



Paul R. LePage
GOVERNOR

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

David Bernhardt
COMMISSIONER

May 24, 2012
Subject: **LaGrange**
State WIN: 018237.00
Amendment No. 1

Dear Sir/Ms:

In the Bid Book (pages 12 thru 18) **REMOVE** the "SCHEDULE OF ITEMS" 7 pages dated 120514 and **REPLACE** with the attached new "SCHEDULE OF ITEMS" 7 pages dated 120524.

In the Bid Book (page 52) **REMOVE** "SPECIAL PROVISION, SECTION 202, (REMOVE EXISTING BRIDGE) 1 page dated April 27, 2012 and **REPLACE** with the attached new "SPECIAL PROVISION, SECTION 202, (REMOVE EXISTING BRIDGE) 1 page dated May 24, 2012.

In the Bid Book after page 109, **ADD** the attached "SPECIAL PROVISION, SECTION 636, MECHANICALLY STABILIZED EARTH RETAINING WALL" 14 pages dated May 2, 2012.

In the Plans, Sheet Number 2 of 31, "ESTIMATED QUANTITIES" **ADD** the following item in pen and ink;

"203.24 Common Borrow 250 CY"

In the Plans, Sheet Number 5 of 31, Note #5 **CHANGE** the words "included in" to read "**incidental to**". Make this change in pen and ink.

The following questions have been received:

Question: Special Provision, Section 636, Mechanically Stabilized Earth Retaining Wall, Subsection 636.02 Quality Assurance, states the following: "The MSE retaining wall system shall be one of the approved wall systems noted in the contract documents." However, we could not find a list of the approved MSE Retaining Wall Systems in the contract documents, nor could we find reference to the Departments' qualified products list of proprietary retaining wall systems.

Response: The MSE retaining wall system shall be one of the Approved Proprietary Retaining Wall Systems meeting Standard Specification Section 636 listed on the



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MaineDOT Qualified Products List website. Also Please see the attached Special Provision.

Question: Due to the holiday weekend would MDOT consider extending the bid 1 week?

Response: The bid date will not be extended by 1 week.

Question: Sheet 23 and 24 show dimensions for the abutments that conflict with the dimensions shown on sheet 22. What are the correct dimensions?

Response: The dimensions on sheets 23 and 24 do not seem to conflict from sheet 22. The section B-B drawing is cut through the structure then viewed along the centerline of the road. If we have misunderstood the question, please send another RFI so that we understand the difference.

Question: Sheet 25, Note #1 calls out Special Provision 636. Could you please provide this Special Provision?

Response: The MSE retaining wall system shall be one of the Approved Proprietary Retaining Wall Systems meeting Standard Specification Section 636 listed on the MaineDOT Qualified Products List website. Also Please see the attached Special Provision.

Question: Is shielding required over the multi-use trail during demolition? If shielding is required, how will it be paid for?

Response: The multi-use trail will be closed during all construction activities and re-routed around the project by the Department of Conservation.

Question: MSE Wall note 1 on sheet 25 refers to Special Provision 636. SP 636 is not attached, please clarify.

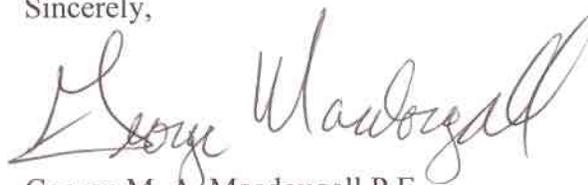
Response: The MSE retaining wall system shall be one of the Approved Proprietary Retaining Wall Systems meeting Standard Specification Section 636 listed on the MaineDOT Qualified Products List website. Also Please see the attached Special Provision.

Question: Due to Monday being a holiday, can the bid opening be pushed back a week?

Response: The bid date will not be extended by 1 week.

Consider these changes and information prior to submitting your bid on May 30, 2012.

Sincerely,

A handwritten signature in cursive script that reads "George Macdougall". The signature is written in black ink and is positioned above the printed name.

George M. A. Macdougall P.E.
Contracts & Specifications Engineer

SCHEDULE OF ITEMS

CONTRACT ID: 018237.00

PROJECT(S): 018237.00

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	0.500 AC				
0020	202.19 REMOVING EXISTING BRIDGE	LUMP	LUMP			
0030	202.202 REMOVING PAVEMENT SURFACE	710.000 SY				
0040	203.20 COMMON EXCAVATION	4000.000 CY				
0050	203.24 COMMON BORROW	250.000 CY				
0060	203.25 GRANULAR BORROW	1150.000 CY				
0070	203.35 CRUSHED STONE FILL	33.000 CY				
0080	206.082 STRUCTURAL EARTH EXCAVATION - MAJOR STRUCTURES	610.000 CY				
0090	304.10 AGGREGATE SUBBASE COURSE - GRAVEL	2350.000 CY				
0100	403.208 HOT MIX ASPHALT 12.5 MM HMA SURFACE	370.000 T				

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REVISED:

