

Updated 04/30/13

FEDERAL PROJECT

BIDDING INSTRUCTIONS

FOR ALL PROJECTS:

1. Use pen and ink to complete all paper Bids.
2. As a minimum, the following must be received prior to the time of Bid opening:

For a Paper Bid:

- a) a copy of the Notice to Contractors, b) the completed Acknowledgement of Bid Amendments form, c) the completed Schedule of Items, d) two copies of the completed and signed Contract Offer, Agreement & Award form, e) a Bid Guaranty, (if required), and f) any other certifications or Bid requirements listed in the Bid Documents as due by Bid opening.

For an Electronic Bid:

- a) a completed Bid using Expedite® software and submitted via the Bid Express™ web-based service, b) an electronic Bid Guaranty (if required) or a faxed copy of a Bid Bond (with original to be delivered within 72 hours), and c) any other Certifications or Bid requirements listed in the Bid Documents as due by Bid opening.
3. Include prices for all items in the Schedule of Items (excluding non-selected alternates).
4. Bid Guaranty acceptable forms are:
 - a) a properly completed and signed Bid Bond on the Department's prescribed form (or on a form that does not contain any significant variations from the Department's form as determined by the Department) for 5% of the Bid Amount or
 - b) an Official Bank Check, Cashier's Check, Certified Check, U.S. Postal Money Order or Negotiable Certificate of Deposit in the amount stated in the Notice to Contractors or
 - c) an electronic bid bond submitted with an electronic bid.
5. If a paper Bid is to be sent, "FedEx First Overnight" delivery is suggested as the package is delivered directly to the DOT Headquarters Building located at 16 Child Street in Augusta. Other means, such as U.S. Postal Service's Express Mail has proven not to be reliable.

IN ADDITION, FOR FEDERAL AID PROJECTS:

6. Complete the DBE Proposed Utilization form, and submit with your bid. If you are submitting your bid electronically, you must FAX the form to (207) 624-3431. This is a curable defect.

*If you need further information regarding Bid preparation, call the DOT
Contracts Section at (207) 624-3410.*

*For complete bidding requirements, refer to Section 102 of the Maine Department
of Transportation, Standard Specifications, Revision of December 2002.*

NOTICE

The Maine Department of Transportation is attempting to improve the way Bid Amendments/Addendums are handled, and allow for an electronic downloading of bid packages from our website, while continuing to maintain an optional planholders list.

Prospective bidders, subcontractors or suppliers who wish to download a copy of the bid package and receive a courtesy notification of project specific bid amendments, must provide an email address to Diane Barnes or David Venner at the MDOT Contracts mailbox at: MDOT.contracts@maine.gov. Each bid package will require a separate request.

Additionally, interested parties will be responsible for reviewing and retrieving the Bid Amendments from our web site, and acknowledging receipt and incorporating those Bid Amendments in their bids using the Acknowledgement of Bid Amendment Form.

The downloading of bid packages from the MDOT website is not the same as providing an electronic bid to the Department. Electronic bids must be submitted via <http://www.BIDX.com>. For information on electronic bidding contact Patrick Corum at patrick.corum@maine.gov , Rebecca Snowden at rebecca.snowden@maine.gov or Diane Barnes at diane.barnes@maine.gov.

NOTICE

For security and other reasons, all Bid Packages which are mailed, shall be provided in double (one envelope inside the other) envelopes. The *Inner Envelope* shall have the following information provided on it:

Bid Enclosed - Do Not Open

PIN:

Town:

Date of Bid Opening:

Name of Contractor with mailing address and telephone number:

In Addition to the usual address information, the *Outer Envelope* should have written or typed on it:

Double Envelope: Bid Enclosed

PIN:

Town:

Date of Bid Opening:

Name of Contractor:

This should not be much of a change for those of you who use Federal Express or similar services.

Hand-carried Bids may be in one envelope as before, and should be marked with the following information:

Bid Enclosed: Do Not Open

PIN:

Town:

Name of Contractor:

October 16, 2001

STATE OF MAINE DEPARTMENT OF TRANSPORTATION
Bid Guaranty-Bid Bond Form

KNOW ALL MEN BY THESE PRESENTS THAT _____

_____ of the City/Town of _____ and State of _____

as Principal, and _____ as Surety, a

Corporation duly organized under the laws of the State of _____ and having a usual place of

Business in _____ and hereby held and firmly bound unto the Treasurer of

the State of Maine in the sum of _____ for payment which Principal and Surety bind

themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

The condition of this obligation is that the Principal has submitted to the Maine Department of

Transportation, hereafter Department, a certain bid, attached hereto and incorporated as a

part herein, to enter into a written contract for the construction of _____

_____ and if the Department shall accept said bid

and the Principal shall execute and deliver a contract in the form attached hereto (properly

completed in accordance with said bid) and shall furnish bonds for this faithful performance of

said contract, and for the payment of all persons performing labor or furnishing material in

connection therewith, and shall in all other respects perform the agreement created by the

acceptance of said bid, then this obligation shall be null and void; otherwise it shall remain in full

force, and effect.

Signed and sealed this _____ day of _____ 20_____

WITNESS:

WITNESS

PRINCIPAL:

By _____

By: _____

By: _____

SURETY:

By _____

By: _____

Name of Local Agency: _____

NOTICE

Bidders:

Please use the attached “Request for Information” form when faxing questions and comments concerning specific Contracts that have been Advertised for Bid. Include additional numbered pages as required. Questions are to be faxed to the number listed in the Notice to Contractors. This is the only allowable mechanism for answering Project specific questions. Maine DOT will not be bound to any answers to Project specific questions received during the Bidding phase through other processes.

NOTICE

Disadvantaged Business Enterprise Proposed Utilization

The Apparent Low Bidder shall submit the Disadvantaged Business Enterprise Proposed Utilization form with their bid. This is a curable bid defect.

The Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan form contains additional information that is required by USDOT.

The Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan form should be used.

A copy of the new Contractor's Disadvantaged Business Enterprise Proposed Utilization Plan and instructions for completing it are attached.

Note: Questions about DBE firms, or to obtain a printed copy of the DBE Directory, contact The Office of Civil Rights at (207) 624-3066.

MDOT's DBE Directory of Certified firms can also be obtained at www.maine.gov/mdot/disadvantaged-business-enterprises/dbe-home.php

INSTRUCTIONS FOR PREPARING THE MaineDOT CONTRACTOR'S DBE/SUBCONTRACTOR UTILIZATION FORM

The Contractor Shall Extend equal opportunity to MaineDOT certified DBE firms (as listed in MaineDOT's DBE Directory of Certified Businesses) in the selection and utilization of Subcontractors and Suppliers.

SPECIFIC INSTRUCTIONS FOR COMPLETING THE FORM:

Insert Contractor name, the name of the person(s) preparing the form, and that person(s) telephone, fax number and e-mail address.

Calculate and provide percentage of your bid that will be allocated to DBE firms, Federal Project Identification Number, and location of the Project work.

In the columns, name each subcontractor, DBE and non-DBE firm to be used, provide the Unit/Item cost of the work/product to be provided by the subcontractor, give a brief description and the dollar value of the work.

Revised 1/12

DBE GOAL NOTICE
Maine Department of Transportation
Disadvantaged Business Enterprise Program

Notice is hereby given that in accordance with US DOT regulation 49 CFR Part 26, the Maine Department of Transportation has established a DBE Program for disadvantaged business participation in the federal-aid highway and bridge construction program; MaineDOT contracts covered by the program include consulting, construction, supplies, manufacturing, and service contracts.

For FFY 2013-15 (October 1, 2012 through September 30, 2015) MaineDOT has established an annual DBE participation goal of **4.0%** to be achieved through race/gender neutral means. This goal has been approved by the Federal Highway Administration and remains in effect through September 30, 2015. Maine DOT must meet this goal each federal fiscal year. If the goal is not met, MaineDOT must provide a justification for not meeting the goal and provide a plan to ensure the goal is met, which may include contract goals on certain projects that contractors will be required to meet.

MaineDOT asks all contractors, consultants and subcontractors to seek certified DBE firms for projects and to work to meet the determined 4.0% goal without the need to impose contract goals. DBE firms are listed on the MaineDOT website at:

<http://www.maine.gov/mdot/disadvantaged-business-enterprises/pdf/directory.pdf>

Interested parties may view MaineDOT's DBE goal setting methodology also posted on this website. If you have questions regarding this goal or the DBE program you may contact Sherry Tompkins at the Maine Department of Transportation, Civil Rights Office by telephone at (207) 624-3066 or by e-mail at: sherry.tompkins@maine.gov

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**MaineDOT CONTRACTOR'S DBE/SUBCONTRACTOR
PROPOSED UTILIZATION FORM**

All Bidders must furnish this form with their bid on Bid Opening day

Contractor: _____ **Telephone:** _____ **Ext** _____

Contact Person: _____ **Fax:** _____

E-mail: _____

BID DATE: _____

FEDERAL PROJECT PIN # _____ **PROJECT LOCATION:** _____

TOTAL ANTICIPATED DBE ____ % PARTICIPATION FOR THIS CONTRACT

W B E	D B E	Non DBE	Firm Name	Item Number & Description of Work	Quantity	Cost Per Unit/Item	Anticipated \$ Value
Subcontractor Total >							
DBE Total >							

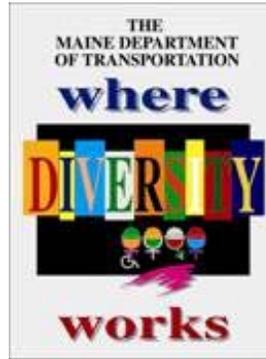
**NOTE: THIS INFORMATION IS USED TO TRACK AND REPORT ANTICIPATED DBE PARTICIPATION IN ALL
FEDERALLY FUNDED MAINE DOT CONTRACTS. THE ANTICIPATED DBE AMOUNT IS VOLUNTARY AND WILL
NOT BECOME A PART OF THE CONTRACTUAL TERMS.**

Equal Opportunity Use:

Form received: ___/___/___ Verified by: _____

FHWA FTA FAA

**For a complete list of certified firms and company designation (WBE/DBE) go to
<http://www.maine.gov/mdot>**



**Maine Department of Transportation Civil
Rights Office**

**Directory of Certified Disadvantaged Business
Enterprises**

Listing can be found at:

**[www.maine.gov/mdot/disadvantaged-business-
enterprises/dbe-home.php](http://www.maine.gov/mdot/disadvantaged-business-enterprises/dbe-home.php)**

**For additional information and guidance contact: Civil
Rights Office at (207) 624-3066**

*It is the responsibility of the Contractor to access
the DBE Directory at this site in order to have
the most current listings.*

Vendor Registration

Prospective Bidders must register as a vendor with the Department of Administrative & Financial Services if the vendor is awarded a contract. Vendors will not be able to receive payment without first being registered. Vendors/Contractors will find information and register through the following link –

<http://www.maine.gov/purchases/venbid/index.shtml>

STATE OF MAINE DEPARTMENT OF TRANSPORTATION NOTICE TO CONTRACTORS

Sealed Bids addressed to the Maine Department of Transportation, Augusta, Maine 04333 and endorsed on the wrapper "Bids for The Gut Bridge Replacement in the town of **SOUTH BRISTOL**" will be received from contractors at the Reception Desk, Maine DOT Building, Capitol Street, Augusta, Maine, until 11:00 o'clock A.M. (prevailing time) on April 30, 2014 and at that time and place publicly opened and read. Bids will be accepted from all bidders. The lowest responsive bidder must have completed, or successfully complete, a bridge, highway, or project specific prequalification to be considered for the award of this contract. **We now accept electronic bids for those bid packages posted on the bidx.com website. Electronic bids do not have to be accompanied by paper bids. Please note: the Department will accept a facsimile of the bid bond; however, the original bid bond must then be received at the MDOT Contract Section within 72 hours of the bid opening.** Until further notice, dual bids (one paper, one electronic) will be accepted, with the paper copy taking precedence.

Description: Maine Federal Aid Project No. BH-1675(000)X, WIN 016750.00

Location: In Lincoln County, project is located on route 129 over the Gut approximately 0.17 mile northerly of the West Side road.

Scope of Work: The Gut Bridge replacement plus other incidental work.

For general information regarding Bidding and Contracting procedures, contact George Macdougall at (207)624-3410. Our webpage at <http://www.maine.gov/mdot/contractors/> contains a copy of the schedule of items, Plan Holders List, written portions of bid amendments (not drawings), and bid results. For Project-specific information fax all questions to **Project Manager Steve Bodge** at (207)624-3431. Questions received after 12:00 noon of Monday prior to bid date will not be answered. Bidders shall not contact any other Departmental staff for clarification of Contract provisions, and the Department will not be responsible for any interpretations so obtained. TTY users call Maine Relay 711.

Plans, specifications and bid forms may be seen at the Maine DOT Building in Augusta, Maine. They may be purchased from the Department between the hours of 8:00 a.m. to 4:30 p.m. by cash, credit card (Visa/Mastercard) or check payable to Treasurer, State of Maine sent to Maine Department of Transportation, Attn.: Mailroom, 16 State House Station, Augusta, Maine 04333-0016. They also may be purchased by telephone at (207) 624-3536 between the hours of 8:00 a.m. to 4:30 p.m. Full size plans \$141.00 (\$149.00 by mail). Half size plans \$70.50 (\$74.50 by mail), Bid Book \$10 (\$13 by mail), Single Sheets \$2, payment in advance, all non-refundable.

Each Bid must be made upon blank forms provided by the Department and must be accompanied by a bid bond at 5% of the bid amount or an official bank check, cashier's check, certified check, certificate of deposit, or United States postal money order in the amount of \$215,000.00 payable to Treasurer, State of Maine as a Bid guarantee. A Contract Performance Surety Bond and a Contract Payment Surety Bond, each in the amount of 100 percent of the Contract price, will be required of the successful Bidder.

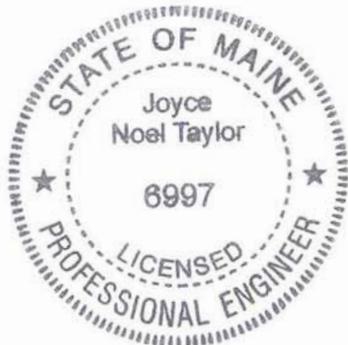
This Contract is subject to all applicable Federal Laws. This contract is subject to compliance with the Disadvantaged Business Enterprise program requirements as set forth by the Maine Department of Transportation.

All work shall be governed by "State of Maine, Department of Transportation, Standard Specifications, Revision of December 2002", price \$10 [\$13 by mail], and Standard Details, Revision of December 2002, price \$20 [\$25 by mail]. They also may be purchased by telephone at (207) 624-3536 between the hours of 8:00 a.m. to 4:30 p.m. Standard Detail updates can be found at <http://www.maine.gov/mdot/contractors/publications/>.

The right is hereby reserved to the Maine DOT to reject any or all bids.

Augusta, Maine
February 5, 2014

JOYCE NOEL TAYLOR P.E.
CHIEF ENGINEER



**SPECIAL PROVISION 102.7.3
ACKNOWLEDGMENT OF BID AMENDMENTS**

With this form, the Bidder acknowledges its responsibility to check for all Amendments to the Bid Package. For each Project under Advertisement, Amendments are located at <http://www.maine.gov/mdot/contractors/> . It is the responsibility of the Bidder to determine if there are Amendments to the Project, to download them, to incorporate them into their Bid Package, and to reference the Amendment number and the date on the form below. The Maine DOT will not post Bid Amendments any later than noon the day before Bid opening without individually notifying all the planholders.

Amendment Number	Date

The Contractor, for itself, its successors and assigns, hereby acknowledges that it has received all of the above referenced Amendments to the Bid Package.

CONTRACTOR

Date

Signature of authorized representative

(Name and Title Printed)

NOTICE

All bids for Federal Projects **shall** be accompanied by the DBE Proposed Utilization form. If you are submitting an electronic bid, the DBE Utilization Form may be faxed to 207-624-3431. Failure to submit the form with the bid will be considered a curable defect.

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 1
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
SECTION 0001 PROJECT ITEMS						
0010	107.51 PROSECUTION OF WORK - INITIAL SCHEDULE	LUMP	LUMP			
0020	107.52 PROSECUTION OF WORK - MONTHLY UPDATE	EA 28.000				
0030	202.08 REMOVING BUILDING NO. : CONTROL HOUSE	LUMP	LUMP			
0040	202.13 REMOVING EXISTING RAILINGS (RETAINED BY DEPARTMENT)	LF 94.000				
0050	202.19 REMOVING EXISTING BRIDGE	LUMP	LUMP			
0060	202.55 REMOVE AND DISPOSE ADVANCED WARNING SIGN SYSTEM	LUMP	LUMP			
0070	203.20 COMMON EXCAVATION	CY 791.000				
0080	203.21 ROCK EXCAVATION	CY 20.000				
0090	203.2311 2,000 - GALLON ON-SITE HOLDING TANK	EA 1.000				
0100	203.24 COMMON BORROW	CY 10.000				

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 2
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0110	203.25 GRANULAR BORROW	CY 760.000				
0120	203.35 CRUSHED STONE FILL	CY 1540.000				
0130	206.082 STRUCTURAL EARTH EXCAVATION - MAJOR STRUCTURES	CY 1820.000				
0140	206.10 STRUCTURAL EARTH EXCAVATION - PIERS	CY 690.000				
0150	304.10 AGGREGATE SUBBASE COURSE - GRAVEL	CY 500.000				
0160	403.208 HOT MIX ASPHALT 12.5 MM HMA SURFACE	T 141.000				
0170	403.209 HOT MIX ASPHALT 9.5 MM (SIDEWALKS, DRIVES, INCIDENTALS)	T 6.000				
0180	403.213 HOT MIX ASPHALT 12.5 MM BASE	T 160.000				
0190	409.15 BITUMINOUS TACK COAT - APPLIED	G 31.000				
0200	462.30 ULTRATHIN BONDED WEARING COURSE	SY 125.000				
0210	501.220 MICRO PILES	EA 26.000				

SCHEDULE OF ITEMS

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0220	501.57 STEEL W24X103 PILES, DELIVERED	1079.000 LF				
0230	501.571 STEEL W24X103 PILES, IN PLACE	1079.000 LF				
0240	501.802 ROCK SOCKET 36 INCH DIAMETER	382.000 LF				
0250	501.804 DRILLING EQUIPMENT MOBILIZATION	LUMP	LUMP			
0260	502.21 STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS	120.000 CY				
0270	502.22 STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS (PLACED UNDER WATER)	400.000 CY				
0280	502.23 STRUCTURAL CONCRETE PIERS	140.000 CY				
0290	502.24 STRUCTURAL CONCRETE PIERS (PLACED UNDER WATER)	52.000 CY				
0300	502.31 STRUCTURAL CONCRETE APPROACH SLABS	LUMP	LUMP			
0310	502.56 CONCRETE FILL	4.000 CY				
0320	503.171 MECHANICAL / WELDED SPLICE	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

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DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0330	503.30 CORROSION RESISTANT REINFORCING SYSTEM, FABRICATED AND DELIVERED	LB 169200.000				
0340	503.31 CORROSION RESISTANT REINFORCING SYSTEM, PLACING	LB 169200.000				
0350	504.60 TIMBER FENDER SYSTEM	LUMP	LUMP			
0360	504.692 FURNISH AND INSTALL STAY CABLES	LUMP	LUMP			
0370	504.693 JACKING STAY CABLES	LUMP	LUMP			
0380	504.701 STRUCTURAL STEEL FABRICATED AND DELIVERED, ROLLED	LUMP	LUMP			
0390	504.702 STRUCTURAL STEEL FABRICATED AND DELIVERED, WELDED	LUMP	LUMP			
0400	504.709 BRIDGE HARDWARE	LUMP	LUMP			
0410	504.71 STRUCTURAL STEEL ERECTION	LUMP	LUMP			
0420	504.9068 PERMANENT GROUTED TIEBACKS, FURNISHED, INSTALLED, AND ACCEPTED	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 5
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0430	504.9069 PERFORMANCE TEST, GROUTED TIEBACK	EA 4.000				
0440	505.08 SHEAR CONNECTORS	LUMP	LUMP			
0450	506.9102 ZINC RICH COATING SYSTEM (SHOP APPLIED)	LUMP	LUMP			
0460	506.9103 GALVANIZING	LUMP	LUMP			
0470	506.9104 THERMAL SPRAY COATING - SHOP APPLIED	LUMP	LUMP			
0480	506.9105 POLYUREA ELASTOMER COATING	LUMP	LUMP			
0490	507.084 STEEL PIPE HAND RAILING	LF 320.000				
0500	507.092 ALUMINUM BRIDGE RAILING, 2 BAR	LF 70.000				
0510	508.14 HIGH PERFORMANCE WATERPROOFING MEMBRANE	LUMP	LUMP			
0520	509.70 COMPOSITE BEAM	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION

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SCHEDULE OF ITEMS

DATE: 140203

REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0530	510.10 SPECIAL DETOUR ROADWAY WIDTH VEHICULAR & PEDESTRIAN TRAFFIC NOT SEPARATED 18'	LUMP	LUMP			
0540	511.07 COFFERDAM: No. 1	LUMP	LUMP			
0550	511.07 COFFERDAM: No. 2	LUMP	LUMP			
0560	511.07 COFFERDAM: No. 3	LUMP	LUMP			
0570	511.07 COFFERDAM: No. 5	LUMP	LUMP			
0580	511.07 COFFERDAM: No. 4	LUMP	LUMP			
0590	512.081 FRENCH DRAINS	LUMP	LUMP			
0600	513.22 CRUSHED STONE SLOPE PROTECTION	SY 355.000				
0610	514.06 CURING BOX FOR CONCRETE CYLINDERS	EA 1.000				
0620	515.21 PROTECTIVE COATING FOR CONCRETE SURFACES	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

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DATE: 140203
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CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0630	520.2024 CLOSED CELL SEAL	70.000 LF				
0640	520.232 EXPANSION DEVICE - ASPHALTIC PLUG JOINT	52.000 LF				
0650	523.52 BEARING INSTALLATION	2.000 EA				
0660	523.5306 BASCULE GIRDER BEARING	2.000 EA				
0670	526.301 TEMPORARY CONCRETE BARRIER TYPE I	LUMP	LUMP			
0680	526.321 PERMANENT CONCRETE BARRIER TYPE III A	LUMP	LUMP			
0690	526.3401 PERMANENT CONCRETE TRANSITION BARRIER - MODIFIED	4.000 EA				
0700	527.34 WORK ZONE CRASH CUSHIONS	4.000 UN				
0710	534.7602 PRECAST PIER	LUMP	LUMP			
0720	535.33 PRECAST CONCRETE LAGGING, FABRICATION AND DELIVERY	4640.000 SF				
0730	535.34 PRECAST CONCRETE LAGGING, INSTALLATION	4640.000 SF				

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

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CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0740	606.23 GUARDRAIL TYPE 3C - SINGLE RAIL	100.000 LF				
0750	606.231 GUARDRAIL TYPE 3C - 15 FOOT RADIUS AND LESS	12.500 LF				
0760	606.265 TERMINAL END - SINGLE RAIL - GALVANIZED STEEL	8.000 EA				
0770	606.353 REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	7.000 EA				
0780	607.19 CHAIN LINK FENCE - 8 FOOT	26.000 LF				
0790	607.2313 CHAIN FENCE GATE 4 FOOT X 8 FOOT OPENING	1.000 EA				
0800	608.26 CURB RAMP DETECTABLE WARNING FIELD	16.000 SF				
0810	609.11 VERTICAL CURB TYPE 1	35.000 LF				
0820	609.12 VERTICAL CURB TYPE 1 - CIRCULAR	13.000 LF				
0830	610.08 PLAIN RIPRAP	270.000 CY				
0840	610.16 HEAVY RIPRAP	115.000 CY				

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

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PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0850	615.07 LOAM	CY 5.000				
0860	618.1301 SEEDING METHOD NUMBER 1 - PLAN QUANTITY	UN 1.000				
0870	619.1201 MULCH - PLAN QUANTITY	UN 1.000				
0880	619.1401 EROSION CONTROL MIX	CY 5.000				
0890	620.58 EROSION CONTROL GEOTEXTILE	SY 400.000				
0900	620.60 SEPARATION GEOTEXTILE	SY 570.000				
0910	626.11 PRECAST CONCRETE JUNCTION BOX	EA 3.000				
0920	626.32 24 INCH FOUNDATION	EA 2.000				
0930	626.35 CONTROLLER CABINET FOUNDATION	EA 1.000				
0940	626.37 SPECIAL FOUNDATION	EA 6.000				
0950	627.733 4" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	LF 1200.000				

MAINE DEPARTMENT OF TRANSPORTATION
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PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
0960	627.75 WHITE OR YELLOW PAVEMENT & CURB MARKING	SF 52.000				
0970	627.76 TEMPORARY PAVEMENT MARKING LINE, WHITE OR YELLOW	LUMP	LUMP			
0980	627.77 REMOVING PAVEMENT MARKINGS	SF 302.000				
0990	629.05 HAND LABOR, STRAIGHT TIME	HR 20.000				
1000	631.12 ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	HR 20.000				
1010	631.14 GRADER (INCLUDING OPERATOR)	HR 20.000				
1020	631.15 ROLLER, EARTH AND BASE COURSE (INCLUDING OPERATOR)	HR 20.000				
1030	631.172 TRUCK - LARGE (INCLUDING OPERATOR)	HR 20.000				
1040	634.160 HIGHWAY LIGHTING	LUMP	LUMP			
1050	634.168 PUMP EQUIPMENT & WIRING	LUMP	LUMP			
1060	634.2042 LED LUMINARIES	EA 2.000				

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 11
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1070	635.31 PREFAB CONCRETE BLOCK GRAVITY WALL	SF 355.000				
1080	635.40 PRECAST AGGREGATE FILLED CONCRETE BLOCK GRAVITY WALL	SF 355.000				
1090	637.071 DUST CONTROL	LUMP	LUMP			
1100	638.02 NAVIGATION LIGHTS	LUMP	LUMP			
1110	639.18 FIELD OFFICE TYPE A	EA 1.000				
1120	643.01 TRAFFIC SIGNALS AND GATES	LUMP	LUMP			
1130	643.60 FLASHING BEACON AT: NORTH APPROACH	LUMP	LUMP			
1140	643.60 FLASHING BEACON AT: SOUTH APPROACH	LUMP	LUMP			
1150	643.72 TEMPORARY TRAFFIC SIGNAL	LUMP	LUMP			
1160	643.80 TRAFFIC SIGNALS AT NORTH APPROACH	LUMP	LUMP			
1170	643.80 TRAFFIC SIGNALS AT SOUTH APPROACH	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION

PAGE: 12

SCHEDULE OF ITEMS

DATE: 140203

REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1180	643.92 PEDESTAL POLE	EA 2.000				
1190	643.94 DUAL PURPOSE POLE 10 FT ARM	EA 1.000				
1200	643.94 DUAL PURPOSE POLE 22 FT ARM	EA 1.000				
1210	643.96 DRAW BRIDGE WARNING SIGN	EA 2.000				
1220	645.51 SPECIAL SIGNING	LUMP	LUMP			
1230	652.312 TYPE III BARRICADE	EA 2.000				
1240	652.33 DRUM	EA 30.000				
1250	652.34 CONE	EA 30.000				
1260	652.35 CONSTRUCTION SIGNS	SF 400.000				
1270	652.361 MAINTENANCE OF TRAFFIC CONTROL DEVICES	LUMP	LUMP			
1280	652.38 FLAGGER	HR 1000.000				

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 13
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1290	653.23 3 INCH POLYSTYRENE PLASTIC INSULATION	45.000 SY				
1300	655.01 ENGINE - GENERATOR SYSTEM STANDBY	LUMP	LUMP			
1310	655.3001 BRIDGE ELECTRICAL AND CONTROL SYSTEM	LUMP	LUMP			
1320	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP	LUMP			
1330	659.10 MOBILIZATION	LUMP	LUMP			
1340	660.21 ON-THE-JOB TRAINING (BID)	1000.000 HR				
1350	815.00 BUILDING 1, CONTROL HOUSE	LUMP	LUMP			
1360	841.48 BOLLARDS	3.000 EA				
1370	845.20 UTILITY ACCESS DOOR	LUMP	LUMP			
1380	860.11 BRIDGE OPERATING MACHINERY DELIVERED	LUMP	LUMP			
1390	860.12 BRIDGE OPERATING MACHINERY INSTALLATION	LUMP	LUMP			

MAINE DEPARTMENT OF TRANSPORTATION
SCHEDULE OF ITEMS

PAGE: 14
DATE: 140203
REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
1400	860. 13 BRIDGE TRUNION MACHINERY DELIVERED	LUMP	LUMP			
1410	860. 14 BRIDGE TRUNION MACHINERY INSTALLATION	LUMP	LUMP			
1420	860. 15 BRIDGE SPAN LOCK MACHINERY DELIVERED	LUMP	LUMP			
1430	860. 16 BRIDGE SPAN LOCK MACHINERY INSTALLATION	LUMP	LUMP			
1440	880. 02 BRIDGE BALANCING	LUMP	LUMP			
1450	880. 031 BALANCE BLOCK	LUMP	LUMP			
1460	880. 112 COUNTERWEIGHT CONCRETE	LUMP	LUMP			
1470	910. 301 SPECIAL WORK BRIDGE OPERATION TRAINING	LUMP	LUMP			
1480	910. 301 SPECIAL WORK FIELD TESTING	LUMP	LUMP			
1490	910. 301 SPECIAL WORK OPERATION AND MAINTENANCE MANUALS	LUMP	LUMP			
1500	910. 301 SPECIAL WORK STAFF GAUGES	LUMP	LUMP			
	SECTION 0001 TOTAL					

MAINE DEPARTMENT OF TRANSPORTATION

PAGE: 15

SCHEDULE OF ITEMS

DATE: 140203

REVISED:

CONTRACT ID: 016750.00

PROJECT(S): BH-01675(000)X

CONTRACTOR : _____

LINE NO	ITEM DESCRIPTION	APPROX. QUANTITY AND UNITS	UNIT PRICE		BID AMOUNT	
			DOLLARS	CTS	DOLLARS	CTS
	TOTAL BID					

SOUTH BRISTOL
ROUTE 129 AND THE GUT BRIDGE #2339
HIGHWAY RECONSTRUCTION AND BRIDGE REPLACEMENT
PIN 16750.00

GENERAL NOTE

A Maine Department of Transportation (MaineDOT) Environmental Office investigation associated with this project discovered data suggesting petroleum related contamination was present at roughly MaineDOT station 118+00 to roughly MaineDOT station 119+00. Subsequent on-site work confirmed petroleum contamination. However, based on the scope of work presented, available data suggests that this contamination may be deeper than and adjacent to any work proposed in this area.

In light of MaineDOT's findings, the contractor shall employ appropriate health and safety measures to protect its workers against hazards associated with working near petroleum-impacted soils. Furthermore, the Contractor shall remain alert for any additional evidence of contamination. If the Contractor encounters evidence of soil or groundwater contamination, the Contractor shall secure the excavation, stop work in the contaminated area, and immediately notify the Resident. The Resident shall contact the Hydrogeologist in MDOT's Environmental Office at 207-624-3100 and the Maine Department of Environmental Protection at 800-482-0777. Work may only continue with authorization from the Resident.

CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street, Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

_____ a corporation or other legal entity organized under the laws of the State of _____, with its principal place of business located at _____

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

A. The Work.

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, WIN **016750.00**, for **The Gut Bridge replacement** in the town of **South Bristol**, County of **Lincoln**, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

B. Time.

The Contractor agrees to complete all Work, except warranty work, on or before **November 15, 2016**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

C. Price.

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is _____

_____ \$ _____ Performance Bond and Payment Bond each being 100% of the amount of this Contract.

D. Contract.

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

E. Certifications.

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in the Federal Contract Provisions Supplement, and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

F. Offer.

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of: **WIN 016750.00 The Gut Bridge replacement plus other incidental work**, State of Maine, on which bids will be received until the time specified in the “Notice to Contractors” do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached “Schedule of Items”.

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached “Schedule of Items” in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached “Schedule of Items”, which may be ordered by the Resident, and to accept as full compensation the amount determined upon a “Force Account” basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier’s check, certificate of deposit or U. S. Postal Money Order in the amount given in the “Notice to Contractors”, payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor’s Disadvantaged Business Enterprise Utilization Plan with their bid.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

Date

(Signature of Legally Authorized Representative
of the Contractor)

Witness

(Name and Title Printed)

G. Award.

Your offer is hereby accepted.
documents referenced herein.

This award consummates the Contract, and the

MAINE DEPARTMENT OF TRANSPORTATION

Date

By: David Bernhardt, Commissioner

Witness

CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street, Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

_____ a corporation or other legal entity organized under the laws of the State of _____, with its principal place of business located at _____

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

A. **The Work.**

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, WIN **016750.00**, for **The Gut Bridge replacement** in the town of **South Bristol**, County of **Lincoln**, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

B. **Time.**

The Contractor agrees to complete all Work, except warranty work, on or before **November 15, 2016**. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

C. Price.

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is _____

_____ \$ _____ Performance Bond and Payment Bond each being 100% of the amount of this Contract.

D. Contract.

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

E. Certifications.

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in the Federal Contract Provisions Supplement, and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

F. Offer.

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications Revision of December 2002, Standard Details Revision of December 2002 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of: **WIN 016750.00 The Gut Bridge replacement plus other incidental work**, State of Maine, on which bids will be received until the time specified in the “Notice to Contractors” do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached “Schedule of Items”.

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached “Schedule of Items” in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached “Schedule of Items”, which may be ordered by the Resident, and to accept as full compensation the amount determined upon a “Force Account” basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier’s check, certificate of deposit or U. S. Postal Money Order in the amount given in the “Notice to Contractors”, payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of December 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor’s Disadvantaged Business Enterprise Utilization Plan with their bid.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

CONTRACTOR

Date

(Signature of Legally Authorized Representative
of the Contractor)

Witness

(Name and Title Printed)

G. Award.

Your offer is hereby accepted.
documents referenced herein.

This award consummates the Contract, and the

MAINE DEPARTMENT OF TRANSPORTATION

Date

By: David Bernhardt, Commissioner

Witness

CONTRACT AGREEMENT, OFFER & AWARD

AGREEMENT made on the date last signed below, by and between the State of Maine, acting through and by its Department of Transportation (Department), an agency of state government with its principal administrative offices located at Child Street Augusta, Maine, with a mailing address at 16 State House Station, Augusta, Maine 04333-0016, and

(Name of the firm bidding the job)

a corporation or other legal entity organized under the laws of the State of Maine, with its principal place of business located at (address of the firm bidding the job)

The Department and the Contractor, in consideration of the mutual promises set forth in this Agreement (the "Contract"), hereby agree as follows:

A. The Work.

The Contractor agrees to complete all Work as specified or indicated in the Contract including Extra Work in conformity with the Contract, PIN No. 1224.00, for the Hot Mix Asphalt Overlay in the town/city of South Nowhere, County of Washington, Maine. The Work includes construction, maintenance during construction, warranty as provided in the Contract, and other incidental work.

The Contractor shall be responsible for furnishing all supervision, labor, equipment, tools supplies, permanent materials and temporary materials required to perform the Work including construction quality control including inspection, testing and documentation, all required documentation at the conclusion of the project, warranting its work and performing all other work indicated in the Contract.

The Department shall have the right to alter the nature and extent of the Work as provided in the Contract; payment to be made as provided in the same.

B. Time.

The Contractor agrees to complete all Work, except warranty work, on or before November 15, 2006. Further, the Department may deduct from moneys otherwise due the Contractor, not as a penalty, but as Liquidated Damages in accordance with Sections 107.7 and 107.8 of the State of Maine Department of Transportation Standard Specifications, Revision of December 2002 and related Special Provisions.

C. Price.

The quantities given in the Schedule of Items of the Bid Package will be used as the basis for determining the original Contract amount and for determining the amounts of the required Performance Surety Bond and Payment Surety Bond, and that the amount of this offer is (Place bid here in alphabetical form such as One Hundred and Two dollars and 10 cents)
\$ (repeat bid here in numerical terms, such as \$102.10) Performance Bond and Payment Bond each being 100% of the amount of this Contract.

D. Contract.

This Contract, which may be amended, modified, or supplemented in writing only, consists of the Contract documents as defined in the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds. It is agreed and understood that this Contract will be governed by the documents listed above.

E. Certifications.

By signing below, the Contractor hereby certifies that to the best of the Contractor's knowledge and belief:

1. All of the statements, representations, covenants, and/or certifications required or set forth in the Bid and the Bid Documents, including those in Appendix A to Division 100 of the Standard Specifications Revision of December 2002 (Federal Contract Provisions Supplement), and the Contract are still complete and accurate as of the date of this Agreement.
2. The Contractor knows of no legal, contractual, or financial impediment to entering into this Contract.
3. The person signing below is legally authorized by the Contractor to sign this Contract on behalf of the Contractor and to legally bind the Contractor to the terms of the Contract.

F. Offer.

The undersigned, having carefully examined the site of work, the Plans, Standard Specifications, Revision of December 2002, Standard Details Revision of December 2002, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of:

PIN 1234.00 South Nowhere, Hot Mix Asphalt Overlay,

State of Maine, on which bids will be received until the time specified in the "Notice to Contractors" do(es) hereby bid and offer to enter into this contract to supply all the materials, tools, equipment and labor to construct the whole of the Work in strict accordance with the terms and conditions of this Contract at the unit prices in the attached "Schedule of Items".

The Offeror agrees to perform the work required at the price specified above and in accordance with the bids provided in the attached "Schedule of Items" in strict accordance with the terms of this solicitation, and to provide the appropriate insurance and bonds if this offer is accepted by the Government in writing.

As Offeror also agrees:

First: To do any extra work, not covered by the attached "Schedule of Items", which may be ordered by the Resident, and to accept as full compensation the amount determined upon a "Force Account" basis as provided in the Standard Specifications, Revision of December 2002, and as addressed in the contract documents.

Second: That the bid bond at 5% of the bid amount or the official bank check, cashier's check, certificate of deposit or U. S. Postal Money Order in the amount given in the "Notice to Contractors", payable to the Treasurer of the State of Maine and accompanying this bid, shall be forfeited, as liquidated damages, if in case this bid is accepted, and the undersigned shall fail to abide by the terms and conditions of the offer and fail to furnish satisfactory insurance and Contract bonds under the conditions stipulated in the Specifications within 15 days of notice of intent to award the contract.

Third: To begin the Work as stated in Section 107.2 of the Standard Specifications Revision of 2002 and complete the Work within the time limits given in the Special Provisions of this Contract.

Fourth: The Contractor will be bound to the Disadvantaged Business Enterprise (DBE) Requirements contained in the attached Notice (Additional Instructions to Bidders) and submit a completed Contractor's Disadvantaged Business Enterprise Utilization Plan with their bid.

Fifth: That this offer shall remain open for 30 calendar days after the date of opening of bids.

Sixth: The Bidder hereby certifies, to the best of its knowledge and belief that: the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with its bid, and its subsequent contract with the Department.

IN WITNESS WHEREOF, the Contractor, for itself, its successors and assigns, hereby execute two duplicate originals of this Agreement and thereby binds itself to all covenants, terms, and obligations contained in the Contract Documents.

Date

(Witness Sign Here)
Witness

(Sign Here)
(Signature of Legally Authorized Representative of the Contractor)

(Print Name Here)
(Name and Title Printed)

CONTRACTOR

G. Award.

Your offer is hereby accepted. documents referenced herein.

This award consummates the Contract, and the

MAINE DEPARTMENT OF TRANSPORTATION

Date

By: David A. Cole, Commissioner

(Witness)

BOND # _____

CONTRACT PERFORMANCE BOND
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That _____
_____ in the State of _____, as principal,
and.....
a corporation duly organized under the laws of the State of and having a
usual place of business
as Surety, are held and firmly bound unto the Treasurer of the State of Maine in the sum
of _____ and 00/100 Dollars (\$ _____),
to be paid said Treasurer of the State of Maine or his successors in office, for which
payment well and truly to be made, Principal and Surety bind themselves, their heirs,
executors and administrators, successors and assigns, jointly and severally by these
presents.

The condition of this obligation is such that if the Principal designated as Contractor in
the Contract to construct Project Number _____ in the Municipality of
_____ promptly and faithfully performs the Contract, then this
obligation shall be null and void; otherwise it shall remain in full force and effect.

The Surety hereby waives notice of any alteration or extension of time made by the State
of Maine.

Signed and sealed this day of, 20.....

WITNESSES:

SIGNATURES:

CONTRACTOR:

Signature.....

.....

Print Name Legibly

Print Name Legibly

SURETY:

Signature

.....

Print Name Legibly

Print Name Legibly

SURETY ADDRESS:

NAME OF LOCAL AGENCY:

.....
.....
.....

ADDRESS
.....
.....

TELEPHONE.....

.....

BOND # _____

CONTRACT PAYMENT BOND
(Surety Company Form)

KNOW ALL MEN BY THESE PRESENTS: That _____
_____ **in the State of** _____, as principal,
and.....
a corporation duly organized under the laws of the State of and having a
usual place of business in
as Surety, are held and firmly bound unto the Treasurer of the State of Maine for the use
and benefit of claimants as herein below defined, in the sum of
_____ **and 00/100 Dollars (\$** _____ **)**
for the payment whereof Principal and Surety bind themselves, their heirs, executors and
administrators, successors and assigns, jointly and severally by these presents.

The condition of this obligation is such that if the Principal designated as Contractor in
the Contract to construct Project Number _____ in the Municipality of
_____ promptly satisfies all claims and demands incurred for all
labor and material, used or required by him in connection with the work contemplated by
said Contract, and fully reimburses the obligee for all outlay and expense which the
obligee may incur in making good any default of said Principal, then this obligation shall
be null and void; otherwise it shall remain in full force and effect.

A claimant is defined as one having a direct contract with the Principal or with a
Subcontractor of the Principal for labor, material or both, used or reasonably required for
use in the performance of the contract.

Signed and sealed this day of, 20

WITNESS:

SIGNATURES:

CONTRACTOR:

Signature.....

.....

Print Name Legibly

Print Name Legibly

SURETY:

Signature.....

.....

Print Name Legibly

Print Name Legibly

SURETY ADDRESS:

NAME OF LOCAL AGENCY:

.....

ADDRESS

.....

.....

TELEPHONE

.....

Maine DOT Map



Map Generated on Tuesday, January 28, 2014 02:42:41 PM

Map Scale 1:150,000

The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information. This map is not intended to support emergency dispatch. Road names used on this map may not match official road names.

General Roads

-  *Interstate*
-  *US Routes*
-  *State Routes*
-  *Public Roads*

Bridges



MaineDOT Regions



State Urban



Water Bodies



Boundary Lines

-  *coastline*
-  *county*
-  *state*
-  *town*

Wetlands



Conserved Lands



General Decision Number: ME140043 01/03/2014 ME43

Superseded General Decision Number: ME20130043

State: Maine

Construction Type: Highway

County: Lincoln County in Maine.

HIGHWAY CONSTRUCTION PROJECTS (excluding tunnels, building structures in rest area projects & railroad construction; bascule, suspension & spandrel arch bridges designed for commercial navigation, bridges involving marine construction; and other major bridges).

Modification Number 0 Publication Date 01/03/2014

* TEAM0340-001 08/01/2013

	Rates	Fringes
TRUCK DRIVER		
Low Boy.....	\$ 14.75	17.5825

* SUME2011-038 09/14/2011

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 18.34	2.84
INSTALLER - GUARDRAIL.....	\$ 10.00	0.00
IRONWORKER, REINFORCING.....	\$ 18.98	0.00
LABORER: Asphalt Raker.....	\$ 14.71	2.95
LABORER: Common or General.....	\$ 12.86	1.38
LABORER: Flagger.....	\$ 9.55	0.00
LABORER: Landscape.....	\$ 14.79	1.76
LABORER: Pipelayer.....	\$ 14.40	1.87
OPERATOR: Asphalt Roller.....	\$ 18.49	10.24
OPERATOR: Backhoe.....	\$ 14.51	2.95
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 16.73	5.57
OPERATOR: Bulldozer.....	\$ 16.95	1.94

OPERATOR: Cold Planer.....	\$ 17.63	0.00
OPERATOR: Crane.....	\$ 20.99	6.40
OPERATOR: Excavator.....	\$ 16.89	2.04
OPERATOR: Grader/Blade.....	\$ 18.63	3.29
OPERATOR: Loader.....	\$ 15.36	2.33
OPERATOR: Mechanical.....	\$ 19.30	7.60
OPERATOR: Milling Machine Reclaimer Combo.....	\$ 13.00	0.80
OPERATOR: Paver (Asphalt, Aggregate, and Concrete).....	\$ 20.22	7.99
OPERATOR: Screed.....	\$ 16.92	5.36
OPERATOR: Roller (Earth).....	\$ 15.74	2.47
TRAFFIC CONTROL: LABORER -Device Monitor.....	\$ 14.80	6.29
TRUCK DRIVER, Includes All Dump Trucks.....	\$ 13.24	1.66
TRUCK DRIVER: Semi-Trailer Truck.....	\$ 16.36	9.09
TRUCK DRIVER: 1, 2, 3 Axle Truck.....	\$ 16.32	7.79

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (ii)).

The body of each wage determination lists the classification and wage rates that have been found to be prevailing for the cited type(s) of construction in the area covered by the wage determination. The classifications are listed in alphabetical order of "identifiers" that indicate whether the particular rate is union or non-union.

Union Identifiers

An identifier enclosed in dotted lines beginning with characters other than "SU" denotes that the union classification and rate have found to be prevailing for that classification. Example: PLUM0198-005 07/01/2011. The first four letters, PLUM, indicate the international union and the four-digit number, 0198, that follows indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2011, following these characters is the effective date of the most current negotiated rate/collective bargaining agreement which would be July 1, 2011 in the above example.

Union prevailing wage rates will be updated to reflect any changes in the collective bargaining agreements governing the rates.

0000/9999: weighted union wage rates will be published annually each January.

Non-Union Identifiers

Classifications listed under an "SU" identifier were derived from survey data by computing average rates and are not union rates; however, the data used in computing these rates may include both union and non-union data. Example: SULA2004-007 5/13/2010. SU indicates the rates are not union majority rates, LA indicates the State of Louisiana; 2004 is the year of the survey; and 007 is an internal number used in producing the wage determination. A 1993 or later date, 5/13/2010, indicates the classifications and rates under that identifier were issued as a General Wage Determination on that date.

Survey wage rates will remain in effect and will not change until a new survey is conducted.

WAGE DETERMINATION APPEALS PROCESS

1.) Has there been an initial decision in the matter? This can be:

- * an existing published wage determination
- * a survey underlying a wage determination
- * a Wage and Hour Division letter setting forth a position on a wage determination matter
- * a conformance (additional classification and rate) ruling

On survey related matters, initial contact, including requests for summaries of surveys, should be with the Wage and Hour Regional Office for the area in which the survey was conducted because those Regional Offices have responsibility for the Davis-Bacon survey program. If the response from this initial contact is not satisfactory, then the process described in 2.) and 3.) should be followed.

With regard to any other matter not yet ripe for the formal process described here, initial contact should be with the Branch of Construction Wage Determinations. Write to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2.) If the answer to the question in 1.) is yes, then an interested party (those affected by the action) can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Write to:

Wage and Hour Administrator
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and by any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3.) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

4.) All decisions by the Administrative Review Board are final.

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END OF GENERAL DECISION

SPECIAL PROVISION
SECTION 102.3
EXAMINATION OF DOCUMENTS, SITE, AND OTHER INFORMATION
(Geotechnical Information)

Add the following to Section 102.3, Examination of Documents, Site and Other Information:

102.3.1 Geotechnical Information In most cases, Geotechnical Information pertaining to the project has been collected and assembled. Bidders and Contractors are obligated to examine and, if necessary, obtain geotechnical information. If one is available, the project geotechnical report may be accessed at the following web address:

<http://www.maine.gov/mdot/contractors/>

The Department shall not be responsible for the Bidders' and Contractors' interpretations of or estimates or conclusions drawn from the Geotechnical Information. Data provided may not be representative of the subsurface conditions between the boring locations.

This section does not diminish the duties imposed upon parties in Section 102 or in any other sections.

SPECIAL PROVISION
SECTION 104
GENERAL RIGHTS & RESPONSIBILITIES
(Pre-Bid Meeting Notification)

There will be a non-mandatory (Contractors are strongly advised to attend) informational pre-bid meeting on February 13th, 2014 at the South Bristol Town Office at 2:00 p.m.

Tentative Meeting Agenda

Contractors are expected to visit the site any time prior to attending this meeting

- 2:00 Department Handout/Presentation
- 2:15 Questions Received by Attendees (recorded)

We will adjourn when all questions have been asked.

Answers will be distributed by addendum.

South Bristol Town Office is located at 470 Clarks Cove Road, South Bristol, Maine.

SPECIAL PROVISIONS
SECTION 104
Utilities

MEETING

A Preconstruction Utility Conference, as defined in Subsection 104.4.6 of the Standard Specifications is required.

GENERAL INFORMATION

These Special Provisions outline the arrangements that have been made by the Department for utility and/or railroad work to be undertaken in conjunction with this project. The following list identifies all known utilities or railroads having facilities presently located within the limits of this project or intending to install facilities during project construction.

Utilities have been notified and will be furnished a project specification.

Overview:

Utility	Aerial	Underground
Central Maine Power Company (CMP)	X	
Tidewater Telecom	X	
Time Warner Company (TWC)	X	

Utility Contact Information

Utility	Contact Person	Contact Phone
Central Maine Power Company (CMP)	Gerry Norton	779-9118
Tidewater Telecom	Louis Rector	563-9932
Time Warner Cable (TWC)	Bruce Vines	620-3412

Temporary utility adjustments **are** anticipated.

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

All adjustments are to be made by the respective utility/railroad unless otherwise specified herein.

All clearing and tree removal in areas where utilities are involved must be completed before the utilities are able to relocate their facilities.

Fire hydrants shall not be disturbed until all necessary work has been accomplished to provide proper fire protection.

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

**** Special Note to Contractor****

The Contractor will design the temporary bridge providing the utilities a temporary aerial crossing during construction of the new bridge.

AERIAL

Summary:

Utility	Pole Set	New Wires/Cables	Trans. Wires/Cables	Remove Poles	Estimated Working Days
Central Maine Power Company	X		X	X	12
Tidewater Telecom			X		16
Time Warner Cable			X		4
Total:					32

Phase I of Construction:

Central Maine Power Company

The utility will set temporary poles on and around the detour for the aerial crossing during the construction of the new bridge. Where these poles are set will be determined with the Contractor as the temporary bridge will be designed by the Contractor and discussed during the project Utility Pre-Construction Meeting. CMP will transfer their facilities once TWC and Tidewater have completed their work. The utility estimates 6 working days to set and transfer their facilities.

Tidewater Telecom

Tidewater Telecom will transfer their facilities once TWC has completed their work. The utility estimates they need 8 working days to transfer their facilities. Tidewater's move hinges on whether they have enough slack in their lines to move thus avoiding the potential for splicing.

Time Warner Cable

TWC will be the first utility to transfer their facilities to the temporary poles. The utility estimates 2 working days to relocate to the temporary poles depending on accessibility.

Phase II of Construction:

Central Maine Power Company

The utility will set four (4) permanent poles during Phase II construction of the new bridge please see pole list for more details. The utility will transfer their facilities once TWC and Tidewater have completed their relocation moves. CMP estimates 6 working days to do this work.

Tidewater Telecom

Tidewater Telecom will transfer their facilities once TWC has completed their work. The utility estimates they need 8 working days to transfer their facilities to the new proposed poles.

Time Warner Cable

TWC will be the first utility to transfer their facilities to the new proposed poles. The utility estimates 2 working days to relocate to the temporary poles depending on accessibility.

Pole List:

Existing Pole #	Existing Station	Left/Right		Existing Offset	Proposed Station	Left/Right		Proposed Offset	Comments
		LT	RT			LT	RT		
241	114+91.4	X			114+91.39	X		17.89'	
241.01	114+91.4	X		65.37'	114+91.39	X		69'	Anchor Pole
241S	115+89.8	X		22.44'	115+89.8	X		25'	Anchor Pole
238	117+20.13		X	8.72'	116+95.3		X	18'	20' Sidewalk Guy

AERIAL SEQUENCE OF WORK

1. Time Warner Cable
2. Tidewater Telecom
3. Central Maine Power Company

MAINTAINING UTILITY LOCATION MARKINGS

The Contractor will be responsible for maintaining the buried utility location markings following the initial locating by the appropriate utility or their designated representative.

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UTILITY SIGNING

Any utility working within the construction limits of this project shall ensure that the traveling public is adequately protected at all times. All work areas shall be signed, lighted, and traffic flaggers employed as determined by field conditions. All traffic controls shall be in accordance with the latest edition of the Manual on Uniform Traffic Control Devices for Streets and Highways, as issued by the Federal Highway Administration.

THE CONTRACTOR SHALL PLAN AND CONDUCT THEIR WORK ACCORDINGLY.

SPECIAL PROVISION
SECTION 104
GENERAL RIGHTS & RESPONSIBILITIES
(Bridge Closure Notification)

Section 104, General Rights and Responsibilities, of the Standard Specifications is amended as follows:

104.4.10 Coordination of Bridge Closure/Bridge Width Restriction Notification:

Paragraphs 4 and 5 are revised to read as follows:

The Contractor shall notify the following public officials, agencies and organizations approximately thirty days prior to, and then again both ten days before, and the day before the date of the beginning of stage 1 and the opening of the temporary detour. The thirty day notice should provide an approximate date and length of closure whereas the ten and one day notices should provide the exact date and the anticipated length of the closure. When the new bridge is reopened to traffic, the following list will again be notified. The Contractor shall provide the Department with documentation that the listed public officials, agencies and organizations received the notification at least 3 days prior to placement of advanced warning approach signs.

Town Officials (Manager or First Selectperson)

County Sheriff's Department

Fire Department

Police Department

State Police

Rescue Service

Hospitals

Miles Memorial – Damariscotta, ME

Regional School System (including school bus services)

Post Office

Chamber of Commerce

Any Large Employers

Department of Motor Vehicle - Commercial Vehicle Center (207-626-8630)

MaineDOT Maintenance Region Office

All newspaper notices, radio announcements and any notifications will be subject to the approval of the Resident and all costs will be considered incidental to the Contract.

SPECIAL PROVISION
SECTION 104.5.5
GENERAL RIGHTS AND RESPONSIBILITIES
Prompt Payment of Subcontractors

104.5.5

104.5.5 Prompt Payment of Subcontractors

A. Pay When Paid The Contractor shall pay Subcontractors for all Work satisfactorily performed and Invoiced by the Subcontractor no later than 30 Days from the date the Contractor receives payment from the Department for such Subcontractor's Work.

B. Payment Tracking Federal Projects On federally funded projects, the prime contractor, subcontractors and lower-tier subcontractors will track and confirm the delivery and receipt of all payments through the Elation System. They will be responsible for entering all payments to all sub and lower tier contractors. MaineDOT will run a query monthly to ensure that contractors are complying and generate an e-mail to contractors who have not responded to confirm receipt of MaineDOT payment or contractor payment to lower tier subcontractors.

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

SPECIAL PROVISION
SECTION 104
GENERAL RIGHTS AND RESPONSIBILITIES
(Electronic Payroll Submission)
(Payment Tracking)

104.3.8.1 Electronic Payroll Submission The prime contractor and all subcontractors and lower-tier subcontractors will submit their certified payrolls electronically on this contract utilizing the Elation System web based reporting. There is no charge to the contracting community for the use of this service. The submission of paper payrolls will not be allowed or accepted. Additional information can be found at <http://www.maine.gov/mdot/contractors/> under the “Quick Links”.

104.3.8.2 Payment Tracking The prime contractor and all subcontractors and lower-tier subcontractors will track and confirm the delivery and receipt of all payments through the Elation System

SPECIAL PROVISION
SECTION 105
General Scope of Work
(Environmental Requirements)

In-Water work consists of any activity conducted below the normal high water mark of a river, stream, brook, lake, pond or “Coastal Wetland” areas that are subject to tidal action during the highest tide level for the year which an activity is proposed as identified in the tide tables published by the National Ocean Service.

<http://www.oceanservice.noaa.gov/> For the full definition of “Coastal Wetlands”, please refer to 38 MRSA 480-B(2)

- I. In-water work is prohibited between April 1 and July 6 of any year
- II. In-Water Work shall be allowed from July 31 to September 9 and November 8 to March 15
- III. In-Water Work shall be conditionally allowed from March 16 through March 31 and July 7 through July 31 as follows:

Activity	Conditions and Requirements
Pile Driving	<ul style="list-style-type: none"> 1. Active use of vibratory and impact hammers and underwater saws and other in-water noise-producing equipment shall be limited to no more than 4 hours per day; or 2. Pile driving may occur unrestricted if completed in the dry at low tide
Riprap	<ul style="list-style-type: none"> 1. Shall be installed in the dry at low tide
Drilled shafts	<ul style="list-style-type: none"> 1. Allowed without restriction

- IV. In-Water work is conditionally allowed between September 10-November 7 as follows:

Activity	Conditions and Requirements
Pile Driving	<ul style="list-style-type: none"> 1. Noise levels may not exceed sound level limits of 187dB accumulated sound exposure level (SEL) and 206 dB peak. Pile driving by vibratory and/or impact hammer that occurs in the water shall require noise monitoring and probable noise attenuation as further described in Section VII of this Special Provision. 2. Pile driving by impact or vibratory hammer shall not occur for more than 12 hours in a 24-hour period. 3. Pile driving may occur unrestricted if completed in the dry at low tide
Riprap	<ul style="list-style-type: none"> 1. Shall be installed in the dry at low tide
Cofferdam construction	<ul style="list-style-type: none"> 1. Cofferdam construction shall be completed in consultation with MaineDOT Environmental Office to coordinate fish exclusion from work area
Drilled shafts	<ul style="list-style-type: none"> 1. Noise levels shall not exceed sound level limits of 187dB accumulated sound exposure level (SEL) and 206 dB peak.

- V. In-Water work applies to The Gut at the proposed bridge replacement

SPECIAL PROVISION
SECTION 105 continued
General Scope of Work
(Environmental Requirements)

VI. Special Conditions:

1. **Individual Permit Application with the Army Corps of Engineers is currently pending. In-water work may not begin until an ACOE permit has been issued. These documents will be provided to the contractor as soon as they are available. In-water work shall NOT begin without written permission from the MaineDOT.**
2. Conditions of DEP Permit-By-Rule Section 11 apply (see permit and conditions in contract documents).
3. Special Conditions of Information Endangered Species Act (Section 7) and Essential Fish Habitat Consultation (EFH) with National Oceanic and Atmospheric Administration (NOAA) apply (summarized in this Special Provision 105).
4. The contractor shall contact Eric Ham of MaineDOT Environmental Office (207-215-7356) at least two weeks prior to installation of cofferdam if installation is planned between September 10 and November 7.
5. In-water blasting is prohibited.

