



STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE
04333-0016

JOHN ELIAS BALDACCI
GOVERNOR

DAVID A. COLE
COMMISSIONER

June 12, 2009
Subject: **South Portland**
Federal Project No's: STP-1123(100)X &
IM-A280(000)
State Pin No's: 011231.00 & 012800.00
Amendment No. 4

Dear Sir/Ms:

Make the following change to the Bid Document:

In the Bid Book (pages 4 through 11) **REMOVE** the "SCHEDULE OF ITEMS" 11 pages dated 090514 (replaced in Amendment #2) and **REPLACE** it with the attached new "SCHEDULE OF ITEMS" 11 pages dated 090611.

In the Bid Book, after page 43, **INSERT** the attached "SPECIAL PROVISION, SECTION 107 – TIME, (Allowable Work Times)", 3 pages dated June 9, 2009.

In the Bid Book (page 87), "SPECIAL PROVISION 534, Precast Structural Concrete, Prefabricated Noise Barrier Wall System" **ADD** the following sentence in pen and ink to section 534.07; "**All common excavation, gravel, and ledge removal associated with the noise barrier wall shall be included in the lump sum price for the wall.**"

In the Bid Book, **REMOVE** "SPECIAL PROVISION, SECTION 606, HIGH-TENSION CABLE BARRIER", 6 pages dated February 20, 2009 and **REPLACE** it with the attached new "SPECIAL PROVISION, SECTION 606, HIGH-TENSION CABLE BARRIER, (State-Supplied)", 6 pages dated June 5, 2009.

In the Bid Book, after page 110, **INSERT** the attached "SPECIAL PROVISION, SECTION 634, HIGHWAY LIGHTING", 1 page dated May 31, 2005.

In the Bid Book, after the previous Special Provision, **INSERT** the attached "SPECIAL PROVISION, Section 634 and 643, Highway Lighting and Traffic Signals", 4 pages dated June 29, 2007.

In the Bid Book, after page 111, **INSERT** the attached "SPECIAL PROVISION, SECTION 645 – HIGHWAY SIGNING" 16 pages dated June 11, 2009.

In the Bid Book, after the previous Special Provision, **INSERT** the attached "Special Provision, Section 645, Overhead Lane Use Sign Assembly" 1 page dated June 11, 2009.



PRINTED ON RECYCLED PAPER

In the Bid Book, after the previous Special Provision, **INSERT** the attached “SPECIAL PROVISION, SECTION 645, HIGHWAY SIGNING” 1 page dated January 29, 2009.

In the Bid Book, after the previous Special Provision, **INSERT** the attached “SPECIAL PROVISION, SECTION 645 - HIGHWAY SIGNING, (Sign Foundations)” 12 pages dated June 11, 2009.

In the Bid Book, after page 112, **INSERT** the attached “SPECIAL PROVISION, SECTION 652, MAINTENANCE OF TRAFFIC, (Traffic Officers)”, 1 page dated June 9, 2009.

In the Plans, SHEET NUMBER 80 OF 119, **ADD** the following note @ 34+00 NB; **“NOTE: REMOVE EXISTING MERGE SIGN”**. Make this change in pen and ink.

In the Plans, SHEET NUMBER 81 OF 119, **CHANGE** the note that reads; “Existing OH Structure/Sign structure to be removed” to read: **“Existing OH Structure/Sign structure to be removed and delivered to Scarborough Maintenance Lot. Payment incidental to 645.12.”** Make this change in pen and ink.

In the Plans, SHEET NUMBER 84 OF 119, **CHANGE** the note @ 180+50 SB to read; **“SIGN/POST TO BE REMOVED.”** Make this change in pen and ink.

In the Plans, SHEET NUMBER 84 OF 119, **CHANGE** the note that reads; “Existing OH Structure/Sign structure to be removed” to read: **“Existing OH Structure/Sign structure to be removed and delivered to Scarborough Maintenance Lot. Payment incidental to 645.12.”** Make this change in pen and ink.

In the Plans, SHEET NUMBER 84 OF 119, **CHANGE** the note that reads; “Portable VMS to be Removed and relocated AOB” to read **“Portable VMS to be delivered to Scarborough Maintenance Lot. Pavement Incidental to 645.155 DMS”**. Make this change in pen and ink.

In the Plans, SHEET NUMBER 89 OF 119, “NOTES”, make the following **CHANGES** to the notes indicated in pen and ink.

Note:

#11 “Incidental to Removal of other items” Should read

“Incidental to Removal of 606 Items”

#13 **ADD** **“This work incidental to 634 Items”**

#20 **ADD** **“This work incidental to 645.155”**

#21 **ADD** **“This work incidental to 645.155”**

#24 **ADD** **“This work Incidental to 634 items”**

#27 **ADD** **“This work incidental to 634.2071”**

#28 **ADD** **“This work incidental to 634 items”**

#29 **ADD** **“Poles to be delivered to Scarborough Maintenance Lot”**

#30 **ADD** **“This work incidental to 634 items”**

In the Plans, SHEET NUMBER 115 OF 119, **CHANGE** the note @ 178+SB that reads “2 * 2* Conduits” to read **“2 – 2in. Conduits”**. Make this change in pen and ink.

The following questions have been received:

Question: Regarding SP 105, how soon would the contract be awarded? The lead time for median cable rail delivery and installation, construction of the temporary detour, procurement and installation of 4500' +/- of temporary barrier and then the construction of the south bound widening prior to construction of the north bound widening appears to schedule north bound surface pavement beyond the October 15th deadline and therefore prohibiting meeting the completion date of 11/27/09.

Response: Contracts will expedite as soon as possible when all approvals and signatures are in place.

Question: Can the south bound barrier be set at night while installing the Exit 5 detour if proper barrier end treatment is installed at the end of each night?

Response: Yes

Question: Will Interstate weight limits apply within the project limits and while hauling excavated pavement to the Scarborough Maintenance lot?

Response: Yes, Interstate weight limits apply

Question: Regarding SP 534 and submitting designs with additional geotechnical data 45 days prior to the start of noise barrier construction. What is the time frame for the Department to review and approve barrier submittals?

Response: Submittals will be reviewed according to requirements of Std. Spec. 105.7.2. The Department will make every effort to expedite the review process.

Question: Plan Sheet 84 of 119 has a note stating "Existing overhead structure/signs to be removed" – item 645.13. The schedule of items does not include a 645.13 bid item. Please clarify.

Response: See Special Provision 645.

Question: Please tell us the location of the new chain link fence and the "Remove and Reset Chain Link Fence"?

Response: As directed by the Resident.

Question: Will Item 652.381, Uniformed Traffic Officer, be State or City Police or Both?

Response: State Police only.

Question: Regarding Items 203.61 & 203.62, Construct and Remove Temp. Detour, are traffic control items to be included in this item or paid under other contract items?

Response: Yes, see Basis Of Payment included in Special Provision 203.61.

Question: Item 526.301, Temporary Concrete Barriers shown on Plan 3 of 11231 (South Bound) and Note 3 states that it will be placed as directed by the resident. Is it the intent to have the entire work area protected by barrier and if so, will this apply to the north bound side as well?

Response: Please see Special Provision, Section 107, Time, for schedule of work items (page 44). Yes the North bound lane will require concrete barrier. Reference 11231.00 Plan set, sheet 3 of 78 shall apply to North bound.

Question: Our sign structure fabricator has asked about a material specification as per full span sign support structures at sta. 163+60 & 63+25.

Response: See the new 645 Specification added in this amendment.

Question: Will soil that was previously contaminated be allowed to be used on the project if it meets gradation requirements?

Response: No

Question: If ledge removal is required for the noise barrier installation, will it be paid for or is it incidental?

Response: It is incidental, see change to 534 spec above.

Question: Are there any additional soil investigations for PIN 12800.00 other than what is shown on Plan 6 of 51? In particular, soil investigations in the vicinity of the noise barrier.

Response: Yes, those investigations are in the soils report recently posted to our web site.

Question: Please confirm that the stationing shown boring logs shown on plan 6 of 51 (IM-A280) is for the noise barrier and not for the roadway.

Response: The stationing shown in the boring logs is the stationing used for the noise wall.

Consider these changes and information prior to submitting your bid on **June 17**, 2009.

Sincerely,

A handwritten signature in dark ink, appearing to read "Scott Bickford". The signature is written in a cursive style with a large, prominent "S" at the beginning.

Scott Bickford
Contracts & Specifications Engineer

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
SECTION 0001 PROJECT ITEMS						
0010	201.11 CLEARING	2.600 AC				
0020	202.202 REMOVING PAVEMENT SURFACE	3250.000 SY				
0030	203.20 COMMON EXCAVATION	17600.000 CY				
0040	203.24 COMMON BORROW	5903.000 CY				
0050	203.25 GRANULAR BORROW	200.000 CY				
0060	203.26 GRAVEL BORROW	100.000 CY				
0070	203.61 CONSTRUCT TEMPORARY ACCESS ROAD	LUMP	LUMP			
0080	203.62 REMOVAL OF TEMPORARY ACCESS ROAD	LUMP	LUMP			
0090	206.061 STRUCTURAL EARTH EXCAVATION - DRAINAGE AND MINOR STRUCTURES, BELOW GRADE	100.000 CY				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0100	304.09 AGGREGATE BASE COURSE - CRUSHED	19130.000 CY				
0110	403.207 HOT MIX ASPHALT 19.0 MM HMA	2050.000 T				
0120	403.2072 19 MM ASPHALT RICH BASE MIXTURE	2050.000 T				
0130	403.208 HOT MIX ASPHALT 12.5 MM HMA SURFACE	1500.000 T				
0140	403.2081 12.5 MM POLYMER MODIFIED HOT MIX ASPHALT	535.000 T				
0150	403.209 HOT MIX ASPHALT 9.5 MM HMA (SIDEWALKS, DRIVES, INCIDENTALS)	2.000 T				
0160	403.213 HOT MIX ASPHALT 12.5 MM BASE	1740.000 T				
0170	409.15 BITUMINOUS TACK COAT - APPLIED	1140.000 G				
0180	504.07 CONCRETE PIPE TIES	8.000 GP				
0190	526.301 TEMPORARY CONCRETE BARRIER TYPE I	LUMP	LUMP			
0200	527.303 ENERGY ABSORBING SYSTEM (ET-PLUS)	1.000 EA				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0210	534.09 PREFABRICATED NOISE BARRIER WALL SYSTEM	LUMP	LUMP			
0220	603.155 12 INCH REINFORCED CONCRETE PIPE CLASS III	4.000 LF				
0230	603.195 24 INCH REINFORCED CONCRETE PIPE CLASS III	44.000 LF				
0240	603.205 30 INCH REINFORCED CONCRETE PIPE CLASS III	4.000 LF				
0250	604.072 CATCH BASIN TYPE A1-C	1.000 EA				
0260	604.182 CLEAN EXISTING CATCH BASIN AND MANHOLE	13.000 EA				
0270	605.09 6 INCH UNDERDRAIN TYPE B	209.000 LF				
0280	605.11 12 INCH UNDERDRAIN TYPE C	250.000 LF				
0290	605.39 UNDERDRAIN DITCH SOIL FILTER	LUMP	LUMP			
0300	606.24 GUARDRAIL TYPE 3D - SINGLE RAIL	2220.000 LF				
0310	606.259 ANCHORAGE ASSEMBLY	3.000 EA				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0320	606.353 REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	6.000 EA				
0330	606.363 GUARDRAIL REMOVE AND DISPOSE	441.000 LF				
0340	606.3651 GUARDRAIL-REMOVE, MODIFY, AND RESET EXISTING TO 3D	2075.000 LF				
0350	606.79 GUARDRAIL 350 FLARED TERMINAL	2.000 EA				
0360	606.92 HIGH-TENSION CABLE BARRIER GUARDRAIL AND END TERMINALS - INSTALL ONLY	LUMP	LUMP			
0370	607.17 CHAIN LINK FENCE - 6 FOOT	250.000 LF				
0380	607.25 REMOVE AND RESET CHAIN LINK FENCE	250.000 LF				
0390	609.11 VERTICAL CURB TYPE 1	395.000 LF				
0400	609.38 RESET CURB TYPE 1	66.000 LF				
0410	610.08 PLAIN RIPRAP	22.000 CY				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR :

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0420	610.16 HEAVY RIPRAP	4600.000 CY				
0430	610.18 STONE DITCH PROTECTION	20.000 CY				
0440	613.319 EROSION CONTROL BLANKET	3205.000 SY				
0450	615.07 LOAM	1420.000 CY				
0460	618.1301 SEEDING METHOD NUMBER 1 - PLAN QUANTITY	7.000 UN				
0470	618.1401 SEEDING METHOD NUMBER 2 - PLAN QUANTITY	65.000 UN				
0480	618.1411 SEEDING METHOD NUMBER 3 - PLAN QUANTITY	162.000 UN				
0490	618.20 ANNUAL RYE GRASS SEED	29.000 LB				
0500	618.25 APPLIED WATER	1.000 MGAL				
0510	619.12 MULCH	359.000 UN				
0520	620.54 STABILIZATION GEOTEXTILE	3360.000 SY				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0530	620.58 NON WOVEN GEOTEXTILE	25.000 SY				
0540	626.11 PRECAST CONCRETE JUNCTION BOX	10.000 EA				
0550	626.11 PRECAST CONCRETE JUNCTION BOX 24" X 36" X 24"	1.000 EA				
0560	626.22 NON-METALLIC CONDUIT STREET LIGHTING (2" SPARE)	260.000 LF				
0570	626.23 PREWIRED CONDUIT SECONDARY WIRING (2" C-(3) #4)	3470.000 LF				
0580	626.23 PREWIRED CONDUIT SECONDARY WIRING (2" C-(3) #6)	6617.000 LF				
0590	626.25 UNDER PAVEMENT DUCT (6" DIR. BORE OR JACK)	150.000 LF				
0600	626.32 24 INCH FOUNDATION	49.000 EA				
0610	626.36 REMOVE OR MODIFY CONCRETE FOUNDATION	4.000 EA				
0620	627.711 WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE (PLAN QUANTITY)	24400.000 LF				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0630	627.75 WHITE OR YELLOW PAVEMENT AND CURB MARKING	150.000 SF				
0640	627.76 TEMPORARY PVMT. MARK LINE, W OR YELLOW	LUMP	LUMP			
0650	627.77 REMOVING PAVEMENT MARKINGS	200.000 SF				
0660	629.05 HAND LABOR, STRAIGHT TIME	50.000 HR				
0670	631.12 ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	50.000 HR				
0680	631.172 TRUCK - LARGE (INCLUDING OPERATOR)	50.000 HR				
0690	631.18 CHAIN SAW RENTAL (INCLUDING OPERATOR)	20.000 HR				
0700	631.20 STUMP CHIPPER (INCLUDING OPERATOR)	10.000 HR				
0710	631.22 FRONT END LOADER (INCLUDING OPERATOR)	50.000 HR				
0720	631.32 CULVERT CLEANER (INCLUDING OPERATOR)	10.000 HR				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0730	633.05 INSTALLATION OF SIGN SUPPORT EQUIPMENT DMS SIGN	LUMP	LUMP			
0740	634.2041 LUMINAIRES (250 W HPS FULL CUT-OFF	EA	49.000			
0750	634.206 LIGHT STANDARD FOR POST TOP LUMINAIRE (24 FT. TALL, ROUND TAPERED ALUM. W/ BREAKAWAY BASE)	EA	20.000			
0760	634.206 LIGHT STANDARD FOR POST TOP LUMINAIRE (40 FT. TALL, ROUND TAPERED ALUM. W/ BREAKAWAY BASE)	EA	29.000			
0770	634.2071 REMOVE EXISTING HIGH-MAST POLE & LUMINAIRES	EA	2.000			
0780	634.25 SERVICE POLE COMPLETE WITH CABINET AND CONTROLS	EA	2.000			
0790	639.18 FIELD OFFICE TYPE A	EA	1.000			
0800	645.103 DEMOUNT GUIDE SIGN	EA	8.000			
0810	645.106 DEMOUNT REGULATORY, WARNING, CONFIRMATION AND ROUTE MARKER ASSEMBLY SIGN	EA	11.000			
0820	645.108 DEMOUNT POLE	EA	22.000			

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0830	645.113 REINSTALL GUIDE SIGN	2.000 EA				
0840	645.118 REINSTALL POLE	6.000 EA				
0850	645.12 OVERHEAD GUIDE SIGN: AT STA. 163+60	LUMP	LUMP			
0860	645.12 OVERHEAD GUIDE SIGN: AT STA. 63+25	LUMP	LUMP			
0870	645.121 OVERHEAD LANE USE SIGN ASSEMBLY	4.000 EA				
0880	645.155 DYNAMIC MESSAGE SIGN DMS SIGN	LUMP	LUMP			
0890	645.161 BREAKAWAY DEVICES SINGLE POLE	2.000 EA				
0900	645.162 BREAKAWAY DEVICES MULTI-POLE	6.000 EA				
0910	645.251 ROADSIDE GUIDE SIGNS	1455.000 SF				
0920	645.271 REGULATORY, WARNING, CONFIRMATION AND ROUTE MARKER ASSEMBLY SIGNS, TYPE I	53.000 SF				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0930	645.285 10 INCH ALUMINUM POLE	2.000 EA				
0940	645.286 12 INCH ALUMINUM POLE	8.000 EA				
0950	645.306 FLEXIBLE REFLECTORIZED DELINEATOR	88.000 EA				
0960	652.31 TYPE I BARRICADE	20.000 EA				
0970	652.311 TYPE II BARRICADE	20.000 EA				
0980	652.33 DRUM	50.000 EA				
0990	652.34 CONE	50.000 EA				
1000	652.35 CONSTRUCTION SIGNS	200.000 SF				
1010	652.36 MAINTENANCE OF TRAFFIC CONTROL DEVICES	200.000 CD				
1020	652.38 FLAGGER	5000.000 HR				
1030	652.381 TRAFFIC OFFICERS	1410.000 HR				

SCHEDULE OF ITEMS

REVISED:

CONTRACT ID: 011231.00

PROJECT(S): STP-1123(100)X
IM-A280(000)

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1040	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP	LUMP			
1050	657.24 SEEDING PITS	126.000 UN				
1060	659.10 MOBILIZATION	LUMP	LUMP			
1070	801.03 TEST PITS	8.000 EA				
	SECTION 0001 TOTAL					
	TOTAL BID					

**SPECIAL PROVISION
SECTION 107 - TIME
(Allowable Work Times)**

107.3.1 General

The following paragraph is added:

The Department encourages the Contractor to schedule and construct the project in a cost effective and timely manner while maintaining traffic on the interstate highway system. Because capacity restrictions result in interference and inconvenience to motorists, it is essential that the highway capacity not be restricted longer than necessary to safely and effectively complete the work. Additionally, the interference and inconvenience results in an administrative cost to the Department and a user cost to motorists. Therefore to minimize construction impacts, these costs will be assessed to the Contractor in the form of supplemental liquidated damages for lane closures and roadway closures that exceed the limitations provided in the contract.

107.3.2 Night Work

The following paragraphs are added:

Lane closures are anticipated to be required for this project. The Contractor is directed that all lanes shall be open between 6 AM and 9 PM on any weekday. No lane closures shall be permitted on Saturdays, Sundays or on state and federal holidays. No lane closures shall be permitted before 9 PM. All lanes shall be reopened to traffic by 6 AM. Lane closures extending beyond 6 AM shall be subject to supplemental liquidated damages. A lane shall be considered reopened when all traffic control devices have been removed from the highway travel lanes and travel in all lanes flows unrestricted.

The Contractor may choose to include ramp closures and detours in his traffic control plan. Ramp closures and detours shall be subject to the same restrictions and supplemental liquidated damages as described for lane closures.

The removal and installation of overhead sign structures will require full roadway closures for brief periods of time to ensure the safety of the motoring public. Each roadway closure shall be brief and the roadway shall be reopened as soon as the roadway is deemed safe by the uniformed officers in coordination with the Contractor and/or by the Department. Subsequent roadway closures shall not begin until queued traffic is released and traffic returns to free-flowing conditions. No more than three (3) roadway closure periods shall be permitted each night. No roadway closures shall be permitted between 5 AM and 11 PM on any weekday. No roadway closures shall be permitted on Saturdays, Sundays or on state and federal holidays.

Each roadway closure shall be restricted to 15 minutes between the hours of 11PM and 5AM on weekdays. Sunday night/Monday morning shall be considered a weekday. The roadway closure time period shall begin when traffic is at a full stop as directed by the uniformed officers. The roadway closure time period shall be considered complete when the fifth vehicle in the queue passes the point where the first vehicle was stopped. Any delay in reopening the roadway after the 15 minute period shall be subject to supplemental liquidated damages.

The Contractor shall receive approval from the Resident for every lane closure and roadway closure at least 60 hours in advance of the closure. Lane closures and roadway closures performed without approval of the Resident shall be considered non-conforming work in accordance with Section 106.8 and the Department shall be entitled to a credit to be deducted from amounts due the Contractor.

**SPECIAL PROVISION
SECTION 107 - TIME
(Liquidated Damages)**

107.8 Supplemental Liquidated Damages

The following paragraph is added:

The interstate highways are vital to the transportation and commerce of the State of Maine. Interruptions to the free-flow of traffic should be minimized to the degree practical. Excessive interruptions shall be subject to supplemental liquidated damages in accordance with the schedules below. Supplemental liquidated damages shall be cumulative. At the option of the Department, the Contractor also may be held responsible for all specific costs incurred by the Department which are due to any Contractor delay in returning traffic lanes to free-flow operations, in addition to the supplemental liquidated damages

Supplemental Liquidated Damages for Lane Closures

Time of Day All Lanes Reopened		Amount of
Beginning	Ending	Supplemental Liquidated Damages
6:00 AM	6:14 AM	\$100 per restricted lane
6:15 AM	6:29 AM	\$200 per restricted lane
6:30 AM	6:44 AM	\$300 per restricted lane
6:45 AM	6:59 AM	\$400 per restricted lane
7:00 AM	7:04 AM	\$500 per restricted lane
7:05 AM	7:09 AM	\$500 per restricted lane
7:10 AM	7:14 AM	\$500 per restricted lane
Each five minutes thereafter		\$1000 per restricted lane

Supplemental Liquidated Damages for Roadway Closures

Time of Roadway Closure		Amount of
Beginning	Ending	Supplemental Liquidated Damages
0 min-0 sec	14 min-59 sec	Permitted closure period
15 min-0 sec	19 min-59 sec	\$100 per closed approach
20 min-0 sec	20 min-59 sec	\$100 per closed approach
21 min-0 sec	21 min-59 sec	\$100 per closed approach
22 min-0 sec	22 min-59 sec	\$100 per closed approach
Each one minute thereafter		\$100 per closed approach

SPECIAL PROVISION
SECTION 606
HIGH-TENSION CABLE BARRIER
(State-Supplied)

Description. This work shall consist of pick-up, delivery to the work site, and installation of State-Supplied high-tension cable barrier and end terminals as shown in the plans and according to manufacturer's details and specifications, and this special provision.

The Department plans to pre-order the Cable Barrier Guardrail and End Terminals in advance of awarding this Contract. The Department will deliver the guardrail and components to the Dunstan Camp maintenance lot in Scarborough for pick-up by the Contractor. This will enable the Contractor to meet the timely schedule for installation and completion of the cable guardrail system.

Materials. The following high-tension cable barrier system is specified for this project:

Cable Safety System (CASS™) TL4 manufactured by Trinity Highway Products of Dallas, TX

All cable barriers and end terminals shall be of the same type from the same manufacturer. The end terminals shall be compatible with the cable barrier system installed. Intermixing and/or overlapping different cable barrier types or cable barrier systems made by different manufacturers shall be prohibited. All cable barrier posts will be of the same type. Intermixing different types of cable barrier posts is prohibited.

The cable barrier shall meet National Cooperative Highway Research Program (NCHRP) 350 Test Level 4 (NCHRP 350, TL-4) when installed on slopes with an inclination of 6:1 or flatter. In addition, the cable barrier shall have Federal Highway Administration (FHWA) acceptance. The end terminals shall meet NCHRP 350 Test Level 3 and have FHWA acceptance. The Contractor shall furnish FHWA acceptance letters to the Resident indicating that the cable barrier and end terminals are NCHRP 350 compliant when installed on a 6:1 slope.