CONTRACT ID: 018237.00

PROJECT(S): 018237.00

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0110	403.213 HOT MIX ASPHALT 12.5 MM BASE	440.000 T				
0120	409.15 BITUMINOUS TACK COAT - APPLIED	73.000 G				
0130	461.131 TEMPORARY PAVEMENT	130.000 T				
0140	502.21 STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS	540.000 CY				
0150	502.41 STRUCTURAL CONCRETE SUPERSTRUCTURE SLAB	75.000 CY				
0160	503.12 REINFORCING STEEL, FABRICATED AND DELIVERED	42500.000 LB				
0170	503.13 REINFORCING STEEL, PLACING	42500.000 LB				
0180	503.14 EPOXY-COATED REINFORCING STEEL, FABRICATED AND DELIVERED	150.000 LB				
0190	503.15 EPOXY-COATED REINFORCING STEEL, PLACING	150.000 LB				
0200	503.16 WELDED STEEL WIRE FABRIC, COMPLETE IN PLACE	1350.000 LB				
0210	508.13 SHEET WATERPROOFING MEMBRANE	LUMP	LUMP			

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0220	509.74 COMPOSITE ARCH SUPERSTRUCTURE ERECTION, INSTALLATION ONLY	LUMP	LUMP			
0230	510.10 SPECIAL DETOUR ROADWAY WIDTH VEHICULAR & PEDESTRIAN TRAFFIC NOT SEPARATED 14'	LUMP	LUMP			
0240	512.081 FRENCH DRAINS	LUMP	LUMP			
0250	514.06 CURING BOX FOR CONCRETE CYLINDERS	EA 1.000				
0260	515.21 PROTECTIVE COATING FOR CONCRETE SURFACES	LUMP	LUMP			
0270	527.34 WORK ZONE CRASH CUSHIONS	UN 1.000				
0280	606.23 GUARDRAIL TYPE 3C - SINGLE RAIL	LF 260.000				
0290	606.353 REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	EA 3.000				
0300	606.366 GUARDRAIL, REMOVE & RESET TYPE 3C	LF 850.000				
0310	606.369 GUARDRAIL REMOVED AND STACKED	LF 84.000				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0320	606.791 REMOVE AND RESET 350 FLARED TERMINAL	1.000 EA				
0330	607.16 CHAIN LINK FENCE - 4 FOOT	150.000 LF				
0340	609.31 CURB TYPE 3	350.000 LF				
0350	610.08 PLAIN RIPRAP	4.000 CY				
0360	613.319 EROSION CONTROL BLANKET	110.000 SY				
0370	615.07 LOAM	130.000 CY				
0380	618.1401 SEEDING METHOD NUMBER 2 - PLAN QUANTITY	1.000 UN				
0390	618.1411 SEEDING METHOD NUMBER 3 - PLAN QUANTITY	19.000 UN				
0400	619.1201 MULCH - PLAN QUANTITY	20.000 UN				
0410	619.1401 EROSION CONTROL MIX	25.000 CY				
0420	620.58 EROSION CONTROL GEOTEXTILE	13.000 SY				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0430	627.733 4" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	2500.000 LF				
0440	627.76 TEMPORARY PAVEMENT MARKING LINE, WHITE OR YELLOW	LUMP	LUMP			
0450	627.77 REMOVING PAVEMENT MARKINGS	1150.000 SF				
0460	629.05 HAND LABOR, STRAIGHT TIME	10.000 HR				
0470	631.10 AIR COMPRESSOR (INCLUDING OPERATOR)	10.000 HR				
0480	631.11 AIR TOOL (INCLUDING OPERATOR)	10.000 HR				
0490	631.12 ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	10.000 HR				
0500	631.14 GRADER (INCLUDING OPERATOR)	10.000 HR				
0510	631.15 ROLLER, EARTH AND BASE COURSE (INCLUDING OPERATOR)	20.000 HR				
0520	631.172 TRUCK - LARGE (INCLUDING OPERATOR)	20.000 HR				
0530	631.18 CHAIN SAW RENTAL (INCLUDING OPERATOR)	10.000 HR				

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0540	631.20 STUMP CHIPPER (INCLUDING OPERATOR)	10.000 HR				
0550	636.40 MECHANICALLY STABILIZED EARTH RETAINING WALL	3100.000 SF				
0560	639.18 FIELD OFFICE TYPE A	1.000 EA				
0570	643.72 TEMPORARY TRAFFIC SIGNAL	LUMP	LUMP			
0580	652.312 TYPE III BARRICADE	4.000 EA				
0590	652.33 DRUM	50.000 EA				
0600	652.34 CONE	50.000 EA				
0610	652.35 CONSTRUCTION SIGNS	350.000 SF				
0620	652.36 MAINTENANCE OF TRAFFIC CONTROL DEVICES	200.000 CD				
0630	652.38 FLAGGER	200.000 HR				
0640	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP	LUMP			

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LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0650	659.10 MOBILIZATION	LUMP	LUMP			
0660	890.01 SPECIAL WORK #1 FIBER OPTIC CONDUIT ALLOWANCE	LUMP	LUMP		2000	.00
	SECTION 0001 TOTAL					
	TOTAL BID					

**SPECIAL PROVISION
SECTION 202
(REMOVING EXISTING BRIDGE)**

The following items on the existing bridge shall be removed by the Contractor and remain property of the Department:

1. Structural steel beams including all diaphragms

The Contractor shall use care during removal of the existing concrete deck so as not to damage the existing structural steel beams. The longitudinal beams for span 2 & 3 shall be disconnected from the transverse floor beam. The structural steel beams and diaphragms shall be removed by the Contractor and transported from the project site to the following location:

Delivery will be made to the old Maine Forest Service Nursery site in Greenbush, Maine; which is on Gould's Ridge Road approximately 1.5 miles north of the intersection with East Ridge Road.