VII. Underwater Noise Monitoring and Noise Attenuation (applies to pile driving between September 10 and November 7)

1. The contractor shall retain the services of a qualified person or firm to perform underwater noise monitoring for in-water work between April 10 and November 7. A list of pre-qualified noise monitoring persons and firms can be found at the following link (Item 502.30): <http://www.maine.gov/tools/whatsnew/attach.php?id=94083&an=2>. Payment for noise monitoring services will be made by contract modification according to Standard Specification, Section 109, Changes.
2. The Contractor shall submit a pile driving plan to the Resident that details the procedures for installing piles including acoustic monitoring. This plan shall be accepted by the Resident prior to installing any piles. The plan shall provide procedures to be implemented if underwater sound levels exceed the allowable levels during pile installation. At a minimum, the plan shall include a list of materials, suppliers, and details needed to construct a bubble curtain.
3. NOAA National Marine Fisheries Service (NFMS) Section 7 Consultation established sound level limits of 187dB accumulated sound exposure level (SEL) and 206 dB peak for in-water pile driving between September 10 and November 7.
4. For pile-driving work with an impact hammer between September 10 and November 7, the contractor shall perform underwater sound monitoring during installation of a representative sample set of piles. The Contractor shall report the results to the Department (Eric Ham, Environmental Office at (207) 215-7356 or eric.ham@maine.gov). If initial sound readings indicate these sound level limits are not exceeded, monitoring may be discontinued. If readings in excess of these levels are observed, contractor shall implement additional noise attenuation measures and monitoring will be required until the Contractor demonstrates that sound level limits are not exceeded. Work may not continue until sound levels are reduced to below 187dB SEL and 206 dB.

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5. The contractor shall be responsible for implementing noise attenuation measures as needed. Payment for this work will be made by contract modification according to Standard Specification Section 109, Changes; **except idle equipment time will not be charged for the first five Working Days to construct, implement, and test noise attenuation devices.** If idle equipment time exceeds more than five (5) Working Days, the Department will pay the Contractor in accordance to Standard Specification 109.7.5c and supplements thereto.
6. Links to information on noise attenuation are provided below:

http://www.dot.ca.gov/hq/env/bio/files/Guidance_Manual_2_09.pdf
<http://www.trb.org/Publications/Blurbs/166159.aspx>
<http://www.trb.org/main/blurbs/162054.aspx>

VIII. Approvals:

1. Temporary Soil Erosion and Water Pollution Control Plan

NOTE: Regulatory Review and Approval is required to modify the existing In-Water work restrictions. Requests for work window extensions must be submitted to the MaineDOT Environmental Office. Approvals of requests for work window extensions are not guaranteed and may result in delays in construction schedule that are the sole responsibility of the contractor.

SPECIAL PROVISION
SECTION 105
GENERAL SCOPE OF WORK

Upon completion of all construction activities, the Contractor shall provide the following to the Department and the U.S. Coast Guard:

1. As-built measurements for the navigation channel: vertical clearance @ MHW and the horizontal clearance fender to fender.
2. Photographs of the new bridge from the mariners perspective both up and down stream views.
3. The start and end dates for construction.

The final submittal product shall be as directed by the Resident.

No additional payment to the Contractor will be associated with this submittal.

SPECIAL PROVISION
SECTION 105
SCOPE OF WORK
(SPECIAL DETOURS)

Subsection 105.4.5 of the Standard Specifications is amended as follows:

During an approved suspension, the Contractor shall maintain the special detour (i.e. temporary detour) by plowing snow, controlling ice and patching or retreating the surface as directed by the Resident when its is decided that additional winter maintenance is needed beyond what is provided by the Department.

The Town of South Bristol has a contract with Plumber Excavation of South Bristol to provide winter maintenance of Route 129. The Contractor shall coordinate with Plumber Excavation to ensure their equipment will not be inhibited by the special detour.

To be added to Standard Specification Section 105.5, Hauling of Materials and Equipment:

105.5.6 Restrictions on Movement and Storage of Heavy Loads and Equipment on Bridges

The Contractor shall comply with legal load restrictions and with special restrictions required by the Contract when hauling or storing materials, including demolition debris, and moving or storing equipment on Bridges within the Project Limits, that are under construction or completed but not yet open to traffic.

The Contractor shall not operate equipment mounted on crawler tracks or steel-tired wheels on or across concrete or bituminous surfaces, unless otherwise approved by the Resident. The Contract requirements may impose special restrictions on speed, load distribution, surface protection, or other precautions.

When construction operations require crossing an existing Bridge with otherwise prohibited equipment or loads, the Contractor shall use Department-approved methods of load distribution or bridging, at no additional cost to the Department.

The Contractor will not be relieved of liability of damages resulting from the operation and movement of construction equipment because of issuance of a special permit, or by adherence to any other restrictions imposed.

Unless otherwise allowed by the Contract or approved by the Department, the Contractor shall temporarily store construction materials, including demolition debris, or park equipment on a Bridge deck during construction in accordance with the following limits, which have been established to reflect typical design live loads:

- A. Stockpiles shall not weigh more than 65,000 pounds per 1,000 square feet,
- B. Individual stockpiles of materials (including pallets of products, reinforcing steel bundles and aggregate stockpiles) shall not weigh more than 25,000 pounds per 100 square feet, or
- C. No single vehicle or piece of equipment shall weigh more than 80,000 pounds and no combination of vehicles, materials and other equipment shall weigh more than 200,000 pounds per span.

The Contractor may submit alternate loadings with calculations stamped by a licensed Professional Engineer, within 30 Days prior to placement of the load(s).

U.S. Coast Guard Bridge Administration

GENERAL CONSTRUCTION REQUIREMENTS

1. All bridge closures, or bridge operating schedule changes, must be requested in writing, 30 days in advance, from the First Coast Guard District Bridge Branch Office. No channel restrictions, or vertical clearance reductions may be made without written approval from the above office. Waterway closures or safety zones must also be requested 90 days in advance.
2. All submissions to the Coast Guard for review and approval must first be approved by the owner of the bridge or their authorized agent. All submission of plans, scope of work, and schedules of operation must be sent to the First Coast Guard District, Bridge Branch Office.
3. At least 30 days prior to commencement of any work, we must have for our review, a copy of the construction plans, contractor schedule, preferably depicted in a time line graphic format, and the contractor's daily hours of operation. The construction plan package must show the following: **(1)** a plan of the entire waterway area in the vicinity of the project. **(2)** The location of work barges and any anchor lines during working and off-hours. **(3)** In addition, a drawing must be included, if applicable, depicting any scaffolding or containment used indicating the location and the total vertical or horizontal channel reduction. All vertical clearance reductions below low steel or concrete under the bridge as a result of the use of scaffolding must be clearly detailed on the drawings shown in total feet. **(4)** Emergency 24 hour telephone numbers for all responsible individuals for this project must be submitted to this office before any phase of construction begins in case of an emergency situation during off-hours.
4. Scaffolding used under ANY span of the bridge must be lighted with constant burning red lights every 50 feet and on all corners. The placement of scaffolding must not interfere with the ability of a moveable bridge to open for vessel traffic. Moveable bridges must continue to operate according to their normal schedule unless special drawbridge operation regulation changes have been requested. Warning signs must be posted on both sides of the bridge, visible for a 1-mile range, to warn mariners of the vertical clearance reduction. The signs shall face upstream and downstream so as to draw the mariner's attention to the fact that the clearance has been reduced.
5. All barges placed in the waterway must be lighted with constant burning white lights on all four corners of the barge. The contractor is required to comply with all provisions of the Navigation Rules International-Inland, regarding the use of work barges or floating equipment in the waterway. Copies are available from the U.S. Government Bookstore, 710 N Capitol Street NW, Washington, DC, 20403, (202) 512-0132, or www.navcen.uscg.gov .
6. Placement of construction barges in the navigable channel shall be done so as to provide a minimum horizontal clearance reduction. Only one navigation channel of a swing bridge may be blocked by work equipment at anytime. Barges must be moved out of the navigable channel after working hours unless approved in writing by this office.
7. Barges held in place by anchor lines must be marked by anchor buoys, which should be lighted.

8. An as-built survey must be taken upon completion of this project, approved by a professional engineer or land surveyor verifying the bridge clearances.
9. The on-scene contractor must have a VHF-FM marine radio set to the bridge communication channels 16/13 or the designated channel for the bridge. Additional marine radios monitoring the above channels must also be maintained at the main control of any floating equipment or barges on station.
10. Preventive measures must be taken to prevent any hot work, debris, or construction material from entering the waterway. This includes sandblasting material, paint, and any concrete work by-products. Welding and burning must cease upon approach of a vessel and shall not start again until the vessel has passed the bridge.
11. The project manager must contact Coast Guard Sector Northern New England via marine radio before commencement of any and after completion of any Hot Work. A cell phone back-up may be used to contact the above Coast Guard Unit at (207) 780-3251.
12. If permanent bridge navigational lighting cannot be maintained operational during any phase of this project, temporary battery/power lights must be installed at the same locations. These temporary lights must be visible for a distance of **2,000 yards on 90% of the nights of the year**. Generally, a lamp of **(50 candela)** will meet these requirements. Plans for temporary lighting shall be submitted to this office for written approval. Deviations from the approved temporary lighting shall be permitted only upon written authorization from this office.
13. **All newly constructed bridge piers, or those in the process of demolition, must be lighted with either red or white flashing (60 flashes per minute) lights. All cofferdams used during construction must also be lighted with red or white flashing (60 flashes per minute) on all four corners.**
14. Bridge protective fenders shall not be constructed or rebuilt with any metal surfaces on the rubbing face of the fender system. All bolts, spikes, or other metal fastening devices must be countersunk. Metal splicing plates, if used, shall be mounted on back of outer wales.
15. All piles including those previously damaged or broken that are not being used in the new or repaired fender shall be extracted rather than cut off at the mud line. Upon completion of all fender repairs a bottom sweep is required to determine if any piles or debris are present in the waterway. A wire-drag sweep or side-scan sonar is the preferred method.
16. During the progress of work should any debris or equipment enter the waterway and become a hazard to navigation, immediate notice shall be given to the Coast Guard and the object removed as soon as possible. Until removal can be effected, the obstruction shall be properly marked.
17. Spillage of oil and hazardous substances is specifically prohibited by the **Federal Clean Water Act**, as amended. Approved spill containment equipment and absorbent material must be located at the project site in the event of a spill into the waterway or the shoreline. The Coast Guard must be notified immediately at (800) 424-8802.

18. The bridge owner is responsible to ensure that channel depths are not affected by this work. Any material, machinery or equipment lost, dumped, thrown into, or otherwise entering the waterway must be removed immediately. If immediate removal is impractical and the object entering the waterway could possibly obstruct or hazard navigation, the object must be marked immediately to protect navigation and the Coast Guard shall be notified as soon as possible. Upon request of the Coast Guard or Corps of Engineers, the bridge owner/contractor shall provide the necessary equipment and personnel to determine the presence of any suspected obstructions in the waterway.
19. The bridge owner/contractor shall provide any and all necessary equipment and personnel to determine the presence of any "suspected" obstructions in the waterway at any time either during or following the completion of bridge construction or demolition operations.
20. Upon project completion, the bridge owner shall provide the Coast Guard with a written certification by a registered professional engineer that the waterway depths have not been impaired as a result of any construction or demolition operations, that the waterway is clear of any and all construction debris or remnants from the existing or previous bridge construction or demolition.
21. This approval may be revoked and/or civil penalties imposed for failure to ensure that the above listed stipulations are adhered to or if work is determined to hazard or impair navigation.

MaineDOT DBE Project Attainment Target (PAT)
for this Project is .018 %

The MaineDOT seeks to meet the specified annual Disadvantaged Business Enterprise (DBE) usage goal set out by 49 CFR 26.45 through the efforts of contractors seeking to employ qualified DBE subcontractors. We seek to meet this goal by race neutral means and do not, at this time, use contract specific requirements for each project. We do however, understand the capacity of Maine's DBE community and the unique characteristics a project may have that would differ from the broad annual goal.

Taking this into consideration, the MaineDOT will review each project and develop an anticipated attainment or Project Attainment Target (PAT) based on several factors that are project specific. Those factors include:

- Scope of Work
- DBE availability according to Specification Item
- Geographic location
- DBE capacity

This PAT is developed to assist contractors to better understand the DBE participation that the MaineDOT can reasonably expect for a specific project. The PAT is NOT a mandate but an assessment of the DBE opportunities that this project could meet or exceed. MaineDOT anticipates that each contractor will make the best effort to reach or exceed the PAT for this project.

SPECIAL PROVISION 105
CONSTRUCTION AREA

A Construction Area located in the **Town of South Bristol** has been established by the Maine Department of Transportation (MDOT) in accordance with provisions of 29-A § 2382 Maine Revised Statutes Annotated (MRSA).

- (a) The section of highway under construction in the town of South Bristol, Lincoln County on route 129.
- (b) (Route 129) over The Gut Bridge station 114+00.00 to station 118+00.00 of the construction plus approaches.

Per 29-A § 2382 (7) MRSA, the MDOT may “*issue permits for stated periods of time for loads and equipment employed on public way construction projects, United States Government projects or construction of private ways, when within construction areas established by the Department of Transportation. The permit:*

A. Must be procured from the municipal officers for a construction area within that municipality;

B. May require the contractor to be responsible for damage to ways used in the construction areas and may provide for:

(1) Withholding by the agency contracting the work of final payment under contract; or

(2) The furnishing of a bond by the contractor to guarantee suitable repair or payment of damages.

The suitability of repairs or the amount of damage is to be determined by the Department of Transportation on state-maintained ways and bridges, otherwise by the municipal officers;

C. May be granted by the Department of Transportation or by the state engineer in charge of the construction contract; and

D. For construction areas, carries no fee and does not come within the scope of this section.”

The Municipal Officers for the **Town of South Bristol** agreed that an Overlimit Permit will be issued to the Contractor for the purpose of using loads and equipment on municipal ways in excess of the limits as specified in 29-A MRSA, on the municipal ways as described in the “Construction Area”.

As noted above, a bond may be required by the municipality, the exact amount of said bond to be determined prior to use of any municipal way. The MDOT will assist in determining the bond amount if requested by the municipality.

The maximum speed limits for trucks on any town way will be 25 mph (40 km per hour) unless a higher legal limit is specifically agreed upon in writing by the Municipal Officers concerned.

SPECIAL PROVISION 105
OVERLIMIT PERMITS

Title 29-A § 2382 MRSA Overlimit Movement Permits.

1. Overlimit movement permits issued by State. The Secretary of State, acting under guidelines and advice of the Commissioner of Transportation, may grant permits to move nondivisible objects having a length, width, height or weight greater than specified in this Title over a way or bridge maintained by the Department of Transportation

2. Permit fee. The Secretary of State, with the advice of the Commissioner of Transportation, may set the fee for single trip permits, at not less than \$6, nor more than \$30, based on weight, height, length and width. The Secretary of State may, by rule, implement fees that have been set by the Commissioner of Transportation for multiple trip, long-term overweight movement permits. Rules established pursuant to this section are routine technical rules pursuant to Title 5, chapter 375, subchapter II-A.

3. County and municipal permits. A county commissioner or municipal officer may grant a permit, for a reasonable fee, for travel over a way or bridge maintained by that county or municipality

4. Permits for weight. A vehicle granted a permit for excess weight must first be registered for the maximum gross vehicle weight allowed for that vehicle.

5. Special mobile equipment. The Secretary of State may grant a permit, for no more than one year, to move pneumatic-tire equipment under its own power, including Class A and Class B special mobile equipment, over ways and bridges maintained by the Department of Transportation. The fee for that permit is \$15 for each 30-day period.

6. Scope of permit. A permit is limited to the particular vehicle or object to be moved, the trailer or semitrailer hauling the overlimit object and particular ways and bridges.

7. Construction permits. A permit for a stated period of time may be issued for loads and equipment employed on public way construction projects, United States Government projects or construction of private ways, when within construction areas established by the Department of Transportation. The permit:

A. Must be procured from the municipal officers for a construction area within that municipality;

B. May require the contractor to be responsible for damage to ways used in the construction areas and may provide for:

(1) Withholding by the agency contracting the work of final payment under contract; or

(2) The furnishing of a bond by the contractor to guarantee suitable repair or payment of damages.

The suitability of repairs or the amount of damage is to be determined by the Department of Transportation on state-maintained ways and bridges, otherwise by the municipal officers;

C. May be granted by the Department of Transportation or by the state engineer in charge of the construction contract; and

D. For construction areas, carries no fee and does not come within the scope of this section.

8. Gross vehicle weight permits. The following may grant permits to operate a vehicle having a gross vehicle weight exceeding the prescribed limit:

A. The Secretary of State, with the consent of the Department of Transportation, for state and state aid highways and bridges within city or compact village limits;

B. Municipal officers, for all other ways and bridges within that city and compact village limits; and

C. The county commissioners, for county roads and bridges located in unorganized territory.

9. Pilot vehicles. The following restrictions apply to pilot vehicles.

A. Pilot vehicles required by a permit must be equipped with warning lights and signs as required by the Secretary of State with the advice of the Department of Transportation.

B. Warning lights may be operated and lettering on the signs may be visible on a pilot vehicle only while it is escorting a vehicle with a permit on a public way.

With the advice of the Commissioner of Transportation and the Chief of the State Police, the Secretary of State shall establish rules for the operation of pilot vehicles.

9-A. Police escort. A person may not operate a single vehicle or a combination of vehicles of 125 feet or more in length or 16 feet or more in width on a public way unless the vehicle or combination of vehicles is accompanied by a police escort. The Secretary of State, with the advice of the Commissioner of Transportation, may require a police escort for vehicles of lesser dimensions.

A. The Bureau of State Police shall establish a fee for state police escorts to defray the costs of providing a police escort. A county sheriff or municipal police department may establish a fee to defray the costs of providing police escorts.

B. The Bureau of State Police shall provide a police escort if a request is made by a permittee. A county sheriff or municipal police department may refuse a permittee's request for a police escort.

C. A vehicle or combination of vehicles for which a police escort is required must be accompanied by a state police escort when operating on the interstate highway system.

10. Taxes paid. A permit for a mobile home may not be granted unless the applicant provides reasonable assurance that all property taxes, sewage disposal charges and drain and sewer assessments applicable to the mobile home, including those for the current tax year, have been paid or that the mobile home is exempt from those taxes. A municipality may waive the requirement that those taxes be paid before the issuance of a permit if the mobile home is to be moved from one location in the municipality to another location in the same municipality for purposes not related to the sale of the mobile home.

11. Violation. A person who moves an object over the public way in violation of this section commits a traffic infraction.

Section History:

PL 1993, Ch. 683, §A2 (NEW).

PL 1993, Ch. 683, §B5 (AFF).

PL 1997, Ch. 144, §1,2 (AMD).

PL 1999, Ch. 117, §2 (AMD).

PL 1999, Ch. 125, §1 (AMD).

PL 1999, Ch. 580, §13 (AMD).

PL 2001, Ch. 671, §30 (AMD).

PL 2003, Ch. 166, §13 (AMD).

PL 2003, Ch. 452, §Q73,74 (AMD).

PL 2003, Ch. 452, §X2 (AFF).

SPECIAL PROVISION
SECTION 105
LEGAL RELATIONS WITH AND RESPONSIBILITY TO PUBLIC
(NPDES)

105.8.2 Permit Requirements This Section is revised by the addition of the following paragraph:

”The Contractor is advised that the Environmental Protection Agency has issued a final National Pollutant Discharge Elimination System (NPDES) General Permit for storm water discharges from construction sites disturbing more than 2 ha [5 acres]. This permit requires:

- Storm Water Pollution Prevention Plan
- Submission of a Notification of Intent (NOI) at least 48 hours before construction commences
- Submission of a Notification of Termination (NOT) when a site has been finally stabilized and all storm water discharges from construction activities are eliminated.

If the project’s land disturbances is 2 ha [5 acres] or more, the Department will prepare the plan and submit the NOI (and NOT). The Contractor shall prepare plans and submit NOI’s (and NOT’s) for regulated construction activities beyond the project limits (e.g., borrow pits).

The Contractor shall be familiar with and comply with these regulations.”

SPECIAL PROVISION 105
GENERAL SCOPE OF WORK
Equal Opportunity and Civil Rights
(Disadvantaged Business Enterprises Program)

105.10.1.1 Disadvantaged Business Enterprises Program The Maine Department of Transportation (MaineDOT) has established a Disadvantaged Business Enterprise (DBE) program in accordance with regulations of the United States Department of Transportation (USDOT), 49 CFR Part 26. The MaineDOT receives federal financial assistance from USDOT, and as a condition of receiving this assistance, the Department has signed an assurance that it will comply with 49 CFR Part 26. The MaineDOT is responsible for determining the eligibility of and certifying DBE firms in Maine.

A DBE is defined as a for-profit business that is owned and controlled by one or more socially and economically disadvantaged person(s). For the purpose of this definition:

1. “Socially and economically disadvantaged person” means an individual who is a citizen or lawful permanent resident of the United States and who is Black, Hispanic, Native American, Asian, Female; or a member of another group or an individual found to be disadvantaged by the Small Business Administration pursuant to Section 3 of the Small Business Act.
2. “Owned and controlled” means a business which is:
 - a. A sole proprietorship legitimately owned and controlled by an individual who is a disadvantaged person.
 - b. A partnership or limited liability company in which at least 51% of the beneficial ownership interests legitimately are held by a disadvantaged person(s).
 - c. A corporation or other entity in which at least 51% of the voting interest and 51% of the beneficial ownership interests legitimately are held by a disadvantaged person(s).

The disadvantaged group owner(s) or stockholder(s) must possess control over management, interest in capital, and interest in earnings commensurate with the percentage of ownership. If the disadvantaged group ownership interests are real, substantial and continuing and not created solely to meet the requirements of this program, a firm is considered a bona fide DBE.

105.10.1.2 Commercially Useful Function MaineDOT will count expenditures of a DBE contractor toward DBE goals only if the DBE is performing a commercially useful function on that contract. A DBE performs a commercially useful function when it is responsible for execution of the work of the contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved. Credit will only be given when the DBE meets all conditions for a CUF. Credit for labor will be in accordance with the responsibilities outlined in the contract. To perform a commercially useful function, the DBE must also be responsible, with respect to materials and supplies used on the Contract, for negotiating price, determining quality and quantity, ordering the materials, and installing (where applicable) and paying for the material itself. To determine whether a DBE is performing a commercially useful function, MaineDOT will evaluate the amount of work subcontracted, industry practices, whether the amount the firm is to be paid under the Contract is commensurate with the work it is actually performing and DBE credit claimed for its performance of the work, and other relevant factors.

Rented equipment used by the DBE must not be rented from the Prime Contractor on a job that the DBE is subcontracted with that Prime Contractor for regular course of business.

A current listing of certified DBEs that may wish to participate in the highway construction program and the scope of work for which they are certified can be found at <http://www.maine.gov/mdot/disadvantaged-business-enterprises/pdf/directory.pdf>. Credit will be given for the value described by a DBE performing as:

- A. A prime contractor; 100% of actual value of work performed by own workforces.
- B. An approved subcontractor; 100% of work performed by own workforces.
- C. An owner-operator of construction equipment; 100% of expenditures committed.
- D. A manufacturer; 100% of expenditures committed. The manufacturer must be a firm that operates or maintains a factory or establishment that produces on the premises the materials or supplies obtained by the Contractor. Brokers and packagers shall not be regarded as manufacturers.
- E. A regular dealer; 60% of expenditures committed. A regular dealer is defined as a firm that owns, operates, or maintains a store, warehouse or other establishment in which the materials or supplies required for the performance of the contract are bought, kept in stock, and regularly sold to the public. For purposes of this provision a "Broker" is a DBE that has entered into a legally binding relationship to provide goods or services delivered or performed by a third party. Brokers and packagers shall not be regarded as regular dealers.
- F. A bona fide service provider; 100% of reasonable fees or commissions. Eligible services include professional, technical, consultant, or managerial, services and assistance in the procurement of essential personnel, facilities, equipment, materials or supplies required for the performance of the contract. Eligible services also include agencies providing bonding and insurance specifically required for the performance of the contract.
- G. A trucking, hauling or delivery operation. 100% of expenditures committed when trucks are owned, operated, licensed and insured by the DBE and used on the contract and, if applicable, includes the cost of the self supplied materials and supplies. 100% of expenditures committed when the DBE leases trucks from another DBE firm including an owner-operator. 100% of reasonable fees or commissions the DBE receives as a result of a lease arrangement for trucks from a non-DBE, including an owner-operator.
- H. Any combination of the above.

105.10.1.3 Race-neutral Goals The Maine DOT is required to set an annual goal (approved on a three year basis) for DBE participation in Federal-aid projects. In order to fulfill that goal, bidders are encouraged to utilize DBE businesses certified by the MaineDOT. MaineDOT seeks to meet the established DBE goal solely through race-neutral means. *Race-neutral* DBE participation occurs when a DBE is awarded a prime contract through customary competitive procurement procedures, is awarded a subcontract on a contract that does not carry a DBE contract goal, or wins a subcontract from a prime contractor that did not consider its DBE status in making the award. A DBE/subcontractor Utilization Proposed Form is required to be included in bid documents.

MaineDOT will analyze each project and create a Project Availability Target (PAT), based on a number of factors including project scope, available DBE firms, firms certified in particular project work, etc. Each bid will request that the contractor attempt to meet the PAT. This PAT is developed to assist contractors to better understand what the MaineDOT expectations are for a

specific project. The PAT is NOT a mandate but an assessment of what this particular project can bear for DBE participation. The Department anticipates that each contractor will make the best effort to reach or exceed this PAT for the project.

105.10.1.4 Race-conscious Project Goals If it is determined by the Department that the annual DBE goal will not be met through *race-neutral* means, the Department may implement *race-conscious contract goals* on some projects. Race-conscious contract goals are goals that are enforceable by the Department and require that the prime contractor use good faith effort to achieve the goal set by the Department for that particular project. If race conscious means are implemented on a project, the Prime must comply with the requirements of 49 CFR.

At the time of the bid opening, all Bidders shall submit with their bid a Disadvantaged Business Enterprise (DBE) Commitment Form provided by the Department. This form will list the DBE and non-DBE firms that are proposed to be used during the execution of the Work. The list shall show the name of the firm, the item/material/type of work involved and the dollar amount of work to be performed. The dollar total of each commitment shall be totaled and a percentage determined.

If the project goal is not met, acceptable documentation showing all good faith efforts made to obtain participation may be required in order to award the project. Failure to provide the required listing with the dollar participation total or acceptable documentation of good faith efforts to obtain DBE participation within 3 days after the bid opening date will be considered a lack of responsiveness on the part of the low bidder. Rejection of the low bid under these circumstances will require the low bidder to surrender the Proposal Guaranty to the Department. The submission and approval of the above forms does not constitute a formal subcontract.

If for any reason during the progress of the Work the Contractor finds that DBEs included on the list are unable to perform the proposed work, the Contractor, with written release by the committed DBE or approval of the Department, may substitute other DBE firms for those named on the list. If the Contractor is able to clearly document their inability to find qualified substitute firms to meet the project goal, the Contractor may request in writing approval to substitute the DBE with a non-DBE firm. If at any time during the life of the Contract it is determined that the Contractor is not fulfilling the goal or commitment(s) and is not making a good faith effort to fulfill the DBE requirement, the Department may withhold progress payments. If good faith effort is determined by the Department, failure to meet the DBE contract goal will not be a detriment to the bid award. Fulfillment of the goal percentage shall be determined by dividing the dollars committed to the DBEs by the actual contract dollars. These requirements are in addition to all other Equal Employment Opportunity requirements on Federal-aid contracts.

105.10.1.5 Certification of DBE attainment on Contracts The MaineDOT must certify that it has conducted post-award monitoring of all contracts to ensure that DBEs had done the work for which credit was claimed. The certification is for the purpose of ensuring accountability for monitoring which the regulation already requires. The MaineDOT will certify these contracts through review of CUF forms, Elations sub-contract payment tracking as well as occasional on-site reviews of projects and through the project's final closeout documentation provided by our Contracts Section.

105.10.1.6 Bidders' List Survey Pursuant to 49 CFR 26.11 the MaineDOT is required to “create and maintain” a bidders list and gather bidder information on our construction/consultant projects, Contractors will maintain information on all subcontract bids submitted by DBE and Non-DBE firms and provide that information to the Department. The Following information is required:

Firm Name

Firm Address

Firm status (DBE or non-DBE)

Age of firm (years)

And the annual gross receipts amount as indicated by defined brackets, i.e. \$500,000 to \$800,000, rather than requesting exact figures.

Not only is this information critical in determining the availability of DBE businesses relative to other businesses that do similar work, but the Federal Highway Administration requires that we obtain this information.

SPECIAL PROVISION
SECTION 105 - GENERAL SCOPE OF WORK
Movable Bridge Project Coordinator

Description

The contractor shall supply a single person responsible for all duties defined below in the construction details section, who shall be designated as the movable bridge project coordinator. The project coordinator shall assure that a responsible party will be on-site during all hours of construction.

Requirements

The contractor shall hire a movable bridge project coordinator (MBPC). A resume of the individual's experience and written evidence of commitment to the project shall be submitted prior to award of contract. The MBPC shall have a minimum of two recent projects with prior professional experience in coordinating a structural-mechanical-electrical project for movable bridges. The project size shall be major rehabilitation of structural elements and complete replacement of drive machinery and electrical control systems, with a construction cost of at least \$8 million for each qualifying project and/or a new movable bridge construction of at least \$8 million for each qualifying project. Should the first individual designated not, in the opinion of the engineer, possess sufficient experience, another shall be offered until one is found satisfactory to the engineer. Should an acceptable individual not be found within the contractor's permanent staff, consideration will be given to an individual hired especially for this position. Under all circumstances, prior movable bridge experience is mandatory, as described above. Written evidence of the willingness of the MBPC to commit fully throughout the duration of the project shall be offered to the engineer as part of the qualification for the individual. The MBPC shall not be changed without prior approval of the engineer and until a successor has been approved by the engineer.

The MBPC shall have the responsibility of coordinating all construction work on the movable bridge portions of the project, from shop drawing preparation and review through field work and final project acceptance, so that the Contractor and all Subcontractors perform in a timely and organized manner, working toward the common goal of finishing the project in a workmanlike manner and in accordance with the approved schedule and in conformance with the Contract Documents.

The MBPC shall be responsible for coordination of all work included in but not limited to the following pay items, as well as any structural work performed on the movable bridge:

638.02 Navigation lights
643.01 Traffic Signals and Gates
655.01 Engine Generator System - Standby
655.3001 Bridge Electrical and Control Systems
815.00 Building: Control House
860.11 Bridge Operating Machinery Delivered
860.12 Bridge Operating Machinery Installation
860.13 Bridge Trunnion Machinery Delivered
860.14 Bridge Trunnion Machinery Installation
860.15 Bridge Span Lock Machinery Delivered
860.16 Bridge Span Lock Machinery Installation
880.02 Bridge Balancing
910.301 Special Work - Operation and Maintenance Manuals
910.301 Special Work - Bridge Operator Training
910.301 Special Work - Field Testing

The coordination functions and responsibilities of the MBPC shall include but not be limited to:

1. Coordination of shop drawings as required from all Suppliers, Fabricators and Subcontractors.
2. Exchange of necessary data related to the movable bridge portion of the project between Subcontractors.
3. Substitution of alternate brands of components, substantiation of equivalency, and coordination of all approvals to all revisions necessitated by the substitution.
4. Submittals of shop drawings, catalog cuts, manufacturer's literature, and operating and maintenance manuals in a timely manner.
5. Certifying that all materials, construction methods and performance of work are in conformance with the requirements of the Contract Documents.
6. Expediting deliveries and shop testing of time critical materials and equipment.
7. Coordinating all structural, mechanical and electrical field work, including temporary channel closures, temporary supports, bracings, jacking, installations and removals.

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

The MBPC shall attend all meetings involving the movable bridge construction project and attended by any combination of Contractor, Subcontractor, material suppliers, and the Engineer. The MBPC shall be the individual to whom all questions relating to the construction of the movable bridge shall be addressed.

Method of Measurement

This work will not be measured for payment.

Basis of Payment

The cost of this work shall be incidental to the various related items in the Contract.

SPECIAL PROVISION
SECTION 105
GENERAL SCOPE OF WORK
(Buy America Certification)

105.11 Federal Requirements Add the following as the third and subsequent paragraphs:

“Prior to payment by the Department, the Contractor shall provide a certification from the producer of steel or iron, or any product containing steel or iron as a component, stating that all steel or iron furnished or incorporated into the furnished product was manufactured in the United States in accordance with the requirements of the Buy America provisions of 23 CFR 635.410, as amended. Such certification shall also include (1) a statement that the iron or steel product or component was produced entirely within the United States, or (2) a statement that the iron or steel product or component was produced within the United States except for minimal quantities of foreign steel and iron valued at \$ (actual value).

All manufacturing processes must take place domestically. Manufacturing begins with the initial melting and mixing, and continues through the coating stage. Any process which modifies the chemical content, the physical size and shape, or the final finish is considered a manufacturing process. These processes include rolling, extruding, machining, bending, grinding, drilling, and coating. “Coating” includes epoxy coating, galvanizing, painting, or any other coating that protects or enhances the value of the material.

A Buy America Certification is required from each manufacturer, fabricator, supplier, subcontractor, etc. that meets the “manufacturing” definition above.

Buy America does not apply to raw materials (iron ore and alloys), scrap, pig iron, or processed, pelletized, and reduced iron ore.”

SPECIAL PROVISION
SECTION 106
QUALITY
(Quality Level Analysis- Structural Concrete)

106.7.1 Standard Deviation Method Under H. Replace the Method A payfactor with the following;

“Method A: $PF = [32.5 + (\text{Quality Level} * 0.75)] * 0.01$ ”

SPECIAL PROVISION
SECTION 107
TIME
(CONTRACT TIME)

The specified contract completion date is November 15, 2016.

SPECIAL PROVISION
SECTION 107
TIME
(Scheduling of Work)

Section 107.4, Scheduling of Work, of the Standard Specifications is amended as follows:

107.4.2 Schedule of Work Required Within 10 Days of Contract Execution and before beginning any on-site activities, the Contractor shall provide the Department with its Schedule of Work in a Critical Path Method (CPM) in the form of an activity on node (AON) diagram. This CPM schedule will become the basis for claims involving delay. The Contractor shall plan the Work, including the activity of Subcontractors, vendors, and suppliers, such that all Work will be performed in Substantial Conformity with its Schedule of Work. The Schedule must include sufficient time for the Department to perform its functions as indicated in this Contract, including QA inspection and testing, approval of the Contractor's TCP, SEWPCP and QCP, and review of Working Drawings. The schedule shall meet the requirements set forth herein.

Schedule Requirements:

1. Activity Information: All activity on node diagrams shall include:
 - a. Activity ID
 - b. Activity Description
 - c. Finish to Start relationships with no leads or lags

2. Duration: No activity, prior to the bridge closure, will have duration greater than 30 working days or less than one working day. Once the bridge closure commences no activity will have duration greater than 5 working days or less than 2 hours. Activity durations expressed in hours will not be allowed unless approved by the Resident. If requested by the Resident, the Contractor shall furnish any information needed to justify the reasonableness of activity time durations. Such information shall include, but not be limited to, estimated activity manpower, unit quantities, and production rates.

3. Procurement and Submittals: Separate procurement into at least two activities, fabrication and delivery. When the procurement also requires a submittal to and approval by the Department, insure these separate activities are shown in the schedule logic. Insure all work activities that require a submittal are preceded by submittal and approval activities.

4. Restrictions: Any restrictions that affect the Schedule of Work such as closure window, paving restrictions, or In-Stream Work windows must be charted with the related activities to demonstrate that the Schedule of Work complies with the Contract.

The Department will review the Schedule of Work and provide comments to the Contractor within 10 days of receipt of the schedule. The Contractor will make the requested changes to the schedule and issue the finalized version to the Department. If the schedule is not approved within 30 calendar days of the Notice to Commence work, the Department will withhold all contract payments until the schedule is approved.

In addition to the Contractor's initial CPM Schedule, the Department will require the Contractor to update the schedule monthly prior to the bridge closure to show current progress. The submittal date for monthly updates shall be determined by the Resident. Two weeks prior to, and during, the planned bridge closure the Contractor shall submit to the resident weekly updates. Should the Contractor fail to provide an update, the Department may withhold payment of the current progress estimate until the schedule update is submitted.

107.4.3 Projected Payment Schedule Within 10 Days of Contract Execution, the Contractor shall also provide the Department with a Projected Payment Schedule that estimates the value of the Work as scheduled, including requests for payment of Delivered Materials. The Projected Payment Schedule must be in accordance with the Contractor's Schedule of Work and prices submitted by the Contractor's Bid. The Contractor shall revise the Projected Payment Schedule to reflect the actual progress of the Work.

107.4.4 Schedule Revisions The progress of the Work shall be compared against the Schedule of Work at each Progress Meeting. If the Department determines that the Contractor's actual progress is not in Substantial Conformity with the Schedule of Work, then the Contractor shall either increase Project resources to get back on schedule or submit a revised Schedule of Work and Projected Payment Schedule to the Department.

107.4.5 Method of Measurement - Schedule of work will be measured for payment as one lump sum for the initial schedule and payments for each Monthly or Weekly update.

107.4.6 Basis of Payment - Schedule of work will be paid for at the contract lump sum price. Upon approval of the initial schedule, the contract lump sum price for the initial schedule will be paid. Thereafter, monthly and weekly schedule updates will be paid for at the contract unit price each. Monthly schedule updates will be paid for at the contract unit price each during work executed within two months of the planned bridge closure. Two weeks prior to, and during, the bridge closure weekly schedule updates will be paid for at the contract unit price each.

Payment will be made under:

Pay Item

Pay Unit

107.51 Prosecution of Work - Initial Schedule
107.52 Prosecution of Work - Monthly Update
107.54 Prosecution of Work - Weekly Update

Lump Sum
Each
Each

SPECIAL PROVISION
SECTION 107
TIME
(SUNDAY WORK)

Subsection 107.3.3 of the Standard Specifications is amended as follows:

The Contractor shall be allowed to work on Sundays during the 213 consecutive calendar day navigation channel closure. The Contractor shall provide the Resident with a minimum 48 hour notice before commencing work on a Sunday.

SPECIAL PROVISION
SECTION 107
TIME
(Limitation of Operations)
(Disincentive/Penalty and Supplemental Liquidated Damages)

Eon Property:

Access to the garage on the Eon property, at approximately station 17+50+/- left, shall be maintained at all times during construction.

Haas Property:

The Contractor shall maintain access to the two entrance doors nearest to the driveway, at station 114+92 right, on the Haas property at all times during construction.

Pickett Property:

Access to the building located on the Pickett property between station 116+ 57 left and station 117+02 left shall be maintained at all times until September 15, 2014. From September 15, 2014 to May 31, 2016 access to the building on the Pickett property can be blocked off. The building on Pickett property shall be accessible from June 1, 2016 to the end of construction.

The building located on the Pickett property between station 116+ 57 left and station 117+02 left shall not be used by the Department or the Contractor for any purpose.

Tunney Property:

Access to the driveway/dock at station 117+50+/- right shall be maintained at all times during construction.

Other properties:

Access to the driveway at station 114+92 right shall be maintained at all times during construction.

On-site parking:

The Contractor shall restrict the number of vehicles on the project site to prevent blocking private residences and drives or creating unsafe traffic conditions near the project site. Only those vehicles which are required for work shall be on site. The Contractor's workers shall park away from the site.

Navigation Channel:

The Contractor shall plan and prosecute work in such a manner as to limit the total closure of the navigation channel to boat traffic to a maximum of 213 consecutive calendar days between September 10, 2014 and May 15, 2015 or between September 10, 2015 and May 22, 2016.

Once the Contractor closes the navigation channel to boat traffic, the navigation channel closure shall be continuous. A disincentive/penalty of \$10,000.00 (ten thousand dollars) per calendar day shall be paid by the Contractor for every day the navigation channel remains closed to boat traffic beyond the 213 consecutive calendar day closure allowed. The maximum disincentive paid by the Contractor shall be capped at \$350,000.

Other:

Starting on June 1, 2016 until construction is complete, the Contractor shall be assessed a penalty of \$214.29 per calendar day for every day the building on the Pickett property located between station 116+ 57 left and station 117+02 is not accessible. A vehicle shall be able to use the garage.

Supplemental liquidated damages will be assessed to the contract at the rate of Five Hundred (\$500.00) U.S. dollars per day for each day that the project remains incomplete beyond the specified contract completion date.

This assessment of liquidated damages will be in addition to the liquidated damages specified in section 107 of the Department of Transportation Standard specification.

SPECIAL PROVISION
SECTION 107
SCHEDULING OF WORK

Replace Section 107.4.2 with the following:

”107.4.2 Schedule of Work Required Within 21 Days of Contract Execution and before beginning any on-site activities, the Contractor shall provide the Department with its Schedule of Work. The Contractor shall plan the Work, including the activity of Subcontractors, vendors, and suppliers, such that all Work will be performed in Substantial Conformity with its Schedule of Work. The Schedule must include sufficient time for the Department to perform its functions as indicated in this Contract, including QA inspection and testing, approval of the Contractor's TCP, SEWPCP and QCP, and review of Working Drawings.

At a minimum, the Schedule of Work shall include a bar chart which shows the major Work activities, milestones, durations, submittals and approvals, and a timeline. Milestones to be included in the schedule include: (A) start of Work, (B) beginning and ending of planned Work suspensions, (C) Completion of Physical Work, and (D) Completion. If the Contractor Plans to Complete the Work before the specified Completion date, the Schedule shall so indicate.

Any restrictions that affect the Schedule of Work such as paving restrictions or In-Stream Work windows must be charted with the related activities to demonstrate that the Schedule of Work complies with the Contract.

The Department will review the Schedule of Work and provide comments to the Contractor within 20 days of receipt of the schedule. The Contractor will make the requested changes to the schedule and issue the finalized version to the Department.”

SPECIAL PROVISION
SECTION 109.5
ADJUSTMENTS FOR DELAY
(Delays due to Flooding)

Subsection 109.5.1, Definitions- Types of Delays, is replaced with the following:

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

A. Excusable Delay Except as expressly provided otherwise by this Contract, an "Excusable Delay" is a Delay to the Critical Path that is directly and solely caused by: (1) an Uncontrollable Event, or (2) a flooding event at the effected location of the Project that results in a Q25 headwater elevation, or greater, but less than a Q50 headwater elevation. Theoretical headwater elevations will be determined by the Department; actual headwater elevations will be determined by the Contractor and verified by the Department.

B. Compensable Delay A "Compensable Delay" is a Delay to the Critical Path that is directly and solely caused by: (1) a weather related Uncontrollable Event of such an unusually severe nature that a Federal Emergency Disaster is declared. The Contractor will only be entitled to an Equitable Adjustment if the Project falls within the geographic boundaries prescribed under the disaster declaration (2) an Uncontrollable Event caused by a Utility Company or other third party (not Subcontractors) Working on Project-related Work within the Project Limits if, and only if, the Utility Company or such other third party offers the Department reimbursement for such Delay; (3) acts by the Department that are in violation of applicable laws or the Contract, or (4) a flooding event at the effected location of the Project that results in a Q50 headwater elevation, or greater. Theoretical Q50 headwater elevations will be determined by the Department; actual headwater elevations will be determined by the Contractor and verified by the Department.

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

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

SPECIAL PROVISION
SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS
(Building Removal)

Description

The work shall consist of the complete demolition and removal of the following units:

Building No. 1: Operators House and 2 Out Buildings

General: Removal of building shall include all attached structures including barns and garages as well as outbuildings, steps, slabs, walks, decks, piers, posts, driveways and other incidentals, as directed by the Resident.

All excavations shall be filled and compacted using vibratory equipment in one-foot layers to the surrounding existing grade levels. In this process, the contour and grades of the abutting land are to be followed. Erosion control including loaming, seeding, and mulch shall be done and will be considered to be incidental to the contract.

Under Section 202.02 of the Standard Specifications, ownership of buildings and all equipment, fixtures, and materials therein shall be interpreted as meaning all equipment, fixtures, and materials that are recognized as real property. Any items that are recognized as personal property are exempt and are reserved to the owner. If the bidder is in doubt as to whether any item not listed is real or personal property, they shall request a determination of the matter prior to date on which bids are to be received.

All debris and unusable materials shall be removed to an approved transfer station or approved landfill. Under no circumstances shall any material or debris be disposed of by burning on the premises nor shall the debris be burned at an off premise site.

Rodent Control. With the "Notice to Proceed", or when a building becomes available to the Contractor, the Contractor will designate whether rodent control measures are required or not.

The Contractor shall not remove a building until the Contractor has certified it to be free of rodents. Should rodent control measures be required, the Contractor shall procure the extermination services as soon as possible. The Contractor will re-inspect the building within 7 days after the extermination services are performed. The cost of extermination services until the building is found to be rodent free will be paid for as a specialty item under Section 109.04(g) of the Standard Specifications.

Each building shall be removed promptly after notification that it is free of rodents. All subsequent inspection costs and extermination services necessary to assure that the building is rodent free at time of removal will be at the expense of the Contractor.

This building may or may not contain asbestos. Prior to any demolition of building(s) the Contractor will conduct an asbestos survey on the building(s) to determine if any asbestos exists. The survey will be conducted by a DEP certified Asbestos Inspector. No separate payment will be made for the survey and it shall be considered incidental. The survey results will be communicated with the Resident. If no asbestos is discovered, the demolition process may proceed. If asbestos is found, the Contractor will employ a DEP certified Asbestos Abatement Contractor for its' removal and disposal. The Department will bear all expenses incurred in the abatement of any asbestos containing material as detailed in Standard Specification 109.7.5 – Force Account. Any questions can be directed to the Office of Legal Service (624-3020).

The Contractor shall remove all utility service connections prior to demolition of any building. The Contractor shall coordinate disconnection of overhead utilities with the appropriate utility companies.

The building has a portable toilet. The portable toilet shall be removed by the Department before the building is removed. The Contractor shall provide the Resident with 7 days of advanced notice before building removal.

All fill material used for foundation cavities, septic systems and other shall meet the Standard Specification requirements for Common Borrow, Section 703.18.

Contractor shall provide and maintain all temporary barricades, signs or other safety measures as necessary to complete the work. Contractor shall obtain any and all permits or licenses necessary for the performance of the work and conform to all Federal, State and local laws, regulations or ordinances applicable to the work.

Any oil/fuel tanks encountered will need to be properly disposed of. The fuel is a regulatory material and may be reused or disposed of in accordance to local, state, and federal regulations. The tanks shall also be disposed of in accordance to local, state, and federal regulations.

All plywood panels, hasps, padlocks, and other materials used to secure these buildings will remain the property of the Department of Transportation. These panels and padlocks will be transported to a location in the area to be determined by the Resident.

Method of Measurement: Removing building will each be measured by the lump sum.

Basis of Payment: All work for will be paid for at the contract Lump Sum price, which shall be full compensation for all materials, labor and equipment necessary for the work described above and as shown in the Plans, and/or as directed by the Resident.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
202.08 Removing Building: Operator's House and 2 Out Buildings	Lump Sum

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

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

1. Metal bridge rail including posts on the west most side of the bridge
2. Hydraulic drive motor
3. Wedge assemblies

The Contractor shall use great care during removal of the existing bridge as not to damage the metal bridge rail to be retained. All material listed above shall be removed by the Contractor and transported from the project site to the following location:

Maine Department of Transportation
Bridge Maintenance Lot
Route 17
Washington, Maine

The Contractor shall contact the Resident and Mike Orne, Maine DOT at (207) 592-1532 a minimum of 72 hours in advance of delivery of the materials. The materials shall be unloaded by the Department.

Method of Measurement Remove Existing Rail – Retained by Department will be paid for by the linear foot.

Basis of Payment Remove Existing Rail – Retained by Department will be paid for by the linear foot. Payment shall be full compensation for all work including all incidentals to remove, transport and unload the gate. Payment for removal, transport and unloading the hydraulic drive motor and wedge assembly shall be considered incidental to item 202.19 Remove Existing Bridge.

Payment will be made under:

<u>Pay item</u>	<u>Pay Unit</u>
202.13 Remove Existing Rail – Retained by Department	Linear Foot

SPECIAL PROVISION
SECTION 202
(Removing Existing Bridge)

Description

This work shall include the complete removal and satisfactory disposal of the existing Gut Bridge fenders, abutments and wingwalls, except such portions thereof as may be required or permitted to be left in place. The wingwall on the Southwest corner shall be removed to approximately station 115+80. This provision neither amends nor modifies other provisions of Section 202 except as specified below.

Construction Requirements

The Contractor shall provide detailed demolition plans. The plans shall include, but is not limited to, the proposed method(s) of removal, all required falsework, protective structures, and equipment needed to safely accomplish the bridge removal. The Contractor shall proceed with demolition no earlier than 10 business days after the demolition plan has been submitted to the Resident.

All materials consisting of hazardous substances such as lead paint, asbestos, petroleum products, or other substances of potential harm to the public or the environment shall be handled, stored, treated and disposed of in accordance with local, state and federal environmental regulations. The Contractor shall hire an environmental specialist to prepare a materials handling plan to be followed during the demolition.

The Contractor shall contain all demolition debris (including debris from wearing surface removal, saw cut slurry, dust, etc.) and shall not allow it to discharge to any regulated resource. All demolition debris shall be disposed of in accordance with requirements of the Standard Specifications and of the Maine Solid Waste Law, Title 38 M.R.S.A., Section 1301 et seq. Containment and disposal of demolition debris shall be addressed in the Contractor's Soil Erosion and Water Pollution Control Plan (SEWPCP).

The Contractor shall dismantle the existing bridge structure in a manner that will not cause damage to persons or property. Strict adherence to the Special Provision 656 and other precautions, including protective structures as required or ordered, shall be taken to insure that no debris is allowed to fall into the water below.

The Contractor shall not disturb any utility or property carrying water, sewer, gas, communications, electric or similar service across or under the bridges unless permitted to do so by the Resident.

Method of Measurement

Removing Existing Bridge will be measured by the lump sum and will include the removal of the superstructure, including structural and incidental steel components, reinforced concrete, bridge lighting, and substructure to the extent specified on the plans and herein.

Basis of Payment

The accepted quantity of Removing Existing Bridge will be paid for at the contract lump sum price, which shall be full compensation for removing and disposing of the existing bridge.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
202.19 Removing Existing Bridge	Lump Sum

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

The following items on the existing bridge shall be removed by the Contractor and delivered and unloaded at the South Bristol Historical Society:

1. One red and one green light that protrude up above the superstructure
2. The entire bridge control panel including the base with all wiring disconnected
3. Bridge bell or gong
4. The following signs on or next to the bridge:
 - i. Keep Off Swing Span (at southwest corner of bridge)
 - ii. Bridge Opening When Flashing (at northwest corner of bridge)
 - iii. Other signs as directed by the Resident

The South Bristol Historical Society contact information is as follows:

Location:

2124 State Route 129
South Bristol, Maine

Mail:

P.O. Box 229
South Bristol, Maine 04568

Telephone/e-mail:

207-315-0558
SBHistorical@gmail.com

The Contractor shall contact the South Bristol Historical Society a minimum of 7 calendar days before delivery.

This work shall not be paid for directly, but shall be considered incidental to item 202.19 Removing Existing Bridge-Lump Sum.

South Bristol
WIN 016750
December 20, 2013

SPECIAL PROVISION
SECTION 202
REMOVAL OF STRUCTURES AND OBSTRUCTIONS
(Removal and Disposal of Advanced Warning Signs)

Description

This work shall consist of removal and proper disposal of the two existing advanced warning signs located on both approaches to the bridge as directed by the Resident. The work shall also include removal of the aerial power cable(s) and filling in any holes with common borrow. The signs each consist of two flashing beacons with two signs mounted on a vertical steel w sections painted with lead paint embedded in a concrete foundation. The Contractor shall not remove the existing advanced warning signs until the existing bridge no long operates or moves.

Construction

The steel portions of the signs are coated with a lead-based paint system. The Contractor is responsible for implementing appropriate OSHA mandated personal protection stands related to this process. Once the existing signs are removed, the contractor is solely responsible for the care, custody and control of the components of the sign and any hazardous waste generated as a result of the storage, recycling or disposal of the sign components including lead coated steel. The Contractor shall recycle or reuse the steel in accordance with the Maine Department of Environmental Protection's "Maine Hazardous Waste management Regulations Chapter 850. A copy of this regulation is available at MaineDOT's offices on Child Street in Augusta.

Method of Measurement

Remove and dispose advance warning sign system will be measured for payment by the Lump Sum, complete.

Basis of Payment

The accepted remove and dispose advance warning sign system will be paid for at the contract Lump Sum price. Payment will be full compensation for the furnishing of all materials, labor and incidentals required for all work including but not limited to earthwork, transportation, disassembly and proper disposal.

Payment will be made under

Pay Item

Pay Unit

202.55 Remove and Dispose Advance Warning Sign System

Lump Sum

SPECIAL PROVISION
SECTION 203
EXCAVATION AND EMBANKMENT
(Dredge Materials)

Description: Dredge Material (See MaineDOT Standard Specifications § 101.2) is regulated as a Special Waste.

Work associated with The Gut Bridge replacement project will require the excavation of select Dredge Material from the The Gut (Damariscotta River). It is anticipated that less than 100-cubic yards of Dredge Material will be excavated. There is onsite Beneficial Use for the Dredge Materials.

It is acknowledged that the excavation of Dredge for this work may include some boulders. The Maine Department of Environmental Protection has determined that sound boulders (rock 12-inches or more in diameter), that are free of adhering sediment or other contaminants, shall be deemed to be Inert Fill material and shall not be included in the Dredge Material Quantities.

The contractor shall Beneficially Use all Dredge Material excavated at The Gut Bridge Replacement Project in an area adjacent to and draining into the dredged water body. No more than 100-cubic yards of Dredge Material may be excavated.

CONSTRUCTION REQUIREMENTS

Management: The contractor shall Beneficially Use all Dredge Material excavated at The Gut Bridge Replacement Project in areas adjacent to and draining into the dredged water body. No more than 100-cubic yards of Dredge Material may be excavated at the project site.

Method of Measurement: Dredge Material will be measured by the cubic yard of material removed.

Basis of Payment: Payment for the Beneficial Use of Dredge Material will be incidental to the Contract Pay Items.

Payment shall be full compensation for excavation, dewatering, managing, transporting, and placement of the Dredge Materials.

SPECIAL PROVISION
SECTION 203
HOLDING TANK

Description: This work shall consist of excavation, furnishing materials, installing and backfilling a Holding tank. The holding tank shall include a 2,000 gallon holding tank with overflow alarm system, precast riser pieces and 24" diameter cast iron manhole. This work also includes the piping, conduit and wiring required from the operator building to the holding tank.

Materials: The holding tank shall be constructed of reinforced precast concrete with a minimum 28 day compressive strength of 4,000 psi, concrete partitioned chambers, concrete lid with lift rings, vent, inlet inspection hole, and inlet turned down 12 inches below effluent level. The holding tank, risers and covers shall be designed for HS20 loading.

All work and materials shall be in general accordance with the following standards:

- a. ASTM C1227 - Standard Specification for Precast Concrete Septic Tanks; 2012
- b. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2013
- c. ASTM D2729 - Standard Specification for Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2011
- d. ASTM D3034 - Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2008

Installation: Excavation shall be done in such a manner that the holding tank and piping is placed to the proper elevations and slopes. Bedding under the holding tank shall be placed in one continuous layer not exceeding 6 inches compacted in place. Tank bedding and backfill shall be granular borrow compacted to 95%. Install holding tank and related components on bedding in accordance with the manufacturer's recommendations.

Install electrical service within conduit from the building to the appurtenance. Electrical service shall be hardwired to the electrical panel as appropriate. Comply with all applicable electrical codes.

Method of Measurement: Holding tank shall be measured by the contract unit price each.

Basis of Payment: The accepted quantity for the Holding tank will be paid for at the contract unit price each, complete and in place. Payment will be full compensation for all labor, excavation, backfill, materials, tools and any other incidentals necessary to complete the work.

South Bristol
WIN 016750.00
January 3, 2014

Pay Item

Pay Unit

203.2311 Holding tank

Each

SPECIAL PROVISION
SECTION 203
Excavation and Embankment

Section 203.02 shall be amended to include the following:

Material shall meet the requirements of the following Subsections of Division 700 – Materials:

Crushed Stone Fill 703.13

Section 203.19 shall be amended to include the following pay item:

<u>Pay Item</u>	<u>Pay Unit</u>
203.35 Crushed Stone Fill	CY

SPECIAL PROVISION
DIVISION 400
PAVEMENTS

SECTION 401 - HOT MIX ASPHALT PAVEMENT

(Longitudinal joint construction using wedge/taper apparatus)

The Special Provision 400. Section 401 – Hot Mix Asphalt Pavement, subsection 401.15 – Spreading and Finishing, and subsection 401.17- Joints have been modified with the following revisions. All sections not revised by this Special Provision shall be as outlined in the Special Provision 400 Pavements, Section 401 – Hot Mix Asphalt Pavement. References to Standard Specifications, Special Provisions, or other documents, shall be determined as the most current version available at the time of bid, or as amended. All costs associated with this Item will not be paid for directly, but shall be considered included in the associated contract items.

401.15 Spreading and Finishing The section has been amended as follows:

On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the HMA with hand tools to provide the required compacted thickness. Solvent based agents that strip asphalts from aggregates will not be allowed as release agents.

On roadways with adjoining lanes carrying traffic, the Contractor shall place each course over the full width of the traveled way section being paved that day, unless otherwise noted by the Department in Section 403 - Hot Bituminous Pavement, or within this Special Provision.

When an approved longitudinal joint construction method is utilized, such as a manufactured notched wedge apparatus, the Department may allow the placement of mixtures in one continuous lane for each calendar day worked, with the following conditions:

The Contractor may utilize a manufactured notched wedge joint apparatus on all HMA layers 1 ½ inch or greater in Zone 1 between the dates of May 30th and the Saturday following September 1st, and in Zone 2 between the dates of May 15th and the Saturday following September 15th. When the work is to be performed, either by contract requirement or Contractor option, during conditions defined as “night work”, the same seasonal limitations shall apply unless the Department determines that the construction method is producing an unsound joint. This work will not be allowed during times of inclement weather as outlined in Division 400 – Special Provision 401; subsection 401.06 Weather and Seasonal Limitations.

If this option is utilized on roadways with two-way traffic, the Contractor will be required to place a matching course of HMA over the adjacent section of travel lane before the end of the following calendar day. Failure to match the centerline course the following day will constitute a traffic control violation unless an excusable delay is granted by the Department.

If this option is utilized on divided highways or expressways with directional traffic, the Contractor will be required to place a matching course of HMA over the adjacent section of travel lane within seven calendar days from placement of the initial paved lane. Failure to match the centerline course the within the seven calendar days will constitute a traffic control violation unless an excusable delay is granted by the Department.