The cable barrier system shall have a minimum of three cables. Each cable shall be 3/4-inch (minimum) diameter, zinc-coated (galvanized) wire rope with 3 x 7 strands manufactured in accordance with AASHTO M 30, Type I, Class A coating. Each cable shall be pre-stretched during manufacture and have a minimum tensile strength of 39,000 pounds. The manufacturer shall furnish a certificate to the Resident that the cable was pre-stretched.

All fittings, including but not limited to turnbuckles and connections, shall have a minimum diameter of 3/4 inch and be zinc coated (galvanized) according to AASHTO M 232 after threading. All fittings shall develop a minimum tensile load (without yielding) of 36,800 pounds. All other components made of ferrous metal shall be zinc coated (galvanized) according to AASHTO M 111 after fabrication.

All materials used for high-tension cable barriers and end terminals shall conform to manufacturer's specifications. In addition, all posts shall be made of steel meeting AASHTO M 183 and zinc coated (galvanized) after fabrication to AASHTO M 111.

Retroreflective sheeting meeting AASHTO M 268, Type III shall be attached to all reflectors on posts. Reflectors shall meet manufacturer's specifications. Reflectors shall match color of edge line adjacent to approaching traffic. Each reflector shall have a minimum of 13 square inches of retroreflective sheeting material facing approaching traffic.

Class LP (5,075 psi) concrete meeting the requirements specified in Section 502 of the Standard Specifications shall be used for all anchorage foundations and line post foundations (sockets), unless otherwise specified by the Resident.

Steel reinforcement meeting the requirements specified in Section 503 of the Standard Specifications shall be used.

Excluder caps (a sleeve cover placed around each post to prevent debris from entering the socket) meeting the manufacturer's specifications shall be used at each post location.

A six inch deep by three feet wide hot mixed asphalt (HMA) paved mow-strip shall be constructed for the entire length of the cable barrier runs, including the anchors/terminals. The top of the finished mow-strip shall be flush with the existing slopes, and tops of post and cable anchors. The finished mow-strip shall not impede, in any way, the functionality of the cable barrier system. This work shall be done in accordance with Section 403 of the Standard Specifications. The mow-strip shall be considered incidental to the cost of the system and will not be a separate payment item.

Sound earth meeting the requirements specified in Section 203 of the Standard Specifications shall be used for grading and earthwork.

The Contractor shall provide written certification to the Resident that the materials used to construct the high-tension cable system and end terminals meet manufacturer's specifications and the requirements contained in this Special Provision.

Pre-Construction. At least 14 days prior to cable barrier installation, the Contractor shall submit three plan sets of the high-tension cable system selected for this project (CASS™). Plan sets must be prepared by the manufacturer of the high-tension cable system selected for the project. One set shall be sent to the MaineDOT Highway Program Project Manager, one set to the MaineDOT Safety Office, and one set to the MaineDOT Transportation Research Division.

Each set of plans shall contain detailed shop drawings of the cable system, design calculations and notes, and any construction specifications. The cable system shall be designed according to the manufacturer's recommendations and all of the requirements specified in this Special Provision. In addition, the following must be included in each plan set:

1. The height of each cable in the system.
2. The post length and height of each post with respect to ground level.
3. The post spacing along the entire length of each cable run.
4. Line post foundation design, including detailed drawing of steel reinforcement.
5. Reflector design.
6. End terminal design, including concrete anchor foundation(s).
7. Detailed drawings showing steel reinforcement in anchor foundation(s).
8. Geotechnical data used to design line post foundations and end terminal foundations.
9. Recommended post spacing as a function of roadway curvature:
 - Radius less than 650' consult a Trinity representative.
 - Radii 650' to 1300' use 10' post spacing or less if specified by the agency.
 - Radii 1301' to 2250' use 16.5' post spacing or less if specified by the agency.
 - Radii greater than 2250' use project post spacing or less if specified by the agency.
10. A table and/or graph showing impact deflection (under NCHRP 350, TL-3 and NCHRP 350, TL-4 conditions) as a function of post spacing.
11. A table showing the recommended cable tension as a function of cable temperature.

All concrete line post and end anchor foundations must contain steel reinforcement according to manufacturer's recommendations.

Individual cables must terminate at an end anchor foundation. Anchoring individual cables to other cables shall be prohibited.

Line post and end anchor foundations shall be designed by the manufacturer based on the project's soil conditions and frost considerations. The Contractor shall be responsible for furnishing all geotechnical information (including soil borings) required by the manufacturer for designing all line post concrete foundations and end anchor terminals.

Line post and end anchor depths must be determined by the manufacturer based on the project's soil conditions. However, the depth below ground level shall not be less than 27 inches.

End anchor foundations shall be designed such that movement due to the forces imparted by the attached cables is less than one inch.

The shop drawings detailing the line post foundations and end anchor foundations shall be signed and sealed by a Licensed Professional Engineer registered in the State of Maine.

Each plan set shall include FHWA acceptance indicating the cable barrier meets NCHRP 350, TL-4 and end terminals meet NCHRP 350, TL-3 when installed on 6:1 slopes. In addition, each plan set shall include a signed certification letter from the manufacturer indicating the cable system meets all of the requirements set forth in this Special Provision.

The manufacturer shall be available to provide formal training and/or consultation, free of charge, as requested by MaineDOT personnel and/or any of MaineDOT's invitees. The manufacturer must provide training with respect to the installation, operation, and maintenance of the cable barrier system. Training and/or consultation shall be held at a location immediate to the project location. The manufacturer/supplier shall issue a dated certificate to each individual that has undergone formal training.

Construction. Furnish and install high-tension cable barrier and end terminals at the location(s) specified on the plans. All cable barriers and end terminals shall be installed according to manufacturer's specifications, the plans, and this special provision.

Construct a concrete foundation for each line post per manufacturer's specifications. Each line post foundation shall have a sleeve/socket embedded in the concrete for placing the post in the sleeve/socket. Each line post foundation shall contain steel reinforcement according to manufacturer's specifications.

Construct end terminals, including end anchor foundations, according to manufacturer's specifications and the requirements in this special provision. Each end anchor foundation shall contain steel reinforcement according to manufacturer's specifications.

The bottom of all concrete foundations, including but not limited to line post foundations and end terminal foundations, shall be a minimum of 27 inches below ground level. The top of all concrete foundations shall be at ground level.

Post spacing will be based on manufacturer's specifications depending on the roadway curvature shown on the plans. However, the following conditions must be satisfied:

1. The post spacing shall not exceed 10 feet, 6 inches under any circumstance.
2. The impact deflection (under NCHRP 350, TL-3 and TL-4 conditions) of the cable system shall not exceed 8 feet under any circumstance.
3. When placing cable barrier near fixed objects (e.g., concrete bridge piers, trusses, barrier walls, guardrail, trees, etc.) or a traffic lane, the cable barrier posts shall be spaced such that the impact deflection (under NCHRP 350, TL-3 and TL-4 conditions) of the cable system is at least 4 feet less than the shortest distance between the fixed object(s)/edge of traffic lane and the cable system.
4. The Contractor shall use a shorter post spacing than the one specified by the manufacturer if directed by the Resident.

An individual run of cable barrier, not including the end terminals, shall not exceed 26,400 feet (5 miles) in length.

At locations where two cable runs overlap, lap cables according to manufacturer's specifications.

Attach reflectors to line posts according to manufacturer's specifications and this special provision. Reflectors shall not be installed on end terminal posts. Reflectors shall be spaced at the following intervals:

- 48 feet (maximum) on tangent sections and curves with a radius of 1,150 feet or more.
- 24 feet (maximum) on curves with a radius less than 1,150 feet.

Grade ground as necessary to maintain a consistent slope with smooth, gradual transitions, or grade as directed by the Resident. Slopes shall be graded to 6:1 or flatter, unless otherwise directed by the Resident. Grade slopes to within 1 inch +/- of average slopes shown on the plans. Concrete foundation tops shall be flush with the surrounding earth. Concrete foundations shall not protrude above ground level after grading. Remove all excess material and dispose of according to Section 203 of the Standard Specifications. This material may be spread thinly over the roadway slopes provided it does not kill vegetation or block drainage.

An employee trained by the manufacturer in the proper installation of the high-tension cable system and end terminals, as well as a manufacturer's representative, must be present during all phases of installation. The manufacturer's representative must be available to consult with and train personnel from MaineDOT and/or any of MaineDOT's invitees with regard to the installation, operation, and maintenance of the cable barrier system.

Upon complete assembly of the cable barrier, set each cable to the required tension specified by the manufacturer (between 2,800 to 8,800 pounds of force). Measure the temperature of each cable prior to tensioning and use this temperature to determine the required tension. The Contractor shall recheck the tension in each cable after two weeks and, if necessary, adjust the tension to the proper setting. The Contractor shall submit written certification to the Resident indicating the dates the cables were tensioned and rechecked, the ambient temperature and cable temperature on each of these dates, and the tension in each cable on each of these dates.

Any end anchor movement exceeding one inch within 12 months of completed installation that results in any tension reduction to the cable system will require repair and re-tensioning of the cable system by the Contractor at the Contractor's expense.

Both the Contractor and the manufacturer's representative shall provide written certifications to the Resident indicating that the high-tension cable system and end terminals were installed according to the plans, manufacturer's specifications and guidelines, and this Special Provision.

Measurement and Payment: High-Tension Cable Barrier and End Terminals – Install Only will be paid by the Lump Sum, complete in place and accepted. This price will include pick-up, delivery to the work site, installation, and any incidentals necessary to satisfactorily complete this item.

Payment will be made under:

Pay Item		Pay Unit
606.92	High Tension Cable Barrier and End Terminals – Install Only	LS

SPECIAL PROVISION
SECTION 634
HIGHWAY LIGHTING

Under 634.024 Light Standards, add the following to the 3rd paragraph just prior to the last 2 sentences:

“High mast poles” exceeding 15 meters [50 ft] but less than 30 meters [100 ft] in height shall be classified as Fatigue Category II with Fatigue Importance Factors (I_f) of 0.65 for Vortex Shedding and 0.72 for Natural Wind Gusts. “High mast poles” of 30 meters [100 ft] or more in height, shall be classified as Fatigue Category I with Fatigue Importance Factors (I_f) of 1.0 for Vortex Shedding and 1.0 for Natural Wind Gusts.”

634.08 Service, add the following after the last paragraph:

“All meter mounting devices shall be installed so that the meters will be upright (plumb). They shall be installed with the top of the meter not less than 1.2 M [48 in] nor more than 1.5 M [60 in] from the floor to the final grade. Exceptions to this height requirement will be made where special permission has been given to install group or modular metering, overall metering enclosures, or pole-mounted meters. Level grade shall be maintained for a minimum of 1.0 M [3 ft] in front of the meter enclosure to provide a safe working space. In order to meet this requirement on uneven terrain, as an option, the Contractor may install a pressure-treated wood platform.

For any non-residential (industrial or commercial) self-contained meter socket the bypass requirements are single phase, 100 or 150 amp, single handle lever operated.

The Contractor shall meet all requirements and regulations of Utility Companies when installing equipment on their poles and for the service connection. It is the responsibility of the Contractor to contact the appropriate Utility to determine their specific requirements.”

SPECIAL PROVISION
Section 634 and 643
Highway Lighting and Traffic Signals

Section 634.09 testing of highway lighting, the first sentence shall be amended as follows:

Before acceptance of the work, the contractor shall cause the following tests to be made on all lighting circuits, by a licensed electrician.

The tests do not need to be performed in the presence of the Resident, but the test results shall be recorded on the Highway Lighting Quality Control Check List and submitted to the Resident by the Contractor for acceptance. The form shall be signed by the licensed electrician certifying that the highway lighting meets the requirements of section 634.09.

Subsection 634.14, field testing of Traffic Signals, the first sentence shall be amended as follows:

Before acceptance of the work the contractor shall cause the following tests to be made on all traffic signal equipment and circuits, by a licensed electrician.

The tests do not need to be performed in the presence of the Resident, but the test results shall be recorded on the Traffic Signal Quality Control Check List and submitted to the Resident by the Contractor for acceptance. The form shall be signed by the licensed electrician certifying that the signal equipment and circuits meet the requirements of section 634.14.

