examination. Provide copies of all notices to the Resident.

3. The survey shall consist of a description of the interior and exterior conditions of the various structures examined. Descriptions shall locate any existing cracks, damage or other defects existing, and shall include such information so as to make it possible to determine the effect, if any, of the construction operations on the defect. Where significant cracks or damage exist, or for defects too complicated to describe in words, photographs shall be taken and made part of the record.

4. The survey shall include a test of all private wells in the area. Water quality tests shall be obtained so that a baseline condition may be developed.

   Contractor's record of the pre-blast condition survey shall consist of written documentation and photographs of the conditions identified, or a good quality videotape survey with appropriate audio description of conditions and defects. Prior to start of work, one copy of the Contractor's record of conditions survey shall be submitted to the Resident for review and retention.

   Upon completion of all excavation (earth/rock) and blasting work, the Contractor shall make an examination similar to the pre-construction survey of any properties, structures, and conditions where complaints of damage have been received or damage claims have been filed. Notice shall be given to all interested parties so that they may be present during the final examination. Records of the final examination shall be distributed the same as the original preconstruction survey.

K. Payment

No separate measurement or payment will be made for the work outlined in this Section including the detailed blasting program, pre-blast and post-blast surveys,

blasting and permit acquisitions. All cost associated with this work shall be incidental to the Rock Excavation item(s).

L. Indemnity

Notwithstanding full compliance with these Specifications, approval of blasting plan, and successful limitation to maximum peak particle velocity noted above, the Contractor shall be solely responsible for any damage, direct or indirect, arising from blasting and shall hold the Authority and Resident harmless from any costs, liens, charges, claims or suits, including the costs of defense, arising from such damage, real or alleged. The Authority and Resident shall be additionally-named insured on any insurance policy covering blasting carried by the Contractor, and this requirement shall also be enforced on any subcontractor.

The Contractor shall provide a pre-blast and post-blast survey including photographs. An inspection of all facilities within and adjacent to the Contract limits shall be made to determine any changes that may occur due to the blasting operations.

The Resident's approval shall not relieve the Contractor of any responsibility for any hazards or damages related to this work. The use of explosives shall conform to all Federal and State laws and regulations. Explosives must not be stored within the turnpike right-of-way. Explosives shall be in the care of competent watchmen at all times, and placement and detonation shall be performed under the direction of a qualified blaster licensed in the State of Maine.

105.3 Traffic Control and Management

See Special Provision Section 526, Concrete Barrier.

See Special Provision Section 652, Maintenance of Traffic.

105.4.1 Maintenance During Construction

This Subsection is amended by the addition of the following:

Once paid for mobilization, the Contractor is responsible for maintenance of the road that is open to local traffic within the Project limits. This does not include winter maintenance of deicing and snow removal.

Mobilization payment is defined as the Pay Requisition being submitted by the Resident to the Authority for payment.

105.4.3 Maintenance During Winter Construction

This Subsection is deleted and replaced with the following:

Except as provided in the following paragraphs, when the Contractor performs Work during winter weather conditions, the Contractor shall plow snow from the portions of a Project that carry vehicular or pedestrian traffic, including all Bridges and

Sidewalks, so as to allow the free and safe flow of such traffic. The State or local governmental agency that would otherwise be responsible for winter maintenance will sand and salt such portions of a Project.

On such portions of a Project that (A) have been untouched or left by the Contractor in a suitable condition to carry traffic as determined by the Authority and (B) are unaffected by the construction operations, the State or local governmental agency responsible for winter maintenance will plow, sand, and salt.

The Maine Turnpike Authority will be responsible for winter maintenance, including snow plowing and application of salt, on Maine Turnpike pavement open to traffic.

The Contractor is responsible for the maintenance of erosion control and traffic control devices. The Contractor is also responsible for snow plowing and ice removal from all work areas, areas around traffic control devices to maintain visibility of traffic control devices, drainage paths, and catch basins within limits of traffic control, in order to maintain drainage away from the paved travel way. The snow plowing by the contractor shall include the snow plowed to the side of the road by the Authority to the areas listed above. No claims will be allowed from the Authority's snow plowing operations.

105.4.4 Maintenance During Suspension of Work – This Subsection is deleted and replaced as follows:

A. Work Responsibilities Prior to suspension, the Contractor must make the Project suitable for the free and safe flow of traffic as determined by the Authority including covering or removal of signs. To provide space for snow removal, all areas to be used by traffic must be clear for the entire usable Roadway including Shoulders, or curb-to-curb including Sidewalks.

During suspension, the Contractor must: (1) take precautions necessary to prevent damage to the Work and to allow the Authority to provide maintenance (such precautions include providing Drainage and erecting any necessary Structures, signs, or other facilities); (2) maintain all temporary Structures and traffic control devices; and (3) continuously maintain, in an acceptable growing condition, all living plant Material, including newly established seedings and soddings furnished under the Contract and take precautions to protect vegetative growth from damage.

After suspension, the Contractor must clean up all evidence of the snow and ice control at its expense, including removing excess sand and debris from the Roadway and replacing all base or subbase Material that was lost as a result of maintenance activity.

If a Work suspension is not approved, the Contractor will remain responsible for maintaining the Project, including plowing snow, controlling ice, and patching or retreating the surface.

B. Cost Responsibilities All costs related to suspending and resuming Work related to approved suspensions will be considered incidental to the contract. For related provisions, see Sections 104.2.6 – Right to Suspend Work and 107.5 – Suspension of Work.

This Subsection is deleted from the General Provisions and replaced with the following:

105.5.1 General Requirements

The Contractor may not use the existing MTA Maintenance Facility for access to either the southbound mainline or to Route 26A.

Construction Access

The Contractor shall construct a stabilized construction entrance in accordance with the Best Management Practices at all locations where construction vehicles will exit and/or enter existing paved shoulders or travel ways from non-paved areas. The Resident shall approve of the locations. The stabilized construction entrance shall be constructed in conjunction with the clearing activities or other early activities. Additional stabilized construction entrances may be required due to the Contractor's operations as well as site conditions. The construction and maintenance of the stabilized construction entrance including frequent sweeping of the paved surfaces shall be incidental to the Contract.

105.6 Construction Surveying

This section is deleted and replaced with the following:

105.6.1 Authority Provided Services

The Authority will provide the Contractor with the description and coordinates of vertical and horizontal control points, set by the Authority, within the Project Limits, for full construction Projects and other Projects where survey control is necessary. For Projects of 1,500 feet in length, or less the Authority will provide a minimum of three points. For Projects between 1,500 and 5,000 feet in length the Authority will provide a minimum of five points. For Projects in excess of 5,000 feet in length the Authority will provide at a minimum one set of two points at each end of the Project, plus one additional set of two points for each mile of Project length. For non-full construction Projects and other Projects where survey control is not necessary, the Authority will not set any control points and, therefore, will not provide description and coordinates of any control points: Upon request of the Contractor, the Authority will provide the Authority's survey data management software and Survey Manual to the Contractor, or its survey Subcontractor, for the exclusive use on the Authority's Projects.

105.6.2 Contractor Provided Services

Utilizing the survey information and points provided by the Authority, described in Subsection 105.6.1, Authority Provided Services, the Contractor shall provide all additional survey layout necessary to complete the Work. This may include, but not necessarily be limited to, reestablishing all points provided by the Authority, establishing additional control points, running axis lines, providing layout and maintenance of all other lines, grades, or points, and survey quality control to ensure conformance with the Contract. The Contractor is also responsible for providing construction centerline, or close reference points, for all utility facility relocations and adjustments as necessary to complete the Work. When the Work is to connect with existing structures, the Contractor shall verify all dimensions before proceeding with the Work. The Contractor shall employ or retain competent engineering and/or surveying personnel to fulfill these responsibilities.

The Contractor shall not take advantage of any ambiguity or error contained data provided by the Authority, and upon discovery of any ambiguity or error shall notify the Authority before proceeding. as provided by Subsection 104.3.3, Duty to Notify Authority If Ambiguities Discovered.

105.6.2.1 Quality Control

The Contractor is responsible for all construction survey quality control. Construction survey quality control is generally defined as, first, performing initial field survey layout of the Work and, second, performing an independent check of the initial layout using independent survey data to assure the accuracy of the initial layout; additional iterations or checks may be required if significant discrepancies are discovered in this process. Construction survey layout quality control also requires written documentation of the layout process such that the process can be followed and repeated, if necessary, by an independent survey crew.

105.6.2.2 Electronic Design Data and Digital Terrain Model (DTM)

If provided by the Authority at the request of the Contractor, any electronic project design data will not be deemed a part of the contract, and is supplied as a courtesy only. The Contractor shall not take advantage of any ambiguity or error contained in said data, and upon discovery of any ambiguity or error shall notify the Authority before proceeding. The Contractor may convert any electronic data provided by the Authority into a format required by the Contractor's system and equipment at the Contractor's expense.

Any Digital Terrain Model (DTM) to be used for construction shall be submitted to the Authority in a format acceptable to the Authority at least 14 days prior to the pre-construction meeting. InRoadsDTM or LandXML formats are preferred – any other format must be preapproved prior to submittal. No changes shall be made to the electronic model after submittal without prior written consent by the Project Resident. The Authority may review and may provide comments to the Contractor within 14 days of receipt of the DTM submittal

105.6.2.3 Survey Work Plan

The Contractor shall provide a Survey Work Plan to the Authority prior to, or at, the preconstruction meeting.

The Survey Work Plan shall include:

A. Make and model of equipment and software used for project layout.
B. Make and model of equipment and software used for machine guidance and control.
C. Manufacturer-stated specifications for vertical and horizontal accuracy attainable by the equipment.
D. Equipment calibration procedures and date of last calibration.
E. Narrative of methodology used to establish any additional horizontal or vertical project control points. Field notes for new vertical control shall be submitted to the Authority.

F. Site Calibration (Localization) and control verification procedures, including a timetable and tolerances. A Site Calibration report shall be submitted to the Authority, including the values of calculated residuals of each point used in the calibration.
G. Type and locations of base stations to be used, including methodology for establishing on-site base broadcast positions and localization procedures used for off-site bases.
H. Describe methodology used to overcome Real Time Kinematic (RTK) signal losses in a portion or portions of the project, and methodology to ensure signals for both inspection operation areas and construction operation areas (i.e. multiple bases operating simultaneously)
I. Describe procedures used to integrate vertical refinement equipment (i.e. laser); including the process of determining and verifying transmitter set-up location and communicating any necessary adjustments to the machine control equipment.
J. Name(s) and qualifications of the Contractor's designated on-site surveyor(s) or engineer(s) responsible for performing the project layout.
K. Design software and version used to develop the Digital Terrain Model (DTM).

The Authority will review and provide comments to the Contractor within 7 days of receipt of the Survey Work Plan.

105.6.2.4 Contractor Provided Equipment to the Authority

The Contractor shall furnish a Global Navigation Satellite System (GNSS) or Global Positioning System (GPS) Rover and/or Robotic Total Station (RTS) equipment to the Authority with the same capabilities as those used by the Contractor. This equipment shall be compatible with the system(s) used by the Contractor and be provided to the Project Resident prior to commencing Work using electronic layout methods. This equipment shall stay in the possession of the Authority for the duration of the project and shall be returned, in good condition, to the Contractor upon final acceptance of the field work. Any augmented features (such as laser refinement) used by the Contractor shall be included in the features available on the equipment provided to the Authority.

The Contractor shall provide manufacturer-certified training on the use of the GNSS, GPS and/or RTS equipment and the Contractor's systems to Authority project personnel prior to beginning any Work. This training is for the purpose of providing Authority project personnel with an understanding of the equipment, software, and electronic data being used by the Contractor.

105.6.2.5 Field Layout Specifications

All Work accomplished through electronic layout methods and/or machine control must meet the same accuracy requirements as the conventional grading construction standards detailed in the Standard Specifications. The contractor shall not use GNSS, GPS or RTS equipment for a construction activity that requires a greater precision than the machine's capability as per the manufacturer's recommendation.

105.6.2.6 Basis of Payment

No payment shall be made by the Authority for the Contractor's elected use of electronic methods of project location layout and control. Any delays arising from the operation of GNS, , GPS, or RTS layout or machine control systems will not result in adjustment to the bid price or quantity of any construction items or be justification for granting any type of contract extension. Any costs incurred through incorrect use of GNSS, GPS, or RTS layout or machine control systems or re-work necessary through their use are the sole responsibility of the Contractor. Training of Authority project personnel in the use of GNSS, GPS or RTS will be paid on a reimbursable basis based on submitted invoices, without Contractor markup.

105.6.3 Quality Assurance

It is the Authority's perogative to perform construction survey quality assurance. Construction survey quality assurance may or may not be performed by the Authority. Construction survey quality assurance is generally defined as an independent check of the construction survey quality control. The construction survey quality assurance process may involve physically checking the Contractor's construction survey layout using independent survey data, or may simply involve reviewing the construction survey quality control written documentation. If the Authority elects to physically check the Contractor's survey layout, the Contractor's designated surveyor may be required to be present. The Authority will provide a minimum notice of 48 hours to the Contractor, whenever possible, if the Contractor's designated surveyor's presence is required. Any errors discovered through the quality assurance process shall be corrected by the Contractor at no additional cost to the Authority.

105.6.2.4 Boundary Markers

The Contractor shall preserve and protect from damage all monuments or other points that mark tthe boundaries of the right-of-way or abutting parcels that are outside the area that must be disturbed in order to perform the Work. The Contractor indemnifies and holds harmless the Authority from all claims to reestablish the former location of all such monuments or points including but not limited to claims arising from 14 MRSA § 7554-A. For a related provision, see Subsection 104.3.11, Responsibility for Property of Others.

105.7.4 Submittal Requirements

The following paragraph is added:

In addition to the hardcopy requirement, the contractor shall also make submittals in PDF electronic file format via email. Submittals shall be accompanied by a cover sheet, which identifies the submittal number, subject date, and any revision numbers associated with the submittal.

105.8.1 Temporary Soil Erosion and Water Pollution Control

This Subsection in the General Provisions is deleted and replaced with the following:

The Contractor shall provide continuous and effective soil erosion and water pollution control in compliance with Section 656 - Temporary Soil Erosion and Water Pollution Control.

Spill Prevention Control and Countermeasure (SPCC) Plan

Any areas where petroleum products, oils or non-petroleum hazardous materials are handled or stored will require a Spill Prevention Control and Countermeasure (SPCC) Plan. These materials may not be stored or handled in areas of the site draining to an infiltration area. The Plan will be submitted to the Resident before construction begins. In addition to petroleum products and hazardous materials, controls must be used to prevent additional pollutants (i.e., fertilizers, pesticides, salt/brine, litter, construction demolition debris, etc.) from being discharged from materials on-site, including storage practices to minimize exposure of the materials to stormwater, and appropriate spill prevention, containment, and response planning and implementation. The Plan shall provide the following information at a minimum:

1. The name and emergency response numbers (telephone number, cellular phone and pager numbers, if applicable) of the Contractor's representative responsible for spill prevention and response
2. Description of handling or storage location noting setbacks from water bodies where relevant. Significant sand and gravel aquifers and other sensitive resources, including infiltration areas, must be avoided wherever possible;

3. Description of storage and containment facilities, such as dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater or surface water;

4. Description of equipment and/or materials used to prevent discharges (including sorbent materials);

5. Preventative measures to minimize the possibility of a spill; and,

6. Contingency plan if spill should occur.

The approved plan must be posted at the Project site. All personnel working in the area are required to read and be familiar with the plan.

There shall be no separate payment for preparation of a SPCC Plan acceptable to the Resident and preparation shall be incidental to the work.

Notification of Authority of Hazardous Material Spills

In addition to MaineDEP reporting requirements for spills greater than five (5) gallons, the Contractor shall notify the on-site Resident Inspector. The on-site Resident Inspector shall notify the Maine Turnpike Radio Room at 207-871-7701. When the on-site Resident Inspector is not available, the Contractor shall notify the Maine Turnpike Radio Room directly at 207-871-7701.

In addition to MaineDEP reporting requirements for all spills where any stream or water body is threatened, the Contractor shall notify the on-site Resident Inspector. The on-site Resident Inspector shall notify the Maine Turnpike Radio Room at 207-871-7701. When the on-site Resident Inspector is not available, the Contractor shall notify the Maine Turnpike Radio Room directly at 207-871-7701.

These notification procedures shall be incorporated into the Spill Prevention Control and Countermeasure (SPCC) Plan.

Responsibility for Control and Cleanup of Hazardous Material Spills

The Contractor shall be responsible to control spills and properly cleanup, containerize, and dispose of petroleum and/or other hazardous material waste that results from the actions and/or equipment of the Contractor or his employees, subcontractors and suppliers. Chemicals, exposed to stormwater must be prevented from becoming a pollutant source.

The Contractor shall also be responsible for all direct and indirect costs associated with the control of spills and proper cleanup, containerization, and disposal of petroleum and/or other hazardous material waste that results from the actions and/or equipment of the Contractor or his employees, subcontractors and suppliers.

105.8.1.1 Environmental Standards

The Project will be performed in accordance with the MaineDOT Best Management Practices (BMP) latest issue. The Contractor shall fully comply with all erosion and sedimentation control requirements outlined in the BMP's or contained herein. Non-compliance with these requirements as determined by the Resident shall result in a financial penalty of $1,000 per day, per violation. Any fines assessed to the Maine Turnpike Authority as a result of the Contractor's non-compliance shall be paid by the Contractor. If the Contractor fails to pay, the cost of the fine will be deducted from monies due, or which may become due, to the Contractor under this Contract.

In the event of conflict between these Specifications and other erosion and pollution control laws, rules or regulations of other Federal, State and local agencies, the more restrictive law, rules or regulations shall apply.

The standards as described below shall be met on the Project:

105.8.1.1.1 Water Pollution Control Requirements

(a) General

1. The Contractor must comply with the applicable Federal, State and local laws and regulations relating to prevention and abatement of water pollution.
2. Except as allowed by an approved permit or otherwise authorized by the Authority in writing, pollutants containing construction debris including excavated material, aggregate, residue from cleaning, sandblasting or painting, cement mixtures, chemicals, fuels, lubricants, bitumens, raw sewage, wood chips, and other debris shall not be discharged into water bodies, wetlands or natural or manmade channels leading thereto and such materials shall not be located alongside water bodies, wetlands, or such channels such that it will be washed away by high water runoff. Furthermore, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in the areas of the site draining to an infiltration area, unless these portions of the site (where storage and handling of these materials) are isolated using dikes, berms, sumps and other forms of secondary containment that prevent discharge to groundwater.
3. Temporary winter stabilization must be used between November 1st and April 15th or outside of said time period if the ground is frozen or snow covered. Temporary winter stabilization involves, at a minimum, covering all disturbed soils and seeded ground that is not Acceptable Work with an approved method. Use of these methods for over-winter temporary erosion control will be paid for under the appropriate Erosion Control items included in the Contract.

4. Construction operations in water bodies or wetlands shall be restricted to the construction limits shown on the Plans and to those areas that must be entered for the construction of temporary or permanent structures, except as allowed by approved permit or otherwise authorized by the Authority in writing. Mechanized equipment shall not be operated in water bodies or wetlands except as allowed by approved permit or otherwise authorized by the Authority in writing.
5. Upon completion of the work, water bodies or wetlands shall be promptly cleared of all falsework, piling, debris or other obstructions caused by the construction operations, except as allowed by approved permit or otherwise authorized by the Authority in writing.

(b) Earthwork

If earthwork disturbance is part of the Project scope:

1. Temporary stabilization with mulch or other non-erodable cover is required on all exposed soils that will not be worked for more than 7 days. Areas within 75 feet of a wetland or waterbody shall be stabilized within 48 hours of the initial disturbance of the soil or prior to any storm event, whichever comes first.
2. Newly disturbed earth shall be mulched or otherwise stabilized by the end of each workday. Mulch shall be maintained on a daily basis.
3. All disturbed ditches shall be stabilized by the end of each workday. Stabilization shall be maintained on a daily basis.
4. Erosion control blanket shall be installed in the bottom of all ditches except where a stone lining is planned. Seed shall be applied prior to the placement of the blanket.
5. Permanent slope stabilization measures shall be applied within one (1) week of the last soil disturbance. Newly seeded or sodded areas must be protected from vehicle traffic, excessive pedestrian traffic, and concentrated runoff until the vegetation is well-established. If necessary, areas must be reworked and restabilized if germination is sparse, plant coverage is spotty, or topsoil erosion is evident.
6. Dust control items, other than those under Standard Specification Section 637, Dust Control, if applicable, shall be included in the plan.

<u>105.8.1.1.2 Construction Requirements</u>

1. The Contractor, to the maximum extent practicable, shall install temporary and permanent sedimentation control measures prior to conducting clearing and grubbing operations.
2. The Contractor shall conduct inspections of disturbed and impervious areas, erosion control measures, materials storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. Inspections shall be conducted (1) at least once a week as well as before and after a storm event and prior to completing permanent stabilization measures; and (2) by a person knowledgeable of erosion and stormwater control, including the standards and conditions in the permit.
3. The Contractor shall maintain all measures in effective operating condition until areas are permanently stabilized. If BMPs need to be modified (i.e., corrective action, additional BMPs installed, etc.), implementation must be completed within seven (7) calendar days and prior to any storm event.
4. Temporary erosion control measures shall be maintained until the site is permanently stabilized with vegetation or other permanent control measures.

5. The Contractor will immediately take appropriate measures to prevent erosion or sedimentation from occurring or to correct any existing problems regardless of the time of year.
6. During periods of approved suspension, the Contractor shall inspect and maintain temporary and permanent erosion and sedimentation controls.
7. Work in wetlands is prohibited except to the minimum extent necessary for completion of the work as detailed on the Plans. Excavated and other material shall not be stockpiled in wetlands. Haybales, silt fence or other suitable barriers shall be used, where necessary, to prevent sedimentation from eroding materials.
8. Disturbance of natural resources beyond the construction limits shown on the Plans is not allowed.
9. Existing ditches shall be maintained until the new ditches are stabilized. Stone check dams shall be placed in existing ditches prior to construction as to prevent the release of sedimentation. Stone check dams shall be installed at the outlets of all existing and proposed ditches adjacent to all stream and wetlands.
10. For proposed ditches, stabilize the outlet first and build from the bottom up. Only excavate what can be stabilized or protected by the end of the work day.
11. Before permitting permanent channels to carry water, they shall be stabilized. This may require the installation of temporary erosion control BMP's or temporarily diverting flows.
12. All cross culvert outlets shall be armored before the end of the work day.
13. The Contractor's operation may require the placement of temporary pipes and fill over a ditch line to provide access to the work area. The Resident shall approve the size of the pipe. The placement and removal of the temporary access shall not be measured for payment and shall be incidental to the Excavation item.
14. Bare earth slopes shall be roughened to dissipate sheet flow. This shall be accomplished by "tracking" the slope perpendicular to the centerline. This work will not be measured separately for payment, but shall be incidental to the Excavation item.
15. Uncured concrete shall not be placed directly into the water body. Concrete may be placed in forms and shall cure at least one (1) week prior to form removal. No washing of tools, forms, etc. shall occur in or adjacent to the water body or wetland.
16. The Contractor shall contain all demolition debris (including debris from wearing surface removal, sawcut slurry, dust, etc.) and shall not allow it to discharge to any resource. Litter, construction debris, and chemicals exposed to stormwater must be prevented from becoming a pollutant source. The Contractor shall dispose of debris in accordance with Maine Solid Waste Law, Title 38 M.R.S.A., Section 1301 et. seq.
17. No wheeled or tracked equipment shall be operated in the water. Equipment operating on the shore may reach into the water with a bucket or similar extension. Equipment may NOT cross streams.
18. The Contractor shall not remove rocks from below the normal high water line of any wetland, great pond, river, stream or brook, except to the extent necessary for completion of the work and as allowed by environmental permits.

105.8.2 Permit Requirements

This Subsection is amended to include the following:

A Tier 3 Maine Natural Resources Protection Act (NRPA) permit has been secured from the Maine Department of Environmental Protection (MDEP) to construct the Project. A copy of the permit is included in Appendix G.

A Maine General Permit Category 2 Notice permit has been secured from the U.S. Army Corps of Engineers (USACE) to construct the Project. A copy of the permit is included in Appendix G.

There is a perennial stream that crosses the area of the southbound on and off ramps that a previous project constructed a 48" culvert that is to be replaced with a 60" culvert under this contract. Please refer to the Special Provision for Section 656 for additional details on this environmental resource. The permit conditions may have specific conditions relative to this stream crossing.

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 14.90 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 Permit by Rule, the US Army Corps of Engineers General 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.

105.8.3 Wetland and Water Body Impacts

This Subsection is amended to include the following:

The following locations are classified as streams:

Tributary to Thayer Brook	125+50

Prior to starting work, the Contractor shall submit for approval a detailed construction plan for the stream crossing. The plan shall outline the schedule, equipment, and materials the Contractor will utilize to construct the culvert in accordance with the Plans. Work in these areas will not be allowed to start until after the Contractor has demonstrated that he has the necessary equipment, material, and manpower to complete the crossing in a logical and timely manner. The Resident will review the plan to assure that the Contractor is constructing the crossing in accordance with the Contract Documents and permit requirements. The Contractor shall complete the stream crossing in a timely manner and in accordance with the timeline provided in the MDEP NRPA Permit.

107.1 Contract Time and Contract Completion Date

This Subsection is amended by the addition of the following:

A contract start date of February 8, 2016 at the discretion of the Authority is anticipated and all work shall be completed on or before October 31, 2017.

The work that reconstructs the southbound on ramp near the southbound mainline, the southbound on ramp acceleration lane, and the Center Road bridge pier protection work shall be substantially completed by June 30, 2016.

The pavement rehabilitation and drainage work along the northbound on ramp acceleration lane shall be substantially completed by June 30, 2016.

The final proposed southbound on and off ramps, the toll plaza, and the toll utility building, shall be fully operational by December 1, 2016. Fully operational shall be understood to include the following work:

- All earthwork, base and subbase aggregates, and pavement, excluding the surface course, shall be completed;
- All drainage, curbing, raised median islands, pavement markings, waterline, loam, and seeding shall be completed;
- All proposed guardrail shall be set to final height along the southbound on and off ramps, complete with end treatments and delineators;
- All proposed signs along the southbound on and off ramps shall be installed and visible to traffic;
- All proposed guide signs along US Route 202 and Route 26A indicating the directions to the ramps shall be installed and visible to traffic;
- All proposed guide signs along US Route 202 indicating destinations for vehicles that have used the turnpike ramps to access US Route 202;
- Traffic signals at US Route 202 and the NB ramps and SB ramps intersections shall be reconstructed to their final condition, including the installation of the new signal cabinets with controllers using proposed signal timing, as adjusted by the Contractor;
- Proposed lighting shall be installed, wired, and lit;
- All proposed southbound toll systems shall be commissioned and accepted by MTA.

The closure of the southbound on ramp to complete the connection from the toll plaza area to the temporary southbound on ramp is permitted from a Friday at 10:00 a.m to the following Monday at 4:00 a.m (a maximum of 66 hours). This closure will not be approved until the toll plaza is fully operational and the work outlined in the above list is complete excluding the portions of permanent ramp to be constructed in Phase 4 (STA 109+00 to 113+00 and STA 115+50 to STA 117+00). If permanent highway lighting is not functional temporary lighting will be required. The actual weekend will be dependent upon the Contractor's CPM schedule for 2016 and shall not be on a holiday weekend. The Contractor shall request approval from MTA 4 weeks prior to the scheduled closure and meet with them prior to the request to discuss the details required for the ramp closure. The Contractor's request shall include sufficient construction details to support the closure duration which shall not exceed the time frames listed above. It is anticipated that MTA will provide approval or a request for additional information or clarification one week after the request is received by MTA. The closure is extremely important to MTA and the communities

affected by the detour. The Contractor shall make accommodations to work with MTA to meet the above mentioned closure period.

Proposed guide signs along US Route 202 and along the ramps shall be installed prior to reopening access to the Turnpike southbound on ramp following the southbound on ramp closure. Signs installed prior to the ramp reopening shall be covered until the southbound on ramp has been reopened.

The remainder of the work shall be substantially complete by September 29, 2017.

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 in 2016 and 2017:

2016

- Southbound on ramp acceleration lane available for traffic including the Center Road bridge pier protection, guardrail and lighting by June 30, 2016.
- Northbound on ramp acceleration lane pavement rehabilitation and drainage work is completed and available for traffic by June 30, 2016.
- Southbound on and off ramps and the toll plaza are fully operational (see Section 107.1) by December 1, 2016.

2017

- All work except for punch list items by September 29, 2017.

Supplemental Liquidated Damages on a calendar day basis in accordance with Subsection 107.7.2 shall be assessed for each calendar day that substantial completion is not achieved for each of the bullets listed above. Supplemental Liquidated damages for substantial completion will end when substantial completion is accepted by the Resident. If the work remains incomplete at the Contract Completion Date, liquidated damages on a calendar day basis in accordance with Subsection 107.7.2 shall be assessed for each calendar day that Contract completion is not achieved. If substantial completion is not completed by the Contract Completion date both supplemental liquated damages and liquated damages will be incurred.

The Contractor's failure to meet the closure duration for the 2016 southbound on ramp closure as described in Section 107.1 will result in the following Supplemental Liquidated Damages:

- **$250 per 15 minutes for the first hour,**
- **$2,000 per hour for each hour after the first hour – no proportional rates for supplemental liquidated damages are allowed for partial hours after the first hour**

107.3.2 Night Work

This Subsection is deleted and replaced as follows:

If the Contractor performs Work during periods of darkness, the Contractor shall comply with Contract requirements governing night Work. If the Contractor elects to perform Work during periods of darkness on its own initiative and without direction from the Authority, then the Contractor shall also comply with all municipal ordinances affecting such Work including noise ordinances. When pricing and scheduling the Work, the Contractor shall not assume that such non-directed night Work will be allowed. Accordingly, the Contractor shall not be entitled to any adjustment to either compensation or time due to its inability to secure any required municipal approvals.

The following Subsection is added:

107.4.2 Schedule of Work Required

A 2 week schedule shall be submitted by the Contractor weekly, the first week shall be detailed. The weekly detailed schedule shall show all lane closures that are anticipated for the following week. Lane closures that are not shown on this schedule will only be allowed if they are deemed emergency lane closures by the Resident.

The following Subsection is added:

107.4.6 Prosecution of Work

The following activities must be completed by the date specified:

- The northbound on ramp acceleration lane pavement rehabilitation and drainage work is completed and available for traffic by June 30, 2016.
- The work that reconstructs the southbound on ramp near the southbound mainline, the southbound on ramp acceleration lane, and the Center Road bridge pier protection work shall be substantially completed by June 30, 2016.
- The proposed southbound on and off ramps and the toll plaza shall be fully operational by December 1, 2016.
- The proposed Route 202 bridge deck work shall not begin until after the proposed final southbound ramps are fully operational.

The following Subsection is added:

107.4.7 Limitations of Operations

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 following Subsection is added:

107.4.9 Failure to Stop Work When Directed

In the event the Authority determines that the safety of the turnpike users (public) might be unduly compromised if work on the Project is not halted; the Resident Engineer, Resident Inspector or other authorized Authority representative will notify the Contractor to stop work. This may include directive to the Contractor to remove lane closures due to significant traffic delays. If the Contractor refuses to stop work within the time frame determined by the Authority, the Contractor will not be allowed to recommence work until after the Contractor meets with the Authority. In addition, work completed after the time allotted by the Authority to stop work, will not be measured for payment.

107.7.2 Schedule of Liquidated Damages

The table of liquidated damages is deleted and replaced with the following:

Original Contract Amount From More Than	Original Contract Amount up to and Including	Amount of Liquidated Damages per Calendar Day
$0	$100,000	$225
$100,000	$300,000	$350
$300,000	$500,000	$475
$500,000	$1,000,000	$675
$1,000,000	$2,000,000	$900
$2,000,000	$4,000,000	$1,000
$4,000,000	and more	$2,100

107.8.1 Fabrication Time

This Subsection is added as follows:

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

Element	Time	Supplemental LD
1) Precast Concrete	3 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.

For precast prestressed concrete fabrication work – tensioning of strands, batching and casting of concrete, breaking of test cylinders, de-tensioning.

108.2.1 Generation of Progress Payment Estimates –

This Subsection is deleted and replaced as follows:

The Resident will make current estimates in writing from time to time as the Work progress warrants, normally no more frequently than once each month, on or before the date set by the Resident.. Estimates shall include all materials complete in place and the amount of Work performed in accordance with the Contract, during the preceding month or period and the value thereof figured at the unit prices contracted together with estimates of the cost of Extra Work performed during the same period. Estimates or payments will not be made, if in the opinion of the Resident, the work is not proceeding in accordance with the provisions of the Contract. The Contractor agrees to waive all claims relating to the timing and amount of such estimates.

If the Contract requires, the Contractor will submit an application for progress payment with a detailed written explanation of the payments requested, on forms and media approved by the Authority, to the Resident for approval. The Resident may request that the Contractor submit backup documentation including copies of receipts, invoices, and itemized payments to Subcontractors.

This Subsection is deleted and replaced as follows:

108.2.3 Mobilization Payments Mobilization includes the mobilization and demobilization of all resources as many times as necessary during the Work.

Upon approval of all pre-construction submittals required for approval by this Contract including those listed in Section 104.4.2 - Preconstruction Conference, the Contractor will receive payment of 50% of the Lump Sum price for Mobilization, not to exceed 5% of the Bid less the amount bid for Mobilization. After the Department determines that the Work is 50% complete, the Contractor will receive the other 50% of the Lump Sum price for Mobilization, not to exceed 5% of the Bid less the amount bid for Mobilization. Any remaining Mobilization will be paid upon Final Acceptance.

108.4 Payment for Materials Obtained and Stored

This Subsection in the General Provisions is deleted and not replaced.

This Subsection of the Standard Specifications is deleted and replaced with the following:

Acting upon a request from the Contractor, accompanied by the required documentation, the Authority will pay for all or part of the value of acceptable, non-perishable Materials that are to be incorporated in the Work, including Materials that are to be incorporated into the Work not delivered on the Work site, and stored at places acceptable to the Authority (e.g. at a facility controlled by the Contractor or his Subcontractor\Fabricator). Examples of such Materials include steel piles, structural steel, prestressed concrete beams and slabs, stone masonry, curbing, timber and lumber, metal culverts, and other similar Materials. The Authority will not make payment on living or perishable Materials until acceptably planted in their final locations.

For structural steel fabrication, the Authority will not make partial payments for expenses such as shop drawing development, overhead, transportation, rent, storage, heat, Contractor mark-ups or other items until after fabrication has commenced. Payment will be based on the Authority's determination of percent complete at the close of the period.

As a condition of payment, the Contractor or his Subcontractor\Fabricator shall provide the following:

1. Proof that all Materials are stored in a secure location acceptable to the Authority.
2. Detailed invoices from the material supplier including a summary of the Materials provided, quantities shipped and received, unit costs, taxes, transportation fees, and all other charges included in the invoice total.
3. Copies of mill certifications, or other material certifications, as required by the Specifications relevant to the Materials.
4. Right of access for the Authority, or its duly authorized agent, to inspect and quantify the Materials at the approved storage site.
5. Proof of insurance for the stored Materials. The Contractor or his Subcontractor\Fabricator shall carry insurance, equal to 100% of the replacement value of the Materials, for all stored Materials. The Maine Turnpike Authority shall be named as an Additional Insured on the insurance policy.

If payment for Materials obtained and stored by the Contractor's Subcontractor\Fabricator is made to the Contractor, then the Contractor must provide proof of payment from his Subcontractor\Fabricator within 14 calendar days of the date the Contractor receives payment for the Materials. Failure by the Contractor to provide timely proof of payment for these Materials will result in the paid amount being withheld from the subsequent progress payment, or payments, until such time proof of payment is received by the Authority.

Materials paid for by the Authority will become the property of the Authority, but the risk of loss shall remain with the Contractor. Payment for Materials does not constitute acceptance of the Material. If Materials for which the Authority has paid are later found to be unacceptable, then the Authority may withhold amounts reflecting such unacceptable Materials from payments otherwise due the Contractor.

In the event of Default, the Authority may use, or cause to be used, all paid-for-Materials in any manner that is in the best interest of the Authority.

<u>108.4.1 Price Adjustment for Hot Mix Asphalt</u>

This Subsection in the General Provisions is deleted and replaced with the following:

For Contracts containing an excess of 500 tons of bituminous pavement, an asphalt price adjustment will be made for all bituminous concrete placed after the bid date of the Contract. No asphalt price adjustment will be allowed for Contracts containing less than 500 tons.

Price adjustments will be based on the variance in cost for the performance-graded binder component of the hot mix asphalt. The quantity of hot mix asphalt for each pay item will be multiplied by performance graded binder given in the table below, times the difference in price between the base price and the period price of asphalt cement. Adjustments will be made upward or downward, as prices increase or decrease. The quantity of Hot Mix Asphalt will be determined from the quantity shown on the progress estimate for each pay period. The base price of performance graded binder to be used is the price per standard ton current with the bid opening date. The period price of performance grade binder shall be determined by the Authority by using the average New England Selling Price and shall be the price per standard ton current with the ending date of the progress estimate. The Authority will determine the price adjustment weekly as prices increase or decrease and the sum of the weekly totals will be included in the monthly payment. No price adjustment will be made after the substantial completion date of September 8, 2017. The last price listed before September 2017will be used for pavement placed after the substantial completion date. The prices shall be determined by using the average New England Selling Price, as listed in the Asphalt Weekly Monitor.

Item 403.206	Hot Mix Asphalt - 25 mm	4.8%
Item 403.207	Hot Mix Asphalt - 19 mm	5.2%
Item 403.208	Hot Mix Asphalt - 12.5 mm	5.6%
Item 403.209	Hot Mix Asphalt - 9.5 mm (sidewalks, drives, & incidentals)	6.2%
Item 403.210	Hot Mix Asphalt - 9.5 mm	6.2%
Item 403.211	Hot Mix Asphalt - Shim	6.2%
Item 403.212	Hot Mix Asphalt - 4.75 mm	6.8%
Item 403.213	Hot Mix Asphalt - 12.5 mm (base and intermediate course)	5.6%

109.5 Adjustments for Delay

This Subsection is deleted and replaced as follows:

109.5.1 Definitions – Types of Delays Delays are defined as follows and may be divided into more than one type depending upon cause.

A. Excusable Delay Except as expressly provided otherwise by this Contract, an "Excusable Delay" is a Delay to the Critical Path that is directly and solely caused by: (1) a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an adjustment of time if the Project falls within the geographic boundaries prescribed under the disaster declaration. (2) a flooding event at the effected location of the Project that results in a Q25 headwater elevation, or greater, but less than a Q50 headwater elevation.

Theoretical headwater elevations will be determined by the Authority; actual headwater elevations will be determined by the Contractor and verified by the Authority, or (3) non-weather Uncontrollable Events.

B. Compensable Delay A "Compensable Delay" is a Delay to the Critical Path that is directly and solely caused by: (1) a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an Equitable Adjustment if the Project falls within the geographic boundaries prescribed under the disaster declaration and receives project-specific emergency funds, and the Contractor can show proof that the Work was delayed by this weather event,

(2) an Uncontrollable Event caused by a Utility Company , for which the Utility Company reimburses the Authority, (3) an Uncontrollable Event caused by other third party (not Subcontractors) Working on Project-related Work within the Project Limits if, and only if, the third party offers the Authority reimbursement for such Delay, (4) acts by the Authority that are in violation of applicable laws or the Contract, or (5) a flooding event at the effected location of the Project that results in a Q50 headwater elevation, or greater. Theoretical Q50 headwater elevations will be determined by the Authority; actual headwater elevations will be determined by the Contractor and verified by the Authority.

C. Inexcusable Delay "Inexcusable Delays" are all Delays that are not Excusable Delays or Compensable Delays.

For a related provision, see Section 101.2 - Definition of Uncontrollable Event.

109.5.2 Entitlement to Adjustments

A. Types of Adjustments Provided the Contractor meets the requirements of Section 109.5.2(B) below and complies with the notification, documentation, and procedural requirements set forth in the Contract, the Contractor is entitled to certain adjustments to the Contract depending upon the type of Delay.

1. If an Excusable Delay, the Contractor is entitled to an extension of time, but no additional compensation.

2. If a Compensable Delay, the Contractor is entitled to an extension of time and an Equitable Adjustment as set forth in Section 109.7 - Equitable Adjustments to Compensation and Time.

3. If an Inexcusable Delay, the Contractor is entitled to neither an extension of time nor additional compensation.

For related provisions, see Sections 104.2.7 - Damage to Project Caused By Uncontrollable Events and 104.3.10 - Responsibility for the Damage to Work.

B. Requirements for Entitlement To be entitled to any adjustments for an Excusable Delay or a Compensable Delay, the Contractor must demonstrate all of the following.

1. The Contractor consistently utilized its Schedule of Work to schedule, coordinate, and manage the Work as evidenced by documentation created as the Work progressed including Progress Meeting minutes;

2. The Delay impacted the Critical Path of the Schedule of Work; and

3. There are no concurrent Inexcusable Delays.

C. Concurrent Delays The Contractor is not entitled to a time extension for the period of time when Excusable and Inexcusable Delays are concurrent. The Contractor also is not entitled to either time extension or an Equitable Adjustment for the period of time when Compensable and Inexcusable Delays are concurrent. In the event Compensable and Excusable Delays are concurrent, the Contractor is only entitled to time extension, not an Equitable Adjustment, for the period of time such Delays are concurrent.

109.5.3 Early Completion Date Delay Claims For the purposes of this Section 109.5.3, a "Contractor's Early Completion Date" means a Project Completion date shown on the Contractor's initial Schedule of Work submitted in accordance with Section 107.4.2 - Schedule of Work Required that is earlier than the Contract's specified Completion date. The Authority will not be liable for any claims or expenses related to the period of time between the Contractor's Early Completion Date and the Contract's specified Completion date, unless the Contractor demonstrates, by clear and convincing evidence that: (A) all requirements of Section 109.5.2(B) - Requirements for Entitlement are met, and (B) that the Contractor's Early Completion Date was reasonable at the time of Bid in light of the surrounding facts and circumstances, including the Contractor's available resources, and the requirements of the Work.

109.5.4 Notice and Procedural Requirements If the Contractor becomes aware of facts or circumstances that may cause a Delay for which the Contractor may seek adjustments to compensation, time, or other Contract requirements, the Contractor must notify the Resident of such "Issue" within 48 hours and before doing any Work relating to such facts or circumstances as provided in Section 104.4.5 - Early Negotiation. Except as otherwise provided in this Section 109.5, the Contractor shall then comply with all other requirements of Part 111 - "Resolution of Disputes". The Contractor will not be entitled to any change to compensation, time, or Work requirements without proper and timely notice. Failure to provide such notice constitutes a waiver of all claims related to such conditions.

109.5.5 Documenting the Delay and Request for Adjustments

A. Weekly Reports During Delay To be entitled to any adjustments for Delay, the Contractor must keep records as provided in Section 111.1.6 - Contractor's Obligation to Keep Records. Further, the Contractor must submit weekly written reports containing the following information.

1. Number of Days of impact to the Critical Path.

2. A summary of all operations that have been Delayed, or will be Delayed on the impact of the Contractor's Critical Path.

3. A narrative describing how the cause of the Delay meets the definition of "Excusable Delay" or "Compensable Delay" contained in Section 109.5.1(A) or (B).

4. Itemization of all extra costs being incurred, including (A) how the extra costs relate to the Delay, (B) the identification of all non-salaried Project employees for whom costs are being compiled, and (c) a summary of time charges for Equipment, identified by the manufacturer's number for which costs are being compiled.

B. Request and Report After Completion Within 14 Days of Completion of the phase of Work that the Contractor claims has been Delayed, the Contractor shall submit a written report to the Department that contains the following information.

1. A description of the operations that were Delayed and the documentation and narrative of how the cause for the Delay meets the definition of "Excusable Delay" or "Compensable Delay" contained in Sections 109.5.1(A) or (B), including all reports prepared for the Contractor by consultants, if used;

2. An as-built chart showing when Work operations were actually performed;

3. A graphic depiction of how the operations were Delayed and the impact on the Critical Path; and

4. An item-by-item request for additional time and compensation for items allowed under Section 109.7.5 - Force Account Work, including measurement and explanation.

The Authority may require that all costs shown in the report be certified by an accountant.

109.5.6 Decision by Construction Program Manager Within 30 Days of receiving all information described in Section 109.5.5(B) - Request and Report After Completion, the Program Manager will Deliver a written decision on the request made to the Contractor. Failure to provide a decision within said 30-day period shall be considered a denial of the Contractor's request, unless the parties mutually agree to an extension of time for such decision.

109.5.7 Additional Consideration By Authority If the Contractor does not agree with the decision of the Construction Program Manager the issue should be considered a Dispute and shall be resolved as outlined in Section 111 –Resolution of Disputes.

109.7.3 Compensable Items

The following is added to Item 3.:

3. "A maximum 15% markup will be allowed on the total..."

The following is added to the end of the paragraph:

4. ..."if determined by the Authority to be lower."

110.3.6 Builder's Risk Insurance

The Contractor shall provide Builder's Risk Insurance for this project in the amount equal to or greater than his bid price for Item 800.01 – Toll Administration Building.

Section 111 – Resolution of Disputes

These Subsections are deleted and replaced as follows:

Scope of Section This Section contains provisions for resolving Disputes early, efficiently, fairly, and as close to the Project level as possible. For related provision, see Section 104.4 - Communication and Coordination.

111.1General

111.1.1Definitions "Dispute" is defined in Section 101.2 - Definitions. "Issue," is defined in Section 104.4.5 - Early Negotiation. Additionally, an "Issue" as used in Sections 111.1 through 111.3 below, is a matter that may give rise to a Dispute.

111.1.2 Escalation Process

To resolve Issues and Disputes, the Contractor and the Maine Turnpike Authority will develop a Decision Matrix at the preconstruction or partnering meeting. See related Subsection 104.4.2, Preconstruction Conference. If an issue is not resolved, the matter becomes a Dispute and may be appealed to the MTA Executive Director. If the Contractor is dissatisfied with the MTA Executive Director's decision, the Contractor may request an Alternate Dispute Resolution (ADR) process, as outlined in this Section. All costs of ADR shall be shared equally.

At the request of the Contractor, appeal decisions rendered by the Executive Director may be appealed by the Contractor to a Final ADR process of either Mediation or Arbitration. The costs of Mediation or Arbitration shall be borne equally by the Contractor and the Authority. Decisions by either a Mediator or an Arbitrator(s) will be non-binding unless the parties mutually agree in writing at the time of process selection that such recommendations will be binding.

It is the intent of this Specification to retain maximum flexibility for the specific procedures for Final Alternative Dispute Resolution. The processes shall follow the guidelines of construction industry ADR practices in general. The Authority and the Contractor will contribute equal input to the selection of location, methods, experts and timing of such processes.

111.1.3 Relationship to Partnering, With the exception of the decision matrix developed pursuant to Section 104.4.2 Preconstruction Conference, partnering including the establishment of a partnership charter, does not in any way waive, alter, or otherwise affect any provision of the Contract including those requiring notice and all other provisions governing the resolution of Issues or Disputes. For a related provision, see Section 104.4.1 - Partnering.

111.1.4 Mandatory Notice The Contractor shall comply with all notice provisions of this Contract relating to Issues or Disputes including those contained in Sections 104.3.3 - Duty to Notify If Ambiguities Discovered; 104.4.5(A) - Early Negotiation, Notice Required; 109.4.3

- Differing Site Conditions, Notice and Procedural Requirements; 109.5.4 - Adjustments for Delay, Notice and Procedural Requirements; and 111 - Resolution of Disputes. In order to promote the purposes of this Section 111, all notice provisions are mandatory and are to be strictly construed. Failure to provide Conforming notice constitutes waiver by the Contractor of any and all claims to additional compensation, time, or modification of Contract requirements related to the Issue or Dispute.

111.1.5 Work to Proceed Despite Issue or Dispute Regardless of the status or disposition of any Issue or Dispute, the Contractor and the Department must perform their Contractual responsibilities Promptly and diligently. Unless expressly directed otherwise by the Department, the Contractor shall proceed without Delay to perform the Work or to Conform to the decision or Order of the Department.

111.1.6 Contractor's Obligation to Keep Records Throughout the course of any Issue or Dispute, the Contractor shall keep daily records, including supporting documentation, of extra costs and time related to the Issue or Dispute. Such records shall include all non-salaried labor, Material costs, Equipment expenses, and location for all operations that are affected by the Issue or Dispute. The Contractor will not be entitled to any change to compensation, time, or Work requirements without such records. The Contractor shall permit the Department daily access to and shall provide copies of these and any other records needed for evaluating the Dispute. The Contractor shall retain those records for the duration of the Dispute and as provided in Section 104.3.6 – Project Records.

111.1.7 Dispute Resolution Time Extensions All deadlines provided in this Section 111 may be extended only by mutual written consent signed by both parties.

111.1.8 V A C A N T

111.1.9 Contract Modification Required All changes to the Contract that regard Issues or Disputes and that affect compensation, time, quality, or other Contract requirements must be made by written Contract Modification as provided by Section 109.8 - Contract Modification.

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 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.

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Pavement Surface)

202.01 Description

The following sentence is added:

This work shall also consist of removing the surface of the bituminous pavement to the depth, width, grade, and cross section as shown on the Plans or as approved by the Resident.

The following Subsection is added:

202.061 Removing Pavement

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. The milling machine shall be capable of accurately establishing profile grades by referencing from a floating straight edge, a minimum of 50 feet. The equipment shall also have an effective means for removing excess material from the surface and for preventing accidents from flying material in compliance with Subsection 105.2.45, Compliance with Health and Safety Laws.

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

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Asbestos Containing Materials)

202.01 Description

The following paragraphs are added:

The work shall also consist of removing and disposing of window caulking containing asbestos in the toll utility building at Interchange 63.

All asbestos containing materials shall be removed by a licensed asbestos abatement contractor prior to the building demolition. 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.

The following Subsection is added:

202.021 Removing Asbestos Containing Materials

No asbestos containing materials may be removed without a Maine Turnpike Authority approved removal and disposal plan; and proper notifications and filings with the Maine Department of Environmental Protection.

Disposal of all Asbestos Containing Material 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.

The licensed asbestos abatement contractor will be responsible for all work associated with the asbestos removal, including the Asbestos Removal Plan, Maine DEP Notification, demolition, final clearances, legal disposal, and Abatement Certification. And shall obtain any and all permits or licenses necessary for the performance of the work, and conform to, all local, State and Federal laws, regulations or ordinances applicable to the work.

202.06 Basis of Payment

This Subsection is amended by the addition of the following:

Removing Asbestos Containing Materials will be incidental to the removal of the specific item.

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Existing Manholes or Catch Basins)

202.05 Removing Manholes or Catch Basins

The following sentence is added:

Frames and grates shall be removed, transported and stacked at the Gray Maintenance Area Exit 63.

202.07 Method of Measurement

The last paragraph is deleted and replaced with the following:

Removing Manholes or Catch Basins will be measured by each unit satisfactorily removed.

202.08 Basis of Payment

The following is added after the first sentence of the fourth paragraph:

Removing, transporting and stacking the frames and grates will not be paid for separately, but shall be incidental to the Removing Existing Manholes or Catch Basin item.

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Existing Bridge)

202.01 Description

The following paragraphs are added:

The work shall include all labor, equipment, and materials required to remove the existing bridge.

Prior to starting any demolition work, the Contractor shall submit a demolition plan to the Resident for review. 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.

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

This Subsection is amended by the addition of the following:

The removal of the existing bridge shall include the removal and disposal of the bituminous concrete pavement, waterproofing membrane, reinforced concrete deck, structural steel beams and diaphragms, bridge bearings, parapets, curbing, abutments, wingwalls, piers, footings, piles, and all other materials which are part of the bridge to the limits shown on the plans.

The existing aluminum bridge railing and railing brackets shall be removed, transported and stacked at the Authority's Crosby Maintenance Area at Mile 46 Southbound.

202.08 Basis of Payment

This Subsection is amended by the addition of the following:

Removing Existing Bridge will be paid for at the Contract lump sum price which shall be full compensation for removing and disposing of the superstructure and substructure as shown on the Plans or as approved by the Resident.

The third sentence in the first paragraph is deleted and replaced with the following:

Material for backfilling holes, resulting from removal of substructure or obstructions, will not be measured separately for payment, but shall be incidental to Removing Existing Bridge. Backfilling material shall conform to Section 304, Aggregate Base and Subbase Course.

Removing, transporting and stacking the existing bridge railing and railing brackets at the location designated by the Authority will not be measured separately for payment, but shall be included in the cost of Removing Existing Bridge.

Payment will be made under:

Pay Item		Pay Unit
202.193	Removing Existing Bridge	Lump Sum

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Pavement Surface)
(Removing Pavement Surface – Bridge Deck)

202.01 Description

The following paragraphs are added:

This work shall also consist of removing the surface of the bituminous concrete pavement from bridge decks and approach roadways to the depth, width, grade, and cross section as shown on the Plans or as directed by the Resident.

Removal of the pavement and membrane surface from the Route 202 Underpass bridge deck shall be completed by scraping or other methods that will not damage the existing concrete deck surface. Milling of bridge deck pavement shall not be allowed.

Removal of approach pavement 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 50 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 Detail – 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.

The following Subsection is added:

202.032 Removing Bridge Pavement Surface and Membrane

All bridge deck pavement, membrane and scrapings shall be disposed of by the Contractor off of the turnpike right-of-way in accordance with the Maine Department of Environmental Protection Solid Waste Management Requirements.

The following Subsection is added:

202.0611 Removing Approach Pavement (non-bridge decks)

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. The milling machine shall be capable of accurately establishing profile grades by referencing from a floating straight edge, a minimum of 50 feet. The equipment shall also have an effective means

for removing excess material from the surface and preventing accidents from flying material in compliance with Subsection 105.2.5, Safety and Convenience of the Public, of the Specification.

The Contractor shall locate and remove all objects in the work area that would be detrimental to his milling or planing machine.

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

202.07 Method of Measurement

The second paragraph is deleted and replaced with the following:

Removing Pavement Surface will be measured by the square yard of material removed to the required depth.

Removing Pavement Surface – Bridge Deck will be measured by the square yard of material removed to the required depth, and will include the complete removal of the existing waterproofing membrane on the bridge deck.

The following paragraph is added:

The installation and removal of temporary bituminous ramps will not be measured separately for payment, but shall be incidental to the Contract.

202.08 Basis of Payment

The following paragraphs are added:

The accepted quantity of Removing Pavement Surface will be paid at the Contract unit price per square yard which price shall be full compensation for removing the pavement surface from bridge approach roadways to the required depth, hauling, and stockpiling the material, locating and removing objects detrimental to the milling or planing machine, sweeping, labor, equipment and all other incidentals necessary to complete the work.

The accepted quantity of Removing Pavement Surface - Bridge Deck will be paid at the Contract unit price per square yard which price shall be full compensation for removing the pavement surface and membrane materials from the bridge deck, hauling, and stockpiling the material, locating and removing objects detrimental to the equipment removing the pavement and membrane, sweeping, labor, equipment and all other incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
202.202	Removing Pavement Surface	Square Yard
202.2021	Removing Pavement Surface – Bridge Deck	Square Yard

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Rumble Strips)

202.01 Description

The following paragraph is added:

This work shall consist of grinding existing rumble strip locations to a depth of 1-1/2 inches, coating vertical and horizontal surfaces with bituminous tack coat, and installing 1-1/2 inches of hot mix asphalt, 9.5 mm over the entire milled area. Locations and lengths of removal shall be as shown on the Plans or as approved by the Resident.

The following Subsections are added:

202.011 Materials

Grinding shall be done in accordance with Section 202. Bituminous tack coat shall conform to Section 409.

Hot mix asphalt, 9.5 mm shall conform to Section 401.

202.025 General

Existing rumble strips are approximately 16 inches long, seven inches wide, 1/2 inch deep, and spaced approximately every five inches.

202.07 Method of Measurement

The following paragraph is added:

Removing Rumble Strips shall be measured by the linear foot removed and accepted. Measurement shall be parallel to the baseline.

202.08 Basis of Payment

The following sentences are added:

Removing Rumble Strips shall be paid for at the Contract unit price per linear foot which includes all grinding, bituminous tack coat, pavement, equipment and labor necessary to satisfactorily complete the work.

Payment will be made under:

Pay Item		Pay Unit
202.206	Removing Rumble Strips	Linear Foot

SPECIAL PROVISION

SECTION 203

EXCAVATION AND EMBANKMENT

This Section is amended as follows:

203.42 Site Specific Excavation

MTA is making their Bennet Road Pit in New Gloucester available through June 30, 2016 for disposal of the preload material and other clean excavation from the project site (no stumps, debris, building materials, pavement, concrete or etc.).

If the Bennett Road pit is utilized then Contractor shall include provisions for the Bennett Road pit in their Spill Prevention Control and Countermeasure Plan and their Temporary Soil Erosion and Water Pollution Control Plans.

The Contractor will be required to submit a pit utilization plan for review prior to any removal of materials from the pit or disposal of any materials in the pit. The Contractor shall delineate any disposal areas in the field for review. Any materials disposed of in the pit will need to be uniformly graded gently slopped to drain and stabilized.

SPECIAL PROVISION

SECTION 203

EXCAVATION AND EMBANKMENT

This Section is amended as follows:

All references to “waste storage areas” shall be deleted.

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 for the proposed roadwork along Route 26A, Route 202, and along the Turnpike 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 third paragraph is deleted and replaced with the following:

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.

Any temporary earth support required to install or remove drainage structures and utilities and support existing or proposed utilities will not be measured separately for payment, but shall be incidental to the Excavation items, unless specifically identified.

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.

After excavation in clay areas, the surface of the clay material must be scarified or roughened prior to placing loam and seed. Failed slopes shall be repaired at the Contractor’s own expense.

203.042 Site Specific Excavation

The Contractor's attention is directed to the fact that moisture-sensitive silty clay soils underlie portions of the project site. These deposits are easily disturbed by cyclic loading/vibrations and require careful moisture control and compaction procedures to result in the required firm and stable fill.

The Contractor shall be aware of the construction start date and the working conditions that likely will be encountered during earthwork construction. These conditions may include, but not necessarily be limited to, high groundwater conditions in areas of moisture-sensitive soils. In addition, precipitation which may create saturated soils shall be anticipated and will not be considered a "changed condition". The Contractor will not be entitled to additional compensation for this condition.

The Contractor shall review the available subsurface information and shall affirmatively demonstrate their understanding of the issues associated with and ability to complete the work under expected construction conditions. The Contractor shall utilize appropriate equipment and methods to effectively handle the anticipated soils. All necessary precautions shall be taken to ensure that the material below and beyond established excavation lines remains in the soundest possible condition, and that all excavated material that meets the Common Borrow Material Specification be handled so as to be available for reuse as fill. Any and all excess excavation, handling, compaction and/or moisture control efforts, aeration, hauling or any other work completed by the Contractor shall be at the Contractor’s own expense. The disposal of any surplus material off the Project site that results from the use of off-site borrow, shall be at the Contractor's own expense.

When directed and approved by the Resident, granular borrow may be placed in low wet areas and as part of the embankment construction to supplement the excavated material. Granular borrow placed and approved by the Resident will be measured for payment as granular borrow.

The following Subsection is added:

203.043 Sampling and Testing

The Contractor is responsible for quality control. Quality assurance testing and sampling, to monitor the conformance of the embankment fill materials, placement, and compaction will be completed by the Resident. Particular emphasis will be placed on the gradation characteristics and the in-place density of the embankment fill.

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.

203.11 Construction of Earth Embankment - Layer Method

The second, third, and fourth paragraphs are deleted and replaced with the following:

Layers shall be placed in lifts not to exceed 12 inches after compaction. Common borrow shall be compacted using vibratory compaction equipment to 92 percent of the material's maximum dry density as determined by ASTM D-1557. The compacted material shall appear firm and stable. Strict moisture control shall be utilized by the Contractor when using a cohesive fill material and the moisture content of the compacted material should not exceed four percent above the material's optimum moisture content.

Satisfactory compaction of granular borrow is defined as not less than 95 percent of the maximum density.

203.12 Construction of Earth Embankment with Moisture and Density Control

The last sentence of the second paragraph is amended as follows:

Each granular borrow layer placed with controlled moisture shall be compacted to not less than 95 percent of the maximum density.

The following paragraph is added:

Common borrow shall be placed in lifts not to exceed 12 inches after compaction. Common borrow shall be compacted using vibratory compaction equipment to 92 percent of the material's maximum dry density as determined by ASTM D-1557. The compacted material shall appear firm and stable. Strict moisture control shall be utilized by the Contractor when using a cohesive fill material and the moisture content of the compacted material should not exceed four percent above the material's optimum moisture content.

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

Any reference to borrow will be deleted from the first paragraph.

The pay quantity of common borrow and granular borrow shall be 100 percent of the compacted quantity measured in place. The volume of material required shall include the additional common borrow that is anticipated due to the settlement that will occur during the common borrow placement operation. Information on the anticipated settlement can be found in the Geotechnical Report posted on the website. The Contractor shall be completed with the common borrow placement once the finished grade has been reached.

The sixth paragraph is amended as follows:

Elevations for final cross sections shall be determined at the bottom of the loam line, not the finished ground line.

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.

203.19 Basis of Payment

The following sentence is added:

The payment for Common Borrow for material placed inside the toll plaza area, as described in 203.08, shall be the same for Common Borrow material placed outside the toll plaza area even though the material gradations are different.

SPECIAL PROVISION

SECTION 206

STRUCTURAL EXCAVATION

This Section is amended as follows:

All references to “waste storage areas” shall be deleted.

206.01 Description

The following is added after the first paragraph:

This work also shall consist of excavating and removal of earth materials at the island slabs utility pits, and pedestals and footings of gantry within the limits of work as shown on the Plans or as approved by the Resident.

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.

The bituminous pavement shall be disposed of by the Contractor off the Turnpike Right-of-Way. All bituminous pavement shall be disposed of in accordance with Chapter 404 of the Maine Department of Environmental Protection Solid Waste Management Regulations.

206.04 Method of Measurement

The following paragraph is added:

Excavation required to expose repair areas will be paid for under Item 206.08, Structural Earth Excavation - Major Structures. Backfill of the repair areas, not requiring gravel or hot bituminous pavement, will not be measured separately for payment, but shall be incidental to the Structural Earth Excavation item.

206.05 Basis of Payment

The following is added after the first paragraph:

The work shall also include all materials, equipment and labor associated with excavating, backfilling and compacting areas of structural excavation.

Payment will be made under:

Pay Item		Pay Unit
206.08	Structural Earth Excavation – Major Structures	Cubic Yard

SPECIAL PROVISION

SECTION 401

HOT MIX ASPHALT PAVEMENT

The following Specification is based on the MaineDOT February 11, 2009 Specification for Division 400, Pavements.

Section 401, Hot Mix Asphalt is deleted in its entirety and replaced with the following:

401.01 Description

The Contractor shall furnish and place one or more courses of Hot Mix Asphalt Pavement (HMA) on an approved base in accordance with the Contract documents and in reasonably close conformity with the lines, grades, thickness, and typical cross sections as shown on the Plans or established by the Resident. The Authority 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 MaineDOT Policies and Procedures for HMA Sampling and Testing.

401.02 Materials

Materials shall meet the requirements specified in Section 700, Materials:

- Asphalt Cement 702.01
- Aggregates for HMA Pavement 703.07
- HMA Mixture Composition 703.09

401.021 Recycled Asphalt Materials

Recycled Asphalt Pavement (RAP) may be introduced into the mixture at percentages approved by the Authority according to the MaineDOT Policies and Procedures for HMA Sampling and Testing. If approved by the Authority, the Contractor shall provide documentation stating the source, average test results for average residual asphalt content, and stockpile gradations showing RAP materials have been sized to meet the maximum aggregate size requirements of each mix designation. The Authority will obtain samples for verification and approval prior to its use.

In the event that RAP source or properties change, the Contractor shall notify the Authority of the change and submit new documentation stating the new source or properties a minimum of 72-hours prior to the change to allow for obtaining new samples and approval.

The RAP for surface pavement shall be processed to meet the requirements of Class I RAP. Base or shim pavement RAP may be from any source meeting the requirements of Class II RAP.

401.03 Composition of Mixtures

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 base, binder, surface, or shim course. The Contractor may be allowed to use more than 15 percent RAP, up to a maximum of 25 percent RAP, in a base, intermediate, or shim course provided that PG 58-34 asphalt binder is used in the mixture.

The MaineDOT (Department), or an independent consultant approved by the Authority, will be providing the mix design verification (Job Mix Formula) for the Authority's approval. The Job Mix Formula (JMF) will be sent to the Department Central Laboratory in Bangor, Maine. The samples will be obtained by the Department for laboratory testing. Before the start of paving, the Contractor and the Department will split a sample for verification of design before production will be allowed. The Contractor shall submit for Authority approval a JMF for each mixture to be supplied. The Authority may approve one (1) active design per nominal maximum size, per traffic level, per plant, plus a 9.5 mm "fine" mix @ 50 gyrations for shimming, and where required, a non-RAP design for bridge decks. The Authority shall then have 15 calendar days in which to process a new design before approval. 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.
- 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 asphalt contents.
- Design Aggregate Structural for at least three trial blends.
- Test results for the selected aggregate blend at a minimum of three binder contents.
- Specific Gravity and temperature/viscosity charts for the PGAB to be used.
- Recommended mixing and compaction temperatures from the PGAB supplier.
- Material Safety Data Sheets (MSDS) 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

stone stockpiles, 75 ton for sand stockpiles, and 50 ton of blend sand before the Authority will sample. 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 sufficient 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 shall split a production sample for evaluation. The Contractor shall test its split of the sample and determine if the results meet the requirements of the Department's written policy for mix design verification (See Maine DOT Policies and Procedures for HMA Sampling and Testing available at the Central Laboratory in Bangor). If the results are found to be acceptable, the Contractor will forward their results to the Authority's Lab, which will test the Authority's split of the sample. The results of the two split samples will be compared and shared between the Authority and the Contractor. If the Department finds the mixture acceptable, an approved JMF will be forwarded to the Authority. 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.

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 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. The cold feed percentage for RAP may be reduced up to five percentage points from the amount listed on the JMF and shall not exceed the percentage of RAP approved in the JMF or for the specific application.

TABLE 1
VOLUMETRIC DESIGN CRITERIA

Design ESAL's (Millions)	Required Density (Percent of G_{mm})			Voids in the Mineral Aggregate (VMA)(Minimum Percent) Nominal Maximum Aggregate Size (mm)					Voids Filled with Binder (VFB) (Minimum %)	Fines/Eff. Binder Ratio
	$N_{initial}$	N_{design}	N_{max}	25	19	12.5	9.5	4.75		
<0.3	≤91.5	96.0	≤98.0	13.0	14.0	15.0	16.0	16.0	70-80	0.6-1.2
0.3 to <3	≤90.5								65-80	
3 to <10	≤89.0								65-80*	
10 to <30										
≥ 30										

** For 9.5 mm nominal maximum aggregate size mixtures, the maximum VFB is 82.*

** For 4.75 mm nominal maximum aggregate size mixtures, the maximum VFB is 84.*

**For 4.75mm nominal maximum aggregate size mixtures, the Fines/Effective Binder Ratio is 0.6-1.4*

401.031 Warm Mix Technology

The Contractor may place Hot Mix Asphalt Pavement produced with an accepted WMA technology if approved by the Authority. Methods or technologies shall generally be at the Contractors' option, but will be limited to proven, Agency and Industry accepted practice. Mixture production, placement and volumetric testing details, including temperatures, shall be included in the project specific QCP, submitted to the Authority for approval prior to any work.

401.04 Temperature Requirements

After the JMF is established, the temperatures of the mixture shall conform to the following tolerances:

- In the truck at the mixing plant – allowable range 275° to 325°F.
- At the paver – allowable range 275° to 325°F.
- Or the recommendations, approved by the Authority, from the Asphalt Binder supplier.

The JMF and the mix subsequently produced shall meet the requirements of Table 1 and Subsection 703.07.

401.05 Performance Graded Asphalt Binder

Unless otherwise noted in Special Provision Section 403, Hot Bituminous Pavement, PGAB shall be 64-28, except that for mixtures containing greater than 15 percent but no more than 25 percent RAP the PGAB shall be PG 58-34. The PGAB shall meet the applicable requirements of AASHTO M320 - Standard Specification for PGAB. The Contractor shall request approval from the Authority for a change in PGAB supplier or source by submitting documentation stating the new supplier or source a minimum of 24-hours prior to the change. In the event that the PGAB supplier or source is changed, the Contractor shall make efforts to minimize the occurrence of PGAB co-mingling.

401.06 Weather and Seasonal Limitations

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 40°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 45°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.

Hot Mix Asphalt Pavement used for curb, driveways, sidewalks, islands, or other incidentals is not subject to seasonal limitations, except that conditions shall be satisfactory for proper handling and finishing of the mixture. All mixtures used for curb, driveways, sidewalks, islands, or other incidentals shall conform to Subsection 401.04, Temperature Requirements. Unless otherwise specified, the Contractor shall not place Hot Mix Asphalt Pavement on a wet or frozen surface and the air temperature shall be 40°F or higher.

On all sections of overlay with wearing courses one inch thick or less, the wearing course for the travelway and adjacent shoulders shall be placed provided the air temperature is determined as above 50°F or higher.

401.07 Hot Mix Asphalt Plant

401.071 General Requirements

HMA plants shall conform to AASHTO M156.

a. Truck Scales - When the hot mix asphalt is to be weighed on scales meeting the requirements of Section 108, Payment, the scales shall be inspected and sealed by the State Sealer as often as the Authority deems necessary to verify their accuracy.

Plant scales shall be checked prior to the start of the paving season, and each time a plant is moved to a new location. Subsequent checks will be made as determined by the Resident. The Contractor will have at least ten 50 pound masses for scale testing.

401.072 Automation of Batching

Batch plants shall be automated for weighing, recycling, and monitoring the system. In the case of a malfunction of the printing system, the requirements of Subsection 401.074 c. of this Specification will apply.

The batch plant shall accurately proportion the various materials in the proper order by weight. The entire batching and mixing cycle shall be continuous and shall not require any manual operations. The batch plant shall use auxiliary interlock circuits to trigger an audible alarm whenever an error exceeding the acceptable tolerance occurs. Along with the alarm, the printer shall print an asterisk on the delivery slip in the same row containing the out-of-tolerance weight. The automatic proportioning system shall be capable of consistently delivering material within the full range of batch sizes. When RAP is being used, the plant must be capable of automatically compensating for the moisture content of the RAP.

All plants shall be equipped with an approved digital recording device. The delivery slip load ticket shall contain information required under Subsection 108.1.3, Provisions Relating to Certain Measurements, Mass and Paragraphs a, b, and c of Subsection 401.073.

401.073 Automatic Ticket Printer System on Automatic HMA Plant

An approved automatic ticket printer system shall be used with all approved automatic HMA plants. The requirements for delivery slips for payment of materials measured by weight, as given in the following Sections, shall be waived: 108.1.3 a., 108.1.3 b., 108.1.3 c., and 108.1.3 d. The automatic printed ticket will be considered as the Weight Certificate.

The requirements of Subsection 108.1.3 f., Delivery Slips, shall be met by the weigh slip or ticket, printed by the automatic system, which accompanies each truckload, except for the following changes:

a. The quantity information required shall be individual weights of each batch or total net weight of each truckload.

b. Signatures (legible initials acceptable) of Weighmaster (required only in the event of a malfunction as described in 401.074 c.).
c. The MaineDOT designation for the JMF.

401.074 Weight Checks on Automatic HMA Plant

At least twice during each five days of production either of the following checks will be performed:

a. A loaded truck may be intercepted and weighed on a platform scale that has been sealed by the State Sealer of Weights and Measures within the past 12 months. The inspector will notify the producer to take corrective action on any discrepancy over 1.0%. The producer may continue to operate for 48 hours under the following conditions:
   1. If the discrepancy does not exceed 1.5%; payment will still be governed by the printed ticket.
   2. If the discrepancy exceeds 1.5%, the plant will be allowed to operate as long as payment is determined by truck platform scale net weight.

   If, after 48 hours the discrepancy has not been addressed and reduced below 1.0%, then plant operations will cease. Plant operation may resume after the discrepancy has been brought within 1.0%.

b. Where platform scales are not readily available, a check will be made to verify the accuracy and sensitivity of each scale within the normal weighing range and to assure that the interlocking devices and automatic printer system are functioning properly.

c. In the event of a malfunction of the automatic printer system, production may be continued without the use of platform truck scales for a period not to exceed the next two working days, providing total weights of each batch are recorded on weight tickets and certified by a Licensed Public Weighmaster.

401.08 Hauling Equipment Trucks for hauling Hot Mix Asphalt

Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, and smooth metal dump bodies, which have been thinly coated with a small amount of approved release agent to prevent the mixture from adhering to the bodies. Solvents based agents developed to strip asphalts from aggregates will not be allowed as release agents.

All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention, which completely covers the mixture. The cover shall be securely fastened on the truck, unless unloading.

All truck bodies shall have an opening on both sides, which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 12 inches above the bed.

401.09 Pavers

Pavers shall be self-contained, self-propelled units with an activated screed (heated if necessary) capable of placing courses of Hot Mix Asphalt Pavement in full lane widths specified in the Contract on the mainline, shoulder or similar construction.

On projects with no price adjustment for smoothness, pavers shall be of sufficient class and size to place Hot Mix Asphalt Pavement over the full width of the mainline travel way with a 10 feet minimum main screed with activated extensions.

The Contractor shall place Hot Mix Asphalt Pavement on the mainline with a paver using an automatic grade and slope controlled screed, unless otherwise authorized by the Authority. The controls shall automatically adjust the screed and increase or decrease the layer thickness to compensate for irregularities in the preceding course. The controls shall maintain the proper transverse slope and be readily adjustable so that transitions and super elevated curves can be properly paved. The controls shall operate from a fixed or moving reference such as a grade wire or ski type device (floating beam) with a minimum length of 30 ft, a non-contact grade control with a minimum span of 24 ft, except that a 40 ft reference shall be used on mainline projects.

The Contractor shall operate the paver in such a manner as to produce a visually uniform surface texture and a thickness within the requirements of Subsection 401.101, Surface Tolerances. The paver shall have a receiving hopper with sufficient capacity for a uniform spreading operation and a distribution system to place the mixture uniformly, without segregation in front of the screed. The screed assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screeds shall have auger extensions and tunnel extenders as per the manufacturer's recommendations, a copy of which shall be available if requested.

The Contractor shall have the paver at the Project site sufficiently before the start of paving operations to be inspected and approved by the Authority. The Contractor shall repair or replace any paver found worn or defective, either before or during placement, to the satisfaction of the Authority. Pavers that produce an unevenly textured or non-uniform mat will be repaired or replaced before continuing to place HMA on MTA projects. On a daily basis, the Contractor shall perform density testing across the uncompacted mat being placed, at 12 inch intervals. If the values vary by more than 2.0 percent from the mean, the Contractor shall make adjustments until the inconsistencies are remedied.

Failure to replace or repair defective placement equipment may result in a letter of suspension of work and notification of a quality control violation resulting in possible monetary penalties as governed by Section 106, Quality.

401.10 Rollers

Rollers shall be static steel, pneumatic tire, oscillatory, or approved vibrator type. Rollers shall be in good mechanical condition, capable of starting and stopping smoothly, and be free from backlash when reversing direction. Rollers shall be equipped and operated in such a way as to prevent the picking up of hot mixed material by the roller surface. The use of rollers, which result in crushing of the aggregate or in displacement of the HMA will not be permitted. Any Hot Mix Asphalt Pavement that becomes loose, broken, contaminated, shows an excess or deficiency of

Performance Graded Asphalt Binder, or is in any other way defective shall be removed and replaced at no additional cost with fresh Hot Mix Asphalt Pavement, which shall be immediately compacted to conform to the adjacent area.

The Contractor shall repair or replace any roller found to be worn or defective, either before or during placement, to the satisfaction of the Authority. Rollers that produce grooved, unevenly textured or non-uniform mat will be repaired or replaced before continuing to place HMA on MTA projects.

The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided Specification densities are attained and with the following requirements:

a. At least one roller shall be a 16 ton pneumatic-tired. Unless otherwise allowed by the Resident, pneumatic-tired rollers shall be equipped with skirting to minimize the pickup of HMA materials from the paved surface. When required by the Resident, the roller shall be ballasted to 20 ton.

b. Compaction with a vibratory or steel wheel roller shall precede pneumatic-tired rolling, unless otherwise authorized by the Authority.

c. Vibratory rollers shall not be operated in the vibratory mode when checking or cracking of the mat occurs, or on bridge decks.

d. Any method, which results in cracking or checking of the mat, will be discontinued and corrective action taken.

e. The use of an oscillating steel roller shall be required to compact all mixtures placed on bridge decks.

The maximum operating speed for a steel wheel or pneumatic roller shall not exceed the manufacturer's recommendations, a copy of which shall be available if requested.

401.101 Surface Tolerances

The Authority will check surface tolerance utilizing the following methods:

a. A 16 ft straightedge or string line placed directly on the surface, parallel to the centerline of pavement.
b. A 10 ft straightedge or string line placed directly on the surface, transverse to the centerline of pavement.

The Contractor shall correct variations exceeding 6 mm [1/4 in] by removing defective work and replacing it with new material as directed by the Authority. The Contractor shall furnish a 10 foot straightedge for the Authority's use.