The Contractor will also be responsible for installing additional warning signage that clearly defines the centerline elevation differential hazard, as well as additional centerline delineation such as double RPM application, or temporary painted line. The Traffic Control Plan shall include this option and the additional requirements. All signs and traffic control devices will conform to Section 719.01, and Section 652, and will be installed prior to the work, at a maximum spacing of 0.50 mile [0.80 km] for the entire length of the effected roadway section. On roadways with two-way traffic, the Contractor will be required to place the specified course over the full width of the mainline traveled way being paved prior to opening the sections to weekend or holiday traffic. If this option is utilized, all additional signing, labor, traffic control devices, or incidentals will not be paid for directly, but will be considered incidental to the appropriate 652 bid items.

The Department reserves the right to have centerline cores cut by the Contractor's QC personnel for informational purposes to monitor the density along the joint. Informational cores at the centerline joint will be taken centered over the tapered part of the wedge joint.

Any notched wedge joint constructed areas that become cracked or broken shall be trimmed back to the limits affected prior to placing the adjoining lane. Any materials that become unbound or separated from the wedge or tapered joint section, or contaminated by materials determined by the Department as being detrimental to the construction of a sound construction joint, shall be removed by sweeping, compressed air and lance, or by hand tools as required. This work, if necessary, will not be paid for directly, but shall be considered incidental to the related contract items.

401.17 Joints The following section has been amended as follows:

Should the notched wedge joint device be used, the Contractor shall apply a coating of emulsified asphalt on the vertical and tapered surface of the longitudinal centerline joint immediately before paving. The rate of application shall be approximately 0.050 G/SY. This application shall be in addition to the normal application of tack coats to the construction joint face and horizontal surfaces prior to placing a new lift. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Department may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one working day.

SPECIAL PROVISION 400 - PAVEMENTS

SECTION 401 - HOT MIX ASPHALT PAVEMENT

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

401.02 Materials Materials shall meet the requirements specified in Section 700 - Materials:

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

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

The Contractor shall submit for Department approval a JMF to the Central Laboratory in Bangor for each mixture to be supplied. The Department may approve 1 active design per nominal maximum size, per traffic level, per plant, plus a 9.5mm “fine” mix for shimming and where required, a non-RAP design for bridge decks. The Department shall then have 15 calendar days in which to process a new design before approval. The JMF shall establish a single percentage of aggregate passing each sieve size within the limits shown in section 703.09. The mixture shall be designed and produced, including all production tolerances, to comply with the allowable control points for the particular type of mixture as outlined in 703.09. The JMF shall state the original source, gradation, and percentage to be used of each portion of the aggregate including RAP when utilized, and mineral filler if required. It shall also state the proposed PGAB content, the name and location of the refiner, the supplier, the source of PGAB submitted for approval, the type of PGAB modification if applicable, and the location of the terminal if applicable.

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

- Properly completed JMF indicating all mix properties (Gmm, VMA, VFB, etc.)
- Stockpile Gradation Summary
- Design Aggregate Structure Consensus Property Summary
- Design Aggregate Structure Trial Blend Gradation Plots (0.45 power chart)
- Trial Blend Test Results for at least three different asphalt contents
- Design Aggregate Structure for at least three trial blends
- Test results for the selected aggregate blend at a minimum of three binder contents
- Specific Gravity and temperature/viscosity charts for the PGAB to be used
- Recommended mixing and compaction temperatures from the PGAB supplier
- Material Safety Data Sheets (MSDS) For PGAB
- Asphalt Content vs. Air Voids trial blend curve
- Test report for Contractor’s Verification sample

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

At the time of JMF submittal, the Contractor shall identify and make available the stockpiles of all proposed aggregates at the plant site. There must be a minimum of 150 ton for stone stockpiles, 75 ton for sand stockpiles, and 50 ton of blend sand before the Department will sample. The Department shall obtain samples for laboratory testing. The Contractor shall also make available to the Department the PGAB proposed for use in the mix in sufficient quantity to test the properties of the asphalt and to produce samples for testing of the mixture. Before the start of paving, the Contractor and the Department shall split a production sample for evaluation. The Contractor shall test its split of the sample and determine if the results meet the requirements of the Department’s written policy for mix design verification (See MaineDOT Policies and Procedures for HMA Sampling and Testing available at the Central Laboratory in Bangor). If the results are found to be acceptable, the Contractor will forward their results to the Department’s Lab, which will test the Department’s split of the sample. The results of the two split samples will be compared and shared between the Department and the Contractor. If the Department finds the mixture acceptable, an approved JMF will be forwarded to the Contractor and paving may commence. The first day’s production shall be monitored, and the approval may be withdrawn if the mixture exhibits undesirable characteristics such as checking, shoving or displacement.

The Contractor shall be allowed to submit aim changes within 24 hours of receipt of the first Acceptance test result. Should all of the Acceptance samples of a Lot be obtained prior to the receipt of the first Acceptance result, the Department will not allow the aim changes to be applied to that Lot. Adjustments will be allowed of up to 2% on the percent passing the 2.36 mm sieve through the 0.075 mm and 3% on the percent passing the 4.75 mm or larger sieves. Adjustments will be allowed on the %PGAB of up to 0.2%. Adjustments will be allowed on GMM of up to 0.010.

The Contractor shall submit a new JMF for approval each time a change in material source or materials properties is proposed. The same approval process shall be followed. The cold feed percentage of any aggregate may be adjusted up to 10 percentage points from the amount listed on the JMF, however no aggregate listed on the JMF shall be eliminated. The cold feed percentage for RAP may be reduced up to 10 percentage points from the amount listed on the JMF and shall not exceed the percentage of RAP approved in the JMF or for the specific application under any circumstances.

TABLE 1: VOLUMETRIC DESIGN CRITERIA

Design ESAL’s (Millions)	Required Density (Percent of G _{mm})			Voids in the Mineral Aggregate (VMA)(Minimum Percent)					Voids Filled with Binder (VFB) (Minimum %)	Fines/Eff. Binder Ratio
	N _{initial}	N _{design}	N _{max}	Nominal Maximum Aggregate Size (mm)						
				25	19	12.5	9.5	4.75		
<0.3	≤91.5	96.0	≤98.0	13.0	14.0	15.0	16.0	16.0	70-80	0.6-1.2
0.3 to <3	≤90.5								65-80	
3 to <10	≤89.0								65-80*	
10 to <30										
≥ 30										

*For 9.5 mm nominal maximum aggregate size mixtures, the maximum VFB is 82.

*For 4.75 mm nominal maximum aggregate size mixtures, the maximum VFB is 84.

401.031 Warm Mix Technology The Contractor may place Hot Mix Asphalt Pavement produced with an accepted WMA technology if approved by the Department. Methods or technologies shall generally be at the Contractors option, but will be limited to proven, Agency and Industry accepted practice. Mixture production,

placement and volumetric testing details, including temperatures, shall be included in the project specific QCP, and submitted to the Department for approval prior to any work.

401.04 Temperature Requirements After the JMF is established, the temperatures of the mixture shall conform to the following tolerances:

- In the truck at the mixing plant – allowable range 275 to 325°F
- At the Paver – allowable range 275 to 325°F

The JMF and the mix subsequently produced shall meet the requirements of Tables 1 and Section 703.07.

401.05 Performance Graded Asphalt Binder Unless otherwise noted in Special Provision 403 - Hot Mix Asphalt Pavement, the Contractor may utilize either a 64-28 or 58-28 PGAB. The Contractor must stipulate which PGAB grading will be used to construct the entire HMA pavement structure prior to starting work. For mixtures containing greater than 20 percent but no more than 30 percent RAP the PGAB shall be PG 58-34 (or PG 52-34 when approved by the Department). The PGAB shall meet the applicable requirements of AASHTO M320 - Standard Specification for PGAB. Polymer-modified PGAB shall meet the applicable requirements of AASHTO MP 19. The Contractor shall provide the Department with an approved copy of the Quality Control Plan for PGAB in accordance with AASHTO R 26 Certifying Suppliers of PGAB.

The Contractor shall request approval from the Department for a change in PGAB supplier or source by submitting documentation stating the new supplier or source a minimum of 24 hours prior to the change. In the event that the PGAB supplier or source is changed, the Contractor shall make efforts to minimize the occurrence of PGAB co-mingling.

401.06 Weather and Seasonal Limitations The State is divided into two paving zones as follows:

- a. Zone 1 Areas north of US Route 2 from Gilead to Bangor and north of Route 9 from Bangor to Calais.
- b. Zone 2 Areas south of Zone 1 including the US Route 2 and Route 9 boundaries.

The Contractor may place Hot Mix Asphalt Pavement for use other than a traveled way wearing course in either Zone between the dates of April 15th and November 15th, provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 40°F or higher.

The Contractor may place Hot Mix Asphalt Pavement produced with an accepted WMA technology for any base, intermediate base, or shim course in either Zone between the dates of April 15th and November 15th, provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 35°F or higher, and the area to be paved is not frozen. The Hot Mix Asphalt Pavement produced with an approved WMA technology shall meet the requirements of section 401.04 - Temperature Requirements, unless otherwise approved by the Department.

The Contractor may place Hot Mix Asphalt Pavement as traveled way wearing course in Zone 1 between the dates of May 1st and the Saturday following October 1st and in Zone 2 between the dates of April 15th and the Saturday following October 15th, provided the air temperature determined as above is 50°F or higher. For the purposes of this Section, the traveled way includes truck lanes, ramps, approach roads and auxiliary lanes. The atmospheric temperature for all courses on bridge decks shall be 50°F or higher.

Hot Mix Asphalt Pavement used for curb, driveways, sidewalks, islands, or other incidentals is not subject to seasonal limitations, except that conditions shall be satisfactory for proper handling and finishing of the mixture. All mixtures used for curb, driveways, sidewalks, islands, or other incidentals shall conform to section 401.04 - Temperature Requirements. Unless otherwise specified, the Contractor shall not place Hot Mix Asphalt Pavement on a wet or frozen surface and the air temperature shall be 40°F or higher.

On all sections of overlay with wearing courses less than 1 inch thick, the wearing course for the travelway and adjacent shoulders shall be placed between the dates of May 15th and the Saturday following September 15th.

On all sections of overlay with wearing courses less than 1 inch thick, the wearing course for the travelway and adjacent shoulders shall be placed between the dates of June 1st and the Saturday following September 1st if the work is to be performed, either by contract requirement, or Contractor option, during conditions defined as “night work”.

401.07 Hot Mix Asphalt Plant

401.071 General Requirements HMA plants shall conform to AASHTO M156.

a. Truck Scales When the hot mix asphalt is to be weighed on scales meeting the requirements of Section 108 - Payment, the scales shall be inspected and sealed by the State Sealer as often as the Department deems necessary to verify their accuracy.

Plant scales shall be checked prior to the start of the paving season, and each time a plant is moved to a new location. Subsequent checks will be made as determined by the Resident. The Contractor will have at least ten 20 Kg [50 pound] masses for scale testing.

401.072 Automation of Batching Batch plants shall be automated for weighing, recycling, and monitoring the system. In the case of a malfunction of the printing system, the requirements of Section 401.074 c. of this specification will apply.

The batch plant shall accurately proportion the various materials in the proper order by weight. The entire batching and mixing cycle shall be continuous and shall not require any manual operations. The batch plant shall use auxiliary interlock circuits to trigger an audible alarm whenever an error exceeding the acceptable tolerance occurs. Along with the alarm, the printer shall print an asterisk on the delivery slip in the same row containing the out-of-tolerance weight. The automatic proportioning system shall be capable of consistently delivering material within the full range of batch sizes. When RAP is being used, the plant must be capable of automatically compensating for the moisture content of the RAP.

All plants shall be equipped with an approved digital recording device. The delivery slip load ticket shall contain information required under Section 108.1.3 - Provisions Relating to Certain Measurements, Mass and paragraphs a, b, and c of Section 401.073

401.073 Automatic Ticket Printer System on Automatic HMA Plant An approved automatic ticket printer system shall be used with all approved automatic HMA plants. The requirements for delivery slips for payment of materials measured by weight, as given in the following Sections, shall be waived: 108.1.3 a., 108.1.3 b., 108.1.3 c., and 108.1.3 d. The automatic printed ticket will be considered as the Weight Certificate.

The requirements of Section 108.1.3 f. - Delivery Slips, shall be met by the weigh slip or ticket, printed by the automatic system, which accompanies each truckload, except for the following changes:

- a. The quantity information required shall be individual weights of each batch or total net weight of each truckload.
- b. Signatures (legible initials acceptable) of Weighmaster (required only in the event of a malfunction as described in 401.074 c.).
- c. The MaineDOT designation for the JMF.

401.074 Weight Checks on Automatic HMA Plant At least twice during each 5 days of production either of the following checks will be performed:

- a. A loaded truck may be intercepted and weighed on a platform scale that has been sealed by the State Sealer of Weights and Measures within the past 12 months. The inspector will notify the producer to take corrective action on any discrepancy over 1.0%. The producer may continue to operate for 48 hours under the following conditions.
 1. If the discrepancy does not exceed 1.5%; payment will still be governed by the printed ticket.
 2. If the discrepancy exceeds 1.5%, the plant will be allowed to operate as long as payment is determined by truck platform scale net weight.

If, after 48 hours the discrepancy has not been addressed and reduced below 1.0%, than plant operations will cease. Plant operation may resume after the discrepancy has been brought within 1.0%.

b. Where platform scales are not readily available, a check will be made to verify the accuracy and sensitivity of each scale within the normal weighing range and to assure that the interlocking devices and automatic printer system are functioning properly.

c. In the event of a malfunction of the automatic printer system, production may be continued without the use of platform truck scales for a period not to exceed the next two working days, providing total weights of each batch are recorded on weight tickets and certified by a Licensed Public Weighmaster.

401.08 Hauling Equipment Trucks for hauling Hot Mix Asphalt Pavement shall have tight, clean, and smooth metal dump bodies, which have been thinly coated with a small amount of approved release agent to prevent the mixture from adhering to the bodies. Solvent based agents developed to strip asphalts from aggregates will not be allowed as release agents.

All truck dump bodies shall have a cover of canvas or other water repellent material capable of heat retention, which completely covers the mixture. The cover shall be securely fastened on the truck, unless unloading.

All truck bodies shall have an opening on both sides, which will accommodate a thermometer stem. The opening shall be located near the midpoint of the body, at least 12 in above the bed.

401.09 Pavers Pavers shall be self-contained, self-propelled units with an activated screed (heated if necessary) capable of placing courses of Hot Mix Asphalt Pavement in full lane widths specified in the contract on the main line, shoulder, or similar construction.

On projects with no price adjustment for smoothness, pavers shall be of sufficient class and size to place Hot Mix Asphalt Pavement over the full width of the mainline travel way with a 10 ft minimum main screed with activated extensions.

The Contractor shall place Hot Mix Asphalt Pavement on the main line with a paver using an automatic grade and slope controlled screed, unless otherwise authorized by the Department. The controls shall automatically adjust the screed and increase or decrease the layer thickness to compensate for irregularities in the preceding course. The controls shall maintain the proper transverse slope and be readily adjustable so that transitions and superelevated curves can be properly paved. The controls shall operate from a fixed or moving reference such as a grade wire or ski type device (floating beam) with a minimum length of 30 ft, a non-contact grade control with a minimum span of 24 ft, except that a 40 ft reference shall be used on Expressway projects.

The Contractor shall operate the paver in such a manner as to produce a visually uniform surface texture and a thickness within the requirements of Section 401.101 - Surface Tolerances. The paver shall have a receiving hopper with sufficient capacity for a uniform spreading operation and a distribution system to place the mixture uniformly, without segregation in front of the screed. The screed assembly shall produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screeds shall have auger extensions and tunnel extenders as per the manufacturer's recommendations, a copy of which shall be available if requested.

The Contractor shall have the paver at the project site sufficiently before the start of paving operations to be inspected and approved by the Department. The Contractor shall repair or replace any paver found worn or defective, either before or during placement, to the satisfaction of the Department. Pavers that produce an unevenly textured or non-uniform mat will be repaired or replaced before continuing to place HMA on MaineDOT projects.

On a daily basis, the Contractor shall perform density testing across the mat being placed, prior to being compacted by equipment at 12 in intervals. If the density values vary by more than 2.0% from the mean, the Contractor shall make adjustments to the screed until the inconsistencies are remedied. Failure to replace or repair defective placement equipment may result in a letter of suspension of work and notification of a quality control violation resulting in possible monetary penalties as governed by Section 106 - Quality

401.10 Rollers Rollers shall be static steel, pneumatic tire, oscillatory, or approved vibrator type. Rollers shall be in good mechanical condition, capable of starting and stopping smoothly, and be free from backlash when reversing direction. Rollers shall be equipped and operated in such a way as to prevent the picking up of hot mixed material by the roller surface. The use of rollers, which result in crushing of the aggregate or in displacement of the HMA will not be permitted. Any Hot Mix Asphalt Pavement that becomes loose, broken, contaminated, shows an excess or deficiency of Performance Graded Asphalt Binder, or is in any other way defective shall be removed and replaced at no additional cost with fresh Hot Mix Asphalt Pavement, which shall be immediately compacted to conform to the adjacent area.

The Contractor shall repair or replace any roller found to be worn or defective, either before or during placement, to the satisfaction of the Department. Rollers that produce grooved, unevenly textured or non-uniform mat will be repaired or replaced before continuing to place HMA on MaineDOT projects. The type of rollers to be used and their relative position in the compaction sequence shall generally be the Contractor's option, provided specification densities are attained and with the following requirements:

- a. On variable-depth courses, the first lift of pavement over gravel, reclaimed pavement, on irregular or milled surfaces, or on bridges, at least one roller shall be 16 ton pneumatic-tired. Unless otherwise allowed by the Resident, pneumatic-tired rollers shall be equipped with skirting to minimize the pickup of HMA materials from the paved surface. When required by the Resident, the roller shall be ballasted to 20 ton.
- b. Compaction with a vibratory or steel wheel roller shall precede pneumatic-tired rolling, unless otherwise authorized by the Department.
- c. Vibratory rollers shall not be operated in the vibratory mode when checking or cracking of the mat occurs, or on bridge decks.
- d. Any method, which results in cracking or checking of the mat, will be discontinued and corrective action taken.
- e. The use of an oscillating steel roller shall be required to compact all mixtures placed on bridge decks.

The maximum operating speed for a steel wheel or pneumatic roller shall not exceed the manufacturer's recommendations, a copy of which shall be available if requested.

401.101 Surface Tolerances The Department will check surface tolerance utilizing the following methods :

- a.) A 16 ft straightedge or string line placed directly on the surface, parallel to the centerline of pavement.
- b.) A 10 ft straightedge or string line placed directly on the surface, transverse to the centerline of pavement.

The Contractor shall correct variations exceeding $\frac{1}{4}$ in by removing defective work and replacing it with new material as directed by the Department. The Contractor shall furnish a 10 foot straightedge for the Departments use.

401.11 Preparation of Existing Surface The Contractor shall thoroughly clean the surface upon which Hot Mix Asphalt Pavement is to be placed of all objectionable material. When the surface of the existing base or pavement is irregular, the Contractor shall bring it to uniform grade and cross section. All surfaces shall have a tack coat applied prior to placing any new HMA course. Tack coat shall conform to the requirements of Section 409 – Bituminous Tack Coat, Section 702 – Bituminous Material, and all applicable sections of the contract.

401.12 Hot Mix Asphalt Documentation The Contractor and the Department shall agree on the amount of Hot Mix Asphalt Pavement that has been placed each day. All delivery slips shall conform to the requirements of 401.073.

401.13 Preparation of Aggregates The Contractor shall dry and heat the aggregates for the HMA to the required temperature. The Contractor shall properly adjust flames to avoid physical damage to the aggregate and to avoid depositing soot on the aggregate.

401.14 Mixing The Contractor shall combine the dried aggregate in the mixer in the amount of each fraction of aggregate required to meet the JMF. The Contractor shall measure the amount of PGAB and introduce it into the mixer in the amount specified by the JMF.

The Contractor shall produce the HMA at the temperature established by the JMF.

The Contractor shall dry the aggregate sufficiently so that the HMA will not flush, foam excessively, or displace excessively under the action of the rollers. The Contractor shall introduce the aggregate into the mixer at a temperature of not more than 25°F above the temperature at which the viscosity of the PGAB being used is 0.150 Pa·s.

The Contractor shall store and introduce into the mixer the Performance Graded Asphalt Binder at a uniformly maintained temperature at which the viscosity of the PGAB is between 0.150 Pa·s and 0.300 Pa·s. The aggregate shall be coated completely and uniformly with a thorough distribution of the PGAB. The Contractor shall determine the wet mixing time for each plant and for each type of aggregate used. The resultant material shall be a uniformly blended, homogenous HMA mixture.

401.15 Spreading and Finishing On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impracticable, the Contractor shall spread, rake, and lute the HMA with hand tools to provide the required compacted thickness. Solvent based agents developed to strip asphalts from aggregates will not be allowed as release agents.

On roadways with adjoining lanes carrying traffic, the Contractor shall place each course over the full width of the traveled way section being paved that day, unless otherwise noted by the Department in Section 403 - Hot Mix Asphalt Pavement.

In addition, hot mix asphalt pavement placed on bridges shall also conform to Section 508.04 and the following requirements.

- a. The bottom course shall be placed with an approved rubber mounted paver of such type and operated in such a manner that the membrane waterproofing will not be damaged in any way.
- b. The top course shall not be placed until the bottom course has cooled sufficiently to provide stability.
- c. The Contractor will not be required to cut sample cores from the compacted pavement on the bridge deck, unless otherwise directed by Special Provision.
- d. After the top course has been placed, the shoulder areas shall be sealed 3 ft wide with two applications of an emulsified bituminous sealer meeting the requirements of Section 612.03 – Sealing and Section 702.12 - Emulsified Bituminous Sealing Compound. The first application shall be pre-mixed with fine, sharp sand, similar to mortar sand, as needed to fill all voids in the mix in the area being sealed. The second application may be applied without sand. The sealer shall be carried to the curb at the gutter line in sufficient quantity to leave a bead or fillet of material at the face of the curb. The area to be sealed shall be clean, dry and the surface shall be at ambient temperature.
- e. The furnishing and applying of the required quantity of sealer for the bridge shoulder areas shall be incidental to placing the hot mix asphalt pavement.
- f. The atmospheric temperature for all courses placed on bridge decks shall be 50°F or higher.

401.16 Compaction Immediately after the Hot Mix Asphalt Pavement has been spread, struck off, and any surface irregularities adjusted, the Contractor shall thoroughly and uniformly compact the HMA by rolling.

The Contractor shall roll the surface when the mixture is in the proper condition and when the rolling does not cause undue displacement, cracking, or shoving. The Contractor shall prevent adhesion of the HMA to the rollers or vibrating compactors without the use of fuel oil or other petroleum based release agents. Solvents designed to strip asphalt binders from aggregates will not be permitted as release agents on equipment, tools, or pavement surfaces.

The Contractor shall immediately correct any displacement occurring as a result of the reversing of the direction of a roller or from other causes to the satisfaction of the Department. Any operation other than placement of variable depth shim course that results in breakdown of the aggregate shall be discontinued. Any new pavement that shows obvious cracking, checking, or displacement shall be removed and replaced for the full lane width as directed by the Resident at no cost to the Department.

Along forms, curbs, headers, walls, and other places not accessible to the rollers, the Contractor shall thoroughly compact the HMA with mechanical vibrating compactors. The Contractor shall only use hand tamping in areas inaccessible to all other compaction equipment. On depressed areas, the Contractor may use a trench roller or cleated compression strips under a roller to transmit compression to the depressed area.

Any HMA that becomes unacceptable due to cooling, cracking, checking, segregation or deformation as a result of an interruption in mix delivery shall be removed and replaced, with material that meets contract specifications at no cost to the Department.

401.17 Joints The Contractor shall construct wearing course transverse and longitudinal joints in such a manner that minimum tolerances shown in Section 401.101 - Surface Tolerances are met when measured with a straightedge.

The paver shall maintain a uniform head of HMA during transverse and longitudinal joint construction.

The HMA shall be free of segregation and meet temperature requirements outlined in section 401.04. Transverse joints of the wearing course shall be straight and neatly trimmed. The Contractor may form a vertical face exposing the full depth of the course by inserting a header, by breaking the bond with the underlying course, or by cutting back with hand tools. The Department may allow feathered or "lap" joints on lower base courses or when matching existing base type pavements.

Longitudinal joints shall be generally straight to the line of travel, and constructed in a manner that best ensure joint integrity. Methods or activities that prove detrimental to the construction of straight, sound longitudinal joints will be discontinued.

The Contractor shall apply a coating of emulsified asphalt immediately before paving all joints to the vertical face and 3 in of the adjacent portion of any pavement being overlaid except those formed by pavers operating in echelon. The Contractor shall use an approved spray apparatus designed for covering a narrow surface. The Department may approve application by a brush for small surfaces, or in the event of a malfunction of the spray apparatus, but for a period of not more than one working day.

Where pavement under this contract joins an existing pavement, or when the Department directs, the Contractor shall cut the existing pavement along a smooth line, producing a neat, even, vertical joint. The Department will not permit broken or raveled edges. The cost of all work necessary for the preparation of joints is incidental to related contract pay items.

401.18 Quality Control Method A, B & C The Contractor shall operate in accordance with the approved Quality Control Plan (QCP) to assure a product meeting the contract requirements. The QCP shall meet the requirements of Section 106.6 - Acceptance and this Section. The Contractor shall not begin paving operations until the Department approves the QCP in writing.

Prior to placing any mix, the Department and the Contractor shall hold a Pre-paving conference to discuss the paving schedule, source of mix, type and amount of equipment to be used, sequence of paving pattern, rate of mix supply, random sampling, project lots and sublots and traffic control. A copy of the QC random numbers to be used on the project shall be provided to The Resident. The Departments' random numbers for Acceptance testing shall be generated and on file with the Resident and the Project Manager. All personnel of the Department and the Contractor who have significant information relevant to the paving items shall attend, including the responsible onsite paving supervisor for the Contractor. The Resident will prepare minutes of the conference and distribute them to all attendees. Any requests to revise the minutes must be made to the Resident within 7 Days of Receipt. These minutes will constitute the final record of the Pre-paving conference.

The QCP shall address any items that affect the quality of the Hot Mix Asphalt Pavement including, but not limited to, the following:

- a. JMF(s)
- b. Hot mix asphalt plant details
- c. Stockpile Management (to include provisions for a minimum 2 day stockpile)
- d. Make and type of paver(s)
- e. Make and type of rollers including weight, weight per inch of steel wheels, and average contact pressure for pneumatic tired rollers
- f. Name of QCP Administrator, and certification number
- g. Name of Process Control Technician(s) and certification number(s)
- h. Name of Quality Control Technicians(s) and certification number(s)
- i. Mixing & transportation including process for ensuring that truck bodies are clean and free of debris or contamination that could adversely affect the finished pavement
- j. Testing Plan
- k. Laydown operations including longitudinal joint construction, procedures for avoiding paving in inclement weather, type of release agent to be used on trucks tools and rollers, compaction of shoulders, tacking of all joints, methods to ensure that segregation is minimized, procedures to determine the maximum rolling and paving speeds based on best engineering practices as well as past experience in achieving the best possible smoothness of the pavement. Solvent based agents developed to strip asphalts from aggregates will not be allowed as release agents.
- l. Examples of Quality Control forms including a daily plant report, daily paving report, and delivery slip template for any plant to be utilized.
- m. Silo management and details (can show storage for use on project of up to 36 hours)
- n. Provisions for varying mix temperature due to extraordinary conditions or production limitations. If a warm-mix technology is utilized, a proposed target production temperature range (not to exceed 50°F) will be provided for each mix design.
- o. Name and responsibilities of the Responsible onsite Paving Supervisor.
- p. Method for calibration/verification of Density Gauge
- q. A note that all testing will be done in accordance with AASHTO and the MaineDOT Policies and Procedures for HMA Sampling and Testing.
- r. A detailed description of RAP processing, stockpiling and introduction into the plant as well as a note detailing conditions under which the percent of RAP will vary from that specified on the JMF.
- s. A detailed procedure outlining when production will be halted due to QC or Acceptance testing results.
- t. A plan to address the change in PGAB source or supplier and the potential co-mingling of differing PGAB's.
- u. A procedure to take immediate possession of acceptance samples once released by MaineDOT and deliver said samples to the designated acceptance laboratory.
- v. Provisions for how the QCP will be communicated to the Contractor's field personnel

The QCP shall include the following technicians together with following minimum requirements:

- a. QCP Administrator - A qualified individual shall administer the QCP. The QCP Administrator must be a full-time employee of or a consultant engaged by the Contractor or paving subcontractor. The QCP Administrator shall have full authority to institute any and all actions necessary for the successful operation of the QCP. The QCP Administrator (or its designee in the QCP Administrator's absence) shall be available to communicate with the Department at all times. The QCP Administrator shall be certified as a Quality Assurance Technologist certified by the New England Transportation Technician Certification Program (NETTCP).

b. Process Control Technician(s) (PCT) shall utilize test results and other quality control practices to assure the quality of aggregates and other mix components and control proportioning to meet the JMF(s). The PCT shall inspect all equipment used in mixing to assure it is operating properly and that mixing conforms to the mix design(s) and other Contract requirements, and that delivery slips and plant recordation accurately reflects the mix being produced with all the required information. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than one PCT is required. The Plan shall include the criteria to be utilized by the PCT to correct or reject unsatisfactory materials. The PCT shall be certified as a Plant Technician by the NETTCP.

c. Quality Control Technician(s) (QCT) shall perform and utilize quality control tests at the job site to assure that delivered materials meet the requirements of the JMF(s). The QCT shall inspect all equipment utilized in transporting, laydown, and compacting to assure it is operating properly and that all laydown and compaction conform to the Contract requirements. The QCP shall detail how these duties and responsibilities are to be accomplished and documented, and whether more than one QCT is required. The QCP shall include the criteria utilized by the QCT to correct or reject unsatisfactory materials. The QCT shall be certified as a Paving Inspector by the NETTCP.

The QCP shall detail the coordination of the activities of the Plan Administrator, the PCT and the QCT. The Project Superintendent shall be named in the QCP, and the responsibilities for successful implementation of the QCP shall be outlined.

The Contractor shall sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with the following minimum frequencies:

TABLE 2 : MINIMUM QUALITY CONTROL FREQUENCIES

Test or Action	Frequency	Test Method
Temperature of mix	6 per day at street and plant	-
Temperature of mat	4 per day	-
%TMD (Surface)	1 per 125 ton (As noted in QC Plan)	ASTM D2950
%TMD (Base)	1 per 250 ton (As noted in QC Plan)	AASHTO T269
Fines / Effective Binder	1 per 500 ton	AASHTO T 312*
Gradation	1 per 500 ton	AASHTO T30
PGAB content	1 per 500 ton	AASHTO T164 or T308
Voids at N_{design}	1 per 500 ton	AASHTO T 312*
Voids in Mineral Aggregate at N_{design}	1 per 500 ton	AASHTO T 312*
Rice Specific Gravity	1 per 500 ton	AASHTO T209
Coarse Aggregate Angularity	1 per 5000 ton	ASTM D5821
Flat and Elongated Particles	1 Per 5000 ton	ASTM D4791
Fine Aggregate Angularity	1 Per 5000 ton	AASHTO T304

*Method A and B only

The Contractor may utilize innovative equipment or techniques not addressed by the Contract documents to produce or monitor the production of the mix, subject to approval by the Department.

The Contractor shall submit all Hot Mix Asphalt Pavement plant test reports, inspection reports and updated pay factors in writing, signed by the appropriate technician and present them to the Department by 1:00 P.M. on the next working day, except when otherwise noted in the QCP due to local restrictions. The Contractor shall also retain splits of the previous 5 QC tests, with QC results enclosed for random selection and testing by The Department during QA inspections of the HMA production facility. Test results of splits that do not meet the Dispute Resolution Variance Limits in Table 10 shall trigger an investigation by the MaineDOT Independent Assurance Unit, and may result in that lab losing NETTCP certification and the ability to request a dispute [Section 401.223 - Process for Dispute Resolution (Methods A , B and C only)].

The Contractor shall make density test results, including randomly sampled densities, available to the Department onsite. Summaries of each day's results, including a daily paving report, shall be recorded and signed by the QCT and presented to the Department by 1:00 p.m. the next working day.

The Contractor shall have a testing lab at the plant site, equipped with all testing equipment necessary to complete the tests in Table 2. The Contractor shall locate an approved Gyrotory Compactor at the plant testing lab or within 30 minutes of the plant site.

The Contractor shall fill all holes in the pavement resulting from cutting cores by the Contractor or the Department with a properly compacted, acceptable mixture no later than the following working day. Before filling, the Contractor shall carefully clean the holes and apply a coating of emulsified asphalt. On surface courses, cores shall not be cut except for Verification of the Nuclear Density Gauge, at a rate not to exceed 3 per day or 2 per 1000 Mg [1000 ton] placed.

The Contractor shall monitor plant production using running average of three control charts as specified in Section 106 - Quality. Control limits shall be as noted in Table 3 below. The UCL and LCL, shall not exceed the allowable gradation control points for the particular type of mixture as outlined in Table 1 of section 703.09

TABLE 3: Control Limits

Property	UCL and LCL
Passing 4.75 mm and larger sieves	Target +/-4.0
Passing 2.36 mm sieve	Target +/-2.5
Passing .075 mm sieve	Target +/-1.2
PGAB Content*	Target +/-0.3
Voids in the Mineral Aggregate	LCL = LSL + 0.2
% Voids at N_{design}	JMF Target +/-1.3

*Based on AASHTO T 308

The Contractor shall cease paving operations whenever one of the following occurs on a lot in progress:

- a. Method A: The Pay Factor for VMA, Voids @ N_d , Percent PGAB, composite gradation, VFB, fines to effective binder or density using all Acceptance or all Quality Control tests for the current lot is less than 0.85.
- b. Method B: The Pay Factor for VMA, Voids @ N_d , Percent PGAB, composite gradation, VFB, fines to effective binder or density using all Acceptance or all Quality Control tests for the current lot is less than 0.90.
- c. Method C: The Pay Factor for VMA, Voids @ N_d , Percent PGAB, percent passing the nominal maximum sieve, percent passing 2.36 mm sieve, percent passing 0.300 mm sieve, percent passing 0.075 mm sieve or density using all Acceptance or all available Quality Control tests for the current lot is less than 0.85.

- d. The Coarse Aggregate Angularity or Fine Aggregate Angularity value falls below the requirements of Table 3: Aggregate Consensus Properties Criteria in Section 703.07 for the design traffic level.
- e. Each of the first 2 control tests for a Method A or B lot fall outside the upper or lower limits for VMA, Voids @ Nd, or Percent PGAB; or under Method C, each of the first 2 control tests for the lot fall outside the upper or lower limits for the nominal maximum, 2.36 mm, 0.300 mm or 0.075 mm sieves, or percent PGAB.
- f. The Flat and Elongated Particles value exceeds 10% by ASTM D4791.
- g. There is any visible damage to the aggregate due to over-densification other than on variable depth shim courses.
- h. The Contractor fails to follow the approved QCP.

The Contractor shall notify the Resident in writing as to the reason for shutdown, as well as the proposed corrective action, by the end of the work day. Failure to do so will be treated as a second incident under 106.4.6 QCP Non-compliance. The Department will consider corrective action acceptable if the pay factor for the failing property increases, based on samples already in transit, or a verification sample is tested and the property falls within the specification limits.

In cases where the corrective action can be accomplished immediately, such as batch weight or cold feed changes, the Contractor may elect to resume production once the corrective action is completed. Additional QC testing shall be performed to verify the effectiveness of the corrective action. Subsequent occurrences of shutdown for the same property in a Lot in progress will require paving operations to cease. Paving operations shall not resume until the Contractor and the Department determines that material meeting the Contract requirements will be produced. The Department may allow the Contractor to resume production based upon a passing QC sample, with a split of the sample being sent to the Department for verification testing. If the submitted verification sample test results fall outside the specification limits, the Contractor shall cease production until a verification sample is submitted to the Department has been tested by the Department and found to be within specification limits.

If the Contractor's control chart shows the process to be out of control (defined as a single point outside of the control limits on the running average of three chart) on any property listed in Table 3: Control Limits, the Contractor shall notify the Resident in writing of any proposed corrective action by 1:00 PM the next working day.

The Department retains the exclusive right, with the exception of the first day's production of a new JMF, to determine whether the resumption of production involves a significant change to the production process. If the Department so determines, then the current lot will be terminated, a pay factor established, and a new lot will begin.

401.19 Quality Control Method D For Items covered under Method D, the Contractor shall submit a modified QC Plan detailing, how the mix is to be placed, what equipment is to be used, and what HMA plant is to be used. All mix designs (JMF) shall be approved and verified by MaineDOT prior to use. Certified QC personnel shall not be required. The Contractor shall certify the mix and the test results for each item by a Certificate of Compliance.

401.20 Acceptance Method A, B & C These methods utilizes Quality Level Analysis and pay factor specifications. For Hot Mix Asphalt Pavement designated for acceptance under Quality Assurance provisions, the Department will sample once per subplot on a statistically random basis, test, and evaluate in accordance with the following Acceptance Criteria:

TABLE 4: ACCEPTANCE CRITERIA

PROPERTIES	POINT OF SAMPLING	TEST METHOD
Gradation	Paver Hopper	AASHTO T30
PGAB Content	Paver Hopper	AASHTO T308
%TMD (Surface)	Mat behind all Rollers	AASHTO T269
%TMD (Base or Binder)	Mat behind all Rollers	AASHTO T269
Air Voids at N_d	Paver Hopper	AASHTO T 312
%VMA at N_d	Paver Hopper	AASHTO T 312
Fines to Effective Binder	Paver Hopper	AASHTO T 312
%VFB	Paver Hopper	AASHTO T 312

In the event the Department terminates a Lot prematurely but fails to obtain the required number of acceptance samples to calculate the volumetric property pay factor under the test method specified in the contract, the pay factor shall be calculated using the number of samples actually obtained from the contract. Should the number of acceptance samples taken total less than three, the resulting pay factor shall be 1.0 for volumetric properties. A minimum of three cores will be used for a density pay factor using the contract's specified Acceptance method, if applicable, for quantities placed to date.

Should the Contractor request a termination of the Lot in progress prior to three acceptance samples being obtained, and the Department agrees to terminate the Lot, then the pay factor for mixture properties shall be 0.80. A minimum of three cores will be used to determine a density pay factor using the contract's specified Acceptance method, if applicable, for quantities placed to date.

Lot Size For purposes of evaluating all acceptance test properties, a lot shall consist of the total quantity represented by each item listed under the lot size heading.

Sublot size - Refer to section 401.201, 401.202, and 401.203 for minimum size and number of sublots. The quantity represented by each sample will constitute a sublot.

If there is less than one-half of a sublot remaining at the end, then it shall be combined with the previous sublot. If there is more than one-half sublot remaining at the end, then it shall constitute the last sublot and shall be represented by test results. If it becomes apparent partway through a Lot that, due to an underrun, there will be insufficient mix quantity to obtain the minimum number of sublots needed, the Resident may adjust the size of the remaining sublots and select new sample locations based on the estimated quantity of material remaining in the Lot.

Acceptance Testing The Department will obtain samples of Hot Mix Asphalt Pavement in conformance with AASHTO T168 Sampling Bituminous Paving Mixtures, and the MaineDOT Policies and Procedures for HMA Sampling and Testing, which will then be transported by the Contractor to the designated MaineDOT Laboratory within 48 hours (except when otherwise noted in the project specific QCP due to local restrictions), as directed by MaineDOT in approved transport containers to be provided by the Department, unless otherwise directed by the Resident. Failure to deliver an acceptance sample to the designated acceptance laboratory will be considered the second incident under 106.4.6-QCP Non-Compliance.

The Department will take the sample randomly within each subplot. Target values shall be as specified in the JMF. The Department will use Table 5 for calculating pay factors for gradation, PGAB Content, Air Voids at N_{design} , VMA, Fines to Effective Binder and VFB. The Department will withhold reporting of the test results for the Acceptance sample until 7:00 AM, on the second working day of receipt of the sample, or after receipt of the Contractors results of the Acceptance sample split. Upon conclusion of each lot, where there is a minimum of four subplots, results shall be examined for statistical outliers, as stated in Section 106.7.2 - Statistical Outliers.

Isolated Areas During the course of inspection, should it appear that there is an isolated area that is not representative of the lot based on a lack of observed compactive effort, excessive segregation, a change in process or any other questionable practice, that area may be isolated and tested separately. An area so isolated that has a calculated pay factor below 0.80 for Method A and C or below 0.86 for Method B, based on three random tests shall be removed and replaced at the expense of the Contractor for the full lane width and a length not to be less than 150 ft.

Pavement Density The Department will measure pavement density using core samples tested according to AASHTO T-166. The Department will randomly determine core locations. The Contractor shall cut 6 inch diameter cores at no additional cost to the Department by the end of the working day following the day the pavement is placed, and immediately give them to the Department. Cores for Acceptance testing shall be cut such that the nearest edge is never within 9 inches of any joint. The cores will be placed in a transport container provided by the Department and transported by the Contractor to the designated MaineDOT Lab as directed by the Department. Pre-testing of the cores will not be allowed. At the time of sampling, the Contractor and the Department shall mutually determine if a core is damaged. If it is determined that the core(s) is damaged, the Contractor shall cut new core(s) at the same offset and within 3 ft of the initial sample. At the time the core is cut, the Contractor and the Department will mutually determine if saw cutting of the core is needed, and will mark the core at the point where sawing is needed. The core may be saw cut by the Contractor in the Department's presence onsite, or in an MaineDOT Lab by The Department, without disturbing the layer being tested to remove lower layers of Hot Mix Asphalt Pavement, gravel, or RAP. No recuts are allowed at a test location after the core has been tested. Upon conclusion of each lot, density results shall be examined for statistical outliers as stated in Section 106.7.2.

On all sections of overlay with wearing courses designed to be 3/4 in or less in thickness, there shall be no pay adjustment for density otherwise noted in Section 403 - Hot Mix Asphalt Pavement. For overlays designed to be 3/4 in or less in thickness, density shall be obtained by the same rolling train and methods as used on mainline travelway surface courses with a pay adjustments for density, unless otherwise directed by the Department.

There shall be no pay adjustment for density on shoulders unless otherwise noted in Section 403 - Hot Mix Asphalt Pavement. Density for shoulders shall be obtained by the same rolling train and methods as used on mainline travelway, unless otherwise directed by the Department. Efforts to obtain optimum compaction will not be waived by the Department unless it is apparent during construction that local conditions make densification to this point detrimental to the finished pavement surface course.

For 9.5 mm NMAAS mixtures the following pay adjustment shall also apply:

The average percent passing for the 0.075 mm sieve shall be evaluated for each Lot. If the average is greater than 6.5%, a pay adjustment according to Table 4A below shall apply in addition to the other pay adjustments for the given method of testing.

TABLE 4A: 0.075 mm SIEVE PAY ADJUSTMENT

AVERAGE PERCENT PASSING 0.075 MM SIEVE	PAY ADJUSTMENT
6.6% - 7.0%	-5% Pay Adjustment
> 7.0%	-10% Pay Adjustment

The Department shall notify the Contractor whenever the average of at least three samples in a given Lot is greater than 6.5%. Disputes on the 0.075 mm sieve values shall not be allowed for Method A or Method B Lots.

401.201 Method A Lot Size will be the entire production per JMF for the project, or if so agreed at the Pre-paving Conference, equal lots of up to 4500 tons, with unanticipated over-runs of up to 1500 ton rolled into the last lot. Sublot sizes shall be 750 ton for mixture properties, 500 ton for base or binder densities and 250 ton for surface densities. The minimum number of sublots for mixture properties shall be 4, and the minimum number of sublots for density shall be five.

TABLE 5: METHOD A ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target +/-7%
Passing 2.36 mm to 1.18 mm sieves	Target +/-4%
Passing 0.60 mm	Target +/-3%
Passing 0.30 mm to 0.075 mm sieve	Target +/-2%
PGAB Content	Target +/-0.4%
Air Voids	4.0% +/-1.5%
Fines to Effective Binder	0.9 +/-0.3
Voids in the Mineral Aggregate	LSL Only from Table 1
Voids Filled with Binder	Table 1 values plus a 4% production tolerance for USL only
% TMD (In place density)	95.0% +/- 2.5%

401.202 Method B Lot Size will be the entire production per JMF for the project and shall be divided into 3 equal sublots for Mixture Properties and 3 equal sublots for density.

TABLE 6: METHOD B ACCEPTANCE LIMITS

Property	USL and LSL
Percent Passing 4.75 mm and larger sieves	Target +/-7
Percent Passing 2.36 mm to 1.18 mm sieves	Target +/-5
Percent Passing 0.60 mm	Target +/-4
Percent Passing 0.30 mm to 0.075 mm sieve	Target +/-3
PGAB Content	Target +/-0.5
Air Voids	4.0% +/-2.0
Fines to Effective Binder	0.9 +/-0.3
Voids in the Mineral Aggregate	LSL from Table 1
Voids Filled with Binder	Table1 plus a 4% production tolerance for USL.
% TMD (In-place Density)	95.0% +/- 2.5%

401.203 Method C Lot Size will be the entire production per JMF for the project, or if so agreed at the Pre-paving Conference, equal lots of up to 4500 tons, with unanticipated over-runs of up to 1500 ton rolled into the last lot. Sublot sizes shall be 750 ton for mixture properties, 500 ton for base or binder densities and 250 ton for surface densities. The minimum number of sublots for mixture properties shall be 4, and the minimum number of sublots for density shall be five.

TABLE 7: METHOD C ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target +/-7%
Passing 2.36 mm to 1.18 mm sieves	Target +/-5%
Passing 0.60 mm	Target +/-4%
Passing 0.30 mm to 0.075 mm sieve	Target +/-2%
PGAB Content	Target +/-0.4%
Air Voids	4.0% +/-1.5%
Fines to Effective Binder	0.9 +/-0.3
Voids in the Mineral Aggregate	LSL Only from Table 1
Voids Filled with Binder	Table 1 values plus a 4% production tolerance for USL only
% TMD (In place density)	95.0% +/- 2.5%

401.204 Method D For hot mix asphalt items designated as Method D in Section 403 - Hot Mix Asphalt Pavement, one sample will be taken from the paver hopper or the truck body per 250 ton per pay item. The mix will be tested for gradation and PGAB content. Disputes will not be allowed. If the mix is within the tolerances listed in Table 8: Method D Acceptance Limits, the Department will pay the contract unit price. Contractor shall cut two 6 in cores, which shall be tested for percent TMD per AASHTO T-269 unless otherwise noted in Section 403 - Hot Mix Asphalt Pavement. If the average for the two tests falls below 92.5% the disincentive shall apply. If the test results for each 250 ton increment are outside these limits, the following deductions (Table 8b) shall apply to the HMA quantity represented by the test.

TABLE 8: METHOD D ACCEPTANCE LIMITS

Property	USL and LSL
Percent Passing 4.75 mm and larger sieves	Target +/-7
Percent Passing 2.36 mm to 1.18 mm sieves	Target +/-5
Percent Passing 0.60 mm	Target +/-4
Percent Passing 0.30 mm to 0.075 mm sieve	Target +/-3
PGAB Content	Target +/-0.5
% TMD (In-place Density)	95.0% +/- 2.5%

TABLE 8b Method "D" Price Adjustments

PGAB Content	-5%
2.36 mm sieve	-2%
0.30 mm sieve	-1%
0.075 mm sieve	-2%
Density	-10%

401.21 Method of Measurement The Department will measure Hot Mix Asphalt Pavement by the ton in accordance with Section 108.1 - Measurement of Quantities for Payment.

401.22 Basis of Payment The Department will pay for the work, in place and accepted, in accordance with the applicable sections of this Section, for each type of HMA specified.

The Department will pay for the work specified in Section 401.11, for the HMA used, except that cleaning objectionable material from the pavement and furnishing and applying bituminous material to joints and contact surfaces is incidental. Payment for this work under the appropriate pay items shall be full compensation for all labor, equipment, materials, and incidentals necessary to meet all related contract requirements, including design of the JMF, implementation of the QCP, obtaining core samples, transporting cores and samples, filling core holes, applying emulsified asphalt to joints, and providing testing facilities and equipment.

The Department will make a pay adjustment for quality as specified below.

401.221 Pay Adjustment The Department will sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with Section 106 - Quality and Section 401.20 - Acceptance, of this Specification.

401.222 Pay Factor (PF) The Department will use the following criteria for pay adjustment using the pay adjustment factors under Section 106.7 - Quality Level Analysis:

Density If the pay factor for Density falls below 0.80 for Method A or C or 0.86 for Method B, all of the cores will be randomly re-cut by Sublot. A new pay factor will be calculated that combines all initial and retest results. If the resulting pay factor is below 0.80 for Method A or C or below 0.86 for Method B, the entire Lot shall be removed and replaced with material meeting the specifications at no additional cost to the Department, except that the Department may, when it appears that there is a distinct pattern of defective material, isolate any defective material by investigating each mix sample subplot and require removal of defective mix sample sublots only, leaving any acceptable material in place if it is found to be free of defective material. Pay factors equal to or greater than the reject level will be paid accordingly.

Gradation For HMA evaluated under Acceptance Method A or B, the Department will determine a composite pay factor (CPF) using applicable price adjustment factors “f” from Table 9: Table of Gradation Composite “f” Factors, and Acceptance limits from Table 5: Method A Acceptance Limits, for Method A or Table 6: Method B Acceptance Limits, for Method B. The Department will not make price adjustments for gradation on Methods A and B except for 9.5mm NMAS mixtures as outlined in Table 4A. Gradations for Methods A and B shall be monitored as shutdown criteria.

TABLE 9: TABLE OF GRADATION COMPOSITE "f" FACTORS (Methods A and B)

Constituent		"f" Factor			
		19 mm	12.5 mm	9.5 mm	4.75 mm
Gradation	25 mm	-	-	-	-
	19 mm	4	-	-	-
	12.5 mm		4	4	-
	9.50 mm				4
	2.36 mm	6	6	6	8
	1.18 mm				
	0.60 mm	2	2	2	2
	0.30 mm	2	2	2	2
	0.075 mm	6	6	6	8

For HMA evaluated under Acceptance Method C, the Department will determine a pay factor using acceptance limits from Table 7: Method C Acceptance Limits.

VMA, Air Voids, VFB and Fines to Effective Binder The Department will determine a pay factor (PF) using the applicable Acceptance Limits.

The following variables will be used for pay adjustment:

- PA = Pay Adjustment
- Q = Quantity represented by PF in ton
- P = Contract price per ton
- PF = Pay Factor

Pay Adjustment Method A

The Department will use the following criteria for pay adjustment: density, Performance Graded Asphalt Binder content, voids @N_d, VMA, VFB, F/B_{eff}, and the screen sizes listed in Table 9 for the type of HMA represented in the JMF. If any single pay factor for PGAB Content, VMA, or Air Voids falls below 0.80, then the composite pay factor for PGAB Content, VMA, and Air Voids shall be 0.55.

Density: For mixes having a density requirement, the Department will determine a pay factor using Table 5: Method A Acceptance Limits:

$$PA = (\text{density PF} - 1.0)(Q)(P)x0.50$$

PGAB Content, VMA and Air Voids: The Department will determine a pay adjustment using Table 5: Method A Acceptance Limits as follows:

$$PA = (\text{voids @ } N_d \text{ PF} - 1.0)(Q)(P)x0.20 + (\text{VMA @ } N_d \text{ PF} - 1.0)(Q)(P)x0.20 + (\text{PGAB PF} - 1.0)(Q)(P)x0.10$$

VFB and Fines to Effective Binder The Department will determine a pay factor (PF) using Table 5: Method A Acceptance Limits. The Department will not make price adjustments for VFB or Fines to Effective Binder, but will monitor them as shutdown criteria.

Pay Adjustment Method B

The Department will use the following criteria for pay adjustment: density, Performance Graded Asphalt Binder content, voids @N_d, VMA, VFB, F/B_{eff}, and the screen sizes listed in Table 9 for the type of HMA represented in the JMF. If any single pay factor for PGAB Content, VMA, or Air Voids falls below 0.86, then the composite pay factor for PGAB Content, VMA, and Air Voids shall be 0.70.

Density: For mixes having a density requirement, the Department will determine a pay factor using Table 6: Method B Acceptance Limits:

$$PA = (\text{density PF} - 1.0)(Q)(P)x0.50$$

PGAB Content, VMA and Air Voids: The Department will determine a pay adjustment using Table 6: Method B Acceptance Limits as follows:

$$PA = (\text{voids @ } N_d \text{ PF- 1.0})(Q)(P)x0.20 + (\text{VMA @ } N_d \text{ PF- 1.0})(Q)(P)x0.20 + (\text{PGAB PF- 1.0})(Q)(P)x0.10$$

VFB and Fines to Effective Binder The Department will determine a pay factor (PF) using Table 6: Method B Acceptance Limits. The Department will not make price adjustments for VFB or Fines to Effective Binder, but will monitor them as shutdown criteria.

Pay Adjustment Method C

The Department will use density, Performance Graded Asphalt Binder content, and the percent passing the nominal maximum, 2.36 mm, 0.300 mm and 0.075 mm sieves for the type of HMA represented in the JMF. If the PGAB content falls below 0.80, then the PGAB pay factor shall be 0.55.

Density: For mixes having a density requirement, the Department will determine a pay factor using Table 7: Method C Acceptance Limits:

$$PA = (\text{density PF- 1.0})(Q)(P)x0.50$$

PGAB Content and Gradation The Department will determine a pay factor using Table 7: Method C Acceptance Limits. The Department will calculate the price adjustment for Mixture Properties as follows:

$$PA = (\% \text{ Passing Nom. Max PF-1.0})(Q)(P)X0.05+(\% \text{ passing 2.36 mm PF- 1.0})(Q)(P)X0.05+(\% \text{ passing 0.30 mm PF-1.0})(Q)(P)X0.05+(\% \text{ passing 0.075 mm PF- 1.0})(Q)(P)X0.10+(\text{PGAB PF-1.0})(Q)(P)X0.25$$

VMA, Air Voids, VFB and Fines to Effective Binder The Department will determine a pay factor (PF) using Table 7: Method C Acceptance Limits. The Department will not make price adjustments for VMA, Air Voids, VFB or Fines to Effective Binder, but will monitor them as shutdown criteria.

Pay Adjustment Method D

The Department will use density, Performance Graded Asphalt Binder content, and the screen sizes listed in Table 8b for the type of HMA represented in the JMF. If test results do not meet the Table 8 requirements, deducts as shown in Table 8b shall be applied to the quantity of mix represented by the test.

401.223 Process for Dispute Resolution (Methods A B & C only)

a. Dispute Resolution sampling At the time of Hot-Mix Asphalt sampling, the Department will obtain a split sample of each Acceptance test random sample for possible dispute resolution testing. The Contractor shall also obtain a split sample of the HMA at this same time. If the Contractor wishes to retain the option of requesting dispute testing of the initial Acceptance sample, the Contractor will test their split of the

Acceptance sample and shall report their results to the Resident, with a copy to the QA Engineer by 7:00 AM, on the second working day from time of QA sampling, otherwise dispute resolution will not be initiated. The Department's dispute resolution split sample will be properly labeled and stored for a period of at least two weeks, or until the sample is tested.

b. Disputing Acceptance results The Contractor may dispute the Department's Acceptance results and request (Methods A, B, & C) that the dispute resolution split sample be tested by notifying the

Department’s Resident and the QA Engineer in writing within two working days after receiving the results of the Acceptance test. The following shall be provided in the request:

- Acceptance sample reference number
- The specific test result(s) or property(ies) being disputed, and
- The complete, signed report of the Contractor’s testing (In a lab certified by the NETTCP and MaineDOT) of their split of the Acceptance sample indicating that the variances in Table 10: Dispute Resolution Variance Limits, for the specific test result(s) or property(ies) were exceeded.

c. Disputable items

For Methods A and B: The Contractor may dispute any or all of the following test results when the difference between the Department’s value and the Contractor’s value for that test equals or exceeds the corresponding allowable variation in Table 10: Dispute Resolution Variance Limits, PGAB content, G_{mb} , and G_{mm} . In addition, if the allowable variation for the G_{mb} or G_{mm} is not met or exceeded, the Contractor may dispute either or both of the following material properties provided the difference between results for them equals or exceeds the corresponding allowable variation in Table 10: Voids at N_{design} , and VMA.

For Method C only: The results for PGAB content and the screen sizes used for pay adjustment may be disputed.

d. Outcome The value of any disputed result or property reported for the initial Acceptance sample shall stand if the value reported for the dispute resolution sample is not closer to the value the Contractor reported for their split sample than to the value reported for the initial Acceptance sample. If the value reported for the dispute resolution falls precisely half-way between the other two values the value reported for the dispute resolution will replace the original acceptance value. Otherwise, the value reported for the dispute resolution sample will replace the value reported for the initial Acceptance sample, and will be used to re-calculate any other affected results or properties.

TABLE 10: DISPUTE RESOLUTION VARIANCE LIMITS

PGAB Content	+/-0.4%
G_{mb}	+/-0.030
G_{mm}	+/-0.020
Voids @ N_d	+/-0.8%
VMA	+/-0.8%
Passing 4.75 mm and larger sieves	+/- 4.0%
Passing 2.36 mm to 0.60 mm sieves	+/- 3.0%
Passing 0.30 mm to 0.15	+/- 2.0 %
0.075 mm sieve	+/- 1.0%

SECTION 402 - PAVEMENT SMOOTHNESS

402.00 Smoothness Projects Projects to have their pavement smoothness analyzed in accordance with this Specification will be so noted in Special Provision 403 - Hot Mix Asphalt Pavement

402.01 Pavement Smoothness The final pavement surface shall be evaluated for smoothness using a Class I or Class II profiler as defined by ASTM E950 (94). Smoothness measurements will be expressed in terms of the International Roughness Index (IRI) as defined by the World Bank, in units of inches/mile.

402.02 Lot Size Lot size for smoothness will be 3000 lane-feet. A subplot will consist of 20 50 lane-feet. Partial lots will be included in the previous lot if less than one-half the size of a normal lot. If equal to or greater than one-half the normal lot size, it will be tested as a separate lot.

402.03 Acceptance Testing The Department will conduct Acceptance testing following completion of the surface course. Sections to be excluded from testing include the following:

- Bridge decks and joints (no smoothness measurements will be taken within 100 ft of bridge joints)
- Acceleration and deceleration lanes
- Shoulders and ramps
- Side streets and roads
- Within 100 ft of transverse joints at the beginning and end of the project
- Within 100 ft of railroad crossings
- Urban areas with speed limits of 30 mph or lower

Each lot shall have 2 measurements made in each wheel path. The average of the 4 measurements will determine the smoothness for that lot.

The smoothness measurements will be statistically evaluated for pay factors as described in Subsection 106.7 - Quality Level Analysis, using the specification limits shown below.