Highway Lighting Quality Control Checklist

Subsection 634.09 Field Testing

Project Pin # _____

Location (if multiple services, please be specific)- _____

Grounding Electrode Resistance at service _____

Number of Circuits _____

Hand-Off-Auto Switch? _____

Circuit #1

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

Circuit #2

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

Highway Lighting Quality Control Checklist

Subsection 634.09 Field Testing

Project Pin # _____

Location (if multiple services, please be specific)- _____

Grounding Electrode Resistance at service _____

Number of Circuits _____

Hand-Off-Auto Switch? _____

Circuit #3

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

Circuit #4

Open Circuit Resistance- (Ohm out both hot legs at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Megger Test- (Meg out both hot legs to ground at the cabinet while they are shorted together at the last pole and the fuse holders are disconnected at each pole) _____

Current draw- (during normal operation) Leg #1 _____ Leg #2 _____

Operating Voltage at last pole _____

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

Traffic Signal Quality Control Checklist

Subsection 643.14 Field Testing

Project Pin # _____

Grounding Electrode Resistance at service _____

ID tags on loop amps / detector cards? _____

Location _____

Street Approach	_____		
Loop #	_____	Resistance	_____
Phase #	_____	Meg to ground	_____
L,C, or R Lane	_____	Amount of bondo covering loop	_____
Pulse or Presence	_____		

Street Approach	_____		
Loop #	_____	Resistance	_____
Phase #	_____	Meg to ground	_____
L,C, or R Lane	_____	Amount of bondo covering loop	_____
Pulse or Presence	_____		

Street Approach	_____		
Loop #	_____	Resistance	_____
Phase #	_____	Meg to ground	_____
L,C, or R Lane	_____	Amount of bondo covering loop	_____
Pulse or Presence	_____		

I, _____, certify that this work was done in accordance with subsection 643.14 and current NEC _____ guidelines, and when tested, was functioning as intended. (YEAR)

Electrician's Signature _____

Electrician's License # _____

SPECIAL PROVISION
SECTION 645 - HIGHWAY SIGNING

645.01 Description This work shall consist of furnishing and installing new signs, sign supports, delineators, and breakaway devices and removing, relocating and/or modifying existing signs and sign supports, in accordance with these specifications and in reasonably close conformity with the plans.

645.02 General All equipment shall be new unless otherwise specified. Requests for substitution of any specified material shall be submitted in writing with all documentation (specifications, mill certifications, etc.) in order to enable the Department to evaluate the proposal. Substitutes for specified material may be accepted, upon approval of the Fabrication Engineer. Substitutes shall give equal or better service than the specified material. Where an existing system is to be modified, the existing material shall be removed, upgraded, or disposed of as directed by the contract documents.

645.021 Materials Materials shall meet the requirements specified in the following Sections of Division 700 - Materials:

Reflective Sheeting	719.01
Demountable High Intensity Reflectorized Letters, Numerals, Symbols and Borders	719.02
Aluminum Extrusions	719.03
Aluminum Sheets	719.04
Plywood	719.05
Demountable Reflectorized Delineators	719.06
Assembly Hardware	719.07
Steel Supports	720.03
Steel H-beam Poles	720.06
Anchor Bolts	720.07
U-Channel Posts	720.08
Wood Sign Posts	720.12

Paint for the edge and back of plywood and field coat paint for wood sign posts shall be an exterior grade dark green enamel conforming to Federal Specifications TT-P-71b.

645.022 Sign Layout Drawings The Contractor shall submit 3 sets of sign-face, layout-detail, and scale drawings. Fabrication of the signs shall not begin until the Contractor has received approval of these drawings. The drawings shall contain complete detailed information and dimensions. One set of drawings will be returned to the Contractor, who will submit corrected drawings, if required. The drawings shall be detailed using the same units used on the plans.

645.023 Support Structures The design, materials and fabrication of sign support structures and foundations shall meet the requirements of the current edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals" and interims thereto, except as otherwise indicated within these specifications or on the plans. Beam mounted signs and their supports shall be designed using wind speeds as determined from the 25-year mean recurrence interval isotach map. Minimum design default values for these structures shall be: $I_r = 0.87$; $C_v = 0.93$; $K_z = 0.87$; and $G = 1.14$. Bridge, cantilever, and butterfly sign supports and associated signs and hardware shall be designed using the wind speeds as determined from the 50 year mean recurrence interval isotach map, as contained in the above referenced AASHTO Specifications. Minimum design default values for these structures shall be: $I_r = 1.00$; $C_v = 1.00$; $K_z = 0.94$; and $G = 1.14$. Minimum fatigue design default values for cantilever & butterfly sign support structures shall be classified as Fatigue Category I with Fatigue Importance Factors (I_f) of 1.0 for Galloping, 1.0 for Natural Wind Gusts and 1.0 for Truck-Induced Gusts. Bridge type sign support structures supporting variable message signs (VMS) shall also use these fatigue criteria in their design.

Minimum fatigue design default values for bridge type structures, without VMS, shall be classified as Fatigue Category II with Importance Factors (I_f) of 0.65 for Galloping, 0.75 for Natural Wind Gusts and 0.89 for Truck-Induced Gusts. For sign supports, as described in 645.023, b., mounted on bridge structures and approaches to bridge structures, the mounting height shall be measured as the distance of the mounted sign(s) center of gravity to one of the following:

For bridges over bodies of water: above the prevailing water level or, in the case of tidal waters, above mean high tide.

For overpass structures: above the lower roadway level.

For approach ramps: above the average adjacent ground level, if said ground level is more than 10 feet below the base of the structure.

All cantilever and butterfly type sign support structures shall be equipped with an approved damping or energy-absorbing device.

After execution of the contract and before any shop work has commenced, the Contractor shall submit 3 sets of drawings, and computations if prescribed below, of all sign supports proposed to be furnished and erected under this contract. The drawings shall be of sufficient detail to indicate material and/or dimensional conformance with these specifications and the contract drawings and, in the case of bridge, cantilever and butterfly type sign supports, shall be sufficiently detailed to show all structural significant details.

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 Department to evaluate the proposal.

Sign support structures and anchor bolts shall meet the requirements specified in Section 720 as well as the current edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

A Certificate of Compliance shall be provided for all material in accordance with the requirements of the General Statement of Division 700 - Materials.

a. Beam Mounted Signs The beams for beam-mounted signs shall be of the size, material and shape designated in the contract documents. The Contractor shall be fully responsible for the adequacy and design of any structural details not shown on the plans, and each drawing shall contain a reference to the design criteria and sealed and signed by a Professional Engineer licensed in accordance with the State of Maine regulations that described design criteria have been met by all parts of the structure designed and/or detailed by the Contractor. Approval of the drawings will signify only approval of the size, material and length of the beam.

b. Bridge, Cantilever, and Butterfly Type Sign Supports The Contractor shall be responsible for the design of the support structure including its foundation. Foundation design shall follow requirements of Section 645.024 - Bridge, Cantilever, and Butterfly Support Structure Foundations, as well as this Section.

Signs shall be placed on the support structure such that the bottom edges are aligned (unless written consent from the Fabrication Engineer is obtained), while accommodating the minimum height requirement - see Section 645.06. The Contractor shall use the Contract Drawings in order to determine the approximate horizontal placement of signs. Installation shall be in accordance with Section 645.06 - Installation of Type I Signs. The structure and foundation shall be designed to accommodate a minimum of 1.5 times the sign area on each structure as shown on the contract documents. This additional theoretical sign load shall be computed by: For single signs increasing the sign widths an additional 25% without changing the horizontal midpoint of the sign; for multiple signs the sign widths shall be increased 25% toward the outside sign edges. The height shall be increased 25% without changing the bottom edge elevation of the signs.

Bridge type structures shall be designed using either a tri-chord, four-chord truss, or monotube structure as the overhead member. The tri-chord truss, four chord truss, and monotube components shall be round. Each of the two upright members supporting the bridge type overhead truss member shall consist of a minimum of two vertical legs. A four chord truss configuration or monotube shall be required if the

Contract Documents specify placing signs on both sides of the overhead structure (two way traffic beneath structure). Cantilever and butterfly type structures shall be designed using either a tri-chord, four-chord truss or monotube overhead member. A monotube structure, bridge or cantilever type, shall consist of a single monotube serving as both column posts and span. Bolted splices shall be located in the horizontal portion of the span and/or the vertical portion of the column post. The upright member of a cantilever or butterfly-type support structure shall have a maximum horizontal deflection of $L/40$, where L is the length of upright member, as determined from design loads calculated in accordance with the AASHTO "Standard Specification for Structural Supports for Highway Signs, Luminaires and Traffic Signals".

The base plates of uprights for all types of support structures shall have heavy hex leveling nut with 2 hardened flat washers. The distance between the bottom of the base plates to the top of the foundations shall not exceed twice the diameter of the anchor bolts. Grout, or other materials, shall not be placed between base plates and the top of foundations. In addition to the required detail drawings, the Contractor shall submit 3 copies of the design computations, including fatigue considerations, in accordance with Section 11, Fatigue Design, in the AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", and interims thereto, for the entire structure. Erection lifting points shall be clearly depicted on the shop drawing. The Contractor shall submit the bending process of monotube components for review.

The computations shall be sufficiently detailed to allow the Engineer to check and approve the computations. Computer printouts will not be accepted unless they meet the above criteria. All plans and design calculations, sign support structure and foundation, shall be sealed and signed by a Professional Engineer licensed in accordance with the State of Maine regulations. Approval will be based on the applicable provisions of Section 105.7 - Working Drawings.

Overhead sign panel mounting devices shall be designed accommodating the requirements of appropriate sign panel tilting included in this specification. The design of this assembly shall include fastening sign panels directly to steel or aluminum members as further described in Section 719.07, as well as other applicable Sections, plans and specifications.

c. Bridge Overpass Mounted Sign Supports Overpass mounted sign supports shall be constructed to the configuration and sizes and of the material shown on the Contract Documents. Approval will be based on the applicable provisions of Section 105.7 - Working Drawings. Fastening sign panels directly to steel or aluminum members shall be as described in Section 719.07, as well as other applicable Sections, plans and specifications.

d. Breakaway Supports for Sign Supports Breakaway supports for sign supports will be required only for those locations indicated on the Contract Documents. Breakaway supports, approved by the Resident, using load-concentrating couplings shall be supplied for use at all locations designated as breakaway. Breakaway Support Certification of both breakaway and structural adequacy shall be provided by the Manufacturer. Design calculations or test data of production samples to support certification shall be provided. Breakaway support components shall provide the same or greater structural strength as the support post or pole utilizing the breakaway device. On multi-pole sign supports designated as breakaway, each pole shall be equipped with breakaway hinges immediately below the lower edge of the sign. Hinges relying on the friction between the hinge and the pole face for transmitting the design moment will not be accepted for use. Breakaway devices are subject to the applicable provisions of Section 721.

645.024 Bridge, Cantilever and Butterfly Support Structure Foundations The Contractor may select a foundation system meeting the design criteria of Section 13 of the current edition of AASHTO "Standard Specifications for Structural Supports for Highway Sign, Luminaries and Traffic Signals", unless otherwise specified by the Department. Geotechnical design of the foundations shall be in accordance with Section 13 of the afore-mentioned AASHTO code. The design criteria for the resistance of drilled caisson and spread footing foundations against overturning, sliding and bearing capacity failure shall meet the requirements of Section 4 of the current edition of AASHTO "Standard Specifications for Highway Bridges". The structural design of foundations shall meet the requirements of the current edition of AASHTO "Standard Specifications for Highway Bridges". The Contractor shall submit to the Fabrication Engineer for approval, detailed plans and calculations of the proposed sign foundation, sealed and signed by a licensed Professional Engineer in accordance with the State of Maine regulations, Construction of the foundation shall not commence until the Department has approved the foundation design.