401.11 Preparation of Existing Surface

The Contractor shall thoroughly clean the surface upon which Hot Mix Asphalt Pavement is to be placed of all objectionable material. When the surface of the existing base or pavement is irregular, the Contractor shall bring it to uniform grade and cross section. All surfaces shall have a tack coat applied prior to placing any new HMA course. Tack coat shall conform to the requirements of Section 409, Bituminous Tack Coat, Section 702, Bituminous Material, and all applicable sections of the Contract.

401.12 Hot Mix Asphalt Documentation

The Contractor and the Authority shall agree on the amount of Hot Mix Asphalt Pavement that has been placed each day. All delivery slips shall conform to the requirements of 401.073.

401.13 Preparation of Aggregates

The Contractor shall dry and heat the aggregates for the HMA to the required temperature. The Contractor shall properly adjust flames to avoid physical damage to the aggregate and to avoid depositing soot on the aggregate.

401.14 Mixing

The Contractor shall combine the dried aggregate in the mixer in the amount of each fraction of aggregate required to meet the JMF. The Contractor shall measure the amount of PGAB and introduce it into the mixer in the amount specified by the JMF.

The Contractor shall produce the HMA at the temperature established by the JMF.

The Contractor shall dry the aggregate sufficiently so that the HMA will not flush, foam excessively, or displace excessively under the action of the rollers. The Contractor shall introduce the aggregate into the mixer at a temperature of not more than 25°F above the temperature at which the viscosity of the PGAB being used is 0.150 Pa·s (Pascal-second).

The Contractor shall store and introduce into the mixer the Performance Graded Asphalt Binder at a uniformly maintained temperature at which the viscosity of the PGAB is between 0.150 Pa·s and 0.300 Pa·s. The aggregate shall be coated completely and uniformly with a thorough distribution of the PGAB. The Contractor shall determine the wet mixing time for each plant and for each type of aggregate used.

401.15 Spreading and Finishing

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the HMA with hand tools to provide the required compacted thickness. Solvent based agents developed to strip asphalts from aggregates will not be allowed as release agents.

On roads opened to two-way traffic, the Contractor shall place each course over the full width of the traveled way section being paved that day, unless otherwise noted by the Authority in Section 403, Hot Mix Asphalt Pavement.

In addition, hot mix asphalt pavement placed on bridges shall also conform to Section 508.04 and the following requirements.

a. The bottom course shall be placed with an approved rubber mounted paver of such type and operated in such a manner that the membrane waterproofing will not be damaged in any way.

b. The top course shall not be placed until the bottom course has cooled sufficiently to provide stability.

c. The Contractor will not be required to cut sample cores from the compacted pavement on the bridge deck, unless otherwise directed by Special Provisions.

d. After the top course has been placed, the shoulder areas shall be sealed 3 ft wide with two applications of an emulsified bituminous sealer meeting the requirements of Section 612.03 – Sealing and Section 702.12 – Emulsified Bituminous Sealing Compound. The first application shall be pre-mixed with fine, sharp sand, similar to mortar sand, as needed to fill all voids in the mix in the area being sealed. The second application may be applied without sand. The sealer shall be carried to the curb at the gutter line in sufficient quantity to leave a bead or fillet of material at the face of curb. The area to be sealed shall be clean, dry and the surface shall be at ambient temperature.

e. The furnishing and applying of the required quantity of sealer for the bridge shoulder areas shall be incidental to placing the hot mix asphalt pavement.

f. The atmospheric temperature for all courses placed on bridge decks shall be 50°F or higher.

401.16 Compaction

Immediately after the Hot Mix Asphalt Pavement has been spread, struck-off, and any surface irregularities adjusted, the Contractor shall thoroughly and uniformly compact the HMA by rolling.

The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving. The Contractor shall prevent adhesion of the HMA to the rollers or vibrating compactors without the use of fuel oil or other petroleum based release agents. Solvents designed to strip asphalt binders from aggregates will not be permitted as release agents on equipment, tools, or pavement surfaces.

The Contractor shall immediately correct any displacement occurring as a result of the reversing of the direction of a roller or from other causes to the satisfaction of the Authority. Any operation other than placement of variable depth shim course that results in breakdown of the aggregate shall be discontinued. Any new pavement that shows obvious cracking, checking, or displacement shall be removed and replaced for the full lane width as directed by the Resident at no cost to the Authority.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the Contractor shall thoroughly compact the HMA with mechanical vibrating compactors. The Contractor shall only use hand tamping in areas inaccessible to all other compaction equipment. On depressed areas, the Contractor may use a trench roller or cleated compression strips under a roller to transmit compression to the depressed area.

Any HMA that becomes unacceptable due to cooling, cracking, checking, segregation or deformation as a result of an interruption in mix delivery shall be removed and replaced, with material that meets Contract Specifications at no cost to the Authority.

401.162 Voids

The HMA will be accepted for percent air voids on a sublot basis. Percent air voids will be determined in accordance with AASHTO T 312. Point of sampling will be from the truck at the plant. A sublot will consist of 500 tons. The number of samples per day will be computed as one for every 500 tons plus one for any additional fractional sublot that is equal to or greater than 100 tons or as directed by the Resident. There shall be a minimum of one sublot per day per JMF. One sample shall be taken and tested for each 500 tons of production or portions thereof. Full payment will be made for each 500 tons of production that meets the specified void range of 2.5 to 5.5 percent.

Payment reduction will be applied to each sublot (500 tons) that falls outside of this range. See Subsection 401.21.

401.163 PGAB Content

The HMA will be accepted for PGAB content on a sublot basis. PGAB content will be determined in accordance with AASHTO T 308. Point of sampling will be from the truck at the plant. A sublot will consist of 500 tons. The number of samples per day will be computed as one for every 500 tons plus one for any additional fractional sublot that is equal to or greater than 100 tons or as directed by the Resident. There shall be a minimum of one sublot per day per JMF.

Payment reduction will be applied to each sublot (500 tons) that falls outside the allowable limits. Note minimum asphalt content specified in Special Provision Section 403. See Subsection 401.21.

401.164 Density

Pavement density will be determined by comparing the density of six inch diameter full depth cores (for the course being laid) taken from the compacted pavement to the Theoretical Maximum Density of that core. Core locations shall be by random samples in conformance with ASTM-D979 & D3665. The Contractor shall supply a masonry saw with a 12 inch deep diamond wet cutting saw blade capable of cutting the six inch diameter cores.

For determination of pavement density, core samples six inches in diameter, for the full depth of the course being laid, shall be taken by the Contractor from the mixture incorporated in the work after finishing operations have been completed and the pavement has cooled to 70°F. Ice or dry ice shall be used to reduce temperature as necessary.

Vertical surface of the core area shall be coated with rubberized joint sealer prior to refilling with bituminous mixture. Cores will not be cut for shim pavement.

The joint sealer, bituminous mixture and the labor for obtaining these samples in the field and restoring the surface shall be furnished without charge by the Contractor. The joint sealant shall conform to Federal Specification SS-S-1401C and shall be incidental to the pavement items. Care must be exercised to avoid excess joint material on top of the finish mat and at the bottom of the joint.

No additional course shall be constructed on a course until the density of the sample has been established and approved.

The densities of the completed pavement shall be 92.5 to 97.0 percent of the theoretical maximum density obtained.

The pavement will be accepted for density on a sublot basis. A sublot will consist of 500 tons. The number of cores per day will be computed as one for every 500 tons plus one for any portion that does not equal 500 tons or as directed by the Resident. There shall be a minimum of one sublot per day per JMF.

Each sublot will be evaluated separately and full or partial payment will be made based on the results of tests performed on the cores.

Payment reduction will be applied to each core that has a density outside of the allowable range (92.5 to 97.0). See Subsection 401.21.

401.17 Joints

The Contractor shall construct wearing course transverse and longitudinal joints in such a manner that minimum tolerances shown in Subsection 401.101, Surface Tolerances, are met when measured with a straightedge.

The paver shall always maintain a uniform head of HMA during the joint construction.

The HMA shall be free of segregation and meet temperature requirements outlined in Subsection 401.04. Transverse joints of the wearing course shall be straight and neatly trimmed. The Contractor may form a vertical face exposing the full depth of the course by inserting a header, by breaking the bond with the underlying course, or by cutting back with hand tools. The Authority may allow feathered or "lap" joints on lower base courses or when matching existing base type pavements.

Longitudinal joints shall be generally straight to the line of travel, and constructed in a manner that will best ensure joint integrity. Methods or activities that prove detrimental to the construction of straight, sound longitudinal joints will be discontinued.

Extra care shall be taken to insure satisfactory vertical joints in the pavements. The Contractor shall apply a coating of joint sealant immediately before paving all cold joints (temperatures less than 120°F) to the vertical face of the wearing surface unless otherwise directed by the Resident. A heavy application of tack coat shall be applied to the vertical face of all cold

joints on lower lifts. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Authority may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one (1) working day. Joint sealer shall conform to Federal Specification SS-S-1401C. The Contractor shall submit to the Resident a manufacturer's certification for the joint sealant (SS-S-1401C).

Where pavement under this Contract joins an existing pavement or when the Authority directs, the Contractor shall cut the existing pavement along a smooth line, producing a neat, even, vertical joint. The Authority will not permit broken or raveled edges. The cost of all work necessary for the preparation of joints is incidental to related Contract pay items.

401.18 Quality Control

The Contractor shall submit for approval and operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the contract requirements. The QCP shall meet the requirements of Section 106.4 – Quality Control and this Section. The Contractor shall not begin paving operations until the Authority approves the QCP in writing. Prior to placing any mix, the Authority and the Contractor shall hold a Pre-paving conference to discuss the paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, random sampling, project lots and sublots and traffic control.
A copy of the QC random numbers to be used on the project shall be provided to the Resident.
The Authority's random numbers for Acceptance testing shall be generated and on file with the Resident and the Project Manager. All personnel of the Authority and the Contractor who have significant information relevant to the paving items shall attend, including the responsible onsite paving supervisor for the Contractor. The Resident will prepare minutes of the conference and distribute them to all attendees. Any requests to revise the minutes must be made to the Resident within 7 days of receipt. These minutes will constitute the final record of the pre-paving conference.

The QCP shall address any items that affect the quality of the Hot Mix Asphalt Pavement including, but not limited to, the following:

a. JMF(s)
b. Hot mix asphalt plant details
c. Stockpile Management (to include provisions for a minimum 2 day stockpile)
d. Make and type of paver(s)
e. Make and type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers
f. Name of QCP Administrator, and certification number
g. Name of Process Control Technician(s) and certification number(s)
h. Name of Quality Control Technician(s) and certification number(s)
i. Mixing and transportation including process for ensuring that truck bodies are clean and free of debris or contamination that could adversely affect the finished pavement
j. Testing plan
k. Laydown operations including longitudinal joint construction, procedures for avoiding paving in inclement weather, type of release agent to be used on trucks tools and rollers, compaction of shoulders, tacking of all joints, methods to ensure that segregation is minimized, procedures to determine the maximum rolling and paving speeds based on best engineering practices as well as past experience in achieving the best possible smoothness

of the pavement. Solvent based agents developed to strip asphalts from aggregates will not be allowed as release agents

l. Examples of Quality Control forms including a daily plant report, daily paving report and delivery slip template for any plant to be utilized.

m. Silo management and details (can show storage for use on project of up to 36 hours)

n. Provisions for varying mix temperature due to extraordinary conditions or production limitations. If a warm-mix technology is utilized, a proposed target production range(not to exceed 50 F) will be provided for each mix design.

o. Name and responsibilities of the Responsible onsite Paving Supervisor

p. Method for calibration/verification of Density Gauge

q. A note that all testing will be done in accordance with AASHTO and the Maine DOT Policies and Procedures for HMA Sampling and Testing

r. A detailed description of RAP processing, stockpiling and introduction into the plant as well as a note detailing conditions under which the percent of RAP will vary from that specified on the JMF

s. A detailed procedure outlining when production will be halted due to QC or Acceptance testing results

t. A plan to address the change in PGAB source or supplier and the potential co-mingling of differing PGAB's.

u. Provisions for how the QCP will be communicated to the Contractor's field personnel

The QCP shall include the following technicians together with following minimum requirements:

a. QCP Administrator – A qualified individual shall administer the QCP. The QCP Administrator must be a full-time employee of or a consultant engaged by the Contractor or paving subcontractor. The QCP Administrator shall have full Authority to institute any and all actions necessary for the successful operation of the QCP. The QCP Administrator (or its designee in the QCP Administrator's absence) shall be available to communicate with the Authority at all times. The QCP Administrator shall be certified as a Quality Assurance Technologist certified by the New England Transportation Technician Certification Program (NETTCP).

b. Process Control Technician(s) (PCT) shall utilize test results and other quality control practices to assure the quality of aggregates and other mix components and control proportioning to meet the JMF(s). The PCT shall inspect all equipment used in mixing to assure it is operating properly and that mixing conforms to the mix design(s) and other Contract requirements, and that delivery slips and plant recordation accurately reflects the mix being produced with all required information. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than one PCT is required. The Plan shall include the criteria to be utilized by the PCT to correct or reject unsatisfactory materials. The PCT shall be certified as a Plant Technician by the NETTCP.

c. Quality Control Technician(s) (QCT) shall perform and utilize quality control tests at the job site to assure that delivered materials meet the requirements of the JMF(s). The QCT shall inspect all equipment utilized in transporting, laydown, and compacting to assure it is operating property and that all laydown and compaction conform to the Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than on QCT is required. The QCP shall include the criteria utilized by the QCT to correct or reject unsatisfactory materials. The QCT shall be certified as a Paving Inspector by the NETTCP.

The QCP shall detail the coordination of the activities of the Plan Administrator, the PCT and the QCT. The Project Superintendent shall be named the QCP, and the responsibilities for successful implementation of the QCP shall be outlined

401.191 Inspection/Testing

All quality control testing at the plant and paving site for bituminous concrete paving shall be provided by the Contractor and will be incidental to the various items of the Contract. Quality control testing to verify the job mix formula at the plant shall be comprised of a sample taken and tested for each 500 tons of production. The plant will be shut down for two consecutive out of Specification test results for VMA, VFB, Fbe, PGAB content, gradation, and/or voids. Prior to resuming paving operations, the plant quality control unit shall satisfy the Authority that the plant production is in compliance with the Specifications. The plant, at no additional cost to the Authority, shall assign qualified quality control staff personnel and have an on-site laboratory equipped to perform all tests.

The Contractor shall submit a list of on-site laboratory and sampling facilities, including available equipment.

Adequate and convenient sampling facilities shall be provided, allowing the Resident and the Authority's designated quality assurance personnel to obtain representative samples from the full width and depth of the discharge area of each aggregate bin. The sampling tray shall be structurally supported during the sampling operation. Access to the sampling facilities shall be provided. The use of such access shall not be more difficult than climbing a ladder leading to a secure platform with railings.

Final acceptance shall be based on quality assurance tests to assure compliance with the job mix formula as established. Samples and certified quality control reports shall be available to the Resident and the Authority's designated quality assurance personnel as often as requested. Sample locations will be random in compliance with ASTM D3665 or as directed by the Resident.

When plant inspection is maintained, the material will be considered acceptable for use when the specified tests from samples obtained at the production plant indicate conformance to the approved job mix formula.

Quality assurance testing services for bituminous concrete pavement shall be provided by the Authority. The Contractor shall provide adequate space and all lab equipment, materials and chemicals at the bituminous plant necessary to verify job mix formula (asphalt content (AASHTO T 164 or T 308) and gradations). Upon completion, the Contractor shall be responsible for the proper disposal of all materials and chemicals. This work will not be measured separately for payment, but shall be incidental to the various items of the Contract.

A. Inspection. The Resident, or his authorized representative, shall have access and use of the laboratory facilities at any time and access to all parts of the plant for:

1. Inspection of the condition and operations of the plant.
2. Confirmation of the adequacy of equipment in use.
3. Verification of the character and proportions of the mixture.

4. Determination of temperatures being maintained in the preparation of the mixtures.
5. Inspection of incidental related procedures.
6. Performing quality assurance testing.

B. Plant Testing Laboratory. The Contractor shall provide a plant testing laboratory for use by the Authority's quality assurance personnel for acceptance testing functions.

The plant laboratory shall be available at the following times for use by the Authority's quality assurance personnel:

1. During periods of pavement production;
2. During periods of sampling and testing; and,
3. Whenever materials subject to the provisions of these Specifications are being supplied or tested.

The Authority's quality assurance personnel will always have priority in use of the laboratory. The laboratory shall have sufficient equipment in order for both (Authority's and Contractor's) testing representatives to operate efficiently.

The plant testing laboratory shall have a floor space area of not less than 150 square feet, with a ceiling height of not less than 7-1/2 feet. The laboratory shall be weather tight, sufficiently heated in cold weather and air-conditioned in hot weather, to maintain temperatures for testing purposes of 70°F ± 5°F.

As a minimum the plant testing laboratory shall have:

1. Adequate artificial lighting.

2. Electrical outlets sufficient in number and capacity for operating the required testing equipment and drying samples.

3. Two fire extinguishers, Underwriter's Laboratory approved.

4. Work benches for testing, minimum 2-1/2 feet by 10 feet.

5. Desk with two chairs.

6. Sanitary facilities convenient to testing laboratory.

7. Exhaust fan to outside air, minimum 12 inch blade diameter.

8. A direct telephone line and telephone including answering machine and FAX machine, operating 24-hours per day, seven days a week.

9. File cabinet with lock for Resident.

10. Sink with running water, attached drain board and drain.

11. Metal stand for holding washing sieves.

12. A Two element hot plate or other comparable heating device, with dial type thermostatic controls for drying aggregates.

13. Mechanical shaker and appropriate sieves (listed in 639.06) meeting the requirements of ASTM E11.

14. Superpave gyratory compactor.

15. Oven, thermostatically controlled, inside minimum one cubic foot.

16. Two volumetric specific gravity flasks, 500 CC.

17. Other necessary hand tools required for sampling and testing.

18. Library containing Contract Specification, latest ASTM Volumes 4.03 and 4.04, AASHTO Materials Parts I and II, and Asphalt Institute Publications MS-2 and SS-1.

19. Equipment for Maximum Theoretical Density meeting the requirements of AASHTO T209 and equipment for Bulk Spec. Gravity meeting the requirements of AASHTO T166.

20. Infra-red temperature measuring device for use at both plant and Project site.

21. Necessary equipment for extraction (wet sample) testing.

22. Diamond blade saw for trimming pavement cores.

23. Two ovens.

24. All equipment (scales, Superpave gyratory compactor, etc.) to have current calibrations and certifications.

Approval of the plant and testing laboratory by the Resident requires all the above facilities and equipment to be in good working order during pavement production, sampling and testing. Failure to provide any of the above shall be sufficient cause for disapproving the bituminous plant operations.

401.21 Method of Measurement

The Authority will measure Hot Mix Asphalt Pavement by the ton in accordance with Subsection 108.1, Measurement of Quantities for Payment.

This Subsection is amended by the following:

A reduction in payment will occur when the voids, asphalt content, and density are other than the limits specified below for 100 percent payment. The payment reduction for voids and PGAB content and density will be based upon each sublot (500 tons) of production as specified in

Subsections 401.162, 401.163 and 401.164. The Contractor may request one retest for each failing sublot for core density only. The original core density and the recut core density shall be averaged together to determine payment for the sublot. No retest will be allowed for voids or asphalt content. The Contractor shall pay $100.00 for each additional core tested. Pavement restoration will not be measured separately for payment, but shall be incidental to the respective pay item.

Any lot resulting in zero payment shall be removed, disposed of and replaced at no additional cost to the Authority. Replacement pavement will be paid for based on the accepted and payment criteria specified herein.

CORE DENSITY VS. CORE THEORETICAL MAXIMUM DENSITY COMPACTION (SURFACE) 92.5-97 PERCENT	
PERCENT COMPACTION	**PERCENT PAYMENT**
92.5 - 97.0	100
91.5 - 92.4, 97.1 - 97.9	95
90.5 - 91.4, 98.0 - 98.9	90
89.5 - 90.4, 99.0 - 99.9	75
<89.5, > 99.9	0
Note: Percent compaction is the percentage of the field core density as compared to the Theoretical Maximum Density (TMD) of that core.	

AIR VOIDS – 2.5 – 5.5 PERCENT	
VOIDS	**PAYMENT PERCENT**
2.5 to 5.5	100
2.0 - 2.4, 5.6 - 6.1	95
1.5 – 1.9, 6.2 – 6.6	90
1.0 - 1.4, 6.7-7.1	75
<1.0, >7.1	0
Note: Voids are based on the average of the test specimens fabricated at the plant for each sublot (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 outside of the following ranges shall not be permitted

9.5 mm	5.7 – 7.5
12.5 mm	5.2 – 6.4
12.5mm(ARGG)	7.6 min.
19.0 mm	4.7 – 6.1

9.5 mm PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 5.7	95
JMF Aim + 0.6 , - 0.6 , < 5.6	85
JMF Aim + 0.7 , - 0.7 , < 5.5	75
JMF Aim + 0.8 , - 0.8 , ≦ 5.4, > 7.5	50
Note: PGAB content is based on samples tested at the plant for each 500 Ton sublot	

12.5 mm PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 5.1	95
JMF Aim + 0.6 , - 0.6 , < 5.0	85
JMF Aim + 0.7 , - 0.7 , < 4.9	75
JMF Aim + 0.8 , - 0.8 , ≦ 4.8, > 6.4	50
Note: PGAB content is based on samples tested at the plant for each 500 Ton sublot	

12.5 mm PGAB CONTENT(ARGG)	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5	95
JMF Aim + 0.6 , - 0.6	85
JMF Aim + 0.7 , - 0.7	75
JMF Aim + 0.8 , - 0.8	50
Note: PGAB content is based on samples tested at the plant for each 500 Ton sublot	

19.0 mm PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 4.6	95
JMF Aim + 0.6 , - 0.6 , < 4.5	85
JMF Aim + 0.7 , - 0.7 , < 4.4	75
JMF Aim + 0.8 , - 0.8 , ≦ 4.3, > 6.1	50
Note: PGAB content is based on samples tested at the plant for each 500 Ton sublot	

As an example of payment reduction, if a sublot of 500 tons was tested and found to have 96 percent TMD compaction, 5.8 percent air voids and asphalt content of 5.58 percent, the payment reduction would be as follows:

500 tons x 1.00	= 500 tons payment	=	0 tons reduction (compaction)
500 tons x 0.95	= 475 tons payment	=	25 tons reduction (voids)
500 tons x 0.95	= 475 tons payment	=	25 tons reduction (asphalt content)

Payment = 500 tons - (0 + 25 + 25) = 450 tons

401.22 Basis of Payment

The Authority will pay for the work, in place and accepted, in accordance with the applicable sections of this Section, for each type of HMA specified.

The Authority will pay for the work specified in Subsection 401.11, for the HMA used, except that cleaning objectionable material from the pavement and furnishing and applying bituminous material to joints and contact surfaces is incidental.

Payment for this work under the appropriate pay items shall be full compensation for all labor, equipment, materials, and incidentals necessary to meet all related Contract requirements, including design of the JMF, implementation of the QCP, obtaining core samples, transporting cores and samples, filling core holes, applying specified material to joints, and providing testing facilities and equipment.

SPECIAL PROVISION

SECTION 403

HOT BITUMINOUS PAVEMENT

403.01 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 320. The PG64E-28 Binder shall contain a minimum of 2.5% Styrene-Butadiene-Styrene (SBS) polymer {BWT} in a homogeneous blend. 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. The binder shall meet the requirements of AASHTO M 332 (including Appendix X1).

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.

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 403.2083 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 403.2083 Hot Mix Asphalt, 12.5 mm (Polymer Modified) – RAP.

The following pay items are added:

Pay Item		Pay Unit
403.2083	Hot Mix Asphalt, 12.5 mm (Polymer Modified) – RAP	Ton

SPECIAL PROVISION

SECTION 403

HOT BITUMINOUS PAVEMENTS

Desc. of Course	Grad. Design	Item Number	Bit Cont. % of Mix	Total Thick	No. Of Layers	Comp. Notes
			Route 202 Underpass Bridge			
Wearing	9.5 mm	403.210	N/A	1 1/4 in.	1	A, C, E, G, H & J
Base	9.5 mm	403.210	N/A	1 ¼ in.	1	A, C, E, G, H & J
			Ramps			
Wearing	12.5 mm	403.2083	5.2 min. to 6.4	1 ½ in.	1	A, B, C, D, E F, G, H, I
Base	12.5 mm	403.213	4.7 min to 6.10	2 in.	1	A, B, C, E F & G
Base	19 mm	403.207	4.7 min to 6.10	2 ½ in.	1	A, B, C, E F & G
Shim	4.75 mm	403.211	5.7 min to 7.50	½ in.	1	A, B, C, E, F, & G
			Route 202 and 26A			
Wearing	9.5 mm	403.210	5.2 min. to 6.4	1 ¼in.	1	A, B, C, E F, G, H
Base	12.5 mm	403.213	4.7 min to 6.10	2 ¼ in.	1	A, B, C, E F & G
Base	19 mm	403.207	4.7 min to 6.10	2 ½ in.	1	A, B, C, E F & G
Shim	4.75 mm	403.211	5.7 min to 7.50	½ in.	1	A, B, C, E, F, & G

COMPLEMENTARY NOTES

A. The required PGAB for Items 403.2083 will meet a **PG 64E-28** grading. Refer to provisions of 403.02 – General for HMA, for additional testing and documentation requirements. The required minimum PGAB for Items 403.207, 403.208, 403.210, 403.211, 403.213 shall be a **PG 64-28** grading.

B. A maximum of 15 percent RAP may be used in the Hot Mix Asphalt.

C. The MaineDOT will conduct the job mix verification. The aggregate qualities shall meet the design traffic level of 3 to < 10 million ESAL for mix placed under this Contract. The design, verification, Quality Control, and Acceptance tests for this mix will be performed at **75 gyrations**.

D. A material transfer vehicle (transfer box) shall be used for the placement of Hot Mix Asphalt, 12.5 mm Nominal Maximum size, wearing surface, on both the northbound and southbound roadways including acceleration and deceleration lanes and all ramps.

E. No vehicular traffic or 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.

F. Tack coat shall be applied to all milled pavement at a rate of 0.03 G/SY prior to placing the surface course.

G. Joints shall conform to Subsection 401.17.

H. Tack coat shall be applied to the pavement at a rate of 0.03G/SY prior to placing the surface course. Tack coat is required between all lifts of pavement, or as directed by the Resident.

I. Asphalt cement shall conform to the provisions of 403.02 – Polymer Modified PGAB for HMA.

J. An oscillating steel roller shall be used to compact all hot mix asphalts placed on bridge decks.

SPECIAL PROVISION

SECTION 409

BITUMINOUS TACK COAT

409.02 Bituminous Material

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

Bituminous material shall conform to the Specifications for Emulsified Asphalt RS-1, of the AASHTO Designation M-140.

409.05 Equipment

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

409.06 Preparation of Surface

The following paragraph is added:

All existing pavement and shoulder areas on which bituminous concrete mixtures are to be placed shall receive a tack coat. The surface area where the tack coat is to be applied shall be dry and cleaned of all dirt, sand, and loose material. Cleaning shall be accomplished by use of revolving brooms or mechanical sweepers. Undesirable material not removed by the above means shall be cleaned by hand-brooming or scraping, or a combination of both. Small areas otherwise inaccessible may be broomed 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, 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 409.15, Bituminous Tack Coat, Applied.

SPECIAL PROVISION

SECTION 419

SAWING AND SEALING JOINTS IN BITUMINOUS PAVEMENT

(Sawing Bituminous Pavement)

419.01 Description

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

419.02 General

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

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

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

419.03 Method of Measurement

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

419.04 Basis of Payment

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

Payment will be made under:

Pay Item		Pay Unit
419.30	Sawing Bituminous Pavement	Linear Foot

SPECIAL PROVISION

SECTION 501

FOUNDATION PILES

501.02 Materials

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

H-Beam piles shall be structural steel and shall meet the requirements of ASTM A572, Grade 50.

501.03 Equipment for Driving Piles

The last sentence of the fourth paragraph is amended as follows:

Also, the Contractor shall provide the Resident with a chart, calibrated within the 90 days prior to use of the actual hammer performance, equating bounce chamber pressure to either equivalent energy or stroke for the closed-end diesel hammer to be used.

The last sentence of the fifth paragraph is amended as follows:

In addition, the Contractor shall provide the Resident with a chart, calibrated within the 90 days prior to use, of the actual hammer performance.

The following is added at the end of this section:

501.04 Driving Procedures and Tolerances

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

Jetting - Jetting shall be done only with permission from the Resident. The Contractor shall submit a written Best Management Practices Plan on how soil and water pollution from the cleaning operation will be controlled with the request for permission to jet the piles.

The following is added to the end of this section:

Upon installation of 50% of the piles within the pile group for a single substructure unit, the Contractor shall measure the as-driven centroid of the piles, compare the location of the centroid to the theoretical centroid, and submit to the Resident for approval a proposed driving plan for the remainder of the piles.

501.11 Method of Measurement

c. Piles in Place - The third paragraph is deleted and replaced with the following:

Unused piles, or pile cutoffs 10 feet or more in length, will remain the property of the Authority and will be transported to a Turnpike Maintenance Facility as directed by the Resident. Hauling and unloading of piles will be done by the Contractor. The Resident will contact the Maintenance Foreman so that proper arrangements can be made for delivery.

The fifth and sixth paragraphs are deleted and not replaced.

e. Pile Splices – This paragraph is deleted and replaced with the following:

Pile splices will be measured by the actual number of splices authorized by the Resident and satisfactorily completed.

501.12 Basis of Payment

The following sentence is added:

Written Best Management Practices Plans and the installation and removal of BMPs for jetting and cleaning operations will not be measured separately for payment, but shall be incidental to the Contract pay item for Pile in Place.

Payment will be made under:

Pay Item	Pay Unit
501.54 Steel H-Beam Piles 117 lb/ft, delivered	Linear Foot
501.54 Steel H-Beam Piles 117 lb/ft, in place	Linear Foot

SPECIAL PROVISION

SECTION 502

STRUCTURAL CONCRETE

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

502.01 Description

This work shall consist of furnishing and placing Portland Cement Concrete for structures and incidental construction in accordance with these Specifications and in conformity with the lines, grades and dimensions shown on the Plans or established, or for placing concrete fill or underwater seals for foundations where called for on the Plans.

502.02 Classification

The Portland Cement Concrete shall be the class indicated on the Plans.

502.03 Materials

Materials shall meet the requirements specified in the following Subsections of Division 700, Materials:

Portland cement and Portland-pozzolan cement	701.01
Water	701.02
Air-Entraining Admixtures	701.03
Water Reducing Admixtures	701.04
High Range, Water Reducing, Admixture	701.0401
Set-retarding Admixtures	701.05
Curing Materials	701.06
Waterstops	701.07
Smoothed Surfaced Asphalt Roll Roofing (formerly heavy roofing felt)	701.08
Fly Ash	701.10
Calcium Nitrite Solution	701.11
Silica Fume	701.12
Ground Granulated Blast Furnace Slag	701.13
Fine Aggregate for Concrete	703.01
Coarse Aggregate for Concrete	703.02
Alkali Silica Reactive Aggregates	703.0201
Preformed Expansion Joint Filler	705.01
Bridge Drains	711.04
Non-Metallic Conduit	715.03
Anchor Bolts	720.07

In Subsection 701.10, Fly Ash, the “Loss on Ignition (LOI)” paragraph is deleted and replaced with the following:

Loss on Ignition (LOI) - Shall be 6.0 percent maximum per AASHTO T105 (ASTM C311) provided the Fly Ash has a documented history of not adversely effecting the concrete air content, otherwise the LOI shall be 3.0 percent maximum per AASHTO T105 (ASTM C311).

502.04 Shipping and Storage

Cement may be shipped in bags or in bulk from pre-tested and approved silos at the cement mill. The cement shall be completely protected from rain and moisture. Any cement damaged by moisture or which fails to meet any of the specified requirements shall be rejected and removed from the site. If requested by the Resident, cement stored for a period longer than 60 days shall be retested before being used in the work.

Bags of cement in shipment or storage shall not be piled more than eight (8) bags high. Bags of cement which for any reason have become partially set or which contain lumps of caked cement shall be rejected. Shipments of cement in bags shall be separately stored in a manner as to provide easy access for identification and inspection of each shipment.

Fly ash and slag shall be stored in weather tight silos approved by the Resident. All silos shall be completely empty and clean before material is deposited therein, unless the silo already contains material of the same type and properties.

Fly ash or slag remaining in bulk storage for a period greater than one (1) year after completion of tests will be resampled and retested by the supplier before shipment or use.

Handling, shipping and stockpiling of aggregates shall be done in such a way as to minimize segregation and breakage.

Fine aggregate and each size of coarse aggregate shall be stored in completely separate stockpiles on prepared bases constructed of the same material as that to be stockpiled, with a minimum thickness of 300 mm [1 foot]. The ground under the prepared bases shall be reasonably graded to drain away from the stockpile and shall be free of brush or other harmful vegetation. The base shall be left in place, undisturbed for the duration of the use of the stockpile. Prepared bases can be salvaged for reuse provided this material is reprocessed. Barge floors, wood, metal or other approved hard surfaces shall be considered acceptable alternates for the prepared bases described above.

502.041 Testing Equipment

The Contractor shall provide testing equipment and materials as specified below for use by the Resident or their representative exclusively. The equipment shall be available and acceptable to the Resident one (1) week prior to placing any concrete. All costs associated with providing and maintaining testing equipment shall be incidental to the work and no additional payment will be made.

The Resident will maintain the test equipment in reasonable condition. However, the Contractor shall replace any equipment that becomes unusable due to normal wear and tear or which is stolen or damaged from other than the Resident's neglect or mistreatment. All such replacement costs shall be incidental to the work and no additional payment will be made.

A. Pressure air meter meeting requirements of AASHTO T152 (Type B) and all accessory pay items required for use with the particular design of apparatus. This shall include one nine inch mason trowel, one metal scoop nine inches long *x* five inches wide, one tamping rod conforming to AASHTO T119, one rubber mallet as described in AASHTO T152, one strike off bar (flat straight bar of steel). The air meter shall be functional and shall bear a current calibration certificate issued by a recognized testing laboratory. Current shall mean within the calendar year.

B. Two pocket dial thermometers 0˚F to 200˚F, one inch diameter dial, five inch pointed stem, unbreakable poly carbonate crystal, stainless steel case, stem and bezel. Accuracy required is one percent over entire range.

C. "Contractors" rubber tired wheelbarrow.

D. Two D-handle square end shovels 9-1/2 inches wide.

E. Two pair heavy duty, long cuff, rubber gloves.

F. Miscellaneous equipment: 16 oz. plastic squeeze bottle, five gallon bucket, scrub brush, paper towels, folding rule, and rubber syringe.

G. Small rod – one tamping rod conforming to AASHTO T277.

H. Slump cone.

I. 10 foot straightedge as required by the Resident.

502.05 Composition and Proportioning

Concrete shall be composed of a homogenous mixture of Portland Cement, fly ash, or ground granulated blast furnace slag, fine aggregate, coarse aggregate, water and admixtures proportioned according to these Specifications and shall conform to the requirements of Table 1.

At least 45 days prior to placement of any concrete to be incorporated in the bridge or other concrete structure, the Contractor shall submit mix designs that meet the requirements of Table 1 along with the proposed sources of aggregates, cement, water and admixtures for each class of cement concrete specified. Sufficient material shall be obtained by the Authority's designated testing personnel at the proposed sources for verification of acceptability by test and for mix design. Materials failing to meet the specified requirements shall be rejected and new materials shall be resubmitted to the laboratory. The Authority's testing laboratory will determine the proportions of cement, aggregate, water, air entraining agents, and other admixtures of all specified and proposed concrete mixtures by means of trial design batches and tests using the consistencies, air content and other properties suitable for the work and in accordance with the latest applicable AASHTO or ASTM Standards and designations.

TABLE 1
MASTER LIMITS TABLE

Class of Concrete	Minimum Compressive Strength at 28 Days	Minimum Cementitious Content	Water Cement Ratio	Slump	Air Content	Maximum Coarse Aggregate Size (703.02)	Notes
	PSI	LB/CY		INCHES	%	INCHES	
A	4000	611	0.38±0.02	6 ± 2	6 ± 1	1	3, 4
AA	4000	658	0.38±0.02	3.5	5 to 7	3/4	1, 3
AAA	4500	658	0.38±0.02	6 ± 2	6 ± 1	3/4	3, 4, 6
AAA-Deck	4500	658	0.42±0.02	6 ± 2	7.5 ± 1	3/4	3, 4, 6
AAA - Modified	4500	752	0.38±0.02	6 ± 2	6 ± 1.5	3/8	3,4
B	3000	517	0.40±0.02	6 ± 2	5 ± 1	1-1/2	1, 3
S	3500	635	0.38±0.02	6 ± 2	6 ± 1	1-1/2	1, 3
P	SEE PLANS	658	0.38±0.02	6 ± 2	5 ± 1	3/4	3, 4, 5
IS	3000	470	0.58	5 ± 1	3.0% Max	1-1/2	2, 3

NOTES:

1. All concrete shall contain either a normal water reducing admixture (Type A) or a high range water reducing admixture (HRWR) meeting the requirements of Subsection 701.0401. When a HRWR is used, a maximum of an 8.0 inch slump is allowed.

2. All concrete shall contain a non-chloride based, mid-range water reducing admixture (MRWR) meeting the requirements of ASTM C494.

3. All concrete shall contain a Portland Cement replacement. Portland Cement pre-blended with either fly ash or ground granulated blast-furnace slag may be used when accepted by the Resident.

   Due to the lower heat of hydration effect of high cement replacements, the Contractor is responsible for selecting a replacement level which is appropriate for the time of year if cold weather conditions are anticipated.

4. All concrete shall contain a high range water reducing admixture (HRWR) meeting the requirements of Subsection 701.0401. A minimum of one-half the design dosage of the HRWR should be added at the plant to insure thorough mixing. The HRWR should be added in strict accordance with the manufacturer's guidelines and limitations. The HRWR Guidelines shall be submitted to the Resident for review and approval. The concrete will not be slump tested by the Authority prior to the addition of the HRWR. The supplier shall provide the aggregate moisture adjustment and plant-added water on the delivery tickets.

If additional slump is required in the field, it will be achieved with additional HRWR (in accordance with the manufacturer's recommendations and limitations).

5. A calcium nitrate corrosion inhibitor meeting the requirements of ASTM 494 Type C shall be added at a rate of not less than four (4.0) gallons per cubic yard.

6. Synthetic Fiber Reinforcement shall be added to all Concrete Pavement Slabs concrete mixes in accordance with Special Provision 503 “Synthetic Fiber Reinforcement”.

Deck concrete (Class AAA - Deck) may gain strength slower than other Authority mix designs, and the Contractor shall plan construction operations accordingly.

The mix design submitted by the Contractor shall include the following information:

A. Description of individual coarse aggregate stockpiles, original source, bulk specific gravity, absorption, gradation and alkali silica reactivity test results. A combined coarse aggregate blended gradation shall be provided.

B. Description of fine aggregate, original source, bulk specific gravity, absorption, colorimetric, gradation and Fineness Modulus (F.M.).

C. Description and amount of cement and cement replacement material.

D. Target water cement ratio.

E. Target water content by volume.

F. Target strength.

G. Target air content, slump, and concrete temperature.

H. Target concrete unit weight.

I. Type and dosages of air entraining and chemical admixtures.

Approval by the Authority will be contingent upon the ability of the mix design proportions to meet the concrete strength requirement and other factors that affect durability. Cement replacements are included in the cementitious material.

Concrete mix designs shall contain 15 to 30 percent fly ash replacement by weight, or 25 to 50 percent slag cement replacement by weight. Class AAA-Deck concrete mix designs shall contain a maximum of 30 percent slag cement replacement by weight.

Cast-in-place concrete shall contain not more than 660 lb/cy of cementitious material, except for Class AAA-Modified which shall contain no more than 760 lb/cy of cementitious material.

All concrete mixes must be designed in accordance with the criteria of this Section. The design proportions with the fine aggregates designated as a percent of the total aggregate must be

stated in terms of aggregate in a saturated, surface dry condition and the batch weights will be adjusted by the Contractor for the actual moisture of the aggregate at the time of use.

Based on the design parameters, including minimum cement factor and maximum water cement ratio, a curve representing the relation between the water/cement ratio and the average seven day and 28 day compressive, or earlier strength at which the concrete is to receive its full working load, will be established by the Authority's laboratory for a range of values including all of the compressive strengths required. The curves shall be established by at least three points, each point representing average values from at least three test specimens. Amount of water used in the concrete, as determined from the curve, shall correspond to the required average strength called for in the Specifications in accordance with the ACI 301-89, Table for Laboratory Mix Design Data – Required Average Compressive Strength shown below. When required, the consistency of the basic mix selected shall be adjusted by the use of high range water reducers.

LABORATORY MIX DESIGN DATA
REQUIRED AVERAGE COMPRESSIVE STRENGTH

SPECIFIED f'_c	REQUIRED f'_{cr}
LESS THAN 3000 PSI	f'_c + 1,000 PSI
3000 PSI TO 5000 PSI	f'_c + 1,200 PSI
OVER 5000 PSI	f'_c + 1,400 PSI
The curves shall be established by at least three (3) points, each point representing the average values from at least three (3) test specimens for each age of seven (7) and twenty-eight (28) days. Laboratory tests are valid for ninety (90) days.	

The laboratory adjusted mix design will then be forwarded to the Contractor for his use. No change in the source or character of the mix ingredients may be made without notice to the Resident, and no new mix ingredients shall be used until the Resident has approved such ingredients and new mix proportions, if they change. Additional testing, if required, shall be paid for by the Contractor.

502.0501 Quality Control

The Contactor shall control the quality of the concrete through testing, inspection and quality control practices which shall be sufficient to assure a product meeting the Contract requirements.

Concrete sampling for quality control (QC) shall be taken at the discharge point with pumped concrete sampling taken at the discharge end of the pump line.

For each truckload of concrete, the Contractor shall provide a Certificate of Compliance to the Authority at the time of the load placement. The Certificate of Compliance shall be a form acceptable to the Authority and shall include the following:

- Contract Name & Number
- Bridge Name (if applicable)

- Manufacturing Plant (Batching Facility)
- Name of Contractor (Prime Contractor)
- Date
- Time Batched/Time Discharged
- Truck No.
- Quantity (Quantity Batched this Load)
- Type of Concrete by Class and Producer Design Mix No.
- Cement Brand or Type, and Shipment Certification No.
- Temperature of Concrete at Discharge
- Target Weights per Cubic Yard and Actual Batched Weights for:

    1. Cement
    2. Pozzolanic additives, including fly ash, slag cement, and microsilica
    3. Coarse concrete aggregate
    4. Fine concrete aggregate
    5. Water (including free moisture in aggregates and water added at the Project)
    6. Admixtures brand and quantity (fl. oz./cubic yard)

        - Air-entraining admixture
        - Water reducing admixture
        - Other admixtures

- Placement Location

502.0502 Quality Assurance

The Authority will determine the acceptability of the concrete through a quality assurance program and field measurement of surface tolerance, alignment and trueness, plumb and batter, and finish.

The Authority will take verification tests at times deemed appropriate by the Resident. Verification tests will include compressive strength, air content and permeability.

Concrete sampling for verification tests will be taken at the discharge point, with pumped concrete sampling taken at the discharge end of the pump line.

Compressive strength test will be completed by the Authority in accordance with AASHTO T22 at 28 days except that no slump will be taken. The average of two cylinders will be used to determine compressive strength.

Testing for entrained air in concrete, at the rate of one test per load, shall be in accordance with AASHTO T152.

Determination of the concrete cover over reinforcing steel for structural concrete shall be made prior to concrete being placed in the forms. Bar supports, chairs, slab bolsters, and side form spacers shall meet the requirements of CRSI Chapter 3, Section 2.5 Class 1, Section 2.6 Class 1A or Section 4. All supports shall meet the requirements for type and spacing as stated in the Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, Chapter 3. Concrete will not be placed until the placing of the reinforcing steel and supports have been approved by

the Resident. If the Contractor fails to secure Authority approval prior to placement, the Contractor's failure shall be cause for removal and replacement at the Contractor's expense. The Contractor shall notify the Resident, at least 48-hours prior to the placement, when the reinforcing steel will be ready for checking. Sufficient time must be allowed for the checking process and any needed repairs.

Rejection by Resident - For material not meeting Project Specifications, the Authority at its sole discretion will:

A. Require the Contractor to remove and replace the entire affected placement with concrete meeting the Contract requirements at no additional expense to the Authority; or,

B. Accept the material at a reduced payment as determined by the Authority.

Surface Tolerance, Alignment and Trueness, Plumb and Batter, and Finish - The Resident will measure each of these properties as follows:

A. Surface Tolerance - Exposed horizontal and sloping portions of the substructure, superstructure slabs, wearing surface, sidewalks, parapets, barriers, and wingwalls will be measured at randomly generated locations with a 10 foot straightedge once per 100 ft^2. Measurements beyond tolerances given in Table 5, Subsection 502.14(E) will be cause for removal or pay adjustment and potential corrective action as determined by the Resident. The Contractor shall furnish the 10 foot straightedge. At the Resident's discretion, measurements may be taken with a lightweight profiler. When the Resident uses the lightweight profiler to measure tolerance, and the International Ride Index (IRI) is between 250 and 300 inches/mile for any one placement, a pay adjustment will be made. When tolerances exceed 300 inches/mile, there will be cause for removal or a pay adjustment and potential corrective action.

B. Alignment and Trueness - Alignment and trueness may be measured by the Resident longitudinally along any vertical surface of any portion of the structure and shall not exceed a deviation of 1/4 inch in three feet for structures up to 30 feet in length. Structures in excess of 30 feet in length will be subject to a maximum tolerance of two inches. Measurements exceeding these tolerances will be cause for removal or pay adjustment and potential corrective action as determined by the Resident.

C. Plumb and Batter - The Resident will measure all columns and other vertical surfaces that will remain exposed to determine actual plumbness and batter. Measurements will be taken subsequent to every placement. Vertical faces of columns will be measured at a minimum of two faces at right angles to each other. Other vertical surfaces will be measured once every 15 feet along the face of longitudinal wall. All measurements will be made on a per placement basis and will be subject to a tolerance of 1/4 inch in 10 feet. Measurements between 1/4 inch and 1/2 inch in 10 feet will result in pay adjustments. Measurements beyond 1/2 inch in 10 feet will be cause for removal or pay adjustment and potential corrective action as determined by the Resident.

D. Finish - The Resident will measure and determine the areas to be repaired in accordance with Subsections 502.10(d), 502.13, and 502.14(e) for each placement. Areas to be repaired will be measured as a percentage of the total surface area of the placement. Those areas to be repaired that are between zero and five percent of the total surface area of the placement will

result in no pay adjustments. Areas to be repaired that are between five percent and 10 percent will result in pay adjustments. Areas greater than 10 percent of the total surface area of the placement will be cause for removal or pay adjustment and corrective action as determined by the Resident.

Appropriate pay adjustments, as described in Subsection 502.194, will be made for any or all of the properties described above that do not meet Specification requirements.

502.0505 Resolution of Disputed Acceptance Test Results

The Contractor shall work cooperatively with the Resident in maintaining Control Charts in order to identify potential issues with any test results and take appropriate actions to address these issues before they become disputed issues. Circumstances may arise where the Authority's test results indicate that a material is unacceptable and removal is warranted. If the material is marginally acceptable, it may remain in place and be paid for at a reduced rate determined by the Authority. This Subsection provides recourse for the Contractor to contest the Authority's QA test results as follows, at no additional cost to the Authority:

A. Compressive Strength - The Contractor shall take appropriate corrective measures when the Resident advises the Contractor that the average of three consecutive compressive strength test results fall to less than 150 psi above the specified strength, or any single test falls more than 200 psi below the specified strength. The Contractor shall make corrective changes in materials, mix proportions, or in the concrete manufacturing procedure before additional concrete of the same class is placed.

There may be situations where there is the possibility that an underlying structural element could be built-upon before test results for the underlying element have been reported, based upon the normal frequency of testing. In these instances, it is in the Contractor's best interest to perform additional testing that will provide indications that the concrete will meet the requirements of the applicable Specifications, prior to continuing to build upon this underlying element. In the extreme case where an underlying structural element has been built-upon before test results for the underlying element have been reported, the above mentioned safeguards of tracking and additional testing have failed and the final test results for the concrete of the underlying element indicate that removal is warranted and the Contractor's QC results do not confirm the Authority's test results, the following procedure concerning compressive strength may be undertaken by the Contractor and witnessed by the Authority, within 36 days of the placement date:

1. Drilled core specimens shall be retrieved from the concrete in question in accordance with the requirements of ASTM C42/C42M, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete. The core strength acceptance and evaluation criteria included in ACI 318 shall not apply.

2. Three drilled core specimens shall be taken from each sublot in question, from randomly selected locations to be representative to the entire volume of the sublot. The Resident and the Contractor's representative shall agree on the sample locations prior to drilling. The specimens shall have a minimum diameter of four inches and a minimum length of eight inches.

3. The concrete cores shall be taken directly from the Project to the Authority's designated independent testing laboratory where they will be tested. The cores shall

be protected from drying and damage during transport. The Contractor shall make arrangements with the Authority's designated independent testing laboratory for testing prior to beginning the coring process.

4. Core test results will be evaluated by the Authority with the understanding that the strength of drilled cores is, in general, 85 percent of that of corresponding standard-cured molded cylinders. Therefore, the test results of the three cored cylinders shall be averaged, and then divided by a factor of 0.85. The resulting compressive strength shall be used by the Authority in the final determination of the acceptability of the material in question and shall replace the contested test result in computing pay adjustments for the sublot in question. If coring is not done with the 36 day time limit, the Authority will not allow dispute testing of the sublot.

5. If the Authority concludes that the strength of the structural element in question is adequate as a result of the above procedure, then the concrete shall remain in place and will be paid for at a reduced rate, as determined by the Authority. If the Authority concludes that the strength of the structural element in question is unsatisfactory as a result of the above procedure, then the Authority will direct the Contractor to take appropriate actions, as determined by the Authority, and at no additional cost to the Authority.

B. Entrained Air – In order to dispute the Authority's test results, the Contractor must test material from the same sample as the Authority. If the difference between the Authority's and the Contractor's air tests is equal to or greater than 0.8 percent, then the material shall be retested by both parties. If the difference between the retests is equal to or greater than 0.8 percent, the concrete placement will be suspended immediately, and 1) both air meters shall be calibrated immediately, or 2) the Contractor shall immediately replace both air meters. Once it is demonstrated the QC and Acceptance air meters are in agreement with 0.8 percent, the concrete placement may resume.

502.06 Batching

Measuring and batching shall be performed at an approved batching plant, unless otherwise approved by the Resident. The batching plant shall meet the requirements of AASHTO M-157.

502.0701 Delivery

A. Delivery and discharge of the concrete from the mixer shall be completed within a maximum of 1-1/2-hours from the time the cement is added to the aggregate, except that in hot weather when the concrete mix temperature exceeds 70˚F or under other conditions contributing to quick stiffening of the concrete, delivery and discharge from the mixer shall be completed within one hour. When approved by the Resident, the use of a retarding admixture (Type D) may be used for increasing the one hour discharge time to 1-1/2-hours, provided concrete temperatures are kept below 80˚F and conditions contributing to quick stiffening of the concrete are not present.

B. Concrete, which has been condemned for any reason, shall be removed immediately from the jobsite and disposed of properly.

C. Concrete temperature before placement shall not exceed 85˚F.

D. All concrete trucks must have working revolution counters, and be set to zero at the start of mixing. Any truck without a counter will be rejected from the job unless the Contractor can assure the Resident that adequate mixing has been achieved.

502.08 Cold Weather Concrete

All frost, ice, and snow shall be removed from all material that will be in contact with fresh concrete.

Unless authorized by the Resident, the mixing and placing of concrete shall be discontinued when the atmospheric temperature is below 40˚F in the shade and dropping and shall not be resumed until the atmospheric temperature is as high as 35˚F in the shade and rising. If authorization is granted for the mixing and placing of concrete under atmospheric conditions different from those specified above, the water shall be heated to a temperature not exceeding 180˚F. When either the aggregate or water is heated to above 120˚F, they are to be combined first in the mixer before the cement is added. If the atmospheric temperature is below 25˚F, the aggregate shall also be heated when approved by the Resident. Materials containing frost or lumps of frozen material shall not be used. Stockpiled aggregates may be heated by the use of dry heat or steam. Aggregates shall not be heated directly by gas or oil flame or on sheet metal over a fire. When aggregates are heated in bins, steam coil or water coil heating or other methods that will not be detrimental to the aggregates may be used. The heating apparatus shall be capable of heating the mass uniformly and preventing the occurrence of spots of overheated material. The temperature of the mixed concrete shall be between the minimum values shown in Table 4 and 70˚F when it is placed in the forms. Salt or other chemicals shall not be added to the concrete for any reason whatsoever, except by written permission of the Resident.

TABLE 4
COLD WEATHER TEMPERATURE TABLE

MINIMUM FORM DIMENSION SIZE

Less than 300 mm (12 in.)	300 – 900 mm (12 - 36 in.)	900 – 1800 mm (36 - 72 in.)	Greater than 1800 mm (72 in.)
13˚C (55˚F)	10˚C (50˚F)	7˚C (45˚F)	5˚C (40˚F)
MINIMUM CONCRETE TEMPERATURE AS PLACED			

When permitted by the Resident, footings may be protected by completely submerging them by admitting water inside the cofferdam. Until submersion takes place, the temperature of the concrete and its surface shall be controlled as specified above. Submersion shall proceed slowly and the temperature of the air or water shall be maintained sufficient to prevent ice from forming within the cofferdam for a period of seven (7) days after the placing of the concrete.

When depositing concrete under water, there shall be no ice inside the cofferdam.

Permission given to place concrete under the conditions mentioned above shall not relieve the Contractor of responsibility for obtaining satisfactory results. The Contractor shall be wholly responsible for the protection of concrete during cold weather operations and any concrete injured by frost action or overheating shall be removed and replaced at the Contractor's expense.

502.10 Forms and False Work

A. Construction of Forms - All forms shall be well built, substantial and unyielding, securely braced, strutted and tied to present motion and distortion while concrete is being placed in them. The forms shall be strong enough to safely support the weight of the concrete and all superimposed loads (such as runways, concrete buggy loads, workers, scaffolding, etc.) placed upon them.

Forms shall be built to conform to the dimensions, location, contours and details shown on the Plans. The faces of forms against which the concrete is to be placed shall be dressed smooth and uniform and shall be free from winds, twists, buckles and other irregularities.

Stay-in-place forms of any type will not be permitted for any part of the slab structures, unless otherwise indicated on the Plans.

The placing of concrete in excavated pits and trenches without forms will be permitted only in exceptional cases and then at the discretion of the Resident.

All corners within the forms shall be fitted with chamfer strips mitered at their intersections, except that chamfer strips will not be required as follows: (1) on corners of slab blocking of interior steel beams and the inside of exterior steel beams; (2) on corners constructed transversely at the underside of the slab of superstructures which consist of a concrete slab on steel beams; (3) on footings not exposed to view; and (4) on all structures when more than two feet below the final finished ground line.

Chamfer strips shall have a width across the diagonal face between 1/2 inch and 3/4 inch. The size to be adopted for a given portion of the work shall depend upon the general dimensions. Except where special size chamfer strips are shown on the Plans, the size of chamfer strips shall be uniform on individual projects. Provisions shall be made for the chamfering of the top edges of abutment bridge seats and wing walls, tops of piers and retaining walls, tops of through girders, roadway curbs, etc., by nailing chamfer strips inside the forms. Unless otherwise provided, all chamfer strips shall produce plain flat surfaces on the concrete.

The forms for beams, girders and spandrel arches shall be so constructed as to permit the sides to be removed without disturbing the supports.

All foreign matter within the forms shall be removed before depositing concrete in them.

In all cases where metal anchorages or ties within or through the face forms are required to hold the forms in their correct position, such anchorages or ties shall be of ample strength and shall be constructed so that the metal work can be removed to a depth of not less than one inch from the face and back surfaces of the concrete without damaging such surfaces.

Elevations will be taken on the top flanges of structural steel beams and girders for the purpose of determining the depth of blocking necessary for the construction of the forms for the concrete slab, after the following conditions have been satisfied:

1. The satisfactory erection of the superstructure structural steel beams or girders, including any required flooring beams and stringers, unless an alternative plan is submitted by the Contractor and approved by the Authority.

2. All bolt tightening operations must be complete.

3. No foreign loads supported by the beams or girders are present.

The Contractor shall submit working drawings for approval of the proposed forms supporting the superstructure slabs, and of the proposed forms and false work supporting the overhanging portion of the superstructure slab in accordance with Subsection 105.7. The working drawings shall show the size, spacing and location of the supporting members, and the proposed loads and weight of the concrete forms to be carried by the members. The proposed superstructure slab form and false work systems' computations, plans, and working drawings shall be designed and sealed by the Contractor's Professional Engineer, who must be registered in the State of Maine. This Professional Engineer may be directly employed or otherwise retained by the Contractor.

In the construction of forms and false work for the portion of superstructure slabs overhanging the exterior members of beam and girder spans, forms and supporting devices resulting in point loadings on the exterior members shall not be used. Loads resulting from supporting devices shall be distributed directly to the flanges by means of brackets or braces.

All forms shall be inspected and approved by the Professional Engineer responsible for the design of the form and false work systems before the placing of any concrete within them. The Professional Engineer shall, after inspection, provide a sealed certification to the Resident that the systems were erected in conformance with the Professional Engineer's Plans and design details.

B. Surface Treatment of Forms - The inside surfaces of forms shall be uniformly coated with form oil or other approved surface treatment.

Form surfaces shall be treated before placing the reinforcing steel.

C. Construction of False Work - All false work used for supporting reinforced concrete superstructures shall be composed of members having ample structural sections to resist all loads imposed upon them, with deformations less than span length / 360.

When the vertical members of false work consist of piles or when framed or other false work is supported upon piles, the piles shall be driven to secure a safe load resistance.

When false work is supported upon mud sills, the foundation pressures resulting from the imposed loads upon the mud sills (false work, forms, fresh concrete, scaffolding, etc.) shall not exceed the capacity of the on-site soils.

All false work systems shall be designed to support all vertical loading and any differential settlement forces, all horizontal and longitudinal forces, and shall account for any temporary unbalanced loading due to the placement sequence of the concrete. Sufficient redundancy shall be designed into centering or false work systems so that the failure of any member shall not cause a collapse. Design computations, layout drawings, and details of materials for the centering or false work systems shall be submitted to the Authority for its records. The erection of centering or false work systems shall be accomplished in strict conformance with the design and details. No concrete shall be placed without prior approval of the Resident.

False work systems adjacent to and/or over traveled ways shall additionally be designed to resist any vibration forces due to traffic and shall incorporate sufficient protection against impact by errant vehicles.

All false work system computations, plans and working drawings shall be designed and sealed by the Contractor's Professional Engineer, who must be registered in the State of Maine. This Professional Engineer may be directly employed or otherwise retained, by the Contractor. Prior to concrete placement, the Professional Engineer responsible for the design of the false work system shall, after false work inspection, provide a sealed certification to the Resident that the system was erected in conformance with the Professional Engineer's Plans and design details.

False work shall be so constructed that the forms will have a camber, the amount depending upon the deflection anticipated in the design.

Forms supported upon false work shall be provided with a satisfactory means for their adjustment in the event of settlement or deformation of the false work due to overloading or other causes.

Provisions shall be made for the gradual lowering of false work and rendering the supported structure self-supporting.

D. Removal of Forms and False Work

1. Location, weather conditions, cementitious materials used and the character of the structure involved shall be considered in determining the time for the removal of forms and false work. Forms and false work shall not be removed until concrete cylinders cured with the structure establish that the concrete has developed 80 percent of design strength. The Contractor shall cast and break two cylinders per sublot and furnish the Resident with these test reports before removal of the forms and false work.

   When approved by the Resident, the vertical forms of footings, walls, columns and sides of beams and slabs may be removed 48-hours after completion of placement of concrete, exclusive of the time the ambient air temperature is below 45˚F and provided the following conditions are met:

   Immediately after the forms are removed, defects in the concrete surface shall be repaired in accordance with Subsection 502.13 and the repaired area thoroughly dampened with water. The surfaces of exposed concrete shall be cured for the remainder of the seven day curing period by the application of a product listed on the Maine Department of Transportation Prequalified list of curing compounds. The curing compound shall be applied continuously by an approved pressure spraying or distributing equipment at a rate necessary to obtain an even, continuous membrane, meeting the manufacturer's recommendation but at a rate of not less than 1 gal/200 ft^2 of surface. Other methods of curing concrete may be used with the prior approval of the Resident.

2. Forms and false work, including blocks and bracing, shall not be removed without the consent of the Resident. The Resident's consent shall not relieve the Contractor of responsibility for the safety of the work. In no case shall any portion of the wood forms be left in the concrete. As the forms are removed, all projecting metal devices that have been used for holding the forms in place shall be removed in accordance with Subsection 502.10. The holes shall be filled as required in Subsection 502.13.

502.11 Placing Concrete

A. General – Concrete shall not be placed until forms and reinforcing steel have been checked and approved by the Resident. The forms shall be clean of all debris. The method and sequence of placing the concrete shall be approved before any concrete is placed.

All concrete shall be placed before it has taken its initial set and, in any case, as specified in Subsection 502.0701. Concrete shall be placed in horizontal layers in such a manner as to avoid separation and segregation. A sufficient number of workers for the proper handling, tamping and operation of vibrators shall be provided to compact each layer before the succeeding layer is placed and to prevent the formation of cold joints between layers. Care shall be taken to prevent mortar from spattering on structural steel, reinforcing steel and forms. Any concrete or mortar that becomes dried on the structural steel, reinforcing steel or forms shall be thoroughly cleaned off before the final covering with concrete. Following the placing of the concrete, all exposed surfaces shall be thoroughly cleaned as required, with care not to injure any surfaces.

Concrete shall not come in direct contact with seawater during placing and for a period of 72- hours thereafter, except as follows:

1. Concrete seals that are located entirely below low tide.

2. Concrete footings constructed in the dry and located entirely below low tide or final ground elevation.

3. Concrete Fill placed under water.

Concrete in any section of a structure shall be placed in approximately horizontal layers of such thickness that the entire surface shall be covered by a succeeding layer before the underlying layer has taken its initial set. Layers shall not exceed 18 inches in thickness and be compacted to become an integral part of the layer below. Should the placement be unavoidably delayed long enough to allow the underlying layer to take initial set or produce a so-called "cold joint", the following steps shall be taken:

- An incomplete horizontal layer shall be bulk headed-off to produce a vertical joint.

- Horizontal joints shall be treated as required in this Subsection 502.11(F).

- Portland Cement concrete with a high range, water reducing admixture shall not be placed when the concrete mix temperature is below 40˚F or above 85˚F.

The concrete in superstructures shall be placed monolithically except when construction joints are shown on the Plans or are authorized in accordance with approved details submitted by the Contractor. If the concrete in the stems of T-beams is to be placed independent of the slab section, the construction joint shall be located at the underside of the slab and the bond between stem and slab shall be a mechanical one. The bond shall be produced by embedding two *x* four, four inch wooden blocks having a length approximately four inches less than the width of the stem and placed horizontally at right angles to the centerline of the beam in the top surface of the concrete immediately following the completion of the concrete placement. To provide for the uniform spacing of the blocks and their ready removal when the concrete has taken a set sufficient to hold its form, the blocks shall be firmly nailed upon a board at a distance of one foot center to center. The blocks shall be thoroughly oiled to facilitate their ready removal from the concrete.

In arch spans, the order of construction or sequence of the work, as shown on the Plans shall be followed in the placing of concrete.

In no case shall the work on any section or layer be stopped or temporarily discontinued within 18 inches below the top of any face, unless the Plans provide for a coping having a thickness less than 18 inches in which case, at the option of the Resident, the construction joint may be made at the underside of the coping. Concrete in columns shall be placed in one continuous operation, unless otherwise directed.

Fresh concrete, threatened with rain damage shall be protected by approved means. Sufficient material for covering the work expected to be done in one day shall be on hand at all times for emergency use. The covering shall be supported above the surface of the concrete.

Concrete Fill shall be placed at least to the pay limits shown on the Plans. Forms may be omitted at the Contractor's option. Vibration of concrete will not be required. The Contractor has the option of placing concrete fill under water or in the dry.

B. Chutes, Troughs, Pipes and Buckets - Sectional drop chutes or short chutes, troughs, pipes and buckets when used as aids in placing concrete, shall be arranged and used in such a manner that the ingredients of the concrete do not become separated or segregated. Wood and aluminum chutes, troughs, pipes or buckets shall not be used.

Dropping the concrete a distance of more than six feet, unless confined by closed chutes or pipe will not be permitted. The concrete shall be deposited at or as near as possible to its final position.

C. Vibrating - Mechanical, high frequency internal vibrators shall be used, operating within the concrete, for compacting the concrete in all structures and precast and cast-in-place piles, with the exception of concrete placed under water. The vibrators shall be an approved type with a frequency of 5,000 to 10,000 cycles per minute and shall be visibly capable of properly consolidating the designed mixture. A spare vibrator shall be available on the Project at all times during the placing of concrete.

Sufficient vibrators shall be used to consolidate the incoming concrete within five (5) minutes after placing. Vibrators shall neither be held against forms or reinforcing steel, nor shall they be used for flowing the concrete or spreading it into place. Over-vibrating shall not be allowed.

D. Dewatering Forms - All forms shall be dewatered before concrete is placed in them. Pumping will not be permitted from the inside of forms while concrete is being placed. Moving water shall not be permitted to be exposed to fresh concrete.

E. Depositing Concrete Under Water - No concrete shall be deposited under water except for cofferdam seals. Pumping will not be allowed within the cofferdam while concrete is being placed.

Seal concrete shall be placed carefully in a compact mass in its final position by means of a tremie or by other approved means and shall not be disturbed after being deposited. Bottom dump buckets will not be permitted. Special care must be exercised to maintain still water at the point of deposit. Seal concrete shall not be placed in running water. The method of depositing concrete shall be so regulated as to produce approximate horizontal surfaces. Each seal shall be placed in one continuous operation.

When a tremie is used, it shall consist of a tube not less than 10 inches in diameter. The means of supporting the tremie shall be such as to permit free movement of the discharge end over the entire seal and to permit its being lowered rapidly, when necessary to choke-off or retard flow. The tremie shall be filled by a method that will prevent washing of the concrete. The discharge end shall be completely submerged in concrete at all times and the tremie tube shall be kept full to the bottom of the hopper. The flow shall be regulated by raising or lowering the tremie.

When the horizontal area of the tremie seal is large, several tremie hoppers shall be provided and positioned strategically to allow easy deposit of concrete near the point where it is

needed to avoid moving concrete horizontally through the water. The number of tremie hoppers and the work plan shall be approved by the Resident.

All laitance or other unsatisfactory material shall be removed from the surface of the seal before placing additional concrete. The surface shall be cleaned by scraping, chipping or other means that will not injure the concrete.

The placing and dewatering of seal concrete within cofferdams shall be in accordance with Section 511, Cofferdams.

F. Construction Joints - Construction joints shall be located where shown on the Plans or permitted by the Resident. When the concrete is in seawater, except concrete cores for stone masonry, no horizontal construction joint will be permitted between extreme low tide and extreme high tide elevations.

At horizontal construction joints, temporary gage strips having a minimum thickness of 1-1/2 inches shall be placed horizontally inside the forms along all exposed faces to give the joints straight lines. The joint shall be so constructed that the surface of the concrete will not be less than 1/4 inch above the bottom of the gage strip. Before placing fresh concrete, the temporary gage strip shall be removed, the surfaces of construction joints shall be thoroughly cleaned, drenched with water until saturated and kept saturated until the new concrete is placed. Immediately prior to placing new concrete, the forms shall be drawn tight against the concrete already in place. Concrete in substructures shall be placed in such a manner that all horizontal joints will be horizontal and if possible, in locations such that they will not be exposed to view in the finished structure.

Where vertical construction joints are necessary, reinforcing bars shall extend across the joint in such a manner as to make the structure monolithic. Construction joints through paneled wing walls or other large surfaces which are to be treated architecturally will not be allowed except as shown on the Plans. All vertical construction joints in abutments and retaining walls shall contain water stops as shown on the Plans. The water stops shall be one continuous piece at each location.

All horizontal construction joints in abutments and retaining walls shall be constructed using a joint cover, as shown on the Plans.

Construction joints in the wearing surface shall be located where called for on the Plans. No other construction joints will be allowed.

All joints shall be formed in the manner detailed on the Plans. The forms shall not be treated with oil or any other bond breaking material that will adhere to the concrete.

Sealing slots shall be provided at all joints in the wearing surface that are located directly over a slab construction joint.

Construction joints in the wearing surface not receiving a sealing slot shall be brushed with a neat cement paste immediately prior to making the adjacent concrete placement.

After the concrete has been cured, sealing slots, when required, shall be sandblasted with approved equipment to remove all laitance and foreign material on the surfaces of the slots. The

bottom of the sealing slots shall receive an approved bond breaker. The joint shall then be filled within 1/8 inch of the surface with a poured sealant conforming to the following requirements and in accordance with the manufacturer's recommendations. The joint sealant supplied shall be an approved two component, elastomeric sealant capable of 50 percent joint movement. Both components shall be in liquid form and the combining ratio of components by volume shall be as recommended by the manufacturer.

G. Concrete Wearing Surface and Structural Concrete Slabs on Precast Superstructures When called for on the Plans, a separate concrete wearing surface or structural concrete slabs on precast superstructures shall be bonded to the supporting slab. No surface preparation of a new structural concrete slab shall begin before completion of the specified curing period.

When the supporting slab is composed of cast-in-place concrete, the Contractor shall scabble the entire surface of the structural concrete slab and then sandblast the entire structural concrete slab surface. When the supporting slab is comprised of precast units, the Contractor shall sandblast the entire deck surface.

The entire area of the deck surface and the faces of curb and barrier walls or other median devices, up to a height of one inch above the top elevation of the wearing surface or slab, shall be cleaned to a bright, clean appearance which is free from curing compound, laitance, dust, dirt, oil, grease, bituminous material, paint and all other foreign matter. Air lines shall be equipped with effective oil traps. The cleaning of an area of the deck shall be performed within the 24-hour period preceding placement of the wearing surface. The cleaning shall be performed by dry sand blasting or other methods approved by the Resident. All debris from the cleaning operation shall be thoroughly removed by compressed dry air from the cleaned surfaces and adjacent areas. The cleaned areas shall be protected against contamination before placement of the wearing surface. Contaminated areas shall be recleaned by dry sand blasting. Prepared, areas that have not received the wearing surface within 36-hours shall be recleaned.

All horizontal surfaces in contact with the wearing surface shall receive a coating of bonding grout or bonding agent listed on Maine Department of Transportation Prequalified List of Bonding Agents. The vertical faces in contact with the wearing surface shall be broomed-up to the elevation of the top of the wearing surface with bonding grout or an approved bonding agent.

Stiff bristled street brooms shall be used to brush the grout onto the surface. The coating shall not exceed 1/8 inch in thickness. The rate of progress in applying grout shall be limited so the grout does not become dry before it is covered with new concrete. During delays in the surfacing operations, should the surface of the grout indicate an extensive amount of drying, the grout shall be removed by methods approved by the Resident and the area should be regrouted.

The bonding grout shall have Portland Cement and fine aggregate proportioned 2 to 1 by volume. The fine aggregate from which the material larger than 1/8 inch has been removed shall be the same source as used in the concrete. The cement and fine aggregate shall be measured separately in appropriately sized containers. The fine aggregate shall be deposited in an approved mechanical mortar mixer before adding cement. Water shall be added in sufficient quantity to allow flow of the grout without segregation of the grout ingredients.

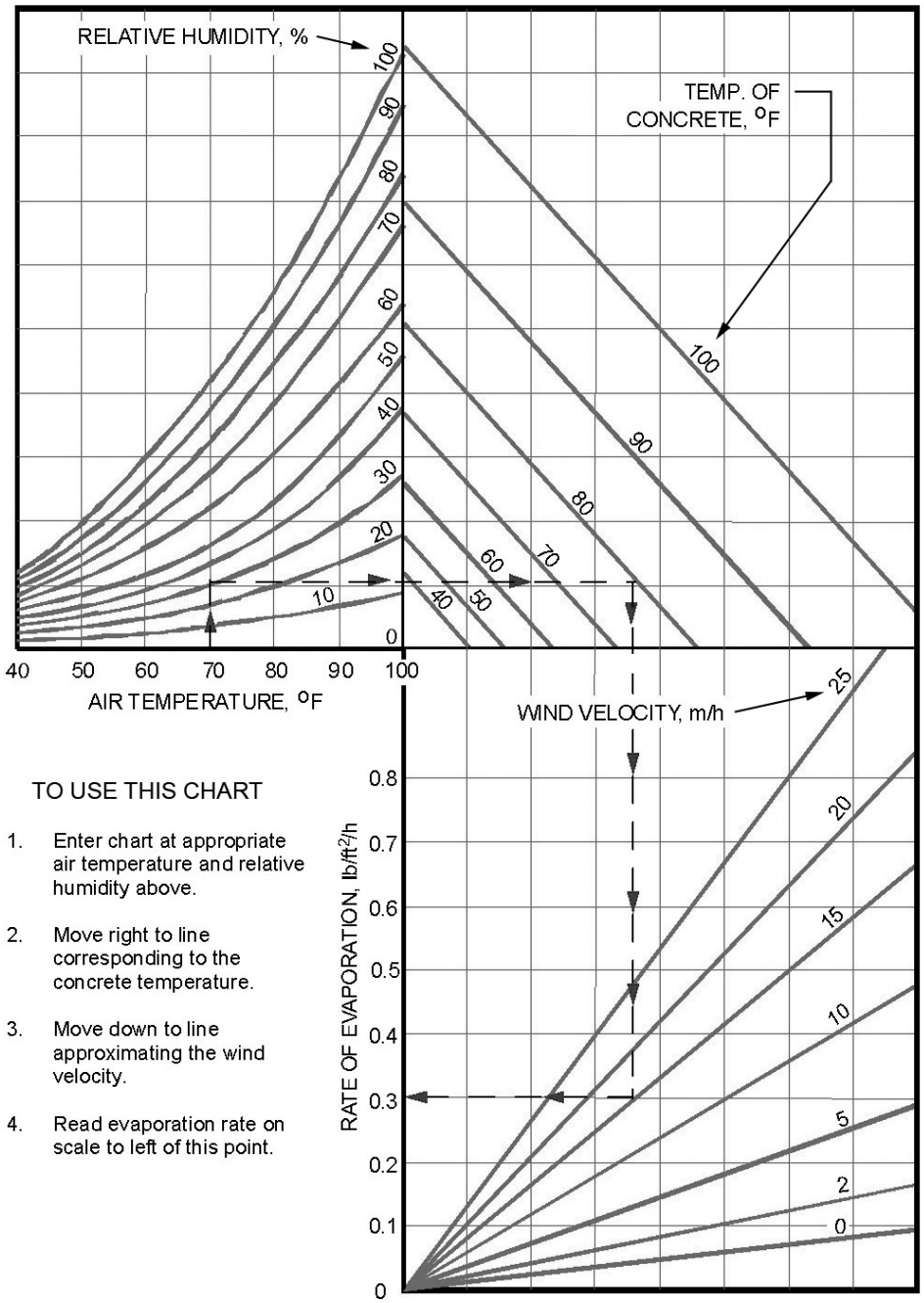
No water shall be added after initial mixing. The grout shall not be allowed to separate before placement. The cement to water contact time of the grout shall not exceed 30 minutes

before it is placed. Any grout that has dried or become unworkable before application, as determined by the Resident, shall not be incorporated into the work. The use of retarding admixtures for increasing the discharge time limits will be allowed.

The Resident may approve the batching of bonding grout at an approved commercial concrete batch plant. In this case, mixing and delivery shall be in transit truck mixers. The bonding agent shall be one of the products listed on the Maine Department of Transportation's List of Prequalified Bonding Agents and shall be applied in accordance with the manufacturer's recommendations.

No structural concrete slab structure, including but not necessarily limited to, concrete deck slabs, wearing surfaces, simple slab spans and slabs on precast superstructures, shall be commenced if the combination of ambient air temperature, relative humidity, wind speed, and plastic concrete temperature result in a surface moisture evaporation rate theoretically equal to or greater than 0.1 $lb/ft^2/hr.$ of exposed surface (refer to the Rate of Evaporation from Concrete Surface Chart). If the surface moisture evaporation rate rises to 0.15 $lb/ft^2/hr.$ of exposed surface, the Contractor shall immediately implement remedial actions to reduce the surface moisture evaporation rate. The temperature of the concrete shall not exceed 75˚F at the time the concrete is placed in its final position. The maximum temperature of the surface on which concrete will be placed shall be 90˚F. The Contractor shall provide all equipment and perform all measurements and calculations in the presence of the Resident to determine the rate of evaporation.

RATE OF EVAPORATION FROM CONCRETE SURFACE NOMOGRAPH



TO USE THIS CHART

1. Enter chart at appropriate air temperature and relative humidity above.
2. Move right to line corresponding to the concrete temperature.
3. Move down to line approximating the wind velocity.
4. Read evaporation rate on scale to left of this point.

502.12 Expansion and Contraction Joints

Expansion and contraction joints shall be located and constructed or sawn as shown on the Plans and within the timeline allotted. Water stops shall be one continuous piece at each location. Joint cover, as shown on the Plans, shall be applied to all joints where water stops cannot physically be installed, as determined by the Resident.