The Contractor shall contact Chuck Simpson, Maine Bureau of Parks and Lands, at (207) 592-2450 a minimum of 5 calendar days in advance of delivery of the structural steel beams and diaphragms. Delivery shall be made during a weekday (Monday to Friday). The structural steel beams shall be unloaded by others. Any dunnage required shall be supplied by others.

The Contractor shall submit a Bridge Demolition Plan to the Resident, at least 10 business days prior to the start of work on this item. This plan shall outline the methods and equipment to be used to remove and dispose of all materials included in the existing bridge. Part of this plan must include the use a MaineDOT approved vendor for the transport and management of any hazardous waste generated from the bridge site. No work related to the removal of the bridge shall be undertaken by the Contractor until the Department has reviewed the Bridge Demolition Plan for appropriateness and completeness. Payment for all work necessary for developing, submitting and finalizing the Demolition Plan will not be made separately, but shall be included in the payment of Pay Item 202.19, Removing Existing Bridge, or other related Pay Items.

SPECIAL PROVISION
SECTION 636
MECHANICALLY STABILIZED EARTH RETAINING WALL

The following replaces Standard Specification Section 636 in its entirety:

636.01 Description The work under this item shall consist of design, fabrication, furnishing, transportation, and erection of Mechanically Stabilized Earth (MSE) retaining wall system of the required type, including miscellaneous items necessary for a complete installation.

The MSE retaining walls shall consist of reinforcing strips or reinforcing mesh earth wall systems utilizing architectural precast concrete facing panels supported on cast-in-place concrete leveling pads. The MSE headwall over the arch shall be constructed using galvanized wire mesh facing. A cast-in-place concrete facing shall be constructed in front of the MSE wall conforming to the requirements of Standard Specification 502, Structural Concrete. All reinforcing strips or mesh material shall consist of galvanized steel. The wall structures shall be dimensioned to achieve the design criteria shown on the plans and specified herein.

The MSE retaining walls shall be constructed in accordance with these specifications and in conformity with the lines, grades, design criteria, and dimensions shown on the plans or established by the Geotechnical Engineer.

636.02 Quality Assurance. The MSE retaining wall system shall be one of the approved wall systems noted in the Contract Documents.

All necessary materials, except backfill and cast in-place concrete shall be obtained from the approved system designer.

Mechanically Stabilized Earth (MSE) retaining walls shall be designed and constructed as specified herein. The design shall be subject to review and acceptance by the Geotechnical Engineer. The acceptability of a MSE retaining wall design shall be at the sole discretion of the Geotechnical Engineer. Any additional design, construction or other costs arising as a result of rejection of a retaining wall design by the Geotechnical Engineer shall be borne by the Contractor.

Precast facing panels shall be manufactured in a concrete products plant with approved facilities. Before proceeding with production, precast sample units shall be provided for the Resident's acceptance. These samples shall be kept at the plant to be used for comparison purposes during production.

All calculations and Shop Drawings shall be signed and sealed by a licensed Professional Engineer registered in accordance with the laws of the State of Maine and specializing in geotechnical construction.

The Contractor installing the MSE retaining walls shall have demonstrated experience constructing MSE walls and shall use personnel having demonstrated experience in the installation procedures recommended by the manufacturer and as specified herein.

All MSE walls shall be built in accordance with the plans and accepted shop drawings for the proposed wall systems.

A qualified representative from the wall design-supplier shall be present during construction of the MSE walls. The services of the qualified representative shall be at no additional cost to the project. The qualified experienced technical representative will advise the Contractor and the Resident concerning proper installation procedures.

The vendor's representative shall specify the required back-batter so that the final position of the wall is vertical. Furthermore, footing berms shall be placed in front of the first three (3) levels of panels erected, to maintain verticality.

636.03 Design Requirements The MSE retaining walls shall be designed to provide the grade separation shown on the plans with a service life of not less than 100 years.

The MSE wall system shall be designed in accordance with:

1. The manufacturer's requirements
2. The Contract Plans
3. The requirements specified herein
4. AASHTO LRFD Bridge Design Specifications, current edition
5. AASHTO LRFD Bridge Construction Specifications, current edition
6. FHWA-NHI-10-024, Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume I, November 2009,
7. FHWA-NHI-10-025, Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volume II, November 2009,
8. FHWA-NHI-09-087, Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, November 2009.

Where conflicting requirements occur, the more stringent requirements shall govern.

The MSE wall design shall follow the general dimensions of the wall envelope shown on the plans. Base of footing elevation shall be as shown on the plans, or may be lower. All wall elements shall be within the right-of-way limits shown on the plans. The panels shall be placed so as not to interfere with drainage or other utilities, or other potential obstructions.

All appurtenances behind in front of, under, mounted upon, or passing through the wall such as drainage structures, utilities, fences, concrete parapet wall or other appurtenances shown on the plans shall be accounted for in the stability design of the wall.

Facing panels shall have tongue and groove, ship lap or similar approved connections along all joints, both vertical and horizontal. Where foundation conditions indicate large differential

settlements, vertical full-height slip joints shall be provided. The shape of the panels shall be such that adjacent panels will have continuous, vertical joints, or as noted on the plans.

MSE facing panels shall be installed on cast-in-place concrete leveling pads. The top of the leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be 4.0 ft as measured to the top of the leveling pad, or as shown on the plans, whichever is greater. The top of the face panels shall be at or above the top of the panel elevation shown on the plans. Where coping or barrier is used, the wall face shall extend up into the coping or barrier a minimum of 2 in.