ACCEPTANCE LIMITS	
Level	USL
I	60 in/mile
II	70 in/mile
III	80 in/mile

Computation of Smoothness Pay Adjustment:

$$PA = (PF-1.0)(Q)(P)$$

where:

Q = Quantity of surface course in the Lot (excluding shoulders, side streets, bridge decks, ramps, acceleration and deceleration lanes)

PF = smoothness pay factor for the Lot

P = Contract unit price for surface pavement

PA = pay adjustment

402.04 Unacceptable Work In the event that any Lot is found to have a pay factor less than 0.80, the Contractor shall take whatever remedial action is required to correct the pavement surface in that Lot at no additional expense to the Department. Such remedial action may include but is not limited to removal and replacement of the unacceptable pavement. In the event remedial action is necessary, the Contractor shall submit a written plan to the Resident outlining the scope of the remedial work. The Resident must approve this plan before the remedial work can begin. Following remedial work, the Lot shall be retested, and will be subject to the specification limits listed above. The resulting pay factor, if within the acceptable range, will be used in the final pay adjustment. The Contractor shall pay the cost of retesting the pavement following corrective action.

Localized surface tolerance defects will be subject to the provisions outlined in Section 401.101 Surface Tolerances.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
402.10 Incentive/Disincentive - Pavement Smoothness	Lump Sum

SECTION 403 - HOT MIX ASPHALT PAVEMENT

403.01 Description This work shall consist of constructing one or more courses of Hot Mix Asphalt pavement on an approved base in accordance with these specifications, and in reasonably close conformity with the lines, grades, thickness and typical cross sections shown on the plans or established.

The HMA pavement shall be composed of a mixture of aggregate, filler if required, and asphalt material.

403.02 General The materials and their use shall conform to the requirements of Section 401 - Hot Mix Asphalt Pavement.

403.03 Construction The construction requirements shall be as specified in Section 401 - Hot Mix Asphalt Pavement.

403.04 Method of Measurement Hot mix asphalt pavement will be measured as specified in Section 401.21-Method of Measurement.

403.05 Basis of Payment The accepted quantities of hot mix asphalt pavement will be paid for at the contract unit price per ton for the mixtures, including hot mix asphalt material complete in place.

Method A, Method B, Method C and Method D shall be used for acceptance as specified in Section 401 - Hot Mix Asphalt Pavements. (See Complementary Notes, Section 403 - Hot Mix Asphalt Pavement, for Method location).

Payment will be made under:

	<u>Pay Item</u>	<u>Pay Unit</u>
403.102	Hot Mix Asphalt Pavement for Special Areas	Ton
403.206	Hot Mix Asphalt, 25 mm Nominal Maximum Size	Ton
403.207	Hot Mix Asphalt, 19.0 mm Nominal Maximum Size	Ton
403.2071	Hot Mix Asphalt , 19.0 mm Nominal Maximum Size (Polymer Modified)	Ton
403.2072	Asphalt Rich Hot Mix Asphalt, 19.0 mm Nominal Maximum Size (Asphalt Rich Base and Intermediate course)	Ton
403.2073	Warm Mix Asphalt, 19.0 mm Nominal Maximum Size	Ton
403.208	Hot Mix Asphalt, 12.5 mm Nominal Maximum Size	Ton
403.2081	Hot Mix Asphalt - 12.5 mm Nominal Maximum Size (Polymer Modified)	Ton
403.20813	Warm Mix Asphalt - 12.5 mm Nominal Maximum Size (Polymer Modified)	Ton
403.2083	Warm Mix Asphalt, 12.5 mm Nominal Maximum Size	Ton

403.209	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (sidewalks, drives, islands & incidentals)	Ton
403.210	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size	Ton
403.2101	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Polymer Modified)	Ton
403.2102	Asphalt Rich Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Asphalt Rich Intermediate course)	Ton
403.2103	Warm Mix Asphalt, 9.5 mm Nominal Maximum Size	Ton
403.2104	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (3/4" Surface Treatment)	Ton
403.211	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Shimming)	Ton
403.2111	Hot Mix Asphalt, 9.5 mm Nominal Maximum Size (Shimming, Polymer Modified))	Ton
403.2113	Warm Mix Asphalt, 9.5 mm Nominal Maximum Size (Shimming)	Ton
403.212	Hot Mix Asphalt, 4.75 mm Nominal Maximum Size	Ton
403.2123	Warm Mix Asphalt, 4.75 mm Nominal Maximum Size	Ton
403.213	Hot Mix Asphalt, 12.5 mm Nominal Maximum Size (Base and Intermediate Base course)	Ton
403.2131	Hot Mix Asphalt, 12.5 mm Nominal Maximum Size (Base and Intermediate Base course, Polymer Modified)	Ton
403.2132	Asphalt Rich Hot Mix Asphalt, 12.5 mm Nominal Maximum Size (Base and Intermediate Base course)	Ton
403.2133	Warm Mix Asphalt, 12.5 mm Nominal Maximum Size (Base and Intermediate Base course)	Ton
403.214	Hot Mix Asphalt, 4.75 Nominal Maximum Size (5/8" Surface Treatment)	Ton
403.2143	Warm Mix Asphalt, 4.75 Nominal Maximum Size (5/8" Surface Treatment)	Ton

SPECIAL PROVISION
SECTION 403
HOT MIX ASPHALT PAVEMENT

401 HOT MIX ASPHALT LONGITUDINAL JOINT DENSITY

401.30 Description The Department will measure the pavement density of longitudinal joints constructed between adjoining mainline travel lanes. Core samples shall be tested according to AASHTO T-166. The Department will randomly determine core locations. The Contractor shall cut 6 in [150 mm] diameter cores at no additional cost to the Department by the end of the working day following the day the pavement is placed, and immediately give them to the Department. The cores will be placed in a transport container provided by the Department and transported by the Contractor to the designated MaineDOT Lab as directed by the Department. Cores shall not be cut except for verification at a rate not to exceed 3 per day or 2 per 1000 ton [1000 Mg] placed. Pre-testing of the acceptance cores will not be allowed. At the time of sampling, the Contractor and the Department shall mutually determine if a core is damaged. If it is determined that the core(s) is damaged, the Contractor shall cut new core(s) at the same offset and within 3 ft [1 m] of the initial sample. At the time the core is cut, the Contractor and the Department will mutually determine if saw cutting of the core is needed, and will mark the core at the point where sawing is needed. The core may be saw cut by the Contractor in the Department's presence onsite, or in an MaineDOT Lab by The Department, without disturbing the layer being tested to remove lower layers of Hot Mix Asphalt Pavement, gravel, or RAP. No recuts are allowed at a test location after the core has been tested. A minimum of five centerline joint cores will be obtained for each lot. Upon conclusion of each lot, density results shall be examined for statistical outliers as stated in Section 106.7.2.

Cores shall be taken directly over the construction joint. Should the notched wedge joint device be used, the cores shall be cut directly over the taper portion of the wedge (approximately centered 3" from the visible joint).

If the pay factor for Density falls below 0.80 for Method A or C, or 0.86 for Method B, the Contractor shall make corrective action to the longitudinal joint density construction method before proceeding with the Lot, or before starting a new Lot. In cases where the corrective action can be shown to immediately increase density, such as with informational cores or density gauge readings, the Contractor may elect to resume production once the corrective action methods are established. Additional QC testing shall be performed to verify the effectiveness of the corrective action.

Should the pay factor for Density remain at or fall below the specified action limit of 0.80 for Method A or C, or 0.86 for Method B, then the Contractor shall be required to make further adjustments to the construction method. The Department will consider corrective action acceptable if the density pay factor increases based on independent verification samples or acceptance samples.

401.31 Acceptance This method utilizes Quality Level Analysis and pay factor specifications as described in Section 106. For Hot Mix Asphalt Pavement designated for acceptance under Quality Assurance provisions, the Department will sample once per subplot on a statistically random basis, test, and evaluate in accordance with the following Acceptance Criteria:

TABLE 1: ACCEPTANCE CRITERIA

PROPERTIES	POINT OF SAMPLING	LOT SIZE	SUBLOT SIZE	TEST METHOD
%TMD (Centerline Joint)	Completed centerline joint	5000 ft* [1520 m]	1000 ft [300 m]	AASHTO T269

* Lot size will not exceed 7500 ft [2280 m]. Projects longer than 7500 ft [2280 m] will be divided into two or more lots. Partial lots will be included in the previous lot if equal to or less than one-half the size of a normal lot. If greater than one-half the normal lot size, it will be tested as a separate lot.

The Department will determine a pay factor using acceptance limits from Table 2.

TABLE 2: METHOD A DENSITY ACCEPTANCE LIMITS

	LSL
Percent of Maximum Theoretical Density*	91.0

* The Theoretical Maximum Density will be determined from the average of the Gmm values used to determine the percent compaction of the nearest acceptance cores on either side of the Centerline Joint Core from each adjacent mat.

The Department will calculate the Pay Adjustment for Centerline Joint Density as follows:

Where

$$PA = (\text{joint density PF} - 1.0)(Q)(P) \times 0.40$$

PA = Pay Adjustment
 Q = Quantity of traveled way pavement represented by PF in tons [Mg]
 P = Contract price per ton [Mg]
 PF = Pay Factor

If the joint density Pay Factor is less than 0.88, the Pay Adjustment shall be:

$$PA = (-0.05)(Q)(P)$$

SPECIAL PROVISION
SECTION 403
HOT MIX ASPHALT

Desc. Of Course	Grad Design.	Item Number	Bit Cont. % of Mix	Total Thick	No. Of Layers	Comp. Notes
<u>3/8" – The Gut Bridge Deck</u>						
Wearing	Type B	462.30	N/A	5/8"	1	27
<u>3" – At Grade Approach Slabs</u>						
Wearing	12.5 mm	403.208	N/A	1 1/2"	1	2,4,10,12,17
Base	12.5 mm	403.213	N/A	1 1/2"	1	2,4,10,12,17
<u>4" - Route 129 Travel Way & Shoulders</u>						
Wearing	12.5 mm	403.208	N/A	1 1/2"	1	2,4,10,12,17
Base	12.5 mm	403.213	N/A	2 1/2"	1	2,4,10,12,17
<u>2" – Town Landing, Drive</u>						
Wearing	12.5 mm	403.208	N/A	2"	1	2,4,10,12,17
<u>2" Operators House, Drive</u>						
Wearing	12.5 mm	403.208	N/A	2"	1	2,4,10,12,17

COMPLEMENTARY NOTES

2. The incentive/disincentive provisions for density shall not apply. A **Quality Control Technician (QCT) equipped with a density meter** shall be required for all roadway mixtures placed under this contract. Rollers shall meet the requirements of section 401.10 Rollers and this special provision. The use of an oscillating steel roller shall be required to compact all mixtures pavements placed on bridge decks.
4. The design traffic level for mix placed shall be 0.3 to <3 million ESALS. The design, verification, Quality Control, and Acceptance tests for this mix will be performed at **50 gyrations**.
10. Section 106.6 Acceptance, (2) Method D.
12. The combined aggregate gradation required for this item shall be classified as a 12.5mm "**fine graded**" mixture, (using the Primary Control Sieve control point) as defined in 703.09.
17. Compaction of the new Hot Mix Asphalt Pavement will be obtained using a minimal roller train consisting of a **10 ton** vibratory, **12 ton** pneumatic, and a **10 ton** finish roller for roadway work. Density testing of the mixture will be performed by the QCT using a density meter (according to ASTM D 2950). The mixture will be rolled until the density readings show less than 1 pcf change for the final roller passes. This density will be used as the target TMD for the mixture. The remaining mixture shall be compacted to a minimum density of 95% of the target density as determined in the control section. The Contractor shall make density test results, including randomly sampled densities, available to the Department's representative onsite. Summaries of each day's results, including a daily paving report, summarizing the mixture type, mixture temperature, equipment used, environmental conditions, and number of roller passes, shall be recorded and signed by the QCT and presented to the Department's representative by the end of the working day. An approved release agent is required to ensure the mixture does not adhere to hand tools, rollers, pavers,

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and truck bodies. The use of petroleum based fuel oils, or asphalt stripping solvents will not be permitted. The Department may require cores for informational purposes.

27. See Special Provision 462.30 – Ultra Thin Bonded Wearing Course, for project specifics.

Tack Coat

A tack coat of emulsified asphalt, RS-1, Item 409.15 shall be applied to any existing pavement at a rate of approximately 0.025 gal/yd², and on milled pavement approximately 0.05 gal/yd², prior to placing a new course. A fog coat of emulsified asphalt shall be applied between shim / intermediate course and the surface course, at a rate not to exceed 0.025 gal/yd².

Tack used between layers of pavement will be paid for at the contract unit price for Item 409.15 Bituminous Tack Coat.

**SPECIAL PROVISION
SECTION 462
GAP-GRADED HMA
(Ultra Thin Bonded Wearing Course)**

DESCRIPTION This work shall be constructed in accordance with the applicable referenced sections of Division 400 – Pavements; Section 401 – Hot Mix Asphalt Pavement, and the requirements of Section 106 – Quality. The Ultra thin Bonded Wearing Course consists of a warm polymer modified asphalt emulsion tack coat followed immediately with an ultra-thin hot mix asphalt wearing course. The tack coat is spray applied immediately prior to the application of the wearing course to produce a durable wearing surface that can be opened to traffic. The finished surface treatment has a minimum thickness of 12.5mm, (1/2”), for Type A and 16mm, (5/8”), for Type B and Type C.

MATERIALS

The contractor shall formulate and submit to the Department, a job mix formula (JMF) that satisfies the design general limits listed in Table 1 – Mixture requirements. The JMF range shall not fall outside the general design limits.

Table 1 – Composite Gradation

AASHTO Standard

Sieve Sizes

Total % Passing by Weight

Sieve Size	Type A - 1/4”	Type B – 3/8”	Type C - 1/2”
19 mm (3/4”)	-	-	100
12.5 mm (1/2”)	-	100	85-100
9.5 mm (3/8”)	97-100	85-100	45-85
4.75 mm (#4)	40-60	24-41	24-41
2.36 mm (#8)	21-33	21-33	21-33
1.18 mm (#16)	15-26	15-26	15-26
0.60 mm (#30)	11-20	11-20	11-20
0.30 mm (#50)	8-16	8-16	8-16
0.15 mm (#100)	5-10	5-10	5-10
0.075 mm (#200)	4-7	4-7	4-7
% PGAB	4.9 – 5.4	4.8 – 5.3	4.8 – 5.3

*Note: All aggregate percentages are based on the total weight of the aggregate. The composite gradation for each individual Type of mixture shall meet the gradation requirements of table 1.

COARSE AGGREGATE

The single size coarse aggregate shall be nominal 6.3 mm (1/4”) for Type A, 9.5 mm (3/8”) for Type B, and 12.5 mm (1/2”) for Type C. These are recommended requirements only listed in Table 2 – Coarse Aggregate Gradations.

Table 2 – Coarse Aggregate Gradations

Total % Passing by Weight

Screen Size	A	B	C
12.5 mm, (1/2”)		100	85-100
9.5 mm, (3/8”)	100	85-100	25-80
6.3 mm, (1/4”)	60-100	0-15	0-15
4.75 mm, (#4)	10-45	0-3	0-3
2.36 mm, (#8)	0-3		
1.18 mm, (#16)			

FINE AGGREGATE

The fine aggregate shall be 100% crushed. These are recommended requirements only listed in Table 3 – Fine Aggregate Gradations.

Table 3 – Fine Aggregate Gradation

Screen Size	% Passing
4.75 mm, (#4)	95-100
2.36 mm, (#8)	70-90
1.18 mm, (#16)	50-70
0.60 mm, (#30)	35-55
0.30 mm, (#50)	25-40
0.15 mm, (#100)	15-28
0.075 mm, (#200)	10-17

AGGREGATES

Aggregates used shall be from an approved source and shall meet the requirements of section 703.07 for 3.0 to < 10 million ESALs, and as modified by items 1 through 7 listed below.

1. Aggregates shall meet a Micro-Deval (AASHTO T 327) value of 18 or less.
2. Aggregates shall have a maximum LA Abrasion (AASHTO T96) of 30.
3. Absorption by AAHSTO T 84 shall be less than 2.0% for fine aggregate blends.
4. Absorption by AAHSTO T 85 shall be less than 2.0% for coarse aggregate blends.
5. Aggregates shall have a minimum sand equivalent of 45, (AASHTO T 176), and the fine aggregate shall be 100% crushed.
6. 95 % of the aggregate shall have at least a single face crushed and 85% shall have 2 or more crushed.
7. Percent by weight of Flat and Elongated particles shall be (5:1 ratio) with 10% maximum.

The Contractor shall test all materials and provide copies of all test results to the Department for materials utilized in the completion of the work. The Contractors' test results shall be submitted to the Department a minimum of 7 days prior to start of the work.

Mineral Filler - Hydrated lime, fly ash, Hot Mix Asphalt plant baghouse fines, or Portland cement may be acceptable as mineral filler.

Typical acceptable gradation: 100% passing 0.60 mm, (#30)
75-100% passing 0.075 mm, (#200).

Performance Graded Asphalt Binder - Unless otherwise noted in Special Provision 403 - Hot Bituminous Pavement, all asphalt binders shall meet a 64-28, or 58-28 PGAB grade.

Emulsified Tack Coat - Tack Coat shall meet a requirement, modified with latex, natural or synthetic, and shall be certified as meeting the requirements of ASTM D2397 except as modified in Table 5 – Tack Coat Material Properties. It is required that the latex be co-milled at the bulk emulsion facility, to ensure complete and balanced blending. CRS-1P asphalt grade emulsions shall have a minimum asphalt content ratio of 63%.

Table 5 – Tack Coat Material Properties

Property	Method	Minimum	Maximum
Latex Content, % Mass of Total Residue		3.0	
Viscosity at 25 deg C, (Sec.)	ASTM D244	20	100
Setting Time, Minutes	Observation	3	7
Demulsibility, % by wt. Residue	ASTM D244	40	
Penetration , 25 deg C (77 deg F)	T 49	60	150

Weather and Seasonal Limitations – All work shall be in accordance with Division 400 – Pavements; Section 401 – Hot Mix Asphalt Pavement , subsection 401.06- Weather and Seasonal Limitations, with the exception of the following revisions;

The minimum pavement surface temperature for application of the tack coat and placement of the wearing course is 10° C, (50° F.)

Ultra Thin Bonded Wearing Course placements shall be have a seasonal limitation of October 1st. All work and materials required to prepare the project for suspension will be considered incidental to the contract.

EQUIPMENT

Placement - The self-priming paver must be capable of spraying the tack coat, applying the hot asphalt overlay and smoothing the surface of the mat in one pass at the rate of 10-30 meters, (33-98 feet), per minute. The self-priming paver must incorporate a receiving hopper, feed conveyor, insulated storage tank for emulsion, metered tack coat spray bar and a variable width, heated, ironing type screed. The screed must have the ability to be crowned at the center both positively and negatively and have vertically adjustable extensions to accommodate the desired pavement profile.

Compaction - The Contractor shall use a steel wheeled double drum rollers weighing at least 7.25 to 9 metric tons, (8 to 10 ton), that are equipped with functioning water systems and scrapers to prevent the fresh mix from adhering to the roller drums.

CONSTRUCTION DETAILS

Surface Preparation - The Contractor shall remove the striping and sweep the roadway as needed prior to the surface treatment. This item will not be paid for directly, but shall be included in the 462.30 - Ultra Thin Bonded Wearing Course contract price.

The Contractor shall crack seal transverse and longitudinal cracks as appropriate. Materials and methods shall conform to item 424.31 – Low Modulus Crack Seal. This item will not be paid for directly, but shall be included in the 462.30 - Ultra Thin Bonded Wearing Course contract price.

Spot shims or leveling course, if required by the Department, shall be paid for under the appropriate 403.211 - 9.5mm Shim unit price included in the contract.

APPLICATION The minimum pavement surface temperature for application of the tack coat and placement of the wearing course is 10° C, (50° F.). Apply the tack coat at a temperature of 60° - 70° C, (140° - 160° F.). Provide a uniform application across the entire width to be overlaid, at a rate of 0.68 – 1.13 liters per square meter, (.15 - .25 gallons per square yard). The Contractor shall continuously monitor the rate of spray. No equipment shall come in contact with the tack coat before the hot mix asphalt wearing course is applied. Immediately after applying the tack coat, the contractor shall apply the hot mix asphalt overlay across the full width of the tack coat at a temperature of 150° – 165° C., (300° - 335° F.).

Compaction - The Contractor shall begin compaction immediately after the application of wearing course. Use a minimum of two passes. The roller(s) will not be allowed to stop on the freshly placed wearing course. The Contractor shall use an adequate number of rollers to complete compaction before the pavement temperature falls below 85° C., (185° F.). The Contractor shall protect the wearing course from traffic until the rolling operation is complete and the material has cooled sufficiently to resist damage.

Acceptance - Acceptance shall be in accordance with Section 401.203 - Testing Method C Lot Size will be the entire production per JMF for the project, or if so agreed at the Pre-paving Conference, equal lots of up to 120,000 square yards. Remaining square yards may be rolled into the last lot allowed up to a maximum of 160,000 square yards. Sublot sizes shall be 30,000 square yards for mixture properties, with unanticipated over-runs of up to 1650 square yards rolled into the last sublot. The minimum number of sublots per Lot for mixture properties shall be 4.

TABLE 4: ACCEPTANCE CRITERIA

PROPERTIES	POINT OF SAMPLING	TEST METHOD
Gradation	Paver Hopper	AASHTO T30
PGAB Content	Paver Hopper	AASHTO T308

TABLE 7: METHOD C ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target +/-7%
Passing 2.36 mm to 1.18 mm sieves	Target +/-4%
Passing 0.60 mm	Target +/-3%
Passing 0.30 mm to 0.075 mm sieve	Target +/-2%
PGAB Content	Target +/-0.4%

Pay Adjustment Method C Testing - The Department will sample, test, and evaluate Hot Mix Asphalt Pavement in accordance with Section 106 - Quality and Section 401.20 - Acceptance, of Division 400 – Pavements.

The Department will use Performance Graded Asphalt Binder content, and the screen sizes listed in this specification for the type of mixture represented in the JMF. If any pay factor for any single property falls below 0.85, the Contractor shall cease production at the HMA plant. If the PGAB content falls below 0.80, then the PGAB pay factor shall be 0.55. If the percent passing the nominal maximum sieve, the 2.36 mm sieve, the 0.300 mm sieve or the 0.075 mm sieve for Method C falls below 0.80, then the composite pay factor for the four sieves shall be 0.55.

PGAB Content and Gradation The Department will determine a pay factor for each square yard using Table 7: Method C Acceptance Limits. The Department will calculate the price adjustment for Mixture Properties as follows:

$$PA = (\% \text{ Passing Nom. Max PF}-1.0)(Q)(P)X0.05+(\% \text{ passing 2.36 mm PF}-1.0)(Q)(P)X0.05+(\% \text{ passing 0.30 mm PF}-1.0)(Q)(P)X0.05+(\% \text{ passing 0.075 mm PF}-1.0)(Q)(P)X0.10+(PGAB \text{ PF}-1.0)(Q)(P)X0.25$$

Method of Measurement The Ultra Thin Bonded Wearing Course shall be measured by the square meter [square yard].

Basis of Payment - The accepted quantity of Ultra Thin Bonded Wearing Course will be paid for at the contract unit price per square meter [square yard], complete in-place which price will be full compensation for furnishing all equipment, material, labor, striping removal, crack sealing, and all incidentals necessary to complete the work. Pay adjustments may be made as outlined in this specification.

Payments will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
462.30 - Ultra Thin Bonded Wearing Course	Square Meter [yd ²]

SPECIAL PROVISION
SECTION 501- Micropiles

501.01 Description

A. General. This work shall consist of furnishing all labor and materials, and performing all operations necessary to install micropiles at the locations and to the required capacities indicated in the contract documents.

B. Definitions. Definitions that apply within this specification are:

Bond Breaker. A device or special treatment incorporated into a length of a micropile that will allow no load to be transferred to the soil over that length. A bond breaker also provides full lateral support of the pile over the length of the bond breaker.

Grout placed in contact with the soil using gravity pressure only will not be considered to constitute a bond breaker.

Bond Zone. The gravity grouted, pressure grouted, and/or post grouted length of a micropile that provides the pile's capacity.

Design Load. The load permitted on a pile. The design load is indicated in the contract documents.

Drill Casing. Steel pipe of flush joint type used in the drilling process to stabilize the drill hole.

Duplex drilling. A method of progressing and cleaning out a hole for installing a micropile in which the outer drill casing is progressed simultaneously with an inner drill rod string. The drill casing is cleaned using reverse circulation. Intimate contact between the soil and an outer drill casing is maintained during drilling.

Extended Length. An additional pile length resulting from a requirement that the pile capacity be achieved below a given elevation. Typically, extended lengths are prompted by a conflict with subsurface elements (e.g., underground structure, utilities, etc.) or unreliable soil strata. Bond breakers may be required.

Micropile. A small-diameter (typically less than 12 inches), friction pile formed by removing material using non-vibratory and non-displacement methods to create a cased open, cylindrical hole in the ground, which is subsequently filled with grout and steel reinforcement.

Mill Secondary. Mill rejected American Petroleum Institute (API) casing, a.k.a. "Mill Rejects," "Structural Grade," "Limited Service," or "Minimum Test Pipe."

Non-production pile. Non-production piles are piles that are not incorporated into the substructure.

Permanent Casing. A steel casing installed in the upper portion of a micropile to increase the pile's moment capacity and lateral capacity against horizontal loads.

Positive circulation or flush. A method of progressing and cleaning out a hole for a micropile wherein drilling fluid is injected into the hole and returns upward along the outside of the drill casing.

Post grouting. A method used to increase pile capacity after the grout column has reached initial set by pumping grout at very high pressure (up to 1000 psi) through a sleeved port pipe (post grout tube).

Pressure grouting. A method used to develop pile capacity wherein pressure is applied continuously to the top of the fluid grout column through the drill head as the casing is removed from the bond zone.

Production pile. A pile which will be incorporated into the structure's foundation.

Recirculation. A method of handling drilling fluid where the fluid coming back out of the hole is captured in a pan and reused.

Reverse circulation. A method of cleaning the inside of the drill casing. Drilling fluid is circulated down through the drill rods and returns upwards through the inside of the drill casing to flush the drill casing clean.

Telltale. A simple mechanical device, a.k.a. "strain rod," that is used to measure deflection in concrete or steel. The device consists of a small-diameter steel rod that is fixed at a selected point along or within the pile. This rod is encased, and free to move, in a slightly larger pipe or tube which extends up to the pile top. Dial gages are used to measure the deflections at the top of the rod.

Tremie grouting. A method used to place grout in a wet hole. A grout tube is placed to the bottom of the drill hole. While keeping the tube opening submerged in the grout, grout is pumped into the hole, causing the drilling fluid to be displaced.

501.02 Materials

For all steel remaining as a permanent part of the work, all Buy America provisions shall apply.

A. Drill Casing. Provide drill casing consisting of flush joint type steel pipe of appropriate thickness to withstand the stresses associated with advancing it into the ground, in addition to the stresses due to hydrostatic and earth pressures.

B. Permanent Drill Casing/Pipe Used As Reinforcement. Provide steel drill casing/pipe used as reinforcement conforming to API 5CT N80 and ASTM A252 Grade 3 with a yield stress (Fy) of 80ksi, with the exception that spiral welded pipe shall not be allowed. Lap welded seams are not acceptable. Mill secondaries cannot be used for reinforcement. The steel shall be a Prequalified Base Metal from the AWS D1.1 Structural Welded Code - Steel.

Splices shall conform to the requirements of ASTM A148/A148M Grade 725-585, (Grade 105-85). Threaded casing joints shall develop at least the required compressive, tensile, and/or bending strength.

The casing shall be flush joint and the pipe joint shall be completely shouldered and with no stripped threads.

C. Reinforcing Steel. Provide Bar reinforcement meeting the requirements of Section 503-Reinforcing Steel. Bar shall be of Grade 75 unless otherwise specified on the plans

D. Grout. Provide a pumpable grout with a 28 day compressive strength of 5000psi consisting of, as a minimum, Portland Cement - Type 2 and Water meeting the following Specification requirements:

Material	Subsection
Portland Cement, Type 2	§701.01
Fine Aggregate for Concrete	§703.01
Fly Ash	§701.10
Water	§701.02

The use of Fine Aggregate for Concrete and Fly Ash in the mix is optional, subject to RE approval.

E. Centralizers and Spacers. Provide centralizers and spacers fabricated from schedule 40 PVC pipe, tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used.

F. Encapsulation (Double corrosion protection) shall be fabricated using high-density, corrugated polyethylene tubing conforming to the requirement of ASTM D3350/AASHTO M252 with nominal wall thickness of 0.8mm. The inside annulus between the reinforcing bars and the encapsulating tube shall be a minimum of 5mm and be fully grouted with non-shrink grout conforming to material Section 700. Grouting shall be performed during fabrication by the manufacturer. Field grouting of corrosion protection will not be allowed.

G. Plates and Shapes: Structural steel plates and shapes for pile tip attachment shall conform to ASTM A 572 Grade 50 (AASHTO M183)

501.03 Equipment:

The equipment shall be capable of installing micropiles to the depth and size shown on the plans and to a depth of 20 percent of the micropile length beyond the tip depths shown in the contract documents.

The equipment shall be capable of advancing drilling casing and permanent casing, and drilling holes for micropiles by rotating the casing (s) and applying a static vertical load. The equipment shall be capable of cleaning out the inside of the casings (s) without disturbing the surrounding soils or rock. The equipment shall be equipped with gauges conveniently located at the pile installation site to measure the volume of grout being pumped into the pile and grout pressure. The equipment shall be able to perform the work without removing or relocating existing utilities, structures and structure member.

501.04 Construction Details

Progress all micropiles using steel drill casing.

The Contractor performing the work described in this specification shall submit proof of the following:

1. Two projects in the past two years on which the Contractor has successfully installed micropiles using non-displacement methods, under similar site conditions to those indicated in the contract documents.
2. The proposed On-Site Supervisor for this work having supervised the successful installation of micropiles or soil tiebacks on at least two projects in the past two years.

A. Submittals. Submit the method-of-installation information outlined below and a Micropile Quality Control Plan (QCP) to the Resident for approval. The Resident will require a minimum of 21 work days to review the initial submittal and 10 work days to review each subsequent revision as per Section 105.7. Do not begin work prior to receiving approval by the Resident. Approval of the installation method by the Resident does not constitute a guarantee of acceptable pile installations. Acceptable installations are the responsibility of the Contractor.

Include in the submittal:

1. Details of equipment for pile installation.

2. Details of procedures for pile installation including, but not limited to, installation sequence and the approximate time required for each sequence step.
3. Procedures for advancing through boulders and other obstructions.
4. Procedures for containment of drilling fluid and spoil, and disposal of spoil.
5. Where applicable, drawings that show the specific work can be performed under limited headroom conditions and as close to obstructions, as site conditions warrant, to install the piles at the locations indicated in the contract documents. Provide information on the length of the casing sections to be used, as dictated by the length of the drill mast and by the available overhead clearance, and the resulting location of joints.
6. Procedures and equipment for placing grout.
 - a. Prepare the mix design for the grout and obtain documentation from an independent laboratory showing the following:
 - i. The mix design conforms to the submitted mix and meets the strength requirements set by the Resident.
 - ii. The compressive strength of the mix, tested at 3, 7, 14, and 28 days.
 - iii. The specific gravity of the mix.
 - b. Identify a method for monitoring quality control of the mix. At a minimum, the Contractor shall use a Baroid Mud Balance per American Petroleum Institute (API) Recommended Practice (RP) 13B-1: Standard Procedure for Testing Water Based Drilling Fluids, to check the specific gravity of the mixed grout prior to placement of the grout into each micropile in addition to 3 cubes per day or per batch, whichever is greater.
 - c. Provide pressure gages capable of measuring the actual grout pressures used and such that actual pressure readings are within the middle third of the gage.
7. If proposed, details of post-grouting equipment and procedures, including the method, sequence of operations and equipment required.
8. Layout drawings showing the proposed sequence of pile installation. Coordinate this sequence with the proposed phasing and scheduling.

B. Permanent Casing Installation and Soil Removal. Install the permanent casing prior to or in conjunction with the micropile installation. Install the permanent casing so that the center of each casing does not vary from the plan location by more than 3 inches. Do not allow the permanent casing to vary from the vertical or established batter by more than ¼ inch per foot as measured above ground. Install the top of the permanent casing to the elevation indicated in the contract documents.

Advance the hole using a duplex drilling method. Do not drill or flush ahead of the drill casing by more than 1 foot. Perform drilling and excavation in such a manner as to prevent the collapse of the hole. Use of bentonite slurry is not permitted. Use of polymer slurry to remove cuttings from the cased hole must be approved by the Resident.

If obstructions are encountered during excavation for a pile, progress through them by means of coring or a tricone roller bit. Use of drop type impact hammers and blasting are not permitted. Use of a down-the-hole hammer shall be approved by the Resident.

Control the procedures and operations so as to prevent mining, damage or settlement to adjacent structures, tunnels, utilities or adjacent ground. If any mining, damage or settlement occurs, halt operations. Provide a written plan to the Resident for review with procedures to avoid reoccurrence. Resume work only after the Resident has approved the plan in writing. Repair all damage and settlement at no additional cost to the State.

Control the procedures and operations so as to prevent the soil at the bottom of the hole from flowing into the hole at all times during installation and cleaning out. Monitor the rate of fluid flow used to progress the holes.

Control drilling fluid and dispose of spoil in accordance with the approved procedure.

Do not progress a hole, pressure grout, or post-grout, within a radius of 5 pile diameters or 5 feet, whichever is greater, of a micropile until the grout for that micropile has set for 24 hours or longer if a retarder is used.

C. Reinforcement and Post Grout Tube Placement. Provide centralizers sized to position the reinforcement within 3/8 inches of plan location from the center of the pile; sized to allow grout tremie pipe insertion to the bottom of the drill hole; and sized to allow grout to freely flow up the drill hole and casing and between adjacent reinforcing bars. Centralizers, spaced not to exceed 10 feet, must be used to center the reinforcement for its entire length. Securely attach the centralizers to withstand installation stresses. Do not drop, but lower the steel reinforcement to its specified location in the hole. If a post grout tube is used, attach it to the steel reinforcement prior to lowering it.

D. Grout Placement. Fill annular space between the permanent casing and the micropile with the grout meeting the requirements of the approved mix design.

Provide quality control of the mix by monitoring grout quality. Measure grout consistency by determining grout density per API Recommended Practice (RP) 13B-1 by the Baroid Mud Balance Test at a frequency, of at least one test per micropile, and provide the information to the inspector.

The Resident will perform quality assurance of the mix in accordance with the Section 106

Place grout by means of a tremie pipe from the bottom of the pile upward. Record the initial volume of grout required to fill the hole. Record grouting pressure and volume of grout being pumped into the pile during pressure grouting. Upon completion, maintain the grout level at or above the pile cut off elevation until the grout has set.

Locate the grout pressure and volume measuring gages at the pile installation site so that they are accessible and legible to the inspector.

E. Post Grouting. *Use of a post-grouting system is subject to Resident approval. Submit all relevant details including grout pressure, volume, location and mix design as part of the submittal required in Section A of this special provision.*

F. Construction Tolerances. Install the piles so that the center of each micropile does not vary from the plan location by more than 3 inches. Do not allow the micropile to vary from the vertical or established batter by more than 1/4 inch per foot, as measured above ground.

Cut off the top of the pile at the elevation indicated in the contract documents.

If the soil at the pile tip is post grouted, monitor the elevation of the pile top during post grouting. If movement occurs notify the Resident immediately.

G. Pile Acceptance Criteria

1. Pile meets Construction Tolerance criteria.
2. Pile was installed in accordance with the approved submittal.
3. Pile is not damaged.

H. Unacceptable Piles. Unacceptable piles are piles which do not meet the acceptance criteria identified in Paragraph G above.

Submit to the Resident a written plan of remedial action, for approval, showing how to correct the problem and prevent its reoccurrence. Repair, augment, or replace the unacceptable pile in accordance with the approved remedial plan at no additional cost to the State.

501.05 Method of Measurement

A. Micropiles. This work will be measured as the number of acceptable micropiles installed. The permanent casing for micropile will not be measured.

B. Drilling Equipment Mobilization (Micropiles). All work related to mobilization of any equipment or temporary access / working platforms required to satisfactorily complete the work will not be measured, and payment will be made on a lump sum basis.

501.06 Basis of Payment

A. Micropiles. The unit price bid shall include the cost of the micropiles (completed grout containing reinforcement and casing constructed to the depth shown on the plan or as directed by the Resident), developing and executing an approved QCP, and furnishing all labor and materials necessary to satisfactorily complete the work. Micropiles that fail to meet the acceptance criteria will be rejected and no payment will be made for these piles. Separate payment will not be made for advancing through boulders and obstructions, include all incidental costs under the pay item Micropiles. The Micropile Contractor is responsible for estimating the grout take. There will be no extra payment for grout overruns. The permanent casing for micropile will not be measured. All cost associated with permanent casing shall be incidental to the contract pay item for Micropiles.

B. Drilling Equipment Mobilization (Micropiles). The unit price bid shall include the cost of furnishing all equipment and temporary access / working platforms required to satisfactorily complete the work. No additional payment will be made for equipment mobilization or temporary access / working platforms under any other item.

Seventy five percent (75%) of the lump sum amount bid will be paid when the required equipment for installing the micropiles is furnished and at least one pile for each piece of equipment specified has been installed to the Engineers satisfaction. The remainder will be when the work of installing all micropiles to the satisfaction of Engineer is complete.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
501.804 Drilling Equipment Mobilization (Micropiles)	Lump Sum
501.220 Micropiles	Each

SPECIAL
SECTION 501 – FOUNDATION PILES
(Soldier Pile Wall)

501.01 Description

This work shall consist of developing and following a Construction Quality Control Plan (QCP), furnishing, installing, and maintaining a soldier pile and lagging wall in accordance with the contract documents and as directed by the Resident. Dispose of removed material.

The Contractor or subcontractor performing the work shall submit his methods of construction and Construction Quality Control Plan (QCP) to the Resident for approval. The Resident will require 20 working days to approve the submission after receipt of all pertinent information. No further work shall begin prior to approval by the Resident.

The Contractor or subcontractor performing the work described in this specification shall submit proof of the following:

1. Two projects on which he has successfully installed soldier piles in the past two years.
2. The foreman for this work having supervised the installation of soldier piles on at least two successful projects in the past two years.
3. Soldier Pile Wall Construction Quality Control Plan in conformance with Section 105.7 of this contract.

All proposed changes to details shown on the plans must be approved, in writing, by the Resident.

501.02 Materials

A. Structural Steel. Provide soldier piles, waling and bracing as shown on the plans conforming to the provisions of §713.01 Structural Steel. Each pile shall consist of one continuous steel section, no pile splices will be allowed.

Used material is not permitted for walls construction.

B. Lagging. Provide the lagging type(s) shown on the plans:

1. **Precast concrete.** Precast concrete panels conforming to the provisions of Sections 534 and Special Provision 534 of this contract.

C. Backfill for Holes. Provide the backfill material shown on the plans:

1. **Concrete Backfill.** Class LP concrete conforming to the provisions of §502 - Structural Concrete.

D. Backfill Behind Walls. Provide the backfill material shown on the plans:

1. **Special Backfill (Crushed Stone and Granular Borrow).**

- a. **Below Elevation +6.0**, Backfill shall be Crushed Stone material conforming to the provisions of §703.13 – Crushed Stone.
- b. **Above Elevation +6.0**, Backfill shall be Granular Borrow material conforming to the provisions of §703.19 – Granular Borrow.

E. Structural Concrete Placed Underwater (Tremie Concrete). Class S concrete conforming to the provisions of §502 - Structural Concrete.

F. Filter Fabric. A filter fabric in accordance with Section 722.02 - Drainage Geotextile.

G. Separation Geotextile. A separation geotextile in accordance with Section 722.04 - Separation Geotextile.

H. Insulation Board. When required for the project and as called out on the Contract Drawings, the Contractor shall furnish two 2 inch thick T&G insulation boards that are rigid, have a compressive strength of 25psi, and an R value of 25. The board shall be molded or extruded polystyrene, forming closed cell foam insulation. The cells shall be uniformly distributed with the foam insulation meeting the following requirements:

Water absorption, percent by volume, tested in accordance with ASTM D 2842	0.1 Max.
Density, lb./cu. ft., tested in accordance with ASTM D 1622	1.0 - 6.0

I. Polyurea Coating. Soldier Piles shall be coated with polyurea coating conforming to Special Provision Section 506.

501.03 Construction Details

A. General. Perform work in a manner that causes no subsidence of the surrounding ground surface and in a manner which will not damage or distress to the adjacent structure(s)/ buildings (between the right of way and 400 feet outside of the right of way line).

Splicing of soldier piles is not allowed.

Install the Soldier Piles by placing them in holes as indicated on the plans in accordance with the following tolerances:

1. Plan tolerance of 3 inches at the top of pile, verified by survey methods.
2. Vertical tolerance of one 1/8th inch per foot on each axis of the soldier pile shown on the plans. Verify the axes on the top 5 feet of the soldier pile with a straight edge (5 feet minimum length) and a level (4 feet minimum length).

For each pile out of tolerance, provide a satisfactory replacement or provide a modification approved by the Resident prior to proceeding at no additional cost to the Owner.

B. Structural Excavation – Major Structures. Excavate all the materials (including overburden soil, stones, boulders, previous construction remnants, debris, etc.) above the bedrock as indicated

on the contract drawing or as directed by the Resident. The structural excavation is anticipated to be performed underwater. Install a cofferdam prior to the commencement of structural excavation.

C. Drilling Holes in Rock for Piles. Locate drill holes as shown on the contract drawings. Whenever a drill hole deviates in location and plumbness by more than the project specification tolerances, the Contractor shall provide corrective measures to the satisfaction of the Resident at no additional cost to the Owner. Unless otherwise specified on the approved working drawings or indicated, all piles shall be drilled piles constructed as follows:

- 1. Drilling Procedure and Depth.** Observe the drilling rate and resistance as the boring of each hole is advanced, and record the relative drilling rate. Upon completion of work submit daily logs and as-built records to the Resident. If a satisfactory socket length is not obtained when the bottom of pile elevation indicated by design is reached, immediately notify Resident for direction. During the drilling of each pile socket, record any soft seams, discontinuities, or decreases in drilling resistance. Increase the socket length as directed by the Resident, to assure that a competent, non-yielding foundation socket is developed at no additional cost to the Owner. Provide equipment capable of establishing holes of the minimum diameter and to the depth 25% beyond the depth of rock socket shown on the plans. If the assumed top of socket elevation shown on the plans varies by more than 2 feet, stop work and notify the Resident. Resume work after obtaining written recommendations from the Resident.
- 2. Casing.** Bored holes require temporary steel casings (part left in place) between existing ground surface/mean high water elevation and top of bedrock to prevent collapse of overburden, or, when necessary, to shut off seepage water. Keep the casing in place through the cleaning and inspection of the prebored holes, during or after concrete placement. The temporary steel casing shall be cutoff to the top of Structural Concrete Placed Underwater after observing 7 days curing time for Concrete Backfill placement.
- 3. Cleaning of Predrilled Holes.** After the holes have been drilled to the proper depth, remove all loose rock, earth, and debris from the bottom of the hole by approved methods acceptable to the Resident. Make a complete check, and verify that all holes have been drilled to a sufficient depth to assure a competent, non-yielding socket foundation.

A minimum of 50 percent of the base of each hole shall have less than ½ inch of sediment at the time of placement of the concrete. The maximum depth of sediment or any debris at any place on the base of the hole shall not exceed 1.5 inch.

D. Placing Piles in Holes. The steel soldier piles shall be placed in predrilled holes that are subsequently backfilled with structural concrete with use of temporary steel casing. Structural welding between steel soldier piles (beams) shall be made by personnel qualified to perform the type of welding involved, in accordance with the qualification procedure of AWS DI.1, except as amended on the working drawings.

The Contractor shall arrange with the selected manufacturer from Subsection 506.53 of Special Provision Section 506 - Shop Applied Protective Coating – Steel to have a manufacturer’s representative available on site during initial soldier pile placement operations. The representative shall be qualified to evaluate coating damage, including measuring and recording of DFT. If the Resident and the manufacturer’s representative determine that the soldier pile placement operation is progressing in a manner that makes severe damage to the coating unlikely, the Resident may curtail the full-time presence of the manufacturer’s representative. The Contractor shall assure that repair personnel are available in a reasonable time period for any necessary repairs.

The Contractor shall submit a field process plan including details of the method for cutting of coated piles, as necessary, and methods of protection for the soldier pile during placement and installation of the tiebacks to prevent damage to the coating.

When necessary, coated soldier piles shall be cut in accordance with submitted and approved field process plan using an abrasive cut-off wheel suitable of cutting ½” minimum thickness ASTM A252, Grade 3 steel or any other method approved by the Resident and the manufacturer’s representative. A heat sink, as required by the coating manufacturer, in contact the coating will be required adjacent to areas that will be thermal cut to minimize heat damage to the coating.

The Contractor shall handle the coated piles in a manner that does not cause impact or abrasive damage. Any falsework in direct contact with the coated soldier piles shall be cushioned or coated to prevent damage to the coating. If the 100% solid polyurea elastomer coating is damaged during placement or tieback installation operations, the Contractor shall cease operations and have the damage evaluated by the manufacturer’s representative.

Coating damaged during installation due to soldier pile placement, cutting, welding, tieback installation, or any other operation shall be repaired as per the submitted and approved field repair plan or as directed by the Resident and the manufacturer’s representative. Coating that has been damaged but retains 80 mils or more of undamaged 100% solid polyurea elastomer coating need not be repaired if the Resident concurs. Coating that has been damaged by thermal cutting but will be embedded in the concrete pile/abutment cap need not be repaired. When repairs are required, the repaired curing shall be allowed to cure prior to the next operation on the pile.

After placing the piles per contract drawings, backfill holes with the Class LP concrete as indicated on the Contract plans.

E. Backfilling

1. Concrete Backfill. Place backfill in accordance with the provisions of §502.11 Placing Concrete and §502.11-E Depositing Concrete Under Water in all rock sockets shown on the plans. Provide a minimum curing time of 7 day before placing any Structural Concrete Placed Underwater.

2. Structural Concrete Placed Under Water (Tremie Concrete). Prior to the placement of Tremie Concrete, cut-off temporary steel casing at the top of Tremie Concrete elevation shown on plans, the bedrock surface within limits of excavation must be cleaned and inspected to assure removal of loose debris. The discharge end of the tremie shall be constructed to permit the free radial flow of concrete during placement operations.

Place Tremie Concrete in accordance with the provisions of §502.11 Placing Concrete and §502.11-E Depositing Concrete Under Water within the limits shown on the plans

Tremie Concrete placement shall not begin until the tremie is placed to the base of excavation. The tremie discharge end shall be immersed at least 5 feet in concrete at all times after starting the flow of concrete. The flow of the concrete shall be continuous. The concrete in the tremie shall be maintained at a positive pressure differential at all times to prevent water or slurry intrusion into the concrete

4. Special Backfill (Crushed Stone and Granular Borrow). Place backfill in accordance with the provisions of §206 – Structural Excavation. Place select Backfill in the locations and to the elevation shown on the plans. Provide a minimum curing time of 7 days for Structural Concrete Placed Under Water before placing Special Backfill.

5. Separation Geotextile. Place a separation geotextile in accordance with the provisions of §620 – Geotextiles. Place separation geotextiles in the locations and to the elevation shown on the plans.

F. Lagging. Install precast concrete lagging in a manner approved by the Resident. Provide a minimum curing time of 7 days for Structural Concrete Placed Under Water before placing lagging.

Panels manufactured without prior written approval from the Resident will not be accepted.

501.04 Method of Measurement

Waiting period for the curing time of Concrete Backfill in Soldier pile hole and Structural Concrete Placed Underwater shall be consider incidental and include all the cost associated with waiting period in respective bid items.

A. Structural Excavation – Major Structures. This work shall be compensated as per section 206 of the project specification.

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including excavation of Structural material (including overburden soil, boulders, previous construction remnants, debris, etc.) above bedrock, storing, transporting and disposal.

Separate payment will not be made for holes in overburden material above bedrock for soldier pile installation, include all the incidental costs under pay item Rock Socket (36" dia.).

B. Rock Sockets (36" dia.). This work will be measured as the number of feet of sockets in rock satisfactorily installed, as measured in the field, in accordance with the contract documents and as directed by the Resident. The upper payment limit is the top of rock as shown on the plans or revised, in writing, by the Resident. The lower payment limit is the pile tip elevation as shown on the plans or as revised, in writing, by the Resident.

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. Separate payment will not be made for mobilizing drilling equipment required for the successful completion of the rock sockets.

C. Steel W24x103 Piles, Delivered. This work will be measured as the number of feet of soldier piles. The quantity to be paid for will be the sum of the lengths in feet of the soldier piles, of the types and lengths ordered in writing by the Resident. No allowance will be made for the length of piles, including test piles furnished by the Contractor, to replace piles that were previously accepted by the Resident, but are subsequently damaged prior to completion of the contract. When extensions of piles are necessary, the extension length ordered in writing by the Resident will be included in the length of piling furnished. All piles must be cutoff at the cutoff elevation shown on the plans. If the piles are cutoff at a higher elevation, the portion between these elevations will be deducted from this Item. No additional payment will be made for furnishing temporary steel casing, temporary steel casing left in place, or welding, all costs associated with furnishing steel casing shall be considered as incidental to the item.

D. Steel W24x103 Piles, In Place (Installing Soldier Piles). This work will be measured as the number of feet of soldier piles satisfactorily installed, as measured in the field, in accordance with the contract documents and as directed by the Resident. The upper payment limit is the pile top elevation as shown on the plans or as revised, in writing, by the Resident. The lower payment limit is established as the tip of the soldier pile driven or placed to the elevation shown on the plans or as revised, in writing, by the Resident. The Concrete backfill placed in all rock sockets of Soldier Piles according to this specification will not be measured separately, include all the incidental cost of Concrete backfill under pay item "501.551 Steel W24x103 Piles, in place".

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including pile placement equipment, equipment for excavating holes, temporary steel casing, temporary steel casing left in place, welding, backfilling the hole with concrete and cutting off the soldier pile where required. No additional payment will be made for complete pile removal, where allowed, or for splices when the pile exceeds the estimated length.

E. Precast Concrete Lagging, Installed. This work will be compensated per Section 534 of the project specification.

F. Structural Concrete Placed Underwater. This work will be compensated as per section 502 of the project specification.

G. Special Backfill (Crushed Stone and Granular Borrow). This work will be compensated as per section 206 of the project specification.

H. Cofferdam. This work will be compensated per Section 511 of the project specification.

I. Separation Geotextile. This work will be compensated per Section 620 of the project specification.

J. Polyurea Coating. This work will be compensated per Section 506 of the project specification.

501.05 Basis of Payment

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
501.57 Steel W24x103 Piles, Delivered	Linear Foot
501.571 Steel W24x103 Piles, In Place	Linear Foot
501.802 Rock Socket (36" dia.)	Linear Foot

SPECIAL PROVISION
SECTION 502
STRUCTURAL CONCRETE
 (QC/QA Acceptance Methods)

CLASS OF CONCRETE	ITEM NUMBER	DESCRIPTION	P	METHOD
A	502.21	Structural Concrete Abut. & Retaining Walls	\$400	A
S	502.22	Structural Concrete Abut. & Retaining Walls (Placed under water)		C
A	502.23	Structural Concrete Piers	\$400	A
S	502.24	Structural Concrete Piers (Placed under water)		C
A	502.31	Structural Concrete Approach Slab		C
LP	526.3401	Permanent Concrete Transition Barrier-Modified	\$425	C
Fill	502.56	Concrete Fill		C
Fill	880.112	Counterweight Concrete		C

P values listed above reflect the price per cubic yard (CY) for all pay adjustment purposes.

The quantity used for Pay Adjustment purposes shall be the actual quantity of cast in place concrete placed and accepted. This quantity shall be computed by the Contractor and submitted to the Resident for approval.

SPECIAL PROVISION
SECTION 502
STRUCTURAL CONCRETE
(Quality Level Analysis)

502.01 Description In second sentence, replace "...METHOD B Small Quantity Product Verification..." with "...METHOD B Statistical Acceptance..."

502.05 Composition and Proportioning Delete Table 1 and replace with the following;

TABLE 1- Methods A, B, and C

Concrete CLASS	Compressive Strength (PSI)		Permeability (COULOMBS)		Entrained Air (%)		Notes
	LSL	USL	LSL	USL	LSL	USL	
S	2,900	N/A	N/A	N/A	6.0	8.5	1, 5
A	4,350	-----	-----	2,400	6.0	8.5	1,2,5,6
P	-----	-----	-----	-----	5 ½	7 ½	1,2,3,4,5
LP	5,075	-----	-----	2,000	6.0	8.5	1,2,5,6
Fill	2,900	N/A	N/A	N/A	N/A	N/A	6

502.503 Delete and replace with the following;

“502.0503 Quality Assurance METHOD B The Department will determine the acceptability of the concrete through a quality assurance program.

The Department will take Quality Assurance samples a minimum of once per subplot on a statistically random basis. Quality Assurance tests will include compressive strength, air content and permeability.

Concrete sampling for quality assurance tests will be taken at the discharge point, with pumped concrete sampling taken at the discharge end of the pump line.

Lot Size A lot size shall consist of the total quantity represented by each class of concrete in the Contract, except in the case when the same class of concrete is paid for under both lump sum items and unit price items in the Contract; in this case, the lump sum item quantities shall comprise 1 lot and the unit price item quantities shall comprise a separate lot. A lot shall consist of a minimum of 3 and a maximum of 10 sublots. If a lot is comprised of more than 10 sublots, sized in accordance with Table #3, then this quantity shall be divided equally into 2, or more, lots such that there is a minimum of 3 and a maximum of 10 sublots per lot. If there is insufficient quantity in a lot to meet the recommended minimum subplot size, then the lot shall be divided into 3 equal sublots.

Sublot Size, General The size of each sublot shall be determined in accordance with Table #3. The Resident may vary sublot sizes based on placement sizes and sequence.

Sublot Size, Unit Price Items Sublot sizes will initially be determined from estimated quantities. When the actual final quantity of concrete is determined: If there is less than one-half the estimated sublot quantity in the remaining quantity, then this quantity shall be combined with the previous sublot, and no further Acceptance testing will be performed; if there is more than one-half the estimated sublot quantity in the remaining quantity, then this quantity shall constitute the last sublot and shall be represented by Acceptance test results. If it becomes apparent part way through a lot that, due to an underrun in quantity, there will be an insufficient quantity of concrete to comprise three sublots, then the Resident may adjust the sizes of the remaining sublots and select new sample locations based on the revised estimated quantity of concrete remaining in the lot.

Sublot Size, Lump Sum Items Each lot shall be divided into sublots of equal size, based on the estimated quantity of concrete.

TABLE 3

Quantity m ³ [cy]	Recommended Sublot Size m ³ [cy]
0-400 [0-500]	40 [50]
401-800 [501-1000]	60 [75]
801-1600 [1001-2000]	80 [100]
1601 [2001] or greater	200 [250]

Determination of the concrete cover over reinforcing steel for structural concrete shall be made prior to concrete being placed in the forms. Bar supports, chairs, slab bolsters, and side form spacers shall meet the requirements of Concrete Reinforcing Steel Institute (CRSI) Manual of Standard Practice, Chapter 3 Section 2.5 Class 1, Section 2.6 Class 1A, or Section 4. All supports shall meet the requirements for type and spacing as stated in the CRSI Manual of Standard Practice, Chapter 3. Concrete will not be placed until the placing of the reinforcing steel and supports have been approved by the Resident. If the Contractor fails to secure Department approval prior to placement, the Contractor's failure shall be cause for removal and replacement at the Contractor's expense. The Contractor shall notify the Resident, at least 48 hours prior to the placement, when the reinforcing steel will be ready for checking. Sufficient time must be allowed for the checking process and any needed repairs.

Evaluation of materials will be made using the specification limits in Table 1.

Compressive strength tests will be completed by the Department in accordance with AASHTO-T22 at ≥ 28 days, except that no slump will be taken. The average of two concrete cylinders per sublot will constitute a test result and this average will be used to determine the compressive strength for pay adjustment computations.

Testing for Entrained Air in concrete, at the rate of one test per subplot, shall be in accordance with AASHTO T152.

Rapid Chloride Permeability test specimens will be completed by the Resident in accordance with AASHTO T-277 at an age \geq 56 days. Two 100 mm x 200 mm [4 in x 8 in] cylinders will be taken per subplot placed.

Surface Tolerance, Alignment and Trueness, Plumb and Batter, and Finish will be measured as described in Section 502.0502.

Rejection by Resident For an individual subplot with a calculated pay factor of less than 0.80, the Department will, at its sole discretion:

A. Require the Contractor to remove and replace the entire affected placement with concrete meeting the Contract requirements at no additional expense to the Department, or

B. Accept the material, at a reduced payment as determined by the Department. (See also Section 502.191)

For a lot in progress, the Contractor shall discontinue operations whenever one or more of the following occurs:

A. The pay factor for any property drops below 1.00 and the Contractor is taking no corrective action

B. The pay factor for any property is less than 0.90

C. The Contractor fails to follow the QC Plan”

502.18 Method of Measurement Under Section E. make the following change from “...Method A, and under Section 502.19...” to “...Method A, Section 502.0503- Quality Assurance Method B, and under Section 502.19...”

502.19 Basis of Payment Modify the first sentence of the seventh paragraph from “...accepted under Method A.” to “...accepted under Method A and Method B.”

502.191 Pay Adjustment for Compressive Strength Add the following as the second sentence to the first paragraph; “Pay factors (PF) for pay adjustments for compressive strength will be determined using the Quality Level Analysis as specified in Section 106.”

502.192 Pay Adjustment for Chloride Permeability Delete and replace with the following;

“Pay factors (PF) for pay adjustments for Chloride Permeability will be determined using the Quality Level Analysis as specified in Section 106.

Values greater than 4000 coulombs shall be subject to rejection and replacement at no additional cost to the Department.”

502.193 Pay Adjustment for Air Content Delete and replace with the following;

“Pay factors (PF) for pay adjustments for air content will be determined using the Quality Level Analysis as specified in Section 106.”

Add the following Section;

“502.195 Pay Adjustments for Compressive Strength, Chloride Permeability and Air Content The Composite Pay Factor (CPF) for each lot of concrete shall be computed as follows:

$$\text{CPF} = [(\text{Compressive Strength PF}-1)(0.20)] + [(\text{Air Content PF}-1)(0.40)] \\ + [(\text{Chloride Permeability PF}-1)(0.40)]$$

The pay adjustment for each lot of concrete shall be computed as follows:

$$\text{Lot Pay Adjustment} = P \times \text{CPF} \times \text{Lot Size}$$

There will be no positive pay adjustments for Method B Concrete.”

SPECIAL PROVISION
SECTION 503
REINFORCING STEEL
(Corrosion Resistant Reinforcing)

503.01 Description: This section shall be replaced in its entirety by the following:

This work shall consist of furnishing and placing of reinforcement, either plain, epoxy coated, or corrosion resistant, in accordance with these specifications and in conformance with the Plans, Supplemental Specifications and Special Provisions.