For estimating and bidding purposes, in the absence of boring samples and standard penetration tests, or the actual determination of soil properties at the proposed footing location, the Department will accept an assumed allowable soil bearing pressure of 1.5 kips/ft² for the design of the footing. The actual, existing, soil classification, analysis and footing design shall be determined by the Contractor's qualified firm or person by use of hollow stem auger boring samples. All costs associated with the work required to sample, classify and analyze the soil, design the footing and prepare submittals shall be incidental to related Contract items. All unsuitable material (peat, organic material, material that has been dumped, etc.) within the limits of a footing must be removed at the direction of the Resident and the shaft depth of drilled caissons shall be increased to bear on suitable material. Concrete for the footing shall be placed immediately after excavation to prevent water from collecting in the excavated area. The structural design of foundations shall meet the requirements of the current edition of AASHTO "Standard Specifications for Highway Bridges". Concrete shall be Class LP in accordance with Section 502 - Structural Concrete. Drilled shaft foundation holes, except in ledge, shall

be excavated by auger method to the neat line of the outside dimensions of the footing without disturbing the soil around or below the proposed footing. Precast foundations shall not be permitted. In areas where rock or ledge is encountered above the proposed bottom of footing, the Contractor will have the option of removing rock and placing the footing at the design depth shown on the Contractor's Working Drawings, or constructing a grouted rock-anchored foundation system. This rock-anchored system shall be designed by the Contractor and approved by the Department. Back fill for pedestal foundations shall be granular borrow for underwater back fill meeting the requirements of Section 703.20 - Gravel Borrow, of the Standard Specification. The granular borrow shall be placed in layers not exceeding 6 inches in depth before compaction. Each layer of back fill shall be thoroughly compacted by use of power tampers to at least 95% of the maximum density as measured in the field per AASHTO T191 or by an approved method using calibrated nuclear device. All back filling and compacting shall be in accordance with the applicable provisions of Section 206, of the Standard Specifications. The Contractor shall submit 3 copies of all foundation design work, structural and geotechnical, together with computations and plans used for design purposes, as specified in Section 645.023.

645.03 Classification of Signs Sign sizes, color and legend designs shall conform to these specifications, the plans, and MUTCD requirements. The signs are classed according to the intended use as follows:

- a. Type I guide signs shall consist of high intensity, reflectorized sheeting or reflectorized, demountable letters, numerals, symbols and border mounted on a high intensity, reflective sheeting background adhered to a sign panel constructed of extruded aluminum planks.
- b. Type I regulatory, warning, and route marker assembly signs shall consist of high intensity, reflective sheeting letters, numerals, symbols, and border on a high intensity, reflective sheeting background adhered to a sign panel constructed of sheet aluminum.
- c. Type II guide signs shall consist of engineering grade, reflective sheeting letters, numerals, symbols and border on an engineering grade, reflective sheeting background attached to a sign panel constructed of plywood.
- d. Type II regulatory, warning and route marker assembly signs shall consist of engineering grade reflective sheeting letters, numerals, symbols and border on an engineering grade reflective sheeting background adhered to a sign panel constructed of sheet aluminum or plywood.

645.04 Fabrication of Type I Guide Signs

a. Panels The panels for this type sign shall be shop-fabricated from aluminum planks to the sizes designated on the approved shop drawings. Cut edges shall be

true, smooth, and free from burrs or ragged breaks. Flame cutting will not be permitted. Bolt holes may be drilled to finished size or punched to finished size, provided the diameter of the punched hole is at least twice the thickness of the metal being punched.

Fabrication of extruded aluminum sign planks, including punching or drilling holes and cutting to length, shall be completed before the metal degreasing and the application of the reflective sheeting. The bolts required for fastening the extruded aluminum planks together shall conform to the designs used in standard commercial processes for the type of extruded aluminum panels to be used as approved.

All route shields shall be on an overlay aluminum sheet of 0.080 inch minimum thickness and shall be in full color with reflective background; they shall not have demountable numerals and borders.

b. Reflective Sheeting The high intensity or engineering grade reflective sheeting shall be applied to the extruded aluminum plank in accordance with the current recommendations of the sheeting Manufacturer.

The reflective sheeting shall cover the complete panel and shall not be trimmed to conform to the border. The reflective sheeting shall overlap into the side recess of the individual planks. There shall be no paint applied to the sign panels. The surface of all completed sign panels shall be flat and free of defects. Extruded aluminum molding shall be placed on the edges of the extruded panels, as shown on the plans.

c. Text The design of upper and lower case letters, numerals and symbols, and the arrangement and spacing of texts shall be as provided on the plans and in conformance with the MUTCD and Standard Highway Signs.

Text for Guide Signs shall be composed of demountable letters, numerals, symbols, and borders and shall be high-intensity, reflective sheeting. The demountable text shall be applied to the panels by use of aluminum pop rivets, in accordance with standard commercial processes, as approved. All demountable letters, numerals, symbols, and borders shall be the same manufacturer's make for the entire project. Cutout high-intensity, reflective sheeting text shall be applied to the sign panel with a pre-coated, adhesive backing.

645.041 Fabrication of Type I Regulatory, Warning and Route Marker Assembly Signs and Type II Sheet Aluminum Regulatory, Warning and Route Marker Assembly Signs

a. Panels Sheet aluminum sign panels shall be shop-fabricated to the size shown on the plans. The corners shall be rounded to the indicated radius where shown.

Bolt holes may be drilled or punched to finished size provided the diameter of the punched hole is at least twice the thickness of the metal being punched. Cut edges shall be true, smooth, and free from burrs or ragged breaks. Flame cutting will not be permitted. Punching or drilling of holes and cutting to size shall be completed before metal degreasing and the application of reflective sheeting.

b. Reflective Sheeting The high intensity or engineering grade reflective sheeting shall be applied to the sheet aluminum sign panels in accordance with the current recommendations of the sheeting Manufacturer. The reflective sheeting colors shall conform to the MUTCD standard highway sign colors for each type of sign. Surface of all panels shall be flat and free from defects.

c. Text The text for regulatory, warning, confirmation and route marker assembly signs shall be composed of: High intensity or engineering grade, reflective sheeting letters, numerals, symbols and borders; or the silver letters may be formed by applying transparent ink to the reflective sheeting background where the silk screen process is used; or other methods to form the text may be used, when approved in advance.

645.042 Fabrication of Type II Guide Signs and Type II Plywood, Regulatory, Warning and Route Marker Assembly Signs

a. Panels Fabrication of all sign panels from high-density, overlaid plywood shall be performed in a uniform manner. All fabrication, including cutting, drilling, and edge routing, shall be completed prior to painting and application of reflective sheeting to the high-density, overlaid plywood. Panels shall be cut to size and shall be plywood. Panels shall be cut to size and shall be free of warping, open checks, open splits, open joints, open cracks, loose knots and other defects resulting from fabrication. Corners shall be left square. The surface of all sign panels shall be flat.

The edge and back of the plywood shall be painted with an exterior grade dark green paint.

b. Blanks Sign blanks shall be cut to shape using a saw blade that does not tear plywood grain. Holes shall be clean-cut and uniform. All cracks, open checks, open splits and other defects occurring on the edge surfaces shall be filled with a synthetic wood filler and sanded smooth prior to sealing and painting. The sign blank edges shall be sealed using an approved sealer/primer. The edges shall then be painted with an exterior grade, dark green paint.

The surface shall not be painted before application of reflective sheeting. Before applying reflective sheeting, dirt or wax shall be removed by one of the following methods:

1. The surface shall be buffed lightly with solvent-soaked steel wool, fine or medium, using organic solvents, such as lacquer thinner, xylol, heptane, benzene or naphtha, and wiped dry with clean cloths.

2. The panel shall be sanded lightly with fine-grade paper, cleaned with solvent, and wiped dry using clean cloths.

c. Reflective Sheeting The engineering grade reflective sheeting shall be applied directly to the cleaned high-density surface in accordance with the recommendations of the reflective sheeting manufacturer.

d. Text The text for regulatory, warning, confirmation and route marker assembly signs shall be composed of cutout, engineering-grade reflective sheeting letters, numerals, symbols and borders or the silver letters may be formed by applying transparent ink to the reflective sheeting background where the silk screen process is used. Other methods to form the text may be used when approved in advance.

The design of the letters, numerals, and symbols, the spacing of the text and the size and spacing of the border shall conform to the MUTCD and Standard Highway Signs.

645.06 Installation of Type I Signs The sign locations shown on the plans are approximate; exact locations will be determined in the field by the Resident. Signs stockpiled before erection shall be stored in a vertical position and completely covered to avoid staining, weathering, and dirt accumulation.

a. Sign Supports Poles for single and multiple support roadside signs shall be erected plumb, using the leveling nuts supplied with the anchor bolts. When signs are supported by more than one pole, all poles shall be carefully aligned to avoid warping of the sign panel.

Bridge, butterfly and cantilever type sign supports and their foundations shall be constructed, assembled and erected, in accordance with the manufacturer's details, as approved. All horizontal supports spanning the roadway shall be level and shall have permanent camber as described in Section 10 of the current edition of AASHTO "Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals", and interims thereto. If, at any time after their erection, bridge, butterfly or cantilever type sign supports are to remain for a period in excess of 72 hours without the sign(s) for which they were designed being in place, suitable vibration damping devices, approved by the Resident, shall be installed until such time as the sign(s) can be erected.

Bridge-mounted sign supports shall be fabricated and assembled in accordance with the details as shown on the Contract Documents.

Where aluminum surfaces are in contact with concrete or dissimilar metals, the contacting surface shall be thoroughly coated with an approved, aluminum impregnated caulking compound or the surfaces shall be separated by another approved material. Before signs are attached, aluminum sign supports shall be cleaned of all dirt and discoloration using methods recommended by the manufacturer.

b. Sign Panels Extruded aluminum planks for sign panels shall be bolted together, as indicated on the plans. Extruded aluminum molding shall be placed on the edges of the extruded panels. Sign panels shall be attached to the posts to provide the vertical and horizontal clearances from the roadway as indicated on the plans. Sign panels on overhead structures shall provide a minimum vertical clearance of 18 feet to the highest point of the roadway surface under the sign(s). Sign panels on bridge-mounted sign supports shall be installed with the bottom edge of the sign approximately 4 inches above the bottom of the bridge beam.

Sign panels mounted over the roadway shall tilt in the direction of the approaching traffic in such a manner that the angle between the sign face and the roadway grade, at the sign location shall be $85^{\circ} \pm 3^{\circ}$.

Ground-mounted signs located 4 to 30 feet from the edge of shoulder shall form an angle of 93° between the approach roadway and the sign.

Signs located more than 30 feet from the edge of the shoulder shall form an angle between the approach roadway and the sign face equal to $87^{\circ} - 1^{\circ}$ for each additional 10 feet beyond 30 feet.

Unless otherwise shown on the plans, or designated by the Resident, a minimum lateral clearance of 4 feet shall be provided between the edge of the shoulder and the edge of any sign panel.

The elevation of the bottom edge of guide sign panels shall be 7 feet above the elevation of the edge of the traveled way, at the sign location, or in case of a curb section, 7 feet above the elevation of the outer edge of the roadway, unless authorized otherwise.

Signs located 30 feet or more from the edge of traveled way shall be 5 feet above the elevation of the edge of shoulder.

In the event that a second sign is to be placed under the main sign, the elevation of the bottom edge of the principal sign shall be a minimum of 8 feet above the outer edge of the traveled way, or a minimum of 8 feet above the edge of the traveled way, in curbed sections; the bottom edge of the second sign must be at least 5 feet above the edge of the traveled way.

The elevation of the bottom edge of the regulatory, warning and route marker sign panels shall be 6 feet above the elevation of the edge of the pavement, or edge of roadway in curbed sections, at the sign location. The elevation of the bottom edge of these sign panels above the elevation of the edge of the pavement on all crossing or connecting roadways shall be 5 feet in rural areas or 7 feet in urban areas. Field conditions may require some variation in elevations, as directed.

Each sign shall have at least two fasteners connecting it to the sign poles, except signs of 1 foot or less in height may have one fastener.

645.061 Installation of Type II Signs The exact sign locations will be determined in the field. Signs stockpiled before erection shall be stored in a vertical position and completely covered to avoid staining, weathering, and dirt accumulation.

a. Sign Supports Support posts for Type II signs shall be U-channel posts weighing 2½ pounds per foot for signs of less than 6.24 ft² in area, 4 inch by 4 inch wood posts or two U-channel posts weighing 2½ lb/ft for signs of area 6.24 ft² to 9 ft², 4 inch by 6 inch wood posts for signs of area 9 ft² to 16 ft², and 6 inch by 6 inch wood posts for signs of area over 16 ft². All signs 60 inches wide or wider shall be mounted on two wood posts. Wood posts shall be set to a depth of 4 feet. U-channel posts shall be set to a minimum depth of 30 inches. Leading signs less than 9 ft² on the apex of islands will be installed on U-channel posts. When it is necessary to set sign posts in bedrock, holes shall be excavated to the required depth and size at the locations indicated on the plans. The excavated material will be satisfactorily disposed of, as directed, and the posts set to the required depth.