The MSE walls shall be dimensioned so that the factored bearing resistance of the foundation soils, as noted on the plans, is not exceeded. Requirements for over excavation of native foundation soils and replacement with compacted structural fill are detailed on the plans.

The design by the wall system supplier shall consider the stability of the wall as outlined below and in the Contract Documents:

(a) Failure Plane The theoretical failure plane within the reinforced soil mass shall be determined per LRFD Section 11 and be analyzed so that the soil stabilizing components extend sufficiently beyond the failure plane within the reinforced soil mass to stabilize the material. External loads which affect the internal stability such as those applied through piling, bridge footings, traffic, slope surcharge, hydrostatic, and seismic loads shall be accounted for in the design.

(b) External Stability - Load and Resistance Factors Loads and load combinations selected for design shall be consistent with AASHTO LRFD. Application of load factors shall be taken as specified in AASHTO LRFD. Sliding resistance factors and bearing resistance factors shall be consistent with LRFD Section 10. Overturning provisions of LRFD Section 11 shall apply.

MSE walls shall be designed to resist failure by instability of temporary construction slope. Passive pressure in front of the wall mass shall be assumed to be zero for design purposes. The factored applied bearing pressures under the MSE mass for each reinforced length shall be clearly indicated on the design drawing.

(c) Internal Stability - Load and Resistance Factors Evaluation of reinforcement pullout, reinforcement rupture and panel connection pullout or rupture shall be consistent with LRFD Section 11. Loads, load combinations and load factors shall be as specified in LRFD Article 11. Resistance factors for internal design shall be consistent with LRFD Article 11. Maximum reinforcement loads shall be calculated using the Simplified Method approach. Calculations for factored stresses and resistances shall be based upon assumed conditions at the end of the design life. The design life of steel soil reinforcements shall comply with LRFD Section 11.

(d) Backfill and Foundation Soils Parameters. The friction angle of the select backfill used in the reinforced fill zone for the internal stability design of the wall shall be assumed to be 34° unless noted otherwise. The friction angle of the foundation soils and random backfill shall be assumed to be 30° unless otherwise shown on the plans.

(e) Reinforcement Length. The soil reinforcement shall be the same length from the bottom to the top of each wall section. The reinforcement length defining the width of the entire reinforced soil mass may vary with wall height. The minimum length of the soil reinforcement shall be 8 ft, but shall not be less than 70 percent of the wall height, H, for walls with level surcharges, or 70 percent of H1 for walls with a sloped surcharge or walls supporting an abutment. The mechanical wall height, H or H1, shall be the vertical difference between the top of the leveling footing and the elevation at which the failure surface, as described above, intercepts the ground surface supported by the wall.

(f) Steel Reinforcement For steel reinforcements, all structural connections, tie strips and loop inserts, the following galvanization and carbon steel loss rates shall be assumed:

	<u>mils/year/side</u>
Zinc galvanizing (first 2 years)	0.58
Zinc galvanizing (subsequent years to depletion):	0.16
Carbon Steel (after zinc depletion to 100 yrs):	0.47

Calculations for factored stresses and resistances in steel reinforcements and connections, including tie-strips and loop inserts, shall be based upon assumed conditions at the end of the design life. (or: The nominal long-term design strength in steel reinforcements and connections, including tie-strips and loop inserts shall be determined at the end of the service life.) The applied factored reinforcement loads shall be calculated in accordance with LRFD Section 11.10, and shall be checked against the nominal tensile strength multiplied by a resistance factor per LRFD Table 11.5.7-1. Transverse and longitudinal grid members shall be sized in accordance with ASTM A185/A158M.

When the expected differential settlement normal to the wall exceeds 3 in, the lower level reinforcement facing connections shall be designed to accommodate the increased tensile forces due to settlement.

(g) Facing Panel Requirements

1. Facing panels shall be designed to resist compaction stresses that occur during wall erection.
2. The minimum thickness for concrete panels in the zone of embedded connections shall be 5.5 in and 3.5 in elsewhere. The minimum concrete cover shall be 1.5 in. Facing panels shall meet the design requirements of LRFD 11.10.2.3

3. The wall facing shall be designed to accommodate differential settlements of 1/100 ft.
4. The minimum spacing between adjacent panels shall be ¾ inches in order to accommodate differential settlements without impairing the appearance of the facing or compromising the structural integrity of the individual panels. Joints between panels shall be no more than 0.75 in. Joint between panels shall have a ship lap configuration or tongue and groove connection. There shall be no openings through the wall facing, except for utilities to pass through the wall. Slip joints to accommodate differential settlement shall be included where shown on the plans.
5. Where wall or wall sections intersect with an angle of 130° or less, a special vertical corner element panel shall be used. The corner element panel shall cover the joint of the panels that abut the corner and allow for independent movement of the abutting panels. Corner elements shall not be formed by connecting standard facing panels that abut the acute corner.

636.04 Materials The Contractor shall be responsible for the purchase or manufacture of the precast concrete facing panels, reinforcing mesh or strips, panel/reinforcement connections, bearing pads, joint filler, and all other necessary components. The Contractor shall furnish to the Resident the appropriate Certificates of Compliance certifying that the applicable wall materials meet the requirements of the project specifications. All materials used in the construction of the MSE retaining walls shall meet the requirements specified in the following subsections of the Maine Standard Specifications and as specified herein.

Materials not conforming to this section of the specifications, or from sources not listed in the contract documents, shall not be used without written consent from the Resident.