502.13 Repairing Defects and Filling Form Tie Holes in Concrete Surfaces

After the forms are removed, all surface defects and holes left by the form ties shall be repaired.

All fins and irregular projections shall be removed from the following: Surfaces which are visible in the completed work; surfaces to be waterproofed; and the portion of vertical surfaces of substructure units which is below the final ground surface to a depth of 12 inches, not including underwater surfaces.

In patching surface defects, all coarse or fractured material shall be chipped away until a dense uniform surface, exposing solid coarse aggregate is obtained. Feathered edges shall be sawcut away to form faces having a minimum depth of one inch perpendicular to the surface. All surfaces of the cavity shall be saturated thoroughly with water, after which a thin layer of neat cement paste shall be applied. The cavity shall then be filled with thick, reasonably stiff mortar, not more than 30 minutes old, composed of material of the same type and quality and of the same proportions as that used in the concrete being repaired. The surface of this mortar shall be floated before initial set takes place and shall be neat in appearance. The patch shall be water cured for a period of five (5) days.

If the removal of defective concrete materially impairs the soundness or strength of the structure, as determined by the Resident, the affected unit shall be removed and replaced by the Contractor at their expense.

The holes left by form ties, on the portions of substructure concrete that are to be permanently covered in the finished work, may be filled with an acceptable grade of plastic roofing cement. Holes in the bottom of slabs caused by supporting hangers need not be filled with the exception of voids that expose the top side of a girder top flange. Where holes in the deck or haunch are required to be filled, this work shall be completed using an approved high performance elastomeric sealant.

502.14 Finishing Concrete Surfaces

Neat cement paste, dry cement powder or the use of mortar for topping or plastering of concrete surfaces will not be permitted.

A. Float Finish - A float finish for horizontal surfaces shall be achieved by placing an excess of concrete in the form and removing or striking-off the excess with a template or screed, forcing the coarse aggregate below the surface. Creation of concave surfaces shall be avoided. After the concrete has been struck-off, the surface shall be thoroughly floated to the finished grade with a suitable floating tool. Aluminum and steel floats are not allowed.

Float finish, unless otherwise required, shall be given to all horizontal surfaces except those intended to carry vehicular traffic and those of curbs and sidewalks.

B. Structural Concrete Slab Structures – Include, but not limited to, structural concrete deck slabs, wearing surfaces, slabs on precast superstructures, top and bottom slabs of box culverts, approach 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.

Screed rail supports set in the concrete shall be so designed that they may be removed to at least 50 mm [2 inches] below the surface of the concrete. Voids created by removal of the upper part of the screed rail supports shall be filled with mortar having the same proportions of sand and cement as that of the slab or wearing surface. The mortar shall contain an approved additive in sufficient proportions to produce non-shrink or slightly expansive characteristics.

The rate of placing concrete shall be limited to that which can be finished without undue delay and shall not be placed more than 10 feet ahead of strike-off.

The Contractor shall furnish a minimum of two work bridges behind the finishing operation, capable of spanning the entire width of the deck and supporting at least a 500 lb. load without deflection to the concrete surface, to be supported on the screed rails. These working bridges shall be used by the Contractor for touch-up and curing cover application and shall be available for inspection purposes. When the overall length of the structure is 60 feet or less only one working bridge will be required.

An approved bridge deck finishing machine complying with the following requirements shall be used, except as otherwise specified, for finishing structural concrete slab structures. The finishing machine shall have the necessary adjustments, built in by the manufacturer, to produce the required cross section, line and grade. The supporting frame shall span the section being cast in a transverse direction without intermediate support. The finishing machine shall be self-propelled and capable of forward and reverse movement under positive control. Provisions shall be made for raising all screeds to clear the screeded surface for traveling in reverse. The screed device shall be provided with positive control of the vertical position.

The finishing machine shall be self-propelled with one or more oscillating screeds or one or more rotating cylinder screeds. An oscillating screed shall oscillate in a direction parallel to the centerline of the structure and travel in a transverse direction. A rotating cylinder screed shall rotate in a transverse direction while also traveling in the same direction. Either type of screed shall be operated transversely in overlapping strips in the longitudinal direction not to exceed six inches. One or more powered augers shall be operated in advance of the screed(s) and a drag (pan type) float shall follow the screed(s). For concrete placements less than six (6) inches in depth, vibratory pan(s) having a minimum of 3000 vibrations/min shall be operated between the oscillating screed(s) or rotating cylinder screed(s) and the power auger(s). For concrete placed in excess of 3-1/2 inches but less than six (6) inches in thickness, hand- operated spud vibrators shall be used in addition to the machine vibratory pan(s).

The transversely operated rotating cylinder(s) of the bridge deck finishing machine shall be rotated such that the direction of the rotation of the cylinder(s) at the surface of the concrete is in accordance with the manufacturer’s recommendations.

Concrete immediately in front of the power auger(s) of a bridge deck finishing machine shall be placed or cut to a depth no higher than the center of the rotating auger(s). The advance auger(s) shall strike-off the concrete to approximately 1/4 inch above the final grade. The concrete shall then be consolidated with the vibrating pan(s) and then finished to final grade.

A small handheld pan vibrator shall be required at edges and adjacent to joint bulkheads. In lieu of the handheld pan vibrator equipment, the Resident may approve small spud vibrator(s).

Lightweight, vibrating screeds may be used on slab structures which are more than 12 inches below the roadway finish grade or have a length of 30 feet or less, or where concrete placements are specified to be less than 16 feet in width and shall have the following features:

1. It shall be portable and easily moved, relocated, or adjusted by no more than four persons.
2. The power unit shall be operable without disturbing the screeded concrete.
3. It shall be self-propelled with controls that will allow a uniform rate of travel and by which the rate of travel can be increased, decreased or stopped.
4. It shall have controlled, uniform, variable frequency vibration, end to end.
5. It shall be fully adjustable for flats, crowns, or valleys.
6. The screed length shall be adjustable to accommodate the available work area.

When a lightweight vibrating screed is utilized, the concrete shall be placed or cut to no more than 1/2 inch above the finished grade in front of the front screed. The screed shall be operated such that at least three feet of concrete is in position in front of the screed.

Supporting slabs for bituminous wearing surfaces shall be finished in accordance with the recommendations of the waterproofing membrane manufacturer.

The texturing of concrete wearing surfaces shall be applied as approved by the Resident. The surface tolerance and texture shall be acceptable to the Resident, or the placement may be suspended until remedial action has been taken. The Resident may order the removal and replacement of material damaged by rainfall.

On all concrete wearing surfaces, a one foot wide margin shall be finished adjacent to curbs and permanent barriers with a magnesium float.

Immediately after screeding, floating and texturing, the surface of the concrete shall be tested for trueness, by the Contractor, with a 10 foot straightedge and all irregularities corrected at once in order to provide a final surface within the tolerance required in Table 5. The surface shall be checked both transversely and longitudinally. Any area that requires finishing to correct surface irregularities shall be retextured.

The straightedges shall be furnished and maintained by the Contractor. They shall be fitted with a handle and all parts shall be made of aluminum or other lightweight metal. The straightedges shall be made available for use by the Resident when requested.

In the event of a delay during a concrete placement, all concrete that cannot receive the final curing cover shall be covered with wet burlap.

No vehicles will be allowed, either directly or indirectly, on reinforcing steel before concrete placement.

C. Curb and Sidewalk Finish on Bridges - Curb and sidewalk finish is a float finish produced by using a short float moved in small circles to produce a shell-like pattern on the surface of the concrete. Alternately, sidewalks may receive a light broom finish perpendicular to the sidewalk.

When a concrete curb is monolithic with a sidewalk, a six inch wide smooth margin shall be made along the top of the curb with a magnesium float.

Unless shown on the Plans, the sidewalk area shall not be divided into sections by transverse grooves.

At all transverse construction and expansion joints, except where steel expansion dams are used, the edges of the joints, on the surface of the sidewalk, shall be finished with a sidewalk edging tool two inches in width with a 1/4 inch radius lip.

D. Form Surface Finish - The character of the materials used and the care with which forms are constructed and concrete placed shall be considered in determining the amount of rubbing required. If using first class form material, well-constructed forms and the exercise of special care, concrete surfaces are obtained that are satisfactory to the Resident, the Contractor may be relieved in part from the requirement of rubbing.

1. Ordinary Finish - An Ordinary Finish is defined as the finish left on a surface after the removal of the forms, the filling of all holes and the repairing of all defects. The surface shall be true and even, free from stone pockets and depressions or projections and of uniform texture. All formed concrete surfaces shall be given an ordinary finish unless otherwise specified.

   Repaired areas that do not meet the above requirements or areas that cannot be satisfactorily repaired to meet the requirements for ordinary finish shall be given a rubbed finish. When a rubbed finish is required on any part of a surface, the entire surface shall be given a rubbed finish.

2. Rubbed Finish - Rubbing of the concrete shall occur within seven days of the concrete placement. If rubbing of the concrete is not complete within seven days, the Contractor must apply a latex bonding agent to the concrete as submitted and approved by the Resident.

   The concrete shall be thoroughly saturated with water immediately before starting this work. Sufficient time shall have elapsed before wetting-down to allow the mortar used in ordinary finish to become thoroughly set. Surfaces to be finished shall be rubbed with a medium coarse carborundum stone, using a small amount of mortar on its face. The mortar shall be composed of cement and fine sand mixed in proportions as used in the concrete being finished. Rubbing shall be continued until all form marks, projections and irregularities have been removed, all voids filled and a uniform surface has been obtained. A thin layer of paste produced by this rubbing shall be left on the surfaces.

After all concrete above the surface being treated has been cast, the final finish shall be obtained by a second rubbing with a fine carborundum stone using only water. This rubbing shall be continued until the entire surface is of a smooth texture and uniform color.

After the final rubbing is completed and the surface has dried, it shall be rubbed lightly with clean and dry burlap to remove excess loose powder and shall be left free from all unsound patches, paste, powder and objectionable marks. This finish shall result in a surface of smooth texture and uniform color.

No surface finishing shall be done in freezing weather or when the concrete contains frost. In cold weather the preliminary rubbing necessary to remove the inert sand and cement materials and the surface irregularities may be done without the application of water to the concrete surfaces.

The following portions of concrete roadway grade separation structures shall be given a rubbed finish unless otherwise indicated in the Contract:

(a) Retaining walls and the breast and wing walls of abutments - face surfaces to 12 inches below the finished ground line.
(b) Piers - all vertical surfaces and the underside of overhanging portions of caps, except that for overpass structures, the piers beyond the outside limits of the roadway pavement, the vertical surfaces on the back which are not visible from the roadway or sidewalk will not require a rubbed finish.
(c) Parapets and end posts – all horizontal and face surfaces, excluding overhead surfaces, to 12 inches below the finish ground.

If, in the opinion of the Resident, the general appearance of a concrete structure, due to the excellence of workmanship, cannot be improved by a rubbed finish, this requirement may be waived.

E. Surface Finish - After the concrete has cured, the surface shall be tested with a 10 foot straightedge or a lightweight profiler.

The straightedge shall be furnished and maintained by the Contractor. It shall be fitted with a handle and all parts shall be made of aluminum or other lightweight metal. The straightedges shall be made available for use by the Resident when requested. The lightweight profiler will be furnished by the Authority.

Areas found to not comply with the tolerance of Table 5 shall be brought into conformity by methods proposed by the Contractor and approved by the Resident at no additional cost to the Authority.

TABLE 5
SURFACE TOLERANCE LIMITS

Type of Surface:	* Maximum deviation of surface in millimeters [in.] below 3 m [10 ft.] straightedge
Concrete Wearing Surface, Curbs, Sidewalks, and Barriers	3 mm [1/8 in.]
Concrete Slab Surfaces to be Covered by Membrane Waterproofing or Concrete Wearing Surfaces	6 mm [1/4 in]
Concrete Slab Surfaces with Integral Concrete Wearing Surface	6 mm [1/4 in.]
Concrete Slab Surfaces to be Covered By Earth or Gravel	10 mm [3/8 in.]
Concrete Surface of Box Culvert Bottom Slab	10 mm [3/8 in.]
Concrete Surface of Abutments, Piers, Pier Shafts, Footings, and Walls	10 mm [3/8 in.]

* Allowance shall be made for crown, camber and vertical curve.

502.15 Curing Concrete

All concrete surfaces shall be kept wet with clean, fresh water for a curing period of at least seven days after concrete placing, with the exception of vertical surfaces as provided for in Subsection 501.10(D), Removal of Forms and False Work.

For concrete wearing surfaces and all concrete containing fly ash or slag, the temperature of the concrete shall be kept above 50˚F for the entire seven day period. All other concrete and its surfaces shall be kept above 50˚F for the first four days of the curing period and above 32˚F for the remainder of the period.

In the 24-hours following the end of the curing period, the temperature of the concrete shall be decreased on a gradual basis, not to exceed a total change of 40˚F for moderate sections, such as abutments and pier bents, and 30˚F for mass sections such as massive piers.

All slabs and wearing surfaces shall be water cured only and kept continuously wet for the entire curing period by covering with one of the following systems:

A. Two (2) layers of wet burlap;

B. Two (2) layers of wet cotton mats;

C. One (1) layer of wet burlap and either a polyethylene sheet or a polyethylene coated burlap blanket; or,

D. One (1) layer of wet cotton mats and either a polyethylene sheet or a polyethylene coated burlap blanket.

Except as otherwise specified, curing protection for slabs and wearing surfaces shall be applied within 30 minutes after the concrete is screeded and before the surface of the concrete has lost its surface "wetness" or "sheen" appearance. The first layer of either the burlap or the cotton mats shall be wet and shall be applied as soon as it is possible. Polyethylene sheets shall not be placed directly on the concrete, but may be placed over the fabric cover to prevent drying.

The covering of concrete wearing surfaces, decks, curbs and sidewalks shall be kept continuously wet for the entire curing period by the use of a continuous wetting system and shall be located to insure a completely wet concrete surface for the entire curing period.

All other surfaces, if not protected by forms, shall be kept thoroughly wet either by sprinkling or by the use of wet burlap, cotton mats or other suitable fabric until the end of the curing period, except as provided for in 502.10(D), Removal of Forms and False Work. Polyethylene sheets shall not be placed directly on the concrete, but may be placed over the fabric cover to prevent drying.

Surfaces of all concrete placements containing silica fume additive shall be coated with an approved evaporation retardant immediately after finishing and texturing the concrete surface. The application of wet burlap or wet cotton mats shall be made within 15 minutes after the finishing of the concrete surface.

The application rate, the desired equipment, and the mixing and application procedures for an approved evaporation retardant shall be as designated by the manufacturer. Successive applications or heavier applications of this evaporation retardant shall be applied as necessary to retain the required surface "wetness" appearance.

502.16 Loading Structures and Opening to Traffic

No superstructure concentrated loads such as structural steel beams, girders and trusses shall be placed upon finished concrete substructures until the concrete has reached its design strength.

No load or work will be permitted on concrete superstructure slabs or rigid frame structures until concrete cylinders cured with the slab establish that design strength has been reached. However, after a shorter period of time, the Resident may permit handwork for form construction and setting stone bridge curb. No curbing or other materials shall be stored on the bridge during the seven day curing period, except that if handwork is permitted, curb stones may be stored in a line near to their final location until ready to be set.

Neither traffic nor fill material shall be allowed on superstructures of concrete bridges or culverts until concrete cylinders cured with the slab establish that design strength has been reached, dependent upon conditions as specified in Subsection 502.10 and with the approval of the Resident.

No traffic will be allowed on the cured concrete of a concrete wearing surface until 24-hours after the completion of the application of protective coating for concrete surfaces.

Concrete approach slabs at the end of structures may be opened to traffic or backfilled if buried when the design strength has been reached.

502.17 Bridge Drains and Incidental Drainage

All drains shall be accurately placed at the locations shown on the Plans or as approved by the Resident, and an adequate means provided for securely holding them in the required positions during the placing of concrete.

Bridge drains shall be galvanized in accordance with Subsection 711.04, Bridge Drains. The Contractor shall furnish an insulator between surfaces of galvanized and weathering steels when erecting the bridge drain support assembly. Epoxy-coated washers shall be used when the support assembly attaches to weathering steel beam webs.

Drains or weep holes through abutments and retaining walls shall be pipe of the size and shape shown on the Plans and shall be of Schedule 40 PVC pipe.

For the purpose of providing drainage for any moisture that may collect between the floor slab and the bituminous concrete roadway surface, approved one inch inside diameter plastic tube drains shall be installed at the low points of the slab surface, adjacent to the end dam or dams. The exact location will be determined in the field by the Resident and the discharge from them shall be such as to clear the bridge seats and any other portion of the structure in their proximity. The tops of the drains shall be depressed 3/8 inch below the surface of the slab and the outlets shall project two inches below the underside of the slab. Care shall be exercised such that the drains are open after the installation of the membrane waterproofing, when it is installed.

502.175 Miscellaneous Construction of Conduits and Anchor Bolts

All conduit materials and installation procedures shall follow the requirements of Section 626.03 through 626.033 of the MaineDOT Standard Specifications.

Before placing concrete, the required elbows of entrance conduits, reinforcement, and anchor bolts shall be carefully positioned. The anchor bolt size and the bolt circle diameter shall be determined from data furnished by the supplier of the poles or as shown on the Plans. Anchor bolts for use with breakaway couplings, longitudinally grooved-type, shall be 1 inch diameter and shall project between 2-1/2 and 3 inches above the top of the foundation. All other anchor bolts shall be a minimum of one inch diameter and shall project sufficiently to accommodate the thickness of the base plus all nuts and washers. The bolt length shall also be sufficient to allow clearances of approximately 1/2 inch below the leveling nut and 1/4 inch above the top nut. At least two threads on each anchor bolt shall project beyond the outside of the nuts holding the plumbed pole.

When the anchor bolt template is removed, the threads of the anchor bolts shall be greased and protected with a metal sleeve, held in position with nuts and washers to be furnished with the bolts. This thread protection shall remain in place until the pole or other equipment is installed.

A copper-clad steel ground rod shall be installed when shown on the Plans.

502.18 Method of Measurement

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

Structural Concrete for any irregular shapes may be measured by the cubic yard as determined from the theoretical yield of the design mix or in the case of transit mixed concrete, by delivery ticket as approved by the Resident.

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.

No deduction will be made for the volume of concrete displaced by structural steel, reinforcing steel, pile heads, expansion joint material, drains, chamfers on corners, inset panels of 1-1/2 inches or less in depth, pipes, weep holes and authorized openings for utilities of 1/4 yd^3 or less in volume, when any of these items occur in structural concrete which is to be paid for on a cubic yard basis.

502.19 Basis of Payment

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 cubic yard 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.

The procurement and installation of the electric conduit and anchorages placed within the Gantry Pedestals will not be measured separately for payment, but shall be incidental to the Structural Concrete, Gantry Pedestals and Footings pay item.

Implementation of the Quality Control Requirements and costs associated with acceptance test sampling shall be incidental to relative pay item.

Payment will be made under:

Pay Item		Pay Unit
502.261	Structural Concrete, Grade Beams	Cubic Yard
502.262	Structural Concrete, Pavement Slabs	Cubic Yard
502.263	Structural Concrete, Plaza Islands, Bumpers and Curtain Walls	Cubic Yard
502.265	Structural Concrete, Utility Pits	Cubic Yard
502.266	Structural Concrete, Pedestals and Footings	Cubic Yard

SPECIAL PROVISION

SECTION 502

STRUCTURAL CONCRETE

(Bridge Drain Grate Modification)

502.01 Description

The following sentences are added:

The work also consists of removing existing bridge drain grates, and fabricating, galvanizing, and installing replacement bridge drain grates where noted and as detailed on the Plans.

502.03 Materials

The following sentences are added:

Bridge drain materials shall meet the requirements specified in, and shall be galvanized in accordance with, Division 700, Subsection 711.04, Bridge Drains.

502.17 Bridge Drains and Incidental Drainage

The following sentences are added:

Prior to beginning the work, the Contractor shall make provisions to ensure that portions of the existing bridge drains do not fall onto the street or shoulder below.

The existing bridge drain grates shall be removed by grinder, cut off wheel or other mechanical means which minimize damage to the adjacent grate to remain. After removal of the existing bridge drain grate the replacement grate shall be fitted and welded to the existing bridge drain body.

All bridge drains grates shall be accurately placed at the locations shown on the Plans or as approved by the Resident. The Contactor shall provide an adequate means for securely holding them in the required positions during welding.

The Contractor shall touch-up any damaged galvanizing with two coats of zinc-rich chromate paint after wire brushing and solvent cleaning the damaged area.

502.53 Method of Measurement

Bridge Drain Grate Modification will be measured per each by the actual number of bridge drains repaired per the Plans, complete in place and accepted.

502.54 Basis of Payment

Bridge Drain Grate Modification will be paid for at the Contract unit price per each, which price shall be full compensation for removing and disposing of the existing bridge drain grate; fabrication, galvanizing and installation of the replacement bridge drain grate and galvanizing touchup, including all materials, labor, tools, equipment and incidentals necessary for furnishing and installing the Bridge Drain Grate Modification in accordance with the Plans and Specifications.

Payment will be made under:

Pay Item		Pay Unit
502.701	Bridge Drain Grate Modification	Each

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 Bridge Design Guide Specifications for GFRP - Reinforced Concrete Bridge Decks and Traffic Railings (November 2009), 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 manufacture’s 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 pounds of reinforcement authorized.

GFRP reinforcing bars placed within drilled shafts shall be included in the respective 626 pay items.

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 pound for each item involved, completed, and accepted.

Pay Item		Pay Unit
503.18	Glass Fiber Reinforced Polymer (GFRP) Reinforcing Bars, Fabricated and Delivered	Pound
503.19	Glass Fiber Reinforced Polymer (GFRP) Reinforcing Bars, Placing	Pound

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 five lbs 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

(Toll Plaza Canopy and Gantry Installation)

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 SB entry lanes and a new gantry over the new SB exiting lanes and the NB express entry and exiting, 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 gantry as described in the Plan drawings and herein as required for the installation of a new canopy and new gantry sections at Interchange 63.

800.52 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.

800.53 Construction Requirements

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

a. Canopy: The contractor shall install a new canopy over new 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 Gantry - Southbound: The contractor shall install the proposed gantry over the southbound exit lane as shown in the Plans and described within these Specifications. The gantry 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.

c. Toll Gantry - Northbound: The contractor shall install the proposed gantry over the northbound entry and exit lanes as shown in the Plans and described within these Specifications. The gantry installations shall include all electrical and communication for the toll system, galvanized or stainless steel mounting hardware, and all materials, labor, equipment and incidentals required to complete the work.

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 gantries 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 gantries, 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 gantries 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, Toll Gantry – Southbound and Toll Gantry – Northbound, 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 gantry 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:

Pay Item		Pay Unit
504.50	Toll Plaza Canopy	Lump Sum
504.61	Toll Gantry – Southbound	Lump Sum
504.62	Toll Gantry – Northbound	Lump Sum

SPECIAL PROVISION

SECTION 506

SHOP COATING APPLICATION

506.11 Description

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

Interchange 63: All new 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 Galvapac 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 in^2 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 New Canopy and Gantry Installation, pay item 800.50.

SPECIAL PROVISION

SECTION 507

RAILINGS

507.04 General

The following paragraph is added after the first paragraph:

The Authority will supply used rail sections and connection hardware from existing stockpiles for the Contractor to install for the work under Item 507.0928 Aluminum Bridge Railing – Rail Section Replace. The Contractor shall load the rail sections at the Crosby Maintenance Yard at Mile 45.8 Southbound in South Portland, and transport and unload the rail sections at the project site.

507.08 Method of Measurement

Aluminum Bridge Railing - Rail Section Replace will be measured as linear foot, delivered, erected, and accepted.

507.09 Basis of Payment

Aluminum Bridge Railing - Rail Section Replace will be paid for at the unit price for linear foot price, complete in place. All costs for loading, transporting and unloading used rail components supplied by the Authority shall be incidental to this item.

Payment will be made under:

Pay Item		Pay Unit
507.0928	Aluminum Bridge Railing – Rail Section Replace	Linear Foot

SPECIAL PROVISION

SECTION 508

MEMBRANE WATERPROOFING

508.01 Description

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

When high performance waterproofing membrane is specified, the Contractor shall furnish and install an approved high performance waterproofing membrane to the concrete deck with a heat welded membrane system applied in accordance with the Plans, Specifications and the manufacturer's published recommendations.

508.02 Materials

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

When high performance waterproofing membrane is specified, the materials shall meet the requirements of the manufacturer and shall be one of the approved heat welded products on the MaineDOT's Prequalified List of Approved Materials for High Performance Waterproofing Membrane.

SPECIAL PROVISION

SECTION 511

COFFERDAMS

(Cofferdam)
(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 all temporary earth support systems including, but not necessarily limited to, cofferdams, caissons, cribs and sheeting, and other related work, including dewatering, required to allow for the excavation of foundation pits; to permit and protect the construction of structural units; to allow for the demolition and/or construction of the concrete abutments, piers, foundations, wingwalls, headwalls, and culverts; removal and/or construction and maintenance of approach roadways; and any other work requiring temporary earth support mandated by OSHA, Subpart P, Excavation Requirements, or required for the maintenance of traffic. The temporary earth support systems shall meet all of the applicable requirements of the standard Specifications.

Temporary earth support structures shall be specified as Cofferdam(s) when it is determined a temporary earth support structure will be required to keep high ground water, stream, river, pond, lake or ocean tidal waters out of the excavation so the identified substructure unit can be constructed in the dry. The locations of Cofferdam(s) will be shown on the Plans. Cofferdam(s) may or may not require seal concrete.

All other temporary earth support structures shall be specified as Temporary Earth Support Structures. 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. Temporary earth support structures do not require seal concrete.

511.02 Materials

A minimum of three (3) weeks prior to the start of work, the Contractor shall submit the proposed method of temporary earth support systems for review and approval. The submission shall include working drawings and list the type and size of the proposed support, details of construction, calculations and a sequence of operations all of which shall be designed and sealed by a Professional Engineer licensed in the State of Maine. This Professional Engineer may be directly employed 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 approved. Approval of the submittals shall not relieve the Contractor of the responsibility for the satisfactory functioning of the temporary earth support systems.

The temporary earth retaining structures shall be designed to support all appropriate combinations of earth, water, and surcharge loads (from traffic, construction equipment, material stockpiles, and other sources) imposed on the systems during all phases of construction. The Contractor's design shall consider the means and methods and construction sequencing proposed by the Contractor. The Contractor is responsible for selecting an appropriate factor of safety for the Temporary Earth Retaining Structures. The factor of safety and maximum applied loads are resistances used for the design shall be clearly stated on the submitted calculations.

Cofferdams shall be designed by the Contractor's licensed engineer to resist hydrostatic and lateral pressures and prevent water infiltration. The height of the cofferdam and the depth of the seal concrete shall be determined by the Contractor based upon the hydrological data shown on Sheet S-01 of the Contract Drawings. Detailed information from the hydrological report is presented **on the website** of these Specifications, if available. The Contractor shall take note of the sensitivity of the river to heavy rain fall. The design shall include calculations for sheet piles and internal bracing, and shall be submitted for review and approval. Where cofferdams are to be left in place as a permanent countermeasure against scour, the minimum sheet pile tip elevations will be shown on the Contract Drawings.

Prior to excavating or loading the temporary earth support systems, the Professional Engineer responsible for the design of the temporary earth support systems shall provide after inspection of the systems a sealed certification to the Resident that the systems were erected in conformance with the Professional Engineer's plans and design details.

The submission 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.

Seal concrete shall conform to the requirements of Class S Concrete. Where seal concrete is required to have a steel reinforcing mat, the steel reinforcement shall conform to ASTM A615, Grade 60.

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. Unless it is contemplated that a concrete foundation seal will be placed under water, the interior dimensions of temporary earth support systems shall be such as to give 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.

During the placing of seal concrete, the elevation of the water inside the temporary earth support systems shall be controlled to prevent any flow through the concrete.

Temporary earth support systems shall be constructed to protect fresh concrete against damage from the sudden rising of the water body and to prevent damage by erosion.

Temporary earth support systems, including all sheeting and bracing involved, shall be removed after the completion of the substructure unless otherwise noted on the Contract Drawings; care being taken not to disturb or otherwise injure the finished masonry. No timber or bracing shall be used in temporary earth support systems in such a way as to remain in the substructure masonry.

At bridge approaches where phased construction results in close confinement of the temporary earth support systems to the existing and new roadways, a lateral support device shall be designed and installed atop the concrete approach slab for the purpose of preventing undermining and/or settlement of the newly constructed roadway. Lateral support systems shall be designed and positioned so as to provide lateral rigidity to the completed roadway during Phase II construction, while preventing any reflection of the device through the pavement above. The design, details, and sketches of the permanent lateral support device shall be presented as part of the Contractor's submissions for Temporary Earth Support Systems. Removal of the lateral support device shall not require additional phases of construction nor compromise the integrity of the roadway. At the Contractor's option, the lateral support device may be left in place with the approval of the Resident.

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, with the exception of Cofferdams, 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.

Cofferdam shall be measured for payment as one lump sum per location identified on the Plans, 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. When cofferdams remain as permanent countermeasures against scour, removal of the unused section of sheet pile above the cut-off line shall be included in the lump sum payment.

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

511.06 Basis of Payment

The accepted quantity of Temporary Earth Support Systems, other than Cofferdam (see below), will be paid for at the Contract lump sum price, per Contract, for the respective 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 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.

All costs of lateral support devices installed in support of phased construction at the bridge approaches, will not be measured separately for payment, but shall be incidental to the Temporary Earth Support Systems item.

The accepted quantity of Cofferdam will be paid for at the Contract lump sum price, per location identified on the Plans.

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 Cofferdam. 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 Cofferdam will be paid in accordance with Subsection 109.7, Equitable Adjustments to Compensation, instead of the Contract lump sum price.

All costs relating to the furnishing and placing of seal concrete will be paid under Pay Item 502.249, Structural Concrete Piers – Seal Concrete (placed under water), pay unit lump sum.

All costs relating to the excavation of earth material to facilitate construction of Temporary Earth Support Systems and Cofferdams, and placement of structural concrete will be paid under Pay Item 206.08, Structural Earth Excavation – Major Structures, pay unit cubic yard; or Pay Item 206.10, Structural Earth Excavation – Piers, pay unit cubic yard, as applicable.

All cost 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 Cofferdam item(s).

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 Cofferdam item(s).

Payment will be made under:

Pay Item		Pay Unit
511.091	Temporary Earth Support Systems	Lump Sum

SPECIAL PROVISION

SECTION 515

PROTECTIVE COATING FOR CONCRETE SURFACES

(Pigmented Concrete Protective Coating)

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

515.01 Description

The work shall include the surface preparation and application of a pigmented concrete protective coating system to protect new and existing concrete and masonry structures. The coating system shall be applied to piers, endposts, wingwalls, abutments, curbs and fascia in accordance with the Plans, Specifications and the manufacturer's published recommendations.

515.02 Materials

The pigmented penetrating sealer system shall be a two coat system consisting of Certi-Vex Guard and Certi-Vex Envio Smooth VOC, as manufactured by Vexcon Chemicals, Inc., or an approved equal, consisting of the following two parts:

- The primer shall be a vinyl toulene acrylic silane polymer blend or an approved equal. This primer shall provide the main protection against the ingress of water borne chlorides and sulfates.

- The top coat shall be solvent borne modified acrylic resins with selected pigments and fillers.

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

The Contractor shall submit the Vexcon Chemical's product data sheets, material safety data sheets and recommended instructions for application of the Certi-Vex Guard and Certi-Vex Envio Smooth VOC.

The pigmented penetrating sealer color shall be Concrete Gray.

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. The surface shall be prepared in strict accordance with the instructions of the approved manufacturer. Surface shall be fully cured, dry, and free from contamination such as asphalt coatings, oil, grease, loose particles, decaying matter, moss, algae growth, and curing compounds. For maximum penetration of the primer, the Contractor shall lightly sandblast the surface.

Existing form tie hole plugs which are loose or deteriorated shall be completely removed. The holes shall be reamed to sound concrete. All open form tie holes, new and existing shall be filled with an approved non-shrinking mortar, and after setting, rubbed level to the adjacent surface. Filled holes shall be cured for at least two (2) days prior to the application of the concrete protective coating.

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.

Grass and vegetation adjacent to surfaces to be coated shall be removed or trimmed closely to permit proper preparation and application of the coating.

515.04 Application

The materials shall be mixed and applied in strict accordance with the instructions of the approved manufacturer. Spray or roll the primer at the recommended application rate. If the surface is very absorbent, the primer should be applied until surface is saturated per the manufacturer’s written instructions. All areas not to receive coating shall be marked with straight, even lines as the limit lines.

The Contractor shall, in the presence of the Resident, apply the materials on a sample area which is representative of a jobsite application. When color and application methods are approved, the sample area shall serve as a standard of acceptance for all further work.

The primer shall not be applied in direct sunlight when the air or surface temperature is greater than 90°F, or when air or surface temperature is below 35°F. The top coat shall not be applied when air or surface temperature is below 40°F or as approved by the Resident.

The primer shall be allowed to dry for a minimum of two-hours before applying pigmented top coat. Under poor drying conditions this time shall be extended. The primer shall not be coated with top coat until the surface is dry. The top coat should be applied by brush, roller or suitable airless spray.

Top coat material shall be applied per the manufacturer's recommended application rate and in strict accordance with the manufacturer's written instructions. The top coat shall provide consistent color without light spots or shadows. The Resident reserves the right to have the Contractor recoat the top coat if the dried top coat(s) lack consistent color or show light spots or shadows.

Protect plants, grass, sealant, asphalt, traffic, etc. during application from spray.

515.05 Method of Measurement

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

515.06 Basis of Payment

Pigmented Concrete Protective Coating 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 pigmented 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 paid for separately, but shall be incidental to the Pigmented Concrete Protective Coating item.

Payment will be made under:

Pay Item		Pay Unit
515.201	Pigmented Protective Coating for Concrete Surfaces	Square Yard

SPECIAL PROVISION

SECTION 515

PROTECTIVE COATING FOR CONCRETE SURFACES

(Clear Concrete Protective Coating)

This Section 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 and existing cast-in-place concrete, precast concrete and masonry structures. The coating system shall be applied to all exposed island, bumpers, curbs, fascia, median barriers, pedestals and other exposed concrete surfaces in accordance with the Plans, Specifications and the manufacturer's published recommendations.

515.02 Materials

The penetrating sealer shall be Stand Off 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 Stand Off 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 100°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.

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:

Pay Item		Pay Unit
515.202	Clear Protective Coating for Concrete Surfaces	Square Yard

SPECIAL PROVISION

SECTION 515

PROTECTIVE 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:

Product Trade Name	Manufacturer or Supplier	Telephone
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

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 manufacture'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:

	Average temperature of concrete surface, epoxy and aggregate components in °F					
Course	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 Item		Pay Unit
515.23	Epoxy Overlay	Square Yard

SPECIAL PROVISION

SECTION 518

STRUCTURAL CONCRETE REPAIR

(Abutment Repairs)
(Pier Repairs)
(Fascia and Overhang Repairs)
(Partial Depth Concrete Deck Repairs)
(Full Depth Concrete Deck Repairs)

518.01 Description

The following paragraphs are added:

The work includes abutment repairs, pier repairs, fascia and overhang repairs, and partial and full depth concrete deck repairs as described below.

- Abutment repairs include concrete surface repairs on all deteriorated horizontal, vertical and overhead abutment and wingwall surfaces as shown on the Plans or identified by the Resident.

- Pier Repairs include concrete surface repairs on all deteriorated horizontal, vertical and overhead pier surfaces as shown on the Plans or identified by the Resident.

- Fascia and overhang repairs are repairs on all deteriorated vertical and overhead fascia and overhang surfaces on the superstructure less than 7.9 inches in depth that are shown on the Plans or identified by the Resident.

- Partial depth concrete deck repairs are repairs on all deteriorated horizontal deck surfaces less than 4.9 inches in depth as shown on the Plans or identified by the Resident.

- Full depth concrete deck repairs are repairs on deteriorated deck surfaces greater than 4.9 inches in depth as shown on the Plans or identified by the Resident. Full depth concrete deck repairs shall be scheduled and coordinated with the Authority.

The work shall also include the removal of all tectyl (bituminous) coating on the backwalls, bridge seats and breastwalls of the existing bridge structures. This work shall occur prior to the start of the abutment concrete repairs so the Resident may identify additional areas requiring repair.

The work shall also include providing the Resident safe access to the bridge pier shafts and hammerheads for sounding of the existing concrete; and providing safe access to the bridge fascia and overhangs for sounding of the existing concrete. This work shall occur prior to the start of pier and fascia overhang concrete repairs so the Resident may identify additional areas requiring repair.

518.03 Repair Materials is re-designated as Subsection 518.02 Repair Materials.

Paragraphs 1-3 and the Coarse Aggregate Gradation Designation/ Thickness of Placement Table of Section 518.03 Repair Materials are deleted and replaced with the following:

All materials used for repair of concrete or reinforcing steel shall meet the applicable requirements of Division 700 as specified in the Standard Specification Sections 502 and 503 respectively. Concrete shall be used as the repair material, and it shall conform to the requirements of Table 1 of Subsection 502.05 for Class AAA Concrete except that the minimum cement factor shall be **750 pounds** per cubic yard. Concrete mix shall be selected at 1,200 psi above design strength of 4,500 psi. The coarse aggregate size shall conform to ASTM C33 Grading 7.

Materials for non-emergency deck patching, and formed vertical and overhead deck repairs, shall be the following:

MTA - AAA modified concrete – transit mixed or mixed on site,

Materials for non-emergency, un-formed vertical and overhead deck repairs shall be one of the following:

SikaTop 123 Plus as manufactured by Sika Corporation, 201 Polito Avenue, Lakehurst, NJ 07011.
SikaRepair 223, as manufactured by Sika Corporation, 201 Polito Avenue, Lakehurst, NJ 07011
Zero-C Vertical Overhead Mortar, as manufactured by BASF Corporation Systems, 889 Valley Park Drive, Shakopee, MN, 55379.
Verticoat Supreme as manufactured by The Euclid Chemical Company, 19218 Redwood Rd., Cleveland, OH, 44110

Materials for emergency deck patching (non-overhead only) may be selected from the Maine Department of Transportation's Qualified Products List for concrete patching materials.

The second sentence in subsection 518.03.1 is revised to read:

"The bonding material shall consist of the following, except that, in the case where an approved proprietary material is used in the repair areas, the manufacturer's published recommendations regarding application and use of bonding materials shall take precedence:"

518.03 Removal of Unsound Concrete

Paragraph 4 item b) is revised to read:
"b) To the minimum depth required per the manufacturer's recommendation, but not less than 1 inch behind the top mat of reinforcing steel, when an approved proprietary material is used."

Paragraph 4 item c) is deleted and not replaced.

Paragraph 4 item d) is revised to read:
"d) To a minimum depth of 1 inch behind the top mat of reinforcing steel."

The following paragraphs are added:

Care shall be taken during the demolition process to ensure the integrity of the surrounding concrete is maintained. The Contractor shall use great care to avoid damaging the existing reinforcing steel during the demolition process. Existing reinforcing steel damaged during the demolition process shall be repaired or replaced by a method approved by the Resident, at no additional cost to the Authority.

All unsound concrete and other material removed shall be disposed of outside the limits of the turnpike right-of-way. 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 Chapter 404 of the Maine Department of Environmental Protection Solid Waste Regulations.

The following Subsection is added:

518.031 Bearing Areas for Superstructure Metal

The Contractor's attention is directed to the fact that the removal of unsound concrete may be immediately adjacent to the structural bearing parts of the steel stringers and may involve removal of unsound concrete under the existing masonry plate.

The Contractor shall submit, a minimum of two (2) weeks prior to the start of work, his proposed method of temporary support which will list the type and size of the proposed members, details of construction, load capacity calculations, and a sequence of operations, all to be made and stamped by a Professional Engineer registered in the State of Maine. Temporary structural supports may bear on the adjacent bridge seat area, backwall or ground.

518.04 Reinforcing Steel

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

All existing reinforcing steel exposed by concrete removal which is to remain in the structure, shall be thoroughly cleaned by sandblasting to an SSPC-SP-6, supplemented by chipping hammers or other means as necessary so that the surfaces are free of rust, scale, mortar and other foreign material, and reasonably free of shadows. The sandblast shall be applied at an angle to the bars so that the embedded steel shall be free of rust and other foreign material to 100 percent of its circumferences. Once the existing reinforcement is cleaned, and prior to casting the repair, all new and existing reinforcing steel shall be coated with an approved epoxy bonding agent. The elapsed time between sandblasting application of the approved epoxy bonding agent shall be a reasonable minimum.

The following paragraph is added to the end of this Subsection:

Where approved by the Resident, exposed reinforcement shall be depressed to provide 1-1/2 inch clear cover of concrete over the top bars. Minimum clear distance under the bottom of reinforcement bars for horizontal repairs, behind reinforcement bars on vertical repairs, and over the top of reinforcement bars on overhead surfaces shall meet the requirements of Subsection 518.03. Epoxy coated reinforcing support chairs shall be provided by the Contractor to support the bars in

their specified location. Bars protruding from sound concrete adjacent to a repair area shall be bent up or down within the repair area to obtain the required minimum clear cover.

518.07 Placing Repair Materials

The following is added after the first paragraph:

All vertical and overhead repair areas shall be formed over the entire surface with quick erecting forms approved by the Resident. The forms shall be held securely in place and be able to withstand the hydrostatic pressure of the fluid concrete of the height to which it is to be placed. Forms shall be built such that the resulting repair will duplicate the original lines of the concrete removed. Form faces shall be of new finished plywood or steel, or other smooth surface as approved by the Resident prior to use. Forms will be provided with a top chute, at a maximum spacing of four feet, for providing a compression head of concrete in the form. The overfilled area shall be struck-off flush when forms are removed. Forms shall be placed snugly against the surface of the old concrete at the edges of the patch and shall extend beyond the edges at least three inches. They shall not deflect under the placement of the fresh concrete. Vertical surface repair forms shall remain in place a minimum of 48-hours.

All proposed bearing pads and bearing pad repairs shall be cast monolithically with the abutment repair concrete.

The following paragraphs are added to the end of this Subsection:

Modified Class AAA Concrete may be transit mixed or mixed on-site. The concrete shall be placed in accordance with the provisions of Section 502 except that the pre-plasticized slump shall not exceed three inches. Materials shall be batched by weight. The concrete shall be pumped or hand shoveled into the forms. Internal mechanical vibrators shall be of an approved design and of a size suitable to the work at hand. External vibrators attached to the forms will be permitted if requested, subject to the results obtained. The amount of vibration shall be guided by results obtained from previous placements.

If the concrete cannot be placed satisfactorily, as determined by the Resident, superplasticizers shall be added to the mix as approved by the Resident and at no additional cost to the Authority. After removal of the forms, the concrete shall be smooth rubbed and wet cured and given a smooth rubbed finish.

518.10 Method of Measurement

The sixth paragraph is deleted and not replaced.

The following paragraphs are added:

The quantity of Abutment Repairs, Pier Repairs, Fascia and Overhang Repairs, Partial Depth Concrete Deck Repairs, and Full Depth Concrete Deck Repairs will be measured by the square foot and shall be computed as the sum of the products of the average length and width of each area repaired.

Removal of all tectyl (bituminous) coating from existing abutments will not be measured separately for payment, but shall be incidental to the Repair items.

Providing safe access for the Resident to sound existing pier shaft and hammerhead concrete, and fascia and overhang concrete will not be measured separately for payment, but shall be incidental to the Repair items.

Fabrication and placement of reinforcing steel for concrete repairs will not be measured for payment separately, but shall be considered incidental to the related contract items.

Temporary supports for supporting steel girders for concrete repairs will not be paid separately, but shall be incidental to the Repair item.

Earth excavation required to expose repair areas will be paid for under Structural Earth Excavation, Item 206.081. Backfill of the repair areas will not be measured separately for payment, but shall be incidental to the Structural Earth Excavation item.

518.11 Basis of Payment

The following paragraphs are added:

Abutment Repairs, Pier Repairs, Fascia and Overhang Repairs, Partial Depth Concrete Deck Repairs, and Full Depth Concrete Deck Repairs will be paid for at the Contract unit bid price per square foot for each type of repair; which price shall include, but not necessarily be limited to, removal and disposal of materials; cleaning existing concrete and reinforcing steel; furnishing and placing new reinforcing steel where required; furnishing, placing and removal of forms, staging, temporary supports where required; placing, curing and finishing new concrete; and, all materials, labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
518.10	Abutment Repairs	Square Foot
518.20	Pier Repairs	Square Foot
518.75	Fascia and Overhang Repairs	Square Foot
518.80	Partial Depth Concrete Deck Repairs	Square Foot
518.81	Full Depth Concrete Deck Repairs	Square Foot

SPECIAL PROVISION

SECTION 518

STRUCTURAL CONCRETE REPAIR

(Repairing Granite Curb Joint and Bedding Mortar)
(Repairing Parapet Elastomeric Joint Sealer)

518.01 Description:

The following paragraphs are added:

This work shall consist of the removal and replacement of existing deteriorated granite curb joint and granite curb bedding mortar as shown on the plans or as directed by the Resident.

This work shall also consist of the removal and replacement of elastomeric joint sealer in existing concrete parapet joints as shown on the plans or as directed by the Resident.

518.03 Repair Materials is re-designated as Subsection 518.02 Repair Materials

518.02 Repair Materials:

The following paragraph is added:

Mortar shall be an approved epoxy resin mortar or an approved polymer modified cementitious repair mortar.

Joint sealer shall be a polyurethane base, non-sag, elastomeric sealant conforming to subsection 714.04 of the specifications.

The following Subsection is added:

518.071 Construction Requirements:

For structures where the existing wearing surface is removed the Resident will, after the existing wearing surface is removed, designate areas where the existing granite curb joint mortar and the existing granite curb bedding mortar is to be repaired.

In areas designated for granite curb joint mortar repair, the existing granite curb joint mortar shall be removed between curb sections to a minimum depth of 1 inch from the face of curb. Any loose mortar shall also be removed. The repair area shall be repointed with new mortar and tooled concave at the face of curb. The mortar shall be proportioned, mixed, and applied in accordance with the Manufacturer's recommendations.

In areas designated for granite curb bedding mortar repair, the existing granite bedding mortar shall be removed under the curb to a minimum depth of 1 inch from the face of curb. Any loose mortar shall also be removed. The mortar shall be replaced with new mortar and finished with a 45 degree bevel at the face of curb. The mortar shall be proportioned, mixed,

and applied in accordance with the manufacturer's recommendations.

Existing joint sealer shall be removed from concrete parapet joints prior to installation of new elastomeric joint sealant. The joint sealant shall be installed in accordance with the manufacturer's recommendations.

518.10 Method of Measurement:

The following paragraph is added:

Repairing Granite Curb Joint and Bedding Mortar will be measured for payment by the linear foot along the face of curb, horizontally and vertically, complete and accepted.

Repairing Concrete Parapet Elastomeric Joint Sealer will be measured for payment by the linear foot along the interior, exterior and top face of the concrete parapet, complete and accepted.

518.11 Basis of Payment:

The following paragraphs are added:

Repairing Granite Curb Joint and Bedding Mortar will be paid for at the contract unit price per linear foot, which will include all materials, labor, equipment, and incidentals necessary to complete the work including removal of existing mortar.

Repairing Concrete Parapet Elastomeric Joint Sealer will be paid for at the contract unit price per linear foot, which will include all materials, labor, equipment, and incidentals necessary to complete the work including removal of existing sealant.

Payment will be made under:

Pay Item		Pay Unit
518.391	Repairing Granite Curb Joint and Bedding Mortar	Linear Foot
518.392	Repairing Concrete Parapet Elastomeric Joint Sealer	Linear Foot

SPECIAL PROVISION

SECTION 520

EXPANSION DEVICES – NON MODULAR

(Expansion Joint Modification)

520.01 Description

The following paragraph is added:

This work shall also include modifying the existing deck expansion joints at the abutments on the Route 202 Underpass Bridge as shown on the Plans and in accordance with these Specifications or as approved by the Resident. The Expansion Joint Modification work at each joint consists of removal and disposal of the existing elastomeric gland seal from the existing joint, removal of pavement from the top of abutment backwall and bridge deck to the limits shown in the plans, furnishing and installing new steel plates and steel edge members on the existing expansion joint angles and curb plates, furnishing and installing new elastomeric concrete joint headers, and furnishing and installing new elastomeric gland seals, as shown on the Plans.

520.03 Fabrication

The following paragraph is added:

For each Expansion Joint Modification the Contractor shall field measure the existing joint and joint components in the deck and curbs prior to development of shop drawings. The shop drawings shall indicate that they are based on field measurements.

520.02 Materials

The following paragraphs are added:

Materials for each new elastomeric gland seal shall meet the material requirements of Expansion Device - Compression Seal specified in this Subsection. The seal shall be a Watson Bowman Acme Wabo StripSeal model number SE-400 and the steel edge members that provide recesses for locking the gland seal in position shall be standard profile configuration “E” in the deck joint and “A” in the curb joints.

The elastomeric concrete placed between the joint plates and deck surface/top of backwall shall be a product be listed on the MaineDOT qualified products list of elastomeric concrete. The elastomeric concrete manufacturer’s onsite representative will not be required for this installation.

520.06 Installation

The following are added after the first paragraph:

On phased construction projects, gland seals shall be installed in one piece after the joint plates and steel edge members are installed for all construction phases. The Contractor shall

schedule the installation of the work when the ambient temperature allows the bridge steel to contract sufficiently so the gland seal may be installed without damage.

After the joint plates are installed the Contractor shall place elastomeric concrete between the joint plates and deck surface/top of backwall as shown in the Plans. The elastomeric concrete shall be cured in accordance with the manufacturer's recommendations.

Once the new gland seals are permanently installed, the Contractor shall thoroughly clean the abutment seats, bearings, and girder ends by pressure washing to remove any debris, salt, or other foreign contaminants.

520.07 Method of Measurement

The following paragraphs are added:

Expansion Joint Modifications will be measured as Each.

Preparation of existing surfaces for the proposed joint modifications including any cutting, grinding and cleaning of existing expansion joint and curb plates, will not be measured separately for payment, but shall be incidental to the Expansion Joint Modification item.

Furnishing, placing and curing elastomeric concrete between the joint plates and deck surface/top of backwall as shown in the Plans will not be measured separately for payment, but shall be incidental to the Expansion Joint Modification item.

Pressure washing the abutment seats after seal installation will not be measured separately for payment, but shall be incidental to the Expansion Joint Modification item.

520.08 Basis of Payment

The following paragraphs are added:

Expansion Joint Modification will be paid for at the Contract unit price which shall be full compensation for: removal and disposal of the existing elastomeric gland seal from the existing joint; removal of pavement and concrete from the top of abutment backwall and bridge deck to the limits shown in the plans; furnishing and installing new steel plates and steel edge members on the existing expansion joint angles and curb plates; furnishing, installing and curing new elastomeric concrete joint headers; and furnishing and installing new elastomeric gland seals; including all materials, labor, tools, equipment and incidentals necessary to complete the work in accordance with the Plans and Specifications.

Payment will be made under:

Pay Item		Pay Unit
520.2211	Expansion Joint Modification	Each

SPECIAL PROVISION

SECTION 524

TEMPORARY 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 plans for review and comment indicating the sizes and dimensions of protective shielding. 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.

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. Shielding on existing structures shall extend the full length of the bridge, and new structures shall

extend 10 feet beyond the edge of pavement of the roadway below as shown 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 for the existing bridge and new bridge. A singular area will be measured for the existing bridge and a singular area will be measure for the new bridge. No additional areas of sequence of placement, removal, or storage will be measured. The total area measure for payment will be that of the existing bridge plus that required for the new bridge. The width of the shielding shall be equal to the total width of the superstructure plus three feet beyond the fascia lines on each side of the structure.

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.

Payment will be made under:

Pay Item		Pay Unit
524.40	Protective Shielding - Steel Girders	Square Yard

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Temporary Concrete Barrier Type I - Supplied by Authority)

526.01 Description

The following paragraphs are added:

This work shall consist of loading, transporting, setting, resetting, removing, transporting and stacking temporary concrete barrier Type I – supplied by Authority of a shape designated on the Plans. 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 526.03, on both Contractor-supplied and Authority-supplied temporary concrete barriers.

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

Maintenance Area	Linear Feet of Barrier
Crosby Maintenance Area Mile 46 Southbound	2,200

Upon substantial completion of work, the Contractor shall remove and transport the concrete barrier - supplied by Authority to back to Crosby Maintenance Area.

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.

f. Connecting pins shall be a one inch diameter A36 steel hot rolled round rod that has a 4” long 180 degree bend at the top (“J” shaped). The rod shall be 2’-11” long pre-bend and 2’-7” long post bend.

526.021 Acceptance

The Resident shall have the authority to accept or reject all temporary concrete barrier Type I and temporary concrete barrier Type I – supplied by Authority used on the Project.

526.03 Construction Requirements

The following paragraphs are added:

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

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

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

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

Concrete barrier utilized on the final surface pavement course placed by this contract or other contractors within the limits of this project shall be done is such a manner that protects the pavement surface during placement, use, and removal operations.

Pins connecting the barrier shall be set flush with the top of the 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:

- 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.
- Barrier shall be dragged away from the travel lane to at least a 30-degree angle by the use of a cable.
- 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:

- One on top of each barrier.

- One on the traffic side of every barrier used in a taper.
- One on the traffic side of every other barrier at regularly spaced intervals and locations.
- Delineators shall be installed on both sides of the barrier if barrier is used to separate opposing traffic.
- Delineators shall be physically adhered so as to withstand the force of throw from a snow plow.
- If more than 25% of delineators in any 50 foot section of barrier fall off for any reason, the Contractor will be responsible for reinstalling all the delineators in that run at that their own cost.
- 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 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:

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

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Pier Protection Concrete Barrier)

526.01 Description

The following paragraph is added after the last paragraph:

Pier Protection Concrete Barrier for protection of Pier 3 at Center Road Underpass Bridge. The work includes excavation; furnishing and placement of: crushed stone below the barrier footing, drainage pipe sleeve through footing, reinforcing steel and concrete for barrier and barrier footing, sand to fill gap between existing pier face and back of barrier, reinforcing steel and concrete for side and top caps to contain the sand, preformed expansion joint filler and joint seal for side and top caps, and backfill; and attachment of a sign to an existing pier column; as shown in the Plans.

526.02 Materials

The first two paragraphs are deleted and replaced with the following:

a. Concrete Portland Cement Concrete shall meet the provisions of Special Provisions Section 502 – Structural Concrete, and Portland cement shall conform to the requirements of AASHTO M85, Type I, II, or III.

Cast-in-Place concrete for permanent pier protection concrete barrier shall be Class AAA-Deck (without synthetic reinforcement) in accordance with Special Provisions, Section 502.05 – Composition and Proportioning, with a minimum compressive strength of 4,500 psi.

The following paragraphs are added:

e. Crushed Stone The crushed stone placed below the pier protection barrier footing shall be Underdrain Backfill Material – Type C meeting the requirements of Section 703.22.

f. Drainage Pipe Sleeve The pipe sleeve through the footing shall be reinforced concrete pipe meeting the requirements of Section 706.02.

g. Sand The sand used to fill the gap between existing pier face and back of barrier shall be Aggregate for Sand Leveling meeting the requirements of Section 703.05.

h. Preformed Expansion Joint Filler The preformed expansion joint filler used to seal the side and top caps of the sand between the existing pier face and back of barrier shall meet the requirements of Section 705.01.

i. Joint Seal The joint seal used to seal the side and top caps of the sand between the existing pier face and back of barrier shall meet the requirements of Section 714.04.

j. Street Sign Supports The street sign support brackets for attaching signs to pier columns shall meet the requirements of Section 720.

526.04 Method of Measurement

The following paragraphs are added:

Pier Protection Concrete Barrier will be measured for payment by Lump Sum complete in place.

526.05 Basis of Payment

The following paragraphs are added:

The accepted quantities of Pier Protection Concrete Barrier will be paid for at the Contract lump sum price, complete in place. Such payment shall be full compensation for: excavation; furnishing and placement of: crushed stone below the barrier footing, drainage pipe sleeve through footing, reinforcing steel and concrete for barrier and barrier footing, sand to fill gap between existing pier face and back of barrier, reinforcing steel and concrete for side and top caps to contain the sand, preformed expansion joint filler and joint seal for side and top caps, and backfill; and attachment of a sign to an existing pier column; including all materials, labor, tools, equipment and incidentals necessary to complete the work in accordance with the Plans and Specifications.

Payment will be made under:

Pay Item		Pay Unit
526.35	Pier Protection Concrete Barrier	Lump Sum

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Median Barrier Type I)
(Median Barrier Transition Type I)

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 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.

Median Barrier Type I - Precast Double faced single slope barrier 2'- 0" wide at the base, 48" high and 45" reveal as shown on the Plans.

Median Barrier Transition Type I - Precast Section of barrier to transition from double faced single slope barrier to vertical section for guardrail attachment as shown on the Plans.

526.02 Materials

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

All concrete Median Barrier and Median Barrier Transitions, except Median Barrier Type II, shall be supplied as precast units produced by an approved commercial precasting plant. Precast concrete shall be Class P, in accordance with Special Provisions, Section 502.05 - Composition and Proportioning, with a minimum compressive strength of 4,500 psi. Cast-in-Place concrete shall be Class AAA-Deck (without synthetic reinforcement) in accordance with Special Provisions, Section 502.05 - Composition and Proportioning, with a minimum compressive strength of 4,500 psi.

Materials for barrier connection assemblies shall be fabricated in accordance with MaineDOT Standard Specification 504. All barrier connection assemblies shall be hot dip galvanized after fabrication in accordance with ASTM A123 and A153.

The second paragraph is amended by the addition of the following:

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.

526.03 Construction Requirements

The first and second paragraphs are deleted and replaced with the following:

All permanent concrete barrier and transition barrier shall be constructed in accordance with the provisions of Special Provision 502 – Composition and Proportioning, through Section 502.15 – Curing Concrete, inclusive, with the following additions:

a. The following is added to Section 502.10 A. – Construction of Forms, after Construction of Forms: "Permanent concrete barrier shall not be formed using slip forming methods. Temporary concrete barrier may be formed by precasting and/or prestressing methods."

The following paragraphs are added after the fourth paragraph:

d. Sections of barrier shall be uniform in color and in good condition, free from cracked or spalled surfaces.

e. Defects shall be divided into two categories, minor defects and major defects. Minor defects in the barrier may be repaired in the field. Major defects shall be cause for rejection of the section or, at the Authority's sole discretion, the section shall be repaired in a manner directed by the Resident.

   Minor defects are defined as holes, honeycombing or spalls which are 6 inch or less, in diameter, and which do not expose the outermost surface of the steel reinforcement. Surface voids 3/8 inch, or less, in diameter and 3/8 inch, or less, in depth are not considered defects and do not require repair.

   Major defects are defined as any defect which does not meet the definition of a minor defect or minor defects which, in aggregate, comprise more than 2% of the surface area of the barrier section.

   The repair of hardened concrete shall be as follows:

   - Minor Defect Repair: Repair shall be made with a fast set non-shrink patching material included on MaineDOT's list of prequalified materials. Methods of repair shall be acceptable to the Resident. The color of the repaired portion shall match as nearly as practicable, the color of the surrounding concrete. Repaired portions shall match shape and tolerance requirements.

   - Major Defect Repair: Major defect repair shall be pre-approved by the Engineer.

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

The layout and placement of the concrete barriers shall be to the alignment and elevations shown on the Plans or as directed. Before any barrier or transitions may be placed, the subbase shall be compacted to 95 percent density and fine graded to a tolerance of +/- 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 connection as detailed in the Plans.

526.04 Method of Measurement

The following paragraphs are added:

Median Barrier Type I will be measured for payment by the linear foot from end to end of each run of barrier measured along the centerline of the barrier complete in place. No deduction in pay length will be made for joints between abutting barrier sections.

Median Barrier Transition Type I will be measured by each barrier as shown on the Plans.

526.05 Basis of Payment

The following paragraphs are added:

The accepted quantities of Median Barrier Type I will be paid for at the Contract unit price per linear foot, as specified, complete in place. Such payment shall be full compensation for furnishing all material, assembling and all incidentals necessary to complete the work.

The accepted quantities of Median Barrier Transition Type I shall be paid for at the Contract unit price per each, as specified, complete in place.

Payment will be made under:

Pay Item		Pay Unit
526.351	Median Barrier Type I - Precast	Linear Foot
526.361	Median Barrier Transition Type I - Precast	Each

SPECIAL PROVISION

SECTION 527

ENERGY ABSORBING UNIT

(Energy Absorbing System (CAT))

527.01 Description

The following sentences are added:

The work consists of furnishing and installing a Crash-cushion Attenuating Terminal (CAT) System as a permanent energy absorbing system at the median opening locations as noted on the Plans, in accordance with these Specifications or as approved by the Resident.

527.02 Materials

The energy absorbing system shall be the SYRO® CAT-350 (SS-546) as manufactured by Trinity Industries, Inc. as approved and crash tested by the Federal Highway Administration. The units shall conform to the Federal NCHRP Report 350 Standard of Testing.

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.

527.03 Construction Requirements

Height of installation of Reset CAT units shall be 27.5-inches to the top of rail, transitioning to the standard height of 30-inches over a 25-foot length of Type 3d Double rail located immediately after the last post of the CAT unit.

The reveal on soil tubes for post #1 and #2 of the CAT units shall not exceed 3.5-inches. If site grading is be required to achieve the required rail height and soil tube reveal height, then such work will be incidental to the installation of the CAT unit(s).

A 12” x 36” reflective adhesive sheeting shall be applied to the nose of the CAT System after installation.

527.03 Method of Measurement

Energy Absorbing System (CAT) will be measured by each unit complete, in place and accepted.

527.05 Basis of Payment

The accepted quantity of Energy Absorbing Systems 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 in accordance with these Specifications and the Contract Plans.

Connection of the CAT Systems to the existing median guardrail will not be paid for separately, but shall be incidental to Item 527.301.

Removal of twisted ends and double-face guardrail necessary for installing the CAT Systems shall be measured separately for payment under Item 606.3631, Guardrail – Remove and Dispose.

New Guardrail Delineators, when required, will be paid for under Item 606.353.

Payment will be made under:

Pay Item		Pay Unit
527.301	Energy Absorbing System (CAT)	Each

SPECIAL PROVISION

SECTION 527

ENERGY ABSORBING UNIT

(Work Zone Crash Cushion)

527.01 Description

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

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

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

527.02 Materials

The following paragraph is added:

Only work zone crash cushions meeting the NCHRP Report 350 TL-3 crash test requirements may be used on the turnpike and local roadways with posted speeds of 45 MPH or greater. Work zone crash cushions meeting the NCHRP Report 350 TL-2 crash test requirements may be used on local roadways with posted speeds of 40 MPH or less. The Contractor shall provide the Resident with documentation of the proposed work zone crash cushion's NCHRP Report 350 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 35 mph for local roads and 65 mph for turnpike roadways unless otherwise noted and down posted on the Plans.

527.05 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
527.341	Work Zone Crash Cushions – TL-3	Unit
527.342	Work Zone Crash Cushions – TL-2	Unit

SECTION 602

PIPE LINING

(Flowable Concrete Fill)

602.01 Description

This work shall consist of providing and placing flowable concrete fill at the locations designated on the Plans.

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
▪ Air Entraining Admixtures	701.03
▪ Water Reducing Admixtures	701.04
▪ Fly Ash	701.10
▪ Fine Aggregate	703.01
▪ Accelerating Admixtures	AASHTO M-194 Type "C"

602.03 Composition and Proportioning

Flowable concrete fill shall be composed of a homogeneous mixture of Portland Cement and/or pozzolans, fine aggregate, water, and chemical admixtures proportioned according to these Specifications.

The flowable concrete fill shall be proportioned to produce a 28 day compressive strength of 110 psi.

The water cement ratio for flowable concrete fill shall not be high enough to cause segregation of the mix.

Air content of five to 15 percent is the target. Higher air contents may be acceptable but will increase set time. All flowable concrete fill shall be air entrained by the addition of an air entraining admixture or other chemical admixtures.

At least 30 days prior to the first placement, a flowable concrete fill mix design shall be submitted by the Contractor to the Resident for approval. No flowable concrete fill shall be placed on the Project until the mix design is approved by the Resident. At a minimum, the mix design submitted by the Contractor shall include the following:

A. Target water cement ratio
B. Target strength
C. Target air content

602.04 Quality Control

Process control measurements of air content, mix temperature, and slump shall be performed on the portion or portions of flowable concrete fill batches delivered to the site. At least one (1) set of measurements for air content, temperature, and slump of flowable concrete fill mix shall be performed per placement or per day, whichever is less frequent. Test cylinders will not be required.

Air content shall be measured following the requirements of AASHTO T152 utilizing Type B equipment.

Slump shall be measured by Modified Slump Test as described below.

Apparatus:

Scoop, measuring tape, flat edge, 3 in. x 6 in. cylinder mold open at both ends, and a flat non-absorbent surface.

Procedure:

1. Set cylinder upright on flat non-absorbent surface.
2. Scoop representative sample of flowable concrete fill.
3. Fill the cylinder, with the sample in one lift without tamping. Strike-off the top with the flat edge to form a level surface.
4. Clear any residue from around the bottom of the cylinder.
5. During a count of three seconds, lift the cylinder straight up allowing the sample to spread on the flat surface.
6. Measure the spread diameter to the nearest 1/2 inch. A spread of nine to 14 inches is considered flowable.

602.05 Batching

Measuring and batching of materials shall be performed at an approved batching plant, either commercial or otherwise.

602.06 Mixing and Delivery

The Contractor shall provide a Certificate of Compliance as described in Standard Specification Section 502, Structural Concrete, Subsection 502.0501, Quality Control METHOD C, for each truckload of flowable concrete fill.

602.07 Cold Weather Placement

The following amended requirements of Standard Specification Section 502, Structural Concrete, Subsection 502.08, Cold Weather Concrete, will apply.

The Cold Weather Temperature Table does not apply to flowable concrete fill. The minimum concrete temperature as placed shall be 40°F. No housing framework or heating will be required when placed under approved cold weather conditions.

602.08 Forms and Containment Berms

When necessary to contain flowable concrete fill within a defined area, berms shall be constructed of compacted granular material.

602.09 Placing Flowable Concrete Fill

Flowable concrete fill shall not be placed until forms and/or containment berms have been checked and approved. Flowable concrete fill shall not be placed under water. The method and sequence of placing flowable concrete fill shall be approved by the Resident before any flowable concrete fill is placed. A technical representative from the flowable concrete fill supplier shall be present during the initial placement.

All flowable concrete fill shall be placed before it has taken its initial set. Flowable concrete fill shall be placed in such a manner as to avoid separation and segregation of the mix. Consolidation, tamping, and vibration is not required or allowed.

Flowable concrete fill shall be discharged directly from the truck into the space to be filled. The drop height of the flowable concrete fill shall be as low as practicable. Flowable concrete fill shall not flow down the vertical face of a trench causing erosion of the trench face. Finishing and curing of flowable concrete fill is not required.

Flowable concrete fill placed will not be opened to traffic or covered with structural concrete or pavement for a minimum of 24-hours.

602.10 Method of Measurement

Flowable Concrete Fill satisfactorily placed and accepted will be measured by the cubic yard, in accordance with the pay limits established, if such limits have been established. If the Contractor elects to omit forms or berms, then any excavation or Flowable Concrete Fill placed beyond the pay limits as indicated on the Plans will not be paid for, but shall be at the Contractor's own expense.

602.11 Basis of Payment

The accepted work done under Flowable Concrete Fill will be paid for at the Contract unit price per cubic yard. Payment will be full compensation for furnishing and placing Flowable Concrete Fill, including all forms, berms, granular material, pumping, dewatering and necessary incidentals.

Payment will be made under:

Pay Item		Pay Unit
602.30	Flowable Concrete Fill	Cubic Yard

SPECIAL PROVISION

SECTION 603

PIPE CULVERTS AND STORM DRAINS

(Reinforced Concrete Pipe)
(Concrete Collar)

603.01 Description

The following paragraphs are added:

This work shall also consist of furnishing and installing Class III reinforced concrete pipe at the locations as shown on the Plans or as approved by the Resident. These pipes shall meet the requirements of Subsection 706.02.

This work also consists of furnishing and installing a concrete collar to join the existing concrete pipe to the proposed concrete 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.

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.

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.

Payment will be made under:

Pay Item		Pay Unit
603.155	12 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.165	15 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.1653	15 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.175	18 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.1753	18 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.195	24 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.205	30 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.215	36 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.225	42 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.235	48 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.245	54 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2551	60 inch Reinforced Concrete Pipe - Class IV	Linear Foot
603.28	Concrete Collar for Reinforced Concrete Pipe	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Bridge Transition- Type III)

606.01 Description

The following sentence is added:

This work shall consist of furnishing and installing Type III guardrail bridge attachments at bridge endposts on bridges over the turnpike.

The following Subsection is added:

606.071 Guardrail Attachments at Bridges

Bridge transition - Type III shall be used at bridge endpost locations.

606.08 Method of Measurement

The following sentence is added:

Guardrail attachment 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 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, one terminal connector, 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	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Terminal End - Trailing End)

606.01 Description

The following sentence is added:

This work shall also consist of furnishing and installing terminal end – trailing end, end treatments in accordance with these Specifications, the AASHTO-AGC-ARBTA Joint Committee Task Force 13 Report: A Guide to Standardized Highway Barrier Hardware, dated May 1995; 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 of 2 of Drawing SEW02a – Trailing End Terminal – Foundation Tube Option in the Task Force 13 Report noted above.

The offset bracket on the final post shall be wood to facilitate the attachment of the flexible delineator.

The following Subsection is added:

606.042 Terminal End - Trailing End

Installation of the terminal end – trailing end shall be in strict accordance with the AASHTO-AGC-ARBTA Joint Committee Task Force 13 Report and the Details on Sheet No. 1 of 2 of Drawing SEW02a – Trailing End Terminal – Foundation Tube Option.

606.08 Method of Measurement

The second paragraph is amended by the addition of: ", Terminal End - Trailing End," after the words "breakaway cable terminal".

606.09 Basis of Payment

The second paragraph is amended by the addition of: ", Terminal End - Trailing End," after the words "breakaway cable terminal".

Payment will be made under:

Pay Item		Pay Unit
606.277	Terminal End - Trailing End	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(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 50 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 that 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.

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 high-impact, ultraviolet and weather resistant thermoplastic.

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, complete in place, which price shall be full payment for furnishing and installing all components and for all incidentals necessary to complete the installation.

Payment will be made under:

Pay Item		Pay Unit
606.352	Reflectorized Beam Guardrail Delineator	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Delineator Post)
(Remove and Reset Delineator Post)

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 existing delineator posts within the Contract limits. The existing reflectorized delineator panels on reset posts shall be removed and replaced with new reflectorized delineator panels as required by the Resident.

Existing and reset delineator posts shall be located as follows:

Outside Shoulder:

- One at guardrail trailing ends (green delineator).
- Two at guardrail approach ends (red delineators at face end and first angle point, FLEAT red on traffic side).
- One at guardrail attachments to endposts (white delineator).

Median:

- One at guardrail trailing ends (green delineator).
- Two at guardrail approach ends (red delineators at face end and first angle point, CAT or FLEAT MT red on both sides).
- One at guardrail attachments to endposts (yellow delineator).

Other Locations:

- One at culvert outlets (red delineator).
- Twenty per mile evenly spaced at the edge of outside shoulder (white delineator).
- One at electrical junction boxes not associated with another item (blue 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.

Delineator posts shall be bolted to the back of the first wood post in the FLEAT 350's, CAT systems and FLEAT MT systems.

606.02 Materials

The following paragraphs are added:

Non-guardrail guardrail delineator posts shall conform to Subsection 606.02.

Guardrail delineator posts for the approach ends of 350 compliant end treatments shall be fabricated of a flexible, durable, non-discoloring polyethylene plastic capable of recovering from repeated impacts and resistant to solar degradation. The posts shall be a minimum of 2-inches in diameter, shall be ovalized at the top of the post to allow application of reflective sheeting, and shall be a maximum length of 36 inches. Color of the guardrail delineator posts shall be grey. Posts shall be capped at the top with a flexible rubber cap; Safe-Hit Flexible Guardrail Delineator Post or approved equal.

Reflective sheeting shall be applied to the top of the post and the color of the sheeting shall be as described in section 606.01. Dimensions of sheeting shall be 3-inches by 8-inches and shall conform to ASTM Type XI; 3MTM Diamond GradeTM DG3 Reflective Sheeting Series 4000 or approved equal.

Guardrail delineator posts shall be fastened to guardrail posts with two fasteners. For wooden posts, two 3-inch by 3/8-inch lag screws with 5/8-inch flat washers shall be used. For steel guardrail posts, two self-drilling ¼-inch by 2 inch screws with 5/8-inch flat washers shall be used.

The demountable reflectorized delineator panel shall meet the requirements of Subsection 719.06. Delineator panel shall be rectangles measuring 8" x 3".

606.03 Posts

The following paragraphs are added:

The installation of delineator posts shall conform to Subsection 606.03 for guardrail delineator posts.

The top of delineator posts associated with guardrail shall be installed 5’-0” (60”) above edge of pavement elevation. White delineator posts for mile delineation shall be 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 post shall be mounted on breakaway supports. The bottom of the sign shall be five feet from 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 installed and accepted. Delineator Posts Removed and Reset will be measured by each unit satisfactorily reset.

Mile Marker post shall be measured for payment as Delineator Post.

606.09 Basis of Payment

The following sentences are added:

The accepted quantity of Delineator Posts will be paid for at the Contract unit price per each which price shall be full compensation for the post, specified delineator or mile marker panel, complete in place.

The accepted quantity of Delineator Posts Removed and Reset will be paid for at the Contract unit price each, which price shall be full compensation for removing and resetting delineator panel or mile marker panel and posts and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
606.353	Delineator Post	Each
606.354	Delineator Post - Remove and Reset	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Guardrail – Remove, Modify and Reset)

606.01 Description

The following paragraphs are added:

This work shall consist of removing existing guardrail elements, component parts and hardware modifying and resetting.

New non-wood offset blocks conforming to NCHRP 350 Test Level 3 shall be installed on all guardrail being reset. The existing steel offset brackets and backup plates shall become the property of the Contractor.

The following Subsection is added:

606.021 General

The modified guardrail shall be installed in accordance with the applicable provisions of the Standard Specifications.

The materials removed shall be utilized in the reset guardrail locations with the following exceptions:

- Existing guardrail posts found to be unfit for reuse, in the opinion of the Resident, prior to or upon pulling;
- Existing steel backup plates when present;
- Existing steel offset brackets shall be replaced with non-wood offset blocks; and,
- Existing W-beam rail elements damaged by traffic and unfit for reuse, in the opinion of the Resident.

This work shall include all modifications to the existing guardrail system that may be necessary to install new non-wood offset blocks including, but not necessarily limited to, the drilling of new holes in the existing posts and cleaning and painting holes with a cold-applied zinc-rich paint. The completed guardrail assembly shall conform to NCHRP 350 Test Level 3.

Existing guardrail components removed, but not reset because of damage, shall become the property of the Contractor. Any materials lost or damaged by the Contractor's operations shall be replaced at no additional cost to the Authority.

Earth around each reset post shall be raked and compacted with a minimum 8 pound hand tamper or an approved device. Holes created due to resetting a post shall be filled with a similar surrounding material and compacted.

606.08 Method of Measurement

The following paragraphs are added:

Guardrail – Remove, Modify and Reset will be measured on a linear foot basis, from center-of-post to center-of-post, for the amount of rail satisfactorily reset.

Steel posts to replace damaged posts shall come from the stockpile of guardrail components to be disposed of, from this Contract and will not be measured separately for payment. If, in the opinion of the Resident, there are no suitable steel posts in the stockpile then steel posts will be measured for payment.

W-beam rail elements to replace damaged rail elements shall come from the stockpile of guardrail to be disposed from this Contract and will not be measured separately for payment. If, in the opinion of the Resident, there are no suitable W-beam rail elements in the stockpile then W-beam rail elements will be measured for payment.

606.09 Basis of Payment

The following paragraphs are added:

The accepted quantity of Guardrail - Remove, Modify and Reset will be paid for at the Contract unit price bid per linear foot. Such payment shall be full compensation for removing, modifying, and resetting guardrail, drilling holes in existing posts, and all equipment, labor and incidentals necessary to complete the work including any necessary modifications to the existing posts.

Furnishing and installing non-wood offset blocks will not be measured separately for payment, but shall be incidental to Item 606.3605, Guardrail - Remove, Modify and Reset, Single Rail, or Item 606.3606, Guardrail - Remove, Modify and Reset, Double Rail.

New steel posts, when measured for payment, will be paid for under Item 606.48, Single Galvanized Steel Post.

New W-beam rail components, when measured for payment, will be paid for under Item 606.178, Guardrail Beam.

Payment will be made under:

Pay Item		Pay Unit
606.3605	Guardrail - Remove, Modify and Reset, Single Rail	Linear Foot

SPECIAL PROVISIONS

SECTION 606

GUARDRAIL

(Guardrail Adjust)

606.01 Description

The following paragraphs are added:

This work shall consist of adjusting the height of the existing single and double rail guardrail at locations noted on the plans to a height of 30 inches, +/- ½ inch. Existing single and double rail shall also be adjusted for lean.

The guardrail adjustment shall take place at all necessary locations; approximate locations are listed in the schedule of guardrail limits both median and outside shoulder. Exact locations for adjustment shall be determined by the Resident.

The following Subsections are added:

606.021 General

All existing guardrail to be raised or lowered shall be completed prior to new guardrail or end treatments being attached.