503.02 Materials: This section has been amended to include:

All Corrosion Resistant Reinforcing shall meet the requirements of ASTM A1055/A1055M – 10e1, Zinc and Epoxy Dual – Coated Steel Reinforcing Bars.

Section X1 Guidelines for Job – Site Practices of ASTM A1055/A1055M – 10e1, Zinc and Epoxy Dual – Coated Steel Reinforcing Bars shall apply.

Surface preparation and patching of field – cut, dual – coated reinforcing bar ends shall conform to X1.3.12 of ASTM A1055/A1055M – 10e1, Zinc and Epoxy Dual – Coated steel Reinforcing Bars.

503.10 Method of Measurement: This section has been amended to include:

Corrosion Resistant Reinforcing will be measured by the Pound for fabrication, delivery and placing.

503.11 Basis of Payment: This section has been amended to include:

The accepted quantity of Corrosion Resistant Reinforcing will be paid for at the contract unit price per Pound. Payment shall include all materials, equipment and labor required for the fabrication, delivery and placing of the Corrosion Resistant Reinforcing.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
503.30 Corrosion Resistant Reinf. System, Fab. & Del.	LB
503.31 Corrosion Resistant Reinf. System, Placing	LB

SPECIAL PROVISION
SECTION 503
REINFORCING STEEL

Section 503.07 of the standard specification is replaced in its entirety with the following:

Reinforcing bars shall be spliced in accordance with the requirements of this section, and in the locations shown on the plans. No modifications of, or additions to, the splice arrangements shown on the plans shall be made without the Resident's prior approval. Any additional splices authorized shall be staggered as much as possible. All splices shall be made in a manner that will ensure that not less than 75% of the clear concrete cover and not less than 75% of the minimum clear distance to other bars will be maintained, as compared to the cover and clear distance requirements for the unspliced bar.

Lapped splices shall be made by placing the bars in contact and wiring them together. Splice laps shall be made in accordance with the following table, unless otherwise noted on the plans:

US CUSTOMARY UNITS

Minimum Lap Splice Length (inches) ¹									
Bar Type	Bar Size								
	#3	#4	#5	#6	#7	#8	#9	#10	#11
Plain	14	18	22	26	33	43	54	68	83
Epoxy Coated	21	27	33	39	50	64	80	103	124

¹ Lap Splice lengths are based on the following parameters: Minimum center-to-center spacing between bars of 6 in; nominal yield strength of the reinforcing steel of 60 ksi; minimum 28-day compressive strength of concrete of 4350 psi. When any of the preceding parameters is altered, appropriate minimum lap splice lengths will be determined by the Resident. When lap splices are placed horizontally in an element where the concrete depth below the splice will be 12 in, or more, the indicated lap splice lengths shall be multiplied by a factor of 1.4.

Mechanical couplers may be used for splicing reinforcing bars, provided they are approved by the Resident and conform to the following requirements:

All couplers

All couplers shall be epoxy coated. The epoxy coating shall meet the requirements of section 503.51.

a. Tension Couplers Couplers shall be able to develop 1.25 times the theoretical yield strength of the spliced bar in tension. Bolted and wedge-lock type couplers will not be allowed.

b. Compression Couplers Couplers shall be capable of maintaining the spliced bars in alignment prior to and during concrete placement. For reinforcing bars designed to act in compression, the individual bar ends shall be within $1\frac{1}{2}^\circ$ of being "square" to the final 300 mm [12 in] of the bar. Additionally, abutting bar ends shall be in contact, and the angle of the gap between abutting bar ends shall be 3° , or less.

c. Mechanical Couplers Any mechanical couplers using a threaded splicer and dowel in combination, requiring a lapped splice with the reinforcing bars, shall have a minimum lap splice length as required by this Section.

The use of welded splices is not allowed. .

SPECIAL PROVISION
SECTION 504 - STRUCTURAL STEEL
(Bridge Hardware)

Description

This work shall consist of detailing, fabricating, delivering and installing miscellaneous structural steel and aluminum items required for the installation of the access ladders and the handrail in the bascule pier and the nose armoring that makes up the deck joint at the heel joint and toe joint as shown on the Contract Plans and in accordance with the specifications. All labor, equipment and material required to install the miscellaneous steel items shall be incidental to this item, including but not limited to angles, shear studs, anchor bolts, bent plates, grab bars, rungs, aluminum pipes and brackets, and all welding, bolts and other hardware necessary for the installation.

Materials

The protective nose armoring at the ends of the concrete where it abuts the movable span shall use as a minimum A36 steel. The protective nose armoring shall be hot dip galvanized per section 504.12 of the standard specifications. The shear studs shall meet the requirements of section 711.06.

The material for the ladders in the bascule piers, including all necessary connection hardware shall use as a minimum A36 steel. They shall be hot dip galvanized per section 504.12 of the standard specifications. Anchor bolts shall meet the requirements of section 720.07.

The handrail in the bascule pier shall be ½” dia. Schedule 40 aluminum pipe. The aluminum bracket for the handrail shall meet the requirements of ASTM B209-10. Anchor bolts shall meet the requirements of section 720.07

Method of Measurement

Furnishing, delivering to the site, and installing the materials specified above will be measured for payment as one lump sum.

Basis of Payment

The lump sum price bid for detailing, fabrication, delivery, and installation of the materials specified above shall include the cost of all purchasing, fabrication, transportation and storage on-site of the materials, and labor and equipment necessary to install them.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
504.709 Bridge Hardware	LS

SPECIAL PROVISION
SECTION 504 - STRUCTURAL STEEL
(Stay Cables)

504.01 Description

This work shall consist of fabricating, installing and jacking the stay cables.

504.02 Materials

Stay Cables

The spiral strands for the stay cables shall be pre-stretched 2" dia ASTM A586 Grade 1 galvanized structural strand. Cables shall be fabricated with Class A zinc-coated wire and shall be of parallel contact core construction with an amorphous polypropylene lubricant. They shall be grade 270 low relaxation strands greased and installed in a polyethylene stay pipe.

Each cable shall have a nominal 2" dia, with approximate metallic area of 2.4 in². The cable shall have a minimum breaking strength of 245 tons.

The anchorages shall be a high strength structural steel casting. Once fabricated, the casting shall be inspected by the magnetic particle method. The coating shall be a hot-dip galvanized coated surface. Anchorages and Pins shall have greater capacity than the breaking strength of the strand.

504.03 Drawings

At least 30 days prior to fabrication of the stay cables, the material properties for the cables shall be submitted to the Department. Fabrication shall not begin until the material is approved by the Department.

504.04 Jacking

The Contractor shall provide stressing calculations to the Quality Assurance Inspector (QAI) before tensioning the cables. Jacking operations shall be performed in the presence of the QAI. Measurement of tensioning force shall be accomplished by one of the following:

- a. Dynamometer
- b. Pressure gauges measuring hydraulic pressure
- c. Load cell-digital readout
- d. Digital readout connected to a transducer measuring hydraulic pressure

Equipment used to measure tensioning force shall be calibrated within 6 months of the beginning of the project. Calibration shall be performed by an approved testing laboratory, calibration service or under the direct supervision of a Professional Engineer registered in the State of Maine. Calibration shall be done in accordance with the manufacturer's recommendations.

The Contractor shall provide a Calibration Report for the tensioning device being used. The Calibration Report shall include a Calibration Conversion Chart that correlates gauge readings with actual force applied. The gauge reading used in production shall be interpolated using the gauge-force reading closest to the required force derived from the stressing calculations.

Equipment used to measure tensioning force shall be graduated to read within +/- 2% of the anticipated force. Rams, gauges, pumps and hoses shall be calibrated together as a system. Replacement of any of the previously listed components shall require re-calibration of the jacking system. If the same device is used for initial and final tensioning, separate gauges shall be installed in the system. Both initial force and final tensioning hydraulic gauges shall be at least 150 mm [6 inches] in diameter and shall be graduated such that the anticipated force falls within the middle third of the gauge range. Gauges shall be at or near eye level and the needles shall remain steady until the load is released.

Prior to tensioning, hydraulic jacking devices shall be run until the hydraulic fluid is brought up to normal operating temperature. The jack shall be cycled several times to assure that the fluid in the lines is also at operating temperature.

504.65 Basis of Payment

“Furnish and Install Stay Cables” and “Jacking Stay Cables” shall be paid for at the contract lump sum price for the respective contract items.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
504.692 Furnish and Install Stay cables	Lump Sum
504.693 Jacking Stay Cables	Lump Sum

**SPECIAL PROVISION
SECTION 504 - STRUCTURAL STEEL
(Timber Fender System)**

504.01 Description This work shall consist of fabricating, delivering and installing composite marine timbers and UHMW fender panels. The composite marine timbers will be connected to the soldier piles and the UHMW fender panels will be connected to the pile caps in accordance with these specifications and the plans.

504.02 Materials

Composite Marine Timbers

The composite marine timbers shall be manufactured from a recycled plastic matrix with glass fiber reinforcement bars, and shall be non-polluting.

The 10x10 sections shall have a height and width of 10”, shall contain 4 reinforcing bars, shall have a yield strength in each direction of 3440 psi and a weight no greater than 35 plf.

The color shall be black or as approved by the Resident.

All hardware shall be Type 316 stainless steel.

UHMW Polyethylene rub rail

The rub rail shall be a UHMW-PE (ultra high molecular weight polyethylene) face pad that has a low coefficient of friction to provide a smooth sliding surface for a vessel travelling along the face of the rub rail. It shall have the following material properties:

Property	Test Method	Unit	Value
Density	ASTM D-792	pcf	58 to 58.9
Sand Wheel Wear	ASTM G-65	AR-01 Steel=100	90 to 116
Yield Strength	ASTM D-638	psi	2900
Elongation at Break	ASTM D-638	%	218 to 250
Dynamic Friction	ASTM D-1894	—	0.12 to .016
Hardness	ASTM D-2240	Type D	68 to 70
Operating Temperature	—	°F	-110 to +175
Coefficient of Thermal Expansion	ASTM D-696	°F ⁻¹	0.00011

The pad thickness shall be 1”.

The color shall be black or as approved by the Resident.

The hardware used to connect the pads to the concrete shall be stainless steel, and as recommended by the manufacturer and approved by the Resident. The bolts shall be counterbored into the pads and there shall be at least 1/8" clear between the face of the pad and the bolt to prevent damage to a vessel from the bolt.

504.03 Method of Measurement

Furnishing, delivering and installing the materials specified above will be measured for payment as one lump sum.

504.04 Basis of Payment

The lump sum price bid for detailing, fabrication, delivery and installation of the materials specified above shall include the cost of all purchasing, fabrication, transportation, labor and equipment necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
504.60 Timber Fender System	LS

SPECIAL PROVISION
SECTION 504- STRUCTURAL STEEL
(Tiebacks)

504.01 Description

A. General. This work shall consist of designing, furnishing, installing and testing permanent cement-grouted or sand-cement grout tiebacks at the locations indicated on the plans, or as directed by the Resident.

The Contractor or subcontractor performing the work shall submit his methods of construction and Construction Quality Control Plan (QCP) to the Resident for approval. The Resident will require 20 working days to approve the submission after receipt of all pertinent information. No further work shall begin prior to approval by the Resident.

The Contractor or subcontractor performing the work described in this specification shall submit proof of the following:

1. Two projects on which he has successfully installed grouted tiebacks in the past two years.
2. The foreman for this work having supervised the installation of grouted tiebacks on at least two successful projects in the past two years.

Unless otherwise specified herein these specifications and/or on the contract plans, the material and constructions requirements of the latest edition of the PTI "Guide Specification for Post-Tensioning Materials" shall govern.

B. Definitions. The following definitions shall apply:

Contractor. The contractor or subcontractor performing the work described in this specification.

Tieback. A system used to transfer tensile loads from a structure to rock. A tieback includes all prestressing steel (tendon), the anchorage, grout, coatings, sheathing, couplers, and encapsulation if used.

Tendon. The steel used to transfer load from the anchorage to rock.

Anchorage. That portion of the tieback, including bearing plate, nuts and wedges, that is used to transfer load from the structure to a tendon.

Bond Length. That portion of the tieback which is bonded to the rock and transfers the tensile force from the tendon to the rock.

Tendon Bond Length. The length of the tendon which is bonded to the grout. This is usually, but not necessarily, the same as the Bond Length.

Stressing Length. That portion of the tendon which is not bonded to grout.

Sheath. That portion of the tieback which encases the tendon in the stressing length only.

Encapsulation. That portion of the tieback which encases or encapsulates the entire length of the tieback, including the sheath, to provide an additional barrier to corrosion.

Total Movement. The total elongation of the tieback under load, measured at the anchor head.

Residual Movement. The permanent set of the tieback resulting from stressing and releasing the tieback.

Trumpet. A steel pipe or tube, integrally attached to the bearing plate that surrounds the tendon in the vicinity of the structure.

Creep Rate. The magnitude of total movement measured during a load hold per log cycle of time.

Centralizer. A device used to center the bond length of the tieback in the hole to assure minimum grout cover over the tieback.

Spacer. A device used in strand tendons to separate each strand in the bond length to permit the grout to bond with each strand.

GUTS. The Guaranteed Ultimate Tensile Strength of the tendon.

504.02 Materials

A. Tendons. The tendon shall consist of clean, straight, rust-free:

1. Continuously threaded "Uncoated High-Strength Steel Bar for Prestressing Concrete" - ASTM A722.

The tendons shall be of such size that the design load does not exceed 53 percent of the GUTS of the tendons. At no time shall a test or temporary load on any tendon exceed 80 percent of the GUTS of the tendon.

B. Couplers. Couplers for tendons shall be capable of developing 100 percent of the GUTS of the tendon.

C. Anchorage. The anchorage shall be capable of developing 95 percent of the GUTS of the tendon and shall be set so that only axial loads are applied. Bar tiebacks shall be provided with spherical

washers and spherical nuts at the anchorage. The anchorage devices shall conform to the static strength requirements of the latest edition of the PTI "Guide Specification for Post-Tensioning Materials".

D. Sheath. A sheath to provide corrosion protection shall encase the entire stressing length of the tendon. Acceptable sheaths for the stressing length shall be one of the following:

1. A polyethylene (PE) tube applied over a corrosion inhibiting grease-coated strand. The polyethylene shall be Type II, III or IV as defined by ASTM D1248. The tubing shall have a minimum wall thickness of 60 mils.
2. A hot-melt extruded polypropylene tube applied over a corrosion inhibiting grease-coated strand. The polypropylene shall be Type II 26500-D as defined by ASTM D2146. The tubing shall have a minimum wall thickness of 60 mils.
3. A heat shrinkable tube coated with an elastic adhesive applied over bar tendons. Prior to shrinking, the tube shall have a nominal wall thickness of at least 24 mils and the elastic adhesive inside the tube shall have a nominal thickness of 20 mils. A smooth bond breaker shall be placed around the heat shrinkable tube in the free length.

E. Grease. The corrosion inhibiting compound placed in either the free length or the trumpet areas shall be an organic compound (i.e. grease or wax) with appropriate polar moisture displacing, corrosion inhibiting additives and self-healing properties. The compound shall permanently stay viscous and be chemically stable and nonreactive with the prestressing steel, the sheathing material, and anchor grout. Do not exceed the following allowable content of deleterious substances in the compounds:

Substance	Maximum Allowable Quantity - ppm	Test Method
Chlorides	10	ASTM D512
Nitrates	10	ASTM D992
Sulfides	10	APHA – "Test Methods: Sulfides in Water"

F. Encapsulation. Encapsulation for the tendons is required, the encapsulation shall consist of a tube of corrugated PVC, high density polyethylene, or steel. Threadbar shall be factory grouted in the encapsulation. The encapsulation shall have sufficient thickness to resist damage due to shipping, handling, and installation.

G. Centralizers and Spacers

1. Centralizers and spacers shall consist of plastic, steel or any material not detrimental to the tendon. Wood shall not be used.
2. Centralizers and spacers shall permit free flow of grout.
3. Combination centralizer/spacers will be permitted.
4. Position centralizer to provide a minimum of 0.5 inch of grout cover

H. Grout. The grout shall consist of materials meeting the following specification requirements:

Material	Subsection
Portland Cement, Type 1, 2, or 3	§701.01
Fine Aggregate for Concrete	§703.01
Water	§701.02

Epoxy resin will not be allowed as a substitute for cement grout.

I. Additives. Chemical additives to control bleeding or retard set, as approved by the Resident, may be used with the grout. Expansive additives shall not be used. Expansive admixture may only be added to the grout used for filling encapsulations, trumpets and anchorage covers. Expansive admixtures shall not be permitted in bond length grout. No accelerators are permitted. Admixture, if used shall be compatible with prestressing steels and mixed in quantities not to exceed the manufacturer's recommendations.

J. Trumpet. The trumpet shall be integral with the bearing plate. The trumpet shall consist of an epoxy coated steel pipe or tube conforming to the requirements of ASTM A53 for pipe or ASTM A500 for tubing.

The trumpet shall have an inside diameter equal to or larger than the hole in the bearing plate, and shall be long enough to accommodate movements of the structure during loading and testing. For encapsulated strand tendons, the trumpet shall be long enough to enable the tendon to make a transition from the diameter of the tendon in the stressing length to the diameter of the tendon at the anchor head without damaging the encapsulation.

A seal to retain grease or grout within the trumpet shall be provided between the trumpet and the stressing length corrosion protection. If grout is used to fill the trumpet, then the seal shall be a deformable seal. If grease is used to fill the trumpet, a description of the seal shall be submitted to the Resident for approval.

504.03 Construction Details

A. Shop Drawings. Shop drawings shall be submitted to the Resident for written approval at least 30 working days prior to commencement of the work. Shop drawings shall conform to the size and type requirements of Contract Drawings and §105.7 Working Drawings. No work shall begin prior to receipt of the approval.

The shop drawings shall include, but not be limited to:

1. A tieback schedule giving:
 - a. Tieback number
 - b. Design load for each tieback
 - c. Type and size of tendon
 - d. Total tendon length
 - e. Bond length and tendon bond length if different from bond length
 - f. Stressing length
2. A drawing of the tieback and corrosion protection including:
 - a. Spacers and their location
 - b. Centralizers and their location
 - c. Stressing length corrosion protection
 - d. Bond length corrosion protection
 - e. Anchorage and trumpet
 - f. Anchorage corrosion protection system
3. Tieback Construction Quality Control Plan (QCP)

B. Completion Report. The Contractor shall submit a report to the Resident within 20 working days after completion of the tieback work. The report shall contain:

1. As-built drawings showing the locations of the tiebacks, total tendon lengths, stressing lengths and bond lengths
2. Prestressing steel manufacturer's mill test reports for the tendons
3. Grouting records indicating the cement type, quantity injected and grout pressures
4. Tieback test results and graphs

C. Hole Progression. The holes for the tiebacks shall be drilled at locations and size indicated on the contract drawings. The hole shall not be progressed in a location that requires the tendon to be bent in order to enable the bearing plate to be connected to the supporting structure. Subsidence or physical damage to existing site conditions caused by such operations shall be

cause for immediate cessation of operations and repair to the satisfaction of the Resident. The Contractor shall immediately revise his operations to prevent reoccurrence of such damage. Any and all costs incurred due to this subsidence or physical damage shall be borne by the Contractor. If the hole will not stand open, casing shall be installed as required to maintain a clean and open hole. The hole shall extend a minimum of 2 feet beyond the tendon length. The holes shall be located in elevation as shown on the plans, within a 3 inch tolerance. The holes shall be progressed to the inclination and alignment as specified on the contract plans, within a $3\pm$ degree tolerance. Unless otherwise indicated by a Special Note in the Plans, all tieback holes shall be progressed perpendicular to the direction of the soldier pile, as seen in the plan. Holes in rock shall be thoroughly cleaned of all dust, rock chips, grease or other material which may affect bond prior to inserting the tendon.

D. Water Tightness Test. A water tightness test will be required for all tiebacks bonded in rock if grout is injected at a pressure of less than 50 psi. If artesian or flowing water is encountered in the drilled hole, pressure shall be maintained on the grout until the grout has reached initial set. The water tightness test shall be performed by filling the entire hole in the rock with water and subjecting it to a pressure of 5 psi as measured at the top of the hole. If the stressing length portion of hole is in fractured rock, a packer or casing shall be used to allow the bond length to be pressure-tested. If the leakage rate from the hole, over a ten minute period, exceeds 0.001 gallons of water per inch of diameter per foot of length per minute, the hole shall be grouted, redrilled and retested. Should the subsequent water tightness test fail, the entire process shall be repeated until results are attained which are within leakage allowances.

The Contractor may eliminate the requirement for water tightness tests in rock by using pressure grouting techniques. Pressure grouting requires that the drill hole be sealed and that the grout be injected until a 50 psi grout pressure, measured at the top of the hole, can be maintained on the grout for 5 minutes without further grout injection.

E. Centralizers. In the bond length, centralizers and their installed locations shall be subject to approval by the Resident. Centralizers shall be provided at a maximum of 10 feet center to center spacing throughout the bond length so that not less than 0.5 inches of grout cover along the bond length is achieved. A centralizer shall be provided at the bottom end of the tendon. Sag of the tendon shall be taken into account when selecting centralizer diameter and spacing. Multi-element tendons shall also employ spacers at maximum 10 foot intervals throughout the bond length to ensure grout cover on all elements.

F. Encapsulation. Factory grouted encapsulation is required to provide double-corrosion protection for the tendons:

1. The tendon shall be encapsulated in a grout-filled corrugated tube of one of the types stated in the Materials section of this specification. The tendon may be grouted inside the encapsulation either before or after inserting the tendon into the drill hole. The bond length of the tendon shall be centralized to provide a minimum grout cover of 0.2 inches within the tube. Spacers shall be used along the tendon bond length for multi-element tendons to ensure good bond with the encapsulation grout.

2. Centralizers shall be used to provide a minimum of 0.3 inches of grout cover over the tendon bond length encapsulation. Centralizers shall be securely attached to the encapsulation and shall be spaced at no more than 10 feet. A centralizer shall be provided at the bottom end of the tendon bond length encapsulation. A centralizer shall also be located a maximum of 5 feet from the top of the bond length.

G. Tendon Installation. The bond length of the tendon shall be degreased prior to installation by using Acetone, MEK, or MIBK. No residue shall be left on the tendon. Other substances may be used subject to approval by the Resident.

The tendon shall be inserted in the casing or hole without difficulty. If the tendon cannot be completely inserted, the Contractor shall remove the tendon and clean or redrill the hole to permit insertion. Partially inserted tendons shall not be driven or otherwise forced into the hole. Tendons shall not be subject to sharp bends. Care shall be taken to prevent damage to the tendon's corrosion protection and centralizers during handling and installation.

H. Grouting. The grouting equipment shall be capable of continuous mixing and shall produce grout free of lumps. The grout pump shall be equipped with a grout pressure gage capable of measuring the highest working pressures attained plus 50 psi. Unless otherwise specified on the contract drawing, the minimum compressive strength of the grout shall be 3000 psi.

The annular space between the tieback and the drilled hole up to the level of the trumpet and between the tendon and encapsulation shall be filled with grout. In order to prevent air voids in the grouting operation, the hole shall be filled with grout progressively from bottom to top. Grouting of the stressing length shall be done at low pressure. The trumpet shall not bear on the top of the stressing length grout column during testing, to ensure that load applied to the tieback during testing is not transferred to the anchorage via the grout column.

I. Corrosion Protection. The tieback shall be centered in the trumpet so that there is no contact between the two. The corrosion protection surrounding the stressing length of the tendon shall extend up beyond the bottom seal of the trumpet but shall not contact the bearing plate or anchor head during stressing and testing.

The anchor head shall be protected from corrosion during the interim between tieback installation and final corrosion protection installation by installing a temporary cap and filling the trumpet and anchor head with corrosion-inhibiting grease. Any detrimental corrosion shall be cause for rejection.

After installation, testing and acceptance of each tieback, the trumpet shall be filled with grout or corrosion inhibiting grease and the permanent corrosion protection of the anchorage shall be installed. The Contractor shall either:

1. Place a water-tight steel cap, filled with corrosion inhibiting grease or grout, over the anchor head

OR

2. Encase the anchor head in concrete

504.04 Testing

Each tieback shall be tested. The following tests are required:

Performance Tests. Unless otherwise specified by a Special Note in the Plans, the first three anchors installed shall be performance tested. These tests are used to determine residual movements.

Proof Tests. Proof tests shall be performed on all anchors not performance or creep tested. These tests are used to verify load capacity.

Lift-Off Readings. Lift-off readings shall be taken on all tiebacks after the load has been transferred to the anchorage, but prior to removing the jack.

Lift-Off Tests. Lift-off tests shall only be performed on tiebacks in rock. If required, lift-off tests shall be performed on at least 2 tiebacks at locations to be chosen by the Resident. Additional tests, up to 10% of the total number of tiebacks may be ordered by the Resident.

Copies of all test results and graphs shall be transmitted to the Resident as each test is completed.

Jacks shall have ram travel at least equal to the theoretical elastic elongation of the stressing length plus the bond length at the maximum test load, and be sufficient to accommodate wall movements. A pressure gauge shall be used with each jack. Gauges shall be calibrated with a single jack and shall not be used with any other jack. All gauges shall be accurate enough to read 100 psi changes in pressure. For performance and creep tests, the jack used shall have two calibrated gauges; a master gauge and backup gauge. The pump shall be capable of applying each load increment in less than 60 seconds.

A load cell, which has been calibrated by an independent testing laboratory within 14 days prior to the start of testing, shall be used to measure the small changes in load during the load hold portion of the performance tests. There will be no substitute for the load cell on testing of the performance tests. Load cells are not required for proof tests. The Contractor shall provide the Resident with the calibration curve for the load cell prior to testing.

For the performance tests, the master gauge and backup gauge shall be connected to the same pressure hose between the pump and jack and be used to measure the applied loads. If the load

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measured by the master gauge and backup gauge differ by more than 10 percent, the jack, master gauge and backup gauge shall be recalibrated as a unit at no expense to the State.

At the completion of the test the tieback load shall be adjusted to the lock-off load and transferred to the anchorage. Unless otherwise specified in the contract documents, the lock-off load shall be 80 percent of the design load (0.80 P).

The alignment load necessary to maintain position of the stressing and testing equipment shall not exceed 0.05 P. The movement of the tieback tendon at each load increment shall be recorded to the nearest 0.001 inch relative to an independent, fixed reference point.

A. Performance Tests. Performance tests shall be performed by incrementally loading and unloading the tieback in accordance with the schedule below. Residual movements shall be taken at the alignment load for each cycle. Total movement measurements shall be taken at the highest load in each cycle.

<u>Cycle</u>	<u>Load</u>
1	AL 0.25 P
2	AL 0.25 P 0.50 P
3	AL 0.25 P 0.50 P 0.75 P
4	AL 0.25 P 0.50 P 0.75 P 1.00 P
5	AL 0.25 P 0.50 P 1.00 P 1.25 P
6	AL 0.25 P 0.50 P 1.00 P 1.25 P 1.50 P

Adjust to lock-off of 0.80 P

P = Design load for the tieback
AL = Alignment load

The load shall be held at each increment just long enough to obtain the total movement reading. Except for the residual movement at AL, no movement readings need to be taken during unloading of the tieback.

The test load of 1.50 P shall be held constant for 10 minutes. The load hold time shall start when the pump begins to load the anchor from the 1.25 P load to the test load. A load cell shall be

used to monitor the constant load. Total movements with respect to an independent fixed reference point shall be recorded at 1 minute, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between 1 minute and 10 minutes exceeds 0.040 inches , the test load shall be held for an additional 50 minutes. Total movements shall be recorded at 15, 20, 25, 30, 45 and 60 minutes.

The Contractor shall plot the tendon movement versus load for each load increment. He shall also plot the creep movement for the load hold as a function of the logarithm of time.

B. Proof Tests. The proof tests shall be performed by loading the tieback in accordance with the following schedule:

Load

AL
0.25 P
0.50 P
0.75 P
1.00 P
1.25 P
1.50 P

Reduce to lock-off load of 0.80 P

The load shall be held at each increment just long enough to obtain a total movement reading, but not more than 1 minute.

The test load of 1.50 P shall be held for at least 10 minutes. The load hold time shall start when the pump begins to load the tieback from 1.25 P to the test load. Total movements shall be recorded at 1, 2, 3, 4, 5, 6, and 10 minutes. If the movement between the 1 and the 10 minute readings is 0.040 inches or more, the test load shall be maintained for an additional 50 minutes and the movement measured. The additional movement shall be recorded at 15 minutes, 20, 25, 30, 45, and 60 minutes.

The Contractor shall plot the tendon movement versus load for each load increment. He shall also plot the creep movement for the load hold as a function of the logarithm of time.

C. Lift-Off Readings. Lift-off readings shall be taken and recorded directly after testing on all tiebacks. The load required to relieve the load from the tieback head shall be measured and recorded. If the lift-off load is not within 5% of the lock-off load the anchorage shall be reset and another lift-off reading taken.

D. Lift-Off Tests. Lift-off tests shall be performed on rock tiebacks only. Locations for lift-off tests shall be selected randomly by the Resident prior to the commencement of any tieback

testing. For each tieback subjected to a lift-off test, the Contractor shall leave an adequate length of tendon protruding over the anchorage to permit jacking.

Lift-off tests shall be performed at least 24 hours, but no more than 7 days after the tieback has been set to lock-off load. The results of all lift-off tests shall be recorded.

If the lift-off load is not within 10% of the lock-off load, the anchorage shall be reset and another lift-off test performed according to the requirements in this specification.

E. Acceptance Criteria

1. General

a. For all tiebacks:

- All tiebacks and components shall be free of detrimental corrosion.
- Lift-off readings shall show a load within 5 percent of the specified lock-off load.
- Lift-off tests shall show a load within 10 percent of the specified lock-off load.
- The total movement at the maximum test load shall exceed 80 percent of the theoretical elastic elongation of the unbonded length, from the alignment load to the test load.

b. For performance or proof tested tiebacks with a 10 minute load hold, the tieback shall also resist the maximum test load with a creep rate that does not exceed 0.040 inches between the 1 and 10 minute readings.

c. For performance or proof tested tiebacks with a 60 minute load hold, the tieback shall also resist the maximum test load with a creep rate that does not exceed 0.080 inches per log cycle of time.

Depending on the results of the performance test or proof test of the Tieback, the Resident may modify size of hole for tiebacks and/or request modifications to tiebacks installation techniques at no additional cost to the Owner. Tiebacks which do not meet the total movement criteria shall not be permitted to carry any load.

2. Conditional Acceptance Criteria. Tiebacks that meet the total movement criteria, but do not meet the creep rate criteria may be accepted by the Resident and locked-off at a load equal to one half their failure load. To determine the failure load, allow the load to stabilize for 10 minutes after the tieback has failed. The load after stabilization is the failure load.

A supplemental tieback shall be installed and tested in accordance with this specification at a location approved by the Resident. The combined test capacity of the tiebacks shall equal or exceed 1.5 times the original design load. That is:

$$1.5 P = 1.5 P_S + 0.5 P_f$$

Where: P = the design load for the original tieback

P_S = the design load for the supplemental tieback

P_f = the failure load for the original tieback

For tiebacks that do not meet the lift-off reading (or test) criteria, the anchorage shall be reset and another lift-off reading (or test) taken.

504.05 Method of Measurement

A. Permanent Grouted Tiebacks, Furnished, Installed and Accepted. This work will be measured as a lump sum item.

Separate payment will not be paid for all labor, materials, tools, supervision, transportation, installation equipment, and incidentals necessary to complete the work specified herein and shown on the Contract Drawings. The work shall include but not be limited to permits, utility markup, mobilization of equipment and materials, surveying, drilling hole for tieback (in soil, boulder, obstruction, rock), temporary access (land or water) needed for tieback construction, tieback inserting, grouting, stressing, proof load testing of tieback, lock-off of tieback at the appropriate locations, and development and execution of an approved QCP. Include all the associated incidental costs under pay item "Permanent Grouted Tiebacks, Furnished, Installed and Accepted".

For tiebacks which do not meet all the acceptance criteria, but do meet the conditional acceptance criteria, the original tieback and any required supplemental tieback(s) are, in sum, considered to be one tieback for payment purposes. No payment will be made for any additional wall connections required for installation of supplemental tiebacks.

B. Performance Tests for Grouted Tiebacks. This work will be measured as the number of performance tests performed.

504.06 Basis of Payment

A. Permanent Grouted Tiebacks, Furnished, Installed and Accepted. The unit price bid shall include the cost of furnishing all labor, equipment, and material required to satisfactorily complete the work. The cost for proof tests and lift off tests shall also be included.

B. Performance Tests for Grouted Tiebacks. The unit price bid shall include the cost of furnishing all labor, equipment and material required to satisfactorily complete the tests.

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Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
504.9068 Permanent Grouted Tiebacks, Furnished, Installed, and Accepted	LS
504.9069 Performance Test for Grouted Tieback	EA

SPECIAL PROVISION

SECTION 506 - SHOP APPLIED PROTECTIVE COATING - STEEL

506.01 Description This work shall consist of applying protective coating to steel substrate in accordance with the Plans and this Specification. The protective coating system shall be as specified on the Plans.

ALL REQUIREMENTS IN THIS SPECIFICATION ARE THE RESPONSIBILITY OF THE CONTRACTOR UNLESS NOTED OTHERWISE.

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

506.03 Submittals Submit the following, as applicable:

- A. The manufacturer's product data sheet for the specified protective coating system(s)
- B. Material Safety Data Sheets
- C. Facility Certification, Endorsement or other Qualification(s)
- D. Quality Control Plan
- E. Quality Control Inspector (QCI) qualifications

506.04 General Specifications Specifications for the protective coating and/or protective coating systems are:

Zinc Rich Coating System	Subsections 506.10 through 506.19
Hot-Dip Galvanizing	Subsections 506.20 through 506.29
Thermal Spray Coating	Subsections 506.30 through 506.39
Fusion Bonded Epoxy Coating	Subsections 506.40 through 506.49
Polyurea Elastomer Coating	Subsections 506.50 through 506.61

506.05 Inspection Quality Control (QC) is the responsibility of the Contractor. Inspect all aspects of the work and supervise all sampling, measurements and testing. Record measurements and test results in a clear and legible manner in a format acceptable to the Fabrication Engineer. Reject materials and workmanship that do not meet Contract requirements. The Quality Control Inspector (QCI) may perform sampling, measurements and testing in addition to the minimum required. Make the results of all sampling, measurements and testing available to the Quality Assurance Inspector (QAI).

Training in surface preparation, coatings application, and inspection is required for QCI's. Acceptable training includes one or more of the following:

- A. National Association of Corrosion Engineers (NACE) International: Coating Inspector Program Level 1 (minimum)
- B. SSPC BCI Coatings Inspection Training and Certification for the Bridge Industry: (Level I without certification), or Level II

C. Other training that is acceptable to the Department.

Quality Assurance (QA) is the prerogative of the Department. The QAI's responsibility is to ensure that the QC personnel are performing acceptably, verify documentation, periodically inspect workmanship and witness sampling, measurements and testing. The QAI will schedule measurements and testing deemed necessary by the Resident in addition to the minimum requirements in a manner that minimizes interference with the production schedule.

The QAI has the authority to reject material or workmanship that does not meet the Contract requirements. The acceptance of material or workmanship by the QAI will not preclude subsequent rejection if found unacceptable by the Department.

506.06 Non-Conforming Work Submit a non-conformance report to the Fabrication Engineer describing the deficiencies and proposed solution. Correct or replace rejected coatings as directed by the Fabrication Engineer.

506.07 Facilities for Inspection Provide a private office at the fabrication plant for the Department's inspection personnel or QAI. The office shall be in close proximity to the work. The office shall be climate controlled to maintain the temperature between 68° F and 75° F and have the exit(s) closed by a door(s) equipped with a lock and 2 keys which shall be furnished to the Inspector(s).

The QAI's office shall meet the following minimum requirements:

<u>Description</u>	<u>Quantity</u>
<u>Office area (minimum ft²)</u>	<u>100</u>
<u>Drafting Table Surface (ft²)</u>	<u>35</u>
<u>Drafting stools-each</u>	<u>1</u>
<u>Office Desk</u>	<u>1</u>
<u>Ergonomic Swivel Chairs</u>	<u>1</u>
<u>Folding Chairs</u>	<u>2</u>
<u>High-speed internet connection (ports) or wireless</u>	<u>1</u>
<u>Fluorescent Lighting of 100 ft-candles minimum for all work areas</u>	<u>2</u>
<u>110 Volt 60 Cycle Electric Wall Outlets</u>	<u>3</u>
<u>Wall Closet</u>	<u>1</u>
<u>Waste Basket with trash bags</u>	<u>1</u>
<u>Broom</u>	<u>1</u>
<u>Dustpan</u>	<u>1</u>
<u>Water Cooler</u>	<u>1</u>
<u>Cleaning materials-floor, surfaces, windows, for duration of the project</u>	

The Contractor will be responsible for disposing of trash and supplying commercially bottled water for the water cooler.

The QAI has the option to reject any furniture or supplies provided to the QAI's office based on general poor condition.

Provide parking space for the QAI(s) in close proximity to the entrance to the QAI's office. Maintain the pathway between the parking area and the QAI's office so that it is free of obstacles, debris, snow and ice.

The facilities and all furnishings shall remain the property of the Contractor upon completion of the Work. Payment for the facilities, heating, lighting, telephone installation, internet connection, basic monthly telephone and internet charges and all furnishings shall be incidental to the Contract.

Failure to comply with the above requirements will be considered denial of access to the Work for the purpose of inspection. The Department will reject all Work done when access for inspection is denied.

506.08 Applicator Qualification Shop-applied paint systems shall be applied by applicators that hold a current AISC Sophisticated Paint Endorsement (SPE) or are qualified in accordance with SSPC-QP3, *Standard Procedure for Evaluating Qualifications of Shop Painting Applicators*. For specialty items, the Fabrication Engineer may accept other shop qualifications based on experience and/or an audit by the Department. Thermal Spray Coating (TSC) including sealers and top coating, fusion bonded coatings and hot-dip galvanizing shall be applied in facilities with a minimum of five years experience of satisfactory performance.

506.09 Documentation Measure and record the following, as applicable to the coating application, in a Job Control Record (JCR):

- A. Surface preparation - cleanliness and anchor profile
- B. Environmental conditions – ambient temperature, surface temperature, relative humidity, dew point
- C. Coating batch and/or lot number, date of manufacture and shelf life
- D. Mixing/thinning
- E. Dry Film Thickness (DFT) for each coat
- F. Cure data-time/temperature/relative humidity
- G. Final inspection and acceptance by the QCI

Submit the format for the JCR to the Fabrication Engineer for review prior to beginning application of protective coating.

Provide work area illumination as follows:

Work Area Illumination Requirements in Foot Candles		
Description of Work	Minimum	Recommended
General Work Area Illumination	10	20
Surface Preparation and Coating Application	20	50
Inspection	50	200

Provide a light meter that measures illumination in foot candles.

Use *SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning* or *SSPC-VIS 3, Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning* as required in order to determine acceptable surface cleanliness.

Measure and record the environmental conditions during application and during the entire curing cycle. Failure to provide accurate and complete environmental data may result in rejection of the coating or an extended cure time as determined by the Fabrication Engineer.

Measure and record the DFT of each coat in accordance with *SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages (PA 2)*.

ZINC RICH COATING SYSTEM

506.10 Description This work shall consist of surface preparation and application of coating systems in accordance with the Plans and this Specification. The color shall be as specified on the Plans.

506.11 Materials Coatings systems shall be from the Northeast Protective Coating Committee (NEPCOAT) Qualified Products List (QPL), list A or B. The list may be found through NEPCOAT's Web page: <http://www.nepcoat.org>.

Provide the paint batch description, lot number, date of manufacture, shelf life and the manufacturer's storage requirements to the QAI. Provide the manufacturer's published data sheet for each coat of the coating system including equipment, surface cleanliness, anchor profile, mixing, thinning, application, and cure time for the entire range of allowable environmental conditions and the DFT.

506.12 Limits of Work Coat all surfaces exposed in the assembled product unless otherwise specified. Apply a mist coat, 0.5 to 1.0 mils, of primer only to surfaces to be embedded in concrete.

Apply primer to faying surfaces of bolted connections that develop a class B slip coefficient in accordance with the "*Specification for Structural Joints Using ASTM A325 or A 490 Bolts*" by the Research Council of Structural Connections (RCSC). Provide

documentation to demonstrate that the primer was tested and the requirements were met. Do not exceed the DFT applied for test purposes.

506.13 Surface Preparation Surface cleanliness shall be *SSPC-SP 10, Near-White Blast Cleaning* (SP 10) unless a higher standard of surface cleanliness is required by the manufacturer's published data sheet. Round all corners exposed in the assembled product to approximately a 3/32 inch radius, prior to abrasive blast cleaning. A series of tangents that approximate a radius may be considered as a rounded edge if there are no sharp breaks. Provide radius gauges to inspect corner preparation. The radius shall be the minimum specified above, but not greater than 3/16 inch.

The abrasive blast media shall meet the requirements of *SSPC-AB 1, Mineral and Slag Abrasives, AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives and/or AB 3, Ferrous Metallic Abrasive*. The anchor profile shall be angular and meet the requirements of the coating manufacturer's published data sheet.

If compressed air is used for abrasive blast cleaning, perform a blotter test ASTM D 4285 at the beginning of each shift and at any time requested by the QAI. Notify the QAI prior to performing the test.

Measure and record the anchor profile in accordance with ASTM D 4417 Method C (replica tape). If the anchor profile fails to meet the minimum requirements, re-blast the substrate until the required anchor profile is achieved. If the anchor profile exceeds the maximum allowed, generate a Non-Conformance Report (NCR) describing the condition of the substrate and a proposed solution and submit it to the Fabrication Engineer for review.

If it has been established to the satisfaction of the QAI that the abrasive blast equipment is capable of providing uniform, acceptable anchor profile, a diminished degree of testing may be allowed at the discretion of the Fabrication Engineer.

The allowable time between abrasive blast cleaning and primer application shall not exceed the manufacturer's published recommendations or one work shift, whichever is less. Any evidence of rust bloom, flash rust or other surface conditions that cause the substrate cleanliness to fall outside the specified cleanliness standard will be rejected. Inspect all substrate immediately prior to coating application. Re-blast steel substrate that does not meet the surface cleanliness requirements.

506.14 Mixing and Application Record the batch and lot numbers of the coating, the type and amount of thinner used, the time and pot life of the coating.

Add thinner in accordance with the manufacturer's published data sheet. Measure thinner with a graduated cup or other container that clearly indicates the amount of thinner being added. Record the amount of thinner added. Mix the paint using the method, equipment and time recommended by the coating manufacturer. Mix each

component separately and mix all components together for at least the minimum time recommended on the Manufacturer's Product Data Sheet but not less than two minutes.

Measure the environmental conditions in the immediate vicinity of the piece(s) being coated during the coating operation and during the entire cure period. Provide two data loggers capable of measuring ambient humidity and temperature. The data loggers shall come with software that can download the data onto a computer. Print out the data and provide a copy to the QAI for review prior to applying the subsequent coat of paint. Place the data loggers in the immediate vicinity of the coating operation during the entire application and curing cycle. The data will be used to determine that the cure/recoat time requirements for each coat have been met. Failure to comply will result in the coating being cured for the maximum time necessary to assure adequate cure, as determined by the Fabrication Engineer.

Stripe all corners, fasteners, welds and locations with poor access, in accordance with *SSPC-PA 1, Shop, Field and Maintenance Painting of Steel (PA 1)*. Do not stripe using inorganic zinc primer (IOZ). Stripe the IOZ primer between the primer and intermediate coats using the intermediate coating.

Apply the coating using equipment recommended in the Manufacturer's Product Data Sheet, or equal. Apply the coating in a uniform manner without sags, runs or drips.

506.15 Dry Film Thickness Measure and record the DFT of each coat in accordance with PA 2. Record the following:

- A. Gauge type/manufacturer/model
- B. Serial number
- C. Coat/shim used for calibration (e.g., Primer Coat or 5 mil shim)
- D. Measurements/spot average/location
- E. Cure time
- F. Non-conforming areas and determination for correction

Each piece or area presented for acceptance, regardless of size, shall be considered a separate structure for purposes of determining the number of spot measurements to be taken, except that large quantities of small parts and/or secondary framing members coated at the same time may be measured at a lesser frequency, as directed by the Fabrication Engineer. When random DFT testing of a large quantity of small parts and/or secondary framing members results in unacceptable DFT's, the Contractor shall have the option of measuring and documenting the DFT of each piece or removing the coating and/or recoating all pieces represented in the production lot.

506.16 Touch-up and Repairs Touch-up is the repair of minor blemishes, including but not limited to, scratches and abrasions that do not penetrate underlying layers of coating. Perform touch-up using the same coating and methods specified in the Manufacturer's Product Data Sheet. Cure the touch-up coating in the same manner as the original coating.

Repair coating damage that penetrates underlying layers in accordance with the Manufacturer's Product Data Sheet and this Specification. Prepare areas to be repaired in a manner that assures the proper adhesion of each coat. Feather back each damaged layer so that each repair coat is continuous with each corresponding existing coat. The topcoat shall be smooth and uniform in appearance. Repair damaged or unacceptable shop coating before the piece is removed from the paint area.

506.17 Handling and Storage Handle coated members in a manner that avoids damage to the coating. Lift and move members using non-metallic slings, padded chains and beam clamps, softeners or by other non-injurious methods. Store painted material in a manner that prevents damage to the coating.

Document damage to the coating that is discovered after the product is loaded for shipment to the job site. Minor damage as a result of handling shall be considered field repair unless, in the opinion of the Fabrication Engineer, the damage is the result of negligence or poor handling methods. Damage that is deemed to be the result of negligence or poor handling methods shall be repaired as directed by the Fabrication Engineer.

506.18 through 506.19 RESERVED

HOT-DIP GALVANIZING

506.20 Description This work shall consist of surface preparation and application of hot-dip galvanizing in accordance with the Plans and this Specification. Hot-dip galvanizing shall meet the requirements of *AASHTO M 111/ASTM A 123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel (A 123)*, including any applicable requirements listed in Section 2-Referenced Documents. The minimum average coating thickness grade shall conform to Table 1. The frequency of testing shall be in accordance with Section 6. The choice of the test method is the prerogative of the Contractor. Record the test results and provide them to the Department. Provide certification of compliance and written test results to The Department in accordance with A 123 - Section 10.

506.21 Surface Preparation Abrasive blast-clean the steel to a minimum of *SSPC-SP 6, Commercial Blast Cleaning (SP6)* prior to galvanizing. Grind all corners exposed in the assembled product to a 1/16 inch radius prior to galvanizing.

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

506.23 Top-coating Galvanized Surfaces Areas of galvanized surfaces to be top-coated will be described on the Plans or in the Special Provisions.

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

506.24 Materials Provide materials in accordance with 506.11.

506.25 Mixing and Application Mix and apply in accordance with 506.14.

506.26 Dry Film Thickness Measure and record the DFT in accordance with 506.15.

506.27 Touch-up and Repairs Perform touch-up and repairs in accordance with 506.16.

506.28 Handling and Storage Handle and store material in accordance with 506.17.

506.29 RESERVED

THERMAL SPRAY COATING

506.30 Description This work shall consist of surface preparation and application of Thermal Spray Coatings (TSC) in accordance with the Plans and this Specification. Application of TSC to steel substrate shall be done in accordance with requirements, recommendations and appendices of Joint Standard *NACE NO. 12/AWS C2.23M/SSPC-CS 23.00, Specification for the Application of Thermal Spray Coatings (Metalizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel* (The Standard) and this Specification.

The applicator shall have a minimum of five years experience and shall provide copies of application procedures, operator qualifications, QC Manuals and repair procedures.

506.31 Submittals Submit an application procedure and QC Plan for review by the Department prior to beginning work. Submit a certified analysis of the feedstock to the Department. Submit sample copies of QC records for review. Submit copies of applicator qualifications, job history, etc. Provide the name and qualifications of the QCI.

506.32 Surface Preparation Prior to abrasive blast cleaning, round all corners exposed in the assembled product to approximately a 3/32 inch radius. A series of tangents to the approximate radius will be considered acceptable. Abrasive blast clean all surfaces to be coated in accordance with the requirements of *SSPC-SP 5, White Metal Blast Cleaning* (SP 5). Use SSPC-VIS. 1 as a visual standard to determine acceptable cleanliness. Inspect the substrate immediately before spray application.

The anchor profile shall be 2.5-4.0 mils. Measure and record the anchor profile in accordance with *ASTM D 4417 Method C (Replica Tape)* on each plane to be sprayed or at 120° intervals on pipe or tube. If the anchor profile fails to meet the minimum required profile, re-blast the substrate until the required anchor profile is achieved.

If compressed air is used for abrasive blast cleaning, perform a blotter test in accordance with *ASTM D 4285* at the beginning of each shift. Empty moisture traps at the beginning of each shift and at any time thereafter when moisture appears to be present on the substrate. Notify the QAI prior to performing the test in order that the QAI can witness the blotter test.

506.33 TSC Requirements The coating thickness shall be between 14 mils and 17 mils. The DFT on faying surfaces shall not exceed the thickness tested for Class B slip coefficient rating. The TSC shall have a minimum tensile bond of 725 psi. Test the tensile bond in accordance with *ASTM D 4541*. The frequency of testing shall be one test every 500 ft² or once per shift, whichever is less. The test location will be as directed by the QAI. The specified tensile force shall be applied to the TSC and removed. If the test does not reveal a failure of the TSC, the tensile bond shall be considered acceptable. Repair or recoat unacceptable work.

Perform a bend test as described The Standard, at the beginning of each shift. If the bend test fails, take corrective action and perform another test. After performing the bend test successfully a number of times, the Fabrication Engineer may reduce the frequency of testing. Document the results of the tensile bond test and bend test and provide the results to the Department.

The TSC shall have a uniform appearance, free from blistering, cracks, loose particles, or exposed steel substrate when examined with 10-X magnification.

506.34 TSC Application Record the batch and lot numbers of the consumables. Measure the environmental conditions in the immediate vicinity of the piece(s) being coated during the coating operation and during the entire cure period for intermediate and top coat. Provide two data loggers capable of measuring ambient humidity and temperature. The data loggers shall come with software that can download the data onto a computer. Print out the data and provide a copy to the QAI for review prior to applying the subsequent coat of paint. Place the data loggers in the immediate vicinity of the coating operation during the entire application and curing cycle. The data will be used to determine that the cure/recoat time requirements for each coat have been met. Failure to

comply will result in the coating being cured for the maximum time necessary to assure adequate cure as determined by the Fabrication Engineer.

506.35 Seal Coat and Top Coat Application (Paint) Apply a wash primer and seal coat that contains pigmentation indicating uniformity of application. Top flanges of beams requiring shear connectors shall receive a flash/primer coat only. The seal coat shall be compatible with an epoxy intermediate coat and a polyurethane top coat from the NEPCOAT QPL. Provide certification of compatibility between the seal coat and intermediate coat from the intermediate coat/top coat manufacturer.

506.36 Materials Provide materials in accordance with 506.11.

506.37 Mixing and Application Mix and apply in accordance with 506.14.

506.38 Dry Film Thickness Measure and record the DFT in accordance with 506.15.

506.39 Touch-up and Repairs Repair damage to TSC by re-blasting the damaged area and re-applying TSC in accordance with this Specification. Perform touch-up and repairs to paint in accordance with 506.16.

FUSION BONDED EPOXY COATING

506.40 Description This work shall consist of surface preparation and application of Fusion-Bonded Epoxy (FBE) coating, in accordance with the Plans and this Specification, including measuring and documenting DFT and testing for holidays and other discontinuities in the epoxy coating. The FBE shall be applied to all surface areas indicated on the Plans.

Perform surface preparation and application of FBE in accordance with the following Specifications:

- A. Steel pipe pile - *ASTM A972, Fusion Bonded Epoxy-Coated Pipe Pile*
- B. H-pile and sheet pile - *ASTM A950, Fusion Bonded Epoxy-Coated Structural Steel H-Piles and Sheet Piling*
- C. Reinforcing steel - *ASTM A775, Epoxy-Coated Steel Reinforcing Bars*

506.41 Materials The FBE coating shall meet all of the physical and testing requirements of the applicable Specifications above (including Annexes). Provide a certification that identifies the coating, batch or lot number, date of manufacture and test results. Supply patching material from the same manufacturer.

506.42 Surface Preparation Prepare the surface(s) in accordance with applicable Specifications listed above. Grind all welds flush on spiral welded pipe pile prior to abrasive blast cleaning.

506.43 Inspection The DFT shall be between 12 mils and 20 mils, unless otherwise specified. Measure the DFT using a fixed-probe gauge in accordance with SSPC-PA 2. The testing procedure and reporting shall be in accordance with ASTM G 12. The frequency of testing shall be each piece coated, unless a lesser frequency of testing is directed by the Fabrication Engineer.

After curing, the coating shall be checked for holidays (pinholes not visible to the unaided eye) using a 67½ Volt d-c, wet sponge, holiday, detector, in accordance with the requirements of ASTM G62, Test Methods for Holiday Detection in Pipeline Coatings. An average of more than five holidays per foot in the coated length of a pile will be cause for rejection of that pile.

506.44 through 506.49 RESERVED

POLYUREA ELASTOMER COATING

506.50 Description This work shall consist of surface preparation, application, protection and field repair of a proprietary protective coating system applied to piles. The work shall be done in accordance with the Manufacturer's Product Data Sheets, Material Safety Data Sheets (MSDS) and this Specification. In case of conflict, this Specification shall be followed.

The Contractor shall provide safe access to the operation for the 100% polyurea elastomer coating repair personnel and the QAI. Failure to provide safe access will be deemed denial of access to the work and all work performed will be subject to rejection.

506.51 Materials The protective coating system shall be a two coat system manufactured and provided by either:

- A. Rhino Linings[®] Corporation
9151 Rehco Road
San Diego, CA 92121
1-800-422-2603
- B. Line-X Franchise Development Co.
1862 Sparkman Drive
Huntsville, AL 35816
Tel. 877-330-1331

The protective coating system shall consist of either:

- A. Primer 161 as provided by Rhino Linings[®], 100% polyurethane primer/sealant Rhino Extreme[™] HP 11-50, 100% polyurea elastomer coating
- B. FCP primer as provided by Line-X
Line-X, XS-350, 100% polyurea elastomer coating

506.52 Submittals Submit the coating batch description, lot number, date of manufacture, shelf life and manufacturer's storage requirements to the Fabrication Engineer. Submit the Manufacturer's Product Data Sheet and MSDS for each coat of the coating system. Submittal shall include equipment requirements, surface preparation and cleanliness requirements, anchor profile, mixing, thinning, application, and cure time for the entire range of allowable environmental conditions and the DFT of each coat.

Submit a field repair plan for 100% solid polyurea elastomer coating (Rhino Extreme™ HP 11-50 or Line-X, XS-350) that may potentially be damaged during the transportation or installation of the pile. Submittal shall include equipment needed and an approximate time to effect repairs. The plan shall include repair procedure for only 100% solid polyurea elastomer coating damage and 100% solid polyurea elastomer coating and Primer (Primer 161 or FCP primer) damage.

Submit all plans to the Department for review a minimum of two weeks prior to the beginning of the pile coating operations.

506.53 Notification The Contractor shall contact the appropriate representative listed below to coordinate the receiving, coating, shipping and field repair of the piles.

John Henningsen
Rhino Linings Corporation
9151 Rehco Road
San Diego, CA 92121
800-747-6966, ext. 6017
jhenningsen@rhinolinings.com

Larry Maillet
LINE-X of Augusta
509 Maine Avenue
Farmingdale, ME 04344
(207)582-0282 work
(207)212-1995 cell
linexofaugusta@netscape.com

The Contractor shall notify the Fabrication Engineer at least fifteen business days prior to beginning the surface preparation/coating process in order to facilitate the presence of a QAI. Work performed without a QAI present will be subject to additional destructive and non-destructive testing and may make the coating subject to rejection. Rejection requires that the coating be removed and re-applied.

506.54 Inspection, Non-Conforming Work, Applicator Qualification and Documentation The Contractor shall meet the requirements of Sections 506.05 through 506.09. The Contractor shall assign unique alpha-numeric identification to each pile. Each pile shall be considered a separate unit for the purposes of inspection and documentation.

506.55 Surface Preparation The requirements of Section 506.13 with the following amendment to paragraph 1 and 4 shall be followed:

Surface cleanliness shall meet the requirements of SSPC-SP 10, Near-White Blast Cleaning (SP 10) unless a higher standard of surface cleanliness is required by the

Manufacturer's Product Data Sheet. Surfaces shall be uniform, free of sharp edges, weld spatter or other conditions injurious to coatings. Round all exposed nicks gouges and sharp changes in geometry to approximately a 3/32 inch radius prior to abrasive blast cleaning. A series of tangents that approximate a radius may be considered as a rounded edge if there are no sharp breaks. Provide radius gauges to inspect corner preparation. Sharp angular changes in the surface such as nicks, gouges and weld toes shall be blended to a smooth transition with the surrounding surfaces. SSPC-VIS. 1 shall be used to determine acceptable cleanliness. Provide a blast media angular anchor profile in accordance with the manufacturer's published recommendations, but not less than 2 mils.

Measure and record the anchor profile in accordance with ASTM D 4417 Method C (replica tape). A minimum of three readings shall be obtained in each of 3 - 6" by 6" locations per pile for each method of surface preparation used. If the anchor profile fails to meet the minimum requirements, re-blast the substrate until the required anchor profile is achieved. If the anchor profile exceeds the maximum allowed, generate an NCR describing the condition of the substrate and a proposed solution and submit it to the Fabrication Engineer for review.

506.56 Application Limit of coating application shall be as shown on the Plans. Record the batch and lot numbers of the coating, the type and amount of thinner used, the time and pot life of the coating. Immediately prior to coating application measure and record the environmental conditions in the immediate vicinity of the piece(s) being coated.

Coating system shall be applied and cured in accordance with the Manufacturer's Product Data Sheet. The 100% solid polyurea elastomer coating shall be applied in accordance with the Manufacturer's Product Data Sheet and Manufacturer's published recommendations. Coating shall be uniform, smooth and free of holidays, sags, runs or drips.

506.57 Dry Film Thickness The DFT of the Primer shall comply with the manufacturer's requirements. The DFT of the 100% solid polyurea elastomer coating shall be a minimum of 125 mils. Measure and record the DFT of each coat using a fixed-probe gauge in accordance with SSPC-PA 2. A minimum of three gage readings shall be obtained in each of 5 spots per 100 square feet, with a minimum of 15 gage readings per pile. Record the following:

- A. Gauge type/manufacturer/model
- B. Serial Number
- C. Coat/shim used for calibration (e.g. Primer Coat/5 mil. shim)
- D. Measurements/spot average/location
- E. Cure time
- F. Non-conforming areas and determination for correction

506.58 Adhesion The primer/coating system shall have a minimum adhesion value of 1000 psi. Test the adhesion in accordance with ASTM D 4541-*Pull Off Strength of*

Coatings Using Portable Adhesion Testers. The frequency of testing shall be one test per pile. The test location will be as directed by the QAI. The specified tensile force shall be applied to the coating and removed. If the test does not reveal a failure of the coating, the adhesion will be considered acceptable. If the coating fails the test, cease the coating operation until the problem is identified and corrected. Record the testing results in accordance with Section 506.05. Perform tests on each coated piece unless a lesser frequency of testing is directed by the Fabrication Engineer. If a pile is not tested, record “not tested” in the testing file.