When installing pressure-treated sign posts, the cut end of the posts shall not be buried in the ground.

Backfilling around the posts shall be with excavated material unless the excavated material is considered unsatisfactory, in which case the backfill shall be granular material conforming to the requirements of Section 703.19 - Granular Borrow. Backfill shall be thoroughly tamped in layers not exceeding 8 inches in depth.

When directed, the area around the posts shall be loamed and seeded in accordance with the applicable provisions of Section 615 and Section 618.

The Contractor shall be responsible for and shall repair all damage to underground drainage structures, utilities, or lighting conduits encountered during placing the posts.

b. Mounting Type II signs shall be mounted using assembly hardware specified in Section 719.07.

645.062 Installation of Delineators Posts for delineators shall be erected so that posts and assemblies will be plumb. All posts, which are bent or otherwise damaged, shall be removed and properly replaced. Posts shall be driven 4 feet from the outside edge of shoulder, 4 feet from the face of curb and 4 feet from the normal edge of shoulder in guardrail sections. A suitable driving cap shall be used and after driving, the top of the post shall have substantially the same cross sectional dimensions as the body of the post.

When bedrock is encountered in erecting posts, the depth to be drilled into the rock shall be determined by the Resident.

After the posts are driven, delineators shall be mounted 4 feet above the elevation of the edge of the traveled way. In the event that a delineator is required to be installed on a bridge structure, it shall be installed by use of a bracket as shown on the plans.

645.063 Installation of Breakaway Devices Breakaway devices shall be installed at locations indicated on the plans by an approved method. Each sign and pole shall be carefully demounted for reinstallation at the same or at a new location. Manufacturer's installation information shall be provided on the project.

If required, poles shall be cut in such a manner that no rough edges will remain. No flame cutting will be permitted. Cut edges on steel poles shall be painted in accordance with Section 645.07.

Existing foundations shall be modified for attachment of the breakaway device as shown on the plans or approved.

Breakaway devices shall be attached to new foundations in accordance with the recommendations of the breakaway device manufacturer and as approved.

645.07 Demounting and Reinstalling Existing Signs and Poles Signs and sign support beams designated to be demounted and not designated to be reinstalled, except those designated to be demounted by others, shall be disassembled into 1 foot sections and delivered to the Belgrade maintenance yard (behind the main building) or as directed. Contractor shall arrange delivery with the Interstate Signing Supervisor (207-287-2846) at least 48 hours before the planned delivery. Existing sign structures and all other equipment designated for removal shall be removed from the highway right of way and shall become the property of the Contractor.

Existing sign panels, poles, foundations, and sign hardware, damaged because of the Contractor's operations shall be replaced or repaired by the Contractor to the satisfaction of the Resident.

New or relocated regulatory, warning, confirmation or route marker assembly signs shall be installed the same working day as the corresponding existing signs are demounted. All new or relocated guide signs shall be installed within two working days

of the time the corresponding existing sign is demounted. Before the Contractor demounts any regulatory or warning sign, they shall erect a similar easel mounted sign at a designated location. The Contractor shall maintain this temporary sign in place until the permanent sign is installed.

Existing signs and poles shall be reinstalled in accordance with the applicable requirements for installing new signs and poles.

Relocated steel posts and clamps shall be field painted two coats after the posts have been erected. The first coat shall be a zinc-dust primer paint meeting Federal Specification TT-P-641B Type II. The second coat shall be bright aluminum paint, aluminum-dust Type II, Class 3 brightness, meeting Federal Specification TT-A-468 with a minimum of 2 lb/gal, with vehicle meeting or exceeding Federal Specification TT-V-109. Scratches shall be touched up after the erection of the sign panels. The touchup shall be with both primer and finish coat. Sign pole surfaces to be painted shall be cleaned and dry when the paint is applied. No painting shall be done in damp weather nor when the air temperature is below 40°F.

645.08 Method of Measurement Demount Signs, Demount Poles, Reinstall Signs, and Reinstall Poles will be measured by each unit.

Bridge, cantilever and butterfly type sign supports, including the foundations, support structures and sign panels, complete in place, as called for on the plans, will be measured by each unit.

Bridge Overpass-Mounted Guide Signs, including supports, will be measured by each unit in place.

Breakaway devices (1 per pole) shall be measured by the unit complete in place and accepted.

The area of roadside guide signs, regulatory, warning, confirmation and route marker assembly signs of the respective types, will be measured by the area in square feet, computed to nearest hundredth of a square foot, as determined by the overall height multiplied by the overall width.

Aluminum poles for roadside guide signs, Type I will be measured by the number of units of each diameter, complete in place. Steel H-beam poles will be measured for payment by the pound, determined from the nominal weight per foot for each size and the lengths as indicated on the plans.

Demountable reflectorized delineators will be measured by the number of units of each type in place.

645.09 Basis of Payment The accepted demounted signs and demounted poles will be paid for at the contract unit price each for the respective item specified. Such price will be full compensation for delivering signs and poles not to be reinstalled to a site designated by the Resident, removal and off-site disposal of sign structures, removal of sign structure foundations to 12 inches below grade, placement of loam, seed and mulch to reestablish turf in the disturbed area, and all other incidentals necessary to complete the work.

The accepted reinstalled signs or reinstalled poles will be paid for at the contract unit price each. Such price will be full compensation for furnishing new hardware, when required, and all incidentals necessary to complete the installations. All signs or poles designated to be reinstalled that are damaged by the Contractor shall be replaced by the Contractor with new signs or poles conforming to the applicable Specifications at no additional cost to the State.

The accepted bridge, cantilever and butterfly type sign supports will be paid for at the contract lump sum price for the respective items. Such price will be full compensation for the signs, support structures, foundations, placement of loam, seed and mulch to reestablish turf in the disturbed area, and all other incidentals necessary to complete the work.

The bridge, cantilever and butterfly type sign supports to be removed will not be paid for directly but will be considered incidental to the installation of the new structure.

The accepted guide signs-overpass mounted, will be paid for at the contract lump sum price for the respective items, which price will be full compensation for the signs, supports and incidentals necessary to complete the work.

The accepted roadside guide signs and regulatory, warning, confirmation, and route marker assembly signs will be paid for at the contract unit price per square foot. Such payment will be full compensation for furnishing and installing signs, assembly hardware, and all incidentals necessary to complete the work.

The accepted aluminum poles will be paid for at the contract unit price each for the specified diameter, complete in place.

The accepted demountable reflectorized delineators will be paid for at the contract unit price each for the type specified, which payment will be full compensation for delineator and post or bridge rail mounting, complete in place.

Payment for breakaway devices shall be full compensation for furnishing and installing the device, all required pole cutting, for adapting the pole to the breakaway device, for adapting the concrete base to the breakaway device and all other incidentals necessary to complete the work. Separate payment will be made at the respective contract unit prices for demounting and reinstalling the signs and the poles at multi-pole

installations. At single-pole installations, separate payment will be made at the respective contract unit prices for demounting and reinstalling the poles only.

The accepted quantity of steel H-beam poles will be paid for at the contract unit price per pound, complete in place as shown on the plans or as designated.

Furnishing and installing posts for Type II signs, including earth excavation and backfilling, furnishing and placing assembly hardware, backfilling material, loam, seed and other incidentals, will not be paid for directly but will be considered incidental to the cost of the signs they support.

Excavating rock will be paid for as provided in Section 206.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>	
645.103	Demount Guide Sign	Each
645.106	Demount Regulatory, Warning, Confirmation and Route Marker Assembly Sign	Each
645.108	Demount Pole	Each
645.113	Reinstall Guide Sign	Each
645.116	Reinstall Regulatory, Warning, Confirmation and Route Marker Assembly Sign	Each
645.118	Reinstall Pole	Each
645.12	Overhead Guide Sign: (STA X + XXX)	Lump Sum
645.13	Bridge Overpass-Mounted Guide Sign: (STA X + XXX) (Left/Right XX)	Lump Sum
645.14	Special Work No.: _____	Lump Sum
645.15	Cantilever Guide Sign: (STA X + XXX)	Lump Sum
645.161	Breakaway Device Single Pole	Each
645.162	Breakaway Device Multi Pole	Each
645.251	Roadside Guide Signs, Type I	Square Foot
645.261	Bridge Guide Sign, Type I	Square Foot
645.271	Regulatory, Warning, Confirmation and Route Assembly Sign, Type I	Square Foot
645.281	5 Inch Aluminum Pole	Each
645.282	6 Inch Aluminum Pole	Each
645.283	7 Inch Aluminum Pole	Each
645.284	8 Inch Aluminum Pole	Each
645.285	10 Inch Aluminum Pole	Each
645.286	12 Inch Aluminum Pole	Each
645.289	Steel H-Beam Poles	Pounds
645.291	Roadside Guide Signs Type II	Square Foot

South Portland

11231.00

June 11, 2009

645.292	Regulatory, Warning, Confirmation and Route Marker Assembly Signs Type II	Square Foot
645.301	Demountable Reflectorized Delineator, Single	Each
645.302	Demountable Reflectorized Delineator, Double	Each

Special Provision
Section 645
Overhead Lane Use Sign Assembly

Method of Measurement

The overhead lane use sign assembly will be measured for payment by each unit in place.

645.121 Basis of Payment

The overhead lane use sign assembly will be paid for at the contract unit price, which payment will be full compensation for furnishing all materials including, but not limited to the wood poles, span wire, stabilizing span wire, guy wires, lane use signs and sign hangers and all appurtenances and incidentals required for a complete functioning installation.

Payment will be made under:

	<i>Pay Item</i>	<i>Pay Unit</i>
645.121	Overhead Lane Use Sign Assembly (@Sta.154+75 SB. & Sta. 151+25 SB.)	Each

SPECIAL PROVISION
SECTION 645
HIGHWAY SIGNING

Under 645.023 Support Structures, add the following to the first paragraph just prior to the last sentence:

Minimum fatigue design default values for cantilever & butterfly sign support structures shall be classified as Fatigue Category I with Fatigue Importance Factors (I_f) of 1.0 for Galloping, 1.0 for Natural Wind Gusts and 1.0 for Truck-Induced Gusts. Bridge type sign support structures supporting variable message signs (VMS) shall also use this fatigue criteria in their design.

Minimum fatigue design default values for bridge type structures, without VMS, shall be classified as Fatigue Category II with Importance Factors (I_f) of 0.65 for Galloping, 0.75 for Natural Wind Gusts and 0.89 for Truck-Induced Gusts.

Under 645 Support Structures, b. Bridge, Cantilever, and Butterfly Type Sign Supports, modify the 1st sentence in paragraph 2 to read:

“Signs shall be placed on the support structure such that the bottom edges are aligned (unless written consent from the Fabrication Engineer is obtained), while accommodating the minimum height requirement - see Section 645.06.

Modify the 4th sentence of paragraph 2 to read:

“This additional theoretical sign load shall be computed by: For single signs increasing the sign widths an additional 25% without changing the horizontal midpoint of the sign; For multiple signs the sign widths shall be increased 25% toward the outside sign edges. The height shall be increased 25% without changing the bottom edge elevation of the signs.”

Under 645.06 Installation of Type I Signs, b. Sign Panels, modify the 4th sentence of the 1st paragraph to read:

“Sign panels on overhead structures shall provide a minimum vertical clearance of 5.5 meters [18 ft] to the highest point of the roadway surface under the sign(s).

SPECIAL PROVISION
SECTION 645 - HIGHWAY SIGNING
(Sign Foundations)

The following paragraph is added to 645.01 Description:

This work consists of performing soil borings, and designing, furnishing, and installing drilled shafts for foundations for bridge, cantilever and butterfly sign support structures. The Contractor shall furnish all labor, materials and appurtenances required to complete the work as specified. The Contractor is expected to furnish the proposed drilled shafts with length and diameter shown on the approved Contractor's Working Drawings.