606.036 Adjusting Existing Guardrail

Any materials or galvanizing damaged by the Contractor's operations shall be replaced or touched-up at no additional cost to the Authority.

Guardrail posts shall be raised to a minimum of five inches above final elevation prior to driving post to final elevation; this applies to both raising and lowering rail.

Any given length of guardrail to be adjusted shall be done in such a way that top of rail elevations do not vary drastically between each section of guardrail. Rail height tolerance shall be 30 inches, +/- 1/2 inch. The 30 inches shall be measured from the edge of pavement to the top of rail beam.

Rail shall be straightened to be perpendicular with the roadway where needed.

When the rail tapers from one bound to the other the rail shall be adjusted to the correct height on the farthest ends and shall be adjusted towards the center of the median to create a smooth line.

Earth around each reset post shall be raked and compacted with a minimum 8 pound hand tamper or an approved device. Holes created due to resetting a post shall be filled with a similar surrounding material and compacted.

606.06 Method of Measurement

The following sentence is added:

Adjusting of both single and double rail guardrail shall be measured by the linear foot of Guardrail Adjusted and accepted.

606.09 Basis of Payment

The following paragraphs are added:

Adjusting of single and double rail guardrail will be paid for at the Contract unit price per linear foot and shall be full compensation for furnishing all labor, equipment and materials necessary to complete the work. Rail will not be measured for payment until all compaction has been completed.

Payment will be made under:

Pay Item		Pay Unit
606.3621	Guardrail Adjust, Single Rail	Linear Foot

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Guardrail - Remove and Dispose)

606.01 Description

The following paragraph is added:

This work shall consist of removing, stockpiling and disposing of existing single and double guardrail elements, component parts and hardware unsuitable for replacement as approved by the Resident. At the completion of the Contract, any unused guardrail elements, posts, component parts and hardware shall become the property of the Contractor and shall be removed from Turnpike property.

606.08 Method of Measurement

The following paragraph is added:

Guardrail disposal will be measured on a linear foot basis of guardrail satisfactorily Removed and Disposed whether single rail or double rail. Double twisted end sections will be measured for payment on a linear foot basis as 25 feet of guardrail removed.

606.09 Basis of Payment

The following paragraphs are added:

The accepted quantity of guardrail removal will be paid for at the Contract unit price bid, which price shall be full compensation for removing, transporting and disposing all guardrail elements, component parts and hardware, equipment, labor and all incidentals necessary to complete the work. No additional payment will be made for double rail.

Stockpiling existing rail elements and posts will not be measured separately for payment, but shall be incidental to Item 606.3631.

Payment will be made under:

Pay Item		Pay Unit
606.3631	Guardrail - Remove and Dispose	Linear Foot

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Guardrail 350 FLEAT Terminal)

606.01 Description

The following sentences are added:

This work shall also consist of furnishing and installing a Guardrail 350 FLEAT (Flared Energy Absorbing Terminal) as manufactured by Road Systems, Inc., 1507 East 4th Street, Big Spring, Texas 79720, (915) 263-2435, and retroreflective adhesive sheeting in accordance with these Specifications and in reasonably close conformity with the lines and grades as shown on the Plans or as approved by the Resident.

This work shall also consist of removing, storing during construction and resetting existing FLEATs.

606.02 Materials

The following sentence is added:

The retroreflective sheeting shall meet the requirements of Subsection 719.01, Reflective Sheeting – Minimum ASTM, Type VII.

The following Subsections are added:

606.03 Posts

Wood offset blocks shall be toe-nailed to the wood post to prevent the blocks from moving.

606.041 Reflective Sheeting

The color for the reflective sheeting shall be silver (white) when installed on the outside shoulder.

606.08 Method of Measurement

The second paragraph is amended by the addition of: “Guardrail 350 FLEAT Terminal” after the words “breakaway cable terminal”.

Guardrail 350 FLEAT Terminal – Remove and Reset will be measured by each unit satisfactorily reset complete in place and accepted.

606.09 Basis of Payment

The second paragraph is amended by the addition of: “and Guardrail 350 FLEAT Terminal” after the words “breakaway cable terminal”.

Guardrail 350 FLEAT Terminal – Remove and Reset will be paid for at the Contract unit price, complete in place and accepted. Payment shall be full compensation for all labor, equipment, materials and incidentals necessary to remove, store during construction and reset in accordance with the Plans and Specifications.

The retroreflective sheeting will not be measured separately for payment, but shall be incidental to the Guardrail 350 FLEAT Terminal item.

Payment will be made under:

Pay Item		Pay Unit
606.80	Guardrail 350 FLEAT Terminal	Each

SPECIAL PROVISION

SECTION 607

FENCES

607.05 Chain Link Fence

This Subsection is amended by the addition of the following:

e. PVC Coated Where PVC coating is required for the chain link fence, posts, the gate, and all other hardware and appurtenances the PVC coating shall be black in color.

607.07 Basis of Payment

This Subsection is amended by the addition of the following:

Payment will be made under:

Pay Item		Pay Unit
607.173	Chain Link Fence 6’ PVC Coated - Black	Linear Foot

SPECIAL PROVISION

SECTION 610

STONE FILL, RIPRAP, STONE BLANKET AND STONE DITCH PROTECTION

(Stone Check Dams)

610.01 Description

Paragraph (f) is deleted and replaced with the following:

(f) Stone Ditch Protection - Machine placed stones on an earth or granular bedding at stone line ditches, stone downspouts and stone check dams.

This work shall also include the placement, removal and storage of the stone used for temporary stone check dams.

610.032 Placing Stones

The following paragraph is added:

Stone check dams shall be constructed in accordance with the details as shown on the Plans 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 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 Stone Check Dam 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.

Excavation will not be required for the placement of stone for Stone Check Dams.

Payment will be made under:

Pay Item		Pay Unit
610.181	Temporary Stone Check Dam	Cubic Yard

SPECIAL PROVISION

SECTION 610

STONE FILL, RIP RAP, STONE BLANKET, AND STONE DITCH PROTECTION

610.01 Description

The following protective covering is added:

g. Cobble Gravel Sand Mix Machine placed in stream stone mixture

610.02 Materials

The following materials are added:

Cobble Gravel Sand Mix 610.19

This material shall consist of natural field stone or natural river rock. Crushed stone from a quarry will not be permitted. Material gradation will approximate the following size distribution; amounts finer than each laboratory sieve (square openings)(percent by weight):

Percent Finer	Size (In)
D16	2
D30	4
D50	7
D84	16
D100	24

Notes:

1. A 10% fine content should be included in the mix to prevent flow from traveling through the voids.
2. The size of the individual stone particles will be determine by measuring its diameter across the intermediate axis. Stone particles shall be sound, tough, dense, resistant to the action of air and water, and suitable in all respects for the intended purpose.
3. The Contractor shall coordinate the selection and preparation of this mix with representatives from MTA and the design engineer two weeks prior to production, transportation and placement of this material.

610.03 Construction

Section 610.031, 610.032 a, b and c shall be deleted and replaced with the following:

The Contractor shall install material as shown on the plans, or as directed by the Resident.

610.05 Method of Measurement

Include Cobble Gravel Sand Mix in the description of material for the first paragraph.

610.06 Basis of Payment

Include Cobble Gravel Sand Mix in the description of material for the first and second paragraphs.

Payment will be made under:

Pay Item		Pay Unit
610.19	Cobble Gravel Sand Mix	Cubic Yard

SPECIAL PROVISION

SECTION 619

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".

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 upstation and downstation 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.

619.04 Applying Mulch

The third paragraph is deleted and replaced with the following:

Temporary stabilization with mulch or other non-erodable cover is required on all exposed soils that will not be worked for more than 7 days. Areas within 75 feet of a wetland or waterbody shall be stabilized within 48 hours of the initial disturbance of the soil or prior to any storm event, whichever comes first.

The Contractor is responsible for applying temporary mulch as necessary, in accordance with the latest edition of the BMP's, to minimize soil erosion prior to the application of the final slope treatment.

Temporary mulch applied during the winter months of November 1st through April 15th shall be applied at twice the standard temporary stabilization rate or 150 lbs. per 1,000 square feet or three tons/acre. Mulch shall not be spread on top of snow and shall be anchored with mulch netting on slopes steeper than eight percent unless erosion control blankets or erosion control mix is being used on the slopes.

The Contractor shall review his construction operations and staging to determine how much temporary mulching is required.

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

The following paragraphs are added:

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

Payment will be made under:

Pay Item		Pay Unit
619.1202	Temporary Mulch	Lump Sum

SPECIAL PROVISION

SECTION 621

LANDSCAPING

(Tree and Shrub Planting)

621.0002 Materials – General

The following sentence is added:

Submittals: The Contractor shall provide samples and data sheets for fertilizers for approval by the Resident.

621.0018 Layout

The following paragraph is added:

The Resident shall be on-site during placement of all plants to identify location of plantings prior to any excavating any tree/shrub pits and plantings.

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.

621.0038 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
621.043	Evergreen Tree (6’-8’) Group A	Each
621.044	Evergreen Tree (6’-8’) Group B	Each
621.248	Large Deciduous Tree (5’-6’) Group A	Each
621.279	Large Deciduous Tree (2.50”-3” Cal) Group A	Each
621.408	Dwarf Evergreen (2.50’-3’) Group B	Each
621.553	Deciduous Shrubs (3’-4’) Group B	Each
621.554	Deciduous Shrubs (3’-4’) Group C	Each
621.80	Establishment Period	LS

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 December 2002 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

625.031 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.

625.032 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.

625.033 Fittings

All fittings shall be compression type, designed for use with high density polyethylene plastic tubing (CTS).

625.034 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.

625.035 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:

Sieve (ASTM D422)	Percent Passing by Weight
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.

625.036 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.

625.037 Water Meter Pit

Water meter pits (materials and installation) shall conform to Section 604.

625.038 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

625.041 Service Pipe

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.

625.042 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.

625.043 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 rechlorine if the samples show presence of coliform, and the pipe section shall not be placed in service until all of 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

625.071 Water Service Supply Lines

Water service supply lines will be measured by the linear foot installed, to the nearest foot.

625.072 Water Meter Pits

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:

Pay Item		Pay Unit
625.106	Water service supply line (< 3 in)	Linear Foot
625.107	Water meter pit	EA

SPECIAL PROVISION

SECTION 626

FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS

(Quazite Junction Box)

626.02 General

The following paragraph is added:

Junction boxes for the electrical and communication conduit associated with the toll equipment, traffic signals, lighting, and intelligent transportations systems shall be polymer concrete. The boxes shall be 36” x 24” and 36” deep or 48” x 36” and 48” deep, as specified on the plans. The words ELECTRIC, LIGHTING, SIGNAL or COMMUNICATION shall be stamped on the cover as noted in the Plans or directed by the Resident. The boxes shall have an 8,000 lb. load rating. All existing Junction Boxes in useable condition shall be removed and relocated as directed by the Resident.

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 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
626.12	36" x 24" x 36" Quazite Junction Box	Each
626.13	48" x 36" x 48" Quazite Junction Box	Each

SPECIAL PROVISION

SECTION 626

FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS
(2 Inch Non-Metallic Conduit)

626.05 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
626.222	2 Inch Non-Metallic Conduit	Linear Foot

SPECIAL PROVISION

SECTION 626

FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS
(Horizontal Directional Drilled Conduit)

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.

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 40 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.

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.

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.

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.

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.

Payment will be made under:

Pay Item		Pay Unit
626.223	Horizontal Directional Drilled Conduit	Linear Foot

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary Painted Pavement Markings)

627.01 Description

The following paragraphs are added:

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

Lines on the turnpike and ramps shall be six inches wide. Lines on local roads shall be four inches wide.

Temporary raised pavement markers will not be allowed as a substitute for temporary painted pavement marking lines unless approved by the Resident for use as a transition between the existing pavement markings and the temporary painted pavement marking lines. Temporary raised pavement markings may be used as a substitute for temporary painted pavement markings when the markings are immediately adjacent to a concrete barrier or guardrail such that the markings will not be subject to traffic. The temporary raised pavement markers will be measured for payment as temporary painted pavement markings when their use has been approved by the Resident.

627.02 Materials

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

Pavement marking paint shall be 100 percent acrylic, low VOC, fast drying, white and yellow waterborne traffic paint.

The paint shall be formulated and processed specifically for service as a binder for beads, in such a manner as to produce maximum adhesion, refraction, and reflection. Any capillary action of the paint shall not be such as to cause complete coverage of the beads. The binder shall be 100 percent acrylic, as determined by infrared analysis according to ASTM D2621. VOC levels shall comply with ASTM D3960. Lead percentage shall comply with ASTM D3335. The paint shall be rated as non-combustible.

627.04 General

The third paragraph is deleted and replaced with the following:

Broken lines shall consist of alternate 10 foot painted line segments and 30 foot gaps.

Dotted white lines (DWL) shall consist of alternate three foot painted line segments and nine foot gaps.

627.09 Method of Measurement

Painted pavement marking lines will be measured by the linear foot.

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, will include the gaps when painted. Temporary Painted Pavement Marking lines will be measured for payment by the linear foot.

Removal of the Temporary Painted Pavement Marking lines will be measured for payment as Removing Existing Pavement Markings.

627.10 Basis of Payment

The following paragraphs are added:

The accepted quantity of Painted 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 markings.

Payment will be made under:

Pay Item		Pay Unit
627.68	Temporary 4 Inch Painted Pavement Marking Line – Yellow or White	Linear Foot
627.681	Temporary 6 Inch Painted Pavement Marking Line – Yellow or White	Linear Foot

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary Pavement Markings - Tape)

627.01 Description

The following sentence is added:

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

Temporary pavement marking tape is scheduled for all temporary pavement markings beyond the limits of the milling or paving west of the Plaza as noted on the Plans.

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.

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 will be made under:

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

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary Pavement Markings – Black Tape)

627.01 Description

The following sentence is added:

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

Temporary pavement marking black tape is scheduled for covering all conflicting existing pavement markings beyond the limits of the milling or paving west of the Plaza as noted on the Plans.

627.02 Materials

The following paragraph is added:

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

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 black pavement marking tape for traffic maintenance during construction as shown on the Plans or as directed by the Resident. The tape shall be cut to the varying lengths necessary to cover the conflicting painted pavement marking.

Temporary pavement marking tape that 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 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 placed. 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 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 Temporary Pavement Markings - Tape, as described above, will be incidental and no separate payment will be made.

Payment will be made under:

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

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary Raised Pavement Markers)

627.01 Description

The following sentences are added:

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

Temporary raised pavement markings may be used to delineate travel lanes after placement of pavement.

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, or two way, markers (Type Tom W-1, Y-1, Y-2, Grade WZ) as distributed by Davidson Plastics Co. (DAPCO), Kent, WA, or an approved equal. Colors shall conform to MUTCD requirements.

627.04 General

The following sentence is added:

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.

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 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:

Pay Item		Pay Unit
627.812	Temporary Raised Pavement Markers	Each

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS
(Pavement Marking Tape)

627.1 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.

627.2 Materials

The following sentence is added:

Pavement Marking Tape for dotted Route 202 lane markings shall be 3M Stamark Extended Season Tape Series 380IES– High Performance pavement marking tape, color-white, four (4) inch wide, as manufactured by 3M of St. Paul, Minnesota.

3M Traffic Safety Systems Division
Mr. Michael D. Allen
Tel: (401) 368-0438
Email: mdallen@mmm.com

627.4 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 6 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 ± ¼ 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."

627.9 Method of Measurements

The following paragraph is added:

The quantity of Pavement Marking Tape measured for payment will be the number of linear feet 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:

Pay Item		Pay Unit
627.94	Pavement Marking Tape	Linear Foot

SPECIAL PROVISION

SECTION 633

UTILITY TRENCH

(Propane Service Trench)

633.01 Description

Work shall consist of excavating, hauling, disposing, backfilling and compacting of all materials for the construction of a utility trench in accordance with the Specifications and in reasonably close conformity with the lines, grades, thickness and typical sections shown on the Plans. The utility trench shall be constructed for the installation of propane gas lines.

633.02 Materials

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 utility trench with Champagne's Energy, the Authority's propane supplier, through the Resident. Backfill shall be in accordance with Section 206, Structural Excavation. Propane gas lines shall be furnished and installed by the Authority's propane gas supplier. Excavation, bedding and backfill shall be completed by the Contractor.

Warning tapes shall be a detectable type made of solid yellow film with continuously printed black-letter caption: "CAUTION—PROPANE GAS BURIED BELOW". The warning tape shall be acid and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, six inches wide and four mils thick, continuously inscribed with a description of the utility.

633.04 Method of Measurement

Propane Service Trench shall be measured by the linear foot along the centerline of the trench complete and accepted.

633.05 Basis of Payment

Payment shall be made for at the Contract unit price for the total number of linear feet of trench completed and accepted, which shall be full compensation for 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:

Pay Item		Pay Unit
633.01	Propane Service Trench	Linear Foot

SPECIAL PROVISION

SECTION 633

GAS 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.

Peastone shall conform to ASTMC33 Grading 7 (Peastone).

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 peastone. 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 supports 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, peastone and gravel, backfilling and all equipment, labor and incidentals necessary to complete the work.

The top six inches of peastone and weed control fabric will not be paid for under this item, but shall be paid for under Item 633.31, Propane Tank Pad.

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 peastone 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:

Peastone shall conform to ASTMC33 Grading 7 (Peastone).

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 peastone 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, peastone, 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:

Pay Item		Pay Unit
633.31	Propane Tank Pad	Square Yard

SPECIAL PROVISION

SECTION 633

GAS UTILITY

(Propane Tank Relocation)

633.01 Description

This work shall consisting transferring remaining liquid propane Gas from the existing tanks, moving the tanks to the new location in accordance with these Specifications and as shown on the Plans, and refilling the tanks.

633.02 Materials

Materials shall meet the following requirements:

No material required – the contractor shall coordinate with the MTA LP Gas Provider for transfer.

633.03 General

Coordination with the MTA Gas Utility Champaign's Energy to transfer tanks and LP gas once new pad and supports are installed and existing tanks can be moved.

633.04 Method of Measurement

The quantity of Propane Tank Relocation will be measured by the contract lump sum price complete and accepted.

633.05 Basis of Payment

The Propane Tank relocation will be paid for at the contract lump sum price, complete and accepted. Payment shall be full compensation for all, equipment, labor and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
633.41	Propane Tank Relocation	LS

SPECIAL PROVISION

SECTION 634

HIGHWAY LIGHTING

(Replacement LED Fixture)
(Remove and Reset 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 removing existing luminaires from light standards remaining in place and installing a new LED luminaires with all new associated appurtenances and wiring system 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.

All removed existing luminaires shall be carefully transported and stacked at the MTA's Sign Shop at Mile 58 NB. All new light standards will be 35 feet tall with 2 foot riser and a 10 foot offset arm.

Existing lighting is intended to remain operational until new luminaires are installed and operational. Existing luminaires, conduit and lighting standards shall be protected until approved by the Resident to be removed. Temporary lighting that may be needed during removing and resetting of existing light standards or for other locations where existing lighting is made inoperative with prior approval of the Resident shall have illumination provided by Item 652.39 Portable Light Towers until new highway lighting is operational. Item 652.39 Portable Light Towers shall be installed and operational along the temporary southbound on ramp prior to opening to traffic.

634.021 Materials

The following paragraphs are added:

Underground junction boxes shall be precast concrete (Item 626.11). Provide manufacturer's listed cover for each junction box with logo stating "LIGHTING". All pull 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. Acceptable LED luminaire alternatives shall be stated on the plans.

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 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 at the plaza shall be maintained while relocated light standards are being installed and made fully operational.

634.06 Luminaires

In the second paragraph “12” is replaced with “10” and “THHN” replaced with “XHHW-2” to read:

“Number 10 wires AWG copper stranded XHHW-2”.

634.092 Method of Measurement

The following sentence is added:

Replacement LED Fixture and Remove and Reset Light Standard 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 removing the existing luminaire and delivering to the MTA, new LED fixture, ballast, lamp 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 MTA, transporting and installing the replacement light pole, resetting the breakaway device or installing a new breakaway device, new pole wiring to the new LED fixture and all incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
634.175	Replacement LED Fixture	Each
634.208	Remove and Reset Light Standard	Each
634.231	Conventional Light Standard with LED Fixture	Each

SPECIAL PROVISION

SECTION 643

TRAFFIC SIGNALS

(Lane Use Signals)

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 Trans-Tech DOT2424RG-175 or approved equal. See Appendix F 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. New Pelco (or equal) mounting brackets may be needed and will be incidental to the installation of the new lane use signal. The contractor shall provide a 1 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:

Pay Item		Pay Unit
643.712	Lane Use Signal	Each

SPECIAL PROVISION

SECTION 643

TRAFFIC SIGNALS

The entire Section 643 Traffic Signals is deleted and replaced with the following:

643.01 Description This work shall consist of furnishing and installing or modifying existing traffic signals at the locations indicated herein and as shown in the Plans. Work shall include traffic signal modifications, new controllers, cabinets, cabinet hardware, new and relocated signal heads and signs, new video detection systems, and new interconnect wiring. The work shall include poles, foundations, backfill, and all necessary fittings, cables, and components as ordered.

The work shall consist of furnishing and installing a new mast arm traffic signal system at the intersection of US 202 / ME 4 / ME 115 and the I-95 Southbound ramps / ME 26A. The signal system shall be constructed as specified herein and as shown on the Plans.

The work shall consist of modifying an existing span wire traffic signal system at the intersection of US 202 / ME 4 / ME 115 and the I-95 Northbound ramps. The existing signal system shall be constructed as specified herein and as shown on the Plans, including furnishing and installing a new controller in a new controller cabinet, a new galvanized steel strain pole, span wire and tether wires, and relocating signal heads and signs to the new span wire

The work shall consist of modifying an existing span wire traffic signal system at the intersection of US 202 / ME 4 / ME 115 and ME 100 / ME 115. The existing signal system shall be constructed as specified herein and as shown on the Plans, including furnishing and installing a new controller in a new controller cabinet.

The work shall consist of modifying an existing span wire traffic signal system at the intersection of US 202 and Brown Street/Shaker Street. The existing signal system shall be constructed as specified herein and as shown on the Plans, including furnishing and installing a new controller in a new controller cabinet.

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.

All traffic signal controller timing parameters shall be adjusted as need to provide optimized coordinated and free operations.

643.02 Materials A list of the recommended materials required to install the system may be included as an amendment to this specification or in the Plans, but the Authority will give no guarantee as to the completeness of these lists.

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.

643.021 Traffic Signal Heads Housings shall be constructed of die cast aluminum or polycarbonate with a smooth outer surface and shall be capable of holding the optical units securely in place. Housings shall be adaptable for pedestal, bracket, or rigid mast arm 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. All traffic signals shall be furnished with a 5 inch backplate. 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.

One cap shall be supplied with each 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.

Mast arm brackets shall be banded or cabled with "Astro-Brac" by Pelco or an approved equal.

LED lamps shall have a regulated power supply designed to electrically protect the diodes. The lamp shall be water tight 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 GelCore as manufactured by General Electric or an approved equal.

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 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 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 20 W and have an initial output of 1900-lumens.

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.

643.022 Additional Materials Materials shall also meet the requirements in the following Special Provision to Section 700 – Materials:

Twelve (12) Position Fiber Optic Patch Panel	718.13
Ethernet Switch with Fiber Optic Interfaces	718.14
Messenger Wire	718.15

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.

The Contractor shall select and design a foundation system for the steel support structures meeting the design criteria of the 2013 edition of the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" with 2014 and 2015 interims, unless otherwise specified by the Authority. The foundation design shall be in accordance with actual soil conditions as indicated in the geotechnical engineering report and the subsurface explorations. The foundation system design shop drawings and calculations shall be prepared and stamped by a licensed Professional Engineer in the State of Maine for each foundation system. The Contractor is encouraged to consider the standard foundation designs contained in the 2014 edition of the MaineDOT Standard Details, specifically Standards 626(01) through 626(04). Construction of the foundation shall not commence until the Authority has reviewed and approved the foundation design.

Anchor bolts. Section 720.07 of the Standard Specifications shall apply.

Strain pole and mast-arm structure and foundations 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 cable 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 controller shall operate on 120 volt, 60 hertz (cycle) alternating current, and shall be delivered completely wired and enclosed in a weatherproof cabinet. All components shall be new, and unless noted, the use of solid state components shall be required. Controllers shall be programmable, menu driven, contain an Ethernet communication port (RJ-45 connection) and one hundred (100) logic processor commands shall be accessible from the front panel of the controller or through remote database management software. The controller shall meet, as a minimum, all applicable sections of the NEMA Standards Publications for TS2 and NTCIP. The controller shall comply with NEMA TS-2 Type 1. The controller shall be a Cobalt as manufactured by the Econolite Control Group.

643.041 Bench test. All components of the controller and cabinet shall be bench tested for a minimum of 72 continuous hours by the Contractor at the Contractor's facility prior to delivery to the project. A representative of the Authority shall verify the test check list. The Contractor shall notify the Authority at least 3 days prior to testing as to the date, time and place that tests are to be performed. Testing shall be performed by a qualified Signal Technician using a test board and in conformance with the design loads, phasing, timing and auxiliary equipment such as pre-emption phases. Any defective component shall be replaced, retested and continuous testing continued. Test results shall be documented on a check list as provided by the Authority and these results attested by the signature of the performing technician. Upon completion of satisfactory bench testing, a written approval will be supplied to the Contractor by the Engineer for delivery to the project only. This approval does not relieve the Contractor from ensuring proper operation of the equipment. The approval shall accompany the cabinet and controller when delivered to the project.

The checklist will contain the following items:

(a) Install all of the equipment into the cabinet as required per the plans and specifications.
(b) Set the phase timings of the controller in accordance with plans.
(c) Wire in load lamps, minimum rating of 90 watts, to the load packs in simulation to the intersection as per the plans.
(d) Check all of the wiring connections for physical tightness.
(e) Power up the cabinet.
(f) Observe the sequences, timings and operations of the controller in conformance to the plans and specifications.
(g) Using the phase test push buttons, insert a call for a phase and observe this phase as it is being called for sequencing, timing and returning to rest condition. Only one separate call for each phase shall be used.
(h) Test the police panel switches, manual, on/off, flash/auto and test the police manual cord if present in the panel.
(i) Test for Fire Pre-emption - Optical Detector - with the receivers wired in the cabinet and using an emitter, test each fire run as per the plans. Hard Wired - Attach a temporary push button as per the plans and test each fire run as per the plans.
(j) Check exhaust fan controls by applying heat from a 100 watt lamp on an extension cord to the thermostat.

(k) Check heat lamp controls by cooling the thermostat.
(l) Check conflict monitor by testing for any conflicting Greens or Yellows by the use of a jumper wire attached to a displayed Green or Yellow and to the other non-parent Greens or Yellows to ascertain that conflicting colors are not present.

When all of the above procedures have been completed, the performing technician shall document the results on the approved form as provided by the Authority.

643.042 Controller Cabinet. Controller, timing and flashing mechanisms, circuitry, and other components shall be enclosed within a weather tight 1/8 inch thick aluminum "P-44" type cabinet with 2 shelves, side and back panels, a main door and a switch compartment door on a 12 inch aluminum extension base unless otherwise indicated in the Plans. All exterior seams shall be continuously welded.

Two adjustable "C" mounting channels to allow for positioning of panels and shelves shall be installed on both side walls and back of the cabinet.

The 2 adjustable equipment shelves shall span the entire width of the cabinet. No part of the back panel shall extend above the equipment shelves.

The cabinet door shall be a minimum of 80% of the front surface area and shall be hinged on the right side with a continuous hinge. The cabinet doorframe shall be flanged on all four sides with a light/alarm switch bracket located in the upper right hand corner. The latching mechanism shall be a 3-point draw roller type made of steel with a center catch. The operating handle shall have provisions for padlocking in the closed position. The main lock shall be a Corbin 1548-1 and furnished with two keys as specified by the Authority. The door shall have a gasket that forms a weather tight seal between the door and the cabinet. The lower portion of the door shall be vented with louvers on the exterior to provide 100 cfm of air flow. A filter held firmly in place by side and bottom brackets shall cover the louver vents on the door's interior. A door restraint shall be furnished to prevent door movement during windy conditions.

The exterior of the cabinet shall be natural aluminum. The interior surface of the cabinet and door, including shelves shall be painted with appliance white alkyd baked enamel paint.

A switch compartment with a removable back plate shall be furnished on the main door. The compartment door opening shall be flanged on all sides. The compartment door shall be hinged on the right side with a continuous hinge and have a gasket that forms a weather tight seal when closed. A compartment door lock Corbin R557565 with keyhole cover and two keys shall be furnished. The switch compartment shall contain:

(a) Signal automatic/flash switch.
(b) Signal on/off switch.
(c) Signal automatic/manual switch.
(d) A manual advanced police button.

A ventilation fan powered by a 115 volt single phase motor and rated at an air flow of 100 cfm shall be installed at the top of the cabinet. The screened exhaust vent shall be vented between the top of the cabinet and the door. The ventilation fan shall be controlled by means of a thermostat with a range of 70°F to 160°F with overload protection and noise suppressor.

A cabinet heat lamp of 100/150 watts shall be installed. The heat lamp shall be controlled by a thermostat located on the left side of the cabinet with a range from 0°F to 50°F.

The cabinet power panel shall be installed on the right side of the cabinet 8 inches up from the mounting flange. It shall have a 30 amp and a 15 amp circuit breaker. The 15 amp breaker shall service the GFI duplex outlet, a switched light outlet, the heat lamp and the ventilation fan. The 30 amp breaker shall service all other items. The GFI outlet shall be mounted on the power panel. The switched light outlet shall be mounted on the upper right side. An AC line filter and ISTROL series line filter for controller and conflict monitor and lightning/surge suppressor shall be installed on the power panel.

The cabinet trouble light shall be a stainless steel, flex shaft type, 18 inch in length with on/off switch. Trouble light shall be mounted on the right-inside of the cabinet.

The cabinet shall be furnished with a resealable plastic print holder and 3 sets of cabinet prints showing all wiring and one copy of the intersection drawings. Print holder shall be mounted on the inside of the door.

643.043 Power and SDLC Bus Panel. The Power and SDLC BUS Panel shall be manufactured from 1/8 inch, 5052-H32 aluminum. It shall provide a central location to supply filtered power for the controller, malfunction management unit, cabinet power supply, and all auxiliary equipment. It shall include the SDLC Bus connecting cables wired to a barrier type terminal block. As an alternate, SDLC Bus connections may be made via an SDLC Hub Assembly.

All cabinet equipment requiring filtered power to operate shall be hardwired directly to the supplied barrier type terminal blocks on the Power and SDLC BUS Panel.

All AC+ power sources shall be protected with a removable plastic cover plate.

An SDLC Hub Assembly shall include a minimum of four and maximum of eight D-Subminiature Female 15 pin (DB15) connectors that are wired in series.

643.044 Detector Rack. A minimum of one Loop Detector rack shall be provided in each cabinet. Detector racks shall be shelf mounted on the bottom shelf of the cabinet and shall support up to 16 channels of loop detection (either eight 2 channel detectors or four 4 channel detectors), 4 channels of preemption devices (either two - 2 channel devices or one – 4 channel device) and one BIU.

All connections to the back of the detector racks to the detector cards shall be soldered to a 44 terminal, double row, 0.156 inch contact spacing, Cinch Jones card edge connector 50-44A-30M, or equivalent centered vertically for each detector module. All designations shall correspond to the requirements of the TS2-2003 specification.

Card Guides shall be provided on the top and bottom of the card rack for each connector position.

Each cabinet shall contain a detector interface panel per each detector rack for the purpose of connecting field loops and vehicle detector amplifiers. The panels shall be manufactured from 1/8 inch thick 5052-H32 Aluminum and use barrier type terminal blocks.

One 16-position interface panel shall be provided for a 16-channel rack cabinet. The vehicle detection panel shall be installed on the left side of the cabinet; the bottom edge shall be 10 inches from the mounting flange.

Each interface panel shall allow for the connection of eight or sixteen independent field loops. A ground bus terminal shall be provided between each loop pair terminal to provide a termination for the loop lead-in cable ground wire.

Each interface panel shall provide a barrier style terminal block to terminate the field wires for up to two 2-channel preemption devices.

Lightning protection device mounting holes shall be provided to accommodate the potential usage of a lightning protection device. Loop field terminals shall be protected from inductive transient surges by 150 V, 10 A Metal Oxide Varistor. All detector terminals shall be identified by number and shall correspond with the cabinet print.

A cable consisting of 20 AWG twisted pair wires shall be wired directly from the interface panel to the detector rack. The twisted pair wires shall be color coded red and white wire. No connectors shall be used to connect the interface panel to the detector rack.

All termination points shall be identified by a unique number and silk screened on the panel.

Each detector rack shall accommodate rack mountable preemption devices such as Opticom

643.045 Load Switches. Load switches shall be solid state and shall conform to the requirements of Section 6.2 of the NEMA TS2 Standard.

Signal load switches shall have a minimum rating of 10 A at 120 VAC for an incandescent lamp load.

The front of the load switch shall be provided with six indicators to show the input and output signal from the controller to the load switch.

Load switches shall be dedicated per phase. The use of load switches for other partial phases is not acceptable except under the provisions of the second paragraph of Section 643.06 of this Special Provision.

The full complement of load switches shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed.

The back panel shall have 16 load switch sockets completely wired including MMU. All terminals shall be labeled for identification corresponding to the back panel print.

643.046 Flash Transfer Relays. All flash transfer relays shall meet the requirements of Section 6.4 of the NEMA TS2 Standard.

The coil of the flash transfer relay must be de-energized for flash operation.

The full complement of relays shall be supplied with each cabinet to allow for maximum phase utilization for which the cabinet is designed. The relay sockets shall be wired as follows:

Relay	Assignment

Flash Relay 1	Load Switch 1 and 2
Flash Relay 2	Load Switch 3 and 4
Flash Relay 3	Load Switch 5 and 6
Flash Relay 4	Load Switch 7 and 8
Flash Relay 5	Load Switch 9 and 10
Flash Relay 6	Load Switch 11 and 12

The cabinet shall be supplied with one (1) NEMA Type 2 solid state cube type flasher.

The flasher shall be solid state and shall conform to the requirements of Section 6.3 of the NEMA TS2 Standard. The signal flasher shall be mounted on the back panel.

Flashing of field circuits for the purpose of intersection flash shall be accomplished by a separate flasher.

The flasher shall be rated at 15 amperes, double pole with a nominal flash rate of 60 FPM.

Vehicle Detector Test Panel. A vehicle detector test panel shall be surface mounted on the interior side of the cabinet door; a push type test button shall be labeled and furnished for each phase. Pushing the button shall cause a detector call to be placed on the controller for as long as the button is held. Test panel wires shall be enclosed in a cable harness.

643.047 Controller On/Off Switch. A controller on/off switch shall be surface mounted on the interior side of the cabinet door or in the upper right hand side of the cabinet.

643.048 Malfunction Management Unit (MMU). Each cabinet assembly shall be supplied with one MMU as defined by the requirements of Section 4 of the NEMA TS2 Standard. The MMU shall retain, at a minimum, complete information on the last 9 events including which channels were active, the date and the time. The assignment of conflicting channels shall be by means of a standard NEMA program card. The MMU shall be wired to detect absence of voltage on all channels. The MMU shall have an Ethernet port for downloading. All software and cabling from the manufacturer will be supplied to the Authority to allow communication to the device with a PC.

Malfunction Management Units shall be a Type 16. The MMU shall be Reno A&E Model MMU-1600GE or approved equal.

643.049 Bus Interface Units (BIU). All BIUs shall meet the requirements of Section 8 of the NEMA TS2 Standard.

The full complement of Econolite Control Products, Inc. Model 32860G1 BIU's, or an approved equal, shall be supplied with each TS2-Type 2 cabinet to allow for maximum phase and function utilization for which the cabinet is designed.

Each Bus Interface Unit shall include power on, transmit and valid data indicators. All indicators shall be LEDs.

643.05 Cabinet Power Supply. The cabinet power supply shall meet the requirements of Section 5.3.5 of the NEMA TS2 Standard.

The cabinet power supply shall provide LED indicators for the line frequency, 12 VDC, 12 VAC, and 24 VDC outputs.

The cabinet power supply shall provide (on the front panel) jack plugs for access to the +24 VDC for test purposes.

One Econolite Control Products, Inc. Model 1084-003 cabinet power supply, or approved equal, shall be supplied with each cabinet assembly and shall be wired directly to the Power Bus Assembly via a 12-pin Molex Robotic type connector Model# 54332-1270 or an approved equal.

643.06 Fire Pre-emption. Fire pre-emption shall be activated by optical detection equipment with optical detectors. Fire pre-emption shall clear the existing phase through a normal clearance followed by the fire phase as shown on the plans for the minimum time specified. The fire phase shall give a green in the called direction; the confirmation light shall be activated only during the fire pre-emption phase, after the call phase is satisfied. Upon release of the fire pre-emption, the controller shall provide a green to the major movement. Phase selector will be Opticom model 764 as manufactured by Global Traffic Technologies. All software and cabling from the manufacturer will be supplied to the Authority to allow communication to the device with a PC.

The engineering, design, and integration of the fire pre-emption shall be by the manufacturer of the equipment, in cooperation with the supplier of the signal controller equipment. Preemption receivers will be Opticom model 700 as required.

The confirmation light shall be operated by a back panel load switch (LS #9 Yellow).

Confirmation light shall be a self-contained 120 volt AC industrial strobe light beacon with a weather-resistant, fully enclosed, rugged, cast aluminum base and lexan red optic lens as manufactured by Whelen Engineering Company Inc. or an approved equal.

Optical detector locations shall be verified by the Engineer to assure optimum reception. Optical detector cable shall run unspliced from the optical detector head to the controller cabinet.

643.07 Video Detection.

643.071 Description

The work shall consist of furnishing and installing a video detection system (GridSmart video-based vehicle detection system – no approved equals) at the traffic signals located at the intersections of US 202 / ME 4 / ME 115 and the Maine Turnpike Exit 63 (I-95) interchange ramps. The following subsection shall be added:

643.072 Video Detection System The video detection system shall meet the following minimum requirements:

VIDEO DETECTION DEVICE

The video detection device shall be a video based 360 degree detection device and meet the following minimum performance standards:

a. The device shall utilize three dimensional, omni-directional tracking to provide real time vehicle detection. This data will be used by the local traffic signal controller as dynamic phase calls to service vehicles on a signalized approach.

b. The device shall include a single wide camera with an ultra-wide lens housed in a ruggedized Wintel platform.
c. The device shall include vision stabilization, vehicle intent digital signal processing technology and electronic shutter speed control.
d. A device control card and module shall be housed in the traffic signal control cabinet and support the interface between the field camera and the traffic signal controller.
e. Multiple approach detection zone programming shall be user configurable.
f. The device shall have the ability to interface to NEMA TS-1, NEMA TS-2, type 1 and NEMA TS-2, type 2 controllers providing real time vehicle demand data.
g. The detection device shall support the following detection functions:
    A. Vehicle Presence
    B. Stopped Vehicle Presence
    C. Directional
    D. Pedestrian
h. The detection device shall support the following vehicle classification functions:
    A. Turn and Vehicle Speed Data
    B. Vehicle Count per Lane
    C. Vehicle Class Data, compiled in 32 user defined bins
    D. Pedestrian
i. The device shall be supplied complete with a traffic simulator feature that will allow for modeling of various traffic flow scenarios for system testing purposes.
j. The device shall be wirelessly configurable utilizing intuitive GUI based programming software.
k. The device shall employ a vehicle tracking point system that will follow these data points through the intersection image to minimize occlusion.

VIDEO CAMERAS

The Video Detection System shall be supplied with two (2) cameras – if the installed system does not require two cameras, the second camera shall be furnished to the Authority as a spare. The cameras shall meet the following minimum requirements:

a. The cameras shall draw 18 watts of electrical power.
b. The cameras shall be support Wi-Fi transmission for initial system set-up and device diagnostics.
c. Operating range shall be -34˚C to 74C˚ and humidity level up to 100%.
d. Camera enclosures shall be ¼” thick cast aluminum and conform to NEMA – 4 specifications, weather adjustable and a sunshield.
e. The lens shall be 360˚wide, 5 megapixel with a CMOS image sensor.
f. Transmission at 100 Mbps IP, 1-10,000 LUX at a useable image digital output.

CONTROL CARD AND MODULE

The control card and module shall meet the following minimum requirements:

a. Card and module shall operate at 120 VAC, 60 Hz at 1.0 amps.
b. Operating range shall be -35˚C to 75C˚ and humidity level up to 100%.
c. The card and module shall be rack mountable in the cabinet.

d. Processing shall be PC-104, embedded controller consisting of a dual Pentium core, 2.8 Ghz, 1028 RAM and a 32 GB diskless hard drive.
e. The module shall be dual channel.
f. The Module shall come preloaded with GridSmart® software and the price of the Video Detection System shall include the cost of the software licenses and performance module.

643.08 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 screw driver.

643.09 Flashers. Intersection beacon flashers shall be housed in an approved cabinet containing: 25 A NEMA cube-type flasher, 10 A circuit breaker and disconnect switch. All components shall be completely wired and mounted within the cabinet. Painting shall be in accordance with 643.1531 of this Special Provision.

643.10 Pedestals.

643.11 Radio and television interference. Electrical equipment shall be prevented from interfering with radio and television reception.

643.12 Cable and Wire. Cable shall be plastic covered cable meeting the applicable requirements of the International Municipal Signal Association (IMSA) specifications. The conductor color coding shall not be by means of printed code. Actual color coding shall be used. The minimum size wire for the circuits shall be as follows:

Service	*A.W.G.#*
(a) To Controller	8 Stranded
(b) Controller to Pole or Pedestal	12 Stranded
(c) Pole or Pedestal to Receptacles	14 Stranded
(d) Equipment Grounding Conductor	8 Stranded

Interconnect cable shall be 6-strand multimode fiber optic cable in accordance with Section 655. Interconnect cable installed in conduit shall be suitable for outside plant installations in an underground environment. Interconnect cable installed aerially shall be continuously lashed to a messenger cable that is connected to each utility pole in a manner acceptable to the utility pole owner or as directed by the Resident.

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.

643.13 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 of federal yellow No. 13538. The door face and inside visor shall be federal black No. 17038.

643.14 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.

643.15 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).

A preconstruction meeting with the Contractor, signal Subcontractor, Engineer and Maine Turnpike 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. When directed, the concrete foundation for the controller cabinet shall be raised to any height up to 18 inches above the surface. Chamfer strips shall be used on all signal controller cabinet foundations. Forms shall be inspected before concrete is placed.

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 ¼ inch in 5 feet.

Wood poles with a back-guy cable shall be placed in the ground to a depth of 20% of their overall length. 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.

643.152 Service and Meter Box. Electrical Service will be provided by the MTA, the Contractor shall run the needed conduit and wiring from the signal cabinet to the existing and proposed utility buildings.

Power for the traffic signals at the Turnpike ramps shall come from the power panels in the Toll Plaza building closest to the signal controller cabinet. The Contractor shall coordinate access to the toll buildings with the Resident. Contractor shall modify the electrical panels in the toll buildings as indicated herein, as shown in the Plans, or as directed by the Resident. The power panel shall be clearly labeled to indicate which circuit(s) service the traffic signal control cabinet. The traffic signal circuit shall be connected to the toll building back-up generator to provide back-up power in the event of utility power failure. The Contractor is responsible for all equipment required to provide power to the I-95 ramp intersections from the toll building power panels.

643.153 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.

Each mast arm assembly 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.

Multiple housings on a single post shall be grouped together using 1-1/2 inch galvanized pipe and 1-1/2 inch galvanized rail fittings. All attachments to the posts shall be made by means of adapters conforming to the following. 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 inch 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. The center of all housings shall be in the same horizontal plane.

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 or made using waterproof wire nuts. 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 street light 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 connected to the ground rod at the controller cabinet.

643.1531 Painting. All paint shall conform to Section 708 of the Standard Specifications. The following colors of enamel shall be used:

(a) Controller Cabinet	Outside: Natural Aluminum
(b) Housings	Yellow (3)

(c) Visors	Inside: Black (2); Outside: Yellow (3)
(d) Meter Box	Same color as its mounting.

	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.

Operating sequences shall be as shown on the plans or ordered.

Operating sequences shall be verified by testing.

Where fire preemption equipment is required, 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.

643.154 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 installed on signal arms shall be mounted with "Astro Bracs" at a right angle to the roadway.

The Contractor shall be responsible for modifying any traffic signal hardware or timing to adjust to the Contractor's construction scheduling. This work may include the installation of temporary span wire signal systems and timing modifications. All temporary wiring and cabling shall be performed by licensed electricians. Timings for temporary traffic signal systems shall be submitted to the Resident for approval prior to making the necessary modifications to the traffic signal system. The Contractor shall be responsible for any subsequent retiming or updated timing plans to accommodate the traffic flows throughout construction. The Contractor shall remove any temporary traffic signal equipment and reset the traffic signal to it final condition when the temporary adjustment is no longer required.

643.155 Operation. The Contractor shall commence the operation of the signal system only when permitted by the Resident. Unless otherwise noted, new signalized intersections 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 Resident.

The Contractor shall provide a qualified technician to thoroughly review and confirm that the system is satisfactory and operational as designed. Prior to the final inspection, 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.

643.156 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.

643.16 Method of Measurement. The new traffic signal will be measured as a lump sum unit. Video detection system relocation will be measured as a lump sum unit. No separate measurement will be done for the removal of the existing traffic signal, but will be considered incidental to the new signal installation. No separate measurement will be done for the installation and subsequent removal of temporary traffic signal equipment necessary to maintain traffic through the construction phases.

643.17 Basis of Payment. The accepted quantity of traffic signals 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 (Item 643.90) will be paid for at the contract lump sum price, which payment will be full compensation for installation, furnishing all materials, including, but not limited to video processing unit, 360 degree video camera, GridSmart® software, supervisory PC software, and all appurtenances and incidentals required for a complete functioning installation. The Contractor shall coordinate with the Manufacturer's Representative for initial configuration and onsite training.

Payment will be made under the following:

Pay Item		Pay Unit
643.71	Traffic Signal Modification: US 202/NB Ramps	Lump Sum
643.71	Traffic Signal Modification: US 202/SB Ramps/26A	Lump Sum
643.71	Traffic Signal Modification: US 202/ME 115/ME 100	Lump Sum
643.71	Traffic Signal Modification: US 202/Brown St/Shaker Rd	Lump Sum
643.83	Video Detection System: US 202/NB Ramps	Lump Sum
643.83	Video Detection System: US 202/SB Ramps/26A	Lump Sum
643.90	Interconnect Wire Between: SB Ramp Intersection to	

	NB Ramp Intersection	Lump Sum
643.90	Interconnect Wire Between: NB Ramp Intersection to NB Toll Building	Lump Sum
643.90	Interconnect Wire Between: NB Ramp Intersection to US 202 and ME 100/ME 115	Lump Sum
643.90	Interconnect Wire Between: US 202 and ME 100/MD 115 to US 202 and Brown/Shaker	Lump Sum

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Canopy Mounted Sign)

645.01 Description

The following paragraph is added:

Canopy mounted static signs are defined as signs fabricated from sheet aluminum as identified in the Plans. Each sign is mounted on framing supports and mounted on brackets to the top of the toll plaza canopy with an attached luminaire. The canopy mounted static signs and sign framing support (NOT mounting brackets) will be provided by the MTA. There are two static signs and one variable message sign that shall be installed on the new canopy. The variable message sign is not part of this pay item.

The following Subsection is added:

645.08 Method of Measurement

The following sentence is added:

Canopy Mounted Signs shall be measured as complete units each transported from the MTA sign shop and installed on site.

645.09 Basis of Payment

The following paragraphs are added:

The accepted Canopy Mounted Signs shall be paid for at the Contract unit price each as specified. Such price shall include transportation and installation of static sign. Providing and installing luminaires, and hardware mounting brackets, and any short term storage on site. The item includes all hardware, labor and equipment necessary to complete this task.

Any signs or framing supports damaged by the Contractor shall be replaced with new signs, or supports conforming to the applicable Specifications at no additional cost to the Authority.

Payment will be made under:

Pay Item		Pay Unit
645.1091	Canopy Mounted Sign	Each

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Remove and Reset Sign)
(Remove and Stack Sign)

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.

At locations as shown on the Plans, several ground-mounted signs are designated to be removed and stacked. This work shall consist of removing and stacking existing sign panels and posts and delivering them to the Maine Turnpike Authority Sign Shop located along the Turnpike northbound at Milepoint 58. The support excavations shall be backfilled and ground restored to the satisfaction of the Resident.

Existing signs proposed to be removed under this Contract shall remain in their existing condition or shall be relocated to temporary supports until no longer applicable. Proposed signs shall be installed when appropriate to the construction phasing such that all proposed signs on new ramps and roadways shall be installed and visible to traffic prior to opening the new ramps and roadways.

Any existing signs not shown on the Plans are to remain in their existing condition unless directed otherwise by the Resident. Any signs affected by grading that are intended to remain shall be removed and reset to meet MUTCD minimum mounting height requirements.

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 stacking existing signs shall be measured as complete units each removed and stacked.

645.09 Basis of Payment

The following paragraphs are added:

The accepted signs removed and stacked shall be paid for at the Contract unit price each as specified. Such price shall include removing and stacking sign panels and supports at the location specified.

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.

Payment will be made under:

Pay Item		Pay Unit
645.105	Remove and Stack Sign	Each
645.109	Remove and Reset Sign	Each

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Sign Structure Foundations)

645.024 Bridge, Cantilever and Butterfly Support Structure Foundations

The second paragraph shall be modified to indicate use of Class A concrete rather than Class LP concrete:

Concrete shall be Class A in accordance with Section 502 – Structural Concrete.

The following paragraphs and sections are added:

The Contractor shall select and design a foundation system for the sign structures in accordance with actual soil conditions as indicated in the geotechnical engineering report and the subsurface explorations. Preliminary foundation sizes and layouts have been provided as part of the contract documents. See the figures following this Special Provision for the preliminary foundation sizes. The Contractor shall provide final foundation system designs for each sign structure that can be constructed within the limitations of the existing rights-of-way and without impact to adjacent utilities. The construction of the new foundations shall include protections for the existing utilities as required by the Utility Companies or as directed by the Resident.

645.0241 Sign Structure Foundation Submittals

All submittals shall be in electronic PDF format and all documents in each PDF shall be legible. All submittals shall be prepared jointly by the Contractor and any subcontractors that will be performing the work.

The Resident will evaluate submittals for conformance with the Plans, Specifications, and Special Provisions and provide acceptance and/or comments within 5 working days of receipt.

Work shall not begin until all the required submittals have been approved in writing by the Resident. All procedural approvals given by the Resident will be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work. In addition to the submittals required for all sign structures and foundations indicated in Section 645.023, the following additional submittals shall be required for sign structure foundations that include drilled shaft construction:

1) Construction Experience Submittal

Prior to the start of drilled shaft construction, the Contractor shall electronically submit a project reference list to the Resident for approval verifying the successful completion by the Contractor of at least three separate foundation projects with shafts of diameters and depths similar to or larger than those shown in the Plans and ground conditions similar to those

identified in the Contract. A brief description of each listed project shall be provided along with the name and current phone number of the project owner or the owner's Contractor.

Prior to the start of shaft construction, the Contractor shall electronically submit a list identifying the on-site supervisors and drill rig operators potentially assigned to the project to the Resident for approval. The list shall contain a brief description of each individual's experience in shaft excavation operations and placement of assembled steel reinforced bar cages and concrete in shafts. The individual experience lists shall be limited to a single page for each supervisor or operator.

(a) On-site supervisors shall have a minimum 2 years of experience in supervising construction of shaft foundations of similar size (diameter and depth) and scope to those shown in the Plans and similar geotechnical conditions to those described in the boring logs and summary of geotechnical conditions. Work experience shall be direct supervisory responsibility for the on-site shaft construction operations. Project management level positions indirectly supervising on-site shaft construction operations is not acceptable for this experience requirement.

(b) Drill rig operators shall have a minimum of 1 year experience in construction of shaft foundations.

The Resident will approve or reject the Contractor's qualifications and field personnel within 5 working days after receipt of the submission. Work shall not be started on any shaft until the Contractor's qualifications and field personnel are approved by the Resident. The Resident may suspend the shaft construction if the Contractor substitutes unapproved personnel. The suspension of work, and no adjustments in contract time resulting from the suspension of work will be allowed.

2) Drilled Shaft Installation Narrative Submittal

The Contractor shall electronically submit a drilled shaft installation narrative for approval by the Resident. In preparing the narrative, the Contractor shall reference the available subsurface data provided in the test boring logs and laboratory testing results provided in the Geotechnical Engineering Report as well as foundation requirements and any foundation-specific information as provided on the Plans. Unless another foundation type is specified on the plans, foundations shall consist of cast-in-place reinforced concrete drilled shafts with pier caps.

This narrative shall provide at least the following information

(a) Proposed overall construction operation sequence.

(b) Description, size, and capacities of proposed equipment, including, but not limited to, cranes, drills, auger, bailing buckets, final cleaning equipment, and drilling unit. The narrative shall describe why the equipment was selected and describe equipment suitability to the anticipated site conditions and work methods. The narrative shall include a project history of the drilling equipment demonstrating the successful use of the equipment on shafts of

equal or greater size in similar soil conditions. The narrative shall also include details of shaft excavation and cleanout methods.

(c) Details of the method(s) to be used to ensure shaft stability (i.e. prevention of caving, bottom heave, using temporary casing, or other means) during excavation (including pauses and stoppages during excavation) and concrete placement. If permanent casings are required, casing dimensions and detailed procedures for installation shall be provided.

(d) Description of the method used to fill or eliminate all voids below the top of shaft between the plan shaft diameter and excavated shaft diameter, when permanent casing is specified.

(e) Details of concrete placement, including proposed operational procedures for pumping methods, and a sample uniform yield form to be used by the Contractor for plotting the approximate volume of concrete placed versus the depth of shaft for all shaft concrete placement (except concrete placement in the dry).

(f) When shafts are constructed in water, the submittal shall include seal thickness calculations, seal placement procedure, and descriptions of provisions for casing shoring dewatering and flooding.

(g) Description and details of the storage and disposal plan for excavated material.

(h) Reinforcing steel shop drawings, details of reinforcement placement, including bracing, centering, and lifting methods and the method to ensure the reinforcing cage position is maintained during construction, including use of bar boots and/or rebar cage base plates.

(i) The reinforcing steel assembly and installation plan shall include:

1. Procedure and sequence of steel reinforcing bar cage assembly.
2. The tie pattern, tie types, and tie wire gages for all ties on permanent reinforcing and temporary bracing.
3. Number and location of primary handling steel reinforcing bars used during lifting operations.
4. Details and orientation of all internal cross-bracing, including a description of connections to the steel reinforcing bar cage.
5. Description of how temporary bracing is to be removed.
6. Location of support points during transportation.
7. Cage weight and location of the center of gravity.
8. Number and location of pick points used for lifting for installation and for transport (if assembled off-site).

The Resident will evaluate the shaft installation narrative for conformance with the Plans, Specifications, and Special Provisions. Construction of the foundation shall not commence until the Authority has reviewed and approved the submittal.

645.0242 Shaft Construction Requirements

1) Shaft Construction Tolerances

Shafts shall be constructed so that the center at the top of the shaft is within a horizontal tolerance equal to 1-inch.

Shafts shall be within 1.5 percent of plumb. During drilling or excavation of the shaft, the Contractor shall make frequent checks on the plumbness, alignment and dimensions of the shaft. Any deviation exceeding the allowable tolerances shall be corrected with a procedure approved by the Resident.

Shaft steel reinforcing bar replacement tolerances shall conform to Section 506 – Reinforcing Steel.

2) Shaft Excavation

Drilled Shafts shall be excavated to the required depth as shown in the Plans. Shaft excavation operations shall conform to this Section and the shaft installation narrative as approved by the Resident.

Shaft excavation shall not be started until the Contractor has received approval from the Resident for the reinforcing steel centralizers required when the casing is to be pulled during concrete placement.

a) Conduct of Shaft Excavation Operations

Once excavation operation has been started, the excavation shall be conducted in a continuous operation until the excavation of the shaft is completed, except for pauses and stops as noted, using approved equipment capable of excavating through the type of material expected.

Pauses, defined as momentary interruptions of the excavation operation, will be allowed only for casing splicing, tooling changes, and removal of obstructions. Shaft excavation operation interruptions not conforming to this definition shall be considered stops. Stops for fully cased excavations shall not exceed 24 hours duration.

For stops exceeding the time durations specified above, the Contractor shall stabilize the excavation, when cased, using the following:

Backfill the hole with flowable fill in accordance with Section 502. The Contractor shall backfill the hole to a minimum of 5 feet above the bottom of casing (temporary or permanent).

During stops, the Contractor shall stabilize the shaft excavation to prevent bottom heave, caving, head loss, and loss of ground. The Contractor bears full responsibility for selection and execution of the method(s) of stabilizing and maintaining the shaft

excavation. Shaft stabilization shall conform to the shaft installation narrative provided by the Contractor and approved by the Authority.

b) Temporary and Permanent Shaft Casing

The Contractor shall furnish and install required temporary and permanent shaft casings as shown in the Plans and as specified in the Special Provisions.

c) General Shaft Casing Requirements

Shaft casing shall be watertight and clean prior to placement in the excavation

The inside diameter of the casing shall not be less than the specified diameter of the shaft. The outside diameter of the casing shall not be greater than the specified diameter of the shaft plus 6 inches, except as otherwise noted for shafts 5 feet or less in diameter.

d) Permanent Shaft Casing

Permanent casing is defined as casing designed as part of the shaft structure and installed to remain in place after construction is complete. All permanent casing shall be of ample strength to resist damage and deformation from transportation and handling, installation stresses, and all pressures and forces acting on the casing. Where the minimum thickness of permanent casing is specified in the Plans, it is specified to satisfy structural design requirements only. The Contractor shall increase the casing thickness as necessary to satisfy the requirements of this Section.

e) Temporary Shaft Casing

Temporary casing is defined as casing installed to facilitate shaft construction only, which is not designed as part of the shaft structure and which shall be completely removed after shaft construction is complete unless otherwise shown in Plans. All temporary casing shall be of ample strength to resist damage and deformation from transportation and handling, installation and extraction stresses, and all pressures and forces acting on the casing. The casing shall be capable of being removed without deforming and causing damage to the completed shaft and without disturbing the surrounding soil.

To maintain stable excavations and to facilitate construction, the Contractor shall furnish and install temporary casing in addition to the required casing specified in the Special Provisions. The Contractor shall provide temporary casing at the site in sufficient quantities to meet the needs of the anticipated construction method.

f) Permanent Slip Casing

Permanent slip casing is defined as casing installed vertically inside the drilled hole, after removal of the temporary casing and prior to pouring the exposed length of shaft, and wet-set into the shaft concrete a minimum of 2 feet below grade or to greater depth, as needed to enhance stability. The casing diameter requirements described in c) above do

not apply to permanent slip casing, but the inside diameter of the permanent slip casing shall provide the steel reinforcing bar clearance specified in Table 1.

g) Conduct of Shaft Casing: Installation, Removal and Excavation Operations

The Contractor shall conduct casing installation and removal operations and shaft excavation operations such that the adjacent soil outside the casing and shaft excavation for the full height of the shaft is not disturbed. Disturbed soil is defined as soil whose geotechnical properties have been changed from those of the original in situ soil and whose altered condition adversely affects the structural integrity of the shaft foundation.

h) Bottom of Shaft Excavation

The Contractor shall use appropriate means, such as a cleanout bucket or air lift to clean the bottom of excavation of all shafts. No more than 2 inches of loose or disturbed material shall be present at the bottom of the shaft just prior to placing concrete.
The excavated shaft shall be inspected and approved by the Resident with consultation with the Geotechnical Engineer prior to proceeding with construction. The bottom of the excavated shaft shall be sounded with a tape with a heavy weight attached to the end of the tape, or other means acceptable to the Resident, to determine that the shaft bottom meets the requirements in the Contract.

i) Shaft Obstructions

When obstructions are encountered, the Contractor shall notify the Resident promptly. An obstruction is defined as a specific object (including, but not limited to, boulders, logs, and manmade objects) encountered during the shaft excavation operation which prevents or hinders the advance of the shaft excavation. When efforts to advance past the obstruction to the design shaft tip elevation result in the rate of advance of the shaft drilling equipment being significantly reduced relative to the rate of advance for the portion of the shaft excavation in the geological unit that contains the obstruction, then the Contractor shall remove, break up, or push aside the obstruction. The method of dealing with such obstructions and the continuation of excavation shall be as proposed by the Contractor and approved by the Resident.

j) Voids Between Permanent Casing and Shaft Excavation

When permanent casing is specified, excavation shall allow its installation within the specified outside diameter of the shaft. All void space occurring between the casing and shaft excavation shall be filled with concrete or excavated flowable fill, in accordance with the shaft installation narrative, as specified in the Contractor’s Shaft Installation Narrative, and as approved by the Resident.

k) Maintenance of a Stable Shaft Excavation

The Contractor shall demonstrate to the satisfaction of the Resident that stable conditions are being maintained. If the Resident determines that stable conditions are not being maintained, the Contractor shall immediately take action to stabilize the shaft. The Contractor shall submit a revised shaft installation narrative that addresses the problem

and prevents future instability. The Contractor shall not continue with shaft construction until the damage that has already occurred is repaired in accordance with the specifications, and until receiving the Resident's approval of the revised shaft installation narrative.

The use of slurry is not allowed.

3) Assembly and Placement of Reinforcing Steel

a) Steel Reinforcing Bar Cage Assembly

The reinforcing cage shall be rigidly braced to to retain its configuration during handling and construction. Individual or loose bars will not be permitted. The Contractor shall show bracing and any extra reinforcing steel required for fabrication of the cage on the shop drawings. Shaft reinforcing bar cages shall be supported on a continuous surface to the extent possible. All rigging connections shall be located at primary handling bars, as identified in the reinforcing steel assembly and installation plan, as approved by the Resident. Internal bracing is required at each support and lift point.

The reinforcement shall be carefully positioned and securely fastened to provide the minimum clearances listed below and to ensure no displacement of the reinforcing steel bars occurs during placement of the concrete. The steel reinforcing bars shall be securely held in position throughout the concrete placement operation.

b) Steel Reinforcing Bar Cage Centralizers

The Contractor shall submit details of the proposed reinforcing cage centralizers along with the shop drawings. The reinforcing steel centralizers at each longitudinal space plane shall be placed at least at the quarter points around the circumference of the steel reinforcing bar cage and at maximum longitudinal spacing of either 2.5 times the shaft diameter or 20 feet, whichever is less.

4) Placing Concrete

a) Concrete Cover Over Steel Reinforcing Bars

Steel reinforcing bars shall be placed as shown in the Plans with minimum concrete cover as shown in Table 1.

b) Concrete Class for Shaft Concrete

Concrete for drilled shafts and spread footings shall be Class A in accordance with Section 502 – Structural Concrete.

TABLE 1: MINIMUM CONCRETE COVER

Shaft Diameter (feet)	Minimum Concrete Cover Except at Permanent Slip Casing (inches)	Minimum Concrete Cover at Permanent Slip Casing (inches)
Less than or equal to 3	3	1 ½
Greater than 3 and less than 4	4	1 ½
Greater than or equal to 4 and less than 5	4	2
5 or larger	6	3

c) Concrete Placement Requirements

Concrete for drilled shafts shall be placed as soon after excavation as practicable to prevent debris from collecting in the excavated area. The Contractor shall provide temporary dewatering of excavations for foundations as needed, such that concrete is placed in the dry. Concrete for drilled shafts shall be placed by tremie methods as temporary casing is withdrawn to prevent debris from contaminating the foundation and to ensure concrete is cast against the surrounding soil.

Before placing concrete, the required elbows of entrance conduits, reinforcing steel, and anchor bolts shall be carefully positioned. The anchor bolt size, spacing, and the bolt circle diameter shall be as shown on the plans and field verified by the Contractor at the existing foundation locations. The Contractor shall construct an anchor bolt template from the existing conditions at each foundation prior to casting in anchor bolts at the proposed foundations. These templates shall be sued in properly locating the anchor bolts to accept the existing sign truss column base plates. Anchor bolts shall be 1 ½ inch diameter, in accordance with Section 503, and shall project between 2 ½ and 3 inches above the top of the foundation. At least two threads on each anchor bolt shall project beyond the outside of the nuts holding the plumbed pole.

Conduit placement penetrating the side of the foundation concrete below grade shall be by one of the following methods:

i) Contractor shall install the vertical conduit and elbow with a block out along the edge of the rebar cage, excavate to the block out below grade as required after concrete has

cured, cut a hole in the permanent slip casing to remove the block out, and splice the conduit and grout the void as required.

ii) Contractor shall provide compacted fill as required to raise grade at the foundation location to form the exposed length of concrete foundation in lieu of providing a permanent slip casing above grade. The conduit, including the elbow and side penetration below grade, shall be placed during the placement of the concrete in the top portion of the drilled shaft.

iii) Contractor shall submit alternative conduit placement methods to the Resident for review and approval.

Concrete placement shall commence immediately after completion of excavation by the Contractor and inspection by the Resident. Immediately prior to commencing concrete placement, the shaft excavation shall conform to 645.0242, paragraph 2. Concrete placement shall continue in one operation to the top of the shaft, or as shown in the Plans. The Contractor shall place concrete in the dry.

During concrete placement, the Contractor shall monitor, and minimize, the difference in the level of concrete inside and outside of the steel reinforcing bar cage. The Contractor shall conduct concrete placement operations to maintain the differential concrete head as a 1-foot maximum.

If water is not present, the concrete shall be deposited through the center of the reinforcement cage by a method that prevents segregation of aggregates and splashing of concrete on the reinforcement cage. The concrete shall be placed such that the free-fall is vertical down the center of the shaft without hitting the sides, the steel reinforcing bars, or the steel reinforcing bar cage bracing.

iv) Concrete Vibration Requirements: When placing concrete in the dry, only the top five feet of concrete shall be vibrated, in accordance with Section 502.

v) Protection of Fresh and Curing Concrete from Vibration: The Contractor's construction operation in the vicinity of a shaft excavation with freshly placed concrete and curing concrete shall avoid operations that generate potentially damaging vibration of the freshly placed concrete.

5) Casing Removal

a) Concrete Head Requirements During Temporary Casing Removal

As the temporary casing is withdrawn, the Contractor shall maintain the concrete inside the casing at a level sufficient to balance the hydrostatic pressure outside the casing and at least two feet above the bottom of the casing.

b) Removing Portions of Permanent Casing Above the Top of Shaft

Tops of permanent casings for the shafts shall be removed to the top of the shaft.

c) Requirements for Leaving Temporary Casing in Place

The Contractor shall completely remove all temporary casings, except as noted. The Contractor may leave some or all of the temporary casing in place, provided all the following conditions are satisfied:

i) The Contractor shall submit the following information in writing to the Resident:
   (1) The Contractor shall completely describe the portion of the temporary casing to remain.

   (2) The Contractor shall specify the reason(s) for leaving the portion of the temporary casing in place.

   (3) The Contractor shall submit structural calculations, using the design specifications and design criteria specified in the Plans, indicating that leaving the temporary casing in place is compatible with the structure, as designed in the Plans.

ii) The Contractor shall have received the Resident's written approval of the submitted request to leave the temporary casing in place.

6) Contractor's Investigation and Remedial Action Plan

For all shafts determined to be unacceptable, the Contractor shall submit a plan for further investigation or remedial action to the Resident for approval. All modifications to the dimensions of the shafts, as shown in Plans, required by the investigation and remedial action plan shall be supported by calculations and working drawings, as specified in Section 626. All investigation and remedial correction procedures and designs shall be submitted to the Resident for approval. The Contractor shall not begin repair operations until receiving the Resident's approval of the investigation and remedial action plan.

7) Cored Holes

At the Resident's request, the Contractor shall drill a corehole in any questionable quality shaft (as determined by observation of the Resident) to explore the shaft condition.

Prior to beginning coring, the Contractor shall submit the method and equipment used to drill and remove cores from the shaft concrete to the Resident and receive the Resident's written approval. The coring method and equipment shall provide for complete core recovery and shall minimize abrasion and erosion of the core.

If a defect is confirmed, the Contractor shall pay for all coring costs. If no defect is encountered, the Maine Turnpike Authority will pay for all coring and grouting of the core hole. Materials and Work necessary, including engineering analysis and redesign, to effect corrections for shaft defects shall be furnished to the Resident's satisfaction at no additional cost to the Maine Turnpike Authority.

If soil conditions differ materially from those described on the boring logs, the Contractor shall stop work on that foundation and contact the Resident. All unsuitable material (including, but not limited to, peat, organic material, and material that has been disturbed

and/or dumped) within the limits of a foundation shall be increased, as directed by the Geotechnical Engineer, to account for the unsuitable material.

8) Shaft Completion

All foundations shall be warranted against leaning and corrosion for two years after the project is completed. If the lean is greater than two degrees from normal or the foundation is spalling within the first two years, the Contractor shall replace the foundation at no extra cost.

The finished ground at each foundation shall be graded as shown on the Plans. If required, approved backfill material shall be added to grade the slopes as specified. There will be no additional compensation for furnishing, placing, and compacting material flush around the foundation. In all cases, the surface area around the foundation shall be graded to drain away from the foundation and loamed and seeded in accordance with the requirements of Section 615 and Section 618.

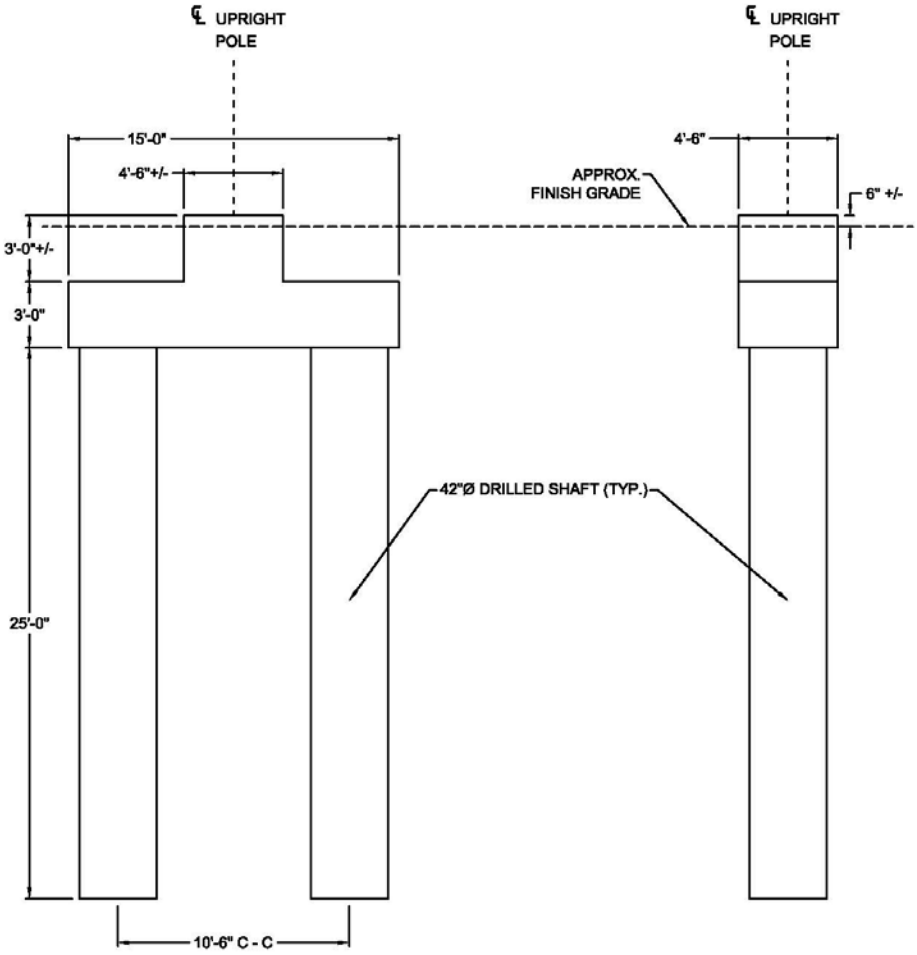
The concrete portion of the foundation exposed to view shall have a troweled finish. A drainage groove shall be formed in the horizontal surface of the foundation. The top of the concrete foundation shall be horizontal.

When the anchor bolt template is removed, the threads of the anchor bolts shall be greased and protected with a metal sleeve, held in position with nuts and washers to be furnished with the bolts. This thread protection shall remain in place until the sign structure upright is installed.

645.08 Method of Measurement

The following paragraph is added:

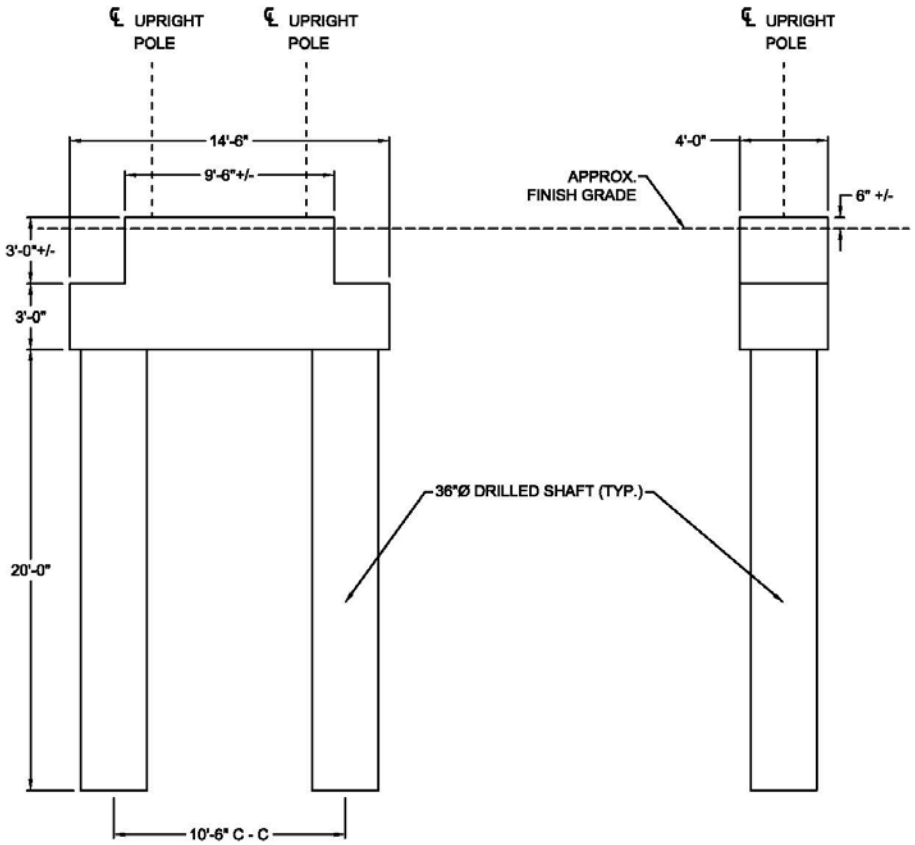
All submittals required for shaft foundation construction will not be measured but shall be incidental to the cost for the sign structure unit item.



PRELIMINARY FOUNDATION FOR
CANTILEVER TYPE SIGN STRUCTURES
NOT FOR CONSTRUCTION - CONTRACTOR RESPONSIBLE FOR FINAL DESIGN

GRAY INTERCHANGE, EXIT 63 - GRAY MAINE

12/2/15

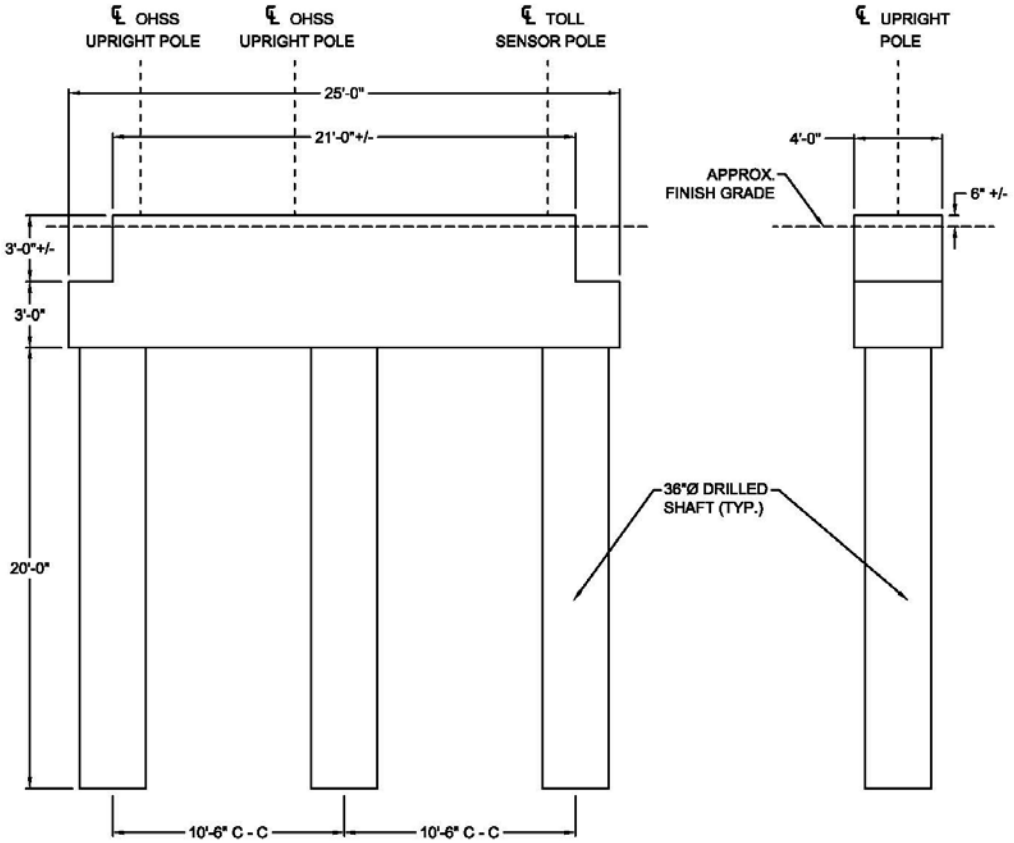


PRELIMINARY FOUNDATION FOR
OVERHEAD TYPE SIGN STRUCTURES

NOT FOR CONSTRUCTION - CONTRACTOR RESPONSIBLE FOR FINAL DESIGN

GRAY INTERCHANGE, EXIT 63 - GRAY MAINE

12/2/15



PRELIMINARY FOUNDATION FOR OVERHEAD SIGN
STRUCTURE AT STATION 304+31/417+03
NOT FOR CONSTRUCTION - CONTRACTOR RESPONSIBLE FOR FINAL DESIGN

GRAY INTERCHANGE, EXIT 63 - GRAY MAINE

12/2/15

SPECIAL PROVISION

SECTION 648

FLAGPOLE

648.01 Description

This work shall consist of furnishing and installation of a 30 foot aluminum flagpole, ground mounted spot light 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' 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 manufacture.