636.041 Reinforced Concrete Facing Panels Reinforced concrete facing panels shall meet the requirements specified in the following subsections:

Structural Precast Concrete Units	712.061
Drainage Geotextile	722.02

636.042 Precast Panel Tolerances and Surface Finish Concrete surface for the front face shall have a smooth steel formed finish, or as noted on the plans. The rear face shall have an unformed surface finish. The rear face of the panel shall be roughly screeded to eliminate open pockets of aggregate and surface distortions in excess of ¼ in. All uncoated steel projecting from the panel unit shall be galvanized in accordance with ASTM A123/A123M (AASHTO M 111) with a minimum coating thickness of 2 oz/ft².

Precast panel tolerances shall comply with the following; units that do not meet the listed tolerances will be rejected.

1. Panel dimensions (edge to edge of concrete) within ±3/16 in.

2. Panel thickness: $\pm 1/8$ in.
3. Squareness. The length difference between the two diagonals shall not exceed $1/2$ in.
4. Distance between the centerline of dowel and dowel sleeve, and to centerline of reinforcing steel shall be $\pm 1/8$ in.
5. Face of panel to centerline of dowel and dowel sleeve, and to centerline of reinforcing steel shall be $\pm 1/8$ in.
6. Position of panel connection devices (Tie Strip) shall be ± 1 in.
7. Location of Coil and loop Imbeds shall be $\pm 1/8$ in.
8. Warping of the exposed panel face shall not exceed $1/4$ in. in 5 ft.
9. Surface defects on smooth-formed surfaces measured over a length of 5 ft shall not exceed $1/8$ in. Surface defects on textured-finished surfaces measured over a length of 5 ft shall not exceed $5/16$ in.

636.043 Reinforcing and Wire Mesh Facing All reinforcing, wire mesh facing, tie strips, and attachment devices shall be carefully inspected to insure they are true to size and free from defects that may impair their strength and durability.

A. Reinforcing Mesh and Wire Mesh Facing shall be shop fabricated from cold drawn steel wire conforming to the requirements of AASHTO M 32 (ASTM A82/A82M) yield strength minimum of 65 ksi and shall be welded into the finished mesh fabric in accordance with AASHTO M 55 (ASTM A185/A185M). Galvanizing shall be in accordance with AASHTO M 111 (ASTM A123/A123M) after fabrication. The minimum coating thickness shall be 2 oz/ft^2 . Any damage done to the mesh galvanization prior to the installation shall be repaired in an acceptable manner and provide a minimum galvanized coating of 2 oz/ft^2 .

B. Reinforcing Strips shall be fabricated from hot rolled bars to the required shape and dimensions. Their physical and mechanical properties shall conform to AASHTO M 223 (ASTM A572/A572M) Grade 65, or approved equal. Reinforcing strips shall be hot dipped galvanized in accordance with AASHTO M 111 (ASTM A123/A123M) after fabrication. The minimum galvanization coating thickness shall be 2 oz/ft^2 . Any damage done to the mesh galvanization prior to the installation shall be repaired 2 oz/ft^2 .

C. Tie strips and reinforcement connectors shall be fabricated of hot rolled steel conforming to ASTM A1011/A1011M, Grade 50 or equivalent. Tie strips and reinforcement connectors shall be hot dipped galvanized in accordance with AASHTO M 111 (ASTM A123/A123M) after fabrication. The minimum coating thickness shall be 2 oz/ft^2 .

D. The tie strips and reinforcing strips shall be cut to lengths and tolerances shown on the submitted plans. Holes for bolts shall be punched in the locations shown.

636.044 Attachment Devices

A. Steel clevis loop embeds shall be fabricated of cold drawn steel wire conforming to ASTM A510, UNS G 10350 or AASHTO M 32 (ASTM A82/A82M). Loop embeds shall be

welded in accordance with AASHTO M 55 (ASTM A185/A185M). Both shall have electrodeposited coatings of zinc applied in accordance with ASTM B633.

B. Fasteners shall consist of hexagonal cap screw bolts and nuts, which are galvanized and conform to the requirements of AASHTO M 164 (ASTM A325) or equivalent.

C. Connector pins and mat bars shall be fabricated from AASHTO M 183 (ASTM A36/A36M) steel and welded to the soil reinforcement mats as shown on the plans. Galvanization shall conform to AASHTO M111 (ASTM A123/A123M) with a minimum coating thickness of 2 oz/ft². Connector bars shall be fabricated of cold drawn steel wire conforming to the requirements of ASTM A82/A82M (AASHTO M 32) and galvanized in accordance with ASTM A123/A123M.

D. Structural plate connectors and fasteners used for yokes to connect reinforcements to wall panels around pile or utility conflicts shall conform to the material requirements for reinforcing strips and fasteners in 636.043.

636.045 Joint Materials Joint material shall be installed to the dimensions and thicknesses specified below, or in accordance with the plans or approved shop drawings.

A. Provide flexible foam strips for filler for vertical joints between panels, and in horizontal joints where pads are used.