645.021 Materials is amended by adding the following language:

The materials shall meet the requirements specified in the following sections of Divisions 500 – Structures and 700 - Materials

Reinforcing Steel	709.01
Concrete (Class LP)	502
Steel Casings	711.01

Add after the first paragraph of 645.024 Bridge, Cantilever and Butterfly Support Structure Foundations the following paragraphs:

For estimating and bidding purposes, drilled shaft foundations for bridge and cantilever support structure foundations shall have minimum diameter of 3 feet and a minimum depth of 15 feet. Shafts with diameters up to 5 feet may be required by the actual design. The minimum diameter for non-redundant drilled shaft sign foundations is 4 feet. Geotechnical design of foundations shall take into account sloping ground. Whereas most of the bending moment in drilled shafts occur with the upper 10 feet of the ground surface, construction joints will not be allowed in drilled shafts near the surface.

Design calculations that consist of computer program generated output shall be supplemented with at least one hand calculation with graphics demonstrating the design methodology used. Design calculations shall provide thorough documentation of the sources of equations used and material properties.

For the strength limit design, the lateral capacity of drilled shafts shall be calculated using the Broms method and a factor of safety of 2.5 to 3.0, to determine the required drilled shaft length. The lateral soil resistance in the upper 6.0 feet of the shaft, or 1.5 times the shaft diameter, whichever is greater, is to be neglected for all soil types. A factor of safety of 1.5 for ultimate shaft torsional capacity to resist torsional loads is required.

For the serviceability design, use COM624P or LPILE software to estimate the lateral deflection and bending moment with depth for the drilled shaft. A maximum lateral deflection at the shaft top of 0.5 inch is permissible, to avoid accumulation of irrecoverable deformation with cyclic wind loads. Deflection at the bottom of the shaft shall be checked to be equal to zero to assure a fixed condition. The design shall assume either cohesive or cohesionless soil conditions, as indicated by geotechnical explorations. The highest possible groundwater table elevation should be used in the design, and saturated strength parameters assumed

645.024 Bridge, Cantilever and Butterfly Support Structure Foundations is amended by adding the following paragraphs, (a.) through (p)., after paragraph 2:

a. Qualifications of Drilled Shaft Contractor

Qualified contractors or specialized drilled shaft subcontractors shall perform construction of the drilled shafts, including excavating, placing casing and reinforcement, and placing concrete. The Contractor shall submit to the Resident for review and acceptance the qualifications of the drilled shaft subcontractor and personnel at least 45 calendar days prior to construction of the drilled shafts. Drilled shaft construction shall not begin until the Resident has reviewed and accepted the subcontractor qualifications.

b. Exploratory Boring

An exploratory boring for accurate assessment of subsurface conditions, soil properties and groundwater conditions shall be performed by the Contractor in the center of the proposed support structure foundation location. The boring shall be performed as described in the AASHTO Manual on Subsurface Investigations, 1988. Borings should extend a minimum of 5 feet below the expected tip elevation of the foundation to be built, or 25 feet, whichever is deeper. Borings should be hollow stem auger (ASTM D 6151) or cased, rotary wash borings (ASTM D 5783) if borehole stability is not achievable. Standard Penetration Testing (SPT) testing (ASTM D 1586) should be performed at the ground surface and at 5-foot intervals thereafter, or at changes in strata. Soil samples should be taken at each SPT test depth, and described and identified per ASTM D 2488. The elevation of the stabilized water table should be measured at the completion of drilling the test hole, and recorded on the boring log. If bedrock is encountered above the a depth of 25 feet below ground surface, a 5-foot long NQ-1.88 inch or NQ-2 inch diameter rock core sample shall be obtained and the Rock Quality Designation calculated. The completed boring shall be sealed with neat cement grout. A boring log should be completed for each test boring, by a Certified Subsurface Inspector. Following the drilling, the Contractor shall provide his support structure design engineer with a copy of the completed boring log.

c. Contractor Drilled Shaft Installation Plan

The Contractor shall submit to the Resident for review, a written installation plan of procedures to follow when excavating the drilled shaft hole, placing the casing, reinforcement and concrete and monitoring the concrete placement through soil and rock.

The installation plan shall be submitted for approval at least 45 calendar days before constructing the drilled shafts. The installation plan shall include the following information:

- Details of the sequence proposed for the overall drilled shaft construction operation.
- The drilled shaft Contractor's quality assurance methods to monitor the shaft installations
- Procedures used for maintaining correct horizontal and vertical alignment of the excavation.
- Method used to advance the casing when a casing is used.
- When a temporary steel casing is used, provide details of the methods to extract the temporary casing and to maintain the concrete slump to keep it workable by adding admixtures such as retarders or superplasticizers.
- Excavation techniques using augers or drilling buckets.
- Details regarding the shaft inspection devices for cleanliness and defects.
- Drilling equipment to be used including sizes, capacities, drilling tools, and supplemental equipment.
- Temporary steel casing size, length, and thickness (if used).
- When slurry is used, slurry shall be identified by manufacturer and type.
- Methods to advance the shafts and shaft depth when slurry is introduced into the hole.
- Details of methods to clean the shaft excavation.
- Proposed methods to remove obstructions such as boulders that are encountered.
- Details of reinforcement cage construction and placement, support and handling of the cage, and the Contractor's proposed centralization methods.
- The proposed concrete mix design including the concrete supplier, aggregate sources, aggregate gradation, admixtures, water-cement ratio, compressive strength results, slump, slump loss versus time (with due consideration to ambient placement temperatures), and yield test results. The maximum aggregate size for the drilled shaft concrete shall be ¾-inch.
- Details of concrete placement including proposed operational procedures for free fall, tremie, or pumping methods. A list of the proposed equipment to be used such as tremies, concrete pumps, casings, etc. shall be included.

Failure to demonstrate the adequacy of methods or equipment to the Resident is cause for the Resident to require appropriate alterations in equipment and/or methods by the Contractor to eliminate unsatisfactory results at no cost to the Department.

d. Hole Excavation

All precautions shall be taken to prevent damage to existing structures and utilities. These measures shall include but are not limited to, selecting construction methods and procedures that will prevent excessive caving of the shaft excavation, monitoring and controlling the vibrations from the driving of casing or drilling of the shaft. The Contractor shall provide equipment with the capacity to excavate as shown in the Plans.

No additional payment will be made if larger equipment than initially proposed must be mobilized. When objects such as large boulders are encountered, they shall be removed.

Excavations required for the shafts shall be constructed to the dimensions and elevations shown on the approved Working Drawings. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Either the dry method, wet method, temporary casing method or permanent casing method will be used as necessary to produce sound, durable concrete foundation shafts free of defects. When a particular method of construction is required on the Working Drawings, that method shall be used. If no particular method is specified for use, the Contractor shall select and use the method as determined by site conditions.

The Contractor shall excavate shafts using non-displacement methods such as rotary drilling, augering or other effective methods to advance the excavation through overburden materials.

If the excavation operation is stopped, the shaft cavity shall be protected by installation of a safety cover. It shall be the Contractor's responsibility to ensure the safety of the shaft excavation, surrounding soil and the stability of the side walls. A temporary casing, slurry or other methods approved by the Resident shall be used if necessary to ensure such safety and stability.

The Contractor shall use appropriate means such as a cleanout bucket or air lift to clean the bottom of the excavation of all shafts.

Excavated soil, rock and slurry shall be properly collected, transported, placed and disposed of. Methods of handling, collection, storage, transportation, and disposal shall follow all local, state and federal laws and regulations. Payment for handling of excavated slurry, soil and rock from the shafts shall not be paid separately but shall be incidental to sign support structure pay item.

i. Dry Construction Method. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft remain stable without any caving, sloughing or swelling and may be visually inspected prior to placing the concrete. The dry method consists of excavating the drilled shaft hole, removing accumulated water and loose material from the excavation, placing the reinforcing cage, and placing the shaft concrete in a relatively dry excavation. The rate of flow of water into the hole should not be more than 12 inches within a one-hour period. There shall not be more than 3 inches of water in the bottom of the hole when the initial concrete is being placed.

ii. Wet Construction Method. The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. This method consists of using water or slurry to contain seepage and groundwater movement. This method may also be appropriate to maintain stability of the hole perimeter while

advancing the excavation to its final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry, final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump, cleanout bucket or other devices; and requires placing the shaft concrete with a tremie or concrete pump.

The water or slurry fluid elevation inside the shaft excavation during the drilling operations shall be higher than the static water table.

For shafts without a permanent casing temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation, unless it is demonstrated to the satisfaction of the Resident that the surface casing is not required. Surface casing is defined as the amount of the casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

iii. Temporary Casing Construction Method. The temporary casing construction method is appropriate when the stability of the excavated hole and/or the effects of groundwater must be controlled. The steel casing is driven or spun into the hole and the auger either drills inside the casing or ahead of the casing. As the hole advances, the casing is driven further into the hole either to a layer of stale soil or until the tip elevation of the shaft is reached. Temporary casings shall be removed while the concrete remains workable. As the casing is being withdrawn, a 5 foot minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head inside the casing. Movement of the casing by rotating, exerting downward pressure and tapping to facilitate extraction will be permitted. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis. Fresh concrete shall fill in any voids left by the casing or unstable soil. The elevation of the top of the steel cage shall be carefully checked before and after casing extraction.

iv. Permanent Casing Construction Method. This method generally consists of driving or drilling a casing to a prescribed depth before excavation begins. If full excavation cannot be attained, the Contractor may either excavate material within the embedded portion of the casing or excavate a pilot hole ahead of the casing until the casing reaches the desired penetration. The pilot hole shall be no larger than one-half the diameter of the shaft and shall be centered in the shaft. The casing shall be continuous. After the installation of the casing and the excavation of the shaft is complete, the reinforcing steel shall be placed, followed by the placement of the shaft concrete.

e. Casings

Use smooth, watertight, steel casings of ample strength to withstand handling and driving stresses and the concrete and surrounding earth pressures. The outside diameter of the steel casing shall be equal to or greater than the plan diameter of the shaft.

When practical, install the casing in a manner that will produce a positive seal at the bottom of the casing to prevent piping of soil materials into the shaft excavation.

If it becomes necessary to remove a casing and substitute a longer or larger diameter casing through caving soils, the excavation shall be stabilized with slurry or backfill before the new casing is installed. Other methods approved by the Resident may be used to control the stability of the excavation and protect the integrity of the foundation soils.

Splices for steel casings shall be made by full penetration butt welding the entire cross section in conformance with the requirements in AASHTO/AWS D1.1.

f. Slurry

Slurry used in the drilling process shall be a mineral or a polymer slurry. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. The use of slurry containing polymers shall be approved by the Resident before use, and will only be permitted if the Contractor demonstrates to the Resident that the stability of the hole perimeter can be maintained while advancing the excavation to its final depth. If stability of the hole perimeter cannot be maintained, the use of slurry containing polymers shall be discontinued and an approved mineral slurry shall be used.

To aid in assuring proper usage of slurries containing polymers, the slurry manufacturer shall furnish technical assistance to the Contractor and Resident through a technical representative who is a full-time employee of the manufacturer. The representative shall be present at the site during the drilling of the first shaft to insure that the slurry is mixed and managed properly.

The approval of slurry containing polymers does not relieve the Contractor of responsibility to maintain the stability of the excavation. Slurries containing polymers shall meet the manufacturer's requirements. Slurries consisting of water mixed with the natural soils will not be allowed.

g. Excavation Inspection

The Contractor shall provide equipment for checking the dimensions and alignment of each shaft excavation. The dimensions and alignment shall be determined by the Contractor. Final shaft depth shall be measured after final inspection.

At the time of concrete placement, the bottom of the completed drilled shaft excavation shall be cleaned of loose soil.

The Contractor shall keep a daily construction record documenting, at a minimum,

- methods of advancing casing, excavating spoils, and cleaning the excavation, and observations relative to these operations,
- description of each soil layer encountered and excavated, including depth of layer, composition, moisture content and quality;

- depth of bedrock if encountered.

h. Shaft Inspection

The Contractor shall provide all labor, equipment, material, and other necessary items to perform inspections of the bottoms of the shaft using cameras or mirrors and lights. The Resident may require a different bottom cleaning procedure (e.g., jetting or air-lifting) at the Contractor's expense. Shaft bottoms and sidewalls shall be inspected within 4 hours prior to placing the rebar cage in the shaft. If more time has elapsed, the inspection shall be repeated. After the rebar cage is placed in the shaft, the shaft shall be sounded to determine if material accumulated on the bottom of the shaft during the cage placement. If there is additional sediment accumulation, the rebar cage shall be removed and the bottom of the shaft shall be recleaned and reinspected.