Concrete shall be Class "A" cement concrete (4000 PSI).

Reinforcing steel shall meet the requirements of Section 503.

648.03 General

When flagpole is to be stored on-site for an extended period before installation, all wrapping material shall be removed and pole stored in a dry place, off the ground.

648.04 Method of Measurement

The flagpole will be measured by each unit.

648.05 Basis of Payment

The accepted quantity of flagpole and lighting will be paid for at the Contract unit price each which payment shall be full compensation for furnishing and installing flagpole 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:

Pay Item		Pay Unit
648.00	Install Flagpole and Lighting	Each

SPECIAL PROVISION

SECTION 650

DYNAMIC MESSAGE SIGN

650.01 Description This work shall consist of furnishing, installing, connecting, configuring, and testing a new dynamic message sign (DMS), DMS controller, ground mounted control cabinet, cellular modem, and solar power system. This work also consists of system training and testing. The DMS supports as well as conduits for power service and communications, are specified elsewhere in the Contract Documents.

650.02 General All equipment shall be new unless otherwise specified.

650.03 Materials Materials shall meet the following requirements:

Electrical materials shall meet the standards herein, local and public utility codes, and the National Electrical Code (NEC).

Cabinets and enclosures shall meet the standards herein and the National Electrical Manufacturer's Association (NEMA) TS-4 standards.

All grounding and electrical installations shall meet the requirements of NEC, as well as all applicable state, local, and applicable public utility codes. All grounding shall meet the requirements of the manufacturers of the devices installed on the project. In the event that the manufacturers' requirements are more stringent than those of the national, state, and local codes, then the manufacturers' grounding requirements shall apply.

The Contractor shall furnish and install Transient Voltage Surge Suppression (TVSS) device(s) for all power and communications conductors leaving the equipment cabinets, including ITS equipment and solar power cabinets, including but not limited to power service, and power and communications for all devices that are external to the cabinet.

The hardware to mount the Dynamic Message Sign (DMS) to the support structures shall be galvanized steel in accordance with AASHTO M232.

a. The mounting bolts shall be 5/8-inch heavy hex head bolts, ASTM A325 Type 1 (AASHTO M164).
b. The nuts to secure the bolts shall be 5/8-inch heavy hex head nuts, ASTM A563 or A194 (AASHTO M291).
c. The washers shall be 5/8-inch hardened washers, ASTM F436 (AASHTO M293).

650.031 Dynamic Message Sign (DMS) The DMS shall be a Ver-Mac model B-1500C only; no alternatives will be considered.

Mounting: The Contractor shall furnish and install all hardware required to attach the DMS panel to the applicable supports. DMS shall be mounted using two Zee bars attached along the top and

bottom of the DMS panel. For ground mounted installations, the Zee bars shall be bolted to the steel H beams on each side of the web as shown in the Plans.

Environmental:

a. Operating temperature range: -40° to + 74°C

b. Humidity operating range: 10 to 95 percent relative humidity, non-condensing

650.032 DMS Controller The DMS Controller shall be a Ver-Mac V-Touch Controller only; no alternatives will be considered.

a. Environmental – The DMS controller shall have the same environmental standards as the DMS panel itself.

650.033 DMS Ground Mounted Control Cabinet The DMS Ground Mounted Control Cabinet shall be ground mounted and installed at the locations shown in the Plans, and in conformance with all requirements shown in the Plans. The DMS cabinet shall consist of an aluminum weatherproof housing, and all ancillary equipment necessary to provide a complete, operational control cabinet for the DMS equipment. This work shall include all wiring, cabling, and connectorizing from the DMS cabinet to the DMS panel.

a. The DMS cabinet shall be NEMA 3R rated.

b. The DMS cabinet shall be a NEMA "P-44" cabinet meeting the requirements of Section 643.042, with the exception that the DMS cabinet shall not require a switch compartment as described in the sixth paragraph of Section 643.042.

c. A 36-inch x 30-inch x 4-inch concrete work pad shall be installed in front of the cabinet door. The pad 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 DMS 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.

d. Each cabinet shall contain a power panel. The power panel shall contain a primary circuit breaker, which will accept the incoming power from the solar power system or from the AC utility power. This primary circuit breaker shall serve as the electrical disconnect for the cabinet and shall shut off all cabinet power when in the "off" position.

e. The DMS 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.

f. The cabinet door shall be supplied and installed with a Corbin 1548-1 lock for access by #2 keys.

g. The DMS cabinet shall be supplied with a captive door restraint bar. The bar shall allow the door 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 bar shall be supplied and installed such that the door is held in place during a 40 MPH wind without the restraint bar being bent. The door restraint bar shall be provided to prevent door movement when open in windy conditions.

h. 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.

i. The top and bottom of the latching pushrods shall contain nylon rollers to promote secure door closure.

j. The door handle shall be stainless steel. The latching handle shall have provisions for padlocking in the closed position. A solid ¼" diameter weatherproof padlock approved by the Resident shall be installed with each cabinet. All padlocks supplied as part of one project shall be keyed alike.

k. The DMS cabinet shall be covered by a one year dated warranty covering material defects for one year from date of acceptance.

l. The DMS 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.

m. 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.

n. All exposed, high voltage electrical terminals shall be insulated with non-conducting material such as rubber boots or silicon/rubber caulking.

o. The DMS cabinet shall be electrically bonded to all of its associated metallic DMS support structure grounding systems, as described elsewhere in this document or in the Contract Documents.

p. All air venting arrangements shall contain air filters. The air filters shall have an average rated efficiency of 30% and an arrestance 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.

q. 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 DMS cabinet.

r. The DMS cabinet shall be supplied and installed with an internal 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.

s. The Contractor shall furnish in a watertight container a control cabinet-wiring diagram. Three sets of identical wiring diagrams shall be furnished for each cabinet.

650.034 Cellular Modem The Cellular Modem shall provide the communications interconnect means between the DMS Controller and the Authority's communications system. The Cellular Modem shall meet the following requirements:

a. The Contractor shall install, integrate and test a Cellular Modem that will be provided by the Authority for use with the DMS controller.

b. The Contractor shall provide all necessary cables and connectors to connect the Cellular Modem to the DMS controller and to the cabinet antenna.

c. The Contractor shall perform a cellular site survey at the DMS locations shown in the Plans to ascertain available cellular signal levels.

d. Based on the results of the cellular site survey, the Contractor shall furnish and install a suitable cellular antenna such that the received signal strength, as measured by the Cellular Modem, shall be -65 dBm or greater. The antenna shall be weatherproof and of the type that is specifically designed for outdoor applications. If needed to achieve a -65 dBm cellular signal strength, the Contractor shall install a high gain antenna, otherwise a unity gain omnidirectional antenna shall be acceptable. The antenna shall include all required cabling and mounting hardware. The antenna shall be mounted in such a manner and location as to minimize the risk of vandalism and damage.

e. The Cellular Modem shall include integral TVSS on its antenna, serial, and Ethernet ports, as well as its power inputs.

650.035 Solar Power System The Solar Power System shall provide power to the DMS, DMS controller, DMS control cabinet, and cellular modem. The Solar Power System shall meet the following requirements:

a. The Solar Power System shall consist of solar panels, solar panel support structures and foundations, batteries, solar power system equipment, an independent control cabinet to house the batteries and solar power system equipment, and all associated cabling.

b. The solar panel support structures and foundations shall meet the following requirements:

    a. The solar array support pole and foundation shall be designed by a Professional Engineer licensed in the State of Maine and constructed to comply with all applicable sections of the 2013 AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals with all published addendums. For other structural requirements, the Contractor shall refer to Section 643 and Section 645.

b. The solar panel support pole shall be a one-piece construction, galvanized steel, and shall conform to ASTM A595 Grade A with a minimum yield strength of 55 ksi, or ASTM A572 with a minimum yield strength of 65 ksi.

c. The solar array support pole shall be designed to support a solar array and all hardware subsidiary to the solar power system necessary to power all DMS equipment and auxiliaries. The support pole shall be designed for the number of solar panels as indicated by the approved solar power calculations. Close consideration shall be given to the effective projected area of the complete solar power system to be mounted on the pole along with the weight of attached hardware when designing the pole to meet the performance criteria, including consideration for all possible loading combinations including wind and ice loads; and the design stresses and allowable stresses for all components which comprise the proposed structure.

d. The structural calculations shall include a pole, base plate, and anchor bolt analysis. The pole calculations shall be analyzed at the pole base and at 5-foot pole intervals along the full height of the pole. At each of these locations, the following information shall be provided by the Contractor:

    i. The pole's diameter, thickness, section modulus, moment of inertia, and cross sectional area.
    ii. The centroid, weight, projected area, drag coefficient, velocity pressure, and wind force of each trapezoidal pole segment.
    iii. The axial force, shear force, primary moment, total moment, axial stress, bending stress, allowable axial stress, allowable bending stress, and combined stress ratio (CSR) at each elevation.
    iv. The pole's angular and linear and angular deflection at each location.

e. Base Plate: Base plates shall conform to ASTM A36 or A572 Grade 42.

f. Foundations shall be cast in place. No precast foundations shall be permitted.

g. Anchor rods shall conform to the requirements of ASTM F1554 Grade 55 (minimum). Galvanize the entire rod per ASTM A153. Each anchor rod shall be supplied with a minimum of two hex nuts (ASTM A563 or ASTM A194) and a minimum of two flat hardened washers (ASTM F436).

h. The top of the foundation should be placed at least 3" higher than adjacent highest soil but not more than 4" higher than adjacent highest soil, unless otherwise specified in the Contract Documents.

i. All electrical materials shall meet all applicable state, local and public utility codes and requirements as well as the National Electrical Code (NEC).

j. The Contractor shall supply and install a grounding system at the base of the solar array support pole. The grounding system shall be connected to the pole through an appropriate ground clamp. A #4 AWG copper wire shall be installed between the

support pole and the battery cabinet providing a common ground system for each terminus. A minimum one-inch conduit through the foundation to the inside of the pole shall provide the means to connect the ground wire from the inside of the pole at a ground lug to the ground rod(s).

k. Additional ground rods shall be installed to meet the manufacturer's recommended resistance to ground, or a maximum of 25 ohms, whichever is less.

c. The solar power batteries shall be sized to provide ten (10) days of autonomy to the DMS, DMS controller, DMS control cabinet, and cellular modem under no-light conditions. After ten (10) days of autonomous operation under no-light conditions, the batteries shall still retain at least 50% of their full capacity.

d. The batteries shall be sealed AGM type, and shall be spill proof.

e. The solar panels shall be sized to fully recharge the batteries in ten (10) days or less, while also supplying power to operate the DMS, DMS Controller, ITS Equipment Cabinet, and Cellular Modem, while under typical light conditions as defined by industry standard solar insolation maps for the State of Maine.

f. The solar panels shall be of the monocrystalline or polycrystalline type.

g. The mount for the solar panel array shall provide for adjustment of the angle of the face of the solar panels. The Contractor shall adjust the position of the solar panel array in a manner that maximizes solar exposure.

h. The Contractor shall locate the solar panel array in a location that results in no shadows being cast on the solar panels whatsoever at any time of the year. The Contractor shall consider the effects of leaves on trees, regardless of whether or not there are any leaves on trees at the time of installation.

i. The solar power system shall provide 24 hours per day of operation, seven (7) days per week, 365 days per year with no loss of operation. The Contractor shall submit for approval a solar calculation which demonstrates compliance with this requirement. The solar calculation shall include the manufacturer's specified loads of each piece of equipment to be powered. The solar calculation shall take into account the full required operating temperature range.

j. The solar power system shall be designed to operate correctly over a free air temperature range of -30°F to +122°F. Solar power system components installed within the control cabinet shall be designed to operate correctly over a temperature range of -30°F to +165°F.

k. The DMS control cabinet shall house the batteries and solar power equipment. The equipment shall include, but not be limited to, charge control circuitry that prevents overcharging of the batteries, low voltage disconnect devices which disconnect the batteries to prevent battery damage in the event of a very low state of charge, and an inverter that provides 120 VAC power to the DMS control cabinet. The inverter shall provide 120 VAC power with three (3) percent or less total harmonic distortion, and with

output voltage regulation of plus or minus five (5) percent or better. The charge control circuitry shall be temperature compensated such that battery charging voltage is automatically adjusted based on temperature variations so as to maximize battery life. The control devices shall also include a system monitoring device which allows maintenance personnel to assess critical system parameters such as battery condition and solar panel output. The cabinet shall include overcurrent protection devices that limit overcurrent in the solar power system to safe levels in the event of a malfunction of the solar power system.

l. Where the Contract Documents indicate solar power systems, the solar power control cabinet shall include all provisions for future utility power connection.

m. The DMS control cabinet shall include an AC powered battery charger which, when operating under generator power or utility power, fully recharges the batteries in two (2) days or less, while also supplying power to operate the DMS, DMS controller, DMS control cabinet, and cellular modem.

n. The solar panels shall be Underwriter's Laboratory (UL) approved. UL certification shall be provided with the catalog cuts and working drawings in the Technical Submittal.

650.04 AC Power Systems The Contractor shall provide utility power systems to DMS systems as indicated in the Contract Documents.

a. The Contractor shall make the necessary arrangements with the utility company to ensure having needed utility service available at the time of equipment testing and turn-on. Any utility energization, connection, or disconnection delays will not be a valid reason for a time extension. The Contractor shall be responsible for all utility charges, including connection and monthly service charges, until System Acceptance.

b. The Contractor shall adhere to all applicable NEC, IEEE 1100-1992, UL 1459, and UL 1950 standards and practices.

c. The metered service shall include a 100 amp main disconnect.

d. The Contractor shall provide a rigid conduit riser on the exterior of the sign structure with a weatherhead at the top of the riser. The meter and disconnect equipment shall be banded to the sign structure support with a condulet below the disconnect switch entering the sign structure support.

650.05 Training The Contractor shall provide up to 6 hours training on all components of the DMS system. The Training shall meet the following requirements:

a. The Contractor shall provide training on the configuration, operation, and maintenance of the items provided under this contract as described herein. The training shall be on the new items provided under this contract, including the DMS, DMS controller, DMS control cabinet, and solar power system.

b. The Contractor shall develop and supply all necessary manuals, displays, class notes, and visual aids, and other instructional materials furnished by equipment manufacturers.

Instructional materials shall include all data sheets and manuals from manufacturers for all contract items supplied.

c. All training shall include hands-on use of all equipment, both field equipment and central equipment.

650.06 Testing The Contractor shall provide testing on all components of the system. The testing shall meet the following requirements:

a. The Contractor shall propose a test plan for the DMS system and for the solar power system and submit the test plan(s) and procedures as detailed herein. Each of the test plans shall contain the following elements:

    a. Proposed date, time, and location of the testing
    b. Names and credentials of the Contractor personnel who will be conducting the testing
    c. Descriptive overview of the proposed test procedure
    d. List of test equipment required to perform the testing
    e. Test cases and test logging forms which detail every step of the test procedure:

b. Test logging forms shall be presented in tabular format, with separate columns for each of the following:

    a. Test case description detailing the test step to be performed.
    b. Expected result
    c. Actual result
    d. Pass/fail
    e. Comments

c. The Contractor shall supply separate test logging forms at the time of testing for each test plan, and for each device location. The test logging forms shall show the device location, date, and the start and end times of the test.

d. At the end of each test logging form, there shall be signature and date locations for each of the following:

    a. Contractor personnel conducting the test
    b. Engineer representative witness
    c. Authority Resident

e. Signatures on the test logging form will signify only that the test was performed and witnessed, not that it passed or failed.

f. The detailed Test Plans shall be submitted to the Engineer no later than thirty (30) days prior to the beginning of each test phase.

g. The Contractor shall have approved test plans prior to submitting a request to schedule the start of any test activities. The Contractor shall notify the Resident no less than seven (7) days prior to the beginning of any equipment or systems testing.

h. Testing shall provide verification and documentation that all requirements as detailed in this Section and the Plans are met. The Test Plans shall be developed by the Contractor to provide a mechanism that ensures that all contract requirements have been met and tested successfully and verified.

i. If any deviations or changes to the approved Test Plans arise, it shall be resubmitted for review and approval by the Engineer at least fourteen (14) calendar days prior to any planned test activity stage. No tests shall be conducted until the Engineer has approved the test plan.

j. A summary of all tests shall be produced at the completion of each testing phase of the project to ensure that all requirements defined by the system are satisfied.

650.07 Method of Measurement

Dynamic Message Sign (DMS) Systems will be measured for payment by the lump sum for a fully operational system in place.

DMS Ground Mounted Control Cabinets will be measured for payment by each unit furnished and installed.

DMS Solar Power System will be measured for payment by the lump sum for a fully operational system in place.

The DMS ground mounted control cabinet foundations will be measured in accordance with Section 626.

650.08 Basis of Payment

The accepted quantity of Dynamic Message Sign (DMS) Systems will be paid for at the Contract lump sum price. This price shall be full compensation for furnishing, installing, configuring, testing, and training associated with the DMS panel and the DMS controller. The price also includes all costs associated with setting-up and paying for a data cellular account, technical support, and training.

The accepted quantity of DMS Ground Mounted Control Cabinets will be paid for at the Contract unit price for each unit installed. This price shall be full compensation for furnishing and installing, and for equipment that uses utility power, for all utility connections, attachments, hardware, meters, disconnects, and associated cabling. The price also includes all costs for associated equipment and hardware within the control cabinet not included in other pay items.

The accepted quantity of DMS Solar Power Systems will be paid for at the Contract lump sum price. This prices shall be full compensation for designing, furnishing, installing, testing and training associated with the DMS solar power system. The price also includes all costs associated with the structural design and fabrication of the solar panel support system and the support foundation.

Payment will be made under:

Pay Item		Pay Unit
650.101	Dynamic Message Sign (DMS) System:	Lump Sum
650.201	DMS Ground Mounted Control Cabinet:	Each
650.901	DMS Solar Power System:	Lump Sum

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(General)

652.2 Materials

The first sentence in the second paragraph is replaced with the following:

Super high intensity fluorescent retroreflective sheeting, ASTM 4956 – Type VII, Type VIII or Type IX (Prismatic), is required for all construction signs.

652.2.3 Flashing Arrow Board

Delete the existing 5 paragraphs and replace with the following: Flashing Arrow Panels (FAP) must be of a type that has been submitted to AASHTO's National Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportations' Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels.

FAP 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. An FAP 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 FAP 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.

FAP 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. FAP shall be at least 2.4 M x 1.2 M [96" x 48"] and finished in non-reflective black. The FAP shall be interpretable for a distance not less than 1.6 km [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 FAP 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 2.1 M [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

The eighth paragraph is deleted and replaced with Special Provision Section 652, Maintenance of Traffic (Portable Changeable Message Sign).

The Subsection is amended by the addition of the following:

Any vehicle used on a project, including pickup trucks and personal vehicles, shall be equipped with auxiliary lighting that emits amber light. The light must be visible from both front and rear, or by means of a single or multiple revolving or flashing light so as to provide visible light coverage over a 360 degrees range. 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.

Such auxiliary lights 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 and utility trucks shall have a strobe light mounted on each side of the vehicle. If properly mounted and functioning, lights meeting SAE J845 Class 1 or SAE J845 Class 2 are presumed to meet this requirement.

652.2.5 Safety Vests

This Subsection is amended by the addition of the following:

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

652.2.6 Signs

The use of temporary plaques to cover text or to change text will not be allowed. All signs shall have a uniform face.

652.4 Flaggers

Replace the first paragraph with the following; "The Contractor shall furnish flaggers as required by the TCP or as otherwise specified by the Resident. All flaggers must have successfully completed a flagger test approved by the MaineDOT and administered by a MaineDOT-

approved Flagger-Certifier who is employing that flagger. All flaggers must carry an official certification card with them while flagging that has been issued by their employer. Flaggers shall wear safety apparel meeting ANSI 107-2004 Class 3 risk exposure that clearly identifies the wearer as a person, and is visible at a minimum distance of 300 m [1000 ft], and shall wear a hardhat with 360° retro-reflectivity. Retro-reflective or flashing SLOW/STOP paddles shall be used, and the flagger station shall be illuminated to assure visibility in accordance with 652.6.2."

Flaggers used by the Contractor for his convenience in allowing construction vehicles to enter or exit the work areas onto roadways and ramps will not be paid but shall be incidental to the Item 652.361 Maintenance of Traffic Control Devices. Flaggers used to provide reversing one way traffic for work along Route 202 will be paid for under Item 652.38 Flaggers.

Second paragraph, first sentence; change "…have sufficient distance to stop before entering the workspace." to "…have sufficient distance to stop at the intended stopping point." Third sentence; change "At a spot obstruction…" to "At a spot obstruction with adequate sight distance,…"

Fourth paragraph, delete and replace with "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)"

652.6 Nightwork

Delete this section entirely and replace with the following:

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 and at all work 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, as a subset of the Traffic Control Plan, a lighting plan at the Preconstruction Conference, 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.

All workers shall wear safety apparel labeled as meeting the ANSI 107-2004 standard performance for Class 3 risk exposure.

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 Contractor shall furnish approved signs reading "Construction Vehicle - Keep Back" to be used on trucks hauling to the project when such signs are deemed necessary by the Resident. The signs shall be a minimum of 30 inches by 60 inches, Black and Orange, ASTM D 4956 - Type VII, Type VIII, or Type IX (prismatic).

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."

652.63 Traffic Coordinator

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

c. Insure 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.

652.8.2 Other Items

Replace the first paragraph with the following: "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."

Replace the last paragraph with the following: "There will be no payment made under any 652 pay items after the expiration of the adjusted total contract time."

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(Specific Project Maintenance of Traffic Requirements)

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

The following minimum traffic requirements shall be maintained:

Route 202 and Route 26A Traffic Control Requirements

Two-lane traffic shall be maintained on Route 202 and Route 26A at all times in accordance with the details shown on the Plans and in accordance with MUTCD guidance except during construction on the Route 202 bridge when a single, reversing lane may be implemented with flaggers. The lanes may be shifted to perform the intended construction. The travel lanes and shoulders shall be a minimum of 11' and 1' respectively unless identified differently on the plans. It is anticipated that the utilization of flaggers is adequate to control traffic entering and existing the work site for critical operations only. The cost of flaggers is paid under Item 652.38.

Maine Turnpike Traffic Control Requirements

A maintenance of traffic control plan has been developed for the construction and demolition of various elements of the project. The traffic control plan allows for the complete closure of the southbound on ramp roadway for a period of up to 3 days (72 hours) to allow the Contractor to complete the connection of the proposed southbound on ramp to the temporary ramp to open the new southbound on ramp toll plaza . The travel lanes and shoulders shall be a minimum of 11' and 1' respectively unless identified differently on the plans. The intent of this plan is to keep traffic moving continuously during construction of the ramps, acceleration and deceleration lanes, and the demolition of the southbound ramps bridge. It is anticipated that the utilization of flaggers is adequate to primarily control traffic entering and existing the work site for critical operations. The cost of flaggers for construction vehicles entering and exiting the work zone will not be measured but shall be incidental to the Item 652.361 Maintenance of Traffic Control Devices. It is envisioned that the short stoppages of traffic may be required occasionally along the mainline and in close proximity to the ramp gores, when a State Police shall be required. The Contractor is required to coordinate these activities through the Resident a week in advance of the operation to ensure coordination and safety can be agreed to for these occasional operations.

During nights of scheduled special bridge removal activities and large material deliveries, the Contractor will be permitted full use of a single closed lane as indicated in Table A. Once the nighttime lane closures and maintenance of traffic control devices are in place, per the Plans or as coordinated with the Resident Engineer, the State Police will be responsible for traffic control.

Activities are only allowed during the times noted in Table A. Travel lanes may not be impeded by traffic control devices until the time frames specified for each activity.

TABLE A

Mainline Northbound
March 1, 2016 to June 30, 2016
September 6, 2016 to June 29, 2017
September 5, 2017 to September 29, 2017
(See Note 1 and Note 2)

		Removal of Bridge Beams	Equipment Moves	Temporary Single Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	6:00 a.m. to 3:30 p.m.		Allowed	Allowed	Allowed
Time of Day:	3:30 p.m. to 6:00 p.m.				Allowed
Time of Day:	6:00 p.m. to 6:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m.	Allowed	Allowed	Allowed	Allowed

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July 6, 2016 to September 1, 2016
July 6, 2017 to August 31, 2017
(See Note 3)

		Removal of Bridge Beams	Equipment Moves	Temporary Single Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	6:00 a.m. to 3:00 p.m.		Allowed	Allowed	Allowed
Time of Day:	3:00 p.m. to 6:00 p.m.				Allowed
Time of Day:	6:00 p.m. to 6:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m.	Allowed	Allowed	Allowed	Allowed

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<u>Mainline Southbound (south of the SB ramps bridge)</u>

March 1, 2016 to October 14, 2016

March 20, 2017 to September 29, 2017

(See Notes 1, 2 and 3)

		Removal of Bridge Beams	Equipment Moves	Temporary Single Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	6:00 a.m. to 8:30 a.m.				Allowed
Time of Day:	8:30 a.m. to 6:00 a.m.		Allowed, except Sundays	Allowed, except Sundays	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m.	Allowed	Allowed	Allowed	Allowed

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October 17, 2016 to March 17, 2017

		Removal of Bridge Beams	Equipment Moves	Temporary Single Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	7:00 a.m. to 8:00 a.m.				Allowed
Time of Day:	8:00 a.m. to 7:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m.	Allowed	Allowed	Allowed	Allowed

Interchange Ramps

March 1, 2016 to June 30, 2016

September 6, 2016 to June 29, 2017

September 5, 2017 to September 29, 2017

(See Note 1)

		Removal and Erection of Overhead Structures and Gantries	Equipment Moves	Temporary Ramp Lane Shifts	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	6:00 a.m. to 9:00 a.m.				Allowed
Time of Day:	9:00 a.m. to 4:00 p.m.		Allowed	Allowed	Allowed
Time of Day:	4:00 p.m. to 6:00 p.m.				Allowed
Time of Day:	6:00 p.m. to 6:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	8:00 p.m. to 5:00 a.m.	Allowed	Allowed	Allowed	Allowed

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July 6, 2016 to September 1, 2016

July 6, 2017 to August 31, 2017

(See Note 3)

		Removal and Erection of Overhead Structures and Gantries	Equipment Moves	Temporary Ramp Lane Shifts	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	6:00 a.m. to 9:00 a.m.				Allowed
Time of Day:	9:00 a.m. to 3:00 p.m.		Allowed	Allowed	Allowed
Time of Day:	3:00 p.m. to 8:00 p.m.				Allowed
Time of Day:	8:00 p.m. to 5:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 4:00 a.m.	Allowed	Allowed	Allowed	Allowed

US Route 202 and Route 26A

March 1, 2016 to June 30, 2016

September 6, 2016 to June 29, 2017

September 5, 2017 to September 29, 2017

(See Note 1)

		Erection of Overhead Structures	Equipment Moves	Flagging / Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	5:30 a.m. to 9:00 a.m.				Allowed
Time of Day:	9:00 a.m. to 3:30 p.m.		Allowed		Allowed
Time of Day:	3:30 p.m. to 7:30 p.m.				Allowed
Time of Day:	7:30 p.m. to 5:30 a.m.		Allowed	Allowed	Allowed
Time of Day:	9:00 p.m. to 4:30 a.m.	Allowed	Allowed	Allowed	Allowed

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July 6, 2016 to September 1, 2016

July 6, 2017 to August 31, 2017

		Erection of Overhead Structures	Equipment Moves	Flagging / Lane Closures	Temporary Shoulder Closure
Days of Week:	Sunday p.m. through Friday p.m.				
Time of Day:	5:00 a.m. to 9:00 a.m.				Allowed
Time of Day:	9:00 a.m. to 3:00 p.m.		Allowed		Allowed
Time of Day:	3:00 p.m. to 8:00 p.m.				Allowed
Time of Day:	8:00 p.m. to 5:00 a.m.		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 4:00 a.m.	Allowed	Allowed	Allowed	Allowed

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NOTE 1: Daytime lane closures are not allowed during February (tentative dates - February 17+/- to February 21+/-) and April (tentative dates - April 18+/- to 22+/-) school vacation weeks. The Contractor shall confirm these weeks with MTA at the onset of construction.

NOTE 2: Daytime lane closures are permitted at any time along the Turnpike southbound north of the SB ramps bridge and along the Turnpike northbound north of the US Route 202 bridge.

NOTE 3: No work which affects traffic flow along the Turnpike or the Turnpike ramps shall occur after Noon on Fridays between June 25th and September 10th.

Lane Closures shall be removed if construction is not ongoing. Unattended lane closures are not allowed.

Construction vehicles are prohibited from merging with mainline traffic after noon on Fridays between June 25th and September 10th unless the merge occurs at an interchange.

652.7 Method of Measurement

The following paragraph is added:

Traffic control devices required to complete the work will be measured for payment under their respective pay items. Installation, maintenance, and removal of traffic setups and the Contractor's dedicated traffic employee will not be measured separately for payment, but shall be incidental to Item 652.361, Maintenance of Traffic Control Devices.

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(Temporary Mainline Lane Closures)
(Lane Closure Installation and Removal Procedures)
(Temporary Mainline Shoulder Closures)
(Ramp Lane Width Reduction)
(Work Requiring Complete Stoppages of Traffic)
(Short-Term or Work Hour Speed)

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

General

Two travel lanes in each direction (each direction being 22 feet wide including/excluding shoulder) shall be maintained at all times except as depicted on the plans and while performing work in a designated lane, directly over or adjacent to traffic, and during the placement and removal of traffic control devices.

Temporary Mainline Lane Closures

A minimum width of 11 feet is required for all lane closures.

A lane closure is required when a danger to the traveling public 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 materials.

A lane closure will be required whenever men or equipment will be present within four feet of a travel lane. Dump trucks shall be parked at least six (6) feet from the travel lane when being loaded. 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.

The lane closure setup may not begin until the beginning time specified. Lane closures that are setup early or that remain in place outside of the approved period shall be subject to a lane rental fee of $500 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 the removal of a lane closure. Construction signs shall be installed immediately prior to the start of the lane closure and shall be promptly removed when no longer required. The installation and removal of a lane closure including signs, channelizing devices and arrow boards shall be a continuous operation. The Authority reserves the right to order removal of an approved lane 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 his

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 following is a partial list of activities requiring lane closures. Lane closures may be required for other activities as well:

- Construction of stabilized construction entrances prior to the construction of the lane shifts toward the median.
- Installation of stone check dams in existing ditches.
- Paving new travel lane adjacent to active travel lane.
- Loading of trucks within four feet of a travel lane.
- Bridge construction activities adjacent to a travel lane
- Bridge work directly over traffic or within six feet of a travel lane as measured from the painted pavement marking line or traffic control device:

    1. Installing and removing shielding
    2. Superstructure demolition
    3. Unbolting structural steel
    4. Removing structural steel
    5. Installing and removing deck and diaphragm forms

When approved by the Resident, Items 3 and 8 may be performed over traffic if a temporary floor is provided between the bottom flanges of the beams.

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.

Daytime lane closures shall be a maximum of two (2) miles. Only one daytime lane closure will be permitted per direction. Nighttime lane closures may extend through the entire length of the Project.

The Resident is required to receive approval from the Maine Turnpike Authority for all lane closures. The request shall be submitted to the Authority by the Resident at least two (2) working days prior to the day of the requested lane closure. All requests must be received by 12:00 p.m. 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.

<u>Lane Closure Installation and Removal Procedure</u>

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.

Temporary Mainline Shoulder Closures

Temporary mainline shoulder closures will only be allowed as outlined in Special Provision Section 652, Specific Project Maintenance of Traffic Requirements. Temporary shoulder closures are anticipated at locations where Contractor access to the mainline is required.

Temporary 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 temporary 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.

Ramp Lane Width Reduction

Typical combined travelway and shoulder width on the ramps shall be 14 feet. When construction operations do not permit 14 feet of lane width, the Contractor shall implement the Wide Loads Restriction signing. The existing signs (provided by others) shall be modified as shown on the Plans. Following the completion of MTA Contract 2016.01, the Contractor shall take possession of and be responsible for the existing wide load signs. New signs shall be installed and left covered until a maintenance of traffic operation requires reducing the 14-foot minimum available space. When the ramp lane width is restricted, the Contractor shall uncover the appropriate wide load signs. At the completion of all work that would restrict ramp lane width, the Contractor shall remove all wide load signs, including signs remaining from the previous contract and new signs installed under this contract.

Work Requiring Complete Stoppages of Traffic

Complete stoppages of traffic will only be allowed outlined in Special Provision Section 652, Specific Project Maintenance of Traffic Requirements, or as approved by the Resident.

The following is a partial list of activities requiring complete stoppages of traffic. Complete stoppages of traffic may be required for other activities as well:

- Erection or removal of structural steel or bridge beams.
- Moving of heavy or slow equipment across or on the travel lanes (stoppage less than five minutes).

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 **Erection or** Removal of Structural Steel

The **erection or** removal of structural steel will only be allowed at times outlined in Section 652, Specific Project Maintenance or Traffic Requirements. 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 (northbound and southbound), in excess of the 25 minutes limit. Total penalty shall be deducted from the next pay estimate.

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 can not 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. These signs shall be covered when not applicable.

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 heavy equipment across the travel lanes shall be considered a violation of the Maintenance of Traffic Requirements and is subject to the fines of $500 per minute or portion thereof.

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.

Short-Term or Work Hour Speed

A short-term or work hour 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. The reduced speed zone shall be at least 1,500 feet long. 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 uncovered on a regular basis are not required to have the supplemental flags.

The reduced speed limit signs shall only be used during the following circumstances unless approved by the Resident:

- Workers are adjacent to traffic
- Travel lane is closed
- Outside shoulder is closed for 3,000 feet with concrete barrier

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 signs installed behind concrete barrier in the outside shoulder are required to be clearly visible to all drivers at all times.

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC
(Portable Light Tower)

652.1 Description

The following sentence is added to the second paragraph:

Traffic control devices shall also include portable light towers.

652.1.1 General

Portable light towers shall be used, when approved by the Resident, to illuminate areas where existing highway lighting has been removed until new or reset highway lighting is installed and operational.

652.7 Method of Measurement

This subsection is amended by the addition of the following to the first paragraph:

Only Portable Light Towers installed with prior approval of the Resident shall be measured for payment. Each Light Tower will only be measured for payment once, regardless of the number of times or locations used. Light Towers utilized for the Contractor's operations will not be paid for.

652.8.2 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
652.39	Portable Light Tower	Each

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(Portable-Changeable Message Sign)

652.2.4 Other Devices

The eighth paragraph is deleted and replaced with the following:

Portable-Changeable Message Signs (PCMS) will be furnished by the Contractor and shall be Ver-Mac PCMS-1210 or an approved equal. 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 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.

652.7 Method of Measurement

The following sentence is added:

Portable-Changeable Message Sign(s) will be measured for payment by each unit furnished, installed and maintained.

652.8 Basis of Payment

The following paragraphs are added:

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

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

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

Payment will be made under:

Pay Item		Pay Unit
652.41	Portable-Changeable Message Sign	Each

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(Truck Mounted Attenuator)

652.1 Description

The following sentence is added:

The Contractor shall furnish, operate and maintain a truck and truck mounted attenuator.

652.2.1 Truck Mounted Attenuator

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.
- A mounted revolving amber light or amber strobe light 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.

652.3.7 Operations

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.

652.7 Method of Measurement

The following sentences are added:

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.

652.8.2 Basis of Payment

The following paragraphs are added:

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 unit price noted in the proposal sheet is fixed by the Maine Turnpike Authority and may not be altered. Altering of the unit price will be a non-curable bid defect.

Payment will be made under:

Pay Item		Pay Unit
652.45	Truck Mounted Attenuator	Calendar Day

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 stand-by generator including a 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 Work Checklist in Appendix E.

- 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 metal 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 Metallic 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. Finish shall be galvanized.

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 metal wireways and accessories as required on elevations. Carefully coordinate with interior finishes and furnishings.

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 space frame to the Resident for approval. The proposed attachment method shall not require drilling, welding or other attachment methods that will damage the space frame or its galvanized 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 120/240 Volt circuits:

UL Type: THW. (Sizes #6 AWG wire and larger)

UL Type: THHW. (Sizes up to #4 AWG wire)

UL Type: USE. (Underground installation)

Material: Copper.

Conductors: (AWG wire 20 to AWG wire 16).

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 OSP grade, gel filled. Interior building communications cables may be plenum rated for interior wall or cable tray applications.

Concentric-lay-stranded (standard flexibility) (AWG wire 14 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 #16 AWG.

Klik-Its (Power & Tel Enterprise Part #C8820) or approved equivalent shall be used at all loopwire 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 space frame to the Resident for approval. The proposed attachment method shall not require drilling, welding or other attachment methods that will damage the space frame or its galvanized 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, 30-ampere, 125-volts, with metal plaster ears, screw terminal connectors, NEMA configuration L5-30R 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 Sections 250-81 or 250-83.

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.

655.08 Scope of Work/Item Description/Measurement and Payment

INSTALLATION OF ORT CONTROL CABINET

RELATED DOCUMENTS

Examine Drawings, Contract Conditions and 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.

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 of the lane controller cabinets as well as mount and install the ORT control cabinets. Mounting cleats which are supplied by the SI shall be attached to the building wall. Conduit, wires and cables shall be pulled to the NB Entry Lane Control and looped. Once the ORT Control is placed and connections to the cabinet have been made the SI will terminate all wiring. The Contractor may be required to be present when the SI terminates to perform any additional work necessary. All work shall be coordinated with the Resident and SI.

INSTALLATION

The Contractor shall install and connect all conduit, wireway, power and data wires associated with the proposed ORT Control Cabinets. The SI shall terminate all toll equipment wiring in the ORT Control Cabinets. The Contractor shall install a concrete pad as detailed in the Plan drawings for each of the ORT Control cabinets to be mounted on.

The Contractor will be required to:

a. Install SI provided mounting cleats to building wall and cabinets in accordance with manufacturer and SI standards.

b. Terminate clean power into three quadplex receptacles or provide alternate termination as shown on the Plans or directed by the Resident and SI. Power termination requirements to be confirmed in the field. The quadplex receptacles shall be white with stainless steel cover.

c. Pull data/power from lane equipment into the ORT Control Cabinets with a 36 inch service loop for all data lines (including 120 volt data);

d. Label each wire coming into the ORT Control Cabinets with numbered tags per wiring schedules and subject to approval as directed by the Resident and SI at the start of the project. Tags shall be neat, legible, waterproof, and approved by the SI/ the Resident.

e. Cap or otherwise prep the ends of all conduit and wiring associated with the proposed lane controller such that these components will be sealed from any environmental impacts prior to installation of the ORT Control Cabinet.

Basis of Payment

Measurement and payment for mounting and installation work associated with the ORT Control cabinets as shown on the Plan drawings and described herein will be per each item. Installation of receptacles and completion of all conduits and wiring associated with the cabinet shall be incidental.

Pulling power wires and data cables as required for the new ORT Control Cabinet and associated equipment as shown on the Plan drawings will be incidental. All new conduit, wireway, wires and data cables installed will be paid under its appropriate pay item.

Payment will be made under:

Pay Item		Pay Unit
655.01	Installation of ORT Lane Controller Cabinet	Each

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. This task includes removing the existing Lane Controller (LC) and the associated conduit and/or wireway, so as to install the conduits and wiring associated with the LC. If deemed appropriate by the Resident and SI, the existing LC quadplex can be reused. Note the SI may request the quadplex be removed to allow direct clean power connection to breakers within the proposed LC installed by the 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 E that the Contractor must complete, indicating what cables will be routed into the new LC, how much slack is present in each of these existing cables, whether or not existing cables will have to be removed and re-installed (with longer run) in order to reach the new LC, 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:

f. 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;
g. pull data/power from lane equipment into the LC cabinet with a 36 inch service loop for all data lines (including 120 volt data);
h. 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.

Note: Existing power wires to proposed lane controller to be spliced if necessary following NEC regulations. If any other existing cable will not reach the proposed LC, a new "Home Run" from the existing equipment to the LC will need to be pulled.

Prior to the start of work on the existing toll equipment or power and comms associated with the toll equipment, the Contractor shall coordinate with the Authority and the SI for proper shut down of toll equipment. The SI will shut down the lane equipment prior to work, including LC and AVI systems. The Contractor shall not commence with work associated with toll system components without the Authority's authorization after proper shutdown of equipment by the SI. Upon authorization, the Contractor will disconnect all power connections to the existing LC and peripheral equipment as specified in the Plans. The SI will then disconnect all communication cables to the existing LC and peripheral equipment as specified in the Plans. The Contractor shall coordinate activities with the SI. The SI shall remove equipment within the existing LC cabinet prior to Contractor removal of the existing LC Cabinet. The Contractor will then pull all power and communication cables out, remove existing LC cabinet, and remove existing conduit as necessary install new conduit as necessary to the proposed LC location, and pull all existing cables to the proposed LC location including the existing AVI communications line (if existing length is adequate, otherwise replace per these Specifications). The Contractor will terminate clean and dirty power into the LC cabinet. The SI will install all electronics in the cabinet and terminate all communications cables to the electronics for testing. After the Contractor completes all conduit and power connections, and pulls all existing and proposed communication cables to the new LC cabinet and associated equipment as specified in the Plans, the Contractor is finished with the installation.

Measurement and payment for preparation work associated with the LC cabinet as shown on the Plan drawings and described herein will be per each item. Removal of the existing LC cabinet, installation of receptacles (if applicable), completion of all conduits and wiring associated with the cabinet shall be incidental.

Pulling of wires out of the existing LC, VES and COS cabinets, and re-pulling power wires and data cables as required for the new LC and associated equipment as shown on the Plans will also be incidental. Any wire / cable that has to be pulled completely back to the existing lane equipment and replaced (due to shortness of slack in existing cable) will be considered Contract

work, and will be paid under appropriate pay items. All new conduit/wireway installed will be paid under its appropriate pay item.

Payment will be made under:

Pay Item		Pay Unit
655.012	Installation of Cash Lane Controller Cabinet	Each

DVAS MOUNT INSTALLATION

The Contractor shall mount a Pelco EM2200 hook to the underside of the space frame 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 space frame. 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:

Pay Item		Pay Unit
655.02	DVAS Mount Installation	Each

INSTALLATION OF SENSOR LOOPS

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 also provide the required materials for sealing the loops including but not limited to the required Loctite epoxy, pump and related injection equipment prior to the Contractor placing sensor loops. The Contractor shall be responsible for obtaining and operation of required sawcutting equipment.

NOTE: 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 associated Sensor loops shown on Plan drawings. Sawcutting of pavement, installation of epoxy and loops will be incidental to item.

Payment will be made under:

Pay Item		Pay Unit
655.04	Installation of Sensor Loops	Lump Sum

INSTALLATION OF AVI ANTENNAS

The Contractor shall pick up AVI antennas and mounting equipment at the Maine Turnpike headquarters or a nearby maintenance yard as coordinated by the Resident. The Contractor shall install antennas and mounts in accordance with the manufacturer's instructions. Antenna wires shall be installed and looped, the AVI equipment vendor will arrive to terminate equipment wiring while the Contractor is onsite. If the vendor requires additional work during termination and 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 terminate and tune equipment.

Payment will be made under:

Pay Item		Pay Unit
655.05	Installation of AVI Antennas	Each

INSTALLATION OF AVI READERS

The Contractor shall pick up AVI readers at the Maine Turnpike headquarters or a nearby maintenance facility as coordinated by the Resident. The Contractor shall install readers in NEMA 4X cabinets mounted on space frame pedestals as shown on the Plans. AVI readers shall be installed in accordance with the manufacturer's instructions with oversight by the SI onsite as needed (to be determined by Resident). Reader wires shall be installed and looped. The vendor will arrive to terminate wiring while the Contractor is onsite. If the AVI equipment vendor requires additional civil or electrical work during termination and testing the Contractor must be present to assist.

Basis of Payment

Measurement and payment for work associated with the installation of AVI readers as shown on the Plan drawings and described herein will be per each item. The Contractor will not pay for the purchase of readers or the AVI equipment vendor's presence to terminate wiring and tune equipment.

Payment will be made under:

Pay Item		Pay Unit
655.06	Installation of AVI Readers	Each

TRAFFIC CONTROL PEDESTAL (TCP) PREPARATION WORK

Measurement and payment for preparation work installation of the TCP as shown on the Plan drawings and described herein will be per each item. Note the procurement of the TCP will be by the SI at a point beyond the completion of this Contract. 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 detail in Appendix F as a template, 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 ½ 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. The installation of the TCP shall be completed with the SI present for oversight and specific instructions for installation.

Payment will be made under:

Pay Item		Pay Unit
655.07	Traffic Control Pedestal Preparation Work	Each

AWG WIRE

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:

Pay Item		Pay Unit
655.08	#2/0 Wire for UPS re-wiring	Linear Foot
655.10	#4 AWG Wire	Linear Foot
655.101	#6 AWG Wire	Linear Foot
655.11	#10 AWG Wire	Linear Foot
655.12	#12 AWG Wire	Linear Foot
655.13	#14 AWG Wire	Linear Foot

4 pr/24 (CATEGORY 5e) CABLE

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 and unshielded. 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:

Pay Item		Pay Unit
655.14	4pr/24 (Category 5e) Cable	Linear Foot

LMR 400 CABLE

This task shall include the providing and installation of the LMR 400 cable shown on the Plan drawings and described herein.

Cable: LMR 400 cable, as approved.

Basis of Payment

Measurement and payment for the installation of the LMR 400 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:

Pay Item		Pay Unit
655.15	LMR 400 Cable	Linear Foot

FIBER OPTIC CABLE

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

Cable: 6-Fiber multi-mode multi-mode Fi, 100 mbs, 62.5/125 Microns, Indoor/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, 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	3.0	200
1,300	0.9	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 400 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 850 lb./in.

- Corning and Berk-Tech fiber are currently recommended for installation. Cable from other manufacturers will be considered. All cable installed must be cleared by MTA prior to installation.

All cable is to be fully supported throughout its entire run.

At no time shall more than 400 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 insure that maximum tension is not exceeded. Alternatively, a "mechanical fuse" rated at 350 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 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 and 200X for single mode 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 and routing of the cable per the wiring schedule.

Payment will be made under:

Pay Item		Pay Unit
655.16	Fiber Optic Cable – 6 Fiber	Linear Foot

IVIS HOMERUN LOOP CABLE (IMSA 50-2 #16)

This task shall include the providing and installation of the IVIS homerun loop cable (IMSA 50-2 #16) shown on the Plan drawings and described herein.

Cable: IMSA 50-2 #16 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, #16 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 #16 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:

Pay Item	Pay Unit

655.17	IVIS Homerun Loop Cable (IMSA 50-2 #16)	Linear Foot

HALF DIAMOND LOOP WIRE (#16 XHHW OR XLP STRANDED WIRE)

This task shall include providing and installation of the half diamond loop wire, as called for in the Plans and Specifications. Half diamond loop wire shall be hand wound and placed with 4 turns of #16 XHHW or XLP stranded wire. The tail loop lead shall be twisted similar to the provided IVIS sensor loops. Half diamond sensors are not provided by the SI as is the case for the preformed full loop sensor.

Basis of Payment

Measurement and payment for the installation of the half diamond loop 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:

Pay Item		Pay Unit
655.18	Half Diamond Loop Wire (#16 XHHW or XLP Stranded Wire)	Linear Foot

PVC CONDUIT

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:

Pay Item		Pay Unit
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
655.2051	5” Schedule 80 PVC Conduit	Linear Foot
655.2052	12” Schedule 80 PVC Conduit	Linear Foot

GALVANIZED RIGID METAL CONDUIT (RMC)

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:

Pay Item		Pay Unit
655.206	1” Galvanized Rigid Metal Conduit	Linear Foot
655.207	1-1/2” Galvanized Rigid Metal Conduit	Linear Foot
655.208	3” Galvanized Rigid Metal Conduit	Linear Foot

LIQUID TIGHT METALLIC FLEXIBLE CONDUIT

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:

Pay Item		Pay Unit
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

INSTALLATION OF PULL BOXES

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:

Pay Item		Pay Unit
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 Outside	Each
655.226	Type G Pull Box Outside	Each

GALVANIZED STEEL JUNCTION BOX

This task shall include providing and installing galvanized steel watertight junction boxes measuring 12” x 12” x 6” or 18” x 18” x 6” to provide an access point from rigid metal conduit to tolling equipment mounted to the space frame 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:

Pay Item		Pay Unit
655.30	12” x 12” x 6” Galvanized Junction Box	Each
655.31	18” x 18” x 6” Galvanized Junction Box	Each

36” x 30” x 20” NEMA 4X CABINET

Provide and install NEMA 4X stainless steel equipment cabinets as designated on the Plan drawings to house 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 power to a quadplex

receptacle (Type 5-15R) that shall be provided within each cabinet as shown on the Plans. The quadplex receptacles shall be orange with stainless steel cover.

AVI Reader cabinets shall be NEMA-4X with minimum dimensions of:

- Height 36”
- Width 30”
- 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:

Pay Item		Pay Unit
655.42	36” x 30” x 20” NEMA 4X Cabinet	Each

PLASTIC WIREWAY

This task shall include providing and the installation of plastic wireway in the tunnel as shown on the Plan drawings and/or described herein. Wireways shall be plastic NEMA 4R, and shall be installed and grounded 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:

Pay Item	Pay Unit

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

REMOVAL OF EXISTING SELECT TOLL EQUIPMENT

The work shall include the removal of existing select toll equipment, defined as the cables/conduit related to removed equipment, existing island traffic light, light curtains, and overhead scanner. Work shall be coordinated with the SI who will be responsible for removing the existing VES cameras, VES lighting, mounting pole(s) and height detector. The removal of existing select toll equipment shall include removing all associated equipment, enclosures, associated pedestals, removing any grout bases, cutting anchor bolts flush with surface, and grouting over any holes or irregularities. It shall also include removal of all associated power and data cables from the existing LC, and the removal of dirty power to the VES lights after removal of VES equipment by the SI. All cables/wires/conduits abandoned from the removal of the existing select toll equipment shall be removed (unless housed in a conduit with other cables, making it impossible to remove without removing and replacing the cables/wires that are staying). Removing abandoned cables/wires/conduits shall be incidental. All existing select toll equipment removed shall be done with care, without harm to the equipment, and shall be stacked at the System Integrator Warehouse in Portland, ME.

Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
655.71	Removal of Existing Select Toll Equipment	Lump Sum

KEY SWITCH

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:

Pay Item		Pay Unit
655.81	Key Switch	Each

RECEPTACLE BOXES

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.

NEMA type L5-30R receptacles are required for the Cash Lanes where shown on the Plan drawings and installation instructions. Additional receptacle locations maybe determined by the Resident and SI. 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:

Pay Item		Pay Unit
655.82	Duplex Receptacle	Each
655.83	NEMA L5-30R Receptacle	Each
655.84	Quadplex Receptacle	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(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 lighting 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.

Coordinate installation of air terminals attached to space frame with space frame manufacturer.

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:

Item	Description	Unit
655.80	Lightning Suppression System	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL WORK

(Canopy Dynamic Message Sign – Center Lane)

655.01 Description

This work shall consist of the installation of a canopy mounted dynamic message sign (DMS) located above the center lane of the new Gray southbound toll plaza. 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.

655.02 Materials

The DMS to be installed at the new Gray southbound toll plaza will be the following:

Daktronics model VL-3550-48X128-20-RGB

655.04 Method of Measurement

Variable Message Sign for Canopy – Center Lane shall be measured by the lump sum for provision and installations accepted by the MTA.

655.05 Basis of Payment

Variable Message Sign for Canopy – Center Lane shall be full compensation for the installation of the new DMS at the new Gray southbound toll plaza, and for all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
655.90	Dynamic Message Sign for Canopy – Center Lane	Lump Sum

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 and an installation plan for installing new LED fixtures into the existing light fixture housings for approval.

655.02 Materials

Provide products produced by:

- CREE Inc. – BetaLED 304 Series

655.03 Method of Measurement

LED replacement light fixtures will be measured by each unit, installed, and accepted.

655.04 Basis of Payment

Installation of the new LED light fixtures will be paid for at the Contract unit price each which payment shall be full compensation for the installation of the new fixture, all conduit and wiring, and for all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Unit
655.92	LED Canopy Light Fixture	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL WORK

(Toll System Temporary Power and Communications)

655.01 Description

This work shall consist of furnishing and installing materials and components to provide all needed power and communication to the existing Gray toll plaza prior to the existing manhole and booth pit in the NB express entry lane being removed.

During the construction of the new NB express entry lane and prior to the manhole and booth pit removal, the contractor shall install the temporary power and communications for the existing Gray Toll Plaza.

The temporary power and communications lines shall not be reused for the new system. Once the new toll system is operational, the temporary power and communications lines shall be removed and will become the property of the contractor.

The contractor may use "used" wiring for temporary power and communication, the size of the power wires shall be verified based on load and length of run prior to installation and shall provide the resident with documentation of that verification. The contractor shall provide (2) coax RG6 and (1) 18 AWG (General C3029 or equivalent) wires for communication from the utility building to Lane 3. In addition, (2) Cat5e cables from each of the existing toll lanes (Entry Lanes 2 and 3 and Exit Lanes 4 and 5) will be run to the utility building.

655.02 Method of Measurement

The temporary power and communication relocation will be measured for payment as one lump sum unit, complete, and accepted.

655.03 Basis of Payment

The accepted work for temporary power and communication relocation will be paid for at the Contract Lump Sum price. All labor and materials required will be incidental to this item.

Payment will be made under:

Pay Item		Pay Unit
655.93	Temporary Power Communication Relocation	Lump Sum

SPECIAL PROVISION

SECTION 655

ELECTRICAL 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 generator shall be exterior mounted on a concrete slab, and shall have all needed enclosures.

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

Manufacturer shall provide base warranty coverage on the material and workmanship of the generator set for a minimum of twenty-four (24) months from registered commissioning and start-up.

The basis for this specification is Cummins Power Generation equipment model C40 N6. Approved equals may be considered from the following manufacturers:

- Onan
- Kohler

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.

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 a 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:

a. AC voltmeter (3-phase, line to line and line to neutral values).
b. AC ammeter (3-phases).
c. AC frequency meter.
d. AC kVA output (total and for each phase). Display shall indicate power flow direction.
e. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
f. 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.
g. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
h. DC voltmeter (alternator battery charging).
i. Engine-coolant temperature gage.
j. Engine lubricating-oil pressure gage.
k. Running-time meter.
l. 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.)
m. 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.
n. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.

o. 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.

p. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.

q. 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 150-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, 150 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.

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 Turnpike 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, enclosures, battery charger, transfer switch, and all associated hardware and wiring for a complete operational system.

Payment will be made under:

Item	Description	Unit
655.94	Stand-By Generator and Transfer Switch	LS

SPECIAL PROVISION

SECTION 656

TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

Section 656 of the Standard Specifications and the General Provisions is deleted in its entirety and replaced with the following:

656.01 Description

This work shall consist of providing temporary erosion and water pollution control during construction in accordance with these Specifications, standard details, Best Management Practices, or as otherwise directed.

All temporary erosion control devices shall be in place and approved by the Resident prior to any operations resulting in disturbed area. The Contractor is responsible for maintaining all erosion control measures in effective operating condition, including repairing and replacing damaged or missing erosion control material until areas are permanently stablized. The Contractor shall maintain these devices in a clean and properly operating condition as described herein.

Prior to construction, the Contractor shall properly install sediment barriers (e.g., silt fence) at the edge of any downgradient disturbed area and adjacent to any drainage channels within the distrubed area. The Contractor shall maintain the sediment barriers until the disturbed area is permanently stabilized.

The Contractor is responsible for all temporary drainage and erosion control measures. The Contractor shall review his construction operations and staging to determine if additional erosion control measures are required. The Resident may also request additional erosion control measures. The cost for all erosion control devices necessary, due solely to the Contractor's construction operations and not shown on the Plans, shall be borne solely by the Contractor. The frequency of inspection of these devices by the Contractor and the Erosion Control Compliance Officer (ECCO) shall be weekly and before, during and immediately following a rainfall of greater than 1/2 inch in a 24-hour period.

The proposed 60” culvert beneath the future southbound on and off ramps is being constructed in a perennial stream and shall include temporary erosion and sedimentation measures that maintain the existing conditions upstream and downstream of the pipe installation. The construction activities in this area include the removal of the existing 48” culvert, placement of the cobble gravel sand mix within the proposed 60” culvert, and the installation of the 60” culvert. There are wetlands that surround this work zone and the groundwater elevations vary by season and localized rainfall events. The Contractor is responsible to maintain or construct separate undisturbed and disturbed areas in the vicinity of the stream in order to construct the various operations in this sensitive area. The contract has several items including; silt fence, baled hay, and erosion control filter berm to assist with erosion and sedimentation control within the project limits.

The conveyance of the upstream water outside of the work zone to a point downstream of the project limits or a staged approach to constructing this area may require the utilization of a

temporary cofferdam in association with a pumped conveyance system may be required to continue the flow of water within the stream at the downstream end of the project limits. In addition, dewatering and construction of a temporary erosion and sedimentation control pit or confined space on uplands may be necessary for treatment of sediment laden water caused by construction activities.

656.02 Temporary Erosion and Sedimentation Control Devices - Materials

The Contractor shall install and maintain all temporary erosion and sedimentation control materials in accordance with the manufacturer's recommendations or the latest BMP's.

1. Baled hay shall be bales at approximately 14 by 18 by 30 inches, or an equivalent, securely tied to form a firm bale.
2. Flexible drainage pipe shall consist of collapsible neoprene pipe, a minimum of 12 inches in diameter or equal.
3. Silt Fence

   (a) Posts - Either hardwood posts or steel posts shall be used. Hardwood posts shall be straight, at least 18 inches longer than the height of the silt fence and at least one inch by one inch.

   Staples shall be of No. 9 wire.

   Steel posts shall be at least 18 inches longer than the height of the silt fence and have the means provided for fastening wire to the fence.

   (b) Wire Support Fence - If required, wire support fence shall be at least two inches higher than the height of the silt fence. Horizontal and vertical wires shall be spaced no more than six inches apart. The top and bottom wires shall be at least 10 gauge; all other wires at least 12 gauge.

   (c) Fabric - The woven geotextile fabric and components shall be made from polypropylene, polyester, polymide or other chemically stable material and be resistant to ultraviolet radiation degradation for at least 12 months of installation. Silt retention capacity shall be no less than 75 percent. The fabric shall have a Mullen burst test of no less than 260 pounds per square inch with a maximum average sieve opening size of No. 20 to No. 60. Roll width of the fabric shall be no less than six inches wider than the height of the fence, except fabric for boom supported floating silt fence which shall be no less than two feet wider than the design width.

656.03 Temporary Erosion and Sedimentation Control Devices - General

Temporary Erosion Checks - Temporary erosion checks shall be constructed in ditches and at other locations designated. Checks shall be in accordance with the Standard Detail unless otherwise directed.

Baled hay shall be used in other areas as necessary to inhibit soil erosion.

During winter construction, November 1st through April 15th, all areas being constructed within 75 feet of a protected natural resource shall be protected with a double row of silt fence.

Sediment deposits behind haybales and silt fence shall be removed when the depth of sediment reaches 50 percent of the erosion control device height.

The Contractor is also required to have on-site, at all times, 25 percent additional Contract quantities of silt fence for use as backup devices.

656.04 Temporary Erosion and Sedimentation Control Devices – Construction Requirements

1. Erosion Control Filter Berm

   The Contractor may opt to furnish and install an erosion control filter berm in lieu of silt fence. The erosion control filter berm shall be a water permeable windrow of a composted bark mix to remove suspended soil particles from water moving off the site. Erosion control filter berm shall be considered an erosion control device. The material and specific application shall be submitted to the Resident for approval.

   The erosion control berm shall be placed uncompacted, in a windrow in locations approved by the Resident. The cross section of the berm shall be four feet wide at the base and 1-1/2 feet high at the center. The erosion control filter berm shall be removed when no longer required, as determined by the Resident, and shall be distributed over an adjacent area.

2. Temporary Berms

   When designated, temporary barriers shall be constructed along the edge of the embankment. The barriers shall be of embankment earth material, gravel or sand as available and shaped approximately as shown in the Standard Details. The barriers shall be compacted with the wheels of construction equipment. When placed on pavement, the berms shall be constructed of asphalt grindings or other non-erodible soil material as approved by the Resident, and shaped as shown in the Standard Details.

   At designated intervals, temporary slope drains shall be constructed with a crescent shaped barrier placed at each slope drain to direct the water into the inlet pipe.

3. Temporary Slope Drains

   Collapsible pipe with corrugated metal pipe inlet shall be placed down the embankment slopes at designated locations and in accordance with the Best Management Practices.

   At the outlet end of the drain, dumped stone shall be placed to prevent scoring unless otherwise directed.

4. Silt Fence

The silt fence shall be installed downhill of disturbed slopes as shown on the Plans or as approved. The Contractor shall have the option to provide a reinforced filter fabric or an un-reinforced filter fabric attached to a wire fence.

The fence posts shall be spaced as specified by the Resident, however, not to exceed a maximum of eight feet [2.5 m] apart when either type of silt fence is used and be driven a minimum of 18 inches [450 mm] into the ground.

The geotextile fabric shall be secured to the post or fence by suitable staples, tie wire or hog rings in such a manner as to prevent tearing and sagging of the fabric. The bottom flap of the geotextile fabric shall be entrenched into the ground a minimum depth of six inches [150 mm] to prevent water from flowing under the fence. The geotextile shall be spliced together only at support posts with a minimum six inches [150 mm] overlap and secure post connection which prevents leakage of silt. The top of the geotextile shall be installed with a reinforced top end section.

The Contractor shall maintain the silt fence in a functional condition at all times. All deficiencies shall be immediately corrected by the Contractor. The Contractor shall make a daily inspection of silt fences in areas where construction activity causes drainage runoff, to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed as approved or otherwise directed.

Sediment deposits shall be removed when sediments reach 50 percent of the height of the device. All sediment deposits remaining in place after the device is no longer required shall be graded to conform to the existing ground, seeded and mulched immediately.

Geotextile fabric which has decomposed or has become ineffective and is still needed shall be replaced with material equal to the original design.

5. Temporary Mulch

Temporary stabilization with mulch or other non-erodable cover is required on all exposed soils that will not be worked for more than 7 days. Areas within 75 feet of a wetland or waterbody shall be stabilized within 48 hours of the initial disturbance of the soil or prior to any storm event, whichever comes first.

The Contractor is responsible for applying temporary mulch as necessary, in accordance with the latest edition of the BMP's, to minimize soil erosion prior to the application of the final slope treatment.

Temporary mulch applied during the winter months of November 1st through April 15th shall be applied at twice the standard temporary stabilization rate or 150 lbs. per 1,000 square feet or three tons/acre. Mulch shall not be spread on top of snow and

shall be anchored with mulch netting on slopes steeper than eight percent unless erosion control blankets or erosion control mix is being used on the slopes.

The Contractor shall review his construction operations and staging to determine how much temporary mulching is required.

656.05 Temporary Erosion and Sedimentation Control Devices - Maintenance

The erosion control devices will be cleaned, repaired or replaced as necessary. All deficiencies shall be corrected immediately by the Contractor.

656.06 Temporary Erosion and Sedimentation Control Devices - Removing and Disposing

When disturbed areas have been permanently stabilized, temporary erosion control devices, including stone check dams, shall be removed. However, erosion control mix filter berms may be spread out, seeded and left to decompose. Areas disturbed during the removal of the erosion control devices shall be repaired and properly stabilized.

When removed, such devices may be reused in other locations provided they are in good condition and suitable to perform the erosion control for which they are intended. Reused devices, if approved, will be measured for payment.

656.07 Erosion Control Compliance Officer

The Contractor shall designate an Erosion Control Compliance Officer (CECCO) on this Project who shall be a "DEP Certified Contractor" or have had equivalent training approved by the Authority. The Contractor shall provide the Resident with the name of the CECCO and any phone numbers or pager numbers that can be used to contact the person in case of emergency.

Before commencing any work that could disturb soils or impact water quality, the CECCO must field review the Project with the Resident's ECCO (RECCO).

656.08 Inspection and Recordkeeping

The CECCO shall accompany the RECCO in the inspection of all erosion control devices. An inspection log shall be maintained by the Resident for the duration of the Project. The log will include daily on-site precipitation and air temperature as well as the performance, failure and/or any corrective action for all erosion and sedimentation controls in place. The log will be updated at least weekly and after all significant storm runoff or flood events. The log shall be signed by the RECCO and the CECCO after each inspection.

Failure to comply with the erosion and sedimentation control requirements herein or as directed by the RECCO within 24-hours after the violation is noted in the inspection log, will result in the $1,000 per day per violation penalty until the violation is corrected to the satisfaction of the Resident.

656.09 Method of Measurement

Baled hay will be measured for payment by the number of bales or bags satisfactorily

placed.

Temporary berms and temporary slope drains will be measured for payment by the linear foot measured parallel with the flow line including the pipe inlet.

Temporary silt fence will be measured by the linear foot along the gradient of the fence, end post to end post.

Erosion control filter berm shall be measured by the linear foot.

The quantity of additional haybales and silt fence material required herein will be measured for payment only when and if they are actually put to use as additional measures on the Project as approved by the Resident. Haybales and silt fence material used for maintenance or replacement of existing devices will not be measured for payment.

The removal of silt and other material from behind the erosion control devices will not be measured separately for payment, but shall be incidental to the Erosion Control items.

656.10 Basis of Payment

The accepted quantity of baled hay will be paid for at the Contract unit price each for each bale which price shall be full compensation for furnishing and placing the bales, for furnishing and driving the stakes for baled hay, for maintaining the bales and stakes, and for the removing and disposing of the bales and stakes when no longer needed.

The accepted quantity of temporary berms will be paid for at the Contract unit price per linear foot of berm which price shall be full compensation for furnishing, placing and compacting material, for maintaining and for removing the berm when no longer needed.

There will be no separate payment for excavation in the construction of temporary erosion control items under this Section and all necessary excavation shall be incidental to the work.

The accepted quantity of temporary silt fence will be paid for at the Contract unit price per linear foot complete in place. Payment shall be full compensation for furnishing, installing, maintaining, replacing deteriorated geotextile and clogged geotextile when required and for removing and disposing of the fence when no longer needed.

The accepted quantity of erosion control filter berm will be paid for at the Contract unit price per linear foot under Item 656.632, 30 Inch Temporary Silt Fence, which price shall be full compensation for furnishing, placing, maintaining, and removing the erosion control filter berm.

Any and all costs associated with temporary coffererdams, deatering, and pumping operations is incidental to the various items in the Contract.

Cost of seeding and mulching the area after removal of the temporary silt fence will be paid for at the Contract unit prices for Item 618, Seeding, and Item 619, Mulch.

Temporary Mulch – See Section 619 Mulch

Payment will be made under:

Pay Item		Pay Unit
656.50	Baled Hay, in place	Each
656.60	Temporary Berms	Linear Foot
656.62	Temporary Slope Drains	Linear Foot
656.632	30” Temporary Silt Fence	Linear Foot

SPECIAL PROVISION

SECTION 670

SEWERAGE DISPOSAL 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 Toll Administration Building. The work shall include furnishing and installing sanitary sewer piping, proprietary-type distribution system (piping, fittings, adapters, etc.), 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 the Plans 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.

670.02 Submittals

Shop and working drawing submittals shall include details of all piping, pipe fittings, subsurface disposal system materials, precast concrete structures 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 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.

670.06 Special Fill for Disposal Bed

Soil material needed for fill beneath, above and adjacent to the In-Drain 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.

670.07 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.

670.08 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.

670.09 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 Plans and as specified herein.

670.10 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.

670.11 Backfilling

Backfill and compaction for trenches and structures shall be as specified in Subsection 206.03, Backfilling, of the Standard Specifications.

670.14 Disposal Bed

The disposal bed shall be constructed as detailed on the Plans, 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 Plans.

670.15 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.

670.15 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.

670.16 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.

670.16 Basis of Payment

Payment will be made for the accepted Sewerage Disposal System, including all excavation, bedding material, special fill, pipes, fittings, septic tank, 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
670.01	Sewerage Disposal System	Lump Sum

SPECIAL PROVISION

SECTION 718

TRAFFIC SIGNALS MATERIAL

The provisions of Section 718 of the Standard Specifications shall apply with the following additions and modifications:

718.12 Conductors Replace second paragraph with the following:

The service wiring for traffic signals shall be single conductor number 4 AWG THWN stranded copper black insulated, number 4 AWG THWN stranded copper white insulated, and number 4 AWG THWN stranded copper green insulated rated 600 volts.

718.13 Twelve (12) Position Fiber Optic Patch Panel This item of work shall conform to this specification. This item shall consist of furnishing and installing 12 Position Fiber Optic Patch Panels at the locations shown on the plans or as indicated by the Engineer.

MATERIALS: The Fiber Optic Patch Panels shall meet the following requirements:

1. The Fiber Optic Patch Panel - 12 position shall be a stand-alone unit manufactured for outdoor field cabinets.

2. The Fiber Optic Patch Panel - 12 position shall include and be capable of accommodating a minimum of 12 ST type connector sleeves.

3. The Fiber Optic Patch Panel - 12 position shall include and be capable of terminating up to 12 connectorized pigtails.

4. The Fiber Optic Patch Panel shall incorporate a hinged access door.

5. The Fiber Optic Patch Panel shall be rack, wall, or shelf mountable as required by the specific location. The patch panel shall be securely fastened in place as recommended by the manufacturer.

6. The Fiber Optic Patch Panel shall include splice trays meeting the following requirements:

    6.1 The splice trays in the Fiber Optic Patch Panel - 12 position shall be capable of holding a minimum of 24 splices.

    6.2 The splice trays shall incorporate a system to retain and provide strain relief to the fiber optic buffers tubes and connector pigtails.

6.3 The splice trays shall incorporate grooves where the fiber optic splice can be held in place.

6.4 Each splice tray shall incorporate a clear snap on lid.

7. The Fiber Optic Patch Panel shall include a restraining system to hold the splice trays securely in place.

8. The Fiber Optic Patch Panel shall incorporate cable guides that maintain fiber strands and fiber buffer tubes bending radius greater than the minimum allowed by the manufacturer.

9. The Fiber Optic Patch Panel - 12 Position shall use 12 connectorized pigtails to connect the fiber optic cable to the Fiber Optic Patch Panel.

10. The number of pigtails to be furnished and spliced to the fiber optic cable are shown in the fiber optic splice tables in the plans. The connectorized pigtails shall meet the following requirements:

    10.1 All fiber optic connectors shall be ST type.

    10.2 The connector mean insertion loss shall be 0.3 dB and maximum 0.5 dB.

    10.3 The connector mean return loss shall be ≤ -59 dB and maximum of ≤ -55 dB.

    10.4 All ST connectors shall have a durability rate of less than 0.2 dB change over 500 rematings.

    10.5 Connectors shall meet ANSI/TIA EIA-604-3A requirements.

    10.6 The fiber optic strand of the connectorized pigtail shall have matching optical properties as the fiber optic strand used on the fiber optic cable.

11. The Fiber Optic Patch Panel shall incorporate a restraining mechanism to hold the fiber optic cable central member and outside jacket.

718.14 Ethernet Switch With Fiber Optic Interfaces This item of work shall conform to this specification. This item shall consist of furnishing and installing a Cisco IE-3000-4TC unit with two each Cisco GLC-FE-1000FX-RGD 550m multimode small form factor pluggable (SFP) modules. It shall also include all additional devices needed for a full and complete installation, including but not limited to connecting cables, Cisco brand power supplies designed to operate with this unit, and mounting hardware.

- The Ethernet Switch shall be fully IEEE 802.3 compliant.

- The Ethernet Switch shall have four 10/100BaseTX RJ-45 ports.
    - The RJ-45 ports shall support full and half duplex operation.
- The Ethernet Switch shall be a layer 2 managed device.
- The Ethernet Switch shall have two 1000BaseFX duplex ports, each with two LC type connectors.
    - The 1000BaseFX ports shall be of the multimode type, and shall be capable of operation over continuous fiber optic strands over a distance of 550 meters.
    - The 1000BaseFX ports shall operate at an optical wavelength of 1300nm.
- The Ethernet Switch shall have an operating temperature range of -40ºC to 75ºC.
- The Ethernet Switch shall have a mean time between failures (MBTF) of 363,942 hours, minimum.
- The Ethernet Switch shall use store and forward technology.
- The Ethernet Switch shall have auto sensing for speed, duplex, and MDIX.
- The Ethernet Switch shall have LED indicators for link active and data activity.
- The Ethernet Switch shall be DIN rail mountable, and shall include all DIN rail hardware needed to mount the Ethernet Switch and accessories in an EIA 19 inch rack.
- The Ethernet Switch shall be powered by 18-60 VDC at 15.1 watts maximum.
- The Ethernet Switch shall include all additional devices needed for a full and complete installation, including but not limited to Category 5 Ethernet patch cords, fiber optic patch cords, and power supplies.
    - Fiber optic patch cords shall have type LC connectors on one end for connection to the Ethernet switch, and shall be connectorized on the opposite ends for proper termination on the fiber optic patch panel, as described herein.

718.15 Messenger Wire This item of work shall conform to this specification. This item shall consist of furnishing and installing aerial fiber optic messenger wire, and appurtenances at the locations shown on the plans or as indicated by the Engineer.

MATERIALS: The aerial fiber optic messenger wire shall be manufactured for aerial installation of fiber optic cable and shall be double galvanized, seven-strand steel wire cable not less than 0.3 inches in diameter and 6,600 lbf breaking strength, Extra High Strength Grade (EHS).

INSTALLATION: Installation shall meet the following requirements:

1. The Contractor shall calculate the strain and sag for the specific aerial installation as shown on the plans and use the recommended tensions and messenger types per the fiber-optic cable and/or messenger wire manufacturer.

2. The Contractor shall install messenger wire with a sag matching that of existing adjacent cables. Messenger wire shall not sag into or near adjacent cables.

3. All utility relocations and required guying shall be completed prior to the installation of messenger wire.

SPECIAL PROVISION

SECTION 719

SIGNING MATERIAL

Delete Section 719.01 Reflective Sheeting and replace with the following:

Section 719.01 Reflective Sheeting Retroreflective sheeting for signs shall meet at a minimum the requirements for, ASTM 4956 – Type VII, Type VIII or Type IX (Prismatic), for all signs. All Type 1 Guide Signs shall meet at a minimum the requirements for ASTM 4956 –Type IX (Prismatic) sheeting.

Reflective sheeting, used in sign construction, shall have been manufactured by the 3M Company 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 block.

Delete Section 719.02 Demountable High Intensity Reflectorized Letters, Numerals, Symbols, and Borders and replace with the following:

719.02 Direct Applied Reflectorized Letters, Numerals, Symbols, and Borders Direct applied letters, numerals, symbols and borders shall consist of cut out sheeting shall meet at a minimum the requirements for ASTM 4956 – Type VII, Type VIII or Type IX (Prismatic) sheeting.

All Type 1 Guide Signs shall meet at a minimum the requirements for ASTM 4956 –Type IX (Prismatic) sheeting.

SPECIAL PROVISIONS

SECTION 800

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. 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.
- 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, and telephone, complete with all appurtenances and accessories.
- Furnishing and installing a new three phase generator, transfer switch and all needed accessories.
- Furnishing and installing power wires (hot, neutral and ground) from panel HP-2 in the new Toll Administration Building to the lane 1 Booth of the new toll plaza, complete with all appurtenances and accessories. Note: the conduits outside of the building pay limits are paid for separately.
- Furnishing and installing power wires (hot, neutral and ground) from the disconnect panels to the electrical panels HP-1 and HP-2 in the new Toll Administration Building, complete with all appurtenances and accessories. Note: the conduits outside of the building pay limits, and in ground junction boxes (splice boxes) are paid for separately.
- Furnishing and installing all junction boxes, conduit, wire, pipe, supports, brackets, etc., including trenching and backfilling, required to provide all utility work, including service runs, relocations, disconnections, reconnections, etc. to the proposed facility required for an operational Toll Plaza.

800.03 Method of Measurement

The Toll Administration Building will be measured for payment by the lump sum, complete and accepted.