B. Provide in horizontal joints between panels either preformed EPDM rubber pads conforming to ASTM D2000 for 4AA, or 812 rubbers or neoprene elastomeric pads having a Durometer Hardness of 55±5, or high density polyethylene pads with a minimum density of 0.946 g/cm³ in accordance with ASTM D1505

636.046 Nonwoven Drainage Geotextile Cover all joints between panels on the back side of the wall with a geotextile fabric meeting the minimum requirements of 722.02 Class 2. Slit film and multifilament woven and resin bonded woven geotextile fabrics are not allowed for this application. The minimum width of the fabric shall be 12 in. Lap fabric at least 12 in. where splices are required. Nonwoven Drainage Geotextile shall be bonded with an approved adhesive compound to the back face covering all joints between panels. Adhesives used to hold the geotextile filter fabric material to the rear of the facing panels prior to backfill placement shall be supplied by the wall supplier and approved by the Resident.

Soil Retention Fabric as supplied by the MSE Wall supplier shall be used behind the welded wire mesh facing to retain the soil over the arch. This material has a temporary function until the cast-in-place concrete facing is placed.

636.047 Concrete Leveling Pad The cast-in-place leveling pad shall be constructed of Class A concrete conforming to the requirements of Section 502 - Structural Concrete. Leveling pad shall have minimum dimensions of 6 in thickness and 12 in width and be placed at the design elevation shown on the shop drawings within a 1/8 in tolerance.

636.048 Backfill Materials All backfill materials used in the MSE Walls volume shall conform to Gravel Borrow conforming to the requirements of Section 703.20, with the following additional requirements:

A. The maximum aggregate size is limited to 4 in (U.S Sieve Size - 102 mm)

B. Soundness The material shall be substantially free of shale or other soft, poor durability particles. The materials shall have a magnesium sulfate soundness loss, as determined by AASHTO T104 (ASTM C88), of less than 30 percent after four cycles.

C. Electrochemical Requirements The backfill materials shall meet the following criteria:

Requirements		Test Methods
Resistivity	>3,000 ohm-centimeters	AASHTO T 288
pH between	Between 5 and 10, inclusive	AASHTO T 289
Chlorides	<100 parts per million	AASHTO T 291
Sulfates	<200 parts per million	AASHTO T 290
Organic Content	<1%	AASHTO T 267-86

D. The plasticity index (PI) as determined by AASHTO T90 shall not exceed 6.

E. The select backfill material shall exhibit a peak angle of internal friction of not less than 34 degrees, as determined by the standard Direct Shear Test, AASHTO T 236 (ASTM D3080-72), on the portion finer than the 2 mm [#10 sieve], compacted to 95 percent of AASHTO T 99, Methods C or D (with oversized correction as outlined in Note 7) at optimum moisture content. No testing is required for backfills where 80 percent of sizes are greater than 3/4 in. (19 mm) Before construction begins, the borrow material selected shall be subject to show conformance with this frictional requirement. Compliance with the test requirements shall be the responsibility of the Contractor, who shall furnish a copy of the backfill test results prior to construction.

636.049 Crushed Stone for Abutment Foundation Crushed stone for use in the foundation layer below the abutment shall be crushed stone conforming to the requirements of MaineDOT Standard Specification Section 703.31.

636.050 Impervious Membrane An impervious geomembrane shall be installed near the top of the reinforced backfill to reduce the chance of water infiltrating into the reinforced backfill. The geomembrane shall be bonded to the inside face of the wall panels and extend perpendicularly from the wall face into the fill, while being parallel to the top of the wall. The membrane should

be sloped to drain away from the facing and outlet beyond the reinforcing zone. The impervious geomembrane shall extend into the fill a distance of 1 ft beyond the MSE reinforcement. The geomembrane shall have a minimum thickness of 30 mil (0.003 in)

The geomembrane shall have both sides textured with a rough finish to improve resistance against sliding. The texture shall be approved by the Resident before installation. The geomembrane shall be shown on the design drawings of the MSE submittal of the Contractor.

636.051 Acceptance of Material The Contractor shall furnish to the Resident a Certificate of Compliance certifying that the above materials comply with the applicable contract specifications including the backfill material, in accordance with Section 700. A copy of all test results performed by the Contractor necessary to assure contract compliance shall also be furnished to the Resident. Acceptance will be based on the Certificate of Compliance, accompanying test reports, and visual inspection by the Resident.

636.06 Submittals

A. Design computations demonstrating compliance with the criteria specified herein and shown on the plans, shall be prepared, signed and stamped by a licensed Professional Engineer licensed in the State of Maine and specializing in geotechnical engineering. Design calculations that consist of computer generated output shall be supplemented with at least one hand calculation and graphic demonstrating the design methodology used. Design calculations shall provide thorough documentation of the sources of equations used and material properties.

The design calculations shall include:

1. Statement of all assumptions made and copies of all references used in the calculations.
2. Analyses demonstrating compliance with all applicable earth, water, surcharges, seismic, or other loads, as specified herein and required by AASHTO LRFD.
3. Analyses or studies demonstrating durability and corrosion resistance of retaining wall systems for the proposed location and environment. The designer shall provide all corrosion protection devices necessary for the retaining wall to have a minimum service life of 100 years in the proposed location and environment.

B. A detailed resume of the wall designer listing similar projects with references, and demonstrating necessary experience to perform the MSE retaining wall design, including a brief description of each project that is similar in scope.

C. A detailed listing of MSE walls that the Contractor has constructed including a brief description of each project and a listing of personnel who will construct the walls

demonstrating their experience in construction of MSE retaining walls. A reference shall be included for each project listed. As a minimum, the reference shall include an individual's name, address and current phone number.

D. Manufacturer's product data for the MSE wall system, including material, manufacture and erection specifications, all specified erection equipment necessary, details of buried MSE wall elements, special details required of reinforcing layout around drainage structures and sign foundations, structures design properties, type of backfill and details for connections between facing panels.