The bottom of each shaft shall be covered with 0.5 inches or less of sediment over no more than 50% of the base at the time of concrete placement. The maximum depth of sediment or any other debris at any one place on the bottom of the shaft excavation shall not exceed 1.0 inch. Shaft cleanliness will be demonstrated by the Contractor and documented in writing for review by the Resident.

i. Reinforcing Steel Cage

Place the reinforcing steel cage as a unit immediately after inspection of the excavation and before concrete placement. If the concrete is not placed immediately after the cage is installed, the cage may have to be removed before placing the concrete to verify the integrity of the excavated area and to ensure loose material is removed from the bottom of the hole.

Tie and support the reinforcing steel so it remains within the required tolerances. Spacers shall be of adequate dimensions and spacing to insure a minimum annular space between the outside of the cage and the side of the hole or casing as called for on the Working Drawings. Internal stiffeners and cross bracing shall be removed as the cage is placed in the borehole so as not to interfere with the placement of concrete.

The cage shall be supported from the top by some positive method, to minimize its slumping downward during concrete placement and/or extraction of the casing. If the reinforcing steel cage is not maintained within tolerances, make acceptable corrections and do not construct additional shafts until the method of reinforcing steel cage support has been approved.

If the bottom of the constructed shaft elevation is lower than the bottom of the shaft elevation in the Plans, a minimum of one half the longitudinal bars required in the portion of the shaft nearest the theoretical tip elevation shall be extended the additional length by adding longitudinal reinforcing bars at the bottom of the cage. Ties or spiral bars shall be continued for the extra depth. All longitudinal bars must be spliced with mechanical couplers. Welding to the reinforcing steel will not be permitted unless specifically shown

in either the Plans or Special Provisions, in which case reinforcing steel shall conform to ASTM A706.

Cylindrical concrete feet (bottom supports), if approved by the Resident, may be provided to insure that the bottom of the cage is maintained the proper distance above the base of the shaft. Steel skids or chairs, or skids or chairs constructed from any other electrical conductor shall not be permitted.

j. Concrete for Drilled Shafts

Concrete shall be Class LP in accordance with Section 502 – Structural Concrete. The concrete mix design shall be submitted for approval as a part of the Contractor's drilled shaft installation plan noted in section (c.) above.

Concrete shall be placed as soon as possible after reinforcing steel placement. Concrete shall be placed in one continuous operation from bottom to top of the shaft or to an optional construction joint if shown on the approved Working Drawings. Continue placing concrete until acceptable quality concrete is evident at the top of the shaft. Concrete shall not be vibrated with a vibrator. Care shall be taken when removing the casing (if required) so that the reinforcing steel cage is not deformed by the force of the downward flowing concrete. The elapsed time from the beginning of concrete placement in temporary cased shafts, until casing extraction is begun, shall not exceed 1 hour.

Concrete shall not be placed in any drilled shaft excavation without prior approval from the Resident. The drilled shaft excavation shall be inspected immediately before the concrete is placed. A light powerful enough to thoroughly inspect the reinforcing steel cage, the sides and the bottom of the drilled shaft should be provided by the Contractor for the dry construction method. The inspection for the wet construction method shall be limited to probing and measuring.

If the elevation of the top of the shaft is below ground at the time of concrete placement, a casing shall be used to prevent caving of materials into fresh concrete.

k. Free Fall Concrete Placement

The concrete can be placed in a dry drilled shaft excavation by the free fall method provided the concrete falls to its final position through air without striking the sides of the hole, the reinforcing steel cage or any other obstruction. A centering drop chute, at least 3 feet in length shall be used with the free fall method. The height of free fall of concrete shall be limited to 3 to 4 feet, preventing segregation. If the concrete placement causes the shaft excavation to cave or slough or if the concrete strikes the rebar cage or sidewall, the height of free fall shall be reduced and/or the rate of concrete flow into the excavation shall be reduced.

If the Resident determines that dewatering is not practical or placement by free fall method can not be accomplished, the Resident shall require that the concrete be placed by means of a tremie or a concrete pump.

l. Tremie

A gravity tremie may be used for concrete placement in lieu of a concrete pump in either wet or dry holes. For uncased wet holes, the drilled shaft excavation shall be maintained full of slurry or water to such a depth that water does not flow into the shaft excavation at any time. Tremies used to place concrete shall consist of a tube of sufficient length, weight and diameter to discharge concrete at the shaft base elevation. The tremie shall not contain aluminum parts that will have contact with the concrete. The inside diameter of the tremie shall be not less than 10 inches. The inside and outside surfaces of the tremie shall be clean and smooth to permit both flow of concrete and unimpeded withdrawal during concreting. The wall thickness of the tremie shall be adequate to prevent crimping or sharp bends that restrict concrete placement.

The tremie used for concrete placement shall be watertight. Underwater placement shall not begin until the tremie is placed to the shaft bottom elevation. Valves, bottom plates or plugs shall be used so that concrete discharge can begin within one tremie diameter of the base. Plugs shall either be removed from the excavation or be of a material, approved by the Resident, which will not cause a defect in the shaft if not removed. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations. The tremie discharge end shall be immersed at least 10 feet in concrete at all times after starting the flow of concrete.

Concrete between the tremie discharge end and the top of the pour shall remain fluid throughout the duration of placement such that rise of the concrete during placement is not hampered.

If the tremie line orifice is removed from the fluid concrete column at any time during the concrete pour, and discharges concrete above the rising concrete level, the drilled shaft shall be considered defective.

m. Pumped Concrete

Concrete may be pumped into either wet or dry holes. For uncased wet holes, the drilled shaft excavation shall be maintained full of slurry or water to such a depth that water does not flow into the shaft excavation at any time. The concrete shall then be placed by means of a concrete pump. The concrete pump pipe shall have a diameter that is not less than 4 inches and be constructed with watertight joints. The concrete pump equipment shall be so arranged that no vibrations result which might damage fresh concrete. Pipes carrying concrete from the pump to the shaft should be arranged with a minimum number of bends. The pipe used to convey the concrete to the bottom of the drilled shaft excavation shall be anchored to the steel casing or another suitable stationary object to

prevent the pipe from undulating during the initial placement of the concrete. Concrete placement shall not begin until the pump line orifice is at the shaft base elevation.

The pumping equipment shall be suitable in kind and adequate in capacity for the work required. The use of aluminum pipe as a conveyance for the concrete will not be permitted. An adequate quantity of grout, mortar or concrete with coarse aggregate omitted shall be pumped through the equipment ahead of the specification concrete to provide lubrication to the pumping system. The concrete used for lubrication shall not be placed in the shaft. The lubrication process will not be repeated as long as the pumping operations are continuous. The operation of the pump shall be such that a continuous stream of concrete without air pockets is produced. In order to prevent the contamination of the concrete placed initially at the bottom of the shaft, the outlet end of the pumping pipe shall be sealed with a diaphragm or plug that is flushed out when the hydrostatic pressure from the column of concrete exceeds that of the water in the shaft. Plugs shall either be removed from the excavation or be of a material, approved by the Resident, which will not cause a defect in the shaft if not removed. The initial rate of concrete placement must be carefully controlled so as not to lift or displace the cage of reinforcing steel. The conveying system shall be water tight, and the outlet end shall always remain well below the top of the freshly placed concrete. The preferred concrete placement procedure is to maintain the outlet end of the pumping system at approximately 10 feet below the top of the fresh concrete. When the concrete reaches the top of the drilled shaft column, all laitance shall be removed.

Concrete between the pump discharge end and the top of the pour shall remain fluid throughout the duration of placement such that rise of the concrete during placement is not hampered.

If the concrete pump line orifice is removed from the fluid concrete column at any time during the concrete pour, and discharges concrete above the rising concrete level, the drilled shaft shall be considered defective.

n. Drilled Shaft Installation Restrictions

A fixed template, adequate to maintain the cage position will be required for when the Contractor fails to demonstrate satisfactorily that he can properly maintain cage position and alignment without use of a template.

Shafts installed using slurry shall be completed within 72 hours of introducing slurry into the shaft excavation, unless otherwise approved by the Resident. Regardless, the Contractor shall be responsible for maintaining an open shaft excavation throughout the installation, inspection, cleaning, cage placement and concreting operations.

Drilling or placing/advancing casing in the vicinity of a drilled shaft excavation with freshly placed concrete and curing concrete shall not occur within three shaft diameters or 20 feet of the centerline of the concrete shaft, whichever is greater, until the concrete has attained a minimum compressive strength of 2,000 psi. When the Contractor must

use impact methods to resolve an obstruction during placement or advancement of casing, or during clean out of the shaft, such work shall not occur within four shaft diameters or 30 feet of the centerline of the concrete shaft, whichever is greater, until the concrete has attained a minimum compressive strength of 3,000 psi.

The layer of water-diluted concrete which has floated to the top during placement shall be removed to the depth directed by the Resident and wasted. In no case shall the removed layer be less than 18 inches thick. Only concrete which meets specification requirements shall remain as a part of the drilled shaft.

o. Obstructions

Obstructions at drilled shaft locations shall be removed by the Contractor. Such obstructions may include natural materials such as boulders or intrusions of geotechnical materials not shown in the boring logs. Special procedures and/or tools shall be employed by the Contractor only after the hole cannot be advanced using conventional augers, drilling buckets, under-reaming tools, or other tools as required for this project. Such special procedures/tools, if required, may include but are not limited to: chisels, boulder breakers, air tools, hand excavation, temporary casing, and increasing the hole diameter. No additional payment for obstructions will be made.

p. Construction Tolerances

The drilled shafts shall be positioned within 3.0 inches of the plan location in the horizontal plane at the plan elevation for the top of the shaft. The vertical alignment of the shaft shall not vary from the required alignment by more than 0.1875 in/ft of depth. The supported structures shall be constructed at their plan location. All corrections required to construct the supported elements (anchor bolts, anchor plates, poles, etc) at their plan locations shall be at the expense of the Contractor.”

The following paragraphs are added to 645.08 Method of Measurement:

The acceptance of each drilled shaft for bridge, cantilever and butterfly sign support foundations shall be the decision of the Resident, based on the shaft integrity and other information on the shaft placement. Drilled shaft foundations for bridge, cantilever and butterfly type sign supports will be measured by each sign unit.

In the case that any drilled shaft is determined to be unacceptable, the Contractor shall submit a plan for remedial repairs and working drawings stamped by a Professional Resident to the Resident for approval registered in the State of Maine. All labor and materials required to perform remedial shaft repairs shall be provided at no cost to the Department and with no extension of the contract time.

The following paragraph is added after paragraph 3 of 645.09 Basis of Payment:

Payment for accepted bridge, cantilever and butterfly type sign support drilled shaft foundations shall be paid for at the Contract lump sum price for the respective sign support pay items. Such price will be full compensation for geotechnical explorations, providing drilled shaft design calculations and Working Drawings, making all excavations, any necessary groundwater pumping, furnishing, placing and removing any required casings, for furnishing and placing all concrete and reinforcing steel, for furnishing all tools, labor and equipment necessary to complete the work. No extra payment will be made for steel casings left in place.

**SPECIAL PROVISION
SECTION 652
MAINTENANCE OF TRAFFIC
(Traffic Officers)**

Description. This work shall consist of furnishing uniformed police officer(s) with police cruiser in the following situations:

- 1.) When roadway closures or lane closures are required.
- 2.) As directed by the Resident

General

The Contractor shall make requests for uniformed police officers a minimum of 48 hours in advance.

Method of Measurement. Traffic officers will be measured for payment by the number of man-hours measured to the nearest ¼ hour.

Basis of Payment. The accepted quantity of traffic officers will be paid for at the contract unit price per man-hour with no additional payment for overtime. The contract unit price will be full compensation for transporting, equipping, supervising and the payment of traffic officers, including police cruisers, and for all incidentals necessary to complete the work.

Payment will be made under:

Pay Item		Pay Unit
652.381	Traffic Officers	Man-hour