The horizontal pay limit shall be 5'-0" from the outside of the Utility building. The vertical pay limit for this work shall be above the lower limit of the aggregate base course - gravel under the concrete floor including the utility pit, for the Toll Administration Building.

All work within this pay limit, including utilities, excavation, backfilling, 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 installation of underground line, as shown on the site and general Plans;

The work described above which shall be included in the Toll Administration Building pay item.

800.04 Basis of Payment

Utility 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.

Payment will be made under:

Pay Item		Pay Unit
800.01	Toll Administration Building	Lump Sum

SPECIAL PROVISION

SECTION 800

MISCELLANEOUS INCIDENTALS

(Electrical Demolition)

800.11 Description

This work shall consist of furnishing and installing materials and components to remove conduit, wires, wireways, cables, outlets, panels, lighting, overhead canopy lighting and all other related electrical equipment show in the Plans. Work shall be completed in a phased manner. ~~.~~

The Contractor shall adhere to lockout/tagout procedures noted in the General Provisions. All electrical systems shall remain operational unless noted in the Plans.

Both dirty and clean power is available in the toll plaza. The Contractor shall take care to maintain both power sources and clearly delineate both in the electrical demolition plan.

Work shall include Contractor submitting a demolition plan noting the sequence of electrical demolition to the Resident for approval prior to beginning demolition work. Electrical demolition work will occur in all Phases. The Contractor shall coordinate installation of proposed work and electrical demolition.

Abandoned wireways, junction boxes, conduit identified to remain shall be tagged or capped as appropriate. The old utility chase remaining under proposed lanes, once abandoned shall be caped and filled with grout.

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

a. Toll Booths and Toll Islands: Associated electrical, communication systems, and structural components as noted on the Plans, including but not limited to: booth power, bumper mounted flashing beacons, switches, wiring, conduits, junction boxes, electrical outlets, pulleys, cables, controllers, communication lines, talk boxes, hangers, posts, and braces.

b. Canopy: Associated electrical, communication systems, and related structural components, including but not limited to: canopy lane lighting, canopy mounted Lane Use signal, canopy mounted sign lighting, heat tapes, portions of the lightning suppression system and AVI antennas.

c. Salvaged Items: Certain items shall be salvaged and delivered to various locations as noted in the Plans.

Basis of Payment

Payment to be made as lump sum for all electrical demolition required including the delivery of specified items noted in the Plans. All labor and materials required will be incidental to this item.

Payment will be made under:

Pay Item		Pay Unit
800.10	Electrical Demolition	Lump Sum

SPECIAL PROVISION

SECTION 800

MISCELLANEOUS INCIDENTALS

(Mechanical Demolition)

800.21 Description

This work shall consist of removing mechanical systems as well as all other related mechanical equipment shown in the Plans. Work shall be completed in a phased manner.

Contractor shall adhere to lockout/tagout procedures noted in the General Provisions.

This item generally includes, but is not limited to demolition and removal of, or portions thereof, the following:

a. Toll Booths and Toll Islands: Associated mechanical and control systems and structural components, including but not limited to booth heaters, hot water supply and return piping, valves, rollers, framing, bracing, actuators, thermostats, controllers, talk boxes, and hangers.

b. Existing Toll Utility Building: The existing gas fired forced hot water heating system shall be removed from the existing utility building and replaced with a Rinnai RHFE-1004FTA or approved equal (same units required for new toll booths – see mechanical plan sheets for details).

Work shall include Contractor submitting a demolition plan noting the sequence of mechanical demolition to the Resident for approval prior to beginning demolition work. Contractor shall coordinate installation of proposed work and mechanical demolition.

800.23 Basis of Payment

Payment to be made as lump sum for all mechanical demolition required. All labor and materials required will be incidental to this item.

Payment will be made under:

Pay Item		Pay Unit
800.20	Mechanical Demolition	Lump Sum

SPECIAL PROVISION

SECTION 800

BUILDING AND STRUCTURES

(Toll Plaza Booths, Canopy and Gantry 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 as shown on the Plans or described herein for the existing Gray toll plaza.

The following work in this item generally includes, but is not limited to the following:

1. Existing lighting on the section of canopy designated for demolition shall be removed and stacked. All items not reset shall become property of the Turnpike Authority.
2. 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.
3. The existing exiting and entry gantries shall be removed and disposed when no longer required for toll operations.
4. The existing sign bridge and foundations shall be removed and the existing signs shall be transported to the MTA Cumberland Maintenance Facility Mile 58.3 northbound.
5. Toll booths shall be removed, masonry debris shall be disposed of; all other components of shall become property of the Turnpike Authority.
6. Granite curb around the toll island shall be removed and shall become property of the Turnpike Authority.
7. All items to become property of the Turnpike Authority shall be transported to the Authority's Cumberland Maintenance Facility Mile 58.3 northbound.

Items not included in this item are:

1. Removal of concrete toll islands, bumpers, pavement slab, and approach slab will be paid under Item 202.12 Removing Existing Structural Concrete.
2. Removal of electrical and mechanical components will be paid under Items 800.10 Electrical Demolition and 800.20 Mechanical Demolition respectively.

800.32 Construction Requirements

The Contractor shall take care in removal, transport, and/or storage of any item that is designated to be reused, reinstalled, or retained by the MTA.

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:

Pay Item		Pay Unit
800.30	Toll Plaza Booths, Canopy and Gantry Demolition	Lump Sum

SPECIAL PROVISIONS

DIVISION 800

BUILDING AND STRUCTURES

(New Toll Booth Installation)

800.01 Description

Division 800 specifies materials, procedures and requirements for the construction of the Toll Facilities, comprised of: installation of two 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 two (2) toll booths complete with aluminum sub-frames, floors, doors, windows, counters, etc. Caulking and sealing of booths to concrete is part of the installation. Weather-stripping to be furnished by others.

2. Furnishing and installing plumbing, heating, ventilating, communications and electrical work in the toll booths and canopy as detailed on the Plans.

3. Furnishing all needed LP gas line from relocated propane tanks, valves, regulators and manifold for the LP Gas Cabinet Unit Heater as noted on the Plans and outlined in this Specification.

The following requirements are included in the LP Gas Cabinet Unit Heater:

- Install 1/2" (Size 18 EHD) Corrugated Stainless Steel tubing to each Cabinet Unit Heater (CUH-1) located in the Toll Booths from the relocated propane tanks. The 1/2” tubing shall be installed in 1” Schedule 80 PVC conduit as shown on the General Plan Sheet GP-01.
- At the Cabinet Unit Heaters provide a UL Listed Gas Cock Shut Off Valve and a drip leg.

- LP gas provider to install a Secondary Pressure Regulator at the LP Tanks to provide 14" w.c. gas pressure to the Toll Booths.

- 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-LockTM jacket capturing for steel tubing protection.

4. Cutting, patching and sealing as required to complete the work per Plans and Specifications.

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 paid for under the specific item.

800.02 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 booth for installation in SB Lanes 1 and 2. The contractor shall transport toll booth from Authority's Sign Shop Facility 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.

800.03 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:

Pay Item		Pay Unit
800.40	New Toll Booth Installation	Lump Sum

SPECIAL PROVISIONS

DIVISION 800

BUILDING AND STRUCTURES

(Generator Pad)

800.01 Description

The work shall consist of installing a concrete pad for the backup generator as detailed in the project plans and these specifications.

800.02 Materials

Concrete shall be Class "A" concrete (4000 PSI) and shall meet the requirements of Section 502.

Reinforcing steel shall meet the requirements of Section 503.

800.03 Method of Measurement

The Generator Pad will be measured for payment by the lump sum, complete, in-place for the Generator Pad installation.

800.04 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, supplies, tools, incidentals, and labor and supervision necessary to satisfactorily complete all work.

Payment will be made under:

Pay Item		Pay Unit
800.90	Generator Pad	Lump Sum

SPECIAL PROVISIONS

DIVISION 800

BUILDING AND STRUCTURES

(Transformer Pad)

800.01 Description

The work shall consist of installing a concrete pad for the 3-phase Transformer as detailed in the project plans and these specifications.

800.02 Materials

Concrete shall be Class "A" concrete (4000 PSI) and shall meet the requirements of Section 502.

Reinforcing steel shall meet the requirements of Section 503.

800.03 Method of Measurement

The Transformer Pad will be measured for payment by the lump sum, complete, in-place for the Transformer Pad installation.

800.04 Basis of Payment

Transformer Pad 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.

Payment will be made under:

Pay Item		Pay Unit
800.91	Transformer Pad	Lump Sum

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART III – DIVISION 800

DIVISION 800

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SECTION 04050

UNIT 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 04100.

C. Masonry Accessories are specified in Section 04150.

D. Brick Masonry is specified in Section 04210.

E. Concrete Masonry Units are specified in Section 04220.

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 07900, 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 05500, Metal Fabrications.

Provide concrete masonry unit reinforced bond beams where shown in accordance with Section 04220 – 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.

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 04100

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 04050, "Unit Masonry, General" for required installation procedures of mortar and grout specified in this section.

END OF SECTION

SECTION 04150

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 04050, "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.

Filler strips at tops of masonry partitions.

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. Compressible Filler: Premolded filer 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.

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 04050, "Unit Masonry, General" for installation of masonry accessories specified under this section.

END OF SECTION

SECTION 04210

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 04050, "Unit Masonry, General".

B. Masonry mortar and grout is specified in Section 04100, "Masonry Mortar and Grout".

C. Masonry accessories, including reinforcing, are specified in Section 04150, "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 04050 "Unit Masonry, General" for installation of brick.

END OF SECTION

SECTION 04220

CONCRETE MASONRY UNITS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings, Contract Conditions and 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. Concrete masonry units (CMU) are indicated on the drawings. The types of concrete masonry units required include the following:

1. Hollow load bearing block, normal weight.

2. Solid load bearing block, normal weight.

B. Installation of CMU is specified in Section 04050, "Unit Masonry, General".

C. Mortar is specified in Section 04100, "Masonry Mortar and Grout".

D. Accessories, including reinforcing, are specified in Section 04150, "Masonry Accessories".

E. Installation of field applied weatherproofing at exterior face of CMU within cavity.

1.03 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. Obtain units from one manufacturer, cured by one process, and of uniform texture and color for each type required, for each continuous area and visually related areas.

C. Standards: Concrete masonry units shall be manufactured to meet the following minimum standards:

Hollow load bearing block; ASTM C 90.

Solid load bearing block; ASTM C 145.

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's data for each type of concrete masonry unit required, including certified copies of laboratory test reports and other data as may be required to show compliance with specified requirements.

B. Samples: Submit 5 samples of each type of concrete masonry unit required to be painted. Select units to show range of texture which can be expected in the finished work.

PART 2 - MATERIAL

2.01 CONCRETE MASONRY UNIT MATERIALS

A. General

Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.

Size: Manufacturer's standard units with nominal face dimensions of 16 inches long x 8 inches high (15-5/8" x 7-5/8" actual) of the various widths shown, unless otherwise indicated.

Exposed Faces: Provide manufacturer's standard color and texture, unless otherwise indicated. Wherever concrete units are indicated to be painted, provide fine-textured units.

Special Shapes: Provide for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.

B. Concrete Block

Where concrete blocks are shown, comply with the following classifications, weights, grades, curing, and other requirements as indicated.

1. Grade: Grade N.

2. Type: Provide Type I, moisture-controlled.

Cure units by autoclave treatment at a minimum temperature of 350°F (176°C) and a minimum pressure of 125 psi.

Limit moisture absorption of 25% of saturation during delivery and until time of installation.

3. Hollow Load bearing Block: ASTM C 90, normal weight.

4. Solid Load bearing Block: ASTM C 145, normal weight using concrete aggregates complying with ASTM C 33, producing a dry net weight of not more than 125 pounds per cubic foot.

C. Field Applied Water Resistive Barrier: Similar to Carlisle Barritech NP

PART 3 - EXECUTION

3.01 INSTALLATION

Refer to Section 04050, "Unit Masonry, General" for installation of the concrete masonry units specified in this section.

Install water resistive barrier at exterior face of CMU wall in accordance with the manufacturer’s installation instructions.

END OF SECTION

SECTION 05300

METAL DECKING

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 DESCRIPTION

Furnish all materials, equipment, tools, supplies, labor and supervision, and perform all work necessary for providing metal decking and accessories as shown on the Drawings, as specified herein, and as is additionally necessary to properly complete the work, unless otherwise definitely excluded.

1.3 REFERENCE STANDARDS:

A. Except as modified by the requirements specified herein and/or the details on the Drawings, all work shall conform to the applicable provisions of the following codes and standards:

1. ASTM-Specifications and standards referred to herein, latest edition.

2. AISI-Light Gauge Cold-formed Steel Design Manual.

3. AWS-Structural Welding Code.

4. SDI-All relevant portions of the design manual.

1.4 SUBMITTALS

A. Submit shop drawings in accordance with Contract requirements, showing complete details of typical and special units; means for fastening together as well as to supporting construction, including all weld details (type, size, spacing, etc.); and erection plans showing a complete layout of the work, including end and side laps, closure plates, fittings, etc.

B. Submit engineering calculations substantiating the section properties prior to fabrication.

1.5 DELIVERY AND STORAGE

Schedule steel deck delivery to the jobsite as required for erection. If deck must be stored at the site, store in bundles off the ground on substantial timbers, with one end elevated to provide drainage, and protect with waterproof materials.

1.6 PROTECTION

Protect installed deck from excessive traffic, dirt and debris prior to the installation of the roofing.

PART 2 - MATERIALS

2.1 MATERIALS

A. Materials and fabricated members shall conform to SDI "Recommended Standard Practice" and "Basic Design Specifications", contained in the "Steel Deck Institute Design Manual for Composite Decks, Form Decks and Roof Decks".

B. Deck material shall be high tensile strength galvanized steel conforming to ASTM A 446, Grade A zinc-coated in accordance with ASTM A 525, G60.

C. Accessory metal sections such as end angle bearing stiffeners, closure plates, and other miscellaneous accessories indicated on the drawings or required to provide a complete installation, shall be two gauge numbers heavier than the gauge of the metal decking, of the same material and finish, and designed especially for the decking being used.

D. Flat Closures: Not less than 8 inches wide, lapped 4 inches on each side. Angle bent edge strips shall be 6 inches wide with 3 inch laps on the flat and vertical legs.

E. Welding Washers: 16 gauge.

F. Welding Rods: 1/8 inch Series E 60 electrodes.

2.2 FABRICATION

A. Fabricate decking at the shop in accordance with the approved shop drawings to fit the conditions and supporting members shown. Where possible, decking shall bear on three supports.

B. The metal deck shall be as manufactured by Epic, Vulcraft, United Steel Deck, or approved equal.

PART 3- EXECUTION

3.1 ERECTION

A. Erect and weld the deck using only experienced, skilled workmen in accordance with the manufacturer’s approved specifications and shop drawings, and as additionally specified herein.

B. Prior to erection, verify that all bearing plates are in proper alignment and that their surfaces are clean for welding.

C. All welds shall be fusion types not less than 1/2 inch diameter. Use welding washers on all welds. Show details of all welds on the shop drawings and conform to the manufacturer's system approval. Burn holes through the metal deck or supporting members will cause rejection of the deck.

D. Cut and reinforce the deck as required at all openings for the work of other trades.

E. Carefully align ribs perpendicular to supports before welding in place. Lap ends a minimum of 2 inches, always over supports. Deck side laps shall be one half corrugation. Weld to supports using welding washers immediately after alignment.

F. After erection of the deck, clean all scars, abrasions, weld areas, etc., on both top and underside surfaces and apply an approved galvanizing touch-up compound in accordance with the manufacturer's instructions.

3.2 CLEANING

The surface and channels of the metal decking shall be clean, free from dirt and debris, and in a proper condition to receive the roofing.

END OF SECTION

SECTION 05500

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.

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 eight (8) 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 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.

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.

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 06100

ROUGH CARPENTRY

PART 1 - DESCRIPTION

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, supplies, transportation, labor and supervision, and performing all operations required to perform all rough carpentry work as shown on the Drawings, as specified herein, and as is additionally necessary to properly complete the work. Work includes, but is not limited to, the following:

1. Structural and rough wood framing.
2. Roof trusses and roof framing, including all blocking, outriggers, etc.
3. Fascia and rake framing.
4. Rough hardware.
5. Gable and overhang framing and sheathing.
6. Roof sheathing.
7. Insulation stops.
8. Wood for other trades (i.e., blocking, nailers, grounds, etc.).
9. Wood blocking required at back of fire extinguishers, electric panels, telephone panels, motor operators, wall stops, windows, toilet accessories, etc.
10. Temporary protection as required.

1.03 SPECIFIED ELSEWHERE

A. The installation of finish hardware is specified in Section 08700.

B. Finish carpentry items such as soffits, cabinets, shelving, standing and running trim, exterior trim, window stools, etc., are specified in Section 06400.

1.04 SHOP DRAWINGS

A. Submit copies of shop drawings and manufacturer's product data for approval.

B. Submit shop drawings of trusses showing all necessary design details and calculations, stamped by a professional structural engineer licensed in the State of Maine. Also include jobsite storage instructions and details for a continuous insulation stop at all eaves. The Contractor shall furnish and install insulation stops even though they are not shown on the Resident's Drawings.

C. Submit 18 inch long samples of wood to be used for each element (i.e., trusses, fasciae, rakes, etc.) for approval. Also submit 24 inch square samples of panel products and each rough hardware item (sheathing clips; metal hangers, straps and gussets; etc.) for approval.

1.05 GENERAL

A. All lumber shall be new, dressed on all sides (S4S), and shall conform to U.S. Department of Commerce Simplified Practice Recommendation R16. Lumber for the various uses shall have characteristics appropriate for the intended use.

B. All lumber and plywood in contact with the ground, concrete, or exposed to the weather shall be preservative treated as specified herein.

C. Obtain measurements and verify dimensions shown on shop drawing details before proceeding with carpentry work, wherever possible.

D. Correlate the location of furring, nailers, blocking, grounds and similar supports so that attached work will comply with design requirements.

E. Fit carpentry work to other work. Scribe and cope as required for accurate fit.

F. Time delivery and installation of carpentry work to avoid delaying other work which is dependent on or affected by the carpentry work and to comply with protection and storage requirements.

G. Keep carpentry materials dry during transport and storage. Store lumber and plywood in stacks with provision for air circulation within stacks. Protect exposed materials against weather. Do not store dressed or treated lumber or plywood outdoors. Store trusses in accordance with the manufacturer's approved instructions and recommendations.

PART 2 - MATERIALS

2.01 STRUCTURAL FRAMING

A. Structural framing, including plates, rafters, outlookers, bracing, blocking, etc., shall be kiln-dried Hem-Fir, No. 1 or better, free of loose knots and other defects that would impair its strength.

2.02 ROOF TRUSSES AND FRAMING

A. The wood trusses and roof framing shall be designed and manufactured by Wood Structures, Inc., of Biddeford, Maine, or approved equal. The top and bottom cords of the trusses shall be a minimum of 2" x 6", as shown. (Coordinate with duct work which may impact the design of trusses and framing.) Provide gussets and extensions as indicated and required.

B. The trusses shall be factory fabricated with adequate plant and under supervision of properly qualified personnel.

C. The trusses shall be assembled with built-in camber and ready for site erection. All members shall be precision cut and assembled in a jig to ensure uniformity with all gusset plates accurately positioned.

D. Metal gusset plates shall be 20 gauge hot-dip galvanized plates perforated with punched teeth. Plate design values shall be as approved by FHA.

E. The fabricator of the trusses shall furnish steel connections and hardware for joining timber members to each other and to their supports exclusive of anchorages embedded in masonry. Such hardware shall conform to the details shown on the Drawings or the approved shop drawings. Hardware items shall have one coat of shop applied premium grade primer containing a rust inhibitor. All exposed connections to be hot-dip galvanized.

2.03 ROUGH HARDWARE

A. Anchors, bolts, nuts, and miscellaneous metal items shall conform to requirements of Federal Specifications FF-B-575. Fastenings for exterior construction shall be hot-dip galvanized.

B. Framing connectors, joist hangers, straps, metal bridging, etc., shall be as manufactured by TECO Timber Engineering Co., Heckman Building Products Inc., or Simpson Strong Tie Connectors, hot dip galvanized in accordance with ASTM A 123 or A 153, as applicable.

2.04 SHEATHING, DECKING AND MISCELLANEOUS PLYWOOD

A. Sheathing shall be "Exterior" APA Performance - Rated Panels (C-D Exterior PS-1), 5/8 inch thick unless otherwise noted. Provide sheathing clips between panels for all joint areas not over framing.

B. Miscellaneous plywood for interior applications, such as electric panel backing boards, shall be Interior DFPA C-D with exterior glue.

2.05 FASCIAE AND RAKES

A. Fasciae, fasciae moldings, rakes, and rake moldings shall be preservative treated custom grade solid Hem-Fir selected for its clear appearance, free of loose knots, large knots, pitch streaks, cupping, etc., subject to approval by the Engineer, fabricated to the shapes shown on the Drawings.

2.06 FURRING

A. Furring shall be No. 1 Common Eastern Spruce of the sizes noted on the Drawings.

2.07 WOOD PRESERVATIVE

A. Preservative Treatment: Lumber and plywood shall be treated with preservatives in compliance with applicable requirements of AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB standards listed below. Mark each treated item with the AWPB Quality Mark.

1. Pressure-treat above-ground items with water-borne preservatives complying with AWPB LP-2. After treatment, kiln-dry to a maximum moisture content of 15 percent. Treat indicated items and the following:

a. Wood cants, nailers, curbs, blocking, stripping, and similar members in connection with roofing, flashing, vapor retarders and waterproofing.

b. Wood sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

c. Wood framing members less than 18 inches above grade.

2. Pressure-treat wood members in contact with ground with water-borne preservatives complying with AWPB LP-22:

3. Complete fabrication of items to be treated prior to treatment, where possible. If members are cut, drilled or otherwise altered after treatment, coat the affected surfaces with two heavy brush coats of same chemical used for treatment. Inspect each piece of lumber or plywood after drying and discard damaged and defective pieces.

2.08 NAILS

A. All nails for framing, sheathing, fasciae, gables and all other exterior applications shall be "double" hot dipped galvanized equal to those provided by Maze Nails, Peru, IL.

PART 3 - CONSTRUCTION METHODS

3.01 INSTALLATION

A. Do all carpentry work required, lay out all lines, provide necessary measurements, and furnish all needed assistance in cooperation with the various trades to insure that the work is thoroughly and satisfactorily completed.

B. Anchor framing members to timber, concrete, and masonry as indicated. All rough carpentry shall be laid out as called for on the Drawings. Cut framing square on bearings, closely fitted, accurately set to required lines and levels, plumb, and secured rigidly in place at bearings and connections.

C. All carpentry shall be performed by workmen skilled in the trade. Lines shall be run true and accurate for support of finish carpentry and other applied finishes.

D. Provide all temporary bracing as required. Maintain OSHA approved ladders at all times for convenient and safe access to all portions of the building.

E. Set trusses plumb, straight and on accurate spacing as shown on the approved Shop Drawings. Use great care in erection to avoid flexing of trusses in the weak direction. Brace trusses temporarily with substantial bracing to prevent falling and distortion from wind and other causes.

F. Frame members for passage of pipes and ducts to avoid cutting structural members. Do not cut, notch or bore members for passage of pipes or wiring without permission of the Resident. Reinforce framing members as directed where damaged or weakened by approved cutting.

G. Nail or spike members in accordance with National Lumber Manufacturer's Association Manual for House Framing.

H. Apply roof sheathing sheets with face grain perpendicular to the rafters and trusses. All end joints shall be on rafters/trusses and shall be staggered. Use a minimum of two (2) sheathing clips to join edges between trusses. Secure sheathing with 8d galvanized nails at 6 inch centers along panel edges, at 12 inch centers at intermediate trusses. Install floor decking in accordance with APA recommendations but with not less than one fastener 6 inches on center at edges and one fastener 12 inches on center over supports.

I. Exterior woodwork shall be provided in the longest practicable lengths to minimize joints. Joints shall be hairline; mitered, scarfed or dadoed, as proposed by the Contractor and approved by the Resident. Joints in running material shall occur only over supports. Exposed mill ends are not acceptable. Drilled holes, cut-outs, cut edges and ends, and other alterations made after preservative treatment shall be sealed before installation.

K. Provide temporary wood protection for concrete, at trucking points, at entrances, over floor openings, at metal door bucks, and at finished woodwork and millwork, until completion and acceptance of the work.

L. Provide temporary supports and wood centering as required.

END OF SECTION

SECTION 06400

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 eight (8) copies of manufacturer's specifications and installation instructions for each product required.

B. Shop Drawings: Submit eight (8) 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.

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 JOB CONDITIONS

1.08 WORK NOT INCLUDED

A. Finishing of standing and running trim is specified in Section 09900.

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.

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 nailings, 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

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 09900 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 07200

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 07530

SINGLE PLY MEMBRANE ROOFING AND FLASHING

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 DESCRIPTION

A. Provide all labor, materials, equipment, services and transportation required to complete the elastomeric roofing and flashings for the Toll Plaza Canopy as shown on the Drawings and as specified herein.

B. Coordinate work with that of other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.3 SUBMITTALS

A. Submit shop drawings to the Engineer for approval in accordance with Contract Requirements. Show details, dimensions, locations and installation methods of all elastomeric sheet roofing, insulation, metal flashings, elastomeric flashing and specialty items as indicated on the Drawings.

B. Do not commence fabrication of any work or begin installation until shop drawing approval has been obtained from the Engineer.

C. Submit samples of all materials as requested by the Engineer for approval.

D. Current EPDM membrane manufacturer's application specifications.

E. Manufacturer's details of the proposed fascia system.

F. History of roofing applications by the Contractor.

G. Roofing applicator’s licensing.

1.4 QUALITY ASSURANCE

A. Roof systems provided shall comply with FM I-90 requirements.

All elastomeric membrane roofing and flashing materials furnished and installed under this Section shall be the products of a single manufacturer, or shall be specifically approved for use by the manufacturer whose roofing specification is used. Materials shall be high grade, first quality of domestic manufacturer with an application history of ten (10) years in the United States. Furnish a written affidavit stating that these requirements have been complied with.

B. Roofing and flashing shall be applied by a roofing applicator licensed, franchised or approved by the roofing materials manufacturer, using experienced skilled roofers. Furnish a written affidavit stating that the roofing applicator is licensed by the roofing manufacturer.

C. All roofing and flashing work shall be applied in strict accordance with the roofing manufacturer's written requirements and specifications applicable to roof conditions. There shall be no deviations made from this specification or the approved shop drawings without prior written approval by the manufacturer and the Engineer.

D. Where additional work or materials, or greater quantities of materials than required by roofing manufacturer are specified herein, these Specifications shall govern.

E. Upon completion of the installation, an inspection shall be made in the presence of the Engineer by a representative of the roofing manufacturer to ascertain that the roofing system has been installed according to the applicable manufacturer's specifications and details.

F. In order to define the level of quality (material characteristics, thickness, performance, etc.), appearance, and type of roofing membrane system required, "Design A" fully adhered, FM I-90 rated, EPDM roofing system by Carlisle SynTec Systems, Carlisle, PA has been specified. Other EPDM systems, equal in all respects, such as thickness, reinforcing, tensile strength, puncture resistance, etc., may be submitted to the Engineer for evaluation.

1.5 PRE-ROOFING CONFERENCE

A. After approval of all materials and prior to installation, a pre-roofing conference shall be held at the site. In attendance shall be the Engineer, the Contractor, the roofing subcontractor and a manufacturer's representative. Notify all participants at least 3 working days prior to date of meeting.

B. The parties shall review Drawings, Specifications and approved materials. Correct conflicts, if any, between approvals and specification requirements. Examine site conditions, including inspection of deck, material labels and methods of storing materials. Confirm that all nailers, curbs and edges are provided and correctly installed. Review installation procedures, scheduling and temperature requirements, and establish protection methods for finished roof from other trades.

C. Submit a copy of pre-roofing conference records covering all discussions and agreements to the Engineer and other participants.

1.6 DELIVERY AND STORAGE

Materials shall be delivered in their original, unopened containers, clearly labeled with manufacturer's name, brand name, and such identifying numbers as are appropriate. Adhesives, sealant and mastics shall be stored at a temperature between 60°F and 80°F. Should they be exposed to lower temperatures, restore to room temperatures for 3 to 5 days prior to use. Do not use and immediately remove from jobsite any materials damaged in handling or on storage. All cardboard containers shall be stored in dry areas or on pallets.

1.7 FINAL INSPECTION

Upon completion of the installation, an inspection shall be made in the presence of the Engineer by an inspector of the EPDM roofing material manufacturer in order to ascertain that the roofing system has been properly installed. Should there be any deviation from the specifications without the prior written consent of the roofing material manufacturer and the Engineer; the Contractor shall correct such deviation to the roofing material at no additional cost to the Authority.

1.8 WARRANTY

The Contractor shall provide the Authority with a ten (10) year written warranty issued by the primary manufacturer of the new roofing system covering full cost of labor and materials necessary to affect water tightness. The original copy of the warranty shall be delivered to the Authority when the job is completed and a 20 year all Material Only Warranty as issued by the primary manufacturer of the EPDM sheeting shall be provided to the Authority. Warranties from fabricator's agents or installers will not constitute compliance with these warranty requirements.

1.9 TESTING OF FASTENERS

Field testing of fasteners will be required. For each separate roof area ten random fasteners shall be tested for minimum pull-out resistance of 400 pounds. A report of the findings shall be forwarded to the Engineer. Testing shall be performed by the fastener manufacturer without additional cost to the Authority.

1.10 INTENT

It is not the intent herein to describe all of the details for roofing and flashing. The Contractor shall assure himself that all items and details not otherwise specified herein but shown on or reasonably inferred or implied by the Drawings, or as otherwise required by the membrane manufacturer to achieve a complete watertight installation, shall be provided under this Contract at no additional cost to the Authority.

PART 2 - MATERIALS

2.1 MEMBRANE AND MATERIALS

A. General: Trade names and materials specified herein for elastomeric materials are based on Carlisle SynTec System and are used throughout for purposes of establishing the quality of materials to be used on this Contract. All requested substitutions submitted for approval shall meet the physical properties, test methods and warranty specified or inferred herein. Substitutions not meeting these requirements will be rejected.

B. Membrane shall be based on 0.060 inch thick "Black" polyester reinforced elastomeric membrane, Ethylene Propylene Diene Monomer sheet "EPDM" compound as manufactured by Carlisle SynTec Systems, Division of Carlisle Corporation, Carlisle, PA or other manufacturer's membrane having equal or better physical characteristics as approved by the Engineer.

C. Metal flashing shall be System 100/200, FA-65 by Metal-Era, Inc. or approved equal. Fascia and extender to be .050" mill finish aluminum.

D. Elastomeric flashing shall be 1/16 inch thick compatible uncured EPDM sheet, flashing furnished by the membrane manufacturer.

E. Bonding adhesive shall be synthetic rubber adhesive furnished by the roofing membrane manufacturer and formulated for bonding elastomeric membrane to substrates.

F. Splicing cement shall be high strength solvent base contact synthetic rubber cement furnished by the roofing membrane manufacturer and formulated for splicing EPDM membranes to them.

G. In-seam sealant shall be silicone base type sealant furnished by the roofing membrane manufacturer and formulated for splice seams following cement application.

H. Splice solvent shall be solvent base cleaner furnished by the roofing membrane manufacturer to provide clean surfaces for application of splicing cement.

H. Lap sealant shall be heavy bodied trowel or gum consistency material furnished by the roofing membrane manufacturer and formulated to seal the exposed edges of elastomeric membrane lap splice and at mechanical terminations of vertical or horizontal surfaces, or to seal off membrane terminating in reglets in accordance with manufacturer's details.

I. Water cut-off mastic shall be a low viscosity butyl compound furnished by the roofing membrane material manufacturer, compounded and designed to be used as a sealing agent between membranes and most substrates for the compartmentalization of waterproof areas, and as a sealant in conjunction with deck drain details.

J. Night seal shall be a two-component, fluid applied elastomer furnished by the roofing membrane manufacturer and compounded for use to temporarily seal the loose edge of the membrane to protect completed sections of roof from infiltration of water and outside elements.

K. Pourable sealer shall be a two-component, fluid applied elastomer furnished by the roofing membrane manufacturer and compounded for use to temporarily seal the loose edge of the membrane to protect completed sections of roof from infiltration of water and other elements.

L. Rubber fastening strips shall be extruded hard rubber, predrilled at 12 inches on center to

accommodate screw fasteners, furnished by the roofing material manufacturer, designed to secure roof membrane at roof perimeter, or other conditions as recommended by the manufacturer's details.

2.2 ROOF BOARD (CANOPY)

Glass mat faced, non-combustible, moisture-resistant silicone treated gypsum core panels equal to “DensDeck” as manufactured by Georgia-Pacific of the thickness indicated on the Drawings.

2.3 FASTENERS

Fasteners required for fiberboard underlayment fastening shall be non-corrosive Phillips-head predrilled self-tapping screw-type with 2-1/2 inch diameter 24-gauge deformed tin-plated steel discs in screw, length approved for conditions respectively to penetrate the wood deck a minimum of 3/4 inch in depth and metal deck as required by the roofing membrane manufacturer. Fastener layout shall conform to FM Class I-90 and membrane manufacturer's specifications and requirements.

PART 3 –EXECUTION

3.1 INSPECTION OF SURFACES AND COORDINATION OF WORK

A. Before roofing work begins, roof areas shall be carefully inspected and checked for all conditions affecting insulation, roof board roofing applications and performance. Carefully check nailing strips for suitability as anchorage. Defects shall be reported in writing to the Engineer and roofing work shall not proceed until defects have been corrected. Commencement of work shall constitute acceptance of the conditions of the surfaces to which the complete roofing system work is to be applied, and all defects in work resulting from such accepted surfaces shall be corrected by this trade without additional cost to the Authority.

B. Coordinate all work with that of other trades affecting, or affected by roofing work. Verify the placement of nailers for all locations and conditions where materials of this Section are affected.

C. Roof Surface Preparation

1. Remove all debris from the roof.

2. Verify that all woodwork is properly installed to receive the roofing materials and that the woodwork is compatible with the roofing membrane and flashing.

3. Make sure surfaces are clean and dry. Sweep, vacuum or use compressed air to clean roof substrate surfaces as required for application of insulation, roofing membrane, and flashings.

4. Repair all joints and cracks wider than 1/4" with approved sealant.

5. Fill depressions with non-asphaltic felt as necessary to provide a level substrate surface where

insulation is to be mechanically fastened.

3.2 INSTALLATION OF INSULATION

A. Install apply each layer of insulation (flat and tapered) in accordance with the approved Shop Drawings, with joints closely butted and staggered in both directions at mid-points. Boards shall be uniform throughout, with square edges and corners, and with no voids, open joints, broken corners, or damaged edges. Immediately remove all wet, broken, bowed and otherwise defective boards from the site.

B. Install only as much insulation as can be covered with completed roofing membrane and flashings, and sealed the same day.

C. Scribe insulation tight to roof projections and vertical surfaces unless otherwise indicated on the approved Shop Drawings or installation instructions.

D. Install insulation with all joints offset. Tightly butt insulation and fill all joints over 1/4" wide with approved sealant. Mechanically fasten the insulation to the deck as required to meet FM I-90 requirements and the membrane manufacturer in open areas and at the perimeter, at curbs and openings, and at intersections with vertical and sloped surfaces.

E. Check all completed insulation installations with accurate optical instruments (e.g., transits) to insure that proper slope has been provided; correct non-compliant work.

3.3 INSTALLATION OF ROOF BOARD

Install roof board in accordance with the requirements specified for insulation above, and the requirements of the board manufacturer.

3.4 INSTALLATION OF DRAINS

A. New drains shall be installed in accordance with the details as shown on the Plans, the recommendations of the manufacturer and/or as directed by the Engineer.

B. Roof drain flashing flanges shall extend beyond the drains to a minimum of 6 inches in all directions. Flashing flanges shall be secured to the drains by means of a clamping ring furnished and set with the drain.

3.5 ELASTOMERIC MEMBRANE INSTALLATION (ADHESIVE APPLIED)

A. Elastomeric sheet roofing shall be installed in strict accordance with manufacturer's standard roofing specifications for a fully adhered sheet roofing system and as specified herein. Comply with manufacturer's recommendations for temperature during installation.

B. Position roofing membrane over insulation without stretching. Allow membrane to relax for approximately one hour prior to bonding. Fold sheet back so one half of sheet is exposed. Sheet fold shall be smooth, no wrinkles or buckles. Apply bonding adhesive

evenly, no globs or puddles, with a plastic core paint roller. Adhesive shall be applied to both sheet and substrate at rate recommended by the manufacturer. Allow adhesive to dry until tacky. Roll coated membrane into adhesive, void wrinkles, and brush down with a push broom to achieve maximum contact. Repeat procedure for unbonded half of membrane.

C. At each lap, fold top sheet back about 12 inches and clean both mating surfaces at a splice area using clean rags with splice solvent. Apply splicing cement using 3 inch paint brush at a rate of approximately 175 lineal feet of 3 inch splice per gallon of splicing cement. Cement shall be brushed on in a circular motion obtaining 100 percent coverage on both mating surfaces. Cement coat shall be smooth with no globs or puddles. Allow cement to dry until it does not string or stick to dry finger touch.

D. Follow procedures using inseam sealant at splice joints applied continuously. Roll top sheet toward splice area until cemented area is nearly touching cement on bottom sheet. Allow top sheet to fall freely into place. Avoid stretching and wrinkling. Roll the splice with 2 inch wide steel roller, using positive pressure, toward outer edge of splice. Solvent clean splice edge, extending at least 1 inch onto top and bottom membranes. Apply bead of lap sealant completely covering splice edge, carefully tooling lap sealant with putty knife or trowel.

E. Install rubber fastening strips at vertical and/or horizontal surfaces to secure membrane flashing, using the approved non-corrosive fastenings in accordance with manufacturer's written instructions.

F. Except where otherwise shown, perimeter flashing and other flashings shall be done with uncured EPDM elastomeric flashing sheet, using the longest pieces practicable. Splicing between flashing and main roof sheet shall be completed before bonding of flashing to the vertical surface. This splice shall be sealed at least 3 inches beyond the fasteners which attach horizontal membrane to nailers. Apply bonding adhesive to both the membrane and the surface to which it is being bonded. After bonding adhesive has dried so that it does not string or stick to dry finger touch, roll the flashing into the adhesive. Take care to assure that the flashing is not bridging where there is any change of direction of the flashing (e.g., where vertical surfaces meet roof deck).

G. Install water cut-off mastic between membrane and substrates in accordance with manufacturer's written specifications and details.

H. Flash all projections passing through the membrane using pipe seals. All flashings and terminations shall be done in accordance with manufacturer's standard printed details. Flash and make watertight roof drains and all other penetrations.

I. At the end of each day's work, take care to ensure that water does not flow beneath any completed sections of roof by temporarily sealing loose edge of membrane with night sealer when weather is threatening. Prepare sealer according to manufacturer's written instructions. Apply sealer at a rate of approximately 100 lineal feet per gallon, 12 inches back from edge of sheet. Use a trowel as necessary to spread sealer material in order to achieve prescribed coverage. After membrane is embedded in night sealer, weight the edge,

providing continuous pressure over the length of the cutoff. When work is resumed, pull the sheet free before installation is continued. Allow no unfinished roof areas to be left unprotected in wet weather or at night.

J. After completion, protect elastomeric roofing from traffic and damage of all kinds.

3.6 ALUMINUM FASCIA

A. Sheet aluminum shall be .040" thick, finish to match existing fascia.

B. Fabricate and install sheet metal with lines, arises and angles sharp and true and plane surfaces free from objectionable wave, warp or buckle. Exposed edges of sheet metal shall be folded back to form a 1/2" wide hem on the side concealed from water leakage under all weather conditions. The workmanship and methods employed for framing, anchoring, cleating and the expansion and contraction of sheet metal work shall conform to applicable details and description as indicated in current edition of the following publications unless other methods are indicated on project drawings or specified herein.

Architectural Sheet Metal Manual as published by the Sheet Metal and Air Conditioning contractors National Association, Inc. and hereinafter referred to as “The SMACNA Manual”

3.7 PROTECTION

This trade shall be responsible for, and repair, all damage resulting from his work or operations. Particular care shall be taken to avoid staining any part of the exposed structure or finished work. Hoisting of materials shall be done with extreme care. Use approved means to protect exposed surfaces.

3.8 CLEAN UP

At completion of work, remove from the site and legally dispose of the packaging, containers, and other accumulated materials, and leave the work in a cleaned and satisfactory condition as approved by the Engineer.

END OF SECTION

SECTION 07600

FLASHING AND SHEET METAL

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 Section 15050, Basic Mechanical Materials and Methods.

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 07610

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

Shall be ice/waterproofing membrane specified below.

E. Ice/Waterproofing Membrane

Self-adhering 60 mil reinforced rubberized asphalt waterproofing membrane equal to "Winter Guard Waterproofing Shingle Underlayment" by CertainTeed Corporation, Valley Forge, PA.

F. Vapor Retarder

Shall be the ice/waterproofing membrane specified above.

G. Sealant

One-part silicone sealant equal to "Spectrem 1" by Tremco Sealants and Coatings, Beachwood, OH.

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, brass two pipe snow guards designed for use with metal roofing and complete with brackets and fasteners for anchoring as manufactured by Alpine Snowguards, or approved equal.

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.

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 07900

JOINT SEALERS

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

C. Sealants for glazing are specified in Section 08800.

1.03 SUBMITTALS

A. Manufacturer's Data: Submit eight (8) 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
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.

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 08110

STEEL 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 08700.

C. Furnishing and installing steel frames for louvers is part of the work of this section. Furnishing and installing louvers is specified under Section 10200.

D. Glass and glazing will be performed under Section 08800.

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.

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 08400

ALUMINUM ENTRANCE DOORS AND 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

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 07900, Joint Sealers.

B. Glass and glazing shall be performed under Section 08800.

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 Medium 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 3-17/32 inches, top rails of 3-17/32 inches, and bottom rails of 6-17/32 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 08700.

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 07900, Joint Sealers.

F. Glazing: Provided under Section 08800, Glass and 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 08500

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 08800, Glass and Glazing.

C. Sealants: Shall be as specified in Section 07900, Joint Sealers.

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 08800, Glass and Glazing.

C. Sealants shall be furnished and installed in accordance with the requirements of Section 07900, Joint Sealers.

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 08700

FINISH 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 08400.

2. Hardware for Cabinets - Section 06400.

3. Installation of hardware for metal doors will be performed under Section 08110.

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.

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. or Glynn-Johnson.

9. Name Plates shall be engraved laminated plastic for the following doors: TOILET, and CUSTODIAL. Plates shall be 1 1/2" wide with 5/8" letters. Install plates with stainless steel screws. Color of nameplates and lettering will be selected by the Engineer.

11. Handicapped Symbols for Toilet Room door shall be 4" x 4" (approximately) by 1/8" thick blue laminated plastic signs with white symbol and No. 2 Braille.

12. Exit Device and Pull: Refer to Section 08400.

2.02 FINISH HARDWARE SCHEDULE

SET NO. 1

For Door No. 101 (Aluminum Entrance Door)
Provide 1 cypher lock
Provide 1 threshold

SET NO. 2

For Door No. 102
1 1/2 pair Butts
1 Lockset
1 Closer
1 Kick Plate

1 Head and Jamb Weatherstripping Set
1 Door Bottom
1 Threshold

SET NO. 3

For Door No. 103
1 1/2 pair Butts
1 Lockset with Electric Strike
1 Card Reader (provided by the Authority)
1 Closer
1 Kick Plate
3 Head and Jamb Weatherstripping Set
1 Door Bottom
1 Threshold

SET NO. 4

For Door Nos. 104
1 ½ pair Butts
1 Latchset – Passage Function
1 Kickplate
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 Kickplate
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 08800

GLASS AND 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. Interior wood door vision lights.

4. 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 eight (8) 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:

Viracon
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 Viracon 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 Viracon Laminated Glass. Color will be blue.

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 Viracon Insulated Glass. Color will be blue.

2.05 GLASS TYPES

Provide the following glass types as indicated in the Glazing Schedule:

Type A - 1 inch 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 insulated: 1/4 inch tinted exterior light, 1/2 inch desiccated air space; 1/4 inch clear obscure (frosted or sandblasted) interior light.

2.06 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.

2.07 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.

2.08 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 09250

GYPSUM DRYWALL

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.

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. 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.

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 Type CU-1 (2'-6" X 2'-6") with 14 gauge galvanized steel frame and door. Door shall be insulated with 1 inch fiber glass insulation. Door shall be equipped with a spring lever, as manufactured by the Bilco Co. 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 09900 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 09300

CERAMIC TILE

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. Gypsum board for ceramic tile - Section 09250

B. Grab bars and bath accessories - Section 10600

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 eight (8) copies of manufacturers' specifications and installation instructions for each material required.

PART 2 - MATERIALS

2.01 CERAMIC MOSAIC FLOOR TILE

A. Tile shall be unglazed, impervious porcelain type with smooth surfaces, cushion edges, 1/4 inch thick. Tile shall be standard colors, all as selected from samples submitted to the Resident for approval. Selections will be made of patterns consisting of 2 inch x 2 inch tiles in a four color repeat pattern equal to American Olean Price Group No. 2.

B. Tile shall be standard grade conforming to ANSI A137.1-1980.

2.02 GLAZED CERAMIC WALL TILE

A. Glazed tile and base shall be first quality, TCA certified. Tile shall be 4-1/4" x 4-1/4" nominal size with cushion edges. Base shall be matching cove type. All external corners (wall and base) shall have standard bull nose corner trim. Provide all shapes required to meet conditions, such as inside corners, caps, etc. Furnish and install bull nose cap and trim members to match the size of the field tile.

B. Glazed tile and base shall conform 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.

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.

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. Cove tile base shall be laid with internal and external corners. Cove shall match the level of the floor so there is a smooth transition between wall and floor.

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 09500

SUSPENDED 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.

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.

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 09650

RESILIENT WALL BASE

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.

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
Kentile Floors, Inc.

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, equal to Kentile VC-100 matte finish.

C. 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 subfloor. 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 09900

PAINTING

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
Devoe
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, flatting, 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 psychronometers, 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 off 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 shop primer and galvanizing in accordance with touch-up specifications.

c. Prime Coat: Prime touch-up areas and bare metal with Tnemec Series 4 Versare Rust Inhibitive Primer. Repair damaged galvanizing with ZRC Cold Galvanizing Compound or equal, and prime all galvanizing with Tnemec 32-1210 Tneme-Grip.

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 Retardo Rust Inhibitive Paint (163). 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 Impervo (133) Semi-Gloss Alkyd Enamel; 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 Block Filler (145) applied as necessary to produce a smooth, dense surface.

c. Finish Coats: Two (2) coats of Benjamin Moore Moorcraft Satin Finish Enamel (250); 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 Moorcraft Vinyl Latex Primer (252); 1 dry mil (spray, brush or roller applied).

c. Finish Coats: Two (2) coats of Benjamin Moore Moorcraft Vinyl Latex Flat (251); 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 Moorcraft Vinyl Latex Primer (252); 1 dry mil (spray, brush or roller applied).

c. Finish Coats: Two (2) coats of Benjamin Moore Moorcraft Satin Finish Enamel (250); 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 Moorcraft Alkyd Enamel Underbody (247); 1.5 dry mils (spray, brush or roller applied).

c. Finish Coats: Two (2) coats of Benjamin Moore Moorcraft Satin Finish Enamel (250); 1.5 dry mils for each coat (spray, brush or roller applied).

7. System F - Wood - Transparent Finish (Stan and Clear Satin Polyurethane Finish):

a. Surface Preparation: Prepare surfaces in accordance with specification for wood.

b. First Coat: Benjamin Moore Penetrating Stain (241).

c. Second Coat: Benjamin Moore Benwood Polyurethane Finish (428) Gloss Finish; 1.0 dry mil film thickness (spray, brush or roller applied).

d. Third Coat: Benjamin Moore Benwood Polyurethane Finish (435) Semi-Gloss Finish; 1.0 dry mil film thickness (spray, brush or roller applied).

8. System G - Concrete Floors (Epoxy):

a. Surface Preparation: Brush blast concrete floors to provide a dense 2 mil anchor profile. Acid surface etching will 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)	G
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 and exposed ceilings	D
5. Wood and PVC	
a. Standing and Running Trim	E
b. Shelves	E
c. Interior Wood Surfaces of Casework	F
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)

Note: All colors will be custom colors as selected by the Engineer.

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.

E. Prime galvanized steel and aluminum with Benjamin Moore Galvanized Metal Primer (155), or an approved equal, before applying finish coats.

END OF SECTION

SECTION 10200

MISCELLANEOUS

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, labor and supervision, and performing all operations required to furnish and install all miscellaneous items as shown on the Drawings, as specified herein, and as is additionally necessary to properly complete the work.

1.03 SHOP DRAWINGS

Submit eight (8) copies of shop drawings for louvers, lockers, flagpole, mop hanger, shelving & supports. Submit eight (8) copies of catalog cuts for all items and materials supplied.

PART 2 - MATERIALS

2.01 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.

2.02 LOUVERS

A. Where indicated on the Drawings, install Airolite type K6774 Horizontal drainable louvers 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 bird screen in extruded aluminum frames. Louvers shall bear AMCA certified ratings seals for air performance and water penetration. 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). Hollow metal frames shall be supplied under Section 08110.

B. Where indicated on the Drawings, install Airolite type K611 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 bird 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 H_2O. 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). Hollow metal frames shall be supplied under Section 08110.

C. See Mechanical Specifications for automatic dampers.

2.03 CASH DROP UNIT (SAFE)

Cash drop unit (safe) will be supplied by the Authority.

2.04 CURRENCY SCANNER & COIN SORTER UNITS

Currency Scanner and coin sorter units will be supplied by the Authority.

2.05 LOCKERS

A. Metal Lockers shall be similar to Global Industries "Infinity" Locker. Lockers shall be Double Tier 12" x 18" x 36" in 6-Door assembled profile. Each door shall have a stainless steel recessed door latch suitable for padlock. Each locker shall have 3 clothes hooks (one per side/rear).

B. Factory applied paint color shall be selected by the Architect.

2.06 SHELVING AND SUPPORTS

A. Shelving shall be ¾" plywood or particleboard core melamine-clad units in sizes indicated. All faces and edges shall be melamine clad. Color shall be white.

B. Supports shall be similar to Knape & Vogt steel heavy-duty #85 Series vertical standards and #185 Series brackets. Bracket shall be full depth of shelf, unless indicated otherwise.

2.06 TRASH RECEPTACLES

A. Trash Receptacles will be supplied by the Authority.

2.07 FILE CABINETS

A. File cabinets will be supplied by the Authority.

2.08 FLAGPOLES

Flagpoles shall be seamless cone tapered aluminum 6063-T6 alloy, 30' (exposed) with a mechanical Class I clear anodized finish for two flags as manufactured by American Flagpole. All fittings, such as ball finial, double revolving truck, two halyard and four snaphooks, two cleats, and pole mounting assembly shall be as manufactured by or recommended by the flagpole manufacturer. Similar flagpoles and appurtenances manufactured by Concord Industries Inc., or EMC, a Division of Eder Manufacturing Corp. may also be acceptable.

2.09 ALUMINUM GRATING

Aluminum grating shall be flush top, SGF Series by Ohio Grating Inc., or approved equal. Bearing bars shall be rectangular 1-1/2" X 3/16" thick and spaced 1-3/16 inches on center maximum. Cross bars shall be locked at right angles to, and on the same plane as, the top surface of bearing bars and spaced 2 inches on center maximum. Finish shall be anodized aluminum.

PART 3 - EXECUTION

3.01 MOP HANGER

Install mop hanger in accordance with the manufacturer's instructions.

3.02 LOUVERS

Install louvers as shown on the approved shop drawings and in strict accordance with the manufacturers' instructions.

3.03 CASH DROP UNIT (SAFE), CURRENCY SCANNER AND COIN SORTER

Place cash drop unit, currency scanners and coin sorters in position after all surrounding work has been completed and approved. Safe, currency scanners and coin sorters supplied by the Authority.

3.04 FLAGPOLES

A. Before installation, when flagpoles are to be stored on site for an extended period, remove all wrapping material and store poles in a dry place, off the ground.

B. Flagpole shall be installed by a manufacturer trained and approved erection crew experienced in handling, assembling and erecting poles, in strict accordance with the manufacturer's instructions and as shown on the approved Shop Drawings.

3.05 ALUMINUM GRATING

A. Install aluminum grating at Utility Pit in accordance with the manufacturer’s instructions.

3.06 SHELVES AND SUPPORTS

A. Install shelves and supports in accordance with the manufacturer's written installation instructions and as indicated.

3.07 LOCKERS

A. Install lockers in location indicated and in accordance with manufacturer's installation instructions. Anchor lockers to wall framing.

END OF SECTION

SECTION 10520

FIRE EXTINGUISHER

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 eight (8) 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 10600

TOILET 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	B290 2436
Sanitary Disposal Unit	B270
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 6206.

C. Obtain all toilet accessories from a single manufacturer.

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 11460

KITCHEN EQUIPMENT

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: General Electric Model no. GTS18DCP

   a. Size: 17.9 cu. ft.

2. Microwave Oven: General Electric Model no. JEM31

   a. Size: 1.0 cu. ft.

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 area 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 15 and 16 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.

END OF SECTION

SECTION 12356

KITCHEN CASEWORK

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.

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.

3. Cabinet hardware.

B. Shop Drawings: For cabinets and countertops. 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.

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

2.1 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 “Rutland II” 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. Wilson: Ralph Wilson Plastics Co.

2.2 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.

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

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.

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.

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.

END OF SECTION 123560

SECTION 15000

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 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.

3.13 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.

3.14 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**.

3.15 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.

3.16 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.

3.17 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.

3.18 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.

3.19 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 *

SECTION 15250

INSULATION

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 15000-"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 15000, 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-ft^2-^{o}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-ft^2-^{o}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-ft^2-^{o}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

SERVICE	THICKNESS	MATERIAL/JACKET
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

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.

* END OF SECTION *

SECTION 15400

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.

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	American Society of Heating, Refrigeration and Air Conditioning Engineers
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

PART 2 - 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 ¾ 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:

Pipe Size	Rod Size
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 <u>are not acceptable</u>.

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. <u>Heating hot water piping shall be labeled differently from Domestic hot water piping</u>. On parallel runs of piping, plumbing markers shall be grouped together, and grouped with heating markers whenever practical.

Legend	Background/Letter Color
“Cold Water”	Green/ white letters
“Domestic 120ºF 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 15250

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 350ºF:

	Soldered Ends	Screwed Ends
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:

	Soldered Ends	Screwed Ends
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:

	Soldered Ends	Screwed Ends
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 ½" 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 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.

2.10 PLUMBING FIXTURES

A. 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.

B. LV Lavatory, Wall Mounted - ADA

1. AMERICAN STANDARD 954.000 Murro Universal Design wall hung lavatory, for concealed arm support, 4” centers, vitreous china, rear overflow, self-draining deck, color “white”. 0059.020 shroud/Knee Contact Guard, vitreous china. Or

reviewed equal.

2. Moen model 8216, commercial brass, lever handle lavatory faucet, 4” centers, ceramic control components, pop-up drain assembly, chrome, meets ADA. Provide 0.5 to 1.0 aerator. Or reviewed equal. Note: if providing an equal, top of faucet (spout) must not exceed 5-1/4” above the sink deck.

3. McGuire P-trap, chrome brass grid drain, chrome plated angle supplies, wheel stops, wrought escutcheons. Or reviewed equal. Must fit inside shroud/knee guard.

4. Provide extra blocking and install using wall hanger with extra-long fasteners.

C. 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 ¾” 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.

D. 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. Sloan Royal WES-111-YO, dual flush, chrome, quiet exposed flush valve for 1.1/1.6 GPF, wall flange, 1” screwdriver angle check stop, vacuum breaker, spud coupling flange, ADA green handle, sweat solder adapter kit, two adhesive backed wall plates (place one over flush valve, and one on back of stall door). Or reviewed equal, by Zurn.

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.

2.11 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.

2.12 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” Round, Finished Floor

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.

PART 3 -

E. Roof Drain (RD): Zurn ZRB121-C 12” diameter roof drain with low silhouette bronze dome with underdeck clamp. Or reviewed equal.

PART 4 -

2.13 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”, 'A' P.D.I. units

Zurn Z-1700, #100. Or reviewed equal.

C. Thermometer (T)

Units to be dial type, 4.1/2” with 30° to 180° range; Trerice 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, ½", capacity 3.5 GPM @ 5 psi differential pressure for exposed piping, rough bronze, set at 120ºF. 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.

2.14 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 175º.

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:

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 ½” 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 *

SECTION 15700

HVAC SYSTEM

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 15000 "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 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 15000, 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. Roof-Mounted Heat Pump RHP-1 in Toll Booths

PART 2 - PRODUCTS

2.1 CENTRAL HEAT PUMP SYSTEM

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, P:UZ 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 installation. In addition the compressors shall have a manufacturer's limited warranty for a period of six (6) years from date of installation.

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.

2.2 ENERGY RECOVERY UNIT (ERV-1)

A. Provide and install indoor, air to air heat recovery ventilators as shown on drawings. Capacities shall be as scheduled on drawings.

B. Units shall be listed per ANSI/UL 1995, Heating and Cooling Equipment. Energy transfer ratings of the energy recovery wheel shall be ARI Certified. Unit shall bear the AMCA Certified Rating Seals for Air Performance. Performance shall be as scheduled on plans. Exhaust discharge and outside air intake shall not be located on the same side of unit casing.

C. Standard casing panels shall be 20 gauge galvanized steel, lined with not less than 1 inch thick fiberglass insulation with Foil-Scrim-Kraft facing. Housings shall be supported by a formed structural base forming a pan to ensure weather tight construction. Lifting holes shall be provided at the unit base. Units shall have a sheet metal roof. The outdoor air

intake opening include an automatic shutoff damper with electric operator and time delay relay to give the damper an opportunity to open prior to the fan starting. The exterior of the unit shall be coated with an epoxy primer and a polyurethane enamel painting system for added protection. Painting system shall be rated to meet a 1500-hour salt spray test.

D. Access to components shall be provided through a large, tightly sealed and easily removable access panel. Access panels shall be constructed of the same materials as the unit casing. The wheel cassette shall be easily removable from the unit. The roof of the unit shall also be removable for access.

E. The supply air and exhaust air duct connections shall be oriented for a horizontal inlet and discharge.

F. Fans shall be double width double inlet design with forward curve type wheels. The blades shall be designed for maximum efficiency and quiet operation. Impellers shall be statically and dynamically balanced.

For belt driven fans V-belt drives shall be sized for a minimum 150% of driven horsepower. Fan sheaves shall be adjustable. Pulleys shall be of the fully machined cast type, keyed and securely attached to the fan wheel and motor shafts. Optional speed controllers on direct-drive fans shall allow independent balancing of exhaust and supply airflows.

Ground and polished steel fan shafts shall be mounted in permanently lubricated, sealed ball bearing pillow blocks. Bearings shall be selected for a minimum (L10) life in excess of 100,000 hours at maximum cataloged operating speeds.

Motors shall be standard NEMA frame, energy efficient, complying with EPACT standards, for single speed ODP enclosures. Motors shall be permanently lubricated, heavy-duty type, matched to the fan load and furnished at the specified voltage and phase with thermal overload protection. Where 3-phase is indicated motors shall be VFD rated.

Fans and motors shall be mounted to a unit base with neoprene isolators as standard. Belt drive motors shall be factory mounted to an adjustable motor plate having two heavy-duty adjusting bolts for alignment and belt tension.

G. The rotor (energy wheel) shall be made of either a light weight polymer media in a stainless steel rotor or an aluminum media, coated to prohibit corrosion in a galvanized steel rotor. All surfaces shall be permanently bonded with a desiccant for both sensible and latent recovery and be designed to insure a laminar flow. Wheels with sprayed on desiccant coatings are not acceptable. The energy recovery wheel shall transfer moisture entirely in the vapor phase. Efficiencies shall match performance as scheduled, transfer ratings must be ARI certified to standard 1060 and bear the ARI certification symbol for ARI Air-to-Air Energy Recovery Equipment Certification Program based on ARI 1060. Ratings “in accordance with 1060” without certification are not acceptable. The media shall be cleanable with low temperature steam, hot water or light detergent, without degrading the latent recovery. Wheel media shall be independently tested and shown to conform to the requirements of NFPA-90A, documenting a flame spread of less than 25 and a smoke generation rating of less than 50.

H. The rotor cassette shall be easily removable from the unit to facilitate rigging (if necessary) and ease of service. The wheel cassette design shall use pillow block bearings for long life. For rotors thicker than 3” an adjustable purge sector shall be included in the cassette.

I. Filters shall be not less than 1 inch thick permanent aluminum washable type mounted in the outside air hood and in the return air plenum. The filters shall be listed by Underwriters' Laboratories as Class 2.

J. Units shall be equipped with a rotation sensor and controller such that should the energy recovery wheel not rotate during a signaled run period, the controller shall send a 24 volt AC signal suitable for operating a relay to be used as an alarm contact. In addition, this controller shall be equipped with an outdoor air temperature and discharge temperature sensors such that the energy recovery wheel can be modulated via a (VFD) during moderate temperature periods if desired.

K. Units shall require a single point 60-cycle power connection. See equipment schedules on sheets BM7 and PM4 for voltage and phase requirements. The electrical panel shall consist of individual motor contactors, short circuit and overload protection, disconnect switch (for pre-heaters) and control power transformer. The NEMA 3R electrical panel shall be mounted on the unit exterior for ease of access or be a factory integral panel to the unit. A factory installed and wired 120 volt convenience outlet shall be provided inside the panel. Units shall be ETL listed and labeled.

L. Manufacturer shall provide and install variable frequency drives (VFD’s) inside the unit for each fan. Drives shall be for balancing purposes only.

M. Manufacturer shall warrant to Owner that for a period of not less than eighteen (18) months from the date of shipment the goods to be delivered to Owner will in all material respects be free from defects in material and workmanship when used in a proper and normal manner. Should any failure to conform to the above appear within eighteen months after the date of shipment, manufacturer agrees upon prompt notification thereof during the Warranty Period and confirmation to manufacturer’s satisfaction that the goods have been stored, installed, operated and maintained properly and in accordance with standard industry practice, to correct the non-conformity at manufacturer’s option either by repairing any defective part or parts or by making available at manufacturer’s plant a repaired or replacement part.

Manufacturer shall warrant to the Owner for a period of not less than 60 months that the wheel contained in the energy recovery unit in all material respects to be free from defects in material and workmanship when used in a proper and normal manner. For warranty purposes the wheel includes, media, desiccant coating, wheel hub, wheel rim and spokes.

N. Provide a remote control panel for unit. Panel shall be located in ceiling space immediately below the unit and shall contain:

1. A contactor to permit start/stop operation with a signal from the building ATC system
2. Rotation detection
3. On-Off-Auto switch
4. Wheel Frost Protection

O. Provide factory authorized start-up and Owner training by a factory authorized representative.

P. Submittals must include performance data which incorporates total unit energy consumption (fan power, wheel operation, energy recovery, etc.) vs. energy savings.

Q. Unit shall be provided with factory insulated curb not less than 14 inches high. Contractor shall fill the curb with fiberglass batt insulation for added thermal and sound protection.

R. Unit shall be RenewAire EV130. Equivalent units meeting the requirements of this specification will be considered but request for consideration must be made prior to bidding. Only units incorporating a heat recovery wheel will be considered for review.

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2.3 CABINET UNIT HEATER CUH-1 (In Each Toll Booth)

A. Furnish and install where shown on the drawings Rinnai Model ERHFE-1005 self-contained wall furnace (or approved equal).
- 36,500 BTUH output LP gas heat
-263 CFM
-81% 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.

2.4 ROOF-MOUNTED HEAT PUMP RHP-1 (In Each Toll Booth)

A. Furnish and install where shown on the drawings Dometic B59516 Roof-mounted Heat Pumps (or approved equal).
-15,000 BTUH cooling/heating

B. Furnish and install the Air Distribution Box and thermostat by manufacturer.

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.

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 *

SECTION 15800

DUCTWORK AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The drawings and the specifications including SECTION 15000 "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 15000, 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.

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.

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 duct systems 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

*

SECTION 15900

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 15000 "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 or Maine Controls.

1.4 SUBMITTALS

A. Substitutions: Your attention is directed to Section 15000 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 15000, 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. Automatic valve schedule showing flow, Cv, and pressure drop.

6. 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.
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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 wiring for the remote thermostat provided with the Unit Heater.

6. The Roof-Mounted Heat Pumps in the Toll Booths provide and install low voltage control wiring for the remote thermostat provided with the Unit Heater.

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

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 the existing adjacent generator shed.
   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 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. Obtain 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 existing facility distribution system.
   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 acceptance.

PART 2 - PRODUCTS

2.01 CONDUIT AND FITTINGS

A. Electrical Metallic Tubing (EMT): ANSI C80.3 galvanized tubing, ¾” minimum size.
   1. Fittings: Set screw-type ANSI/NEMA FB1.

B. Flexible Metal Conduit: Steel, ¾” 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.
   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: THW or XHHW.

2.03 METAL CAD 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: 60 degrees 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. Receptacles
1. Description: NEMA WD1; Heavy-duty type, 125-volt grounded duplex receptacle.
2. Device Body: Ivory nylon (normal power circuits); Green nylon (clean power circuits)
3. Configuration: NEMA 5-20.
4. Color: White.
5. Model: *CR20-W*

D. Ground Fault:
1. Description: UL 498, 544, 943; 125 volt, ground fault interrupt type duplex receptacle with TEST and RESET.
2. Device Body: Ivory, Thermoplastic.
3. Configuration: NEMA 5-20.
4. Model Number: *2095-w*

E. Wall Plates
1. Description: White colored nylon.

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: 5/8-inch diameter by 8-feet long copper clad ground rod.

2.08 PANELBOARDS

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, 225-ampere bus, 150-ampere, 3-pole main circuit breaker.
2. Branch Circuit Breakers: (2) 40-ampere 3-pole; (1) 30-ampere, 2-pole; (3) 20-ampere, 2-pole; (1) 15-ampere, 2-pole; (26) 20-ampere, 1-pole.

D. Panelboard CP1:
1. 120/208 volts, 3-phase, 4-wire, 225-ampere bus, main lugs only.
2. Branch Circuit Breakers: (24) 20-ampere, 1-pole.

E. Emergency Main Circuit Breaker (located in Storage room 102)
1. 120/208 volts, 3-phase, 4-wire, 225-ampere frame, 150-ampere trip.

F. Distribution Feeders:
1. Provide and install an emergency power feeder between the emergency main circuit breaker and the UPS being provided by the Turnpike Authority. The feeder shall consist of 4 # 1/0, 1# 6 gnd in a 2-1/2" conduit. At the UPS, tap the emergency power feeder and connect to both the incoming UPS wiring terminals as well as to the UPS by-pass wiring terminals.
2. Provide and install an emergency power feeder between the UPS being provided by the Turnpike Authority and panelboard CP1. The feeder shall consist of 4 # 1/0, 1# 6 gnd in a 2-1/2" conduit.

G. Service Grounding:
1. Provide and install a new service ground at the Administration Building consisting of a base copper #2 conductor and a ¾ inch diameter by 10 foot long copper-clad steel ground rod.

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.

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:

   (a) Automatic Lightning Protection.
   (b) ERICO International Corporation.
   (c) Harger Lightning Protection, Inc.
   (d) Heary Bros. Lightning Protection Co. Inc.
   (e) Independent Protection Co.
   (f) Robbins Lightning Inc.
   (g) 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. 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
   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:

(a) 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.

(b) Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.

(2) Alarm Silence Switch:

(a) 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:

(a) 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:

(a) 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:

(a) 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 (2002 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

incompliance 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 (2002 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 to a Municipal 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 B 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) principal 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.

2.13. 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: EIA/TIA 19-inch wide telecommunications rack and accessories. Floor racks shall be constructed of heavy gauge metal with standard 4-post configuration. Provide adjustable leveling feet and earth grounding kit. Provide a complete assembly for mounting all telecommunications equipment within racks.

1. Floor Rack Manufacturers:
   a. *Chatsworth* – Four-Post System
   b. Substitutions: Or Approved equal
2. Free Standing Floor Equipment Racks: Free standing equipment racks shall be seven feet (2134mm) high, EIA nineteen inch (518mm) wide, fifteen inch (381mm) deep, open bay as indicated on the Drawings. Rack features shall include the following:
   a. Universal hole pattern on the front and rear flanges, and mounting holes on both sides of rack assembly for management brackets.
   b. Racks shall be extruded (not sheet metal) with 10 - 32 threaded equipment mounting holes. Mounting holes that require supplemental threaded clips are specifically prohibited.
   c. Shelves for electronic equipment with load carrying capacity to support at least 125 percent of each piece of electronic equipment weight. Shelves shall have adequate openings within them to dissipate heat and allow for adequate electronic equipment ventilation.
   d. Mounting brackets specifically designed to support the equipment installed within the rack.
   e. Hook and loop (Velcro) cable strain relief system on rear of rack to support horizontal and backbone cables. Tie-wraps are specifically prohibited.
   f. Hook and loop (Velcro) horizontal and vertical cable management on front of rack for dressing patch cable and cross connect wiring. Tie-wraps are specifically prohibited.
   g. Hook and loop (Velcro) cable management system independent of telecommunications cabling management to properly dress the electronic equipment power cords through the rack maintaining as much clearances between the two as possible. Tie-wraps are specifically prohibited.
   h. Bonding and grounding cables for all equipment not directly bolted to equipment rack (i.e shelf mounted electronic equipment, etc.).
   i. Bonding and grounding bus bar with individual set screw terminals for at least a minimum of six #6 Cu. bonding cables.
   j. Surge protected power strip as described in this specification.
   k. Patch panels as described in this specification.
   l. All hardware, supplementary steel, channel and supports as required to properly assemble the rack and support it to the building structure.
3. Each equipment rack shall have cable management panels with horizontal and vertical brackets.
   a. Cable management shall be EIA nineteen inch (518mm) rack mounted 3.5 inch (88mm) high panel with horizontal and vertical patch cable, distribution rings, or approved equivalent and shall be provided above and below each patch panel in the equipment rack.
   b. Equipment rack cable management shall be furnished by patch panel

manufacturer.

c. Cable management for high density, IDC Type cross-connect block panels shall be distribution rings integral to the panel or approved equivalent. Cable management shall be provided above and below each cross connect block in the equipment rack.

4. Equipment Rack Surge Protected Power Strip Manufacturers:
   a. *Wiremold*
   b. *Sentrex*
   c. *TrippLite*
   d. *S.L. Weber*
   e. Substitutions: Or approved equal
5. Surge protected power strip shall be rack mount type.
6. Surge protected power strip with six NEMA 5-15R outlets 15 amp capacity, 120 volts, UL 1449 listed, maximum surge current of 33,000 amps, clamping voltage of 260 volts, maximum 5 picosecond response time, resettable overload circuit breaker, surge suppression warning light, surge protection for line to neutral, line to ground, neutral to ground, EMI/RFI filters. One required for each load up to 1200 watts (total of individual equipment loads).

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 ½ ± 15% (from 1MHz to 100 MHz)
   b. Maximum DC Resistance: 9.38 ½ / 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/TIA-568A, 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.
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 6-inch separation. Provide minimum 24 inches separation in acoustic rated 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: 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. Install receptacles with grounding pole on top.

G. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.

H. 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 return the existing fire alarm system to complete an operating condition.
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. Securely mount equipment rack to the building structure. Proper supports such as 3/8" lag screws and expansion anchors shall be used. Proper quantity of supports shall be utilized.

J. Position racks in order to have minimum 3-foot clearance for easy access.

K. Install terminating components such as patch panels (UTP); cable management, etc. into the

equipment rack.

L. Patch Panels: Mount patch panels onto the rack at the top of the rack.

M. 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.

N. Once the cabling system has been installed and terminated, install all active components and surge protected power strips into the rack.

O. Surge Protected Outlet Strips: Mount UPS and surge protected outlet strips per Manufacturer's directions.

P. Outlets shall be seated properly and shall be installed level on walls and parallel to building elements as required.

Q. All conductors of every cable shall be completely terminated at both ends.

R. Cable bending radius shall not be less than minimum required by EIA/TIA and BICSI.

S. Cabling installed concealed shall be supported from the building structure (e.g. J-Hooks, etc.).

T. 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.

U. Clearances: Clearances between cabling and other building systems as required by EIA/TIA 569 and BICSI shall be maintained throughout the building.

V. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements.

W. 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.

X. 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.

Y. 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.

Z. Protect all cables during construction. Cables damaged during installation shall not be repaired. They shall be completely replaced with new cable.

AA. All cabling shall be concealed within partitions or above ceilings.

BB. 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.

CC. The general topology shall be a "hierarchal 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.

DD. 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.

EE. 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.

FF. 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.

GG. Maximum pulling tension shall not exceed 25 lbs/ft. when installing cables.

HH. Modular Jacks: Each Category 5E jack shall have a Category 5E home cable run back to its associated patch panel.

II. 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.

JJ. Cabling systems shall meet or exceed the electrical and transmission characteristics of the systems specified.

KK. 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).

LL. 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.

MM. 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.

NN. 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.

OO. 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.

PP. 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.)

QQ. 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.

RR. 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

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Department of Human Services
Division of Health Engineering, 10 SHS
(207) 287-5672 Fax: (207) 287-3165

PROPERTY LOCATION

City, Town, or Plantation	Gray
Street or Road	Route 115
Subdivision, Lot #	

>> CAUTION: LPI APPROVAL REQUIRED <<

Town/City _____ Permit # _____

Date Permit Issued ____/____/____ Fee: $ _____ Double Fee Charged ☐

_____ L.P.I. # _____
Local Plumbing Inspector Signature

☐ Owner ☐ Town ☐ State

The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. This 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/APPLICANT INFORMATION

Name (last, first, MI): Maine Turnpike Authority ■ Owner ☐ Applicant

Mailing Address of Owner/Applicant:

Daytime Tel. #:

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.

_____ _____
Signature of Owner or Applicant Date

CAUTION: INSPECTION REQUIRED
I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application.

_____ _____
Local Plumbing Inspector Signature (1st) date approved

_____ _____
(2nd) date approved

PERMIT INFORMATION

TYPE OF APPLICATION
- ■ 1. First Time System
- ☐ 2. Replacement System
  - Type replaced: _____
  - Year installed: _____
- ☐ 3. Expanded System
  - ☐ a. <25% Expansion
  - ☐ b. >= 25% Expansion
- ☐ 4. Experimental System
- ☐ 5. Seasonal Conversion

THIS APPLICATION REQUIRES
- ■ 1. No Rule Variance
- ☐ 2. First Time System Variance
  - ☐ a. Local Plumbing Inspector Approval
  - ☐ b. State & Local Plumbing Inspector
- ☐ 3. Replacement System Variance
  - ☐ a. Local Plumbing Inspector Approval
  - ☐ b. State & Local Plumbing Inspector
- ☐ 4. Minimum Lot Size Variance
- ☐ 5. Seasonal Conversion Permit

DISPOSAL SYSTEM COMPONENTS
- ■ 1. Complete Non-engineered System
- ☐ 2. Primitive System (graywater & alt. toilet)
- ☐ 3. Alternative Toilet, specify: _____
- ☐ 4. Non-engineered Treatment Tank (only)
- ☐ 5. Holding Tank, _____ gallons
- ☐ 6. Non-engineered Disposal Field (only)
- ☐ 7. Separated Laundry System
- ☐ 8. Complete Engineered System (2000 gpd or more)
- ☐ 9. Engineered Treatment Tank (only)
- ☐ 10. Engineered Disposal Field (only)
- ☐ 11. Pre-treatment, specify: _____
- ☐ 12. Miscellaneous Components

SIZE OF PROPERTY
☐ SQ. FT. ■ ACRES

SHORELAND ZONING
☐ Yes ■ No

DISPOSAL SYSTEM TO SERVE
- ☐ 1. Single Family Dwelling Unit, No. of Bedrooms: ____
- ☐ 2. Multiple Family Dwelling, No. of Units: ____
- ■ 3. Other: Turnpike Plaza Office (specify)

Current Use ☐ Seasonal ☐ Year Round ■ Undeveloped

TYPE OF WATER SUPPLY
■ 1. Drilled Well ☐ 2. Dug Well ☐ 3. Private
☐ 4. Public ☐ 5. Other

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK
- ■ 1. Concrete
  - ■ a. Regular
  - ☐ b. Low Profile
- ☐ 2. Plastic
- ☐ 3. Other: _____

CAPACITY: 1,000 GAL

DISPOSAL FIELD TYPE & SIZE
- ☐ 1. Stone Bed ☐ 2. Stone Trench
- ■ 3. Proprietary Device
  - ■ a. cluster array ☐ c. Linear
  - ☐ b. regular load ☐ d. H-20 load
- ☐ 4. Other: _____

SIZE: 576 ■ sq. ft. ☐ lin. ft.