To avoid damaging the pile coating, testing may be performed on witness panels that are coated at the same time that piles are coated or on a coated pile surface that extends beyond the plan limits.

506.59 Handling, Shipping and Storage Handle coated members in a manner that avoids damage to the coating. Lift and move members using non-metallic slings, padded chains and beam clamps, softeners or by other non-injurious methods. Store and transport the piles in a manner that prevents damage to the coating. The Contractor shall work with appropriate coating manufacturer’s personnel to determine and use the best possible handling, shipping and storage means that will avoid damage to the coating.

Load the piles on trailers in a manner that prevents coating damage due to impact or abrasion during transit. Document damage to the coating that is discovered after the product is loaded for shipment to the job site. Minor damage as a result of handling shall be considered field repair unless, in the opinion of the Fabrication Engineer, the damage is the result of negligence or poor handling methods. Damage that is deemed to be the result of negligence or poor handling methods shall be repaired as directed by the Fabrication Engineer.

506.60 Field Repair Repair of damaged coating resulting in less than 80 mils of 100% solid polyurea elastomer coating remaining is the responsibility of the Contractor. Repairs shall be performed in accordance with the approved field repair plan submittal using the same coating and methods specified in the Manufacturer's Product Data Sheet to the satisfaction of the Resident. Repaired pile shall not be driven until the coating has cured.

506.61 Method of Measurement Protective coating shall be measured by the lump sum, complete and accepted. The coating limits shall be as shown or described in the Contract Documents.

506.62 Basis of Payment All work for Protective Coating will be paid for at the lump sum price for the respective item. Payment will be full compensation for all labor, materials and equipment required to complete the surface preparation and coating work, including, but not limited to, coating and cleaning materials, shipping, staging or accessing, testing, surface preparation, cleaning, application, curing and repairs.

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WIN 16750.00
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Cost for the manufacturer's representative to remain on the project site during pile driving operation shall be considered incidental to the Shop Applied Protective Coating - Steel. If at any time the Polyurea Elastomer Coating requires Field Repair the cost of repair is the responsibility of the Contractor.

Payment will be made under:

<u>Pay Items</u>	<u>Pay Unit</u>
506.9101 Galvanizing (and Top Coat)	Lump Sum
506.9102 Zinc Rich Coating System (Shop Applied)	Lump Sum
506.9103 Galvanizing	Lump Sum
506.9104 Thermal Spray Coating (Shop Applied)	Lump Sum
506.9105 Polyurea Elastomer Coating	Lump Sum
506.9106 Fusion Bonded Epoxy Coating	Lump Sum

SPECIAL PROVISION
SECTION 507 - RAILINGS

The following shall be added to Section 507.02 Materials:

507.02 Materials The Materials for the item “Aluminum Bridge Railing, 2 Bar (Foothills TL-2 Rail)” shall be in accordance with the Plans, and comply with the requirements of Sections 713 and 716 of the Specifications.

Aluminum in contact with concrete shall be coated with an approved aluminum-impregnated caulking compound. Aluminum surfaces in contact with metals other than stainless or galvanized steel shall be insulated with approved materials.

The Materials for the item “Steel Pipe Hand Railing” shall be in accordance with the Plans, comply with the requirements of Section 713 of the Specifications, and be approved by the Resident.

The pipe for the posts and top rail and toe rail shall be ASTM A312, Type 316 stainless steel.

All mounting and connection components and hardware shall be stainless steel.

The cable shall be wire rope, 1x19 configuration, conforming to the dimensional properties specified in MIL-DTL-87161 (Military specification for wire strand, stainless steel and zinc coated, non-flexible, for aircraft control.), and shall meet the requirements of ASTM A492, type 316 stainless steel wire, and have a working load limit of 580 lb or greater.

The tensioners shall be 316 grade stainless steel.

The following shall be added to Section 507.04 General:

507.04 General All posts shall vertical.

Rails shall follow the profile grade of the bridge in accordance with the heights shown on the Plans. Field bending of the tube sections shall not be allowed. Railings shall be carefully adjusted prior to being fixed in place to ensure proper matching at abutting joints and correct alignment and camber throughout their length.

The following Section shall be added:

Section 507.071 Steel Pipe Handrailing The tensioners shall provide the connection of the cables to the end posts, and allow for tightening of the cables by shortening the tensioner. The amount of adjustment

provided to shorten the tensioner (and therefore the cable) shall be at least 1.35". The tensioner shall be connected to the post with 3/16" diameter rivets.

The wire ropes, once installed shall be parallel to each other, free of kinks, sags or other defects, and clean.

The Contractor shall replace defective or damaged wire ropes and hardware as directed by the Resident, at no additional cost to the Department.

The wire ropes and hardware shall be adjusted as required to provide a complete and properly installed decorative metal railing system.

The Contractor shall protect installed products from damage or soiling until completion of project.

The Contractor shall remove and replace railing components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage, including dented and bent components.

The following shall be added to Section 507.09 Basis of Payment:

507.09 Basis of Payment The accepted quantity of Steel Pipe Hand Railing and Aluminum Bridge Railing, 2 Bar (Foothills TL-2 Rail) will be paid for at the contract lump sum price, which price shall be full compensation for furnishing and installing rails, rail posts, railing components and connectors, and anchor assemblies.

In addition, the Contractor shall provide 2 additional aluminum rail pieces and two additional traffic rail posts, which will not be measured for payment and will be incidental to the item "Aluminum Bridge Railing, 2 Bar (Foothills TL-2 Rail)". The additional pieces will be stored at a location determined by the Resident.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
507.084 Steel Pipe Hand Railing	Lump Sum
507.092 Aluminum Bridge Railing, 2 Bar (Foothills TL-2 Rail)	Lump Sum

SPECIAL PROVISION
SECTION 509 – STRUCTURAL PLATE PIPES, PIPE ARCHES, ARCHES, AND METAL BOX
CULVERTS
(Composite Beam Sidewalk)

509.01 Description This work shall consist of fabricating and installing a high strength system of fiberglass reinforced polymer (FRP) planks to form a sidewalk on the bascule span and an access platform for the lock bars and shall be paid for under item “Composite Beam Sidewalk”. The item shall include all materials, equipment and incidentals necessary to complete the work as shown on the plans and in accordance with these specifications.

509.02 Material The material shall be as follows, unless otherwise approved by the Resident:

Fiber may be of any commercial E-glass fiber. The overall fiber volume fraction in a given FRP plank shall be no less than 25% and no greater than 60%

Resin shall be commercial grade thermoset polyester resin. Resins shall be mixed per manufacturer’s standard practices and procedures.

Other materials, such as additives, fillers, pigments, fire retardants, etc., will be permitted if they are appropriate for use with the fiber resin.

The fiber and resin materials shall be certified in accordance with ASTM standards, and accompanied by certification documents. The following mechanical properties shall be as determined in accordance with the following ASTM standard tests:

Resin tensile strength and modulus of elasticity	ASTM D 638
Laminate tensile strength and modulus of elasticity	ASTM D 638
Laminate flexural strength and modulus of elasticity	ASTM D 790
Laminate shear strength	ASTM D 2344

509.03 FRP Planks The FRP planks that make up the sidewalk shall be a composite of fiberglass reinforcements (a core of continuous glass strand rovings wrapped with continuous strand glass mat) and a thermal resin system. The pultrusion process shall be used to produce the planks. The resin system shall be a slate gray fire retardant polyester resin meeting the requirements of Class 1 flame spread rating of 25 or less per ASTM E-84 the flammability characteristics of UL 94 V0 and the self-extinguishing requirements of ASTM D635. The resin shall be UV inhibited and the composite shall include a surface veil on all exposed surfaces for enhanced corrosion and UV protection. Other resins and colors may be acceptable if approved by the Resident.

The FRP planks shall be 2” deep and 12” or 24” wide with interlocking joints on the outside legs of the FRP plank. The top surface of all FRP planks shall have a non-skid grit. The grit system shall be a

polyurethane based fine grit. A minimum of two hold down clamps shall be used at each FRP plank. The hold down connections shall be Grade 316 stainless steel.

The visual quality of the pultruded shapes shall conform to ASTM D4385.

All exposed surfaces shall be smooth and true to form, consistent with ASTM D4385.

After fabrication, all cut ends, holes and abrasions shall be sealed with a compatible resin coating as recommended by the manufacturer.

509.04 Design FRP planks shall be capable of withstanding a uniform load of 100 PSF or a concentrated load of 300 lbs. on an area of 4 sq. inches located in the center of the plank with a deflection of no more than 0.25”.

A 24” wide section of sidewalk shall have a moment of inertia of no less than 3.10 in^4 , a uniform weight of no greater than 5.1 plf, and a deflection no greater than .017 inches under a uniform load of 100 psf and a span of 24”.

A 12” wide section of sidewalk shall have a moment of inertia of no less than 1.69 in^4 , a uniform weight of no greater than 2.6 plf, and a deflection no greater than .014 inches under a uniform load of 100 psf and a span of 24”.

509.05 Tolerances

Panel Height Variation: +/- 1/8” with no adjacent panels having a difference of greater than 1/8” at the top surface of the panels.

Panel width Variation: +/- 1/4”

Straightness: Maximum deviation from straight .030”/ft of length when measured with a string.

Squareness of end cut: Within 1/4”

Length Tolerance: +/- 1/4”

509.06 Quality Assurance The material covered by these specifications shall be furnished by an ISO-9001:2008 and ISO-14001 certified manufacturer of proven ability who is regularly engaged in the manufacture, fabrication and installation of FRP systems.

The manufacturer shall be experienced in successfully producing FRP fabrications similar to that indicated for this project, with sufficient production capacity to produce required units without causing a delay in the work.

In addition to requirements of these specifications, the Contractor shall comply with the manufacturer’s instructions and recommendations for work.

509.07 Submittals The following shall be submitted to the Resident for approval in accordance with the requirements of Section 105.7-Working Drawings:

Shop drawings of all fabricated FRP planks and appurtenances. Fabrication shall not start until receipt of the Resident's approval marked "Approved As Submitted" or "Approved As Noted". The shop drawings shall include dimensions, sectional assembly, and location and identification marks.

The manufacturer's catalog data showing materials of construction, and dimensions, spacings, and strength properties of the FRP planks.

Detailed raw materials description, the pultrusion process summary, and the manufacturer's quality control procedures.

The manufacturer's installation instructions, and recommendations for maintenance and inspection.

Samples of each type of product shall be submitted for approval at the request of the Resident.

509.08 Shipping and Storage FRP planks shall be shipped from the manufacturer, palletized and banded with exposed edges protected to prevent damage in shipment.

All systems, sub-systems and structures shall be shop fabricated and assembled into the largest practical size suitable for transporting. Each piece shall be clearly marked showing manufacturer's applicable drawing number.

All materials and equipment necessary for the fabrication and installation of the sidewalk shall be stored before, during, and after shipment in a manner to prevent cracking, twisting, bending, breaking, chipping or damage of any kind to the materials or equipment, including damage due to over exposure to the sun. Any material which, in the opinion of the Resident, has become damaged as to be unfit for use, shall be replaced at the cost of the Contractor.

509.09 Method of Measurement The item "Composite Beam Sidewalk" will be measured as one lump sum unit, fabricated, delivered, erected, and accepted.

509.10 Basis of Payment The accepted quantity of "Composite Beam Sidewalk" will be paid for at the contract lump sum price, which price shall be full compensation for furnishing and installing the sidewalk, including all connections and equipment required, on the bascule span.

Payment will be made under:

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

Pay Item

Pay Unit

509.70 Composite Beam Sidewalk

Lump Sum

SECTION 510 - SPECIAL DETOURS

510.01 Description This work shall consist of the design, construction, maintenance in good condition and removal of temporary structures and approaches required for the satisfactory maintenance of vehicular and pedestrian traffic.

Easements or right-of-way for the Special Detour will be furnished by the Department and will be shown on the Contract Plans. If the Contractor proposes an alternative location for the Special Detour, and the alternative location is approved by the Department, that easement may only be acquired by the Department. All additional costs associated with the acquisition, including, but not limited to, obtaining easements, environmental mitigation, restoration and Department time, shall be borne by the Contractor.

510.02 Materials Materials used for the Special Detour structure and approaches shall conform to the detailed plans and specifications submitted by the Contractor.

510.03 Vehicular and Pedestrian Traffic Not Separated The Special Detour shall be located as close as practicable to the new Work, or as shown on the Plans.

The Special Detour, including the temporary structure and approaches, shall be designed and sealed by a Professional Engineer, licensed in accordance with the laws of the State of Maine. The Contractor shall submit the design computations and detailed plans of the temporary structure and approaches that will serve as the temporary detour to the Resident prior to beginning construction of the Special Detour.

If the Department requires changes to Temporary Detour plans or computations, based on Contract requirements, then the Contractor shall implement the changes at no additional cost to the Department.

The Department shall have no obligation to review or comment on any design, construction, maintenance or removal of Temporary Detours. No review or comment by the Department, or any lack of review or comment by the Department, shall not relieve the Contractor of its responsibility to properly design, construct, maintain in good condition, and remove Temporary Detours in accordance with the Contract, or shall shift any responsibility to the Department. The Contractor shall be responsible for all damages resulting from the failure of temporary structures or approaches.

The Special Detour shall not be opened to traffic until the Contractor's Professional Engineer inspects the temporary structure and provides the Department with a signed and sealed document certifying that the structure was built in accordance with the previously submitted sealed plans and design details of the structure and approaches.

510.031 Structure Design Temporary structures shall be designed in accordance with the AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002, or the current edition of

AASHTO LRFD Bridge Design Specifications, except as noted herein, to meet live load requirements of HS25 for ASD and LFD, or HL-93, Maine Modified, for LRFD designs.

a. Deflections Primary structural members shall be designed so that deflection due to live load plus impact shall not exceed 1/300 of the span.

b. Fatigue Stresses Fatigue stresses for steel need not be considered if the steel is judged by the Contractor's Professional Engineer to be in sound structural condition.

c. Bridge Railing Loads Bridge railing shall be designed in accordance with AASHTO Standard Specifications, 17th Edition, 2002 or the current edition of AASHTO LRFD Bridge Specifications, except that the Standard Specification design load "P", specified as 10 kips, may be decreased to 5 kips. However, allowable design stresses for material used in bridge rails and posts shall not be increased above those allowed by AASHTO Standard Specifications.

d. Waterway Opening The minimum waterway opening of the temporary structure shall be designed to pass the Design Discharge indicated in the Contract Specifications, without any overtopping of the roadway.

e. Foundations Temporary foundations, embankment foundations and earth retaining structures shall be designed in accordance with the AASHTO Standard Specifications, 17th Edition, or the current edition of the AASHTO LRFD Bridge Design Specifications and AASHTO LRFD Bridge Construction Specifications, except as noted herein. The Contractor is responsible for determining the ultimate load carrying capacity of the foundation materials and foundation elements for the Special Detour. The determination of the ultimate load carrying capacity may require characterization of the subsurface conditions by the Contractor by means of subsurface investigation.

The applied loads on foundations shall consider both dead and live loads and all other applicable loads and forces. The Contractor is responsible for choosing an applicable factor of safety for foundations on soil and rock and an appropriate design load group. The factor of safety and maximum applied load, or LRFD factored applied loads and factored geotechnical resistances, used for each foundation design shall be clearly stated on the submitted calculations.

510.032 Geometric and Approach Design The geometric design of the Special Detour, except as otherwise shown on the Plans or as noted herein, shall be designed in accordance with the current AASHTO Specification "A Policy on Geometric Design of Highways and Streets".

a. Horizontal Alignment Horizontal curve radius shall not be less than 200 feet at the centerline of roadway, except as otherwise shown on the Plans.

Roadway width as indicated in the Contract shall be the minimum clear travel width between faces of bridge curbs, bridge rails or approach rails, whichever is less. The approach roadway shall have 2 feet wide shoulders, minimum, to the roadway berms, where guardrail is not required, in addition to the roadway width indicated in the Contract.

The roadway width shall be increased on curved portions of the Special Detour to account for the off tracking characteristics of a BUS-45 vehicle in accordance with table 3-28b, Case I or Case III, of the AASHTO Standard Specifications.

b. Vertical Alignment Grades shall not exceed 10% and any change in grade shall accommodate all legal highway vehicle components or attached loads.

c. Approach Road Guardrail The Special Detour approaches shall have guardrail where side slopes are steeper than three horizontal to one vertical. Approach guardrail shall be attached to the bridge rail in a manner that develops the approach guardrail in tension. Approach guardrail shall consist of Type 3 guardrail or an approved equal, unless other rail or barriers are specified.

The termination of approach guardrail and the end treatment of the rail shall be in accordance with the current AASHTO Roadside Design Guide.

The temporary barrier on the left side of the temporary detour from station D0+30 to station D1+20 shall have on top a solid and rigid barrier with top of the temporary barrier 8' tall above finished grade.

d. Approach embankments The earth material used for approach embankments shall have sufficient strength under the placement method specified in the Contractor's plans to maintain stability throughout the duration of the Special Detour.

e. Approach Road Base Drainage The approach road base structure shall consist of a 1 foot thick layer, minimum, of aggregate subbase course gravel, Type D or E. This layer shall be designed to support legal loads during the use of the detour. Drainage shall be designed to drain the approach area.

f. Approach Road Surface The approach road surface, including the shoulders, shall be paved with a 3 inch, minimum, thickness hot bituminous pavement layer, except when specified to be a gravel surface. When a gravel surface is specified, it shall consist of an approved gravel.

g. Design Speed The design speed of the Special Detour shall be not less than the construction area posted speed limit, or the advisory speed limit, as applicable, unless otherwise indicated in the Contract.

510.04 Pedestrian Traffic Only The provisions of Section 510.03 - Vehicular and Pedestrian Traffic Not Separated, shall apply to this Section with the following modifications:

- a. Structures shall be designed for a live load of 85 lb/ft².
- b. The Special Detour shall have a minimum clear width of 5 feet or as specified in the Contract.
- c. Vertical alignment and ramps shall be ADA compliant.
- d. Deflections due to live load shall not exceed 1/300 of the span.

510.05 Vehicular and Pedestrian Traffic Separated The provisions of both Section 510.03 - Vehicular and Pedestrian Traffic Not Separated, and Section 510.04- Pedestrian Traffic Only, shall apply to this Section. If vehicles and pedestrians are carried on the same structure, each shall have its own lane as specified. The pedestrian lane shall be protected from vehicular traffic by being at least 225 mm [9 in] above the roadway surface or suitably protected by means of an adequate curb at least 225 mm [9 in] in height above the roadway surface. No bridge rail will be required between vehicle traffic and pedestrian traffic, unless otherwise specified, but shall be located at the exterior side of the sidewalk.

510.06 Special Detour Construction The Special Detour, including temporary structures and approaches, shall be constructed in accordance with the plans submitted by the Contractor. Barricades, warning signs, lights and other traffic control devices shall be provided in accordance with the Contract and the approved Traffic Control Plan.

The temporary structure's deck and floor members shall be fastened or anchored so that all contact surfaces with adjacent supporting members bear continuously. If timber plank decking is used, it shall be secured into timber nailer strips with screw-type nails, or securely fastened by an alternate method that will prevent the decking from loosening. Immediate corrective action shall be taken by the Contractor to remedy any condition in the structure that results in objectionable or distracting noise levels, or results in the decking becoming loose, when subject to traffic loads.

Screw-type nails will not be required to anchor timber plank decking for pedestrian traffic use.

The approach road surface, including shoulders, whether paved or graveled, shall be maintained in a compacted and smooth condition. The temporary structure travel surface shall be constructed and maintained in an acceptably smooth condition, as determined by the Resident. Immediate corrective action shall be taken by the Contractor to remedy objectionable roughness of the Special Detour riding surface.

Provisions shall be made for a skid resistant wearing surface throughout the period of time the temporary structure is open to public travel for vehicular and pedestrian traffic. A steel grid floor may be used for vehicular traffic if installed in accordance with the design plans and these specifications.

Erosion control shall be accomplished in accordance with Section 656 - Temporary Soil Erosion and Water Pollution Control.

When the Project has been opened to traffic, the temporary structure and approaches shall be removed to, or below, the streambed, finish ground line or original ground line, as applicable. The approaches shall be obliterated and the disturbed areas shall be stabilized to original, or better than original, conditions. The provisions of Section 104 - General Rights and Responsibilities, shall apply.

510.07 Contractor's Responsibility The Contractor shall be responsible for removal of snow from areas provided for pedestrian traffic as well as vehicular traffic in accordance with Section 105,

General Scope of Work. In addition to normal maintenance, should any part, or all, of the Special Detour be damaged or destroyed by high water, or any other cause, prior to, or after, opening the Special Detour to traffic, it shall be repaired or replaced by the Contractor without additional compensation.

510.08 Method of Measurement Special Detours will be paid by the lump sum.

510.09 Basis of Payment The accepted Special Detour will be paid for at the Contract lump sum price which price shall be full compensation for the respective items, as called for in the Contract, including design, construction, maintenance, complete removal, rehabilitation and permanent stabilization including loaming, seeding and mulching. All gravel or borrow material and excavation needed to accommodate changes in elevation between temporary structures and existing roadways shall be incidental to this item. The lump sum price shall also include the cost of furnishing and revising, as necessary, all plans, computations and certifications, as called for in the Contract. Payment will be made as follows: 60 percent of the lump sum price will be paid when the Special Detour is acceptable and open to traffic; another 20 percent of the lump sum price will be paid when the Special Detour is no longer needed and is closed to traffic; the final 20 percent of the lump sum price will be paid when the Special Detour is removed and the area encompassing the Special Detour is acceptably restored.

Traffic control devices, temporary erosion control, pavement, and dust control will be paid for in accordance with the applicable Contract items.

Payment will be made under:

<u>Item</u>	<u>Pay Unit</u>	<u>Pay</u>
510.10 Special Detour, 18 foot Roadway Width Vehicular and Pedestrian Traffic Not Separated	Lump Sum	
510.11 Special Detour, Pedestrian Traffic Only	Lump Sum	
510.12 Special Detour, ___ foot Roadway Width Vehicular and Pedestrian Traffic Separated	Lump Sum	

SPECIAL PROVISION
SECTION 511 – COFFERDAMS

The following shall replace 511.01 Description

511.01 Description

This work shall consist of the complete design, construction, maintenance and removal of all excavation support, cofferdams, caissons, cribs and sheeting, and other related work, including dewatering (as needed) and inspection, required to allow for and protect the construction of this project foundation, substructure and superstructure.

The following shall replace 511.02 Materials

511.02 Materials

The Contractor shall submit the following to the Resident, in accordance with the Special Provisions:

1. Detailed design notes and Shop Drawings for the Cofferdams that are stamped, signed and dated by a Professional Engineer registered or licensed to practice in the State of Maine.
2. The Contractor shall design and implement Cofferdams at the locations identified in the Contract Plans.
3. The Cofferdam design shall be in accordance with the requirements of contract documents.

Approval of the plans shall not relieve the Contractor of the responsibility for the satisfactory functioning of the cofferdam.

The Contractor shall be responsible for the supply, safe storage, and handling of all materials associated with this Work.

The following shall be added to 511.03 Cofferdam Construction

511.03 Cofferdam Construction

The Cofferdam shall be constructed in accordance with approved working drawings. Unless otherwise provided, all Cofferdams shall be removed or cut off as required on the plans after the completion of the project. Care shall be taken not to disturb or otherwise damage the finished work and/or the adjacent existing structure(s) during construction and removal of the Cofferdams. The Contractor shall be responsible for the righting and resetting of cofferdams that have tilted or moved laterally, as required for construction.

The following shall be added to 511.05 Method of Measurement

511.05 Method of Measurement

Additional excavation support including cofferdams, caissons, cribs and sheeting, or any other method of earth support installed outside/inside of the limits shown on the plans to facilitate the construction of the project shall be considered incidental to the Cofferdam items.

The following shall replace 511.06 Basis of Payment

511.06 Basis of Payment

The accepted quantity of cofferdam will be paid for at the Contract lump sum price for the respective cofferdam items, **which price shall be full compensation for design, construction, maintenance, inspection and removal.**

All costs associated with preparation of Working Drawings, design calculations, written procedure for sediment/overburden removal and excavation inspection, constructing, maintaining, and the inspection of the seal cofferdam excavation, and removing of Cofferdams, as well as dewatering, and other materials and labor will not be paid for directly, but will be considered incidental to the Cofferdam pay item(s). shall be considered incidental to the cofferdam Pay Item(s). There shall be no additional payment for repeated inspection by the Department of the same cofferdam excavation.

Separate payment and measurement will not be made for additional excavation support including cofferdams, caissons, cribs and sheeting, or any other method of earth support installed to facilitate construction of this project, such excavation support including cofferdams, caissons, cribs and sheeting, or any other method of earth support will be considered incidental to the above mentioned Cofferdam items.

When required, the elevation of the bottom of the footing of any substructure unit may be lowered, without change in the price to be paid for Cofferdams. However, if the average elevation of more than 25% of the area of the excavation is more than 1 m [3 ft] below the elevation shown on the plans, and if requested by the Contractor, then the entire cost of the cofferdam will be paid for in accordance with Section 109.7 - Equitable Adjustments to Compensation, instead of at the contract lump sum price.

All costs of constructing, maintaining, and removing a sedimentation basin, and pumping or transporting water and other materials to the sedimentation basin will not be paid for directly, but will be considered incidental to the cofferdam pay item(s).

All costs of related temporary soil erosion and water pollution controls, including inspection and maintenance, will not be paid for directly, but will be considered incidental to the cofferdam pay item(s).

Payment will be made under:

Pay Item	Pay Unit
511.07 Cofferdam No.1	Lump Sum
511.07 Cofferdam No.2	Lump Sum
511.07 Cofferdam No.3	Lump Sum
511.07 Cofferdam No.4	Lump Sum
511.07 Cofferdam No.5	Lump Sum

SPECIAL PROVISION
SECTION 511
Coffer Dam

511.01 Description This work shall consist of the complete design, construction, maintenance and removal of cofferdams and other related work, including dewatering and inspection, required to allow for the excavation of foundation units, to permit and protect the construction of bridge or other structural units and to protect adjacent Roadways, embankments or other structural units, in accordance with the Contract.

511.02 Materials As specified in the cofferdam Working Drawings.

511.03 Cofferdam Construction

A. Working Drawings The Contractor shall submit Working Drawings, showing the materials to be used and the proposed method of construction of cofferdams to the Department. Construction shall not start on cofferdams until such Working Drawings have been submitted. Any review of or comment on, or any lack of review of or comment on, these Working Drawings by the Department shall not result in any liability upon the Department and it shall not relieve the Contractor of the responsibility for the satisfactory functioning of the cofferdam.

B. Construction Construct cofferdams in conformance with the submitted Working Drawings. Cofferdams shall, in general, be carried below the elevation of the bottom of footings to adequate depths to ensure stability and adequate heights to seal off water. Cofferdams shall be braced to withstand pressure without buckling, secured in place to prevent tipping or movement and be as watertight as necessary for the safe and proper construction of the substructure Work inside them. With the exception of construction of a concrete foundation seal placed under water, the interior dimensions of cofferdams shall provide sufficient clearance for the construction and inspection of forms and to permit pumping outside of forms. The Contractor shall be responsible for the righting and resetting of cofferdams that have tilted or moved laterally, as required for construction.

During the placing and curing of seal concrete, maintain the water level inside the cofferdam at the same level as the water outside the cofferdam, to prevent flow through the concrete.

No timber or bracing shall be used in cofferdams in such a way as to remain in the substructure Work.

Cofferdams shall be constructed to protect fresh concrete against damage from the sudden rising of the water body, to prevent damage by erosion and to prevent damage to adjacent Roadways, embankments or other structural units.

Unless otherwise noted, cofferdams, including all sheeting and bracing involved, shall be removed after the completion of the substructure Work in a manner that prevents disturbance or injury to the finished Work.

Cofferdams shall be constructed, dewatered and removed in accordance with the requirements of Section 656 - Temporary Soil Erosion and Water Pollution Control and related Special Provisions.

C. Inspection of Seal Cofferdams Seal cofferdam excavations shall initially be inspected and approved by the Contractor.

For each seal cofferdam excavation, the Contractor shall submit a written procedure to the Resident for sediment/overburden removal and excavation inspection. For cofferdams where seal concrete is to be placed on bedrock, the inspection procedure shall describe the Contractor's final cleaning and inspection process for attaining cleanliness of each cofferdam excavation. For cofferdams where seal concrete is not excavated to bedrock, the procedure shall describe the Contractor's final cleaning and inspection process for attaining the bottom of seal elevation shown on the Plans.

The Contractor shall notify the Resident at least 48 hours prior to when each seal cofferdam excavation will be ready for final inspection by the Department. The Contractor shall allow adequate time for each occurrence of cofferdam excavation inspection by the Department. The Contractor shall provide and maintain access and equipment, such as steel probes, for the Resident and/or the Department's Dive Team to independently inspect each cofferdam excavation.

No seal concrete placement shall begin until the Department has approved the cofferdam excavation.

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

Pumping to dewater a sealed cofferdam shall not commence until the seal concrete has set sufficiently to withstand the hydrostatic pressure and meets the following minimum curing time, after the completion of the installation of the seal concrete:

1. When the temperature of the water body outside the cofferdam is greater than 40°F, a minimum of 5 days.
2. When the temperature of the water body outside the cofferdam is less than 40°F, a minimum of 7 days.

Procedures for the removal of all water and materials from cofferdams shall be described in the Soil Erosion and Water Pollution Control Plan as required in Section 656 Temporary Soil Erosion and Water Pollution Control and related Special Provisions.

511.05 Method of Measurement Cofferdams will be measured as one lump sum unit, as indicated on the Plans or called for in the Contract.

511.06 Basis of Payment The accepted quantity of cofferdam will be paid for at the Contract lump sum price for the respective cofferdam items, which price shall be full compensation for design, construction, maintenance, inspection and removal.

When required, the elevation of the bottom of the footing of any substructure unit may be lowered, without change in the price to be paid for cofferdams. However, if the average elevation of more than 25% of the area of the excavation is more than 3 feet below the elevation shown on the Plans, and if requested by the Contractor, then the additional costs incurred that are included in the cofferdam Pay Item will be paid for in accordance with Section 109.7 - Equitable Adjustments to Compensation. The Contractor shall immediately notify the Department when these additional costs commence. Failure of the Contractor to provide this notification will result in undocumented additional work that will be non-reimbursable. The Department will evaluate this additional work to determine an appropriate time extension, if warranted.

All costs for sedimentation control practices, including, but not limited to, constructing, maintaining, and removing sedimentation control structures, and pumping or transporting water and other materials for sedimentation control will not be paid for directly, but will be considered incidental to the cofferdam Pay Item(s).

All costs for related temporary soil erosion and water pollution controls, including inspection and maintenance, will not be paid for directly, but will be considered incidental to the cofferdam Pay Item(s).

All costs associated with preparation of Working Drawings, design calculations, written procedure for sediment/overburden removal and excavation inspection, and the inspection of the seal cofferdam excavation shall be considered incidental to the cofferdam Pay Item(s). There shall be no additional payment for repeated inspection by the Department of the same cofferdam excavation.

All costs for cofferdams and related temporary soil erosion and water pollution controls, including inspection and maintenance, will be considered incidental to related Pay Items, when a specific Pay Item for cofferdams is not included in the Contract.

Seal concrete will be evaluated under Section 502.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
511.07 Cofferdam	Lump Sum

SPECIAL PROVISION
SECTION 513
SLOPE PROTECTION

Section 513.02 of the standard specification is removed and replaced with the following:

513.02 Materials Materials shall meet the Requirement of the following Sections of Division – 700 Materials.

Stone Ditch Protection

703.29

SECTION 515 - PROTECTIVE COATING FOR CONCRETE SURFACES

515.01 Description This work shall consist of furnishing and applying a protective coating on concrete surfaces as called for on the Plans or as designated by the Resident in accordance with these specifications.

515.02 Materials Materials shall meet the requirements of Type 1c penetrating silane concrete sealers, from the MaineDOT Qualified Products List (QPL).

515.03 Surface Preparation On surfaces to be treated, all voids shall be filled with mortar and the entire surface shall be dressed by dry rubbing to remove form marks and blemishes to present a neat appearance. The concrete shall remain dry for at least 48 hours before treatment and shall be free of laitance, oil, grease, dirt and dust. All traces of dust shall be removed immediately before applying the silane sealer.

The treatment shall not be done until at least 14 days after casting the concrete, or in accordance with the manufacturer's published recommendations, and completed at least 24 hours before the treated portion is opened to traffic.

515.04 Application The application rate and method of application shall be in accordance with the manufacturer's published recommendations.

When practical, treatment of the concrete surfaces shall be completed before exposure to deicing salts. The temperature of the concrete to be treated shall be above 40°F at the time of application, or per the manufacturer's published recommendations.

515.05 Method of Measurement Protective coating for concrete surfaces will be measured for payment by the square yard or lump sum unit as specified, satisfactorily applied and accepted.

515.06 Basis of Payment Protective coating for concrete surfaces will be paid for at the contract unit price per square yard or lump sum, as specified.

Payment will be made under:

	<u>Pay Item</u>	<u>Pay Unit</u>
515.20	Protective Coating for Concrete Surfaces	Square Yard
515.21	Protective Coating for Concrete Surfaces	Lump Sum

SPECIAL PROVISION
SECTION 520 – CLOSED CELL SEAL

520.01 Description

This work shall consist of furnishing and installing a closed cell seal in the gap between the bascule girder and the curb to prevent the accumulation of debris.

520.02 Quality Control

Manufacturer shall have a minimum ten (10) years experience specializing in the design and manufacture of closed cell foam expansion control systems.

Manufacturer shall be ISO-9001:2000 certified and shall provide written confirmation that a formal Quality Management System and Quality Processes have been adopted in the areas of, (but not limited to) Engineering, Manufacturing, Quality Control and Customer Service for all processes, products and their components.

520.03 Product

Provide a seal that consists of:
impermeable closed-cell, low density, resilient, non-extrudable, ethylene vinyl acetate foam material with a hindered amine light stabilizer. Seal shall be held in place by a two-component 100% solids epoxy- adhesive. The design of the seal shall be capable of accommodating movement and variations in joint widths through compression and tension of its shape. Enhanced Surface Preparation (E.S.P.) shall be grooves 1/8" (3mm) wide by 1/8" deep (3mm) and spaced between 1/4" (6mm) to 1/2" (13mm) apart and run along the entire length of the bond surfaces of the seal to ensure an effective and quality surface for adhesion. Provide seal profile that satisfies project requirements including water-tightness. Install all components using manufacturer's recommended adhesive for complete installation.

520.04 Components and Materials

The contractor shall furnish a manufacturer's certification that the materials proposed will meet the requirements as set forth in the specification.

1. Seal Profile

The seal shall be manufactured of low density closed-cell cross-linked ethylene vinyl acetate polyethylene copolymer nitrogen blown material using hindered amine light stabilizer for U.V. stability exhibiting the physical properties listed in the table below:

Physical Properties	Test Method	Requirement
Elongation at Break	ASTM D3575; Suffix T	225% avg
Tensile Strength, psi	ASTM D3575; Suffix T	115psi +/- 20%
Tear Resistance	ASTM D624	10-20 lbs/inch
Density Method A	ASTM D3575; Suffix W	2.7-3.4 lbs/ft ³
Water Absorption	ASTM D3575; Suffix L	0.035 lbs/ft ² avg
Compression Deflection	ASTM D3575	25% 6psi avg 50% 16psi avg
Weather/Deterioration	ASTM G154	3000 Hours No Effect
Compression Set 50% compression for 22 hours @ 73°F 2 hour recovery 50% compression for 22 hours @ 73°F 24 hour recovery	ASTM D 3575; Suffix B	10% set 9% set
Extrusion (specimen compressed 60% of original thickness with 3 restrained sides	ASTM D545	Estrusion on free side does not exceed 0.25 inches
Operating Temperature	In-house	160°F max
Movement Range Compression Tension Shear (horizontal and vertical)	In-house	50% 25% 50% +/-

2. Adhesive

The seal shall be installed utilizing a 100% solids two-component moisture insensitive modified epoxy-adhesive which meets ASTM C881 Type I & II Grade 2 Class B & C, and the requirements of the properties listed below:

Properties (uncured):

	Part A	Part B	Mixed
Color (Beige or Gray):	White	Caramel	Beige
Shelf Life	2 Years	2 Years	
Mixed Ratio (by vol)	3	1	3:1
Specific Gravity	1.47	1.15	
Density (lbs/gal) @ 77°F	12.0 +/-0.5	9.7 +/-0.2	11.6 +/-0.2
Viscosity (cps) @ 77°F	35,000	33,000	26,000
Pot Life (200 gms)			32-36 minutes
Initial Set @ 77°F			1 ½ - 2 hours
Initial Cure			8-12 hours
Full Chemical Cure			7 days

Properties after cure:

Physical Properties	Test Method	Requirement
Compressive Strength	ASTM D 695	7000 psi
Tensile Strength	ASTM D 638	3500 psi
Elongation at Break	ASTM D 638	3-5%
Shore D Hardness	ASTM D 2250	85 +/- 5
Water Absorption	ASTM D 570	0.25%
Bond Strength	ASTM C 882	430 psi min
Lap Shear		2000 psi min

Use a bonder that is appropriate for the temperature and salt-water conditions as recommended by the manufacturer.

520.05 Construction Requirement

The contractor shall submit product information and necessary details after the award of the contract. At the discretion of the resident, the manufacturer may be required to furnish a representative sample of material to be supplied in accordance with the project specifications. Where indicated and noted on the contract plans, install seals in a neat and workmanlike manner. All surfaces to receive seal shall be free from dirt, water and any other loose foreign debris, which may be detrimental to effective sealing. Measure the width of the gap. The low density closed cell material should be sized 25% larger than the

gap. The seal profile shall be cut to the correct length for installation. Care should be taken to extend the profile to its full length, without exerting any tension or stretching of the seal. The bond at the splice location is achieved by heat welding. Heat welds and splices and other directional changes should be cut and made a minimum of fifteen (15) minutes before seal installation. Seal shall be installed in strict accordance with the manufacturer's written instructions.

520.06 Method of Measurement

The accepted quantity of closed cell seal will be paid for at the contract unit price per lineal foot of seal installed and accepted.

520.07 Basis of Payment

Payment will be full compensation for all work necessary to complete the work including furnishing and installing the seal, and any miscellaneous patching required.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
520.2024 Closed Cell Seal	LF

SPECIAL PROVISION

SECTION 520

EXPANSION DEVICES -- NON MODULAR

(Asphaltic Plug Joint)

520.01 Description

This work consists of furnishing and installing asphaltic plug joint systems at the locations shown on the Plans, in accordance with these Specifications or as directed by the Resident.

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

520.02 Submittals

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

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

520.03 Materials

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

The following systems are acceptable for use as asphaltic plug joints:

<u>Thorma-Joint</u>	<u>Polyjoint</u>	<u>Koch BJS</u>
Linear Dynamics, Inc. 400 Lannidex Plaza Parsipanny, NJ 07054	A.H. Harris 321 Ellis Street New Britain, CT 06050	Koch Materials Company P.O. Box 510 Stroud, OK 74079

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

(a) Asphaltic Binder:

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

PROPERTY	REQUIREMENT	TEST METHOD
Softening Point, °F	180 min.	ASTM D36
Tensile Adhesion @ 77°F, %	800 min.	ASTM D3583
Ductility @ 77°F, inch	16 min.	ASTM D113
Penetration, 0.1 mm 77°F, 150 g, 5 s 0°F, 200 g, 60 s	90 max. 10 max.	ASTM D3407
Flow 5 hrs @ 140°F, mm	3.0 max.	ASTM D3407
Bond @ -20°F	pass 3 cycles	ASTM D3407
Resilience @ 77°F, %	60 min.	ASTM D3407
Asphalt Compatibility @ 140°F	pass	ASTM D3407
Recommended Pouring Temperature, °F	380 to 390	
Safe Heating Temperature, °F	410	

(b) Backer Rod:

Backer rod shall be a cylindrical closed cell expanded polyethylene foam rod, with a diameter of 150 percent of joint opening width, capable of

withstanding the temperature of the hot binder materials and having the following properties:

PROPERTY	REQUIREMENT	TEST METHOD
Density, lb/ft ³	2.0 min.	ASTM D1622
Tensile Strength, psi	25 min.	ASTM D1623
Water Absorption, % of wt.	1.0 max.	ASTM C509

(c) Bridging Plate:

Bridging plate shall be ASTM A36 steel, minimum of 1/4 inch thick and galvanized. Holes for the centering nails shall be approximately one foot center to center along the centerline of plates.

(d) Centering Nail:

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

(e) Aggregates:

Aggregate shall be crushed, double-washed and dried granite or basalt and meeting ASTM C 33 Size No. 6 gradation. This aggregate shall also be used for top dressing on the finished joints.

(f) Plastic Compound:

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

520.04 Installations

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

Asphaltic plug joint system shall allow total joint movement for up to two inches. The installation shall be centered over the expansion joint gap as indicated on the Plans. It shall not be installed when ambient or substrate temperatures are below 40°F, when rain is imminent or as directed by the Resident.

Sawcut and remove bituminous concrete overlay and waterproofing membrane to the required dimensions as shown on the Plans. If required, a leveling course shall be applied to concrete surfaces prior to placing bridging plates. Vertical surfaces of bituminous concrete overlay shall be cleaned to remove all water and cutting dust.

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

Binder shall be heated to a safe temperature as recommended by manufacturer. Heating kettles shall be equipped with continuous agitation system, temperature controller, calibrated thermometer and double steel jacket with an oil layer in between, to prevent scorching of the binder. During application, the temperature of binder shall be maintained at a minimum of 350°F. It shall be poured into expansion joint openings until it runs over edges.

Steel bridging plates shall be placed from curb to curb on the roadway portion of expansion joints. Plates shall be centered over joint openings. Centering nails shall be placed in pre-drilled holes and hammered in to secure plates.

Aggregate shall be heated in a rotating drum mixer to a minimum of 350°F or as recommended by the Engineer. The thermoplastic polymeric modified asphalt Binder shall be added to the mixer to precoat aggregates.

Coated aggregate shall be placed into blockouts in layers as recommended by the manufacturer. Blockouts shall be overfilled with coated aggregate as required to compensate for compaction. Equipment for compaction shall be as recommended by the manufacturer. Additional thermoplastic polymeric modified asphalt binder shall be screeded over the compacted joint to fill any surface voids.

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

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

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

520.05 Method of Measurement

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

520.06 Basis of Payment

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

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
520.232 Expansion Device - Asphaltic Plug Joint	Linear Foot

SPECIAL PROVISION
SECTION 526 – CONCRETE BARRIER

Section 526.01 shall be replaced with the following:

526.01 Description This work shall consist of the furnishing, constructing, erecting, setting, resetting, and removal of concrete barrier and associated elements in accordance with these specifications and the lines and grades shown on the plans or established by the Resident.

The types of concrete barrier are designated as follows:

Temporary Concrete Barrier Type I Double faced removable concrete barrier of the shape shown on the plans.

Permanent Concrete Barrier Type II Double face barrier of a shape shown on the plans.

Permanent Concrete Barrier Type IIIa Single face barrier 825 mm [32 in] high of a shape shown on the plans.

Permanent Concrete Barrier Type IIIb Single face barrier 1075 mm [42 in] high of a shape shown on the plans.

Permanent Concrete Transition Barrier Barrier of various heights joining steel bridge rail to steel guardrail.

Permanent Texas Classic Rail Barrier, either traffic rail or sidewalk rail, as shown on the plans.

Permanent Concrete Transition Barrier - Modified Barrier of various heights joining aluminum bridge rail to concrete approach barrier.

Section 526.04 Method of Measurement shall be amended to include the following:

“Permanent Concrete Transition Barrier – Modified” will be measured by each barrier connecting bridge rail to approach rail complete in place.

Section 526.04 Method of Measurement shall be amended to include the following:

“Permanent Concrete Transition Barrier – Modified” will be paid for at the contract price each complete in place, and will be full compensation for furnishing all material and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
526.3401 Permanent Concrete Transition Barrier – Modified	EA

SPECIAL PROVISION
SECTION 534 – PRECAST STRUCTURAL CONCRETE

534.01 Description This work shall consist of casting, delivering and erecting the precast concrete bascule pier to the limits shown on the plans, or as approved by the Resident. This work shall also consist of casting, delivering and erecting the precast concrete wall panels for the soldier pile walls.

The installation of the precast concrete wall panels shall be in conformance with special provision 501 for the soldier pile wall, in addition to the the Plans and specifications.

Materials, work, inspection and documentation not specifically addressed by this Specification shall done be in accordance with the applicable sections of the PRECAST/PRESTRESSED CONCRETE INSTITUTE (PCI), Manual for QUALITY CONTROL for Plants and Production of PRECAST AND PRESTRESSED CONCRETE PRODUCTS (MNL 116), including Commentary.

534.02 Materials Materials for precast concrete products shall meet the requirements of section 535.02.

The precast concrete wall panels shall meet the requirements of section 712.061.

The reinforcing steel shall meet the requirements of special provision 503, corrosion resistant reinforcing.

534.03 Drawings Drawings shall meet the requirements of section 535.03.

534.04 Plant The precast manufacturing facility shall meet the requirements of section 535.04.

534.05 Inspection Facilities The inspection facilities shall meet the requirements of section 535.05.

534.06 Notice of Beginning Work The Contractor shall give the Fabrication Engineer Notice of Beginning Work in accordance with section 535.06.

534.07 Inspection Inspection requirements shall be in accordance with section 535.07.

534.08 Inspector's Authority The inspector's authority shall be as defined in section 535.08.

534.09 Rejections Rejected material and workmanship shall be in accordance with section 535.09.

534.10 Forms and Casting Beds Forms and casting beds shall meet the requirements of section 535.10.

534.11 Reinforcing Steel Reinforcing Steel shall be in accordance with section 535.11.

534.12 Voids and Inserts Voids and Inserts shall be in accordance with section 535.12.

534.13 Concrete Concrete shall meet the requirements of section 535.13, except that the rate of corrosion inhibitor admixture, calcium nitrite, shall be increased from 3 gal/cy to 5.5 gal/cy and the max permeability of the precast concrete shall be 2000 coulombs.

534.14 Concrete Placement Concrete Placement shall be in accordance with section 535.14.

534.15 Process Control Test Cylinders All process control test cylinders shall be made and tested in accordance with the following Standards:

- AASHTO T23 (ASTM C31/C31M) Practice for Making and Curing Concrete Test Specimens in Field
- AASHTO T22 (ASTM C39) Test Method for Compressive Strength of Cylindrical Concrete Specimens
- AASHTO T119 (ASTM C143) Test Method for Slump of Hydraulic Cement Concrete
- AASHTO T141 (ASTM C172) Practice for Sampling Freshly Mixed Concrete
- AASHTO T152 (ASTM C231) Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- ASTM C1064 - Test Method for Temperature of Freshly mixed Portland Cement Concrete

A minimum of 8 concrete test cylinders shall be cast to represent each continuous concrete placement. Six of the cylinders from each test shall be cured under the same conditions as the units. Unit identification, entrained air content, water-cement ratio, slump and temperature of the sampled concrete shall be recorded by the Contractor at the time of cylinder casting. Testing shall be done in the presence of the QAI. The QAI will designate the loads to be tested.

At least once a week, the Contractor shall make four cylinders for use by the Department. They shall be cured in accordance with AASHTO T23 (ASTM C31/C31M).

If the Contractor fails to make enough cylinders to demonstrate that the product meets the contract requirements, the product will be considered unacceptable.

The standard size test cylinder for acceptance shall be 150 mm by 300 mm [6 in by 12 in]. If 100 mm by 200 mm [4 in by 8 in] cylinders are used for acceptance, the compressive strength values shall be reduced by 5%. The compressive strength of the concrete shall be determined by averaging the compressive strength of two test cylinders made from the same load.

For the purpose of acceptance, the average of two cylinders shall meet or exceed the design strength, and, neither cylinder shall be more than 3.5 MPa [500 psi.] below the required strength.

Compressive testing to determine design strength shall be done in the presence of the QAI. Cylinder tests not witnessed by the QAI will not be acceptable.

534.16 Curing Curing shall be in accordance with section 535.16.

534.17 Accelerated Curing (Optional) Accelerated Curing shall be in accordance with section
535.17

534.18 Reserved

534.19 Reserved

534.20 Finishing Concrete and Repairing Defects Finishing and repairing defects shall meet the
requirements of section 535.20.

534.21 Reserved

534.22 Tolerances Surface Tolerance, Alignment and Trueness, Plumb and Batter, and Finish will be
measured as described in Section 502.0502. Areas found to not comply with the tolerance of Table 5 shall
be brought into conformity by methods proposed by the Contractor and approved by the Resident at no
additional cost to the Department.

534.23 Transportation and Storage After the precast products are fabricated, they may be handled and
moved, but shall not be transported until the 28 day design strength has been attained.

The Contractor shall submit details that describe his proposed procedure for transporting and installing each
Precast Pier (Bascule Pier), including complete details and calculations for proposed supports and required
lifting operations during all phases of the work to the Resident for review no less than 30 days prior to the
start of work. Proposed lifting points are to be identified. All procedures and calculations shall be prepared
by a licensed professional engineer in the state of Maine.

All precast concrete products shall be protected from damage during handling and transportation.

Stored products shall be supported above the ground on dunnage in a manner to prevent twisting or
distortion. Products shall be protected from discoloration and aesthetic damage.

Units damaged by improper storing, hoisting, transportation, or handling shall be replaced by the Contractor
at no additional cost to the Owner.

534.24 Reserved

535.25 Underwater Grout Seal

Immediately before filling the gap, it shall be cleared of debris.

The cost of all material, labor and equipment necessary to place the grout shall be incidental to the item
“Precast Pier (Bascule Pier)”

534.26 Reserved

534.27 Reserved

534.28 Method of Measurement The item “Precast Pier (Bascule Piers)”, once complete and in place, shall be measured by the lump sum.

The item “Precast Concrete Lagging, Fabrication and Delivery”, shall be measured by the number of square feet of surface area of wall panels fabricated and delivered.

The item “Precast Concrete Lagging, Installation”, shall be measured by the number of square feet of surface area of wall panels fabricated and delivered.

534.29 Basis of Payment The accepted quantity of “Precast Pier (Bascule Piers)” shall be paid for at the contract lump sum price, which price shall be full compensation for casting, delivering and erecting the piers and all work incidental to the installation.

The accepted quantity of “Precast Concrete Lagging, Fabrication and Delivery”, shall be paid for at the contract unit price per square foot, which price shall be full compensation for casting and delivering the wall panels.

The accepted quantity of “Precast Concrete Lagging, Installation”, shall be paid for at the contract unit price per square foot, which price shall be full compensation for installation of the wall panels. The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, furnish insulation board, install insulation board, including waling, bracing, connections and lagging removal, where required. No additional payment will be made when a wall is excavated on both sides. No additional payment will be made if wood lagging is placed behind concrete.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
534.7602 Precast Pier (Bascule Piers)	Lump Sum
535.33 Precast Concrete Lagging, Fabrication and Delivery	Square Foot
535.34 Precast Concrete Lagging , Installation	Sqaure Foot

SPECIAL PROVISION
SECTION 606
GUARDRAIL

606.01 Description This work shall consist of furnishing and installing guardrail components in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans or as established. The types of guardrail are designated as follows:

Type 3-Galvanized steel "w" beam, wood posts or galvanized steel posts.

Type 3a-Galvanized steel "w" beam, wood posts, wood or composite offset blocks.

Type 3aa-Corrosion resistant steel "w" beam, wood posts, wood or composite offset blocks.

Type 3b-Galvanized steel "w" beam, galvanized steel posts, galvanized steel offset blocks.

Type 3c-Galvanized steel "w" beam, wood posts or galvanized steel posts, wood or composite offset blocks.

Type 3d-Galvanized steel "w" beam, galvanized steel posts, wood or composite offset blocks.

Thrie Beam-Galvanized steel thrie beam, wood posts or galvanized steel posts, wood or composite offset blocks.

Median barriers shall consist of two beams of the above types, mounted on single posts. Except for thrie beam, median barriers may include rub rails when called for.

Bridge mounted guardrail shall consist of furnishing all labor, materials, and equipment necessary to install guardrail as shown on the plans. This work shall also include drilling for and installation of offset blocks if specified, and incidental hardware necessary for satisfactory completion of the work.

Remove and Reset and Remove, Modify, and Reset guardrail shall consist of removing the existing designated guardrail and resetting in a new location as shown on the plans or directed by the Resident. Remove, Modify, and Reset guardrail and Modify guardrail include the following guardrail modifications: Removing plate washers at all posts, except at anchorage assemblies as noted on the Standard Details, Adding offset blocks, and other modifications as listed in the Construction Notes or General Notes. Modifications shall conform to the guardrail Standard Details.

Bridge Connection shall consist of the installation and attachment of beam guardrail to the existing bridge. This work shall consist of constructing a concrete end post or modifying an existing endpost as required, furnishing, and installing a terminal connector, necessary hardware, and incidentals required to complete the work as shown on the plans. Bridge Transition shall consist of a bridge connection and furnishing and installing guardrail components as shown in the Standard Details.

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

Timber Preservative	708.05
Metal Beam Rail	710.04
Guardrail Posts	710.07
Guardrail Hardware	710.08

Guardrail components shall meet the applicable standards of "A Guide to Standardized Highway Barrier Hardware" prepared and approved by the AASHTO-AGC-ARTBA Joint Cooperative Committee, Task Force 13 Report.

Posts for underdrain delineators shall be "U" channel steel, 2.44m [8 ft] long, 3.72 kg/m [2 ½ lb/ft] minimum and have 9.5 mm [3/8 in] round holes, 25 mm [1 in] center to center for a minimum distance of 610 mm [2 ft] from the top of the post.

Reflectorized Flexible Guardrail Markers shall be mounted on all guardrails. A marker shall be mounted onto guardrail posts at the flared end treatment's terminal and its tangent point, both at the leading and trailing ends of each run of guardrail. The marker's flexible posts shall be grey with either silver-white or yellow reflectors (to match the edge line striping) at the tangents, red at leading ends, and green at trailing ends. Whenever the end treatment is not flared, markers will only be required at the end treatment's terminal. These shall be red or green as appropriate. Markers shall be installed on the protected side of guardrail posts unless otherwise approved by the Resident. Reflectorized flexible guardrail markers shall be from the Maine DOT's Approved Product List of Guardrail Material. The marker shall be grey, flexible, durable, and of a non-discoloring material to which 75 mm [3 in] by 225 mm [9 in] reflectors shall be applied, and capable of recovering from repeated impacts. Reflective material shall meet the requirements of Section 719.01 for ASTM D 4956 Type III reflective sheeting. The marker shall be secured to the guardrail post with two fasteners, as shown in the Standard Details.

Reflectorized beam guardrail ("butterfly"-type) delineators shall be mounted on all "w"-beam guardrail. The delineators shall be mounted within the guardrail beam at guardrail posts. Delineators shall be fabricated from high-impact, ultraviolet & weather resistant thermoplastic. Reflectorized beam guardrail delineators shall be placed at approximately 20 m [62.5 ft] intervals or every tenth post on tangents and at approximately 10 m [31.25 ft] intervals or every fifth post on curves. Exact locations of the delineators shall be as directed by the Resident. On divided highways, the left hand delineators shall be yellow and the right hand delineators shall be silver/white. On two directional highways, the right hand side shall be silver/white and no reflectorized delineator used on the left. All reflectors shall have reflective sheeting applied to only one side of the delineator facing the direction of traffic as shown in the Standard Detail 606(07). Reflectorized sheeting for guardrail delineators shall meet the requirements of Section 719.01.

Single wood post shall be of cedar, white oak, or tamarack, well seasoned, straight, and sound and have been cut from live trees. The outer and inner bark shall be removed and all knots trimmed flush with the surface of the post. Posts shall be uniform taper and free of kinks and bends.

Single steel post shall conform to the requirements of Section 710.07 b.

Single steel pipe post shall be galvanized, seamless steel pipe conforming to the requirements of ASTM A120, Schedule No. 40, Standard Weight.

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

The Guardrail 350 Flared Terminal shall be a terminal with a 1.2 m [4 ft] offset as shown in the Manufacturer's installation instructions.

Existing materials damaged or lost during adjusting, removing and resetting, or removing, modifying, and resetting, shall be replaced by the Contractor without additional compensation. Existing guardrail posts and guardrail beams found to be unfit for reuse shall be replaced when directed by the Resident.

606.03 Posts Posts for guardrail shall be set plumb in holes or they may be driven if suitable driving equipment is used to prevent battering and distorting the post. When posts are driven through pavement, the damaged area around the post shall be repaired with approved bituminous patching. Damage to lighting and signal conduit and conductors shall be repaired by the Contractor.

When set in holes, posts shall be on a stable foundation and the space around the posts, backfilled in layers with suitable material, thoroughly tamped.

The reflectorized flexible guardrail markers shall be set plumb with the reflective surface facing the oncoming traffic. Markers shall be installed on the protected side of guardrail posts. Markers, which become bent or otherwise damaged, shall be removed and replaced with new markers.

Single wood posts shall be set plumb in holes and backfilled in layers with suitable material, thoroughly tamped. The Resident will designate the elevation and shape of the top. The posts, that are not pressure treated, shall be painted two coats of good quality oil base exterior house paint.

Single steel posts shall be set plumb in holes as specified for single wood posts or they may be driven if suitable driving equipment is used to prevent battering and distorting the post.

Additional bolt holes required in existing posts shall be drilled or punched, but the size of the holes shall not exceed the dimensions given in the Standard Details. Metal around the holes shall be thoroughly cleaned and painted with two coats of approved aluminum rust resistant paint. Holes shall not be burned.

606.04 Rails Brackets and fittings shall be placed and fastened as shown on the plans. Rail beams shall be erected and aligned to provide a smooth, continuous barrier. Beams shall be lapped with the exposed end away from approaching traffic.

End assemblies shall be installed as shown on the plans and shall be securely attached to the rail section and end post.

All bolts shall be of sufficient length to extend beyond the nuts but not more than 13 mm [$\frac{1}{2}$ in]. Nuts shall be drawn tight.

Additional bolt holes required in existing beams shall be drilled or punched, but the size of the holes shall not exceed the dimensions given in the Standard Details. Metal around the holes shall be thoroughly cleaned and painted with two coats of approved aluminum rust resistant paint. Holes shall not be burned.

606.045 Offset Blocks The same offset block material is to be provided for the entire project unless otherwise specified.

606.05 Shoulder Widening At designated locations the existing shoulder of the roadway shall be widened as shown on the plans. All grading, paving, seeding, and other necessary work shall be in accordance with the Specifications for the type work being done.

606.06 Mail Box Post Single wood post shall be installed at the designated location for the support of the mailbox. The multiple mailbox assemblies shall be installed at the designated location in accordance with the Standard Details and as recommended by the Manufacturer. Attachment of the mailbox to the post will be the responsibility of the home or business owner.