E. Details of precast yard and concrete mix design.

F. Shop drawing showing the configuration and all details, dimensions, quantities and cross sections necessary to construct the MSE wall, including but not limited to the following:

1. A plan view of the wall, which shall include Contract limits, stations and offsets, and the face of wall line shown on the plans.

2. An elevation view of the wall which shall include the elevation at the top of the wall at all horizontal and vertical break points and at least every 50 ft along the face of the wall, all steps in the leveling pads, the designation as to the type of retaining wall system(s), and an indication of the final ground line and calculated factored bearing pressures. The face of wall shown on the plans shall be indicated.

3. A typical cross section or cross sections showing the elevation relationship between existing ground conditions and proposed grades, and the proposed wall configuration, including details for the proposed methods for connecting to existing conditions. The sections shall also indicate the location of the face of wall shown on the plans.

4. General notes pertaining to design criteria and wall construction.

5. A listing of material quantities for each wall.

6. Details of sleeves and pipes and other embedded items to be installed through the walls.

7. Clearly indicated details for construction of walls or reinforcing elements around drainage, foundations, utilities or any other potential obstructions.

8. Details of the architectural treatment of facing panels.

9. Drainage design detail and design scheme.

10. Location of utilities.

11. Sequence and schedule of construction, including overall construction schedule.

12. Methods of excavation and backfill.

13. Method of maintaining stability of excavated trenches.

14. Method of monitoring plumbness and deviation of wall.

15. Excavation support system, if any.

16. Any acceptance testing and frequency.

17. Details and location of all necessary construction and expansion joints along the wall.

18. Connection details at the interface of the wall and any adjacent proposed cast in place retaining wall or abutment structure.

19. Details of impermeable membrane connection to abutment in roadway runoff collection system.

636.07 Delivery, Storage and Handling

A. Contractor shall check the material upon delivery to assure that the proper material has been received. A product certification should be provided with each shipment.

B. Material shall be stored above -20° F

C. Contractor shall prevent excessive mud, wet cement, epoxy and like substances which may affix themselves to the material from coming in contact with the material.

D. Material may be laid flat and stored outside for 30 days. For extended storage, material shall be stored in or beneath a trailer or covered with a colored tarpaulin to prevent long-term exposure.

636.08 Wall Excavation The excavation and use as fill disposal of all excavated material shall meet the requirements of Section 203 - Excavation and Embankment, except as modified herein. Temporary excavation support as required shall be the responsibility of the contractor.

636.09 Foundation Preparation. The foundation for the structure shall be graded level for a width equal to the length of reinforcement elements plus 5 ft, or as shown on the plans. Prior to wall construction the foundation shall be compacted with at least 10 passes of a smooth wheel vibratory roller weighing at least 10,000 lbs. Any foundation soils found to be unsuitable or incapable of sustaining the required compaction shall be removed and replaced with 703.20, Gravel Borrow. The foundation for the structure shall be approved by the Resident before erection is started.

A concrete leveling pad shall be constructed as indicated on the submitted plans. The leveling pad shall be cast to the design elevations as shown on the plans. Allowable elevation tolerances are +0.01 ft and -0.02 ft from the design elevations. Placement of wall panels may begin after 24 hours curing time of the concrete leveling pad.

636.10 Wall Erection A field representative from the proprietary wall system being used shall be available, as needed, during the erection of the wall. The services of the representative shall be at no additional cost to the project.

Precast concrete panels and welded wire facing units shall be placed so that their final position is vertical or battered as shown on the plans. The vendor representative shall specify the required back-batter so that the final position of the wall is vertical. Earth berms at the footing

shall be placed to maintain the desired position of panels. For erection, panels are handled by means of lifting devices connected to the upper edge of the panel. Panels should be placed in successive horizontal lifts in the sequence shown on the approved shop drawings as backfill placement proceeds. As backfill material is placed behind the panels, the panels shall be maintained in position by means of temporary wedges or bracing according to the wall supplier's recommendations.

Concrete facing vertical tolerances and horizontal alignment tolerances shall not exceed $\frac{3}{4}$ inch when measured with a 10 ft straightedge ($\frac{1}{4}$ in/yd). During construction, the maximum allowable offset in any panel joint shall be $\frac{3}{4}$ in. The overall vertical tolerance of the wall (from top to bottom) shall not exceed $\frac{1}{2}$ inch per 10 ft of wall height.

636.11 Backfill Placement Backfill shall not be placed between November 1st and April 1st. Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed and compacted in such a manner as to avoid any damage or disturbance of the wall materials or misalignment of the facing panels or reinforcing elements. Any wall materials which become damaged during backfill placement shall be removed and replaced at the Contractor's expense. Any misalignment or distortion of the wall facing panels due to placement of backfill outside the limits of this specification shall be corrected by the Contractor at his expense. Prior to the placement of the soil reinforcement, the backfill elevation after compaction shall be at the required elevation of the reinforcements. At each reinforcement level, the backfill shall be placed to the level of the connection. Backfill placement methods near the panels shall assure that no voids exist directly beneath the reinforcing element.

Gravel borrow backfill shall be compacted in accordance with Subsection 203.12 except that the minimum required compaction shall be 92 percent of maximum density as determined by AASHTO T 180, Method C or D (with oversize correction, as outlined in Note 7 of that test). If 30 percent or more of the backfill material is greater than 19 mm [$\frac{3}{4}$ in] in size, AASHTO T 180 is not applicable, and the acceptance criterion for control of compaction shall be either a minimum of 70 percent of the relative density of the material as determined by ASTM D4253 and D4254, or a method of compaction consisting of at least 4 (four) passes by a heavy roller.