GARBAGE DISPOSAL UNIT
■ 1. No ☐ 2. Yes ☐ 3. Maybe

If Yes or Maybe, specify one below:
- ☐ a. multi-compartment tank
- ☐ b. ___ tanks in series
- ☐ c. increase in tank capacity
- ☐ d. Filter on Tank Outlet

DESIGN FLOW
115 gallons per day

BASED ON:
- ■ 1. Table 4A (dwelling unit(s))
- ☐ 2. Table 4C (other facilities)

SHOW CALCULATIONS
— for other facilities —

- ☐ 3. Section 4G (meter readings)

ATTACH WATER METER DATA

SOIL DATA

PROFILE	CONDITION
9	D

at Observation Hole # TP-1
Depth 11 "
of Most Limiting Soil Factor
Groundwater

DISPOSAL FIELD SIZING
- ☐ 1. Medium—2.6 sq. ft. / gpd
- ☐ 2. Medium—Large 3.3 sq. f.t / gpd
- ☐ 3. Large—4.1 sq. ft. / gpd
- ■ 4. Extra Large—5.0 sq. ft. / gpd

EFFLUENT/EJECTOR PUMP
- ■ 1. Not Required
- ☐ 2. May Be Required
- ☐ 3. Required

Specify only for engineered systems:
DOSE: _____ gallons

LATITUDE AND LONGITUDE
at center of disposal area

Lat. N43 d 52 m 55.46 s
Lon. W70 d 20 m 18.04 s
if g.p.s. state margin of error: 20'

SITE EVALUATOR STATEMENT

I certify that on 07-16-15 (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 State of Maine Subsurface Wastewater Disposal Rules (10-144A CMR 241).

Site Evaluator Signature	034 SE #	12/16/15 Date
Richard A. Sweet Site Evaluator Name Printed	797-2110 Telephone Number	dick@sweetassociates.com Email Address

Designed with SeptiCAD v3

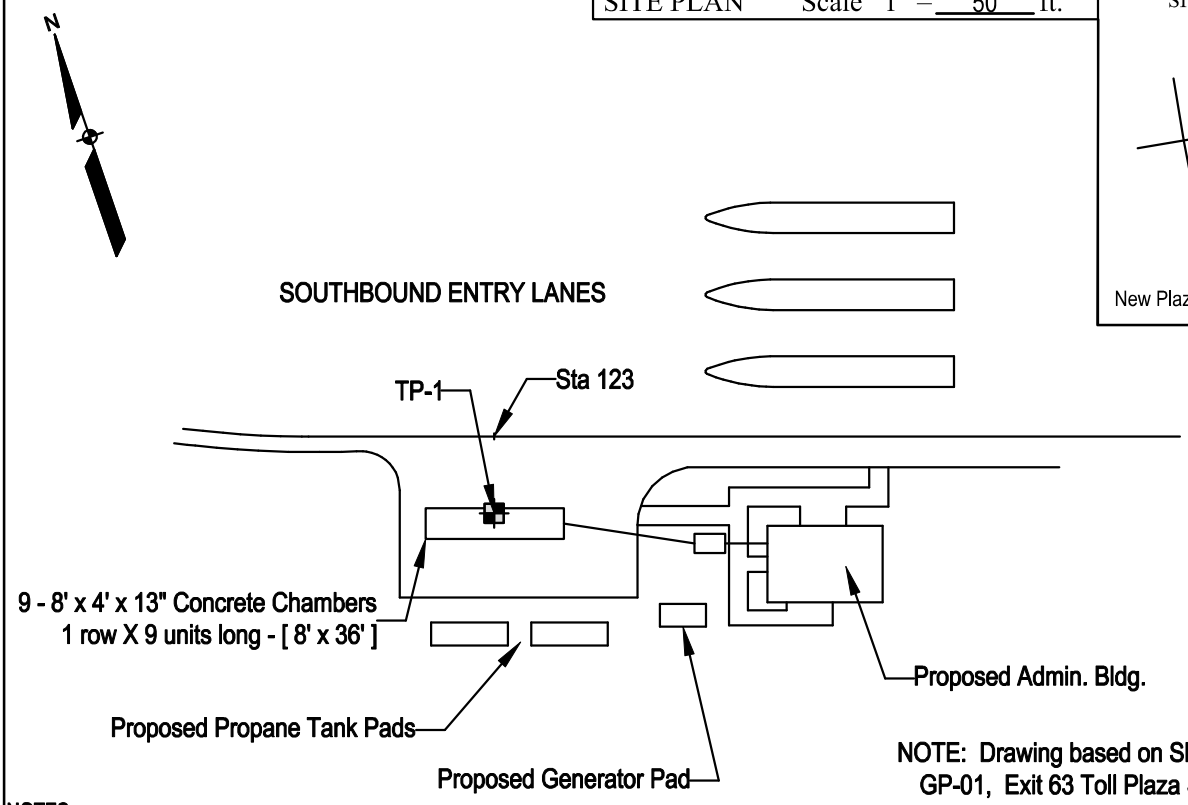
Note: Changes to or deviations from the design should be confirmed with the Site Evaluator.

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

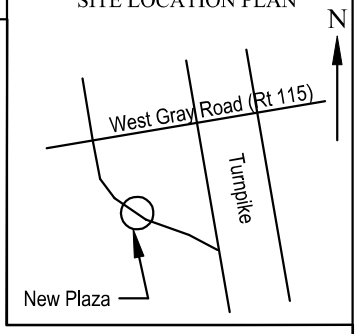
Maine Department of Human Services
Division of Health Engineering, Station 10
(207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner or Applicant Name
Gray	Route 115	Maine Turnpike Authority

SITE PLAN Scale 1" = 50 ft.



SITE LOCATION PLAN



NOTE: Drawing based on Sheet Number GP-01, Exit 63 Toll Plaza Side Plaza Conversion, Southbound Plaza General Plan by HNTB Corporation dated December 4, 2015

NOTES:
1. Septic tank and disposal field must be located at least 8' and 20' from below surface foundation.
2. Scarify all ground to be filled.
3. Min. 1/4"/ft (2%) pitch of pipe from building to septic tank.
4. Min. 1/8"/ft (1%) pitch of pipe from septic tank to disposal field.

SOIL PROFILE DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole # TP-1 ■ Test Pit ☐ Boring

" Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–6	Fine Sandy Loam	Friable	Dark Brown	
6–12			Brown	
12–30	Silty Clay Loam	Firm	Gray	Common & Faint
30–48				

Limit of Excavation at 48 inches

Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
9	D	0-6	11"	■ Groundwater ■ Restrictive Layer ☐ Bedrock

Observation Hole # _____ ☐ Test Pit ☐ Boring

" Depth of organic horizon above mineral soil

Depth below mineral soil surface (inches)	Texture	Consistency	Color	Mottling
0–48				

Soil Profile	Classification Condition	Slope Percent	Limiting Factor Depth	
				☐ Groundwater ☐ Restrictive Layer ☐ Bedrock

Richard Ahnert — Site Evaluator Signature | 034 — SE # | 12/16/15 — Date

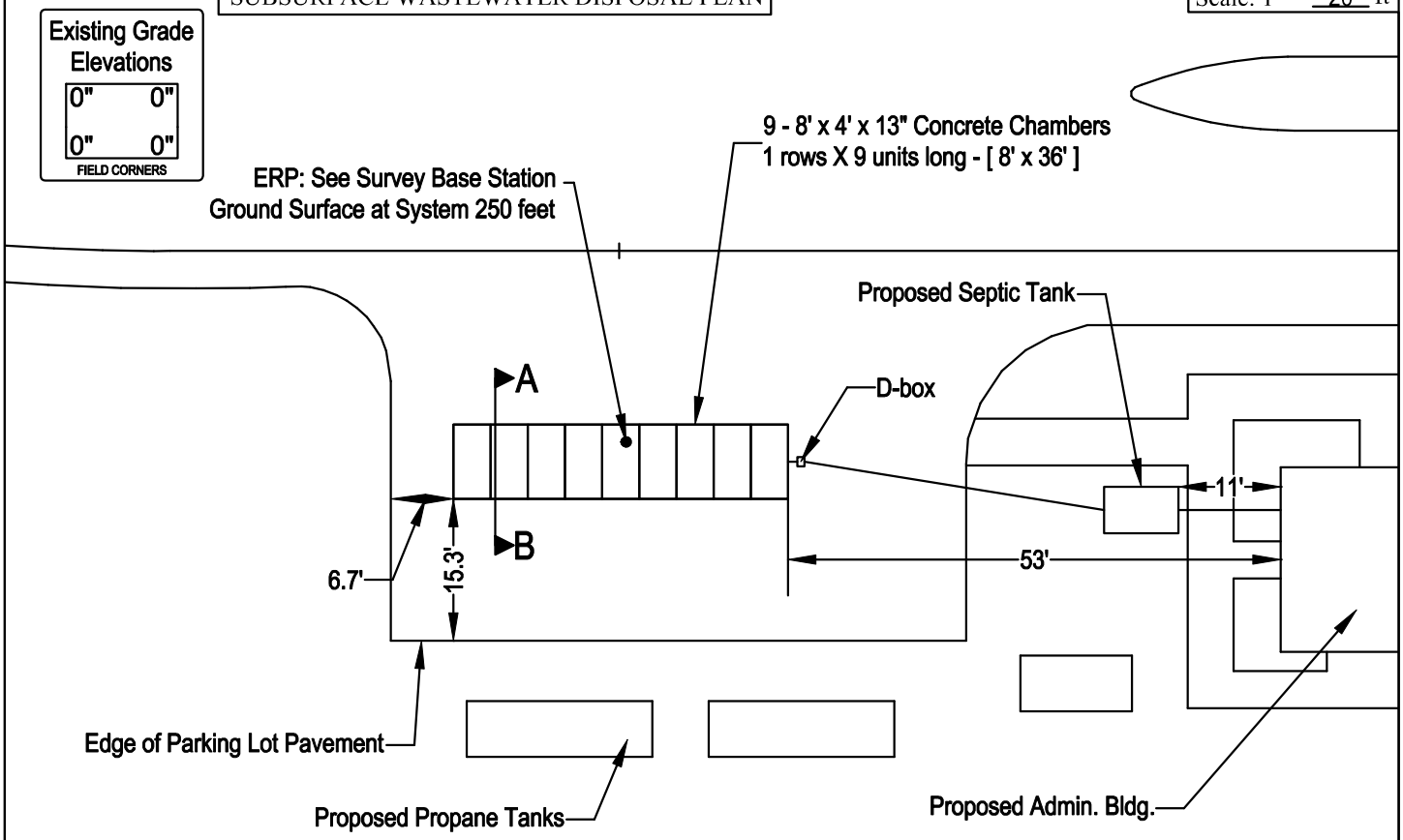
SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Department of Human Services
Division of Health Engineering, Station 10
(207) 287-5672 Fax: (207) 287-3165

Town, City, Plantation	Street, Road, Subdivision	Owner or Applicant Name
Gray	Route 115	Maine Turnpike Authority

SUBSURFACE WASTEWATER DISPOSAL PLAN

Scale: 1" = 20 ft

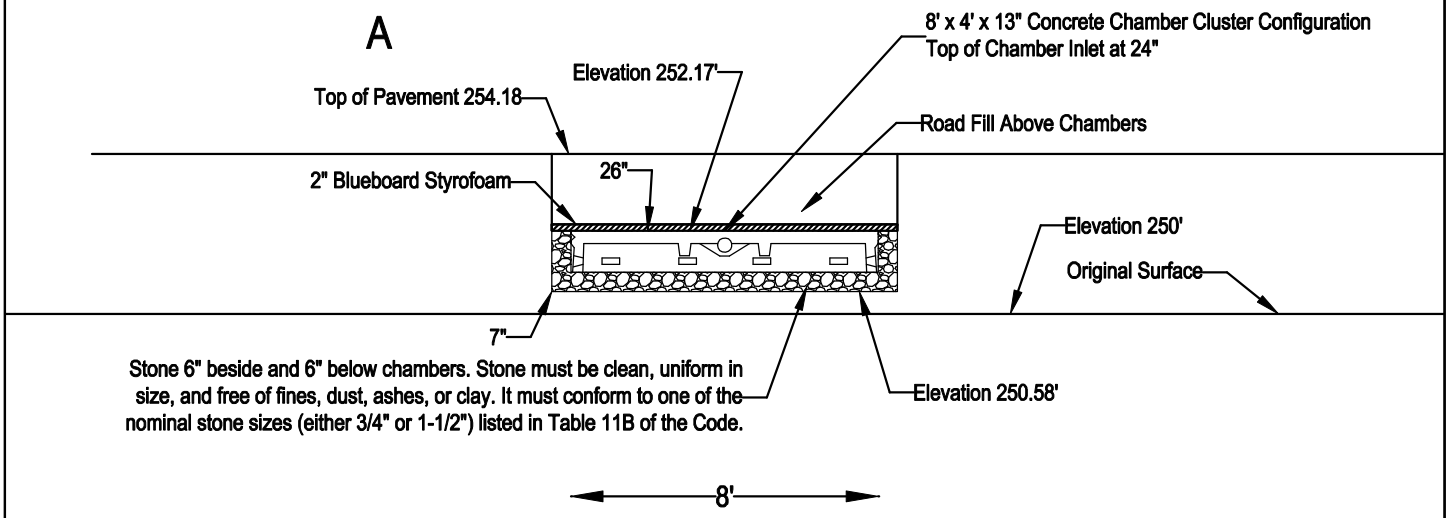


BACKFILL REQUIREMENTS		CONSTRUCTION ELEVATIONS		ELEVATION REFERENCE POINT
Depth of Backfill (upslope)	34-34"	Finished Grade Elevation (at Row 1)	50"	Location & Description: See Base Station
Depth of Backfill (downslope)	34-34"	Top of Proprietary Device (at Row 1)	26"	Ground Surface at System 250 feet
		Bottom of Disposal Field (at Row 1)	7"	Reference Elevation is 0.0" or:

NOTE: SCARIFY ALL GROUND SURFACE TO BE FILLED. USE GRAVELLY COARSE SAND WITHIN 3' OF CONCRETE CHAMBERS. REMAINING FILL: LOAMY SAND (no clay)

DISPOSAL FIELD CROSS SECTION

Scales:
Verticle: 1" = 5
Horizontal: 1" = 5



Site Evaluator Signature	SE #	Date	
[signature]	034	12/16/15	Page 3 of 3
			HHE-200 Rev. 10/02

APPENDIX B

LEAD PAINT ASSESSMENT

and

ASBESTOS REPORT

Abatement Professionals

590 County Road, Suite 2, Westbrook ME 04092 Tel (207) 773-1276 * Fax (207) 772-1203

October 12, 2015

R. Bruce Munger, PE, PTOE
HNTB Corp
340 County Road, Suite 6C,
Westbrook, Maine 04092

Re: Lead/Asbestos Demolition Renovation Impact Assessment, of the Gray Maine Turnpike Toll facilities

Dear Mr. Munger:

Abatement Professionals Corporation (APC) is providing you with the Lead/asbestos bulk testing results for the samples collected from readily accessible building materials that may be impacted By demolition/renovations activities as outlined in below. APC is a fully licensed certified firm with the Maine DEP as a consultant for asbestos and lead as outlined in their chapter 424 and 425 standards. The inspection of this site took place on September 24, 2015 Robert Rickett Jr was the chief inspector and I was assisted by Kevin Rickett a certified asbestos and lead paint supervisor. During this inspection we collected a total of two (2) bulk samples of suspect asbestos roofing materials and One (1) composite sample of suspect lead based paints from the roofing surfaces and structural beams. Five (5) on site Lead Cheks were also performed on site. Excess to the toll booth pits was somewhat limited due to steel plates being bolted or welded in place. From what I could see of the pits they appear to have fiberglass pipe covering were clean for suspect asbestos materials.

HNTB Billing Code: 63069-DS-001

- **Exit 63 – Gray Toll Plaza**
  - **Lead testing of canopy posts, canopy framing, and canopy underside.**
    - Turnpike furnished a boom truck to allow access to the roof and ceiling surfaces the sampling tech collected one large composite sample weighting approx 18 grams of paint, samples were collected from the roof deck canopy ceiling, steel framing and support post properly packaged manifested and delivered to EMSL Analytical for where they were *tested by Flame AAS (SW 846-3050B/7000B)* Samples L-01 of the painted surfaces on the Canopy and support posts came back as Less Than the detection limit of <0.010 % which means the material is negative for lead paints.
    - Five (5) additional on-site tests were performed on booth components that were not flaking and friable and not easy to scrape loose, the lead chek is an instant Positive /Negative test to determine if lead is present, all 5 areas tested were negative using this testing method.
    - OSHA only recognizes testing performed by lead chek or Flame AAS as a testing method.
  - **Asbestos testing of suspect materials.**
    - The upper canopy and lower toll booth roofs were sampled for suspect ACM building materials. Two (2) samples of the roofing materials were collected properly packaged, manifested and delivered to EMSL Analytical were Tested for *Asbestos Analysis of Bulk Material via EPA 600/R-93/116 Method via Polarized Light Microscopy* in accordance with the work standards of the Maine DEP and EPA rules and regulations. Both of the roofing materials came back as None Detected for asbestos content. Also during the inspection we looked into the toll booth pits, checked other building materials such as counter tops, wall materials and no other suspect materials were noticed during this process.

Abatement Professionals

590 County Road, Suite 2, Westbrook ME 04092 Tel (207) 773-1276 * Fax (207) 772-1203

Final conclusion of this inspection for asbestos and lead materials all materials tested and inspected were negative for both Lead based paints and Asbestos containing materials.

Attached to this report will be the testing results for both lead paint and asbestos materials along with some field photos of the surfaces and conditions.

We appreciate the opportunity to service your asbestos/lead testing needs, should you require Further bulk or air quality sampling please feel free to contact us at any time.

Very truly,

Robert W. Rickett Jr CIE,CMR
President

EMSL Analytical, Inc.
200 Route 130 North, Cinnaminson, NJ 08077
Phone/Fax: (856) 303-2500 / (856) 786-5974
http://www.EMSL.com cinnaminsonleadlab@emsl.com

EMSL Order:	201511516
CustomerID:	ABAT52
CustomerPO:	140
ProjectID:	

Attn: **Robert W Rickett**
Abatement Professionals Corporation
590 County Road
Suite #2
Westbrook, ME 04092

Phone: (207) 773-1276
Fax: (207) 772-1203
Received: 09/30/15 9:30 AM
Collected:

Project: **15-314**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
01	*201511516-0001*		10/5/2015	<0.010 % wt
	Site: 15-314			

Julie Smith - Laboratory Director
NJ-NELAP Accredited:03036
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements established by the AIHA-LAP, unless specifically indicated otherwise.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NELAP Certifications: NJ 03036, NY 10872, PA 68-00367, AIHA-LAP, LLC ELLAP 100194, A2LA 2845.01

Initial report from 10/07/2015 09:51:10

EMSL Analytical, Inc.

161 John Roberts Road South Portland, ME 04106
Phone/Fax: (207) 517-6921 / (207) 517-6922
http://www.EMSL.com / portlandlab@emsl.com

EMSL Order ID:	621501767
Customer ID:	ABAT52
Customer PO:	15-314
Project ID:	

Attn:	Bob Rickett	Phone:	(207) 773-1276
	Abatement Professionals Corporation	Fax:	(207) 772-1203
	590 County Road	Collected:	9/27/2015
	Suite #2	Received:	9/29/2015
	Westbrook, ME 04092	Analyzed:	9/30/2015
Proj:	15-314		

Summary Test Report for Asbestos Analysis of Bulk Material via EPA 600/R-93/116 Method via Polarized Light Microscopy

Client Sample ID: 15-314-A ***Lab Sample ID:*** **621501767-0001**

Sample Description: LOWER ROOF MATERIAL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/29/2015	Black	35%	65%	None Detected	
PLM Grav. Reduction	9/30/2015	Black	2.6%	97.4%	None Detected	

Client Sample ID: 15-314-B ***Lab Sample ID:*** **621501767-0002**

Sample Description: UPPER ROOF MATERIAL

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/29/2015	Black	40%	60%	None Detected	
PLM Grav. Reduction	9/30/2015	Black	0.0%	100%	None Detected	

PLM: ME CERT # BA-0150 (AM)

PLM EPA NOB: ME CERT # BA-0150 (AM)

Analyst(s):

Alexander Maxinoski PLM (2)
PLM Grav. Reduction (2)

Reviewed and approved by:

Alexander Maxinoski, Asbestos Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. This test report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. EMSL bears no responsibility for sample collection activities or analytical method limitations. The laboratory is not responsible for the accuracy of results when requested to physically separate and analyze layered samples. PLM alone is not consistently reliable in detecting asbestos in floor coverings and similar NOBs

Samples analyzed by EMSL Analytical, Inc. South Portland, ME

Initial report from: 09/30/201515:26:04

Chain of Custody

EMSL Order Number *(Lab Use Only)*: 01150581 for 20151156

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

EMSL ANALYTICAL, INC.
161 JOHN ROBERTS ROAD
SOUTH PORTLAND, ME 04106
PHONE: (856) 858-4800
FAX: (856) 858-4960

Company: Abatement Professionals Corp	EMSL-Bill to: ☐ Same ☐ Different If Bill to Is Different note Instructions In Comments** Third Party Billing requires written authorization from third party
Street: 590 County Rd	
City: WESTBROOK State/Province: ME	Zip/Postal Code: 04062 Country:
Report To (Name): Robert Rickett	Fax #:
Telephone #: 207-671-4361	Email Address: Bob@AbatementProfessionals.com
Project Name/Number: 15-314	
Please Provide Results: ☐ Fax ☐ Email	Purchase Order: U.S. State Samples Taken:

Turnaround Time (TAT) Options* - Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 96 Hour ☒ 1 Week ☐ 2 Week

**For RUSH TAT's Please Call Ahead to Confirm Lab Hours and Availability. Not all TAT options are valid for every test. Materials Science and IAQ TATs are in Business Days rather than Hours (i.e. 24 Hour = End of Next Business Day)*

Asbestos

PCM - Air
☐ NIOSH 7400
☐ w/ 8hr. TWA

TEM– Air ☐ 4-4.5hr TAT (AHERA ONLY)
☐ AHERA 40 CFR, Part 763
☐ NIOSH 7402
☐ EPA Level II
☐ ISO 10312

TEM - Water
Fibers ≥10µm ☐ Waste ☐ Drinking
All Fiber Sizes ☐ Waste ☐ Drinking

PLM - Bulk
☐ PLM EPA 600/R-93/116
☐ PLM EPA NOB (<1%)
☐ NYS 198.1 (friable-NY)
☐ NYS 198.6 (non-friable-NY)
Point Count ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
Point Count w/ Gravimetric ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

TEM - Dust
☐ Microvac – ASTM D 5755
☐ Wipe-ASTM D6480

TEM - Bulk
☐ TEM EPA NOB
☐ NYS NOB 198.4 (non-friable-NY)
☐ Chatfield SOP

Soil/Rock/Vermiculite
☐ PLM CARB 435 – A (0.25% sensitivity)
☐ PLM CARB 435 – B (0.1% sensitivity)
☐ TEM CARB 435 – B (0.1% sensitivity)
☐ EPA Reg. 1 Screening Protocol (Qualitative)

Other:

Lead (Pb)

Flame Atomic Absorption
☒ Chips SW846-7000B or AOAC 974.02
☐ Soil SW846-7000B/7420
☐ Air NIOSH 7082
☐ Wastewater SM3111B or SW846-7000B/7420
☐ ASTM Wipe SW846-7000B/7420
☐ non ASTM Wipe SW846-7000B/7420
☒ TCLP SW846-1311/7420/SM 3111B

ICP
☐ Air NIOSH 7300 Modified
☐ non ASTM Wipe SW846-6010B or C
☐ ASTM Wipe SW846-6010B or C
☐ Soil SW846-6010 B or C
☐ Waste Water SW846-6010B or C
☐ TCLP SW846-6010B or C

Graphite Furnace Atomic Absorption
☐ Soil SW846-7421 ☐ Wastewater EPA 200.9
☐ Air NIOSH 7105 ☐ Drinking Water EPA 200.9

Other: ☐

Materials Science

☐ Common Particle ID (large particles)
☐ Full Particle ID (environmental dust)
☐ Basic Material ID (solids)
☐ Advanced Material ID
☐ Physical Testing (Tensile, Compression)
☐ Combustion-by-products (soot, char, etc.)
☐ X-Ray Fluorescence (elem. analysis)
☐ X-Ray Diffraction (Crystalline Part.)
☐ MMVF's (Fibrous glass, RCF's)
☐ Particle Size (sieve/microscopy/laser)
☐ Combustible Dust
☐ Petrographic Examination
Other: ☐

Microbiology

Wipe and Bulk Samples
☐ Mold & Fungi – Direct Examination
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi Culture (Genus & Species)
☐ Bacterial Count & ID (Up to Three Types)
☐ Bacterial Count & ID (Up to Five Types)
☐ MRSA
☐ *Pseudomonas aeruginosa*

Water Samples
☐ Total Coliform & E.coli (P/A)
☐ Fecal Coliform (SM 9222D)
☐ Sewage Screen
☐ Heterotrophic Plate Count (SM 9215)

Air Samples
☐ Mold & Fungi (Spore Trap)
☐ Mold & Fungi Culture (Genus Only)
☐ Mold & Fungi (Genus & Species)
☐ Bacterial Culture & ID (Up to Three Types)
☐ Bacterial Culture & ID (Up to Five Types)
☐ Endotoxin Testing

Real Time Q-PCR (See Analytical Guide for Code)
Code:

Legionella
☐ Level 1 ☐ Level 2 ☐ Level 3 ☐ Level 4

Other: ☐

IAQ

Nuisance Dust NIOSH ☐ 0500 ☐ 0600
Airborne Dust ☐ PM10 ☐ TSP
Silica Analysis: ☐ All Species
Silica Analysis – Single Species
☐ Alpha Quartz ☐ Cristobalite ☐ Tridymite
☐ HVAC Efficiency
☐ Carbon Black
☐ Airborne Oil Mist
Radon Testing: Call for Kit and COC
Other: ☐

****Comments/Special Instructions:** TCLP Heavy Metals RCRA.

Client Sample #'s	15-314	Total # of Samples:	1
Relinquished (Client):	RRickett	Date: 9-29-15	Time: 8:00 am
Received (Lab):		Date: 9-30-15	Time: 0730 22°C

Analysis Completed in Accordance with EMSL's Terms and Conditions located in the Analytical Price Guide
Controlled Document-OneChain-R2-1/12/2010

ATT BOB, ANALYZE FOR Pb by FAA 2:41pm 9/30/15 -EZ

EMAILED – INSUFFICIENT WEIGHT 9/30/15 -EZ

Asbestos Chain of Custody

EMSL Order Number *(Lab Use Only)*: 621501767

EMSL ANALYTICAL, INC.
161 JOHN ROBERTS ROAD
SOUTH PORTLAND, MAINE 04106
PHONE: (971) 717-3894
FAX: (971) 717-3895

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

Company: Abatement Professionals	EMSL-Bill to: ☐ Same ☐ Different If Bill to is Different note instructions in Comments** *Third Party Billing requires written authorization from third party*
Street: 590 County Rd	
City: Westbrook / State/Province: ME	Zip/Postal Code: / Country:
Report To (Name):	Telephone #:
Email Address: Bob@AbatementProfessionals.com	Fax #: / Purchase Order:
Project Name/Number: 15-314	Please Provide Results: ☐ Fax ☐ Email
U.S. State Samples Taken: ME	CT Samples: ☐ Commercial/Taxable ☐ Residential/Tax Exempt

Turnaround Time (TAT) Options* – Please Check

☐ 3 Hour ☐ 6 Hour ☐ 24 Hour ☒ 48 Hour ☐ 72 Hour ☐ 96 Hour ☐ 1 Week ☐ 2 Week

**For TEM Air 3 hr through 6 hr, please call ahead to schedule.*There is a premium charge for 3 Hour TEM AHERA or EPA Level II TAT. You will be asked to sign an authorization form for this service. Analysis completed in accordance with EMSL's Terms and Conditions located in the Analytical Price Guide.*

PCM - Air ☐ Check if samples are from NY
- ☐ NIOSH 7400
- ☐ w/ OSHA 8hr. TWA

PLM - Bulk (reporting limit)
- ☒ PLM EPA 600/R-93/116 (<1%)
- ☒ PLM EPA NOB (<1%)

Point Count
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)

Point Count w/Gravimetric
- ☐ 400 (<0.25%) ☐ 1000 (<0.1%)
- ☐ NYS 198.1 (friable in NY)
- ☐ NYS 198.6 NOB (non-friable-NY)
- ☐ NIOSH 9002 (<1%)

TEM – Air ☐ **4-4.5hr TAT (AHERA only)**
- ☐ AHERA 40 CFR, Part 763
- ☐ NIOSH 7402
- ☐ EPA Level II
- ☐ ISO 10312

TEM - Bulk
- ☐ TEM EPA NOB
- ☐ NYS NOB 198.4 (non-friable-NY)
- ☐ Chatfield SOP
- ☐ TEM Mass Analysis-EPA 600 sec. 2.5

TEM – Water: EPA 100.2
- Fibers >10µm ☐ Waste ☐ Drinking
- All Fiber Sizes ☐ Waste ☐ Drinking

TEM- Dust
- ☐ Microvac - ASTM D 5755
- ☐ Wipe - ASTM D6480
- ☐ Carpet Sonication (EPA 600/J-93/167)

Soil/Rock/Vermiculite
- ☐ PLM CARB 435 - A (0.25% sensitivity)
- ☐ PLM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - B (0.1% sensitivity)
- ☐ TEM CARB 435 - C (0.01% sensitivity)
- ☐ TEM Qual. via Filtration Technique
- ☐ TEM Qual. via Drop-Mount Technique

Other:
- ☐

☒ **Check For Positive Stop – Clearly Identify Homogenous Group** | **Filter Pore Size (Air Samples):** ☐ 0.8µm ☐ 0.45µm

Samplers Name: Robert Rickett | **Samplers Signature:** [signature]

Sample #	Sample Description	Volume/Area (Air) HA # (Bulk)	Date/Time Sampled
15-314-A	Lower Roof material		
15-314-B	Upper Roof material		

Client Sample # (s): 15-314-A - 15-314-B **Total # of Samples:** 2

Relinquished (Client): Date: Time:

Received (Lab): [signature] Date: 9-27-15 Time: 8:00 Am

Comments/Special Instructions:

RECEIVED SEP 29 2015 By [illegible]

TO
TO
KOMATSU

heck™
Swabs
MATION CARD

WARNING! Harmful if swallowed
Contains: Cellulose (9004-34-6)
Lead Nitrate (10099-74-8)

APPENDIX C

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 constructions 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 D

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 E

PLAZA WORK CHECKLIST

PLAZA – WORK CHECKLIST

DATE SUBMITTED:		**DATE APPROVED:**				
REVISION #1:		**DATE APPROVED:**				
REVISION #2:		**DATE APPROVED:**				

PROPOSED EQUIPMENT	**PROPOSED LOCATION**	**POWER SOURCE**		**EXTRA WORK (Y/N)**	**APPRVL DATE**	**APPRVL BY**
		PANEL	**CIRCUIT**			
(2) AVI READERS						
(26) SENSOR LOOPS						
(2) DVAS CAMERA MOUNTS						
(2)LANE CONTROLLER CABINETS						
(12) VCARS CAMERAS						
(10) AVI ANTENNAS						
(2) LIGHTNING SUPPRESSION SYSTEMS						
(2) SPACE FRAME LIGHTING SYSTEMS						

EXISTING TO REMAIN EQUIPMENT	**LOCATION**	**POWER SOURCE**		**EXTRA WORK (Y/N)**	**APPRVL DATE**	**APPRVL BY**
		PANEL	**CIRCUIT**			
(1) UPS IN TUNNEL						

EXISTING EQUIPMENT TO BE REMOVED	**LOCATION**	**POWER SOURCE**		**EXTRA WORK (Y/N)**	**APPRVL DATE**	**APPRVL BY**
		PANEL	**CIRCUIT**			
(4) ENTRY LOOPS						
(4) EXIT LOOPS						
(4) TREADLES						
(4) LIGHT CURTAIN						
(4) PATRON FARE DISPLAY						
(4) ISLAND TRAFFIC LIGHT						
(2) OVERHEAD SCANNER						
(4) CANOPY OVERRIDE SWITCH						
(6) RED/GREEN LIGHTS						
(2) RED LIGHTS						
(4) AVI ANTENNAS						
PORTION OF LIGHTNING SUPPRESSION SYSTEM						
PORTION OF CANOPY LIGHTING						

EXPLANATION OF ALL EXTRA WORK (USE ADDITIONAL SHEET IF REQUIRED)

APPENDIX F

PRODUCT DATA SHEETS

CHG3000S Series Specifications

Models

CHG3000S	Enclosure, environmental, 12.5-inch (31.75 cm) lower body length
CHG3000SHB	Enclosure, environmental, 12.5-inch (31.75 cm) lower body length. 24V thermostat controlled heater and blower

General

Maximum Camera and Lens Size	Accepts camera and lens combinations (including BNC connector) up to:
CHG3000S	11.5″L x 3.5″ W x 2.5″ H (29.21 cm x 8.89 cm x 6.35 cm)
CHG3000SHB	11.5″ L x 3.5″ W x 2.5″ H (29.21 cm x 8.89 cm x 6.35 cm)
Window Size	.11-inch (3.0 mm) thick tempered glass 2.42″ H x 2.65″ W (6.15 cm x 6.75 cm)
Construction	Die-cast, extruded, and sheet aluminum
Finish	Light-gray polyester power coat
Camera Mounting	Removable camera sled with adjustable height
Housing Mounting	Two (2) 1/4-20 tapped holes
Cable Entry	Two .35-inch (9.0 mm) glands on rear of housing
Rear Locking	Located at rear of housing; available for security lock
Environment	Indoor/outdoor: -10˚F to 120˚F (-23.33˚C to 48.89˚C)

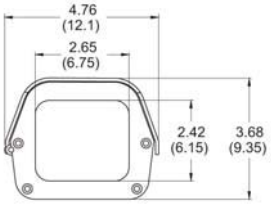
Weight	Unit	Shipping
CHG3000S	2.70lb (1.23kg)	3.03lb (1.38kg)
CHG3000SHB	3.67lb (1.67kg)	4.18lb (1.90 kg)

Electrical

Input Voltage	24VAC, 50/60Hz lower body length

Power Consumption

Heater	Heater activates ON at 42-58˚F (6-14˚C) and OFF at 72-88˚F (22-31˚C), 20W, 0.83 Amp
Blower	Blower activates ON at 77-93˚F (25-34˚C) and OFF at 62-78˚F (17-26˚C), 2W, 0.08 Amp



Optional Accessories

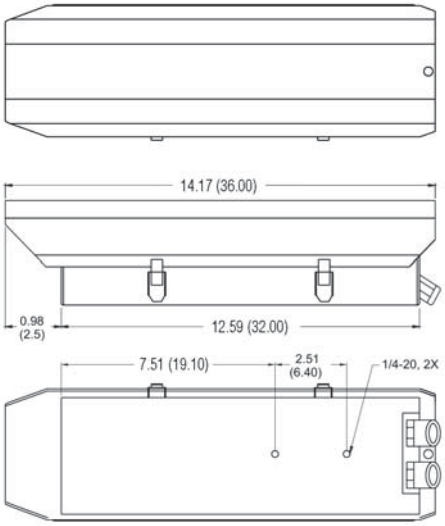
CHG3000-02	Heater kit, 24V, 20W, 0.83 Amp
CHG3000-03	Blower kit, 24V, 2W. 0.8 Amp

Note: Heater and Blower assemblies require O/I PCB BOARD assembly for connection.

Recommended Mounts

Wall	
CHG2700	Light duty wall mount. Max. load 20 lb (9.06kg)
Ceiling/Pedestal	
CHG2720	Medium duty celing "J" mount. Max. load 20 lb (9.06kg)

Design and specifications subject to change without notice.
Conversion: 1″ = 25.4mm
Measurement conversions are approximate.



Unit: inch(cm)

Form CHG3000S-8/06

Costar VIDEO SYSTEMS, LLC
2720 Commodore Drive, Suite 150 • Carrollton, TX 75007 www.costarvideo.com
Tel: 972-446-8844 • 46-8866 • 1-888-694-STAR (7827)

EM1109/EM2000/EM2200 Mount

PIPE/POLE MOUNT, MEDIUM DUTY, ENCLOSURE

Product Features

- Low Cost
- Manually Adjustable Swivel Head
- Cable Feedthrough Hole
- Supports up to 40 lb (18.14 kg)
- Mounts on Vertical or Horizontal Pipe/Pole; Mounting Straps Included
- Compatible with Most Pelco Enclosures with a 2-Inch (5.08 cm) Mounting Pole Pattern

EM2200

The **EM1109/EM2000/EM2200** are medium duty enclosure mounts designed for applications where mounting on a pipe or pole is necessary. These mounts can be used with Pelco enclosures having a 2-inch (5.08 cm) mounting hole pattern and are capable of supporting up to 40 lb (18.14 kg). All three mounts feature a manually adjustable swivel head and a cable feedthrough hole to conceal wiring. Multiple mounting holes on the tilt table provide maximum 360-degree horizontal positioning of the enclosure.

The **EM1109** is a pedestal mount for use on a horizontal or vertical pipe or pole. The **EM2000** is a J-type mount for use on a vertical pipe or pole, and the **EM2200** is a "hook" type mount for use on a horizontal pipe or pole. The **EM1109/EM2000/EM2200** must be mounted on pipes or poles having a 3-inch (7.62 cm) to 8-inch (20.32 cm) diameter. Mounts are secured to the pipe or pole with stainless steel mounting straps. Two 1/4-20 mounting bolts required to secure the enclosure to the mount are also supplied.

The **EM1109/EM2000/EM2200** are constructed of aluminum and have a white epoxy powder coat finish.

EM2000

EM1109

TECHNICAL SPECIFICATIONS

MODELS

EM1109	Medium duty pedestal mount for horizontal or vertical pipe or pole applications. Manually adjustable swivel head and cable feedthrough hole.
EM2000	Medium duty 90 degree J-mount for vertical pipe or pole applications. Manually adjustable swivel head and cable feedthrough hole.
EM2200	Medium duty "hook" mount for horizontal pipe or pole applications. Manually adjustable swivel head and cable feedthrough hole.

MECHANICAL

Pan Adjustment	Unlimited 360°
Tilt Adjustment	±75°
Locking Method	3/8-16 hex head bolts (on manually adjustable swivel head)

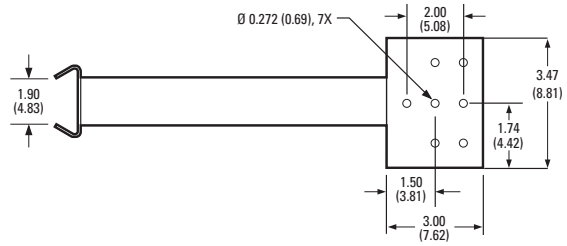
GENERAL

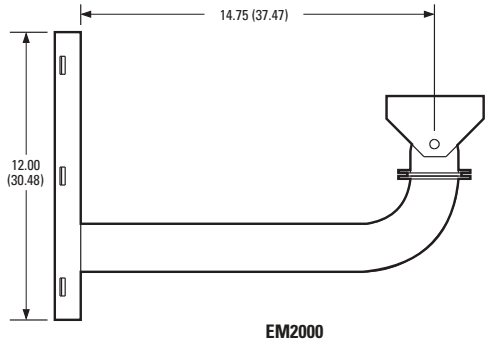
Suggested Mounting Method	Slots provided for mounting straps; 3 stainless steel straps supplied. Straps fit 3-inch (7.62 cm) to 8-inch (20.32 cm) diameter pole.
Enclosure Mounting	2, 1/4-20 mounting bolts (supplied)
Maximum Load	40 lb (18.14 kg)
Construction	Aluminum
Finish	White epoxy polyester powder coat
Environment	Indoor/outdoor
Unit Weight	
EM1109	1.88 lb (0.85 kg)
EM2000	3.05 lb (1.38 kg)
EM2200	3.51 lb (1.59 kg)
Shipping Weight	
EM1109	3 lb (1.36 kg)
EM2000	8 lb (3.60 kg)
EM2200	9 lb (4.10 kg)

RECOMMENDED ENCLOSURES

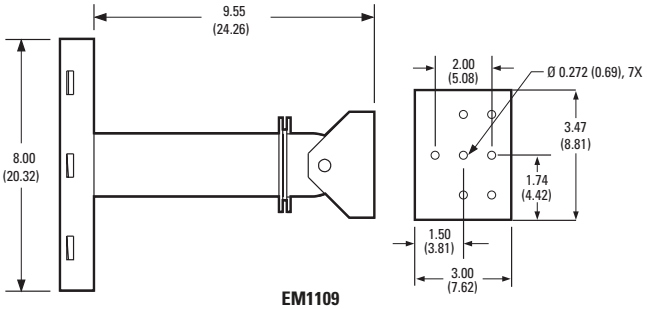
Pelco enclosures having a 2-inch (5.08 cm) mounting hole pattern can be used with these mounts. Be sure the enclosure/camera/lens combination you select does not exceed 40 lb (18 kg) and is suitable for the type of mount you have selected. The following list indicates the most applicable enclosures.

EH3010/EH3014 Series
EH4010 EH4014 Series
EH3508 Series, Environmental
EH3512/EH3515 Series, Environmental
EH4700 Series, Environmental
EH4700DB Series, Environmental
E700 Series, Dust-Tight
EHX4E, Explosion-Proof
EH8100 Series, Pressurized

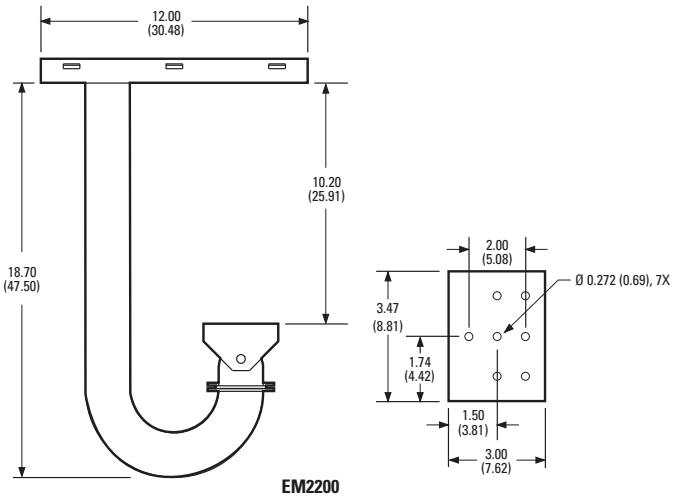




EM2000



EM1109



EM2200

NOTE: VALUES IN PARENTHESES ARE CENTIMETERS; ALL OTHERS ARE INCHES.

Pelco, Inc. Worldwide Headquarters:
3500 Pelco Way, Clovis, California 93612-5699 USA
USA & Canada Tel: (800) 289-9100 • FAX: (800) 289-9150
International Tel: +1 (559) 292-1981 • FAX: +1 (559) 348-1120
www.pelco.com

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LOCTITE®

Hysol® E-40FL™

December 200

PRODUCT DESCRIPTION

Hysol® E-40FL™ provides the following product characteristics:

Technology	Epoxy
Chemical Type (Resin)	Epoxy
Chemical Type (Hardener)	Polyamide
Appearance (Resin)	Off-white to beige liquid[LMS]
Appearance (Hardener)	Dark gray liquid[LMS]
Appearance (Mixed)	Gray, opaque liquid[LMS]
Components	Two component - requires mixing
Viscosity	Medium
Mix Ratio, by volume - Resin : Hardener	1 : 1
Mix Ratio, by weight - Resin : Hardener	100 : 85
Cure	Room temperature cure after mixing
Application	Bonding

Hysol® E-40FL™ is a toughened, medium viscosity, industrial grade epoxy adhesive with a medium working life. Once mixed, the two component epoxy cures at room temperature to form a flexible, gray bondline with excellent resistance to shock and impact. When fully cured, the epoxy is resistant to a wide range of chemicals and solvents, and acts as an excellent electrical insulator. Typical applications include bonding plastic, metal, glass, wood, ceramic, rubber, and masonry materials where flexibility is required. Suited for low-stress, high-impact bonding applications of dissimilar materials. Hysol® E-40FL™ can also be used for repairing strain gauges, sealing seams on fiberglass components, repairing printed circuit boards, bonding stainless steel inserts, and rubber hose to steel tubing.

TYPICAL PROPERTIES OF UNCURED MATERIAL

Resin:

Specific Gravity @ 25 °C	1.3
Flash Point - See MSDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 7, speed 10 rpm	60,000 to 90,000[LMS]

Hardener:

Specific Gravity @ 25 °C	1.1
Flash Point - See MSDS	
Viscosity, Brookfield - RVT, 25 °C, mPa·s (cP):	
Spindle 7, speed 10 rpm	50,000 to 85,000[LMS]

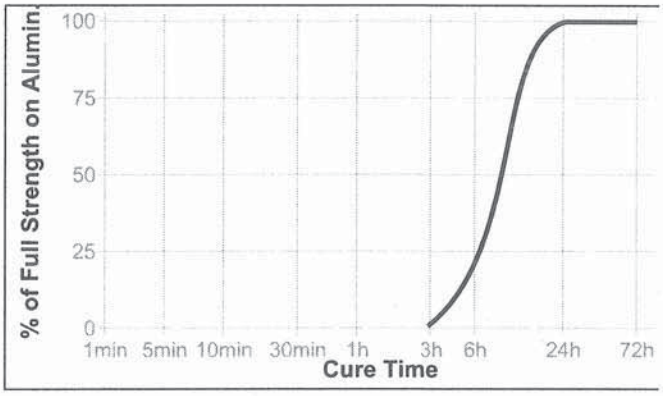
Mixed:

Specific Gravity @ 25 °C	1.2
Working life, minutes	40
Tack Free Time minutes	130

TYPICAL CURING PERFORMANCE

Cure Speed vs. Time

The graph below shows shear strength developed with time on abraded, acid etched aluminum lapshears @ 25 °C with ar average bondline gap of 0.1 to 0.2 mm and tested according tc ISO 4587.



TYPICAL PROPERTIES OF CURED MATERIAL

Cured @ 25 °C

Physical Properties:

Glass Transition Temperature (Tg), °C		30
Shore Hardness, ISO 868, Durometer D		75
Elongation, ISO 527-2, %		22
Tensile Strength, ISO 527-2	N/mm²	16
	(psi)	(3,210)

Electrical Properties:

Dielectric Breakdown Strength, IEC 60243-1, kV/mm	16

TYPICAL PERFORMANCE OF CURED MATERIAL

Adhesive Properties

Cured for 3 days @ 22 °C

Lap Shear Strength, ISO 4587:

Steel (grit blasted)	N/mm²	4.4
	(psi)	(640)
Aluminum (acid etched & abraded), 0.1 to 0.2 mm gap	N/mm²	25.9
	(psi)	(3,750)
Aluminum (anodised)	N/mm²	6.3
	(psi)	(920)
Stainless steel	N/mm²	5.2
	(psi)	(760)
Polycarbonate	N/mm²	2.3
	(psi)	(330)
Nylon	N/mm²	2.6
	(psi)	(380)
Wood (Fir)	N/mm²	6.6
	(psi)	(960)

Block Shear Strength, ISO 13445:

PVC	N/mm²	2.8
	(psi)	(400)
ABS	N/mm²	3.1
	(psi)	(450)
Epoxy	N/mm²	11
	(psi)	(1,600)
Acrylic	N/mm²	3.2
	(psi)	(460)
Glass	N/mm²	12.9
	(psi)	(1,860)

Cured for 2 hours @ 65 °C
Lap Shear Strength, ISO 4587:

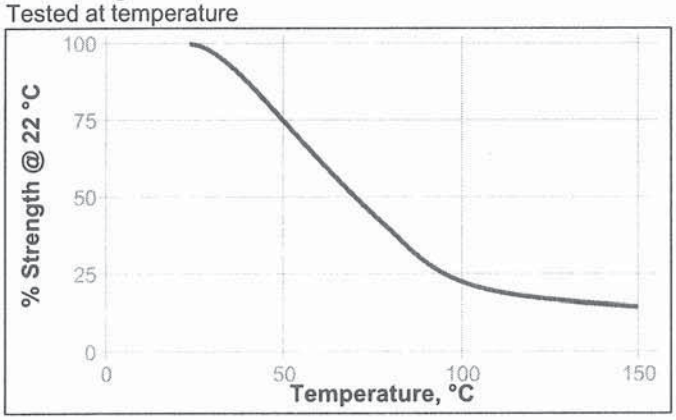
Aluminum (acid etched) 0.13 mm gap	N/mm²	≥6.9[LMS]
	(psi)	(≥1,000)

TYPICAL ENVIRONMENTAL RESISTANCE

Cured for 12 hours @ 65 °C followed by 4 hours @ 22 °C
Lap Shear Strength, ISO 4587:
Aluminum (acid etched & abraded), 0.1 to 0.2 mm gap

Hot Strength

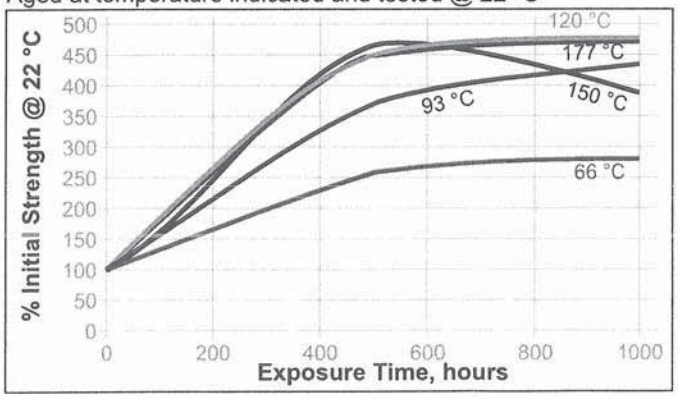
Tested at temperature



Cured for 5 days @ 22 °C
Lap Shear Strength, ISO 4587:
Steel

Heat Aging

Aged at temperature indicated and tested @ 22 °C



Chemical/Solvent Resistance

Aged under conditions indicated and tested @ 22 °C.

		% of initial strength	
Environment	**°C**	**500 h**	**1000 h**
Air	87	195	248
Motor oil (10W30)	87	269	215
Unleaded gasoline	87	61	73
Water/glycol 50/50	87	235	134
Salt fog	22	25	5
95% RH	38	60	64
Condensing Humidity	49	61	54
Water	22	50	0
Acetone	22	0	0
Isopropanol	22	68	61

GENERAL INFORMATION

This product is not recommended for use in pure oxygen and/or oxygen rich systems and should not be selected as a sealant for chlorine or other strong oxidizing materials.

For safe handling information on this product, consult the Material Safety Data Sheet (MSDS).

Directions for use

1. For high strength structural bonds, remove surface contaminants such as paint, oxide films, oils, dust, mold release agents and all other surface contaminants.
2. Use gloves to minimize skin contact. DO NOT use solvents for cleaning hands.
3. **Dual Cartridges:** To use simply insert the cartridge into the application gun and start the plunger into the cylinders using light pressure on the trigger. Next, remove the cartridge cap and expel a small amount of adhesive to be sure both sides are flowing evenly and freely. If automatic mixing of resin and hardener is desired, attach the mixing nozzle to the end of the cartridge and begin dispensing the adhesive. For hand mixing, expel the desired amount of the adhesive and mix thoroughly. Mix for approximately 15 seconds after uniform color is obtained.
   Bulk Containers: Mix thoroughly by weight or volume in the proportions specified in Product Description section. Mix vigorously, approximately 15 seconds after uniform color is obtained.
4. For maximum bond strength apply adhesive evenly to both surfaces to be joined.
5. Application to the substrates should be made within 40 minutes. Larger quantities and/or higher temperatures will reduce this working time.
6. Join the adhesive coated surfaces and allow to cure at 25 °C for 24 hours for high strength. Heat up to 93 °C, will speed curing.
7. Keep parts from moving during cure. Contact pressure is neccesary. Maximum shear strength is obtained with a 0.1 to 0.2 mm bond line.
8. Excessive uncured adhesive can be cleaned up with ketone type solvents.

Loctite Material Specification[LMS]
LMS dated July 19, 2001 (Resin) and LMS dated July 19, 2001 (Hardener). Test reports for each batch are available for the indicated properties. LMS test reports include selected QC test parameters considered appropriate to specifications for customer use. Additionally, comprehensive controls are in place to assure product quality and consistency. Special customer specification requirements may be coordinated through Henkel Loctite Quality.

Storage
Store product in the unopened container in a dry location. Storage information may be indicated on the product container labeling.
Optimal Storage: 8 °C to 21 °C. Storage below 8 °C or greater than 28 °C can adversely affect product properties. Material removed from containers may be contaminated during use. Do not return product to the original container. Henkel Corporation cannot assume responsibility for product which has been contaminated or stored under conditions other than those previously indicated. If additional information is required, please contact your local Technical Service Center or Customer Service Representative.

Conversions
(°C x 1.8) + 32 = °F
kV/mm x 25.4 = V/mil
mm / 25.4 = inches
µm / 25.4 = mil
N x 0.225 = lb
N/mm x 5.71 = lb/in
N/mm² x 145 = psi
MPa x 145 = psi
N·m x 8.851 = lb·in
N·m x 0.738 = lb·ft
N·mm x 0.142 = oz·in
mPa·s = cP

Note
The data contained herein are furnished for information only and are believed to be reliable. We cannot assume responsibility for the results obtained by others over whose methods we have no control. It is the user's responsibility to determine suitability for the user's purpose of any production methods mentioned herein and to adopt such precautions as may be advisable for the protection of property and of persons against any hazards that may be involved in the handling and use thereof. In light of the foregoing, **Henkel Corporation specifically disclaims all warranties expressed or implied, including warranties of merchantability or fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation specifically disclaims any liability for consequential or incidental damages of any kind, including lost profits.** The discussion herein of various processes or compositions is not to be interpreted as representation that they are free from domination of patents owned by others or as a license under any Henkel Corporation patents that may cover such processes or compositions. We recommend that each prospective user test his proposed application before repetitive use, using this data as a guide. This product may be covered by one or more United States or foreign patents or patent applications.

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Reference 0.0

Material Safety Data Sheet

Henkel

Revision Number: 002.1

Issue date: 01/26/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: UNITED TOLL EPX RESIN
Product type: Epoxy resin

IDH number: 744608
Item number: 40486
Region: United States

Company address:
Henkel Corporation
One Henkel Way
Rocky Hill, Connecticut 06067

Contact information:
Telephone: 860.571.5100
Emergency telephone: 860.571.5100
Internet: www.henkelna.com

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Physical state: Liquid
Color: Light
Odor: Faint, Epoxy

HMIS:
HEALTH: 2
FLAMMABILITY: 1
PHYSICAL HAZARD: 0
Personal Protection: See MSDS Section 8

WARNING: MAY CAUSE ALLERGIC SKIN REACTION.
MAY CAUSE EYE, SKIN AND RESPIRATORY TRACT IRRITATION.

Relevant routes of exposure: Skin, Inhalation, Eyes

Potential Health Effects

Inhalation: May cause respiratory tract irritation.
Skin contact: May cause allergic skin reaction. May cause skin irritation. Burning sensation. Itching. Redness. Swelling.
Eye contact: May cause irritation. Direct contact may cause temporary redness and discomfort.
Ingestion: Not a relevant route of exposure.

Existing conditions aggravated by exposure: Skin allergies. Skin disorders. Respiratory disorders.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Section 11 for additional toxicological information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous components	CAS NUMBER	%
Epichlorohydrin-4,4'-isopropylidene diphenol resin	25068-38-6	60 - 100
Kaolin	1332-58-7	10 - 30

4. FIRST AID MEASURES

Inhalation: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If symptoms develop and persist, get medical attention.

Skin contact: Immediately flush skin with plenty of water (using soap, if available). Remove contaminated clothing and footwear. If symptoms develop and persist, get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Ingestion: DO NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

5. FIRE FIGHTING MEASURES

Flash point: > 93 °C (> 199.4 °F) Setaflash Closed Cup

Autoignition temperature: Not available

Flammable/Explosive limits - lower: Not available

Flammable/Explosive limits - upper: Not available

Extinguishing media: Water spray (fog), foam, dry chemical or carbon dioxide.

Special firefighting procedures: Wear self-contained breathing apparatus and full protective clothing, such as turn-out gear.

Unusual fire or explosion hazards: None expected.

Hazardous combustion products: Acids. Aldehydes. Irritating organic vapours. Oxides of carbon.

6. ACCIDENTAL RELEASE MEASURES

Use personal protection recommended in Section 8, isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental precautions: Do not allow product to enter sewer or waterways.

Clean-up methods: Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Scrape up spilled material and place in a closed container for disposal.

7. HANDLING AND STORAGE

Handling: Use only with adequate ventilation. Keep container closed. Prevent contact with eyes, skin and clothing. Do not breathe vapor and mist. Wash thoroughly after handling.

Storage: Keep in a cool, well ventilated area away from heat, sparks and open flame. Keep container tightly closed until ready for use.

For information on product shelf life contact Henkel Customer Service at (800) 243-4874.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Employers should complete an assessment of all workplaces to determine the need for, and selection of, proper exposure controls and protective equipment for each task performed.

Hazardous components	ACGIH TLV	OSHA PEL	AIHA WEEL	OTHER
Epichlorohydrin-4,4'-isopropylidene diphenol resin	None	None	None	None
Kaolin	2 mg/m3 TWA Respirable fraction.	5 mg/m3 TWA Respirable fraction. 15 mg/m3 TWA Total dust.	None	None

Engineering controls: Use local ventilation if general ventilation is insufficient to maintain vapor concentration below established exposure limits.

Respiratory protection:	Use NIOSH approved respirator if there is potential to exceed exposure limit(s).
Eye/face protection:	Safety goggles or safety glasses with side shields.
Skin protection:	Use impermeable gloves and protective clothing as necessary to prevent skin contact. Butyl rubber gloves.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Liquid
Color:	Light
Odor:	Faint, Epoxy
Odor threshold:	Not available
pH:	Not available
Vapor pressure:	Not available
Boiling point/range:	> 250 °C (> 482°F)
Melting point/ range:	Not available
Vapor density:	Not available
Flash point:	> 93 °C (> 199.4 °F) Setaflash Closed Cup
Flammable/Explosive limits - lower:	Not available
Flammable/Explosive limits - upper:	Not available
Autoignition temperature:	Not available
Evaporation rate:	Not available
Solubility in water:	Negligible
Partition coefficient (n-octanol/water):	Not available
VOC content:	< 1 %; < 10 g/l Estimated

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions of storage and use.
Hazardous reactions:	Will not occur.
Hazardous decomposition products:	Oxides of carbon. Hydrocarbons. Phenolics.
Incompatible materials:	Strong oxidizing agents. Amines. Acids. Bases.
Conditions to avoid:	Avoid temperatures above 149°C (300°F).

11. TOXICOLOGICAL INFORMATION

Hazardous components	NTP Carcinogen	IARC Carcinogen	OSHA Carcinogen (Specifically Regulated)
Epichlorohydrin-4,4'-isopropylidene diphenol resin	No	No	No
Kaolin	No	No	No

Hazardous components	Health Effects/Target Organs
Epichlorohydrin-4,4'-isopropylidene diphenol resin	Allergen, Irritant
Kaolin	Nuisance dust

12. ECOLOGICAL INFORMATION

Ecological information:	Not available

13. DISPOSAL CONSIDERATIONS

Information provided is for unused product only.

Recommended method of disposal:	Follow all local, state, federal and provincial regulations for disposal.
Hazardous waste number:	Not a RCRA hazardous waste.

14. TRANSPORT INFORMATION

The shipping classifications in this sections are for non-bulk packaging only (unless otherwise specified). Shipping classification may be different for bulk packaging.

U.S. Department of Transportation Ground (49 CFR)

Proper shipping name:	Not regulated
Hazard class or division:	None
Identification number:	None
Packing group:	None

International Air Transportation (ICAO/IATA)

Proper shipping name:	Environmentally hazardous substance, liquid, n.o.s. (Bisphenol-A Epichlorhydrine resin)
Hazard class or division:	9
Identification number:	UN 3082
Packing group:	III

Water Transportation (IMO/IMDG)

Proper shipping name:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Bisphenol-A Epichlorhydrine resin)
Hazard class or division:	9
Identification number:	UN 3082
Packing group:	III
Marine pollutant:	Bisphenol-A Epichlorhydrine resin

15. REGULATORY INFORMATION

United States Regulatory Information

TSCA 8 (b) Inventory Status:	All components are listed or are exempt from listing on the Toxic Substances Control Act Inventory.
TSCA 12(b) Export Notification:	None above reporting de minimus
CERCLA/SARA Section 302 EHS:	None above reporting de minimus
CERCLA/SARA Section 311/312:	Immediate Health
CERCLA/SARA 313:	None above reporting de minimus
California Proposition 65:	This product contains a chemical known in the State of California to cause cancer.

Canada Regulatory Information

CEPA DSL/NDSL Status:	All components are listed on or are exempt from listing on the Canadian Domestic Substances List.
WHMIS hazard class:	D.2.B

16. OTHER INFORMATION

This material safety data sheet contains changes from the previous version in sections: New Material Safety Data Sheet format., This Material Safety Data Sheet contains changes from the previous version in Section(s): 2, 5, 10, 14, 15

Prepared by: Rena Petrides, Regulatory Affairs Specialist

DISCLAIMER: The data contained herein are furnished for information only and are believed to be reliable. However, Henkel Corporation does not assume responsibility for any results obtained by persons over whose methods Henkel Corporation has no control. It is the user's responsibility to determine the suitability of Henkel's products or any production methods mentioned herein for a particular purpose, and to adopt such precautions as may be advisable for the protection of property and persons against any hazards that may be involved in the handling and use of any of Henkel Corporation's products. In light of the foregoing, Henkel Corporation specifically disclaims all warranties, express or implied, including warranties of merchantability and fitness for a particular purpose, arising from sale or use of Henkel Corporation's products. Henkel Corporation further disclaims any liability for consequential or incidental damages of any kind, including lost profits.

Material Safety Data Sheet

Henkel

Revision Number: 002.1

Issue date: 05/07/2009

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: UNITED TOLL EPX HARD 18.9L
Product type: Epoxy Hardener

Company address:

IDH number: 744609
Item number: 40487
Region: United States
Contact information:
Not available
Emergency telephone: 860.571.5100

2. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Physical state: Liquid
Color: Gray
Odor: Mild

HMIS:

HEALTH:	*2
FLAMMABILITY:	1
PHYSICAL HAZARD:	0
Personal Protection:	See MSDS Section 8

WARNING: CAUSES EYE AND SKIN IRRITATION.
MAY CAUSE RESPIRATORY TRACT IRRITATION.

Relevant routes of exposure: Skin, Inhalation, Eyes

Potential Health Effects

Inhalation: May cause respiratory tract irritation.
Skin contact: Causes skin irritation.
Eye contact: Causes eye irritation.
Ingestion: Not a relevant route of exposure.

Existing conditions aggravated by exposure: Eye, skin, and respiratory disorders. Skin allergies.

This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

See Section 11 for additional toxicological information.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous components	CAS NUMBER	%
Al-silicate Kaolin	1332-58-7	10 - 30
Salicylic acid	69-72-7	1 - 5
Glycerol	56-81-5	1 - 5
2,4,6-Tris(dimethylaminomethyl)phenol	90-72-2	1 - 5
Silica, amorphous, fumed, crystal-free	112945-52-5	1 - 5

4. FIRST AID MEASURES

Inhalation: Move to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Skin contact: Immediately flush skin with plenty of water (using soap, if available). Remove contaminated clothing and footwear. Thoroughly clean shoes before reuse. Get medical attention.

Eye contact:	Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.
Ingestion:	DO NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

5. FIRE FIGHTING MEASURES

Flash point:	> 93 °C (> 199.4 °F) Setaflash Closed Cup
Autoignition temperature:	Not available
Flammable/Explosive limits - lower:	Not available
Flammable/Explosive limits - upper:	Not available
Extinguishing media:	Foam, dry chemical or carbon dioxide.
Special firefighting procedures:	Wear self-contained breathing apparatus and full protective clothing, such as turn-out gear.
Unusual fire or explosion hazards:	Personnel in vicinity and downwind should be evacuated.
Hazardous combustion products:	Ammonia. Nitric acid. Oxides of carbon. Oxides of nitrogen. Irritating organic fragments.

6. ACCIDENTAL RELEASE MEASURES

Use personal protection recommended in Section 8, isolate the hazard area and deny entry to unnecessary and unprotected personnel.

Environmental precautions:	Do not allow product to enter sewer or waterways.
Clean-up methods:	Immediately contact emergency personnel. Ensure adequate ventilation. Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Scrape up spilled material and place in a closed container for disposal.

7. HANDLING AND STORAGE

Handling:	Prevent contact with eyes, skin and clothing. Do not breathe vapor and mist. Wash thoroughly after handling. Keep container closed. Use only with adequate ventilation.
Storage:	Keep in a cool, well ventilated area away from heat, sparks and open flame. Keep container tightly closed until ready for use. Do not store near acids. Do not store in reactive metal containers.

For information on product shelf life contact Henkel Customer Service at (800) 243-4874.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Employers should complete an assessment of all workplaces to determine the need for, and selection of, proper exposure controls and protective equipment for each task performed.

Hazardous components	ACGIH TLV	OSHA PEL	AIHA WEEL	OTHER
Al-silicate Kaolin	2 mg/m3 TWA Respirable fraction.	5 mg/m3 TWA Respirable fraction. 15 mg/m3 TWA Total dust.	None	None
Salicylic acid	None	None	None	None
Glycerol	10 mg/m3 TWA Mist.	15 mg/m3 TWA Total dust. 5 mg/m3 TWA Respirable fraction.	None	None
2,4,6-Tris(dimethylaminomethyl)phenol	None	None	None	None
Silica, amorphous, fumed, crystal-free	10 mg/m3 TWA Inhalable dust. 3 mg/m3 TWA Respirable fraction.	20 MPPCF TWA 0.8 mg/m3 TWA	None	None

Engineering controls: Local exhaust ventilation is recommended when general ventilation is not sufficient to control airborne contamination.

Respiratory protection: Use NIOSH approved respirator if there is potential to exceed exposure limit(s).

Eye/face protection: Safety goggles or safety glasses with side shields.

Skin protection: Chemical resistant, impermeable gloves. Butyl rubber gloves.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state: Liquid
Color: Gray
Odor: Mild
Odor threshold: Not available
pH: Not available
Vapor pressure: Not available
Boiling point/range: Not available
Melting point/ range: Not available
Vapor density: Not available
Flash point: > 93 °C (> 199.4 °F) Setaflash Closed Cup
Flammable/Explosive limits - lower: Not available
Flammable/Explosive limits - upper: Not available
Autoignition temperature: Not available
Evaporation rate: Not available
Solubility in water: Partially soluble
Partition coefficient (n-octanol/water): Not available
VOC content: < 1 %; < 10 g/l

10. STABILITY AND REACTIVITY

Stability: Stable

Hazardous reactions: Will not occur.

Hazardous decomposition products: Ammonia. Oxides of carbon. Oxides of nitrogen. Nitric acid. Irritating organic fragments.

Incompatible materials: Strong oxidizing agents. Organic acids. Mineral acids. Bases. Halogenated compounds. This product slowly corrodes copper, aluminum, zinc and galvanized surfaces.

Conditions to avoid: Direct sources of heat. Store away from incompatible materials.

11. TOXICOLOGICAL INFORMATION

Hazardous components	NTP Carcinogen	IARC Carcinogen	OSHA Carcinogen (Specifically Regulated)
Al-silicate Kaolin	No	No	No
Salicylic acid	No	No	No
Glycerol	No	No	No
2,4,6-Tris(dimethylaminomethyl)phenol	No	No	No
Silica, amorphous, fumed, crystal-free	No	No	No

Hazardous components	Health Effects/Target Organs
Al-silicate Kaolin	Nuisance dust
Salicylic acid	Irritant
Glycerol	Blood, Irritant, Kidney, Nuisance dust
2,4,6-Tris(dimethylaminomethyl)phenol	Irritant, Allergen
Silica, amorphous, fumed, crystal-free	Nuisance dust

12. ECOLOGICAL INFORMATION

Ecological information: Not available

13. DISPOSAL CONSIDERATIONS

Information provided is for unused product only.

Recommended method of disposal: Follow all local, state, federal and provincial regulations for disposal.

Hazardous waste number: Not a RCRA hazardous waste.

14. TRANSPORT INFORMATION

The shipping classifications in this sections are for non-bulk packaging only (unless otherwise specified). Shipping classification may be different for bulk packaging.

U.S. Department of Transportation Ground (49 CFR)

Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None

International Air Transportation (ICAO/IATA)

Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None

Water Transportation (IMO/IMDG)

Proper shipping name: Not regulated
Hazard class or division: None
Identification number: None
Packing group: None

15. REGULATORY INFORMATION

United States Regulatory Information

TSCA 8 (b) Inventory Status: All components are listed or are exempt from listing on the Toxic Substances Control Act Inventory.
TSCA 12(b) Export Notification: None above reporting de minimus

CERCLA/SARA Section 302 EHS: None above reporting de minimus
CERCLA/SARA Section 311/312: Immediate Health, Delayed Health

CERCLA/SARA 313:	None above reporting de minimus
California Proposition 65:	This product contains a chemical known in the State of California to cause cancer. This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

Canada Regulatory Information

CEPA DSL/NDSL Status:	All components are listed on or are exempt from listing on the Canadian Domestic Substances List.
WHMIS hazard class:	D.2.A, D.2.B

16. OTHER INFORMATION

This material safety data sheet contains changes from the previous version in sections: New Material Safety Data Sheet format.

Prepared by: Gary Pierson, Sr. Regulatory Affairs Specialist

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PRODUCT DATA

W. R. MEADOWS SEALTIGHT

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/mm^2) minimum and 25 psi (17.58 g/mm^2) 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.

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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 tinted polycarbonate

FINISH
Standard Cabinet Color: Black
Custom colors available upon request

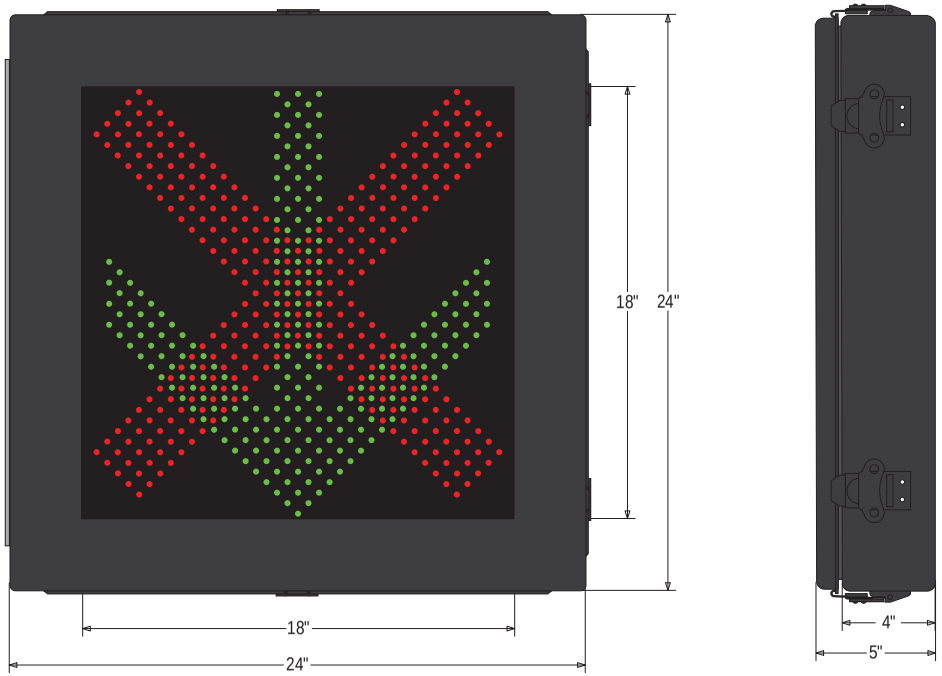
MESSAGE	COLOR	HEIGHT	AMPS
X	30° Red Round	18.0"	0.17
Down Arrow	30° Green Round	18.0"	0.13

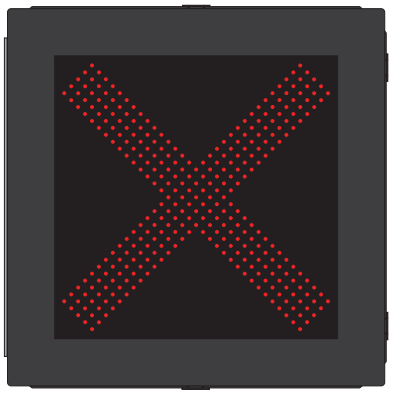
Trans-Tech
4999 Pittsburgh Ave.
Erie, PA 16509
Phone: (888) 811-7010
Fax: (814) 836-8401
Email: sales@transportation-tech.com
Website: www.transportation-tech.com

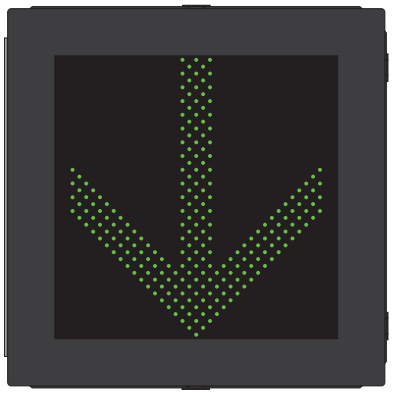
Proudly Made in the USA

Product View

NOTE: Sign image may not exactly represent the finished product. For illustration purposes only.