606.07 Abraded Surfaces All galvanized surfaces of new guardrail and posts, which have been abraded so that the base metal is exposed, and the threaded portions of all fittings and fasteners and cut ends of bolts shall be cleaned and painted with two coats of approved rust resistant paint.

606.08 Method of Measurement Guardrail will be measured by the meter [linear foot] from center to center of end posts along the gradient of the rail except where end connections are made to masonry or steel structures, in which case measurement will be as shown on the plans.

Terminal section, low volume end, NCHRP 350 end treatments, reflectorized flexible guardrail marker, terminal end, bridge transition, bridge connection, multiple mailbox post, and single post will be measured by each unit of the kind specified and installed.

Widened shoulder will be measured as a unit of grading within the limits shown on the plans.

Excavation in solid rock for placement of posts will be measured by the cubic meter [cubic yard] determined from the actual depth of the hole and a hypothetical circle diameter of 600 mm [2 ft].

606.09 Basis of Payment The accepted quantities of guardrail will be paid for at the contract unit price per meter [linear foot] for the type specified, complete in place. Reflectorized beam guardrail (“butterfly”-type) delineators will not be paid for directly, but will be considered incidental to guardrail items. Terminal section, buffer end, NCHRP 350 end treatment, bridge connection, single post and reflectorized flexible guardrail markers will be paid for at the contract unit price each for the kind specified complete in place.

NCHRP 350 end treatments and low volume guardrail ends will be paid for at the contract price each, complete in place which price shall be full payment for furnishing and installing all components including the terminal section, posts, offset blocks, "w" beam, cable foundation posts, plates and for all incidentals necessary to complete the installation within the limits as shown on the Standard Details or the Manufacturer’s installation instructions. Each end treatment will be clearly marked with the manufacturers name and model number to facilitate any future needed repair. Such payment shall also be full compensation for furnishing all material, excavating, backfilling holes, assembling, and all incidentals necessary to complete the work, except that for excavation for posts or anchorages in solid ledge rock, payment will be made under Pay Item 206.07. Type III Retroreflective Adhesive Sheeting

shall be applied to the approach buffer end sections and sized to substantially cover the end section. On all roadways, the ends shall be marked with alternating black and retroreflective yellow stripes. The stripes shall be 75 mm [3 in] wide and sloped down at an angle of 45 degrees toward the side on which traffic is to pass the end section. Guardrail 350 flared terminal shall also include a set of installation drawings supplied to the Resident.

Anchorage to bridge end posts will be part of the bridge work. Connections thereto will be considered included in the unit bid price for guardrail.

Guardrail to be placed on a radius of curvature of 45 m [150 ft] or less will be paid for under the designated radius pay item for the type guardrail being placed.

Widened shoulder will be paid for at the contract unit price each complete in place and will be full compensation for furnishing and placing, grading and compaction of aggregate subbase and any required fill material.

Adjust guardrail will be paid for at the contract unit price per meter and will be full compensation for adjusting to grade. Payment shall also include adjusting terminal end treatments where required.

Modify guardrail will be paid for at the contract unit price per meter and will be full compensation for furnishing and installing offset blocks, additional posts, and other specified modifications; removing, modifying, installing, and adjusting to grade existing posts and beams; removing plate washers and backup plates, and all incidentals necessary to complete the work. Payment shall also include removing and resetting terminal ends where required.

Remove and Reset guardrail will be paid for at the contract unit price per meter and will be full compensation for removing, transporting, storing, reassembling all parts, necessary cutting, furnishing new parts when necessary, reinstalling at the new location, and all other incidentals necessary to complete the work. Payment shall also include removing and resetting terminal ends when required. No payment will be made for guardrail removed, but not reset and all costs for such removal shall be considered incidental to the various contract pay items.

Remove, Modify, and Reset guardrail will be paid for at the contract unit price per meter and will be full compensation for the requirements listed in Modify guardrail and Remove and Reset guardrail.

Bridge Connections will be paid for at the contract unit price each. Payment shall include, attaching the connection to the endpost including furnishing and placing concrete and reinforcing steel necessary to construct new endposts if required, furnishing and installing the terminal connector, and all miscellaneous hardware, labor, equipment, and incidentals necessary to complete the work.

Bridge Transitions will be paid for at the contract unit price each. Payment shall include furnishing and installing the thrie beam or "w"-beam terminal connector, doubled beam section, and transition section, where called for, posts, hardware, precast concrete transition curb, and any other necessary materials and labor, including the bridge connection as stated in the previous paragraph.

Payment will be made under:

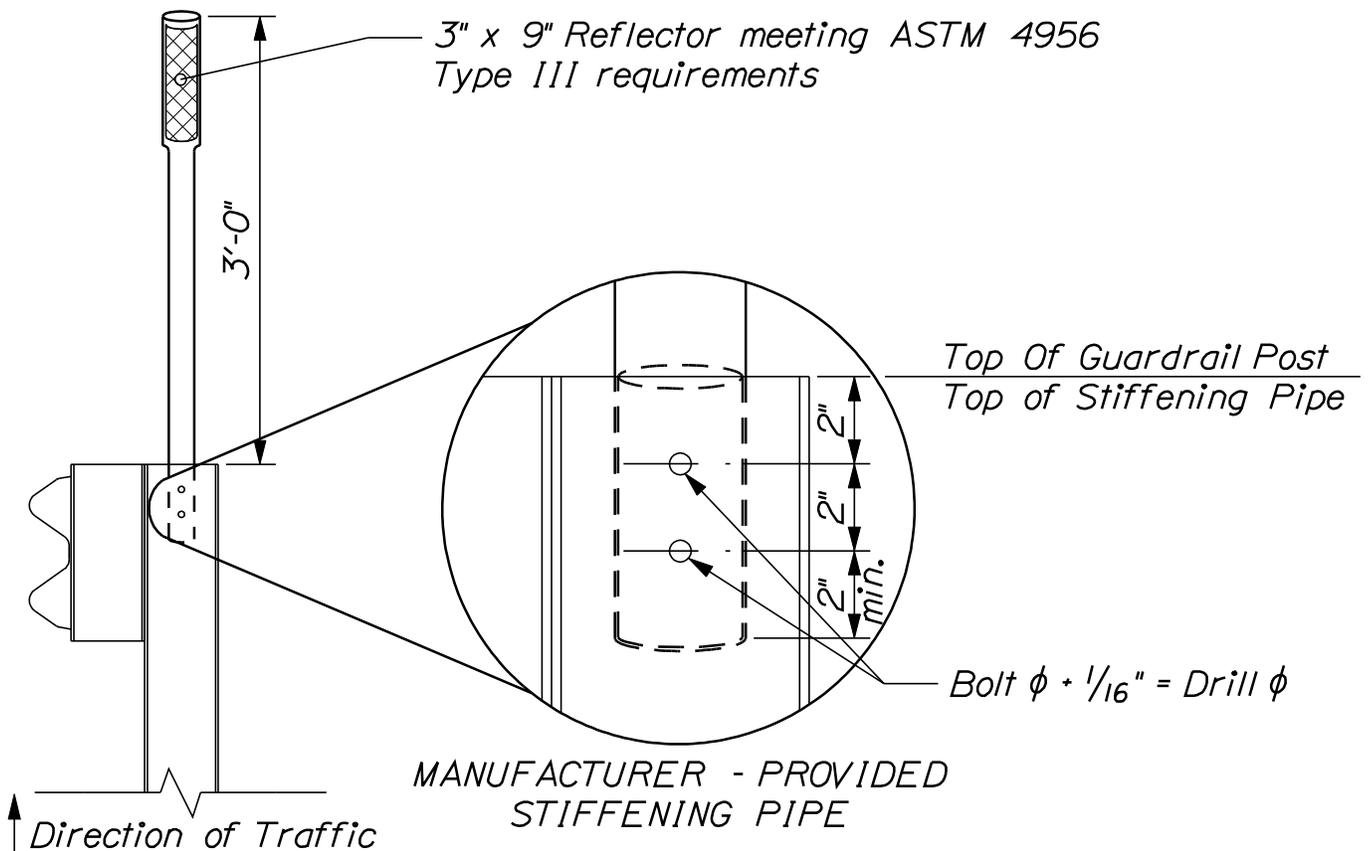
<u>Pay Item</u>	<u>Pay Unit</u>	
606.15	Guardrail Type 3a-Single Rail	meter [Linear Foot]
606.151	Guardrail Type 3aa-Single Rail	meter [Linear Foot]
606.17	Guardrail Type 3b-Single Rail	meter [Linear Foot]
606.1721	Bridge Transition - Type I	Each
606.1722	Bridge Transition - Type II	Each
606.1731	Bridge Connection - Type I	Each
606.1732	Bridge Connection - Type II	Each
606.178	Guardrail Beam	meter [Linear foot]
606.18	Guardrail Type 3b - Double Rail	meter [Linear foot]
606.19	Guardrail Type 3a - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.191	Guardrail Type 3aa - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.20	Guardrail Type 3a - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.201	Guardrail Type 3aa - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.21	Guardrail Type 3b - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.22	Guardrail Type 3b - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.23	Guardrail Type 3c - Single Rail	meter [Linear Foot]
606.2301	Guardrail Type 3c - Double Rail	meter [Linear Foot]
606.231	Guardrail Type 3c - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.232	Guardrail Type 3c - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.24	Guardrail Type 3d - Single Rail	meter [Linear Foot]
606.2401	Guardrail Type 3d - Double Rail	meter [Linear Foot]
606.241	Guardrail Type 3d - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.242	Guardrail Type 3d - over 4.5 m [15 feet] radius	meter [Linear Foot]
606.25	Terminal Connector	Each
606.257	Terminal Connector - Thrie Beam	Each
606.265	Terminal End-Single Rail - Galvanized Steel	Each
606.266	Terminal End-Single Rail - Corrosion Resistant Steel	Each
606.275	Terminal End-Double Rail - Galvanized Steel	Each
606.276	Terminal End-Double Rail - Corrosion Resistant Steel	Each
606.353	Reflectorized Flexible Guardrail Marker	Each
606.354	Remove and Reset Reflectorized Flexible Guardrail Marker	Each
606.356	Underdrain Delineator Post	Each
606.358	Guardrail, Modify, Type 3b to 3c	meter [Linear Foot]
606.3581	Guardrail, Modify Existing to Type 3d	meter [Linear Foot]
606.362	Guardrail, Adjust	meter [Linear Foot]
606.365	Guardrail, Remove, Modify, and Reset, Type 3b to 3c	meter [Linear Foot]
606.3651	Guardrail, Remove, Modify, and Reset Existing to Type 3d	meter [Linear Foot]
606.366	Guardrail, Removed and Reset, Type 3c	meter [Linear Foot]
606.367	Replace Unusable Existing Guardrail Posts	Each
606.47	Single Wood Post	Each
606.48	Single Galvanized Steel Post	Each
606.50	Single Steel Pipe Post	Each

606.51	Multiple Mailbox Support	Each
606.55	Guardrail Type 3 - Single Rail	meter [Linear Foot]
606.551	Guardrail Type 3 - Single Rail with Rub Rail	meter [Linear Foot]
606.56	Guardrail Type 3 - Double Rail	meter [Linear Foot]
606.561	Guardrail Type 3 - Double Rail with Rub Rail	meter [Linear Foot]
606.568	Guardrail, Modify Type 3c -Double Rail	meter [Linear Foot]
606.59	Guardrail Type 3 - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.60	Guardrail Type 3 - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.63	Thrie Beam Rail Beam	meter [Linear Foot]
606.64	Guardrail Thrie Beam - Double Rail	meter [Linear Foot]
606.65	Guardrail Thrie Beam - Single Rail	meter [Linear Foot]
606.66	Terminal End Thrie Beam	Each
606.70	Transition Section - Thrie Beam	Each
606.71	Guardrail Thrie Beam - 4.5 m [15 ft] radius and less	meter [Linear Foot]
606.72	Guardrail Thrie Beam - over 4.5 m [15 ft] radius	meter [Linear Foot]
606.73	Guardrail Thrie Beam - Single Rail Bridge Mounted	meter [Linear Foot]
606.74	Guardrail Type 3 - Single Rail Bridge Mounted	meter [Linear Foot]
606.753	Widen Shoulder for Low Volume Guardrail End - Type 3	Each
606.754	Widen Shoulder for Guardrail 350 Flared Terminal	Each
606.78	Low Volume Guardrail End - Type 3	Each
606.79	Guardrail 350 Flared Terminal	Each

1. *Reflectorized Flexible Guardrail Markers shall be from Maine DOT's Approved Product List of Guardrail Material.*

2. *Installation:*

- a. *Each bolt-hole diameter shall be the bolt diameter + 1/16".*
- b. *Wood post attachment - attach marker with 2, 5/16" diameter zinc-coated lag bolts, having 2" of embedment into wood post.*
- c. *Steel post attachment - attach marker with 2, 1/4" diameter zinc-coated bolt, washer and nut assemblies, having 1/2" of bolt extension behind steel post.*
- d. *When provided by the marker manufacturer, a stiffening pipe shall be inserted into the base of the marker prior to drilling bolt holes and shall remain in-place.*



REFLECTORIZED FLEXIBLE GUARDRAIL MARKER DETAILS

606(34)

SPECIAL PROVISION
SECTION 607
Chain Link Fence
(4' x 8' gate)

The following is added to subsection 607.02 Materials

The 4'x8' gate located at approximately station 1116+80 right shall have a heavy duty latching mechanism that can be secured closed with a padlock. The padlock shall be a heavy duty weather proof padlock with two keys. The key opening on the padlock shall have a cover. The keys shall be provided to the Resident before bridge testing begins.

The following is added to subsection 607.05 Chain Link Fence:

The chain link fence around the base of the barrier gate at station 116+75.07 right shall have a top and bottom rail. The gate shall also have a diagonal bracing assembly.

Method of Measurement The gate will be measured by the unit specified as each, accepted in place.

Basis of Payment Gates will be paid for at the contract unit price for each unit complete in place. Payment shall be full compensation for all work including all incidentals to fabricate, deliver and install the gate. Payment will include bracing assemblies and locking mechanisms. There will be no separate payment for gate posts.

Payment will be made under:

<u>Pay item</u>	<u>Pay Unit</u>
Chain Link Fence Gate 4 ft Wide x 8 ft Tall	Each

SPECIAL PROVISION
SECTION 607
Chain Link Fence

607.06 Method of Measurement

Fence will be measured by the linear foot accepted in place. Measurement will be along the gradient of the fence from outside to outside of end post for each continuous run of fence and shall include fence at bracing assemblies but shall not include space at gates and barways. Excavation in rock for placement of fence post in drilled holes will be measured by the cubic meter determined from the actual depth of the drilled hole in the rock and hypothetical circle diameter 2 feet. The following paragraph is added:

607.07 Basis of Payment The accepted quantities of fence will be paid for at the contract unit price per meter [linear foot] of the type and size specified complete in place. Barways, gates, and bracing assemblies will be paid for at the contract unit price for each type specified complete in place. Payment shall be full compensation for furnishing and assembling all materials, for excavating and backfilling holes, and for all incidentals necessary to complete the work except that in rock, payment for drilled holes will be made under Pay Item 206.07. Excavation of earth to exposed rock shall be incidental to the several items for erection of the fence.

Payment for bracing assemblies shall include furnishing and installing the various larger size and longer length posts, diagonal bracing, ties, anchors and all incidental hardware necessary to complete the type of assembly required, all as shown in the Standard Details. At gateways, payment will be made for bracing assemblies and there will be no separate payment for the gate posts. All extra costs incurred for furnishing and installing the oversize posts at gateways shall be considered included with the various contract items.

Clearing or removal of trees, stumps or boulders, required to install the fence shall be included in the work of the respective pay items of this section.

Payment will be made under:

Pay Item

Pay Unit

607.19 Chain Link Fence – 8’

Linear Foot

SPECIAL PROVISION
SECTION 608
DETECTABLE WARNINGS
(Cast Iron)

Description This work shall consist of furnishing and installing curb ramp detectable warning plates with truncated domes at the locations shown on the plans or as established by the Resident.

MATERIALS

Detectable Warnings The Contractor shall provide new cast iron detectable warning plates as manufactured by one of the manufacturers listed on Maine DOT's Qualified Products list of Cast Iron Detectable Warning Plates. This list can be found at:

<http://www.maine.gov/mdot/tr/qpl/>

Each field shall match the width of the ramp and shall have a natural finish.

Prior to starting this work, the Contractor shall submit for approval the name of the selected supplier, manufacturer's literature describing the product, installation procedures, and routine maintenance required.

Concrete Portland cement concrete shall meet the requirements of Section 502, Structural Concrete, Class A

CONSTRUCTION REQUIREMENTS

Existing Concrete Curb Ramps Existing Concrete shall be saw-cut to a dimension 100mm [4 in] larger than the detectable warning plates. New concrete shall be placed in the resulting opening and finished, and the new plates set into the wet concrete, according to manufacturer recommendations. New plates shall be set square with the curb edge and the base of the truncated domes shall be flush with adjacent surfaces to allow proper drainage.

New Concrete Curb Ramps New concrete shall be placed and finished for the ramp, and the new plates set into the wet concrete, according to manufacturer recommendations. New plates shall be set square with the curb edge and the base of the truncated domes shall be flush with adjacent surfaces to allow proper drainage

New Asphalt Ramps Asphalt shall be saw cut and removed to provide an opening that will allow for the dimensions of the cast iron plate surrounded by an additional 100mm [4 in] border on all sides of the plate. New concrete shall be placed in the resulting opening and finished, and the new plates set into the wet concrete, according to manufacturer

recommendations. New plates shall be set square with the curb edge and the base of the truncated domes shall be flush with adjacent surfaces to allow proper drainage.

Method of Measurement Detectable warning fields properly placed and accepted shall be measured for payment by the square meter [ft²]. Measurement shall include actual plate area, not surrounding concrete.

Basis of Payment Payment will be full compensation at the contract unit price for all labor, materials, and equipment required to install the detectable warning fields. This shall include surface preparation and removal of concrete or asphalt, and necessary replacement concrete. On new concrete ramps, concrete shall be paid for under separate items

Pay Item	Pay Unit
608.26 Curb Ramp Detectable Warning Field	Square Meter [Square Foot]

SPECIAL PROVISION
SECTION 627
PAVEMENT MARKINGS

The last paragraph of Subsection 627.10, Basis of Payment is revised by the addition of the following:

<u>Pay Item</u>	<u>Pay Unit</u>
627.733 4" White or Yellow Painted Pavement Marking Line	LF

SPECIAL PROVISION
SECTION 634 – HIGHWAY LIGHTING
(Sump Pump)

634.01 Description The following work shall be paid for under item "Pump Equipment and Wiring":

Furnish and install, as shown on the plans two (2) Heavy Duty Vertical Sump Pumps, capable of pumping 50 GPM when operating against a total pumping head of 50 feet at temperature, specific gravity and viscosity indicated.

Furnish and install two (2) sump pumps, one in each machinery enclosure, capable of pumping 50 GPM when operating against a total pumping head of 20 ft, with a motor of not less than 1/2hp as shown on the plans.

This work shall include all associate wiring and conduit work.

634.02 Construction Details

Heavy Duty Sump Pump

The pump liquid end including casing, impeller, suction head, strainer and bearing housing shall be of cast iron having minimum tensile strength of 30,000 lbs. Impeller shall be a semi-open type secured to the shaft with a key, washer and lock nut and shall be fully adjustable, without dismantling the pump, by means of an adjusting nut located above the thrust bearing in the motor support. The flanged column pipe shall be a full weight steel pipe with a machined register fit at all assembly points to assure concentric alignment. The pump shaft shall be of a high grade carbon steel of sufficient size to transmit required horsepower. The replaceable shaft guide bearings, of material suitable for the liquid being pumped, shall be contained in precision machined bearing housings; flanged for machined register fit in the column pipe flanges and spaced on recommended bearing centers, but not to exceed 5-foot centers. The bottom bearing assembly shall include a choker ring. Suitable lubrication shall be provided to each shaft guide bearing. The cast iron motor support, mounted on a heavy steel support plate, shall align the motor with the column pipe and shafting. The high capacity ball thrust bearing, in waterproof housing, shall be mounted in the motor support. The bearing shall be grease lubricated with a provision for purging old grease from the bearing housing.

Machinery Enclosure Sump Pumps

The pump shall have a titanium housing with titanium, Buna-N, polypropylene, and ABS – thermoplastic wetted parts, or approved equal, for pumping salt water.

634.03 Control

Heavy Duty Sump Pump

A suitable float switch shall be mounted on a support plate and shall be operated by a guided copper plated float. The switch shall operate the motor directly or with a starter, as required.

Machinery Enclosure Sump Pumps

The pump shall be direct-wire tethered float-switch controlled. It shall have two floats, one that turns the pump on and the other turns it off. The float switch shall be directly wired to the pump.

634.04 Motor

Heavy Duty Sump Pump

The motor shall be not less than 1-1/2 hp 1750 RPM, NEMA design B squirrel cage type, (drip proof)(TEFC) (EISA)(premium) efficiency motor with (1.15)(1.0) service factor and suitable for operation on (115)(230) volt, 1 phase, (50)(60) Hertz power supply OR (200)(230)(460) (575) volt, 3 phase, 60 hertz power supply. The motor size shall be sufficient to prevent overloading at operating conditions or at the lowest listed head conditions, whichever point requires greater horsepower. Following installation, grouting and connection of all piping, pump and motor must be checked for alignment in accordance with the standards of the Hydraulic Institute.

634.05 Method of Measurement “Pump Equipment and Wiring” shall be measured by the lump sum, complete and accepted.

634.06 Basis of Payment The accepted quantity of “Pump Equipment and Wiring” will be paid for at the contract lump sum price, which price shall be full compensation for furnishing and installing the Sump Pumps, including all labor and material for the associated wiring and conduit work.

Payment will be made under:

Pay Item

Pay Unit

634.168 Pump Equipment and Wiring

Lump Sum

SPECIAL PROVISION
SECTION 634 – Highway Lighting
LED Luminaires

Description

This work shall consist of furnishing and installing LED luminaires. The LED luminaries shall provide lighting to meet or exceed the lighting levels of 250 watt conventional luminaries where required, as located in the contract plans.

General

The luminaire shall be of Lighting Emitting Diode (LED) type designed for roadways, pole mounting. The luminaire shall be UL listed for wet locations, and the optic enclosure shall be IP66 classified. The enclosure shall be cast aluminum with integral weather tight LED driver compartments and high performance heat sinks specifically designed for LED lighting applications. The luminaire shall be equipped with a built-in power driver, and STRAY VOLTAGE indicator lamp. Luminaire shall operate on a 120 volt, 60 Hz, and shall operate normally in temperatures from -20 degrees Celsius to 50 degrees Celsius.

The luminaire shall consist of housing with electrical components and an optical system.

The luminaire shall provide efficient even illumination, be optically sealed, mechanically strong, and easy to maintain. The driver components shall be mounted in a structurally sound manner within the housing of the luminaire, with provision made for optimum heat dissipation. The terminal board, and driver components shall be readily accessible, and the optical assembly shall be sealed against the entry of moisture, dirt, and insects.

The luminaire shall withstand severe outdoor conditions due to seasonal changes in temperature and shall be structurally capable of operating satisfactorily in winds of 80 miles per hour with 50% gust.

The wiring of the luminaire to the primary circuit shall be done at the terminal board in the power driver compartments. Housing shall be provided with an entry to securely connect 3#12 cables to terminal board. Luminaire shall be mounted on an arm with clamps that shall accept 1 1/2" - 2" diameter arm, and photo electric control cell receptacle.

The whole luminaire assembly shall be completely prewired, requiring only the connection of the primary circuit wires for its operation.

Any material may be substituted for a material specified herein provided that the substitute material is equal to or better than the material specified herein subject to approval.

All equipment shall be as specified herein or approved equal.

Housing

The luminaire housing shall be cast aluminum. The housing shall support the power driver, terminal board, arm connection and optical system.

All materials inside the housing shall be corrosion resistant, and shall have a protective coating providing a corrosion resistant finish. Metals in contact shall be compatible to prevent corrosion due to contact of dissimilar metals. The fastening arrangement shall be of corrosion resistant material, shall be such as to prevent relative motion between fastener members, and shall permit easy opening and closing of the power driver compartment assembly with snap action. A means shall be provided to prevent accidental opening of the fastening arrangement. Upon closure, the hinge arrangement shall produce a lifting action to adequately seat the sealing gasket.

Lenses

LED shall have glass or acrylic lens that will direct the output light in a way that the luminaire shall give the light distribution and luminaire efficiency as described under "PHOTOMETRIC REQUIREMENTS". Lens shall be of a material that will not attract dirt, withstand outdoor weather and ultra-violet stabilized with smooth outside surface. Lenses shall be completely sealed and shall be moisture proof and dirt proof.

Castings, Hardware and Painting

Castings may be die castings, permanent mold castings, or sand castings.

Castings shall be clean and free from injurious defects and shall be painted on external surface as follows:

A coat of baked on epoxy base enamel, lacquer base enamel, alkyd enamel, or equal, shall be applied to give the castings an aluminum grey colored protective finish with good metal adhesion, having abrasion, corrosion and weather resistance and leaving no exposed metal. Same protective finish shall be applied to external surfaces of aluminum housing.

All screws, washers, and nuts shall be stainless steel, or steel of a corrosion finish.

Electrical Components

The electrical components in the luminaire shall include an electronic power driver, and terminal board with pressure type terminals, all to be prewired and tested at the point of manufacture. The LED power driver shall be 120- 277 Volt, 50/60HZ class 1, with power factor more than 90% and THD less than 20% of full load. It shall be provided with an integral weather-tight electrical box for easy power hook-up. Voltage dips up to 30% below the nominal line volts of 120 shall not affect LED board power or cause luminaire to dim or fail.

The terminal board shall be equipped with three {3} clamp-type pressure terminals for connection to the phase leg, neutral and ground of the primary circuit. The terminals shall be properly identified for connection, with notations on terminal board, color coding, or wiring diagram.

The whole luminaire assembly shall be completely prewired requiring only the connection of the primary circuit wires for its operation.

Wiring shall be #16 stranded wires, with silicone rubber insulation, fiberglass sheath and lacquer finish, or cross-linked polyethylene insulation of 105° Centigrade rating.

Photometric Requirements

The luminaire shall have a total delivered light efficiency of not less than 95% at mean life of LEDS, and 70% at 20 years; measurements shall be done at 25 degree Celsius. Luminaire shall deliver 8192 lumens minimum, with efficacy not less than 75.

Color temperature range shall be 4500 +/- 500 Kelvins. Color Rendering Index shall be more than 71% (CRI > 71%) at 25 degree Centigrade. Luminaire shall be in compliance with LM 79 -08.

Luminaire IES classification shall be type II or type III. Longitudinal classification shall be medium, cutoff classification.

The vendor shall submit for approval certified photometric test data report, giving the light distribution pattern, the luminaire efficiency and measurements as per IES- LM- 79-08. The test report shall certify that the luminaire comply with the photometric requirements, and include the performance data of luminaire with time and the junction temperature. UL certification, IP66 certification and 3G vibration certification shall be submitted.

All tests shall be performed by an independent and recognized testing laboratory.

Guarantee

The vendor shall guarantee the entire luminaire against defects of materials and parts, workmanship, and failure to operate properly in service for a period of seven (7) years after date of final delivery or seven (7) years after being placed in service, whichever occurs first. Guarantee shall cover operation of luminaire, luminaire shall be defective if power driver is not performing correctly, lighting output has decreased by 30% of the initial lighting output of the fixture, or lighting color has changed to outside the specified range.

Basis of Payment

All materials, labor and equipment required to incorporate furnish and install LED luminaires, including photocell.

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
634.2042	LED Luminaires	Each

SPECIAL PROVISION
SECTION 635
PRECAST AGGREGATE-FILLED, CONCRETE BLOCK GRAVITY WALL

The following replaces Section 635 in the Standard Specifications in its entirety:

635.01 Description The work under this item shall consist of the design, fabrication, furnishing and construction of a Precast Aggregate-filled Concrete Block Gravity Wall in accordance with these specifications and in conformance with the lines and grades shown on the Plans, or established by the Resident. The Precast Aggregate-filled Concrete Block Gravity Wall shall consist of blocks made of Structural Precast concrete made from Portland cement, water, chemical admixtures, and aggregates, supported on concrete leveling pads, and if required, geosynthetic reinforced backfill.

Included in the scope of the precast gravity wall construction are: geotechnical design of any wall with an exposed height greater than 4.5 ft or as specified on the Plans, all grading necessary for wall construction, compaction of the wall foundation soil, backfill, piped drainage, construction of leveling pads, and concrete wall unit installation. The top of the upper row of concrete wall units shall be at or above the top of the face elevation shown on the Plans.

635.02 Quality Assurance The wall system shall be one of the approved combinations of facing block and soil reinforcement systems noted in the Plans or on the Department's Qualified Products List (QPL). Alternate wall systems will not be considered for this Item.

All design calculations and Shop Drawings shall be signed and sealed by a Professional Engineer licensed in the State of Maine.

The Contractor shall require the wall design-supplier to provide an on-site, qualified experienced technical representative to advise the Contractor concerning proper installation procedures. The technical representative shall be on-site during initial stages of installation and thereafter shall remain available for consultation as necessary for the Contractor or as required by the Resident.

635.03 Materials Materials for walls shall meet the requirements of the following sections of Division 700:

Gravel Borrow	703.20
Underdrain Backfill Type C	703.22
Underdrain Pipe	706.06 or 706.09
Reinforcing Steel	709.01
Structural Precast Concrete Units	712.061
Reinforcement Geotextile	722.01
Drainage Geosynthetic	722.02

The Contractor is cautioned that all of the materials listed are not required for every Precast Aggregate-filled Concrete Block Gravity Wall. The Contractor shall furnish the Resident a Materials

Certification Letter certifying that the applicable materials comply with this section of the specifications. Materials shall meet the following additional requirements:

635.031 Concrete Units The Materials Certification Letter described above shall contain the date of concrete casting, a lot identification number, compressive strength results, and entrained air results. All prefabricated concrete units shall conform to the requirements of 712.061 with the following exceptions:

A. Materials. Materials are modified as follows: the maximum water cement ratio shall be 0.42, use of calcium nitrite is not required unless the design of the concrete wall units requires fabrication with reinforcing steel, the minimum 28 day compressive strength shall be 4600 psi.

B. Quality Control and Quality Assurance. Quality Control and Quality Assurance is modified as follows: delete the second paragraph.

C. Construction. Construction requirements are modified as follows:

Replace the first sentence in the paragraph which begins "Forms shall remain ..." with the following:

The forms shall remain in place until the concrete has gained sufficient strength such that removal of the forms and subsequent handling will not damage the units.

Add the following paragraph at the end of the Construction section:

Face texture of the units shall be a formed finish on all exposed surfaces. Pigment shall be added during the casting process of the concrete unit to achieve a consistent shade of gray or other color as determined by the Resident.

D. Concrete Testing. The concrete testing requirements are modified as follows:

Replace the paragraph which begins "The Contractor shall cast a minimum of 8 ..." With the following:

The Contractor shall make and test at least one set of cylinders for every 50 CY of production concrete used to cast the concrete units.

Replace the paragraph which begins "At least once ..." with the following:

The Contractor shall make four cylinders for use by the Department to represent every 200 CY or fraction thereof.

E. Tolerances. Maximum dimensional deviation of formed unit dimensions shall not vary more than 1/2-inch or 2 percent of the unit dimension or the manufacturer's published tolerances, whichever is less. All units not meeting the specified tolerances will be rejected.

635.032 Geosynthetic Reinforcement Geosynthetic Reinforcement shall be as required by the proprietary wall system manufacturer or wall designer. Geosynthetic reinforcement shall consist of a geotextile or geogrid approved by the Geotechnical Engineer. Substitution of a geosynthetic other than that required by the proprietary wall system manufacturer shall not be allowed unless approved by the Geotechnical Engineer after submittal of shop drawings and pullout and interface friction test data.

- A. Geotextiles and Thread for Sewing. Woven or nonwoven geotextiles shall consist of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design life. At least 95 percent by weight of the long chain polymer shall be polyolefin or polyester. The material shall be free of defects and tears. Geotextiles used for reinforcement shall conform as a minimum to the properties indicated for 722.01, Stabilization/Reinforcement Geotextile and shall meet the requirements of part D and E below. Geotextiles shall have a minimum permeability greater or equal to that shown on the Shop Drawings and the reinforced soil permeability.
- B. Geogrids. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. Geogrids shall conform as a minimum to the criteria specified in part D and E below.
- C. Required Properties. The specific geosynthetic materials shall be preapproved and shall have the ultimate tensile strength (T_{ult}) shown on the approved Shop Drawings for the geosynthetic specified and for the fill type shown. T_{ult} shall be determined from wide width tests specified in ASTM D 4595 for geotextiles and ASTM D 6637 or GRI:GG1 for geogrids. The ultimate tensile strength value is based on the minimum average roll values (MARV) for the product.
- D. The geosynthetic shall conform to the following criteria:
- PP and HDPE: Min. retained strength of 70 percent after 150 hours, per ASTM D-4355.
 - HDPE: Grade = E-4, E-5, E-8, E-9, E-10, E-11, J-3, J-4, or J-5, per ASTM D-1248.
 - PET: Molecular weight (M_n) > 25,000, per GRI:GG8 and ASTM D-4603.
 - PET: Carboxyl end group (CEG) \geq 15 mmol/kg, GRI:GG7.
 - All polymers: Minimum Weight per Unit Area of 8 oz/yd², per ASTM D-5261.
 - All Polymers: Maximum 0 percent post consumer recycled material by weight.
 - A default total reduction factor for creep, durability, and installation damage of $RF = 7$ may be used in design, provided the criteria of 2 through 6 are satisfied and 1 is adjusted to 70 percent after 500 hours is satisfied.
- E. Manufacturer Quality Control. The geosynthetic reinforcements shall be manufactured with a high degree of quality control. The Manufacturer is responsible for establishing and maintaining a quality control program to ensure compliance with the requirements of the specification. The purpose of the QC testing program is to verify that the reinforcement geosynthetic being supplied to the project is representative of the material used for performance testing and approval. Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. As a minimum the following index tests shall be considered as applicable for an acceptable QA/QC program:

<u>Property</u>	<u>Test Procedure</u>
1. Specific Gravity (HDPE only)	ASTM D-1505
2. Ultimate Tensile Strength	ASTM D-4595 GRI:GG1
3. Melt Flow (HDPE and PP only)	ASTM D-1238
4. Intrinsic Viscosity (PET only)	ASTM D-4603
5. Carboxyl End Group (PET only)	ASTM D-2455

F. Sampling Testing and Acceptance. Sampling and conformance testing shall be in accordance with ASTM D-4354. Conformance testing procedures are established above. Geosynthetic product acceptance shall be based on ASTM D-4759. The quality control certificate shall include:

1. Roll numbers and identification
2. Sampling procedures
3. Results of quality control tests, including a description of test methods used.

G. Certification. The Contractor shall submit a manufacturer's certification that the geosynthetics supplied meet the respective index criteria set when the geosynthetic was approved, measured in full accordance with all test methods and standards specified, or referenced, in this specification.

The manufacturer's certificate shall state that the furnished geosynthetic meets the requirements of these specifications as evaluated by the manufacturer's quality control program. The values submitted shall be certified by a person having legal authority to bond the manufacturer. In case of dispute over validity of values, the Resident can require the Contractor to supply test data from an agency approved laboratory to support the values submitted, at the Contractor's cost.

635.033 Concrete Leveling Pad Concrete for leveling pads shall be Fill Concrete conforming to the requirements of Section 502 Structural Concrete. Unless otherwise specified, concrete for leveling pads shall be accepted under Method "C" requirements.

635.034 Drainage Stone Fill Concrete wall unit voids shall be filled with drainage stone material that conforms to the requirements of 703.22, Underdrain Backfill Material, Type C.

635.035 Backfill Material Backfill material placed behind the concrete wall units shall meet the requirements of Section 703.20 Gravel Borrow, except that the backfill material shall only contain particles that will pass the 3-inch square mesh sieve. The contractor is required to submit a grain size distribution curve (ASTM D 422) and a moisture-density relationship curve (AASHTO T-180) for acceptance of the proposed backfill material and determination of the appropriate installation damage reduction factor (RF_{ID}).

Walls with reinforced backfill also require that the backfill material be subjected to pH testing to determine the appropriate durability reduction factor (RF_D).

635.036 Materials Certificate Letter The Contractor, or the supplier as their agent, shall furnish the Resident a Materials Certificate Letter for the above materials, including the backfill material, in accordance with Section 700 of the Standard Specifications. A copy of all test results performed by the Contractor or their supplier necessary to assure contract compliance shall also be furnished to the Resident. The Resident will base acceptance upon the materials Certificate Letter, accompanying test reports, and visual inspection.

635.04 Design Requirements The wall shall be designed with a service life of not less than 75 years. The Precast Aggregate-filled Concrete Block Gravity Wall shall be designed and sealed by a Professional Engineer licensed in the State of Maine. The wall shall be designed in accordance with the following:

- AASHTO LRFD Bridge Design Specifications, current edition, herein referred to as LRFD
- FHWA-NHI-10-024 and FHWA-NHI-025 Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Volume I and II, 2009
- FHWA-NHI-09-087 Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, 2009
- The Contract Plans
- The requirements specified herein
- The manufacturer's requirements

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

Forty-five days prior to beginning construction of the wall, the design computations shall be submitted to the Resident for review by the Geotechnical Engineer. Any additional design or costs arising as a result of rejection of a wall design by the Geotechnical Engineer shall be borne by the Contractor.

Design calculations that consist of computer program 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 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 in accordance with LRFD Article 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.
- B. External Loads External loads which affect the internal and external stability such as those applied through traffic loadings, impact on traffic barrier posts, slope surcharge, hydrostatic, and seismic loads shall be accounted for in the design. Traffic surcharge and traffic impact loads shall be calculated and applied in compliance with LRFD Section 11.

- C. External Stability Loads and load combinations selected for design shall be consistent with LRFD. Application of load factors shall be taken as specified in LRFD Section 11. Sliding resistance factors and bearing resistance factors shall be consistent with LRFD. Overturning and sliding provisions of LRFD shall apply.
- D. Internal Stability Evaluation of reinforcement pullout, reinforcement rupture and reinforcement/block connection pullout or rupture shall be consistent with LRFD Section 11, and checked at each level. Loads, load combinations and load factors shall be as specified in LRFD Section 11. Resistance factors for internal design are specified in LRFD Section 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.
- a. Geosynthetic Reinforcement Design Tensile Resistance The nominal long term reinforcement design strength (T_{al}) shall be determined by reducing T_{ult} by reduction factors (RF) in accordance with the documents referenced above. The designer shall procure and use the manufacturers tested and certified geosynthetic reinforcement reduction factors for creep (RF_{CR}), durability (RF_D), and installation damage (RF_{ID}) to determine T_{al} . In absence of manufacturers tested and certified reduction factors, a combined default reduction factor $RF = 7$ shall be used in accordance with the referenced documents. For RF_{ID} , the installation damage reduction factor shall be checked in accordance with LRFD and FHWA-NHI-00-044.
- b. Reinforcement/Facing Connection Design Strength The nominal long-term connection strength between the geosynthetic reinforcement and the concrete blocks shall be checked in accordance with LRFD and FHWA-NHI-00-043.
- c. Reinforcement Pullout The pullout resistance factor, (F^*), and scale effect correction factor (α) used in pullout design, shall be determined from project specific pullout tests using the proposed geosynthetic in the specified project backfill material or equivalent soil. The pullout resistance factors shall be determined in accordance with LRFD and FHWA-NHI-00-043. In the absence of test data, empirical relationships may be used to determine the pullout resistance factors, any empirical relationships used in design shall be referenced in the design calculations.
- E. Backfill and Foundation Soils Parameters The friction angle of the backfill used in the reinforced fill zone for internal stability design shall be assumed have a friction angle of 34 degrees unless specific project select backfill is tested for frictional strength. The friction angle of the foundation soils and random backfill shall be assumed to be 30 degrees unless otherwise shown on the plans.
- F. 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.

- G. Bearing Resistance The factored bearing pressures under the Precast Aggregate-filled Concrete Block Gravity Wall shall be clearly indicated on the Shop Drawings. Walls shall be dimensioned so that the factored bearing resistance of the foundation soils, as noted on the Plans, is not exceeded.
- H. Facing Stability Stability calculations for the concrete facing blocks shall be in accordance with LRFD, and shall include an evaluation of the maximum vertical spacing between reinforcement layers.
- I. Stability During Construction 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.
- J. Design Life The wall design life shall be a minimum of 75 years.
- K. Depth of Embedment The depth of embedment for frost protection and stability shall be at or below the elevation shown on the Plans and the approved Shop Drawings.
- L. Drainage System Piped drainage shall be designed to collect and dispose of water from the base of the reinforced soil zone and backfill soil. This shall outlet into surrounding drainage systems or ditches.

635.05 Submittals. The Contractor shall supply wall design computations, wall details, dimensions, quantities, and cross sections necessary to construct the wall. A sample hand calculation including all equations, parameter values used, units, theory, free-body diagram, comparison to design requirements, etc. shall be provided. Spreadsheet calculations alone are not acceptable.

Forty-five (45) days prior to beginning construction of the wall, four (4) sets of the wall design computations and Shop Drawings shall be submitted to the Resident for review by the Geotechnical Engineer. Mix design information shall be submitted at the same time, including aggregate source, current gradation, aggregate quality information and concrete unit weight.

The contractor shall also submit backfill material test results as part of the wall submittal package. Backfill material test results shall include grain size distribution curve, moisture-density relationship curve, and pH test results required for reinforced backfill only.

If geotechnical design is required, the fully detailed plans shall be prepared in conformance with Section 105 and shall include, but not be limited to the following items:

- A. A plan and elevation sheet or sheets for each wall, containing the following: elevations at the top of leveling pads, the distance along the face of the wall to all steps in the leveling pads, the location of the original and final ground line.
- B. All details for foundations and leveling pads, including details for steps in the leveling pads, as well as allowable and actual maximum bearing pressures shall be provided.
- C. Details for the barriers, posts, curbs and facing as required by the project conditions.
- D. Design computations prepared and sealed by a licensed Professional Engineer.
- E. Prior to the beginning of construction, the contractor shall supply the Resident with two copies of the design-supplier's Installation Manual. In addition, the Contractor shall have two copies of the Installation Manual on the project site.

635.06 Construction Requirements The Precast Aggregate-Filled Concrete Block Gravity Wall shall have the following construction requirements:

- A. Excavation. The excavation and use as fill or disposal of all excavated material shall meet the requirements of Section 203 - Excavation and Embankment, except as modified herein.
- B. Foundation. The area upon which the prefabricated, aggregate-filled concrete block gravity wall structure is to rest, and within the limits shown on the submitted plans, shall be graded for a width equal to, or exceeding, the length of the blocks. Prior to wall and leveling pad construction, this foundation material shall be compacted to at least 95 percent of maximum laboratory dry density (AASHTO T-180 Method C or D). Frozen and unsuitable soil shall be removed and replaced with gravel borrow compacted to 95 percent of AASHTO T-180, or as shown on the plans.

A concrete leveling pad shall be constructed a minimum of 6 inches beyond the front and back of the concrete wall units, or as indicated on the plans. Dimensions may be modified per the wall supplier's recommendations, with written approval of the Geotechnical Engineer. The leveling pad shall be cast to the design elevations as shown on the plans, or as required by the wall supplier upon written approval of the Geotechnical Engineer.

The allowable elevation tolerances from the design elevations are +0.01 ft and -0.02 ft. Leveling pads which do not meet this requirement shall be repaired or replaced as directed by the Resident at no additional cost to the Department. Placement of wall units may begin after the strength of the concrete leveling pad reaches 1000 psi or is adequate to support the proposed loads. Contractor may begin placement of concrete block units after 12 hours at their own risk.

- C. Method and Equipment. Prior to erection of the wall, the Contractor shall furnish the Resident with detailed information concerning the proposed construction method and equipment to be used. The erection procedure shall be in accordance with the manufacturer's instructions. Any units that are damaged due to handling will be replaced at the Contractor's expense.
- D. Installation of Concrete Wall Units. A field representative from the 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.

The contractor shall place the first course of wall units directly on the leveling pad and check for level and alignment. Adjacent units should be in contact. The prefabricated concrete wall units shall be installed to a tolerance of plus or minus 3/4 inch in 10 ft in vertical and horizontal alignment.

Fill all voids between and within the wall units with drainage stone as described in this specification. The drainage stone fill shall extend a minimum of 6 in behind the tails of the wall units unless a geotextile filter is placed over the inside joint at the back of adjacent wall units. If used, the drainage geotextile shall conform to the requirements of Section 722.02.

- E. Backfill Placement. Backfill placement shall closely follow the erection of each row of prefabricated wall units. The maximum lift thickness shall be 8 inches loose. The Contractor shall decrease the lift thickness if necessary to obtain the specified density. The backfill shall be compacted in accordance with Section 203.12 except that the minimum required compaction shall be at least 92 percent of maximum density as determined by AASHTO T-180 Method C or D. Backfill compaction shall be accomplished without disturbance or displacement of the concrete wall units. Sheepsfoot rollers will not be allowed. Whenever a compaction test fails, no additional backfill shall be placed over the area until the lift is recompacted and a passing test achieved.

The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-180, Method C or D. At the end of the day's operations, the Contractor shall shape the last level of backfill so as to direct runoff of rainwater away from the wall face.

635.07 Method of Measurement Precast Aggregate-filled Concrete Block Gravity Wall will be measured by the square foot of front surface not to exceed the dimensions shown on the Contract Plans unless authorized by the Resident. Vertical and horizontal dimensions will be from the edges of the blocks. No field measurements for computations will be made unless the Resident specifies, in writing, a change in the limits indicated on the Plans.

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

635.08 Basis of Payment The accepted quantity of Precast Aggregate-Filled Concrete Block Gravity Wall will be paid for at the contract unit price per square foot complete in place. Payment shall be full compensation for furnishing geotechnical design as required, all labor, equipment and materials including all precast concrete units, hardware, joint fillers, geosynthetic, drainage pipe, 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 Precast Aggregate-Filled Concrete Block Gravity Wall. Excavation, foundation material and backfill material will all be incidental to the Precast Aggregate-Filled Concrete Block Gravity Wall.

There will be no allowance for excavating and backfilling for the Precast Aggregate-Filled Concrete Block Gravity Wall beyond the limits shown on the approved submitted plans, except for excavation required to remove unsuitable subsoil in preparation for the foundation. Payment for excavating unsuitable subsoil shall be full compensation for all costs of pumping, drainage, sheeting, bracing and incidentals for proper execution of the work, and will be paid as common excavation in accordance with Section 203.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
635.40 Precast Aggregate-Filled Concrete Block Gravity Wall	Square Foot

SPECIAL PROVISION
SECTION 635
PRECAST CONCRETE BLOCK GRAVITY WALL

The following replaces Section 635 in the Standard Specifications in its entirety:

635.01 Description The work under this item shall consist of design, fabrication, furnishing and construction of a Precast Concrete Block Gravity Wall in accordance with these specifications and in close conformance with the lines and grades shown on the Plans, or established by the Resident. The Precast Concrete Block Gravity Wall shall consist of facing blocks made of wet cast concrete made from Portland cement, water, chemical admixtures, and aggregates, supported on concrete leveling pads, and if required, geosynthetic-reinforced backfill.

Included in the scope of the precast gravity wall construction are: geotechnical design of any wall with a exposed height greater than 4.5 feet or as specified on the Plans, all grading necessary for wall construction, compaction of the wall foundation soil, backfill, piped drainage, construction of leveling pads, and block wall installation. The top of the upper row of blocks shall be at or above the top of the face elevation shown on the Plans.

635.02 Quality Assurance The wall system shall be one of the approved combinations of facing block and soil reinforcement systems noted in the Plans or on the Department's Qualified Products List (QPL). Alternate wall systems will not be considered for this Item.

All design calculations and Shop Drawings shall be signed and sealed by a Professional Engineer licensed in the State of Maine.

The Contractor shall require the wall design-supplier to provide an on-site, qualified experienced technical representative to advise the Contractor concerning proper installation procedures. The technical representative shall be on-site during initial stages of installation and thereafter shall remain available for consultation as necessary for the Contractor or as required by the Resident.

635.03 Materials Materials for walls shall meet the requirements of the following sections of Division 700:

Gravel Borrow	703.20
Underdrain Backfill Type C	703.22
Underdrain Pipe	706.06 or 706.09
Reinforcing Steel	709.01
Structural Precast Concrete Units	712.061
Reinforcement Geotextile	722.01
Drainage Geotextile	722.02

The Contractor is cautioned that all of the materials listed are not required for every Precast Concrete Block Gravity Wall. The Contractor shall furnish the Resident a Materials Certification Letter certifying

that the applicable materials comply with this section of the specifications. Materials shall meet the following additional requirements:

635.031 Concrete Units The Materials Certification Letter described above shall contain the date of concrete casting, a lot identification number, compressive strength results, and entrained air results. All prefabricated concrete units shall conform to the requirements of 712.061 with the following exceptions:

D. Materials Materials are modified as follows: the maximum water cement ratio shall be 0.42, use of calcium nitrite is not required, and the minimum 28 day compressive strength shall be 4600 psi.

E. Quality Control and Quality Assurance. Quality Control and Quality Assurance is modified as follows: delete the second paragraph.

F. Construction. Construction requirements are modified as follows:

Replace the first sentence in the paragraph which begins “Forms shall remain ...” with the following:

The forms shall remain in place until the concrete has gained sufficient strength such that removal of the forms and subsequent handling will not damage the units.

Add the following paragraph at the end of the Construction section:

Face texture of the units shall be a formed finish on all exposed surfaces. Pigment shall be added during the casting process of the concrete unit to achieve a consistent shade of gray or other color as determined by the Resident.

D. Concrete Testing. Concrete testing requirements are modified as follows:

Replace the paragraph which begins “The Contractor shall cast a minimum of 8 ...” With the following:

The Contractor shall make and test at least one set of cylinders for every 50 CY of production concrete used to cast the concrete units.

Replace the paragraph which begins “At least once ...” with the following:

The Contractor shall make four cylinders for use by the Department to represent every 200 CY or fraction thereof.

E. Tolerances. Maximum dimensional deviation of formed unit dimensions shall be ½ -inch or 2 percent or the manufacturer’s published tolerances, whichever is less. Units not meeting the specified tolerances will be rejected.

635.032 Geosynthetic Reinforcement Geosynthetic reinforcement shall be as required by the proprietary wall system manufacturer or wall designer. Geosynthetic reinforcement shall consist of a geotextile or geogrid approved by the Geotechnical Engineer. Substitution of a geosynthetic other than that required by the proprietary wall system manufacturer shall not be allowed unless approved by the Geotechnical Engineer after submittal of shop drawings and pullout and interface friction test data.

- A. Geotextiles and Thread for Sewing. Woven or nonwoven geotextiles shall consist of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and design life. At least 95 percent by weight of the long chain polymer shall be polyolefin or polyester. The material shall be free of defects and tears. Geotextiles used for reinforcement shall conform as a minimum to the properties indicated for 722.01, Stabilization/Reinforcement Geotextile and shall meet the requirements of part D and E below. Geotextiles shall have a minimum permeability greater or equal to that shown on the Shop Drawings and the reinforced soil permeability.
- B. Geogrids. The geogrid shall be a regular network of integrally connected polymer tensile elements with aperture geometry sufficient to permit significant mechanical interlock with the surrounding soil or rock. The geogrid structure shall be dimensionally stable and able to retain its geometry under manufacture, transport and installation. Geogrids shall conform as a minimum to the criteria specified in part D and E below.
- C. Required Properties. The specific geosynthetic materials shall be preapproved and shall have the ultimate tensile strength (T_{ult}) shown on the approved Shop Drawings for the geosynthetic specified and for the fill type shown. T_{ult} shall be determined from wide width tests specified in ASTM D 4595 for geotextiles and ASTM D 6637 or GRI:GG1 for geogrids. The ultimate tensile strength value is based on the minimum average roll values (MARV) for the product.
- D. The geosynthetic shall conform to the following criteria:
- PP and HDPE: Min. retained strength of 70 percent after 150 hours, per ASTM D-4355.
 - HDPE: Grade = E-4, E-5, E-8, E-9, E-10, E-11, J-3, J-4, or J-5, per ASTM D-1248.
 - PET: Molecular weight (M_n) > 25,000, per GRI:GG8 and ASTM D-4603.
 - PET: Carboxyl end group (CEG) \geq 15 mmol/kg, GRI:GG7.
 - All polymers: Minimum Weight per Unit Area of 8 oz/yd², per ASTM D-5261.
 - All Polymers: Maximum 0 percent post consumer recycled material by weight.
 - A default total reduction factor for creep, durability, and installation damage of $RF = 7$ may be used in design, provided the criteria of 2 through 6 are satisfied and 1 is adjusted to 70 percent after 500 hours is satisfied.
- E. Manufacturer Quality Control. The geosynthetic reinforcements shall be manufactured with a high degree of quality control. The Manufacturer is responsible for establishing and maintaining a quality control program to ensure compliance with the requirements of the specification. The purpose of the QC testing program is to verify that the reinforcement geosynthetic being supplied to the project is representative of the material used for performance testing and approval. Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. As a minimum the following index tests shall be considered as applicable for an acceptable QA/QC program:

<u>Property</u>	<u>Test Procedure</u>
6. Specific Gravity (HDPE only)	ASTM D-1505
7. Ultimate Tensile Strength	ASTM D-4595 GRI:GG1
8. Melt Flow (HDPE and PP only)	ASTM D-1238
9. Intrinsic Viscosity (PET only)	ASTM D-4603
10. Carboxyl End Group (PET only)	ASTM D-2455

F. Sampling Testing and Acceptance. Sampling and conformance testing shall be in accordance with ASTM D-4354. Conformance testing procedures are established above. Geosynthetic product acceptance shall be based on ASTM D-4759. The quality control certificate shall include:

4. Roll numbers and identification
5. Sampling procedures
6. Results of quality control tests, including a description of test methods used.

G. Certification. The Contractor shall submit a manufacturer's certification that the geosynthetics supplied meet the respective index criteria set when the geosynthetic was approved, measured in full accordance with all test methods and standards specified, or referenced, in this specification.

The manufacturer's certificate shall state that the furnished geosynthetic meets the requirements of these specifications as evaluated by the manufacturer's quality control program. The values submitted shall be certified by a person having legal authority to bond the manufacturer. In case of dispute over validity of values, the Resident can require the Contractor to supply test data from an agency approved laboratory to support the values submitted, at the Contractor's cost.

635.033 Geosynthetic Connection Reinforcing bar used in the geosynthetic connection shall be ½-inch diameter epoxy coated reinforcing bar, coated on the ends and meeting the requirements of Section 503, Reinforcing Steel. Installation shall be in accordance with manufacturer's recommendations.

635.034 Concrete Leveling Pad Concrete for leveling pads shall be Fill Concrete conforming to the requirements of Section 502 Structural Concrete. Unless otherwise specified, concrete for leveling pads shall be accepted under Method "C" requirements.

635.035 Backfill Material Backfill material placed behind the concrete units shall meet the requirements of Section 703.20 Gravel Borrow, except that the backfill material shall only contain particles that will pass the 3-inch square mesh sieve. The contractor is required to submit a grain size distribution curve (ASTM D 422) and a moisture-density relationship curve (AASHTO T-180) for acceptance of the proposed backfill material and determination of the appropriate installation damage reduction factor (RF_{ID}).

Walls with reinforced backfill require that the backfill material be subjected to pH testing to determine the appropriate durability reduction factor (RF_D).

Material between blocks must be Gravel Borrow, or Underdrain Backfill Material meeting the requirements of Section 703.22, Type C.

635.036 Materials Certification Letter The Contractor, or the supplier as his agent, shall furnish the Resident a Materials Certification Letter for the above materials, including the backfill material, in accordance with Section 700 of the Standard Specifications. A copy of all test results performed by the Contractor or his supplier necessary to assure contract compliance shall also be furnished to the Resident. The Resident will base acceptance upon the materials Certificate Letter, accompanying test reports, and visual inspection.

635.04 Design Requirements The wall shall be designed with a service life of not less than 75 years. The Precast Concrete Block Gravity Wall shall be designed and sealed by a Professional Engineer licensed in the State of Maine. The wall shall be designed in accordance with the following:

- AASHTO LRFD Bridge Design Specifications, current edition, herein referred to as LRFD
- FHWA-NHI-10-024 and FHWA-NHI-025 Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, Volume I and II, 2009
- FHWA-NHI-09-087 Corrosion/Degradation of Soil Reinforcements for Mechanically Stabilized Earth Walls and Reinforced Soil Slopes, 2009
- The Contract Plans
- The requirements specified herein
- The manufacturer's requirements

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

Forty-five days prior to beginning construction of the wall, the design computations shall be submitted to the Resident for review by the Geotechnical Engineer. Any additional design or costs arising as a result of rejection of a wall design by the Geotechnical Engineer shall be borne by the Contractor.

Design calculations that consist of computer program 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 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 in accordance with LRFD Article 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.
- B. External Loads External loads which affect the internal and external stability such as those applied through traffic loadings, impact on traffic barrier posts, slope surcharge, hydrostatic, and seismic loads shall be accounted for in the design. Traffic surcharge and traffic impact loads shall be calculated and applied in compliance with LRFD Section 11.

- C. External Stability Loads and load combinations selected for design shall be consistent with LRFD. Application of load factors shall be taken as specified in LRFD Section 11. Sliding resistance factors and bearing resistance factors shall be consistent with LRFD. Overturning and sliding provisions of LRFD shall apply.
- D. Internal Stability Evaluation of reinforcement pullout, reinforcement rupture and reinforcement/block connection pullout or rupture shall be consistent with LRFD Section 11, and checked at each level. Loads, load combinations and load factors shall be as specified in LRFD Section 11. Resistance factors for internal design are specified in LRFD Section 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.
- a. Geosynthetic Reinforcement Design Tensile Resistance The nominal long term reinforcement design strength (T_{al}) shall be determined by reducing T_{ult} by reduction factors (RF) in accordance with the documents referenced above. The designer shall procure and use the manufacturers tested and certified geosynthetic reinforcement reduction factors for creep (RF_{CR}), durability (RF_D), and installation damage (RF_{ID}) to determine T_{al} . In absence of manufacturers tested and certified reduction factors, a combined default reduction factor $RF = 7$ shall be used in accordance with the referenced documents. For RF_{ID} , the installation damage reduction factor shall be checked in accordance with LRFD and FHWA-NHI-00-044.
- b. Reinforcement/Facing Connection Design Strength The nominal long-term connection strength between the geosynthetic reinforcement and the concrete blocks shall be checked in accordance with LRFD and FHWA-NHI-00-043.
- c. Reinforcement Pullout The pullout resistance factor, (F^*), and scale effect correction factor (α) used in pullout design, shall be determined from project specific pullout tests using the proposed geosynthetic in the specified project backfill material or equivalent soil. The pullout resistance factors shall be determined in accordance with LRFD and FHWA-NHI-00-043. In the absence of test data, empirical relationships may be used to determine the pullout resistance factors, any empirical relationships used in design shall be referenced in the design calculations.
- E. Backfill and Foundation Soils Parameters The friction angle of the backfill used in the reinforced fill zone for internal stability design shall be assumed have a friction angle of 34 degrees unless specific project select backfill is tested for frictional strength. The friction angle of the foundation soils and random backfill shall be assumed to be 30 degrees unless otherwise shown on the plans.
- F. 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.