Where spread footings support bridge or other structural loads, the top 5 ft below the bottom of footing elevation shall be compacted to 98 percent of the maximum density as determined by AASHTO T 180, Method C or D (with oversize correction, as outlined in Note 7 of that test).

The moisture content (determined in accordance with AASHTO T 180, Method C or D) of the backfill material prior to and during compaction shall be uniformly distributed throughout each layer. Backfill materials shall be placed at a moisture content not more than 2 percentage points less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniformly acceptable throughout the entire lift.

At each reinforcing level, backfill shall be leveled before placing and bolting the reinforcing. The maximum lift thickness after compaction shall not exceed 12 in. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density.

Heavy compaction equipment shall not be used to compact backfill within 3 ft of the wall face. Compaction within 3 ft of the back face of the wall shall be achieved by at least three (3) passes of lightweight mechanical tamper, lightweight roller, or vibratory system. The specified lift thickness shall be adjusted as warranted by the type of compaction equipment actually used. No vehicular equipment shall be operated within 3 ft of the panels.

The frequency of sampling of the backfill material necessary to assure gradation control throughout construction shall be as directed by the Resident.

At the end of each day's operation, the Contractor shall slope the last level of the backfill away from the wall facing to rapidly direct runoff away from the wall face. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

636.12 Reinforcement Placement Prior to placing the first layer of reinforcements (strips, mats or grids), backfill shall be placed and compacted in accordance with Subsection 636.11, Backfill Placement.

Bending of reinforcements in the horizontal plane resulting in a permanent deformation in their alignment shall not be allowed. Gradual bending in the vertical direction that does not result in permanent deformations is allowable.

Cutting of longitudinal or transverse reinforcement bars to avoid conflicts with utility obstructions or piles will not be allowed. A structural connection (yokes) from the wall panel to the reinforcement shall be used whenever it is necessary to avoid cutting or excessive skewing of reinforcement due to pile or utility conflicts.

Soil reinforcements shall be placed normal to the face of the wall, unless otherwise shown on the plans or directed by the Resident. If skewing of the soil reinforcements is required due to obstructions in the reinforced fill, rotatable bolted connections shall be used and the maximum skew angle shall not exceed 15° from the normal position except in the case of acute corner where redundant reinforcements are used. The tensile capacity of splayed reinforcement shall be reduced by the cosine of the splay angle.

636.13 Method of Measurement Mechanically Stabilized Earth Retaining Wall will be measured by the square foot of face area computed using the plan dimensions. No adjustment in the pay quantity will be made if the computed quantity, based on the working drawings, varies from the plan quantity.

Vertical dimension limits will be from the top of leveling pad or arch deck to the top of the wall facing units, as shown on the plans. The horizontal dimension limits will be from the edges

of the facing units at each end of a wall, as shown on the plans. No field measurements will be made unless the Resident specifies, in writing, a change to the limits indicated on the plans.

The wall surface area, as shown on the plans, includes the surface area of nominal panel joint openings and wall penetrations such as pipes and other utilities.

636.14 Basis of Payment The accepted quantity of Mechanically Stabilized Earth Retaining Wall will be paid for at the contract unit price per square foot. Payment shall be full compensation for design, fabrication and erection of MSE retaining walls, furnishing all labor, equipment and materials including concrete face panels, welded wire facing units, fasteners, reinforcing mesh, reinforcing strips, tie strips, hardware, joint fillers, coping, woven drainage geotextile, soil retention fabric, impervious membrane, select granular backfill, excavation to subgrade and technical field representative. Cost of cast-in-place concrete for leveling pad will not be paid for separately but will be considered incidental to the Mechanically Stabilized Earth Retaining Wall.

Any extra excavation due to unsuitable foundation material, will be measured and paid for under Item 203.20 - Common Excavation. Foundation material and select backfill material in the reinforced zone will be considered incidental to the Mechanically Stabilized Earth Retaining Walls.

The unit price for Mechanically Stabilized Earth Wall shall include costs for:

1. All design work, preparation of written submittals and plans, revision of submittals, sample submittals and any other necessary preliminary work prior to and after acceptance of the retaining wall by the Resident.
2. All materials, including transportation, for the MSE walls, including facing panels, welded wire facing units, MSE reinforcing elements, attachment devices, fasteners, bearing blocks and shims, joint materials, soil retention fabric, copings, vertical corner elements, concrete masonry, reinforcing steel, crushed stone, select backfill and incidentals.
3. All labor and equipment required to excavate and prepare the wall foundation, form and cast the leveling pad, erect the MSE wall to the lines and grades shown on the plans, place and compact backfill, place and compact the drainage layer, and construct any other items necessary to complete the MSE wall.
4. All temporary sheeting, temporary excavation, and temporary dewatering necessary to perform the other work in this section.

There will be no allowance for excavating and backfilling for the Mechanically Stabilized Earth Retaining Wall beyond the limits shown on the approved submitted plans, except for excavation required to remove unsuitable subsoil in preparation for the foundation.

Payment will be made under:

Lagrange
B&A Overhead Bridge Replacement
WIN 18237.00
May 2, 2012
Pay Unit

Pay Item

636.40 Mechanically Stabilized Earth Retaining Wall

Square foot