R-325
G-229

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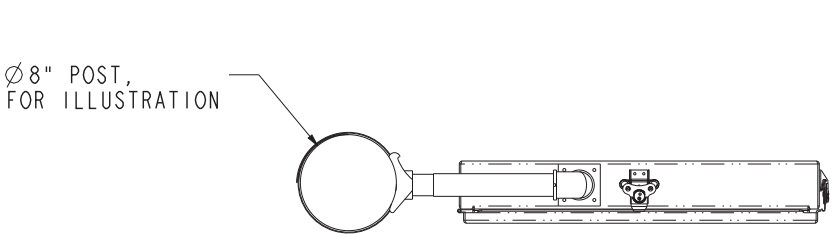
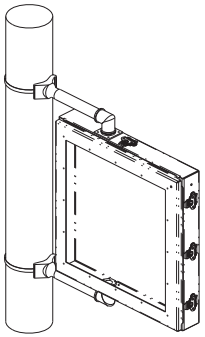
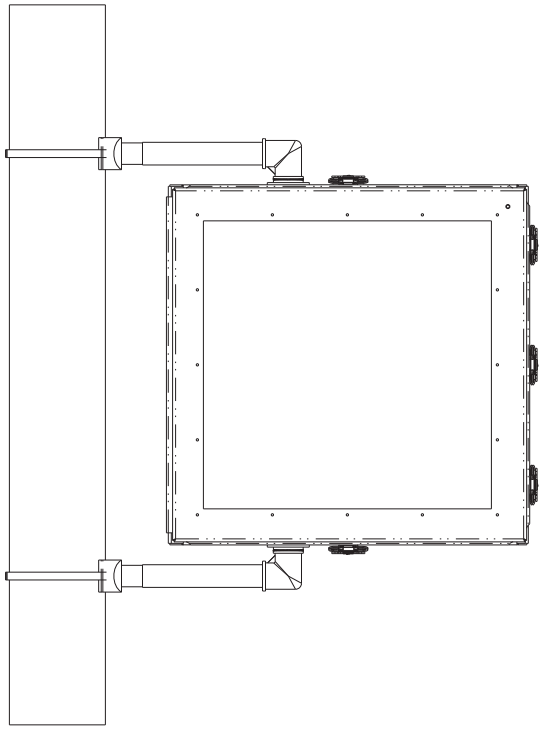
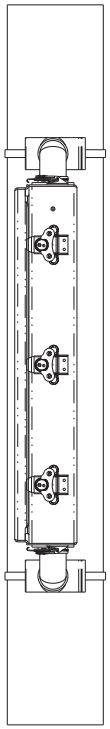




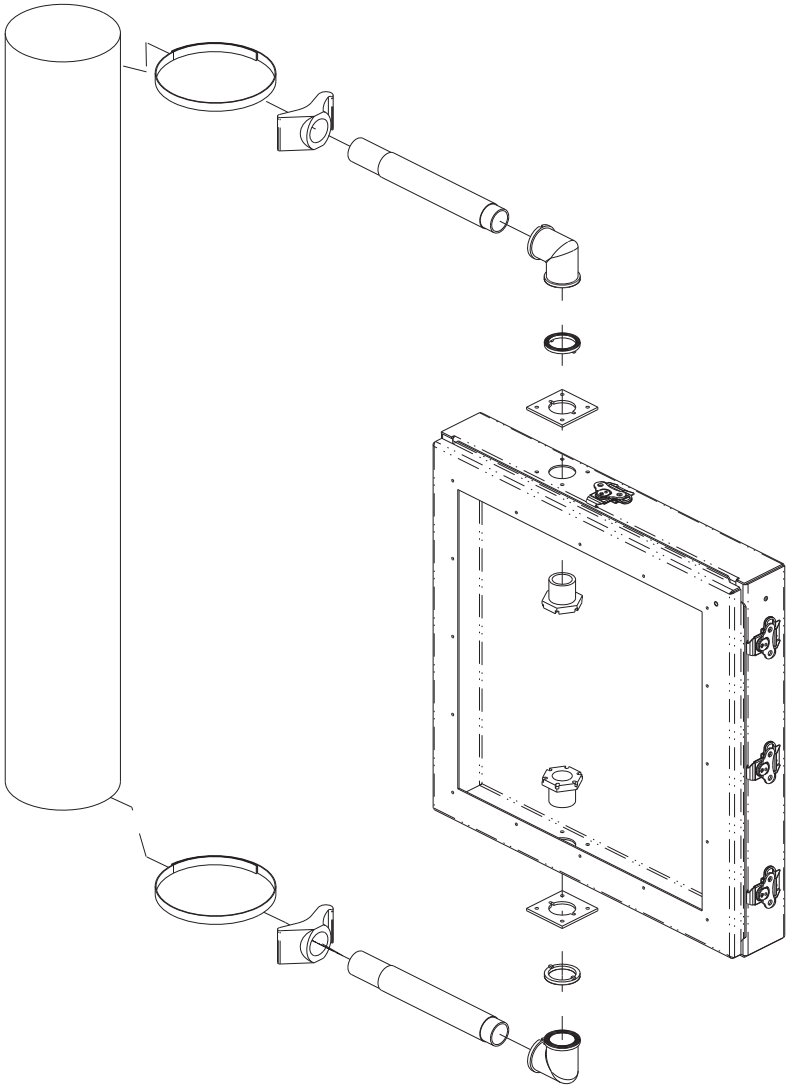




AP-F21

TYP TOL: ±1/16" ANGLES: ±2°		DATE: 10-MAR-11 SHEET 1 OF 3	3030 DOT, PELCO-MOUNTING	INV ID#:
		SignalTech	JDG	PROD ID#:
			4985 Pittsburgh Ave Erie, PA 16509	CUST ID#:

AP-F22



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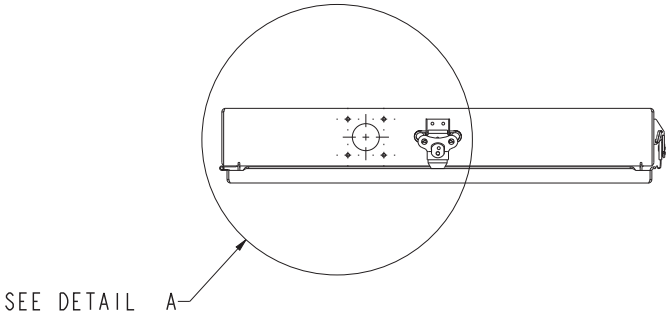
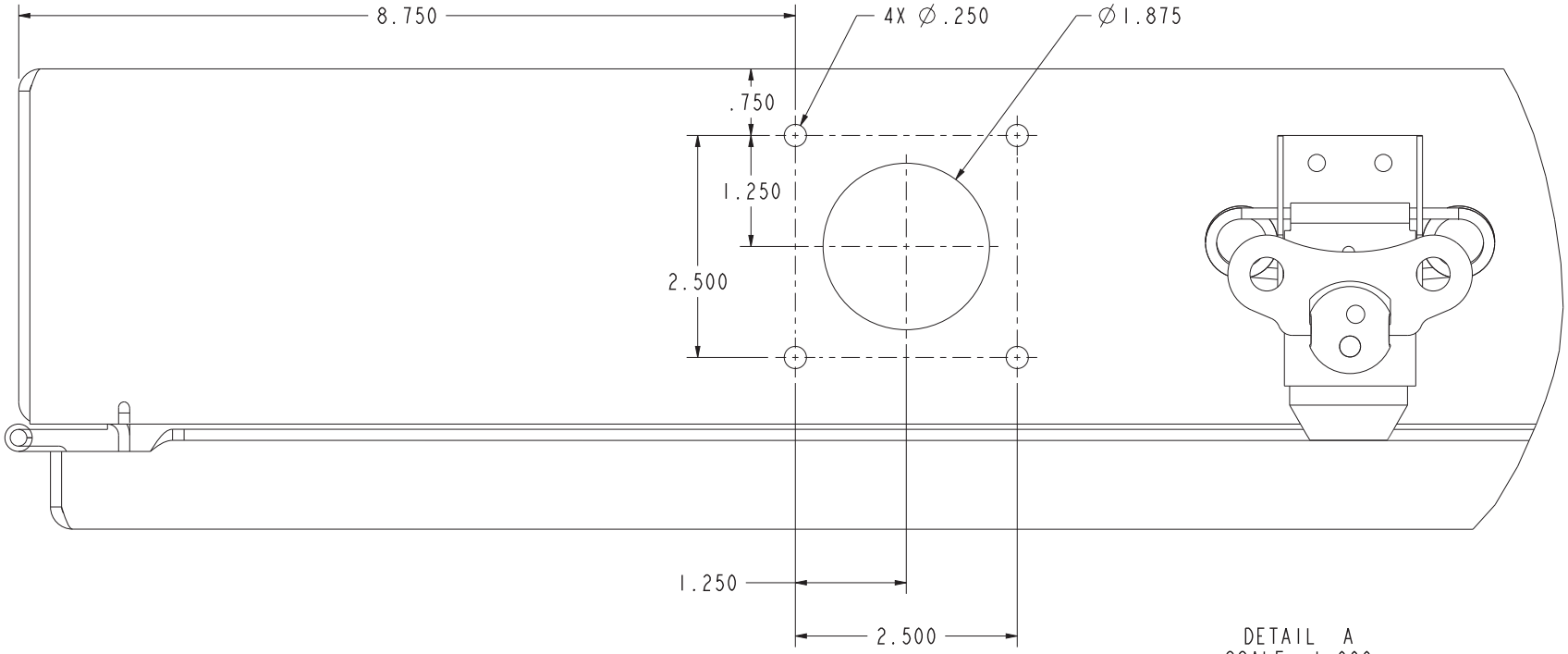
		SignalTech	JDG	PROD ID#:
			4985 Pittsburgh Ave Erie, PA 16509	CUST ID#:





DETAIL A
SCALE 1.000

AP-F23

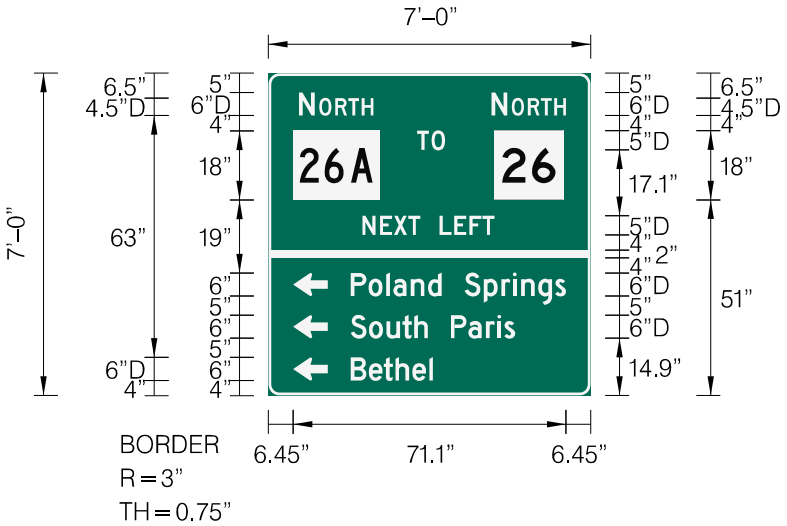
TYP TOL: ±1/16" ANGLES: ± 2°		DATE: 10-MAR-11 SHEET 3 OF 3	3030 DOT, PELCO-MOUNTING	INV ID#:
		SignalTech	JDG	PROD ID#:
			4985 Pittsburgh Ave Erie, PA 16509	CUST ID#:

APPENDIX G

SIGN TEXT LAYOUT SHEETS

SIGN DETAIL
1:50

Maine Turnpike Authority



SIGN NUMBER	GS–1	
WIDTH x HGHT.	7'–0" x 7'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL		X	Y	WID	HT
M1–5(26A)	0	6.4	51	22.5	18
M1–5(26)	0	58.9	51	18	18
AR_Type D	90	6.5	25.9	6	9
AR_Type D	90	6.5	14.9	6	9
AR_Type D	90	6.5	3.9	6	9

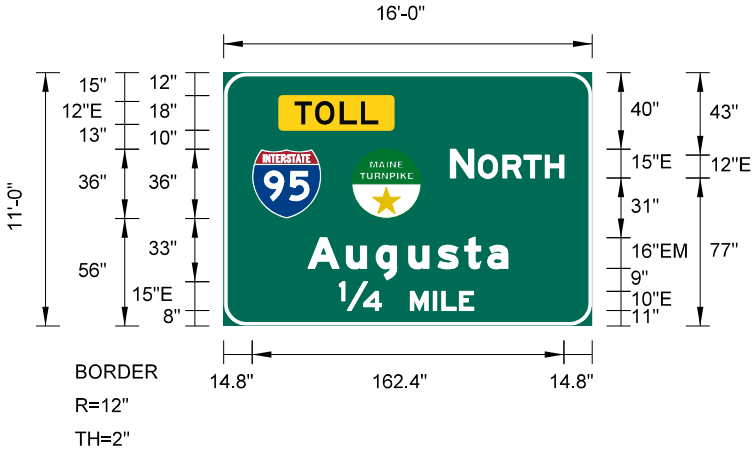
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
N	O	R	T	H												D 2000
8	13.2	17.4	20.9	24.3											19.4	6,4.5
N	O	R	T	H												D 2000
58.2	63.4	67.6	71	74.5											19.4	6,4.5
T	O															D 2000
38.7	42.5														7.3	5
N	E	X	T		L	E	F	T								D 2000
24.5	29.1	32.7	36.5	39.6	44.6	48.4	52.4	55.8							34.4	5
P	o	l	a	n	d		S	p	r	i	n	g	s			D 2000
21.5	26.1	30.7	32.6	37.1	41.6	45.2	51.2	56.1	60.7	63.7	65.9	70.3	74.7		56.1	6⁄4.5
S	o	u	t	h		P	a	r	i	s						D 2000
21.5	26.2	30.8	35	38	41.6	47.6	52.1	56.7	59.7	61.5					42.8	6⁄4.5
B	e	t	h	e	l											D 2000
21.5	26.2	30	33.1	37.5	41.9										21.4	6⁄4.5

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–2
WIDTH x HGHT.	16'–0" x 11'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White /Black/White



SYMBOL		X	Y	WID	HT
M1_1(95)	0	14.8	56	36	36
M1–1(MT)	0	66.8	56	36	36

Panel Style: guide_exp_overhead.ssi
Dimensions are in inches.tenths
Letter locations are panel edge to lower left corner

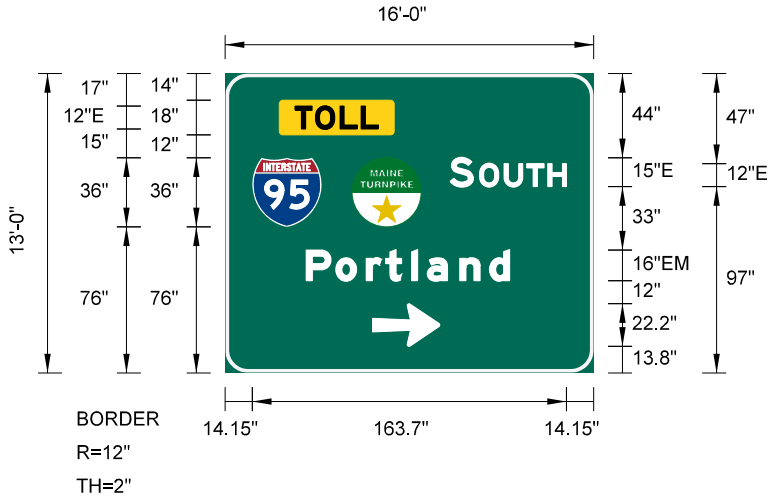
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.9	47.6	60.5	71.5												43.6	12
N	O	R	T	H												E 2000
118.1	132.6	145.4	156.5	167.5											59.1	15,12
A	u	g	u	s	t	a										EM 2000
43.9	63.9	79.4	96.4	111.6	125.5	137.5									104.2	16,12
1/4	M	I	L	E												E 2000
60.2	97.2	109.2	113.6	122.8											70.1	15,10

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–3
WIDTH x HGHT.	16'–0" x 13'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White /Black/White



SYMBOL	X	Y	WID	HT
M1_1	14.1	76	36	36
M1–1(MT)	66.1	76	36	36
AR_Type A	76.8	13.8	22.2	35

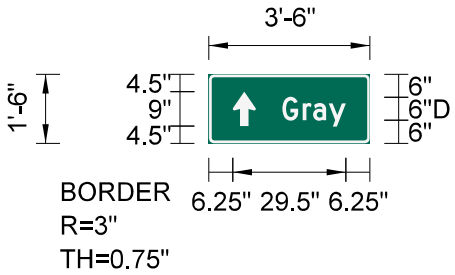
Panel Style: guide_exp_overhead.ssi
Dimensions are in inches.tenths
Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.3	47	59.8	70.9												43.6	12
S	O	U	T	H												E 2000
117.1	132.5	145.3	157.1	168.1											60.7	15,12
P	o	r	t	l	a	n	d									EM 2000
42.2	57.6	73.4	83.6	97.1	105.2	122.2	137.7								106.1	16/12

SIGN DETAIL
1:50

Maine Turnpike Authority



SIGN NUMBER	GS–4	
WIDTH x HGHT.	3'–6" x 1'–6"	
BORDER WIDTH	0.75"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

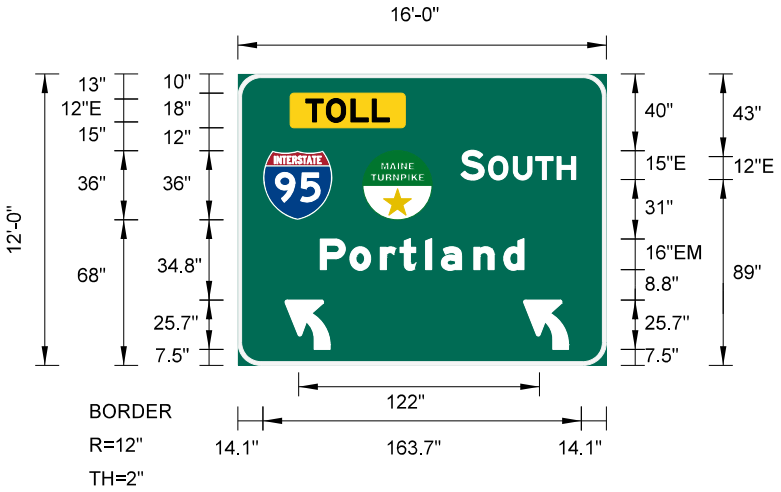
SYMBOL	X	Y	WID	HT
AR_Type D 0	6.3	4.5	6	9

LETTER POSITIONS (X)

G	r	a	y												LENGTH	SERIES/SIZE
																D 2000
19.2	24.5	27.2	31.2												16.6	6/4.5

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–5
WIDTH x HGHT.	16'–0" x 12'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White /Black/White

SYMBOL	X	Y	WID	HT
M1_1 (95)	14.1	68	36	36
M1–1 (MT)	66.1	68	36	36
AR45L2	23.8	7.5	23.4	25.7
AR45L2	145.6	7.5	23.4	25.7

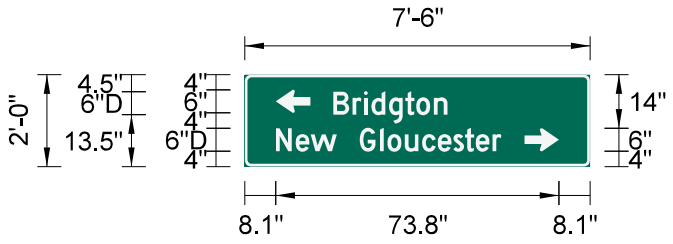
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.3	47	59.8	70.9												43.6	12
S	O	U	T	H												E 2000
117.1	132.5	145.3	147.1	68.1											60.7	15,12
P	o	r	t	l	a	n	d									E 2000
42.2	57.6	73.4	83.6	97.1	105.2	122.2	137.7								106.1	16/12
C	A	S	H													E 2000
125.5	136.9	150.5	162.6												46.8	12

SIGN DETAIL
1:50

Maine Turnpike Authority

SIGN NUMBER	GS–6	
WIDTH x HGHT.	7'–6" x 2'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



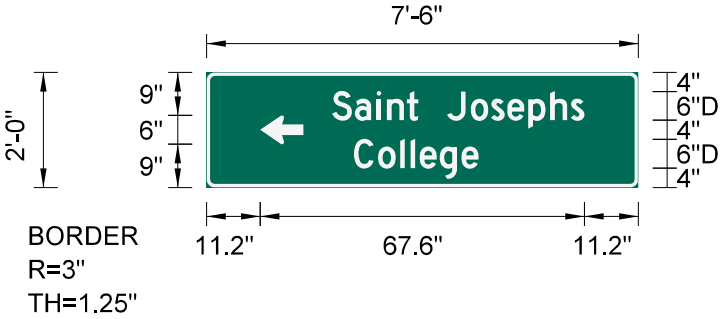
BORDER
R=3"
TH=1.25"

SYMBOL		X	Y	WID	HT
AR_Type D	90	8.1	14	6	9
AR_Type D	270	72.9	4	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
B	r	i	d	g	t	o	n									D 2000
23.1	28.1	31.1	33	37.6	41.8	44.7	49.3								29.7	6⁄4.5
N	e	w		G	I	o	u	c	e	s	t	e	r			D 2000
8.1	13.3	17.2	24	30	35.3	37.2	41.7	46.2	50.3	54.3	57.4	60.2	64.6		58.7	6⁄4.5

SIGN DETAIL
1:40



Maine Turnpike Authority

SIGN NUMBER	GS–7
WIDTH x HGHT.	7'–6" x 2'–0"
BORDER WIDTH	1.25"
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

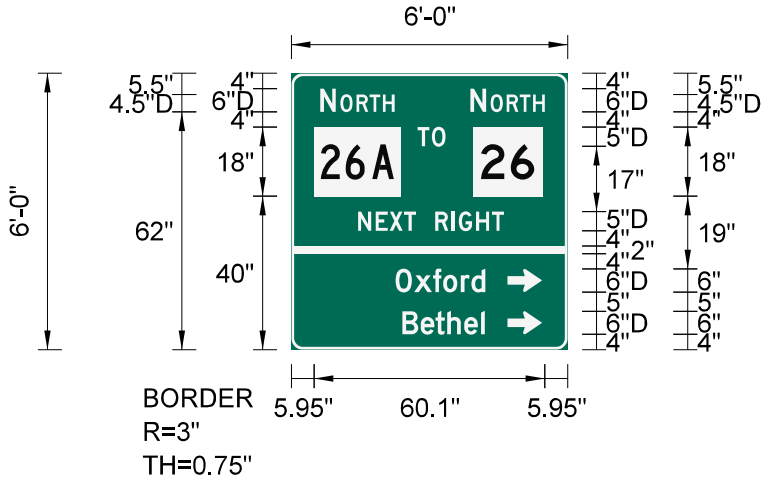
SYMBOL	X	Y	WID	HT
AR_Type D 90	11.2	9	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
S	a	i	n	t		J	o	s	e	p	h	s				D 2000
26.2	30.9	35.5	37.6	41.8	44.2	50.2	55.1	59.3	62.7	67.1	71.6	76			52.6	6/4.5
C	o	l	l	e	g	e										D 2000
30.7	35.8	40.4	42.5	44.5	48.6	53.2									26	6/4.5

SIGN DETAIL
1:50

Maine Turnpike Authority



SIGN NUMBER	GS–8
WIDTH x HGHT.	6'–0" x 6'–0"
BORDER WIDTH	1.25"
CORNER RADIUS	3"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

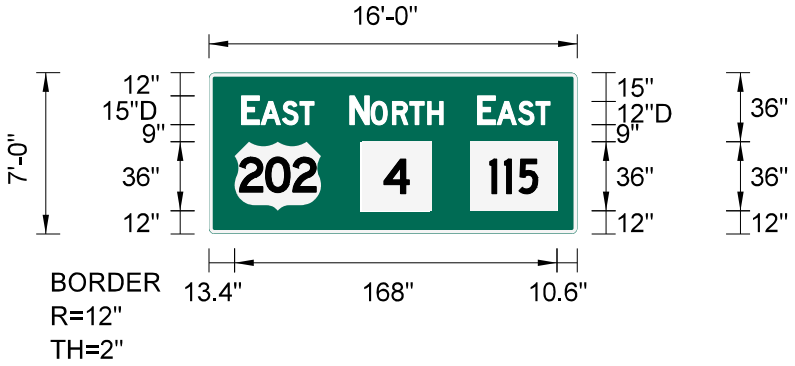
SYMBOL		X	Y	WID	HT
M1–5(26A)	0	6	40	22.5	18
M1–5(26)	0	47.4	40	18	18
AR_Type D	270	56.3	15	6	9
AR_Type D	270	56.3	4	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
N	O	R	T	H												D 2000
7.5	12.8	17	20.4	23.8											19.4	6,4.5
N	O	R	T	H												D 2000
46.7	51.9	56.1	59.5	63											19.4	6,4.5
T	O															D 2000
35.1	38.8														7.3	5
N	E	X	T		R	I	G	H	T							D 2000
17.4	22	25.6	29.4	32.5	37.5	41.7	43.6	48.1	52.3						38	5
O	x	f	o	r	d											D 2000
27.1	32	36.9	39.6	44.2	46.9										23.4	6/4.5
B	e	t	h	e	l											D 2000
29	33.7	37.5	40.6	45	49.4										21.4	6/4.5

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–9
WIDTH x HGHT.	16'–0" x 7'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White

SYMBOL		X	Y	WID	HT
M1–4(202)	0	13.4	12	45	36
M1–5(4)	0	79.8	12	36	36
M1–5(115)	0	136.4	12	45	36

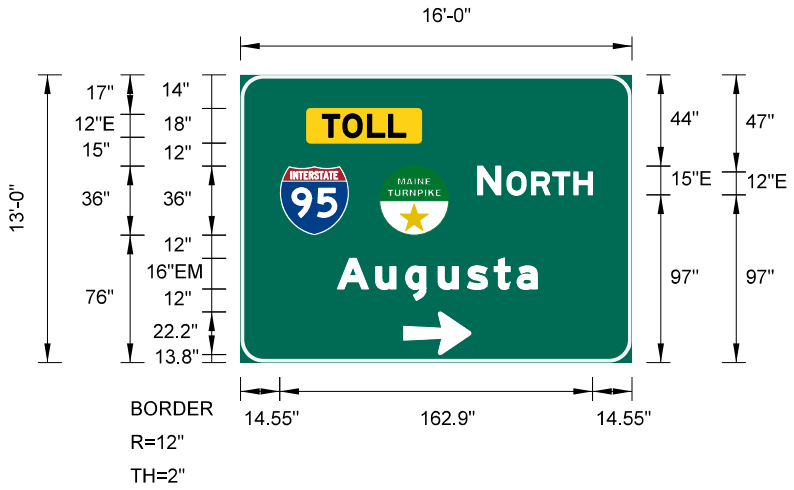
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
E	A	S	T													D 2000
17	27.1	38.38	47.4												37.8	15,12
N	O	R	T	H												D 2000
73.4	84.4	95.6	104.7	113.9											48.7	15,12
E	A	S	T													D 2000
140	150.1	161.2	170.4												37.8	15,12

SIGN DETAIL

1:100

Maine Turnpike Authority



SIGN NUMBER	GS–10
WIDTH x HGHT.	16'–0" x 13'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: Black /White/White

SYMBOL		X	Y	WID	HT
M1_1(95)	0	14.5	76	36	36
M1–1(MT)	0	66.5	76	36	36
AR_Type A	270	79.2	13.8	22.2	35

Panel Style: guide_exp_overhead.ssi

Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)

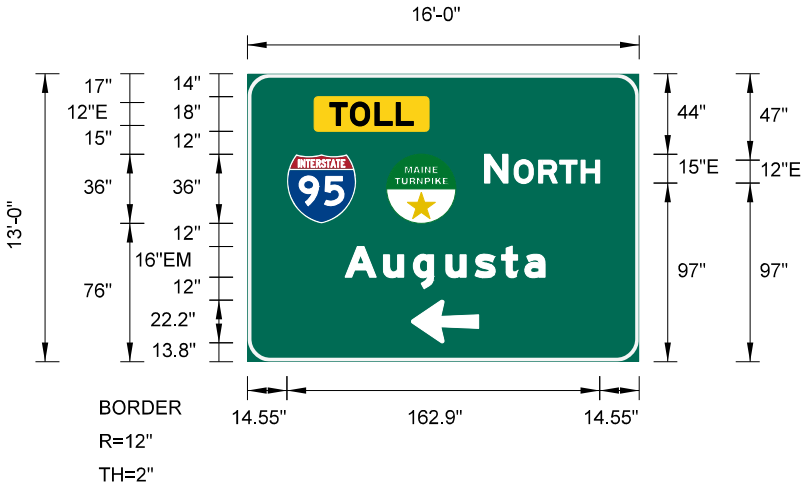
															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.8	47.4	60.3	71.3												43.6	12
N	O	R	T	H												E 2000
117.5	132.8	145.7	156.7	167.8											59.9	15,12
A	u	g	u	s	t	a										EM 2000
44.6	64.6	80.1	97.1	112.3	26.2	138.2									104.2	16/12

SIGN DETAIL

1:100

Maine Turnpike Authority

SIGN NUMBER	GS–11
WIDTH x HGHT.	16'–0" x 13'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: Black /White/White



SYMBOL		X	Y	WID	HT
M1_1(95)	0	14.5	76	36	36
M1–1(MT)	0	66.5	76	36	36
AR_Type A	90	79.2	13.8	22.2	35

Panel Style: guide_exp_overhead.ssi

Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

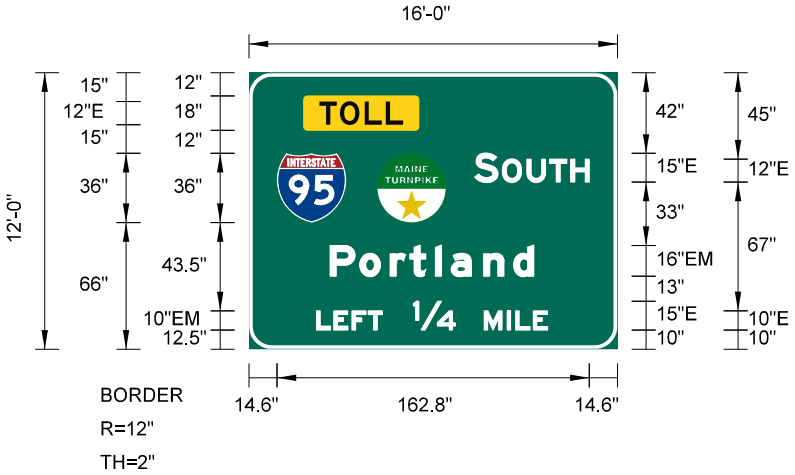
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.8	47.5	60.3	71.4												43.6	12
N	O	R	T	H												E 2000
117.5	132.8	145.7	156.7	167.8											59.9	15,12
A	u	g	u	s	t	a										EM 2000
44.6	64.6	80.1	97.1	112.3	126.2	138.2									104.2	16/12

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–12
WIDTH x HGHT.	16'–0" x 12'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White /Black/White



SYMBOL		X	Y	WID	HT
M1_1(95)	0	14.6	66	36	36
M1–1(MT)	0	66.6	66	36	36

Panel Style: guide_exp_overhead.ssi
Dimensions are in inches.tenths
Letter locations are panel edge to lower left corner

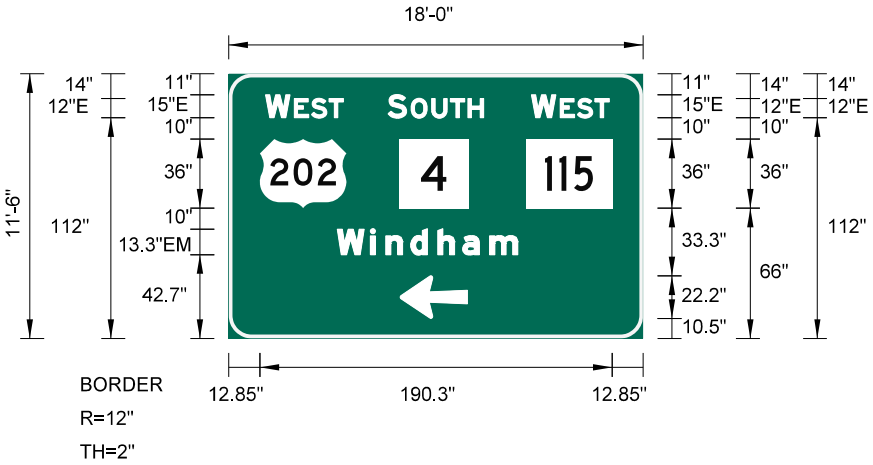
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.8	47.4	60.3	71.3												43.6	12
S	O	U	T	H												E 2000
117.6	132	144.9	156.6	167.7											59.8	15,12
P	o	r	t	l	a	n	d									EM 2000
42.3	57.7	73.5	83.8	97.2	105.4	122.3	137.8								106.1	16/12
L	E	F	T	1/4	M	I	L	E								EM 2000,E 2000
35.2	44.2	53.7	62.2	85.6	122.5	134.5	138.9	148.1							120.5	10, 15

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–14	
WIDTH x HGHT.	18'–0" x 11'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



SYMBOL		X	Y	WID	HT
M1_4(202)	0	12.8	66	45	36
M1–5(4)	0	85.4	66	36	36
M1–1(115)	0	151.4	66	45	36
AR_Type A	90	90.9	10.4	22.2	35

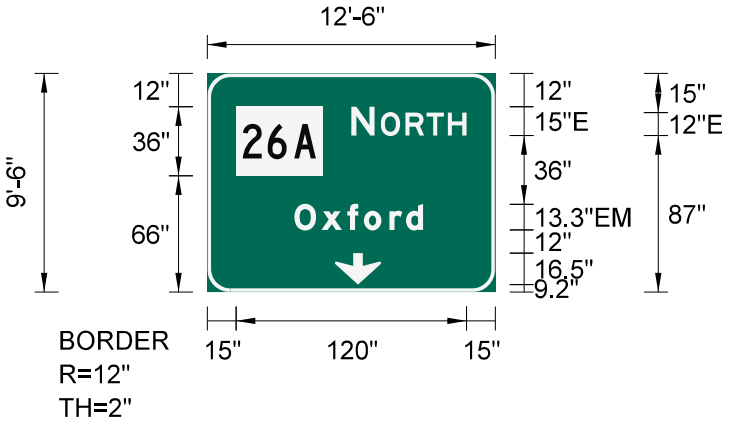
Panel Style: guide_exp_overhead.ssi
Dimensions are in inches.tenths
Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
W	E	S	T													E 2000
15.8	33.9	44.6	55.6												48.8	15,12
S	O	U	T	H												E 2000
79.6	94	106.9	118.6	129.7											59.8	15,12
W	E	S	T													E 2000
154.3	172.4	183.4	194.2												48.8	15,12
W	i	n	d	h	a	m										EM 2000
61	78.3	86.3	99.3	113.4	126.3	140.5									94.1	13.3/10

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–15	
WIDTH x HGHT.	12'–6" x 9'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

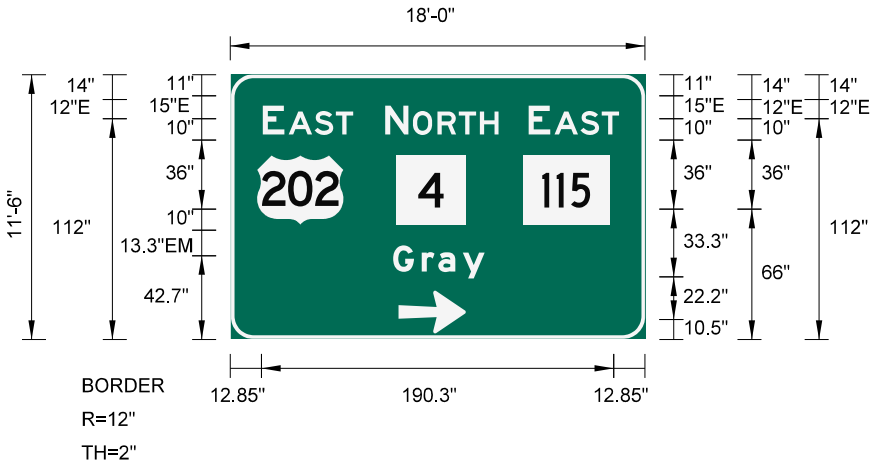
SYMBOL		X	Y	WID	HT
M1–5(26A)	0	15	60.6	45	36
ARDOWN	0	66.5	3.9	24	16.5

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
N	O	R	T	H												E 2000
75	90.4	103.2	114.2	125.3											60	15,12
O	x	f	o	r	d											EM 2000
45.4	59.5	73	81.6	94.8	103.5										67	13.3/10

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–16	
WIDTH x HGHT.	18'–0" x 11'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL		X	Y	WID	HT
M1–4(202)	0	13.7	59.6	45	36
M1–5(4)	0	86.3	59.6	36	36
M1–5(115)	0	152.3	59.6	45	36
AR_Type A	270	87.5	3	22.2	35

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
E	A	S	T													E 2000
16.7	30.1	43.7	54.7												47	15,12
N	O	R	T	H												E 2000
80.5	94.9	107.8	118.8	129.8											59.1	15,12
E	A	S	T													E 2000
155.2	168.7	182.2	193.3												47	15,12
G	r	a	y													EM 2000
84.6	99.5	108.2	120.9												47.7	13.3/10

SIGN DETAIL
1:40

Maine Turnpike Authority

BORDER
R=12"
TH=2"

SIGN NUMBER	GS–17	
WIDTH x HGHT.	10'–6" x 8'–0"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL	X	Y	WID	HT
EZPASS	15	61	96	24

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
O	N	L	Y													EM 2000
31.2	48.4	65.9	78.7												63.7	16
K	E	E	P		L	E	F	T								E 2000
14.1	26	37.4	48.8	58.5	70.5	81.5	92.9	102.9							97.8	12

SIGN DETAIL

1:40

BORDER
R=12"
TH=2"

Maine Turnpike Authority

SIGN NUMBER	GS–18	
WIDTH x HGHT.	11'–0" x 9'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

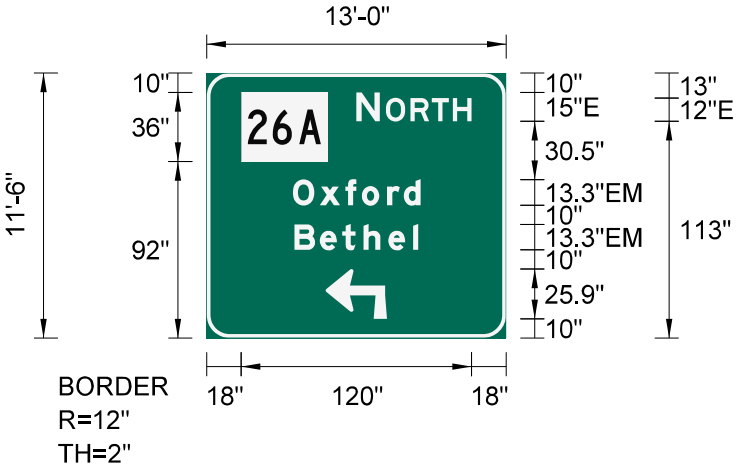
SYMBOL		X	Y	WID	HT
EZPASS	0	30	35	72	18

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
C	A	S	H													EM 2000
34.3	49.2	67.8	84.7												63.4	16
O	R															EM 2000
56.6	67.4														18.9	10
K	E	E	P		R	I	G	H	T							E 2000
12.7	24.5	35.9	47.3	57.1	69.1	81.2	86.1	98.6	110.3						106.7	12

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–19	
WIDTH x HGHT.	13'–0" x 11'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL		X	Y	WID	HT
M1–5(26A)	0	18	92	45	36
AR_Type C 90L	0	46.4	10	25.9	31.9

LETTER POSITIONS (X)

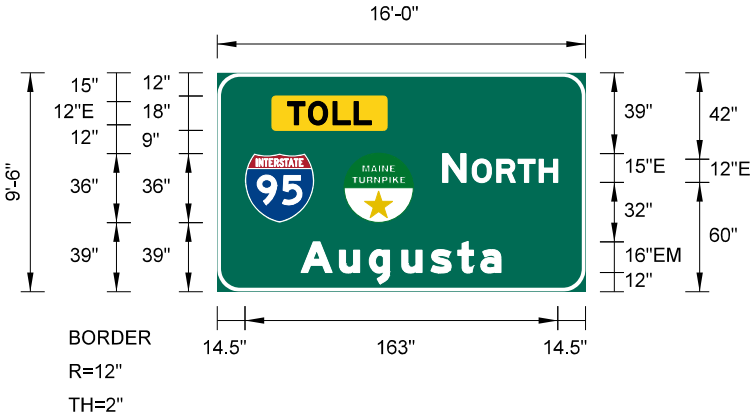
															LENGTH	SERIES/SIZE
N	O	R	T	H												E 2000
78	93.4	106.2	117.2	128.3											60	15,12
O	x	f	o	r	d											EM 2000
29.3	43.3	56.7	65.2	78.4	87.1										66.5	13.3/10
B	e	t	h	e	l											EM 2000
30.1	43.4	55	66.2	79.1	92										64.5	13.3/10

SIGN DETAIL

1:100

Maine Turnpike Authority

SIGN NUMBER	GS–20
WIDTH x HGHT.	16'–0" x 9'–6"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White/White



SYMBOL		X	Y	WID	HT
M1_1(95)	0	14.5	36	36	36
M1–1(MT)	0	66.5	36	36	36

Panel Style: guide_exp_overhead.ssi

Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

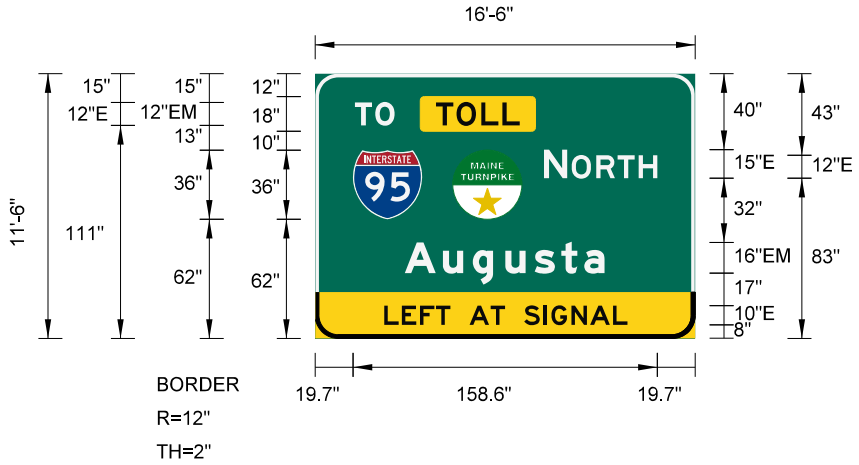
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.8	47.5	60.3	71.4												43.6	12
N	O	R	T	H												E 2000
117.5	132.9	145.7	156.7	167.8											60	15,12
A	u	g	u	s	t	a										EM 2000
43.7	63.7	79.2	96.2	111.4	125.3	137.3									104.2	16/12

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–21
WIDTH x HGHT.	16'–6" x 11'–6"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: Black /White/White



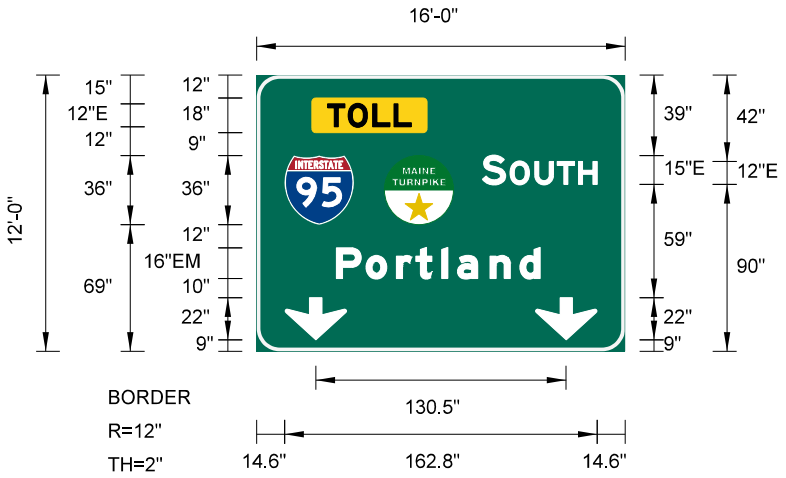
SYMBOL		X	Y	WID	HT
M1–1(95)	0	19.7	62	36	36
M1–1(MT)	0	71.7	62	36	36

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O															EM 2000
20.7	31.3														20.6	12
T	O	L	L													E 2000
63	73.7	86.5	97.6												43.6	12
N	O	R	T	H												E 2000
119.2	133.6	146.5	157.5	168.6											59.1	15,12
A	u	g	u	s	t	a										EM 2000
46.6	66.6	82.2	99.1	114.3	128.2	140.2									104.2	16/12
L	E	F	T		A	T		S	I	G	N	A	L			E 2000
35.9	45.1	54.6	62.9	70.4	80.4	91.4	98.9	108.9	119	123.1	133.5	143.3	155.2		126.8	10

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–22
WIDTH x HGHT.	16'–0" x 12'–0"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: White /Black/White

SYMBOL	X	Y	WID	HT
M1_1 (95)	14.6	66	36	36
M1–1 (MT)	66.6	66	36	36
ARDOWN	14.8	6	32	22
ARDOWN	145.3	6	32	22

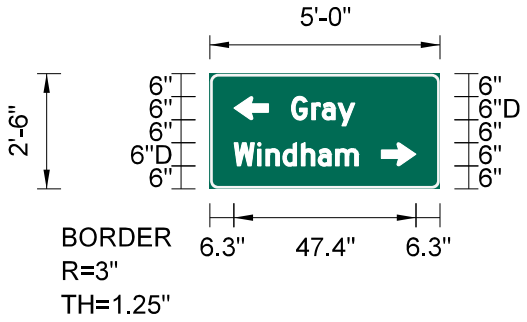
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
T	O	L	L													E 2000
36.9	47.6	60.5	71.5												43.6	12
S	O	U	T	H												E 2000
117.6	132	144.9	156.6	167.7											59.8	15,12
P	o	r	t	l	a	n	d									EM 2000
42.8	58.2	74	84.3	97.7	105.9	122.8	138.4								106.1	16/12

SIGN DETAIL
1:50

Maine Turnpike Authority

SIGN NUMBER	GS–23	
WIDTH x HGHT.	5'–0" x 2'–6"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



SYMBOL		X	Y	WID	HT
AR_Type D	90	6.3	18	6	9
AR_Type D	270	44.7	6	6	9

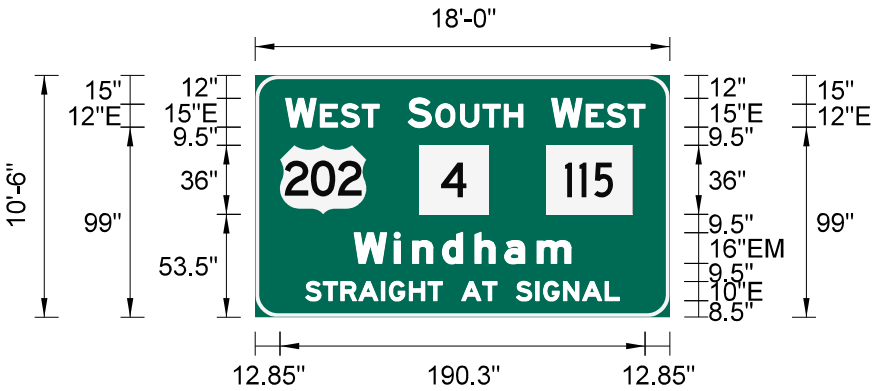
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
G	r	a	y													D 2000
21.3	26.6	29.3	33.4												16.6	6/4.5
W	i	n	d	h	a	m										D 2000
6.3	12.4	14.6	19	23.8	28.2	32.8									32.4	6/4.5

SIGN DETAIL
1:100

Maine Turnpike Authority

SIGN NUMBER	GS–24	
WIDTH x HGHT.	18'–0" x 10'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



BORDER
R=12"
TH=2"

SYMBOL		X	Y	WID	HT
M1–4(202)	0	12.8	53.5	45	36
G24_A2	0	85.4	53.5	36	36
G24_B3	0	151.4	53.5	45	36

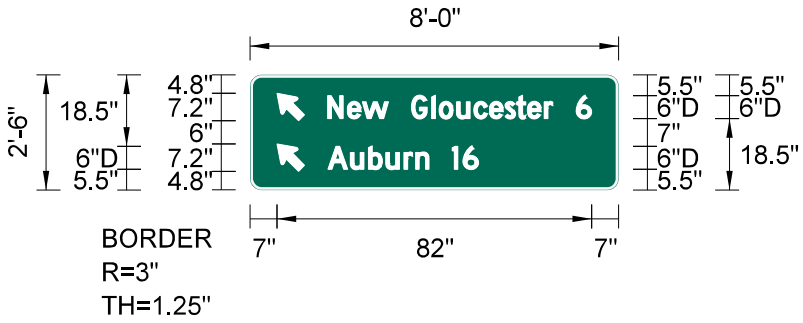
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
W	E	S	T													E 2000
15.8	33.9	44.6	55.6												48.8	15,12
S	O	U	T	H												E 2000
79.6	94	106.9	118.6	129.7											59.8	15,12
W	E	S	T													E 2000
154.3	172.4	183.1	194.2												48.8	15,12
W	i	n	d	h	a	m										EM 2000
51.5	72.3	81.9	97.4	114.4	129.9	146.9									113	16/12
S	T	R	A	I	G	H	T		A	T						E 2000
26.2	35.4	44.6	53.8	65.7	69.8	80.2	90	97.5	107.5	118.5	126					10
S	I	G	N	A	L											E 2000
136	146.1	150.2	160.6	170.4	182.3										163.6	10

SIGN DETAIL
1:50

Maine Turnpike Authority

SIGN NUMBER	GS–25	
WIDTH x HGHT.	8'–0" x 2'–6"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



SYMBOL		X	Y	WID	HT
AR_Type D	45	7	18	6	9
AR_Type D	45	7	4.9	6	9

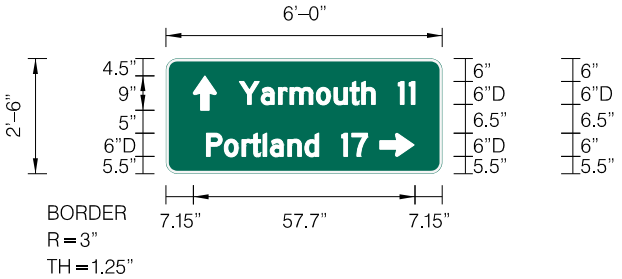
LETTER POSITIONS (X)

																LENGTH	SERIES/SIZE
N	e	w		G	l	o	u	c	e	s	t	e	r	6			D 2000
20.2	25.3	29.2	36	42	47.3	49.2	53.8	58.3	62.3	66.4	69.4	72.2	76.6	84.9	68.8		6/4.5
A	u	b	u	r	n	1	6										D 2000
20.3	26.1	30.8	35.3	40.1	43.1	52.6	55.4								39.2		6/4.5

SIGN DETAIL
1:50

Maine Turnpike Authority

SIGN NUMBER	GS–26	
WIDTH x HGHT.	6'–0" x 2'–6"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



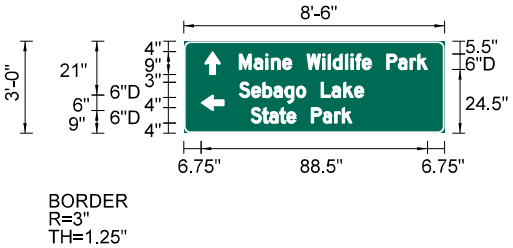
SYMBOL		X	Y	WID	HT
AR_Type D	0	7.1	16.5	6	9
AR_Type D	270	55.7	4.5	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
Y	a	r	m	o	u	t	h	1	1							D 2000
19.1	24.8	29.3	32.3	39.2	43.7	47.9	51	60.5	63.4						45.7	6/4.5
P	o	r	t	l	a	n	d	1	7							D 2000
10.6	15.2	19.8	22.3	25.3	27.2	31.7	36.2	45.8	48.4						41.9	6/4.5

SIGN DETAIL

1:75



Maine Turnpike Authority

SIGN NUMBER	GS–27	
WIDTH x HGHT.	8'–6" x 3'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL		X	Y	WID	HT
AR_Type D	0	8.3	23	6	9
AR_Type D	90	6.8	8.9	6	9

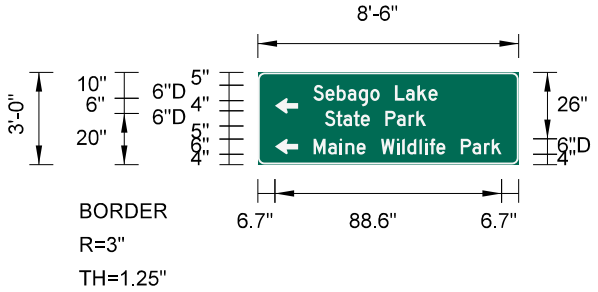
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
M	a	i	n	e		W	i	l	d	l	i	f	e			D 2000
21.7	27.4	32	34.2	38.6	42.1	48.1	54.3	56.4	58.3	63.1	65.3	67.1	69.7	73.3		6/4.5
P	a	r	k													D 2000
79.3	83.8	88.4	91.4											73.5		6/4.5
S	e	b	a	g	o		L	a	k	e						D 2000
21.8	26.5	30.9	35.1	39.5	44	47.7	53.7	57.9	62.4	66.8					48.5	6/4.5
S	t	a	t	e		P	a	r	k							D 2000
26.3	30.7	33.5	37.5	40.3	43.8	49.8	54.4	59	62						39.5	6/4.5

SIGN DETAIL
1:75

Maine Turnpike Authority

SIGN NUMBER	GS–28	
WIDTH x HGHT.	8'–6" x 3'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



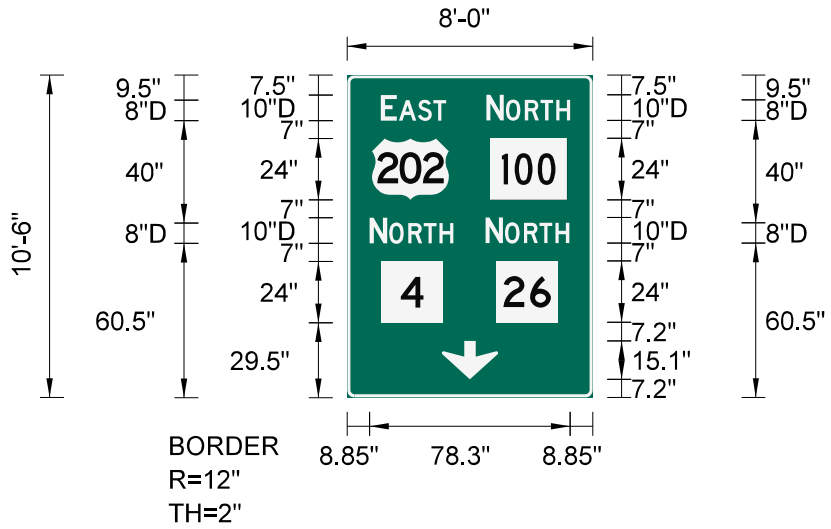
SYMBOL		X	Y	WID	HT
AR_Type D	90	6.7	19.9	6	9
AR_Type D	90	6.7	4	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
S	e	b	a	g	o		L	a	k	e						D 2000
21.7	26.5	30.8	35.1	39.4	44	47.6	53.6	57.8	62.4	66.7					48.5	6/4.5
S	t	a	t	e		P	a	r	k							D 2000
26.2	30.7	33.4	37.4	40.3	43.8	49.8	54.4	58.9	61.9						39.5	6/4.5
M	a	i	n	e		W	i	l	d	l	i	f	e			D 2000
21.8	27.5	32	34.2	38.6	42.2	48.2	54.3	56.5	58.4	63.2	65.3	67.1	69.8	73.3		6/4.5
P	a	r	k													D 2000
79.3	83.9	88.4	91.4												73.5	6/4.5

SIGN DETAIL
1:75

Maine Turnpike Authority



SIGN NUMBER	GS–29	
WIDTH x HGHT.	8'–0" x 10'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

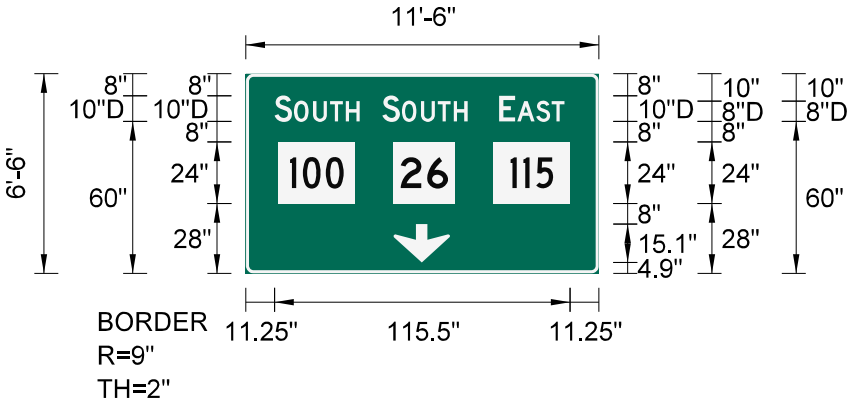
SYMBOL		X	Y	WID	HT
M1–4(202)	0	9.8	77.5	30	24
M1–5(100)	0	56	77.5	30	24
M1–5(4)	0	13.4	29.5	24	24
M1–5(26)	0	58.4	29.5	24	24
ARDOWN	0	37	7.2	22	15.1

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
E	A	S	T													D 2000
13.2	20.2	27.7	33.7												25.5	10,8
N	O	R	T	H												D 2000
54.4	62	69.5	75.6	81.7											32.7	10,8
N	O	R	T	H												D 2000
8.8	16.4	23.9	30	36.1											32.7	10,8
N	O	R	T	H												D 2000
54.1	61.7	69.1	75.2	81.4											32.7	10,8

SIGN DETAIL
1:75

Maine Turnpike Authority



SIGN NUMBER	GS–30	
WIDTH x HGHT.	11'–6" x 6'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	9"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL		X	Y	WID	HT
M1–5(100)	0	12.8	27.3	30	24
M1–5(26)	0	57.8	27.3	24	24
M1–5(115)	0	96.8	27.3	30	24
ARDOWN	0	57.8	4.2	22	15.1

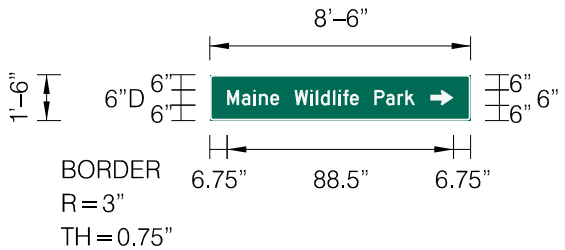
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
S	O	U	T	H												D 2000
11.2	18.8	26.3	32.9	39.1											33.3	10,8
S	O	U	T	H												D 2000
53.4	61	68.4	75.1	81.2											33.3	10,8
E	A	S	T													D 2000
99	106	113.5	119.6												25.5	10,8

SIGN DETAIL
1:75

Maine Turnpike Authority

SIGN NUMBER	GS–31	
WIDTH x HGHT.	8'–6" x 1'–6"	
BORDER WIDTH	0.75"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



SYMBOL	X	Y	WID	HT
AR_Type D 270	86.2	6	6	9

LETTER POSITIONS (X)

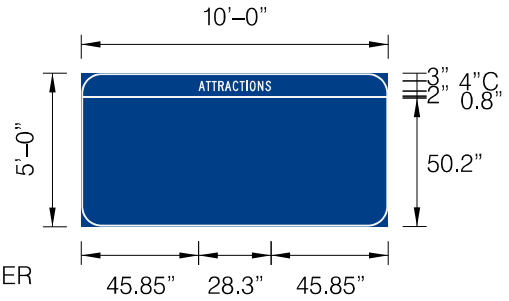
															LENGTH	SERIES/SIZE
M	a	i	n	e		W	i	l	d	l	i	f	e			
6.8	12.5	17	19.2	23.6	27.2	33.2	39.3	41.4	43.4	48.2	50.3	52.1	54.8	58.3		
P	a	r	k													D 2000
64.3	68.9	73.4	76.4												73.5	6/4.5

SIGN DETAIL

1:75

Maine Turnpike Authority

SIGN NUMBER	GS–32	
WIDTH x HGHT.	10'–0" x 5'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	9"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Blue
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



BORDER
R = 9"
TH = 1.25"

SYMBOL	X	Y	WID	HT

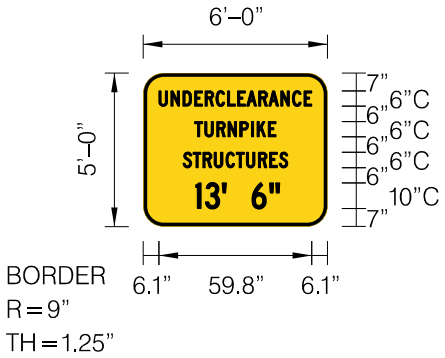
LETTER POSITIONS (X)

A	T	T	R	A	C	T	I	O	N	S					LENGTH	SERIES/SIZE
45.8	48.6	50.9	53.5	56.1	59.2	61.9	64.5	65.8	69	71.9					28.3	C 2000 4

SIGN DETAIL
1:75

Maine Turnpike Authority

SIGN NUMBER	GS–33
WIDTH x HGHT.	6'–0" x 5'–0"
BORDER WIDTH	1.25"
CORNER RADIUS	8"
MOUNTING	Ground
BACKGROUND	TYPE: Reflective
	COLOR: Yellow
LEGEND/BORDER	TYPE: Reflective
	COLOR: Black



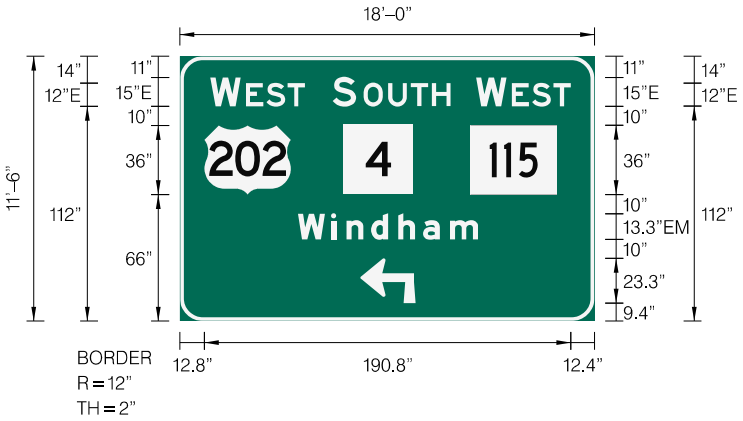
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
U	N	D	E	R	C	L	E	A	R	A	N	C	E			C 2000
6.1	10.8	15.5	20	24.1	28.4	32.9	36.8	40.4	45.1	49	53.7	58.3	62.8		59.8	6
T	U	R	N	P	I	K	E									C 2000
20.1	24	28.7	33.1	37.7	42.3	44.5	48.8								31.8	6
S	T	R	U	C	T	U	R	E	S							C 2000
15.5	19.4	23.3	27.7	32.3	36.4	40.3	44.9	49.3	53.1						40.9	6
1	3	'		6	'	'										C 2000
20.5	24.3	30.9	32.5	42.5	49.4	51.8									32.9	10

SIGN DETAIL
1:100

Maine Turnpike Authority



SIGN NUMBER	GS–34	
WIDTH x HGHT.	18'–0" x 11'–6"	
BORDER WIDTH	2"	
CORNER RADIUS	12"	
MOUNTING	Overhead	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

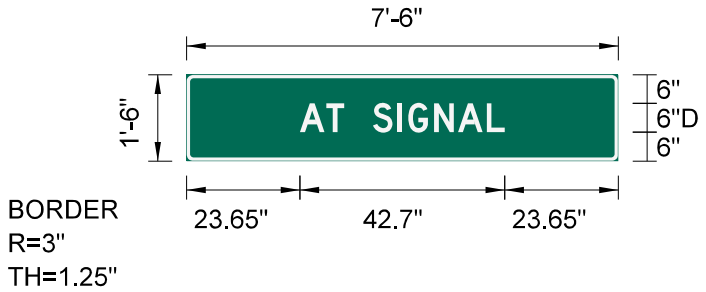
SYMBOL		X	Y	WID	HT
M1–4(202)	0	12.8	66	45	36
M1–5(4)	0	85.4	66.5	36	36
M1–5(115)	0	151.4	66	45	36
AR_Type C 90L	0	94.1	9.4	23.3	28.7

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
W	E	S	T													E 2000
15.8	34.4	45.1	56.1												49.3	15,12
S	O	U	T	H												E 2000
79.6	95.7	108.5	120.3	131.3											61.4	15,12
W	E	S	T													E 2000
154.3	172.9	183.6	194.6												49.3	15,12
W	i	n	d	h	a	m										EM 2000
61.5	78.8	86.8	99.7	113.8	126.7	140.8									93.9	13.3/10

SIGN DETAIL
1:40

Maine Turnpike Authority



SIGN NUMBER	GS–35	
WIDTH x HGHT.	7'–6" x 1'–6"	
BORDER WIDTH	1.25"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White

SYMBOL	X	Y	WID	HT

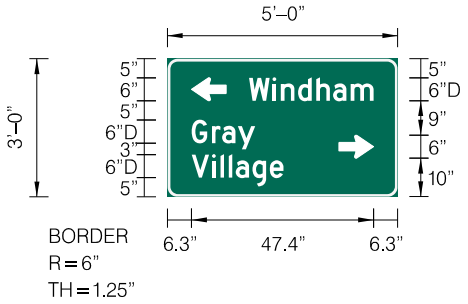
LETTER POSITIONS (X)

A	T		S	I	G	N	A	L								LENGTH	SERIES/SIZE
23.7	29.1	32.9	38.9	44	46.2	51.6	56.6	62.6								42.7	D 2000 6

SIGN DETAIL
1:50

Maine Turnpike Authority

SIGN NUMBER	GS–36	
WIDTH x HGHT.	5'–0" x 3'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	6"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



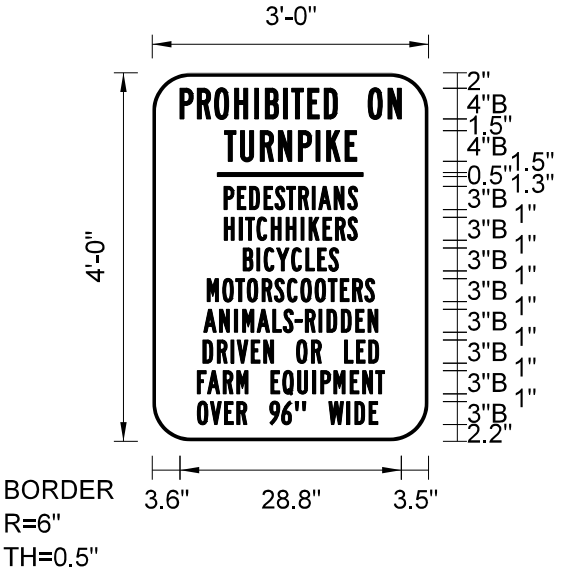
SYMBOL		X	Y	WID	HT
AR_Type D	90	6.3	25	6	9
AR_Type D	270	44.7	10.1	6	9

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
W	i	n	d	h	a	m										D 2000
21.3	27.4	29.6	34	38.8	43.2	47.8									32.4	6/4.5
G	r	a	y													D 2000
6.3	11.6	14.3	18.4												16.6	6/4.5
V	i	l	l	a	g	e										D 2000
6.3	11.6	13.8	16	17.8	22.1	26.7									23.9	6/4.5

SIGN DETAIL
1:25

Maine Turnpike Authority



SIGN NUMBER	SP–01	
WIDTH x HGHT.	3'–0" x 4'–0"	
BORDER WIDTH	0.5"	
CORNER RADIUS	6"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	White
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black

SYMBOL	X	Y	WID	HT

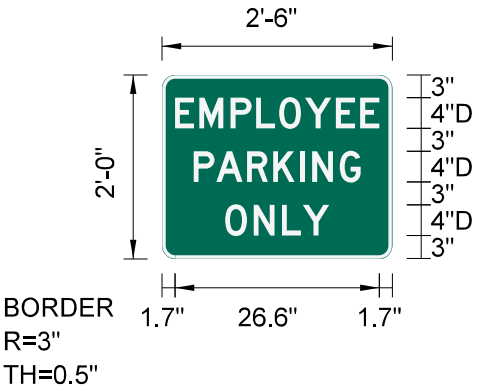
LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
P	R	O	H	I	B	I	T	E	D		O	N				B 2000
3.6	5.9	8.1	10.7	13.3	14.7	17.1	18.2	20.3	22.4	24.1	28.1	30.7			28.8	4
T	U	R	N	P	I	K	E									B 2000
9.4	11.5	14.1	16.5	19.1	21.3	22.7	25.1								17.2	4
P	E	D	E	S	T	R	I	A	N	S						B 2000
9.4	11.1	12.7	14.6	16	17.5	19.1	20.9	21.7	23.7	25.5					17.4	3
H	I	T	C	H	H	I	K	E	R	S						B 2000
9.4	11.3	12.2	13.6	15.5	17.4	19.4	20.4	22.2	23.9	25.4					17.3	3
B	I	C	Y	C	L	E	S									B 2000
11.8	13.6	14.6	16.2	18.1	20	21.6	23								12.5	3
M	O	T	O	R	S	C	O	O	T	E	R	S				B 2000
7.1	9.2	10.9	12.4	14.3	15.9	17.6	19.4	21.2	22.9	24.5	26.1	27.7			21.8	3
A	N	I	M	A	L	S	–	R	I	D	D	E	N			B 2000
6.7	8.8	10.7	11.8	13.7	15.7	17.1	18.6	20	21.7	22.8	24.6	26.5	28.1		22.7	3
D	R	I	V	E	N		O	R		L	E	D				B 2000
6.6	8.5	10.3	11.1	12.9	14.5	15.8	18.8	20.8	22	25	26.6	28.2			22.9	3
F	A	R	M		E	Q	U	I	P	M	E	N	T			B 2000
5.9	7.2	9.2	11	12.5	15.5	17	19	20.9	22	23.7	25.8	27.4	29.1		24.4	3
O	V	E	R		9	6	'	'		W	I	D	E			B 2000
5.9	7.6	9.4	11	12.3	15.3	16.9	18.6	19.6	20	23	25.3	26.4	28.3		23.5	3

SIGN DETAIL
1:25

Maine Turnpike Authority

SIGN NUMBER	SP–02	
WIDTH x HGHT.	2'–6" x 2'–0"	
BORDER WIDTH	0.5"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Green
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	White/White



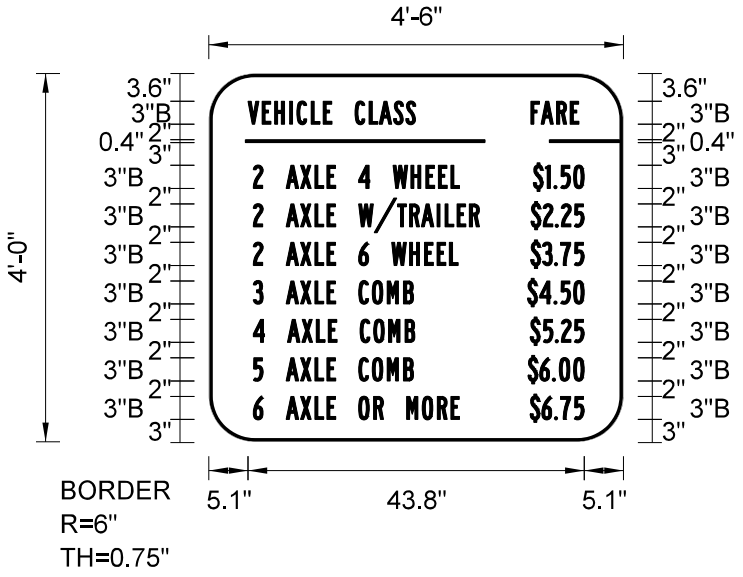
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
E	M	P	L	O	Y	E	E									D 2000
1.7	4.9	8.9	12.3	15.3	18.6	22.7	25.8								26.6	4
P	A	R	K	I	N	G										D 2000
4.1	7.1	11.1	14.5	18	19.6	23.2									21.8	4
O	N	L	Y													D 2000
8.2	11.9	15.6	18.3												13.6	4

SIGN DETAIL
1:25

Maine Turnpike Authority



SIGN NUMBER	SP–03	
WIDTH x HGHT.	4'–6" x 4'–0"	
BORDER WIDTH	0.75"	
CORNER RADIUS	6"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	White
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black

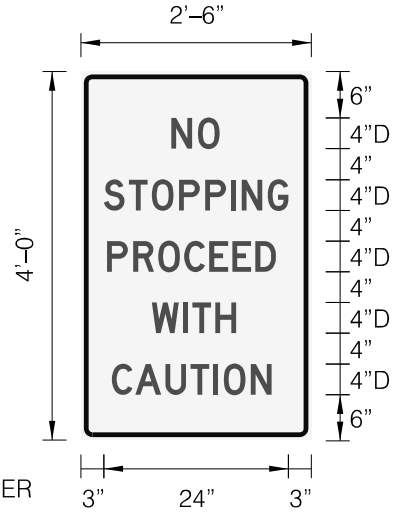
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

																					LENGTH	SERIES/SIZE
V	E	H	I	C	L	E		C	L	A	S	S		F	A	R	E					B 2000
5.1	6.9	8.6	10.5	11.5	13.3	14.9	16	19	20.9	22.2	24.1	25.7		41.9	43.3	45.3	47.1				43.1	3
2		A	X	L	E		4		W	H	E	E	L		$	1	.	5	0			B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	21	24	26.3	28.3	29.9	31.5		42.3	43.9	44.9	45.8	47.5		43.1	3
2		A	X	L	E		W	/	T	R	A	I	L	E	R	$	2	.	2	5		B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	21.5	24.6	26.2	27.7	29.7	30.8	32.3	34	42	43.6	45.1	45.9	47.6	43.1	3
2		A	X	L	E		6		W	H	E	E	L		$	3	.	7	5			B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	20.8	23.8	26.2	28.1	29.7	31.3		41.9	43.5	45	45.8	47.6		43.1	3
3		A	X	L	E		C	O	M	B		$	4	.	5	0						B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	21.3	23.2	25.4		41.5	43.1	44.9	45.8	47.5					43.1	3
4		A	X	L	E		C	O	M	B		$	5	.	2	5						B 2000
5.8	7.3	10.3	12.1	14	15.6	16.7	19.7	21.5	23.4	25.6		41.9	43.6	45.1	45.9	47.6					43.1	3
5		A	X	L	E		C	O	M	B		$	6	.	0	0						B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	21.3	23.2	25.4		41.6	43.1	44.8	45.7	47.5					43.1	3
6		A	X	L	E		O	R		M	O	R	E		$	6	.	7	5			B 2000
5.8	7.1	10.1	11.9	13.8	15.4	16.5	19.5	21.5	22.8	25.8	27.8	29.8	31.5		41.8	43.4	45	45.8	47.6		43.1	3

SIGN DETAIL
1:25

Maine Turnpike Authority



BORDER
R = 3"
TH = 0.75"
IN = 0.75"

SIGN NUMBER	R8–7(MOD)	
WIDTH x HGHT.	2'–6" x 4'–0"	
BORDER WIDTH	0.75"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	White
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black/Black

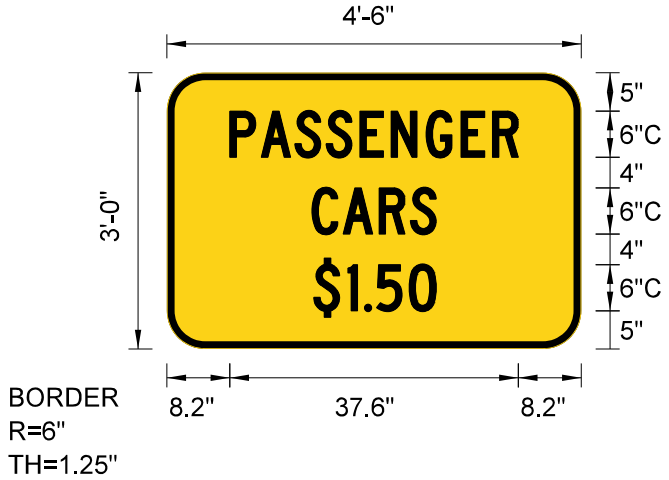
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
N	O															D
11.8	15.2														6.3	4
S	T	O	P	P	I	N	G									D
3	6.2	9.2	12.8	16.2	19.6	20.9	24.3								24	4
P	R	O	C	E	E	D										D
3.4	6.8	10.1	13.5	16.7	19.7	22.7									22	4
W	I	T	H													D
9.2	13.3	14.5	17.5												11	4
C	A	U	T	I	O	N										D
4	7.1	11	14.3	17.3	18.6	22.1									20.8	4

SIGN DETAIL
1:25

Maine Turnpike Authority



SIGN NUMBER	W9–6(MOD)	
WIDTH x HGHT.	4'–6" x 3'–0"	
BORDER WIDTH	1.25"	
CORNER RADIUS	6"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Yellow
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black

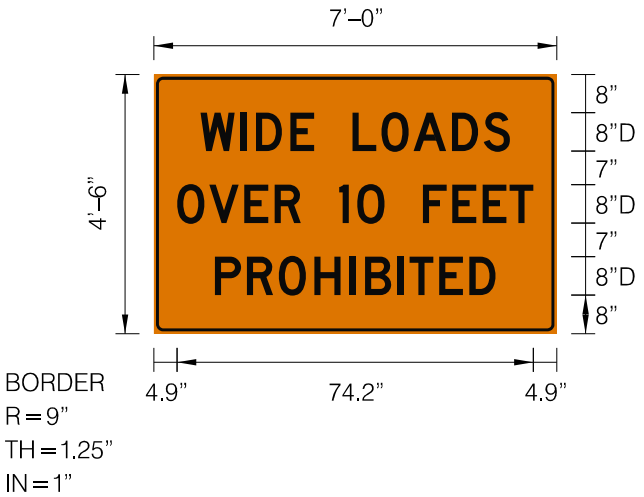
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
P	A	S	S	E	N	G	E	R								C 2000
8.2	12.3	16.7	20.8	25.1	29.2	33.8	38.3	42.4							37.6	6
C	A	R	S													C 2000
18.9	23	27.7	31.7												16.2	6
$	1	.	5	0												C 2000
19.1	23.6	25.7	27.3	31.6											16	6

SIGN DETAIL
1:40

Maine Turnpike Authority



SIGN NUMBER	CS–1	
WIDTH x HGHT.	7'–0" x 4'–6"	
BORDER WIDTH	1.25"	
CORNER RADIUS	9"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Orange
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black/Black

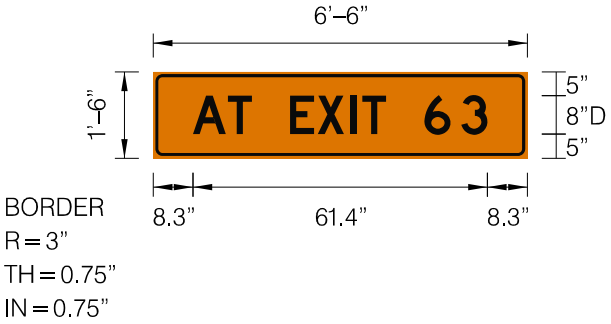
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

															LENGTH	SERIES/SIZE
W	I	D	E		L	O	A	D	S							D 2000
9.8	18.1	21.3	28.5	33.4	41.4	47.4	54.2	62.2	68.8						64.5	8
O	V	E	R		1	0		F	E	E	T					D 2000
4.9	11.6	18.9	25.2	30.6	38.6	42.4	48.1	56.1	62.2	68.6	74.2				74.2	8
P	R	O	H	I	B	I	T	E	D							D 2000
12.8	19.4	26	33.5	40.8	44	50.8	53.3	59.5	65.8						58.5	8

SIGN DETAIL
1:40

Maine Turnpike Authority



SIGN NUMBER	CS–2	
WIDTH x HGHT.	6'–6" x 1'–6"	
BORDER WIDTH	0.75"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Orange
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black/Black

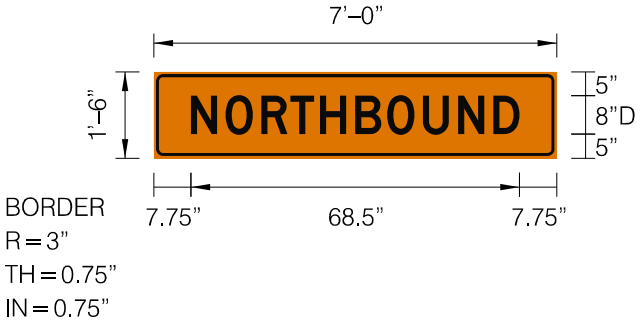
SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

A	T		E	X	I	T		6	3							LENGTH	SERIES/SIZE
8.3	15.6	20.6	28.6	34.3	41.1	43.6	48.6	56.6	64.2							61.4	D 2000 8

SIGN DETAIL
1:40

Maine Turnpike Authority



SIGN NUMBER	CS–4	
WIDTH x HGHT.	7'–0" x 1'–6"	
BORDER WIDTH	0.75"	
CORNER RADIUS	3"	
MOUNTING	Ground	
BACKGROUND	TYPE:	Reflective
	COLOR:	Orange
LEGEND/BORDER	TYPE:	Reflective
	COLOR:	Black/Black

SYMBOL	X	Y	WID	HT

LETTER POSITIONS (X)

N	O	R	T	H	B	O	U	N	D							LENGTH	SERIES/SIZE
7.8	15	22.4	28.5	34.6	42	48.6	56.1	63.4	70.8							68.5	D 2000 8