- G. Bearing Resistance The factored bearing pressures under the Precast Concrete Block Gravity Wall shall be clearly indicated on the Shop Drawings. Walls shall be dimensioned so that the factored bearing resistance of the foundation soils, as noted on the Plans, is not exceeded.
- H. Facing Stability Stability calculations for the concrete facing blocks shall be in accordance with LRFD, and shall include an evaluation of the maximum vertical spacing between reinforcement layers.
- I. Stability During Construction 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.
- J. Design Life The wall design life shall be a minimum of 75 years.
- K. Depth of Embedment The depth of embedment for frost protection and stability shall be at or below the elevation shown on the Plans and the approved Shop Drawings.
- L. Drainage System Piped drainage shall be designed to collect and dispose of water from the base of the reinforced soil zone and backfill soil. This shall outlet into surrounding drainage systems or ditches.

635.05 Submittals The Contractor shall supply wall design computations, wall details, dimensions, quantities, and cross sections necessary to construct the wall. A sample hand calculation including all equations, parameter values used, units, theory, free-body diagram, comparison to design requirements, etc. shall be provided. Spread sheet calculations alone are not acceptable.

Forty-five days prior to beginning construction of the wall, four (4) sets of the wall design computations and Shop Drawings shall be submitted to the Resident for review by the Geotechnical Engineer. Mix design information shall be submitted at the same time, including aggregate source, current gradation, aggregate quality information and concrete unit weight.

The contractor shall also submit backfill material test results as part of the wall submittal package. Backfill material test results shall include grain size distribution curve, moisture-density relationship curve, and pH test results required for reinforced backfill only.

If geotechnical design is required, the fully detailed plans shall be prepared in conformance with Section 105 and shall include, but not be limited to the following items:

- A. A plan and elevation sheet or sheets for each wall, containing the following: elevations at the top of leveling pads, the distance along the face of the wall to all steps in the leveling pads, the location of the original and final ground line.
- B. All details for foundations and leveling pads, including details for steps in the leveling pads, as well as allowable and actual maximum bearing pressures shall be provided.
- C. Details for the barriers, posts, curbs and facing as required by the project conditions.
- D. Design computations prepared and sealed by a licensed Professional Engineer.
- E. Prior to the beginning of construction, the contractor shall supply the Resident with two copies of the design-supplier's Installation Manual. In addition, the Contractor shall have two copies of the Installation Manual on the project site.

635.06 Construction Requirements The Precast Concrete Block Gravity Wall shall have the following construction requirements:

- A. Excavation. The excavation and use as fill or disposal of all excavated material shall meet the requirements of Section 203 - Excavation and Embankment, except as modified herein.
- B. Foundation. The area upon which the prefabricated block gravity wall structure is to rest, and within the limits shown on the submitted plans, shall be graded for a width equal to, or exceeding, the length of the blocks. Prior to wall and leveling pad construction, this foundation material shall be compacted to at least 95 percent of maximum laboratory dry density (AASHTO T-180 Method C or D). Frozen and unsuitable soil shall be removed and replaced with gravel borrow compacted to 95 percent of AASHTO T-180.

A concrete leveling pad shall be constructed as indicated on the plans. Dimensions may be modified per the wall supplier's recommendations, with written approval of the Geotechnical Engineer. The leveling pad shall be cast to the design elevations as shown on the plans, or as required by the wall supplier upon written approval of the Geotechnical Engineer. The allowable elevation tolerances from the design elevations are +0.01 feet and -0.02 feet. Leveling pads which do not meet this requirement shall be repaired or replaced as directed by the Resident at no additional cost to the Department. Placement of wall units may begin after the strength of the concrete leveling pad reaches 1000 psi or is adequate to support the proposed loads. Contractor may begin placement of concrete block units after 12 hours at his own risk.

- C. Method and Equipment. Prior to erection of the prefabricated concrete block wall, the Contractor shall furnish the Resident with detailed information concerning the proposed construction method and equipment to be used. The erection procedure shall be in accordance with the manufacturer's instructions. Any units that are damaged due to handling will be replaced at the Contractor's expense.

- D. Installation of Wall Units. A field representative from the 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. Horizontal joint fillers shall be installed as needed.

The maximum offset in any unit horizontal joint shall be 1/4 inch. The prefabricated wall blocks shall be installed to a tolerance of plus or minus 3/4 inch in 10 feet in vertical alignment and horizontal alignment.

- E. Backfill Placement. Backfill placement shall closely follow the erection of each row of prefabricated wall units. The Contractor shall decrease the lift thickness if necessary to obtain the specified density. The maximum lift thickness shall be 8 inches loose. Gravel borrow backfill shall be compacted in accordance with Section 203.12 except that the minimum required compaction shall be at least 92 percent of maximum density as determined by AASHTO T-180 Method C or D. Backfill compaction shall be accomplished without disturbance or displacement of the wall blocks. Sheepsfoot rollers will not be allowed. Whenever a compaction test fails, no additional backfill shall be placed over the area until the lift is recompacted and a passing test achieved.

The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content 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 uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-180, Method C or D. At the end of the day's operations, the Contractor shall shape the last level of backfill so as to direct runoff of rain water away from the wall face.

Material between blocks must be Gravel Borrow or Underdrain Backfill Material meeting the requirements of Section 703.22, Type C. If Gravel Borrow is used between blocks, 722.02 drainage geotextile shall be placed behind vertical joints to prevent loss of granular material between blocks. Compliance with the gradation requirements shall be the responsibility of the Contractor, who shall furnish a copy of the backfill test results prior to construction. If Underdrain Backfill Material is used between blocks, no geotextile is required behind vertical joints.

635.07 Method of Measurement Precast Concrete Block Gravity Wall will be measured by the square foot of front surface not to exceed the dimensions shown on the Contract Plans unless authorized by the Resident. Vertical and horizontal dimensions will be from the edges of the blocks. No field measurements for computations will be made unless the Resident specifies, in writing, a change in the limits indicated on the Plans.

635.08 Basis of Payment The accepted quantity of Precast Concrete Block Gravity Wall will be paid for at the contract unit price per square foot complete in place. Payment shall be full compensation

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for furnishing geotechnical design as required, all labor, equipment and materials including all precast concrete units, hardware, joint fillers, geosynthetics, reinforcing steel, drainage pipe, backfill materials 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 Precast Concrete Block Gravity Wall. Excavation, foundation material and backfill material will all be incidental to the Precast Concrete Block Gravity Wall.

There will be no allowance for excavating and backfilling for the Precast Concrete Block Gravity Wall beyond the limits shown on the approved submitted plans, except for excavation required to remove unsuitable subsoil in preparation for the foundation. Payment for excavating unsuitable subsoil shall be full compensation for all costs of pumping, drainage, sheeting, bracing and incidentals for proper execution of the work, and will be paid as Common Excavation in accordance with Section 203.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
635.31 Precast Concrete Block Gravity Wall	square foot

SPECIAL PROVISION

SECTION 643

Traffic Signals
(Foundations)

643.021 Materials

Add Concrete Section 502.03

Add Reinforcing Steel Section 503.02

Add Section 643.041 Foundations as follows:

Foundations shall consist of cast-in-place reinforced concrete drilled shafts; one drilled shaft per mast arm or dual purpose pole. Supplier shall determine the Bending Moment, Shear Force, Torsion and Axial Load at the top of each mast arm or dual purpose pole foundation. Foundation size (diameter and length) shall depend on the Torsion and Bending Moment at the top of the foundation based on Chart 1 and 2, below. The larger of the foundation sizes shown for Torsion or Bending Moment shall be the required foundation size. Lengths are depths below lowest adjacent (proposed) grade.

643.041.a. Signal Foundation at approximately Station 116+85, Right

Chart 1 - Foundation Length (feet) Based on Maximum Torsion

Torsion (foot-kips)	30'' diameter	36'' diameter
10	10'	10'
20	12'	10'
30	14'	11'
40	16'	13'
50	17'	14'

Chart 2 - Foundation Length (feet) Based on Maximum Bending Moment

Bending Moment (foot-kips)	30'' diameter	36'' diameter
10	10'	10'
20	10'	10'
30	10'	10'
40	10'	10'
50	10'	10'

Drilled shafts at Station 1165+85 shall not be permanently cased, except for the top 3-feet; concrete shall be cast directly against the surrounding soil. Precast foundations will not be accepted.

Reinforcing Steel shall be as shown in Standard Detail 626(03) and 626(04) for 30-inch and 36-inch foundations.

Concrete for foundation shall be placed immediately after excavation to prevent water from accumulating in the excavated areas. Concrete shall be Class LP in accordance with Section 502, Structural Concrete. Drilled shaft foundation holes, except in bedrock, 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. Drilled shafts shall not be permanently cased, except for the top 3 feet; concrete shall be cast directly against the surrounding soil. Precast foundations will not be permitted.

All provisions of Section 626.034 Concrete Foundations shall apply to these drilled shaft foundations.

If bedrock is encountered above the proposed bottom of the drilled shaft, the Contractor will have the option of removing rock and placing the shaft at the design depth shown above, or constructing a rock-anchored foundation system to the depth of the foundation shown. Rock-anchored foundations shall be constructed according to Standard Detail 626(06) Foundations for Traffic Signals, Highway Signing and Lighting.

643.041.b. Signal Foundation at approximately Station 115+80, Right

Contractor shall construct a cast-in-place 30-inch diameter foundation from the top of tremie concrete to the required finish elevation. Reinforcement steel shall be drilled and grouted a minimum of 3-feet into the tremie concrete and/or bedrock as shown in Standard Detail 626(06). Permanent casing will be allowed for this foundation. Any joints in the foundation shall be designed to resist the design Torsion and Bending Moment with a Factor of Safety of 2.5. Contractor may submit alternate designs to include this foundation in the design and construction of the Soldier Pile and Lagging wall. MaineDOT will require the full review period allowed under Standard Specification Section 105.7.2 for any such alternate submittals.

Any damage to slopes or pavement resulting from installation of mast arm or dual purpose poles and foundations shall be repaired by the Contractor as directed by the Resident. Costs of repairs shall be incidental to payment under Section 643.

Section 643.19 Basis of Payment Add the following sentence: Foundations for Mast Arm Poles and Dual Purpose Poles shall be incidental to the Pole Item and shall be full compensation for all labor, equipment and materials for the accepted complete signal foundation installation, including but not limited to foundations, excavation, excavation stabilization, backfill, replacement of subbase gravel, replacement or repair of pavement, slope regrading, and placement of loam, seed and mulch on disturbed slopes.

SPECIAL PROVISION
SECTION 643 – TRAFFIC SIGNALS

643.01 Description The item “Traffic Signals and Gates” shall consist of providing and installing the traffic barrier gates and the pedestrian gates. The following shall pertain to this item:

Requirements for furnishing all labor, materials, tools, and equipment, and performing all operations necessary to install, field test and place in satisfactory condition, the traffic barrier gates and the pedestrian barrier gates indicated on the Contract Drawings and specified herein. The Contractor shall use this Specification in conjunction with the relevant portions of the other electrical Specifications included within the Contract Documents.

The work under this item shall consist of furnishing, installing, and placing in proper operating condition the gongs, pedestrian gates and resistance type barrier gates complete with all appurtenances, including anchor bolts, required for proper operation of the traffic gates.

All apparatus for controlling the operation of the traffic gates and all conduits, boxes, wiring, cables, and other equipment required to extend the necessary circuits from the Control House to the traffic control equipment shall be furnished and installed under “Bridge Electrical System” section. The concrete foundations for mounting the traffic gates are included under separate pay items as shown on the Contract Plans.

It is the intent and purpose of these Specifications to cover and include all apparatus, appliances, material, and labor necessary to properly install, wire, connect, equip, test, adjust, and put in approved working order the respective portions of the work herein specified.

Cited Standards

- A. AASHTO
- B. ASTM
- C. AWS

Quality Control

- A. Local Electrical Code
- B. NEC

General Equipment and Material Provisions

All equipment and its installation shall conform to the requirements of the latest revision of the Standard Specifications for Movable Highway Bridges of the American Association of State Highway and Transportation Officials, except as may be otherwise provided herein.

Materials and construction shall conform to the requirements of the current local Electrical Code, NEC and to any applicable local rules and ordinances. The Contractor shall obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

All equipment and materials shall be new. All equipment, materials, and workmanship shall be first-class in every particular and shall be manufactured and erected to the satisfaction of the Resident. The Contractor shall warrant the in-service working of the traffic control equipment for one year following the date of project acceptance. If the Contractor has any objection to any feature of the equipment as designed and laid out, he must state his objection at once, in writing, to the Resident; otherwise, his objection will be ignored if offered as an excuse for malfunctioning of the equipment or for defective or broken apparatus.

Each piece of electrical equipment and apparatus shall have a corrosion-resisting metal nameplate, on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

All mounting hardware and all wire and cable terminals shall be vibration-proof.

If any departures from the Plans or these Specifications are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted for approval as soon as practicable. No such departures shall be made without approval of the Resident.

All metal parts of the installation, except structural steel, shall be of corrosion-resisting material such as aluminum, bronze, or stainless steel. Cast-iron, malleable iron, or steel with a hot-dip galvanized finish shall be used where specified herein or permitted by the Resident.

Welding shall meet the requirements of the American Welding Society's Structural Welding Code - Aluminum D1.2.

The warning gate housings and arm supports and the cable anchorages shall be painted

Shop Painting:

Electrical equipment which has a galvanized finish and which normally are given a factory finish need not be shop painted. All other electrical equipment shall be given one shop coat.

Field Painting:

Electrical equipment, which is normally given a factory painted finish suitable to the Resident, need not be field painted. All other electrical equipment shall be given two field coats of paint as specified under

the requirements for painting structural steel. Before applying the two field coats, galvanized surfaces shall be cleaned free of all grease, oil, dirt, and foreign material and shall be etched with copper sulphate solution, after which the solution shall be applied. In lieu of etching and a coat of shop paint, the Contractor may use galvanizing primer as a first coat for galvanized surfaces. The final field coat on electrical equipment in the Control House shall be of a color and type of paint to match the house interior.

The Contractor shall furnish seven copies of complete maintenance and servicing data for the Barrier and Pedestrian gates.

The Contractor shall prepare and submit for review, within 90 days after the award of the Contract, the following working drawings executed in accordance with the provisions of the Contract:

- Assembly drawings of the gate stands locating and identifying all apparatus and equipment inside. Arrangement and complete construction details of the gate operating machinery.
- Detail drawings showing the construction of gate arms, including provisions for guying and bracing.
- Wiring diagrams of all gate electrical equipment, including development diagrams for the gate limit switches. All wires shall be suitably numbered in accordance with the wire numbers on the control system vendors approved shop drawings.
- Certified dimension prints of apparatus shall state in the certification the name of the job, the application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.

Materials

Barrier Gates

Each barrier gate shall be operated from the control desk. There shall be a selector switch on the desk, which enable the gate to be raised or lowered while the selector switch is operated. The raise and lower circuitry shall be arranged such that the warning gate will stop immediately when the selector switch is released. In addition, the gates shall be provided with a group raise pushbutton on the main desk. After a pushbutton is momentarily depressed, all gates shall travel to their fully raised limits. The group shall stop immediately upon momentary contact of the group stop pushbutton.

Each barrier gate motor shall be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and shall be protected by a three-element, thermal overload relay, with automatic reset to be provided under a different item. This equipment shall be mounted in the motor control center under section Bridge Electrical System.

The barrier shall be designed for use as a penetration resistance barrier and shall be suitable for use as a warning barrier for wide spans. The barrier shall be explicitly designed for traffic control on movable bridges, as required by AASHTO's current Standard Specifications for Movable Highway Bridges, and shall be suitable for similar applications as well.

The operating mechanism and main control components shall be contained in a weatherproof housing. The housing shall be constructed of .375" (9.5mm) carbon steel, hot dip galvanized after fabrication. Exterior surfaces shall be painted aluminum. All external fasteners 1/2" and under shall be stainless steel. Fasteners over 1/2" shall be stainless steel, hot dip galvanized or mechanically galvanized. Arm shaft openings shall incorporate O-ring seals.

The barrier arm shall pivot in the vertical plane via a mechanical 4-bar linkage. The linkage shall utilize cranks keyed to the main arm shaft and transmission shaft and an adjustable connecting rod between a pair of self-aligning spherical rod ends. The connecting rod shall be of AISI 4150. An auxiliary crank shall be used, paired with the transmission crank, to reduce the load on the transmission and to better balance and stabilize the load on the housing and mounting structure. The auxiliary crank shall be mounted in a permanently lubricated bronze bearing. The velocity of the arm shall follow a sinusoidal pattern to provide smooth operation. The arm shall begin and end its full motion path with zero velocity and accelerate smoothly to maximum velocity at mid-travel.

The mechanism linkage shall be driven by a fully enclosed, heavy duty worm gear, double reduction speed reducer. The transmission shall have an occasional momentary peak load rating of not less than 30,000 inch-pounds. The output shaft shall be 2" in diameter. Gear ratio used shall produce an operation time of approximately 16 seconds.

A heavy duty torque limiter shall be provided to limit torque transmitted to the operating mechanism in the event of excessive winds or a physical obstruction to the arm that could damage the mechanism during operation. The torque limiter shall be capable of being set anywhere within a range of 10,000 to 75,000 in-lbs torque. Each torque limiter shall be factory set for the load recommended by the manufacturer, based on installation requirements. Each torque limiter shall be adjusted and tested at the factory, under over-load condition, for a minimum of 5 minutes to verify the setting. The gate limit switch assembly shall be driven from the output side of the torque limiter so that slippage of the torque limiter will have no effect upon the limit settings.

The motor shall be 480 VAC, three phase, 60 hz. The motor horsepower shall be as recommended by the barrier manufacturer to suit the installation, typically 1 hp. The motor shall be a C-face design and shall be mounted directly to the transmission. The motor shall be instantly reversing and overload protected. The motor shall be equipped with a solenoid-release, automatic brake. The brake shall have a manual release lever to permit manual operation of the barrier during setup or emergencies.

The barrier limit switch assembly shall be a self-contained unit. The standard assembly shall provide 8 independent SPDT control switches. Switches shall be rated for 15 amps, 480 VAC. Switches shall be controlled by individually adjustable cams. The limit switch assembly design shall permit adjustment of all cams with the barrier in any position. The limit switch assembly shall have a

removable cover to help prevent accidental contact with switch terminals. Shaft, cams, bushings and housing pieces shall be of non-ferrous corrosion resistant materials.

The main arm shaft shall be of 2.5" (63mm) diameter AISI 4150 with a minimum tensile strength of 140,000 psi. The shaft shall be mounted in heavy duty sealed ball bearings with lubrication fittings.

Front and rear access doors shall be mounted on strap hinges. Hinges shall be of the slip-off type and shall have stainless steel pins. A stop shall be mounted inside the door to secure the door from being raised off the hinges in the closed position. Door latches, two per door, shall use a vise action to compress a neoprene bulb-type gasket to seal the door openings.

A pair of carbon steel rectangular tubes, hot dip galvanized after fabrication, painted aluminum, shall be rigidly affixed to the ends of the main arm shaft. The tubes shall be offset to locate the arm centerline at the height specified above the housing base. The tubes and a steel cross-member shall provide a sturdy mount for the arm and counterweights. The tubes shall have provision for easily adjusting the counterweight offset so the arm can be properly balanced in all positions.

Hot dip galvanized steel counterweights shall be mounted at the rear of the side arm tubes to balance the arm. Counterweights shall be sectional and shall be balanced at the factory.

The barrier arm design shall be double rail aluminum tube. Arm length shall be measured from the centerline of the housing. Stainless steel truss cables and a roadway type bumper rod shall be furnished with longer arms at the discretion of the manufacturer. Front and rear arm surfaces shall be covered with alternating red and white high intensity reflective sheeting. Stripes shall be 16" (406mm) wide and shall slope at 45 degrees down toward the arm tip. Remaining exposed surfaces shall be painted white.

The barrier shall utilize 6x25 construction, 300-series stainless steel, annealed energy absorption cables to assist in diffusing the kinetic energy of an impacting vehicle. Cables shall be annealed in a coil not less than 42" diameter. The barrier shall typically be capable of absorbing the energy of a 5,000 pound vehicle traveling up to 50 mph. Actual capacity shall necessarily depend on individual barrier configuration. Double rail aluminum tube arms shall have two or three .50" (12mm) cables, one inside each tube, and one along the center of the arm if three cables are used.

The energy absorption cables shall be anchored at both ends of the span in the closed to traffic position. At the housing, heavy duty side arm locks shall be mechanically linked to the operating mechanism to automatically engage and lock the side arm tubes into a rigid configuration when the arm is lowered, to assist in transferring the load into the housing in the event of an impact. This will minimize the chance of damage to the internal operating mechanism.

The energy absorption cables shall be anchored at the tip end of the arm in the closed to traffic position. A passive end latch mounted on the arm tip shall engage a rigidly mounted and anchored socket on a post. End latches shall not require powered actuation for proper engagement.

The barrier shall be fixed to a suitable foundation, as specified elsewhere, using eight 1" (25mm) diameter anchor bolts. The barrier housing base shall provide 1.25" (32mm) mounting holes.

Both a handcrank and a drill crank shall be provided with each barrier to facilitate manual operation.

A manual disconnect switch shall be provided, pre-wired at the factory to break the main motor leads, to protect personnel during service. A handcrank safety switch shall be provided to prevent automatic actuation of the barrier during manual operation. Additionally, safety switches shall be installed and set at the factory to break the control circuit when either access door is opened. Door safety switches shall have a pull-to-override feature for test operation and shall automatically reset when doors are closed. Control components and terminal blocks shall be mounted inside an electrical enclosure, which shall be mounted inside the operator housing, with roadway side access, except where customer requirements prevent this arrangement. Stud and nut terminal blocks shall be fully labeled and clearly coded to control system vendor wiring diagrams. All control wiring shall be clearly coded to control system vendor wiring diagrams and shall terminate at the terminal block. Connections to stud-type terminals shall have lugs. Conductors shall be #14 AWG stranded, minimum.

A warranty shall cover the barrier and related equipment against defective material and components for 1 year from date of shipment from manufacturer. Manufacturer shall furnish replacement parts for a minimum of 5 years. Replacement parts for most components shall normally be available in 1 working day.

The barrier gates shall be model VR6 as manufactured by B&B Roadway or Resident approved equal by FedTransit Safety Systems or Automatic Power.

Each barrier gate motor shall be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and shall be protected by a three-element, thermal overload relay, with automatic reset to be provided under a different item. This equipment shall be mounted in the motor control center under section Bridge Electrical System.

A warning gong shall be mounted on the top of the warning gate housings. Each warning gong shall be a weatherproof, motor-operated, vandal-proof, 12 inches gong mounted in a heavy-duty, cast-aluminum housing with hinged back door. The gong shall be of cast-bronze, fire alarm metal. Gongs shall be painted and mounted with hardware in such a way as to prevent theft.

Each gong shall be the Type G-12 Warning Gong as made by the B & B Roadway LLC, the Western-Cullen No. 555, or the Security Products Division of Federal Signal Corporation Type 555 or equal as approved by the Resident.

Pedestrian Gates

Each pedestrian gate shall be operated from the control desk. There shall be a selector switch on the desk, which enable the gate to be raised or lowered while the selector switch is operated. The raise and lower circuitry shall be arranged such that the pedestrian gate will stop immediately when the selector switch is released. In addition, the gates shall be provided with a group raise pushbutton on the main

desk. After a pushbutton is momentarily depressed, all gates shall travel to their fully raised limits. The group shall stop immediately upon momentary contact of the group stop pushbutton.

The gate shall be designed for use as a warning, traffic control and access control gate. The gate shall be explicitly designed for industrial/commercial access control, traffic control for HOV and reversible lanes, pedestrian traffic control on movable bridges and similar applications.

The operating mechanism and main control components shall be contained in a weatherproof housing. The housing shall be constructed of minimum .188" carbon steel, hot dip galvanized after fabrication. Exterior surfaces shall be painted aluminum. All fasteners shall be corrosion resistant. Shaft openings shall incorporate O-ring seals. Access panels shall be bolt-on and fitted with a gasket.

The gate shall be fixed to a suitable foundation, as specified elsewhere, using four 1/2" (13mm) diameter minimum anchor bolts. The gate housing base shall provide four 3/4" (19mm) holes, spaced 9 3/4" (248mm) x 17 3/4" (450mm).

The gate arm shall be 2" x 5", 6005-T5 aluminum extruded tubing. Front and rear arm surfaces shall be covered with alternating red and white high intensity reflective sheeting. Stripes shall be 16" (406mm) wide, and shall be vertical as per MUTCD 2009. Remaining exposed surfaces shall be painted white.

The arm base shall be designed with a shear pin mechanism to minimize damage to the gate and vehicle in the event of a collision. In the event of an impact, the shear pin shall break, allowing the arm to swing approximately 60 to 80 degrees. At the full open position, a spring-loaded latch shall engage, preventing the arm from swinging back into traffic. Arm shall be easily reset by manually releasing the latch, rotating the arm back into position and replacing the shear pin.

The main arm shaft shall be of 1 1/2" (32mm) diameter AISI 4150 with a minimum tensile strength of 140,000 psi. The shaft shall be mounted in heavy duty relubricable ball bearings.

The warning arm shall pivot in the vertical plane via a mechanical 4-bar linkage. The linkage shall utilize cranks keyed to the main arm shaft and transmission shaft and an adjustable connecting rod between a pair of self-aligning spherical rod ends. The connecting rod shall be of 3/4" (19mm) diameter AISI 4150. The linkage shall be driven by a fully enclosed, double reduction, worm gear speed reducer. Gear ratio used shall produce an operation time of 5 seconds, or as recommended by manufacturer if not specified. The velocity of the arm shall follow a sinusoidal pattern to provide smooth operation. The arm shall begin and end its full motion path with zero velocity and accelerate smoothly to maximum velocity at mid-travel.

The motor shall be 1/2 hp, 480 VAC, three phase, 60 hz. The motor shall be a C-face design and shall be mounted directly to the transmission. The motor shall be instantly reversing and overload protected. The motor shall be equipped with a solenoid-release, automatic brake. The brake shall have a manual release lever to permit manual operation of the gate during emergencies or setup.

The gate limit switch assembly shall be a self-contained unit. The assembly shall provide 4 independent SPDT control switches. Switches shall be rated for 15 amps, 480 VAC. Switches shall be controlled by individually adjustable cams. The limit switch assembly design shall permit adjustment of all cams with the gate in any position. The limit switch assembly shall have a removable cover to help prevent accidental contact with switch terminals. Shaft, cams, bushings and housing pieces shall be of non-ferrous corrosion resistant materials.

A manual disconnect switch shall be provided, pre-wired at the factory to break the main motor leads, to protect personnel during service. Safety switches shall be installed and set at the factory to break the control circuit when an access panel is opened. Door safety switches shall have a pull-to-override feature for test operation and shall automatically reset when doors are closed. The gate shall be provided with stud and nut style terminal blocks which shall be fully labeled with numbers from the control system vendor wiring diagrams. All control wiring shall be clearly coded to wiring diagrams and shall terminate at the terminal block. Conductors shall be #14 AWG stranded, minimum.

A 1 year warranty shall cover the gate and related equipment against defective material and components. Manufacturer shall furnish replacement parts for a minimum of 5 years. Replacement parts for standard components shall normally be available within 1 working day.

The gates shall be B&B Roadway model VW1 or approved equal by FedTransit Safety Systems or Automatic Power.

Each pedestrian gate motor shall be controlled by a magnetic reversing contactor, electrically and mechanically interlocked, and shall be protected by a three-element, thermal overload relay, with automatic reset to be provided under a different item. This equipment shall be mounted in the motor control center under section Bridge Electrical System.

Spare Parts

Spare parts shall be supplied in accordance with AASHTO Article 2.10.58 requirements and the Contract Plans. The spare parts shall be furnished and packed in suitable cartons for storage at the bridge. The spare parts supplied shall include, but not be limited to the following:

1. One (1) barrier gate motor, complete with motor pinion.
2. One (1) pedestrian gate motor, complete with motor pinion.
3. One (1) barrier gate rotary cam limit switch with operating mechanism.
4. One (1) pedestrian gate rotary cam limit switch with operating mechanism.
5. Two (2) access door limit switch.
6. Six (6) arm light fixtures complete with lamps.

7. Six (6) lamps for arm lights.
8. One (1) barrier gate arm
9. One (1) pedestrian gates arm
10. One (1) flasher unit.

The Contractor shall arrange the spare parts in cartons of substantial construction, with typed and clearly varnished labels to indicate their contents. The cartons shall be stored where directed by the Owner.

The cost of supplying the spare parts listed above shall be included in the lump sum price bid for the "Traffic Signals and Gates."

643.18 Method of Measurement The item "Traffic Signals and Gates" will be measured as one lump sum unit.

643.19 Basis of Payment

The lump sum price bid for "Traffic Signals and Gates" shall include the cost of all labor, materials, training and equipment necessary for a complete installation, and making it ready for connection to the controls for operation. The work shall also include adjustment of all apparatus and overload devices to provide proper functioning of the equipment.

New control equipment, conduit, and wiring for warning gates shall be installed under section "Bridge Electrical System."

The foundations for the gates are included under separate pay items as shown on the Contract Plans.

The Contractor shall submit to the Resident a detailed breakdown of his costs under this item within 30 days of award of the contract. This breakdown shall be evaluated by the Resident and be utilized as the basis for monthly progress payments for work satisfactorily completed. A minimum of ten-percent of the bid will be retained by the Owner until final acceptance of the bridge electrical system, and the Contractor has completed all items on their punch lists, and all aspects of bridge operation, operator and maintenance personnel testing, training, and control are complete. Electrical component installation may not proceed until all electrical components are on site.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
643.01 Traffic Signals and Gates	Lump Sum

SPECIAL PROVISION
SECTION 643
TRAFFIC SIGNALS
(Drawbridge Warning Sign)

Description: This work shall consist of fabrication, delivery and installation of a drawbridge warning sign on the two advanced warning signs as shown on the contract plans or as directed by the Resident. The sign shall be an MUTCD W3-6 36" x36" sign with black text on a yellow background.

Materials: Materials shall be in general accordance with section 645.01 of the standard specification.

Classification of sign

Sign shall be a type I sign.

Fabrication

Fabrication shall be accordance with section 645.041 of the standard specifications.

Installation

Installation shall be accordance with section 645.06 of the standard specifications.

Method of Measurement

The Drawbridge Warning Sign will be measured by the unit each complete accepted in place.

Basis of Payment

The Drawbridge Warning Sign will be paid for at the contract unit price each. Such price will be full compensation to furnish, install and all incidental necessary to complete the installations. All signs designated to be reinstalled that are damaged by the Contractor shall be replaced by the Contractor with new signs at no additional cost to the State.

Pay Item

Pay Unit

643.96 Drawbridge Warning Sign

Each

SPECIAL PROVISION
SECTION 645
HIGHWAY SIGNING
(Special Signing)

Description

This work shall consist of furnishing all materials and equipment necessary for the finishing and installation of the signs listed below in accordance with these specifications, as shown on the plans, and as directed by the Resident.

New Signs

Sign No. / Text on Sign

- 1 Danger/Keep Out
- 2 Danger/Keep Out
- 3 Danger/Keep Out
- 4 Reserved/Bridge Operator House Employees Only
- 5 Reserved/Bridge Operator House Employees Only

Sign No. Sign Location

- 1 South side of safety fence around the right end of barrier gate at station 116+75.07
- 2 East side of safety fence around the right end of barrier gate at station 116+75.07
- 3 North side of safety fence around the right end of barrier gate at station 116+75.07
- 4 Station 116+73, 29' +/- right
- 5 Station 116+76, 36' +/- right

Materials:

All materials shall be in general accordance with section 645 of the Standard Specifications.

Method of Measurement

Special Signing will be measured for payment by the Lump Sum, complete and in place.

Basis of Payment

The accepted Special Signing will be paid for at the contract Lump Sum price. Payment will be full compensation for the furnishing of all materials, labor and incidentals required

for all earthwork, fabrication, finishing and installation of the special signing, complete and in place.

Payment will be made under

Pay Item

Pay Unit

645.51 Special Signing

Lump Sum

SPECIAL PROVISION
SECTION 652
MAINTENANCE OF TRAFFIC
(Work Zone Traffic Control)

652.1 Description The following paragraphs are added:

The Contractor shall provide a Traffic Control Plan (TCP) to the Resident, in accordance with Subsection 105.7 of the Standard Specifications. Traffic includes both vehicular and boat traffic. The traffic control plans also needs to address boat traffic. The Contractor shall not commence work in the field until the Department approves the TCP. The Contractor shall provide a Traffic Control Supervisor who will be responsible for providing traffic control management in compliance with the contract and the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD), including supervision of personnel for the installation, inspection and maintenance of all traffic control devices. The Traffic Control Supervisor, or a qualified substitute, shall monitor traffic control details 7 days a week.

No disruptions to traffic will be allowed before the TCP is reviewed and approved by the Department. The Contractor should allow ten Business Days in his/her schedule for MaineDOT to review and approve the first submission of the TCP after the pre-construction traffic control meeting. If the initial TCP is rejected, the Contractor should allow five Business Days in his/her schedule for the Department to review and approve the second submission of the TCP after it is resubmitted.

In addition to other TCP Requirements enumerated herein, the TCP shall show all Construction Signs, Detour Route Signs, Speed Signs, Channelization Devices, Work Zone Crash Cushions, Temporary Traffic Signal, and Boater signs.

652.3.4 General The following paragraphs are added:

Boater signs

Signing shall include the following signs for boaters and/or watercraft:

- 2 Signs - Bridge Under Construction Pass At Your Own Risk
- 2 Signs - Upcoming bridge closure
- 2 Signs - Bridge Closure

52"

- BRIDGE UNDER CONSTRUCTION -
FOR YOUR SAFETY, STAY
BETWEEN CHANNEL MARKERS
AT THE CONSTRUCTION SITE.
PASS AT YOUR OWN RISK

96"

Bridge Under Construction

52"

- BRIDGE CLOSING
TO PASSAGE
ON (insert date/dates and/or times)

96"

Warning sign about upcoming closure

52"

- BRIDGE CLOSED
TO PASSAGE

96"
Closure

The Contractor shall locate the boater construction signs near the West side of the existing bridge main span and on the East side of the special detour near the center of the navigation span. The exact location of these signs shall be as directed by the Resident.

Passage for watercraft shall be maintained through the construction area, except at times as noted in the Special Provision Section 107 Limitation of Operations. When the bridge is closed to boat traffic, a boat barrier shall be installed on both sides of the bridge. The barrier shall consist of a series of orange and white colored floats. The design and layout of the boat barrier shall be included in the traffic control plan.

Prior to closing the bridge to passage by boaters, the Contractor shall notify public officials, agencies and the public of the date of bridge closure and the anticipated length of closure as follows:

A Public Notice shall be published in a local newspaper 14 calendar days prior to and then again the day before the bridge closure to boaters. Post copies of notices at local boat launches/ramps 14 calendar days prior to the bridge closure to boaters.

The Contractor shall notify the following public officials, agencies and organizations ten days prior to, and then again the day before, of the date of closure and the anticipated length of closure. When the bridge is reopened to boater, the following list will again be notified.

- Town Officials (Selectman, town administrator and town clerk)
- County Sheriff's Department
- Fire Department
- Police Department
- State Police
- Rescue Service
- Coast Guard
- Harbor Master
- Local marina owners
- Local yacht clubs
- Local lobster pounds
- Local boatyards
- MaineDOT Regional. Office

All newspaper notices and any notifications will be subject to the approval of the Resident and all costs will be considered incidental to the contract.

Advanced warning approach signs for navigation channel closure

30" by 60" signs (black on orange) with the following wording shall be in place a minimum of 3 weeks before the start of the closure of the bridge to boat traffic and no sooner than 5 weeks before the start of the closure of the bridge to boat traffic. The signs shall be removed 3 weeks after the bridge is closed to boat traffic. The signs shall be installed at the locations listed below:

Locations:

- Route 129 (North of Bridge) for southbound traffic
- Route 129 (South of Bridge) for northbound traffic

This sign shall read as follows:

GUT BRIDGE
CLOSED
TO BOAT TRAFFIC
STARTING
MONTH DAY

The exact location of these advanced warning signs shall be approved by the Resident.

652.7 Method of Measurement This entire Subsection is revised to read:

Work Zone Traffic Control, including the Contractor's Traffic Control Plan, Traffic Control Supervisor, furnishing, installation and maintenance of traffic control devices, will be measured as one lump sum for all work authorized and performed.

652.8 Basis of Payment This Subsection is revised to read:

Maintenance of Traffic Control Devices will be paid at the contract lump sum price. Such payment will be full compensation for all days that the Contractor maintains traffic as specified herein, and for moving devices as many times as necessary; for replacing devices damaged, lost, or stolen; and for cleaning, maintaining and removing all device.

The following related work will be paid for under their respective contract bid items:

1. Flaggers
2. Temporary Pavement Markings
3. Removing Pavement Markings
4. Temporary Traffic Signal
5. Type III Barricade
6. Temporary Concrete Barrier
7. Work Zone Crash Cushions
8. Construction Signs
9. Temporary Flexible Delineator
10. Drum
11. Cone

The boat barrier shall not be paid for directly. Payment shall be incidental to related contract items.

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

Failure by the contractor to follow the Contract 652 Special Provision and/or The Manual of Uniform Traffic Control Devices (MUTCD) will result in a reduction in the payment, computed by reducing the lump sum total by 5% per occurrence. The Resident will provide the Traffic Control Supervisor with a written warning of a possible occurrence. The written warning from the Resident will be date and time stamped. The Contractor shall immediately fix the problem. If the problem(s) is not corrected immediately or repeatedly occurs, then a reduction in payment of 5% of the lump sum total will occur. The Department reserves the right to suspend the work and request a meeting to discuss violations and remedies.

There will be no payment for work done under this item after the expiration of contract time.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
652.361 Work Zone Traffic Control	Lump Sum

SPECIAL PROVISION
SECTION 652
MAINTENANCE OF TRAFFIC
Construction Sign Sheeting Material

Super high intensity fluorescent retroreflective sheeting, ASTM D 4956 - Type VII, Type VIII, or Type IX (prismatic), is required for all construction signs.

SPECIAL PROVISION
SECTION 652
MAINTENANCE OF TRAFFIC
(Traffic Control)

Failure by the contractor to follow the Contracts 652 Special Provisions and Standard Specification and/or The Manual on Uniform Traffic Control Devices (MUTCD) and/or The Contractors own Traffic Control Plan will result in a violation letter and result in a reduction in payment as shown in the schedule below. The Department's Resident or any other representative of The Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item. Any reduction in payment under this Special Provision will be in addition to forfeiting payment of maintenance of traffic control devices for that day.

**ORIGINAL CONTRACT
AMOUNT**

<u>From More Than</u>	<u>Up to and Including</u>	<u>Amount of Penalty Damages per Violation</u>		
		<u>1st</u>	<u>2nd</u>	<u>3rd & Subsequent</u>
\$0	\$1,000,000	\$250	\$500	\$1,250
\$1,000,000	\$2,000,000	\$500	\$1,000	\$2,500
\$2,000,000	\$4,000,000	\$1,000	\$2,000	\$5,000
\$4,000,000	and more	\$2,000	\$4,000	\$10,000

**SPECIAL PROVISIONS
SECTION 653
POLYSTYRENE
PLASTIC INSULATION**

Description: Furnish and install polystyrene rigid board insulation of type indicated and in locations shown on the drawings or as directed by the Resident.

MATERIALS

Materials:

- A. The polystyrene plastic insulation shall meet the requirements for ASTM C578 Type V with a compressive strength per ASTM D 1621 of 100 psi.
- B. Polystyrene rigid board insulation with thickness of 3 inches, and a minimum width of 4 feet or as shown on the plans.
- C. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.

CONSTRUCTION REQUIREMENTS

General. Install insulation as shown on the plans or as describe below
Insulation shall be placed directly on top of the holding tank. Insulation over any piping shall be placed a minimum of 3 inches above the piping. Joints shall be butted tightly for maximum protection. Backfilling over the insulation shall be done by hand for the first 200mm (8") and compacted before remaining backfill is applied.

Installation for each type of insulation shall be according to the manufacturers' recommendations. In general, backfill shall be clean, dry, and be free of any material which can dissolve or harm the plastic such as petroleum products.

Method of Measurement: 3 Inch Polystyrene Plastic Insulation measured for payment shall consist of the actual number of square yards of Polystyrene Plastic Insulation installed as directed by the Resident.

Basis of Payment: The contract unit price for 3 Inch Polystyrene Plastic Insulation shall constitute full compensation for all labor, equipment and materials necessary to complete the work including excavation, backfill, compaction, furnishing and installing insulation and all incidentals needed to complete the item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
653.23	3 Inch Polystyrene Plastic Insulation	Square Yard

SPECIAL PROVISION
SECTION 655 – BRIDGE ELECTRICAL SYSTEM

655.01 Description

General

This specification covers the fabrication and installation of the bridge power, control and electrical equipment and machinery for the Gut Bridge.

Conformance

Electrical equipment and its installation shall conform to the requirements of the latest revision of the American Association of State Highway Transportation Officials (AASHTO), except as may be otherwise provided herein. In addition, it shall conform to the requirements of the current National Electrical Code (NEC), National Electrical Manufacturer's Association (NEMA), Underwriters Laboratory (UL), Institute of Electrical and Electronics Engineers (IEEE) and to any applicable local rules and ordinances.

Obtain any required permits and approvals of all Departments or Agencies having jurisdiction.

Scope of Work

The work covered by this Item consists of furnishing, installing, and placing in satisfactory operating condition the complete electrical systems for permanent operation of the bridge and auxiliaries as indicated on the Plans, called for in these Specifications, or as required for complete pieces of work. The major pieces of equipment or systems covered include, but are not limited to, the span drive motors and brakes, limit switches, programmable logic controller (PLC), power distribution and motor control equipment, service lights, navigation lights, vector motor drives, complete raceway and conductor systems, and monitoring equipment.

It is the intent and purpose of these Specifications to cover and include all apparatus and appliances to properly install, wire, connect, equip, test, adjust, and put into approved working order the respective portions of the electrical work herein specified. Furnish any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included, but that the Resident deems necessary to comply with the requirements of the related documents and referenced standards or codes, just as if specifically mentioned in these Specifications and without extra cost.

The alignment and fastening of electrical equipment to be incorporated into the bridge machinery, such as motors, brakes, rotary limit switches, and position encoders, is included under the appropriate machinery item.

Working Drawings and Samples

Provide shop drawings and operation and maintenance manuals as specified herein.

Prepare and submit for review working drawings in accordance with the approved project schedule. Provide the following working drawings in accordance with the provisions of the Contract:

- Certified dimension prints of all motors, span brakes, brake wheels, limit switches, and other electrical apparatus external to the control panels.
- Complete schematic wiring diagrams, including all power, control, and lighting connections. Identify electrical devices and each wire between devices by an individual designation of letters, numbers, or a combination of both; and use such designations wherever the devices or wires appear on other drawings. Include a complete set of catalog cuts for materials furnished for review at time of schematic submittal.
- Layout drawings and internal connection diagrams of the control panels.
- A schedule of electrical apparatus which lists each electrical device by its designation as shown on the schematic wiring diagram and states for each device its rating, number of poles or contacts, function, catalog number, and location.
- Complete interconnection diagrams for all electrical apparatus and equipment used in the operation of the spans and their auxiliaries. The diagrams shall be of the point-to-point type and shall show the external connections of all devices and equipment. The control system vendors shop drawings shall include complete drawings of terminal block layouts to allow the contractor to properly develop interconnect drawings. Computer-generated interconnection lists will not be acceptable in lieu of a true interconnection diagram.
- A complete schematic conduit and cable diagram or diagrams showing the interconnection of all devices and equipment, including ducts and junction boxes, and showing all multi conductor cables. Show the size of each conduit, and the wire number of each conductor in multi conductor cables on the diagrams. Suitably number or letter each conduit and multi conductor cable, and show percent wire fill. As built the final installed length.
- A complete set of layout and installation drawings for the electrical work showing the location and installation, including support and mounting details, of all electrical apparatus and equipment. Make these drawings to scale and show the exact location of all conduits, cables, wiring ducts, boxes, motors, brakes, limit switches, disconnect switches, and other electrical equipment and the method of supporting them on the structure.
- Outline drawings and mounting details of all navigation lights and air horns.
- Detail drawings showing the construction and mounting details of all wiring troughs and raceways.
- A complete list of all spare parts furnished as part of the Contract.

- Material listing and specifications for programmable controller, including input/output units, programming terminal, and equipment for interfacing.
- The programmable controller program listings in ladder-rung formats. Describe circuit functions; identify all contacts and outputs by word description and by number designation. Number ladder rungs sequentially for reference. Fully document and comment the ladder diagram, and identify and list internal ladder logic relay contacts usage in other rungs. Reference inputs and outputs to locations of signals on interconnection diagram. Include a full cross-reference report.
- Detail drawings showing the construction of cabinets, brackets, and special supports required for the installation of the flexible cable between the fixed pier terminal cabinets and the movable bascule leaf terminal cabinets.
- Any other drawings, which may, in the opinion of the Resident, be necessary to show the electrical work.

Where specific manufacturers catalog numbers and/or class/type/form are noted on the contract document, these items need not be submitted for review, so long as these exact devices are utilized. For contactors, starters, pilot devices, circuit breakers, disconnect switches and control relays, any NEMA rated device that meets the required ratings from Square D, Allen-Bradley, Cutler-Hammer, or General Electric may be utilized without submitting for review, save that the Resident reserves the right to reject as unsuitable, during the shop inspection or in the field, devices or equipment that in his sole opinion do not meet the requirements of the contract documents. Any rejected equipment or device shall be replaced with Resident approved equipment or device at no additional cost to the State or impact with the construction schedule. In addition, using the pre-approved equipment and material does not relieve the contractor of the requirements to properly integrate this equipment into a complete, fully operational system.

On certified dimension prints of the apparatus, state in the certification the name of the job, the application of the apparatus, device designation, number required, right-hand or left-hand assembly, electrical rating, number of poles or contacts, material, finish, and any other pertinent data to show that the apparatus meets the specified requirements.

Upon completion of the work, correct all electrical shop or working drawings to show the work as constructed and provide one (1) set of Mylar reproducibles. In addition, submit in computerized file form in Adobe Acrobat (pdf) Format all electrical schematics, ladder diagrams, internal ladder logic diagrams, systems documentation, dimension drawings of equipment, and devices submitted by the electrical systems vendor.

Submit for inspection and test, if directed by the Resident, samples of any apparatus or device, which is proposed for use as a part of the electrical installation.

Instruction Books and Drawing Books

Furnish to the Resident for each bridge seven bound copies and a CD, one of which remains with the Design Consultant Engineer, of an instruction manual with the title "Operation and Maintenance Manual, Volume 1, Operation of Electrical Equipment," containing the following:

- Table of Contents.
- Detailed, technical operating instructions, which cover span operation, manual operation, span operation with PLC disabled, etc.
- Detailed description of all control equipment including instructions to achieve optimum settings of all limit switches, detectors, etc.
- Description of control, which shall describe in full the functions of all protective devices, limit switches, contactors, relays, PLC and associated equipment and all other electrical equipment used, both in the power service and in the control system, in connection with each step in the operating sequence. Use wire and apparatus numbers appearing on the wiring diagrams in this description for identifying the various devices and circuits.

To augment the description of control and operations, include reference drawings showing locations of equipment. Include a layout of control apparatus in the machinery rooms. Cross-reference all descriptions with reference drawings.

Furnish to the Resident for each bridge seven bound copies and a CD, one of which remains with the Design Consulting Engineer, of a book with the title "Operation and Maintenance Manual, Volume 2, Maintenance of Electrical Equipment," containing the following:

- Table of Contents.
- Maintenance instructions for the electrical equipment, including warnings and precautions to be observed during maintenance actions. All preventive maintenance procedures are to be outlined and a chart listing all maintenance procedures in chronological order shall be provided.
- Set of descriptive leaflets, bulletins, maintenance instructions, and drawings covering all approved items of equipment furnished and installed under the item "Bridge Electrical Work."
- A troubleshooting flow chart for troubleshooting the bridge electrical system shall be provided to facilitate the diagnosing and correcting of malfunctions.
- Instructions for diagnosing malfunctions of the programmable control system and for detecting failures in the external controls connected thereto.
- Reduced size prints of working drawings, including all schematic wiring diagrams, control console and control panel layouts and connection diagrams.
- PLC schematic wiring, relay logic, PLC input/output hardwire diagram, PLC logic and PLC ladder diagrams.
- Control console and control panel layouts and wiring diagrams.
- Composite schedule of electrical apparatus.
- Complete spare parts list.
- Test data, equipment, criteria, and performance curves for all span drive motors.
- Conduit layout and installation drawings.
- Names, addresses and telephone numbers of vendors and suppliers.
- PLC software program.

Assemble the material for the operation and maintenance manuals to form a booklet for each volume with heavy plastic covers. Assemble each booklet in a three-ring binder, approximately 229 mm by 305 mm with 76mm "D" rings, with a vinyl cover to allow insertable Title Sheets. Neatly entitle each booklet with a descriptive title, the name of the bridge, the Owner, the location, year of installation, Contractor, and Designer. Include easily legible copies of drawings in black on a white background. Submit the arrangements of the booklets, the method of binding, material to be included, and the text to the Resident for approval. Complete the final bound volumes of the instruction books and make them available at the bridge site for use during the field-testing period hereinafter specified for the electrical work.

Number and list by section in the Table of Contents all literature and descriptive materials included in any manual.

Separate each section/subsection with tabbed divider sheets. Suitably title each tab.

Use 20 pound, 3 hole pre-punched loose leaf paper and reinforced with plastic or cloth tape.

Related Sections

Conform to applicable requirements from the following construction specification sections.

- MECHANICAL WORK

655.02 Material

Equipment and Material Provisions

Provide all new equipment and materials. Provide equipment, materials, and workmanship that is first-class in every particular and that is manufactured and erected to the satisfaction of the Resident. Provide a warrantee for the in-service working of the electrical installations for one year following project acceptance. If the Contractor has any objection to any feature of the electrical equipment as designed and laid out, he must state his objection at once in writing to the Resident, otherwise his objection will be ignored if offered as an excuse for malfunctioning of the equipment or for defective or broken apparatus.

Provide each piece of electrical equipment and apparatus with a corrosion-resisting metal nameplate on which is stamped the name of the manufacturer and the rating or capacity of the equipment or apparatus.

Use corrosion-resisting material, such as aluminum, bronze, or stainless steel, for all metal parts of the installation, except parts that are specified to be structural steel. Use cast-iron, malleable iron, or steel with a hot-dip galvanized finish where specified herein. For structural steel conform to the requirements given under Structural Steel – General Requirements.

Provide vibration proof mounting hardware, wire and cable terminals.

Submit for approval as soon as possible details of any departures from the Plans or the Specifications that are deemed necessary by the Contractor, and reasons therefore on. No such departures shall be made nor work started without approval of the Resident.

Material requirements for specific apparatus, equipment, and materials are found in the articles under the section "Construction Details" in this item.

Bridge Control System Vendor

Use a single, qualified control system vendor for the manufacture and/or furnishing and assembly of all apparatus and equipment comprising the bridge control systems, including, but not limited to, drives, motors, brakes, limit switches, motor controls, control cabinets, special control panels, programmable controllers, interfacing equipment, laptop hardware for local troubleshooting, and other apparatus required to provide a complete functioning system. The vendor shall assemble the control panels and console at an Underwriters Laboratory approved Facility in accordance with UL 508.

The control system vendor is required to have experience in providing electrical control systems for movable bridges of various types, including bascule, vertical-lift, swing bridges, and control systems, including AC vector motor drives and programmable controllers. Identify a minimum of five movable bridges for which the system vendor has provided complete systems, including solid-state drive motor control and programmable controller logic within the past 10 years.

The following applies to the control system vendor:

- Assume complete system responsibility for the integrated functioning of all components to provide a satisfactory assembled system operating in accordance with specified requirements.
- Assume responsibility for the detailed schematics and fabrication of the total control systems to ensure compatibility of equipment and suitability for the intended system functioning.
- Assume responsibility for developing the program for the Programmable Logic Controller (PLC) based on the performance specification for operation of the bridges.
- Assume responsibility for developing and integrating PanelView operator display and diagnostic screens.
- Provide supervisory assistance in the installation of equipment to ensure maximum reliability and ease of maintenance.
- During testing of the electrical systems, it may be found that deviations from the performance specifications are required for optimum bridge operation. Include all hardware and software required for these modifications in the control system vendor scope of work at no additional cost to the Department.
- Provide a field service staff having the capability of providing services for field coordination of construction and final adjustments to the drive system. Upon final acceptance of the bridges, provide on-call warranty service for a period of 1 year. Field staff shall be capable of responding to an emergency within 6 hours.

Provide written certification of compliance with specified requirements for the control system vendor. Include this certification in the bid documents. The certification shall be subject to approval by the Resident.

Factory Inspection and Testing

The control cabinets and other apparatus fabricated or assembled by the control system vendor shall be subjected to shop inspection to demonstrate compliance with all specified requirements. The inspection is intended as a means of facilitating the work and avoiding errors, and it is expressly understood that it will not relieve the Contractor of responsibility for imperfect material or workmanship.

Assemble and temporarily interconnect for operational testing at the plant of the control system vendor the power and control cabinets and drives with programmable controllers with all required interfacing equipment. Limit switches shall be simulated with temporary switches, and reduced horsepower motors shall be connected to the drives. The testing is intended to demonstrate proper programmed operation of all bridge drives and auxiliary equipment in accordance with specified requirements for system functioning, including the programmable controllers, vector drives, and all control relays and motor starters.

Special testing shall include complete verification, adjustment, and testing of the regulator circuits and equipment using regulator simulators as necessary.

Perform all tests required herein in the presence of the Resident or his authorized representative. Do not ship any equipment from the factory until it has been released for shipment by the Resident. Provide notification sufficiently in advance of the date of the tests so that arrangements can be made for the Resident to be present at the tests.

During the witnessed inspection, the Resident will check nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving, and all other details of construction for conformity with specified requirements.

Span Drive Motors

The span drive motors shall be AC gearmotors with integral disc brakes. The motors shall be assembled with the gearboxes as indicated on the Mechanical Plans and Specifications.

The brakemotors shall be 10 hp, 4 pole, three phase, 480 VAC 60 hz high efficiency motors. They shall be rated for use with inverter drives and shall be provided with internal space heaters and thermostats.

The motor housings shall be rated IP65, and provided with stainless steel hardware and nameplate. The motor shall be rated for high humidity environments and the winding insulation shall be extra heavy duty. The motor frames shall be provided with condensation drains.

The motors shall be supplied with an integrated mechanical brake. The brake shall be rated for full load motor torque. The brake shall be an electromagnetic disk brake with a DC coil that releases electrically and brakes using spring force. Due to its operating principle, the brake is applied if the power fails. It meets the basic safety requirements. The brake shall be supplied with a manual brake release with a hand lever with automatic reset. The brake is controlled by a brake controller that is installed in the motor wiring compartment.

The motors shall be provided with encoders for use with the variable frequency drives. They shall be quadrature type encoders with a 1024 pulse per revolution. They shall operate with a power supply ranging from 4.75 – 30 volts DC. They shall operate at an ambient temperature [°C] -30 to +85. The enclosures shall be rated IP66 (EN 60529). They shall be provided with a connection terminal strip in a pluggable connection cover.

Vector Motor Drives

The drives shall be properly sized based on the full load ampere rating of the motors and shall allow for 150% overload for 90 seconds. The catalog numbers and ratings of the drives listed on the drawings is approximate and shall be confirmed with the drive motor approved shop drawings. The correctly sized drive, meeting all the requirements, shall be provided at no additional cost to the State.

Vector drives must be four quadrant drives and shall be capable to run in speed and torque mode with adjustable torque limits in all four quadrants.

To minimize electrical and acoustical noise, and to eliminate low speed cogging, a minimum switching frequency of 15 kHz shall be used. The drive shall not "cog" at any frequencies with a 1,000:1 speed regulation. There shall be no sudden frequency shifts and associated acoustical noise shifts as the output frequency is varied between 0 and 60Hz.

The drive's input displacement power factor shall be 0.98 or better over the entire operating frequency and load range. Efficiency shall be measured 96% minimum at rated load. The Contractor shall provide manufacturers typical test results or calculations with submittal to verify efficiency and power factor.

The drives shall be provided with input reactors as specified by the drive manufacturer.

Output reactors shall be supplied as required per drive and motor manufacturer recommendations.

The vector drives shall have, but not be limited to the following features:

- Manufacturer provided ethernet communications module to allow transfer of all commands and operational data/faults to the PLC network
- High speed analog inputs
- Allow for smooth and instantaneous connection into rotating loads, regardless of commanded direction, without the need for any speed feedback.

- Inertia Ride-Through to allow for tripless operation during a prolonged power outage by using the rotating energy stored in high inertia, low-friction loads.
- Provide a torque proving circuit to ensure proper control of the load when transferring control between the drive and a mechanical brake.
- Slip Compensation to provide a minimum 0.5% speed regulation without feedback hardware.
- Encoder Feedback to provide $\pm 2\%$ regulation and the ability to hold full load at zero speed.
- Solid state output ground fault protection shall be provided.
- Adaptive electronic motor overload protection shall be provided which shall protect both the motor and the drives at all frequencies. This overload must be UL approved. Electronic thermal overload circuits which only protect the motor at full speed shall not be acceptable. The drive shall sense the load and speed and shall recalibrate the thermal trip curve to insure low speed motor protection. The initial trip point shall be adjustable from at least 40% of the drive continuous rating to account for motor magnetizing current.
- Input surge protection
- Input and output phase loss detection
- Output short circuit protection
- Eight programmable digital inputs for Raise, Lower, Fast Speed, Reduced Speed, Creep Speed, Reduced Torque, and Spare.
- Four programmable digital dry contact outputs for Drive Trouble, Drive Running, Drive Ready, Spare.
- Programmable current limit.
- Remote drive reset contact.
- Minimum of 1,000:1 controllable constant torque speed range when in closed loop mode. Speed regulation shall be 0.01% or better over the entire speed range.
- Minimum of 2 second power loss ride-through capability. In the event of a loss of three-phase power lasting 2 seconds or less, the drive must maintain operation and prevent nuisance trips upon return of power.
- 2 each 4 – 20 mA programmable analog outputs. They shall be preprogrammed to provide drive output kilowatts and motor RPM.

The 'Drive Trouble' fault condition shall cause the drives to shut off and shall be annunciated to the PLC control system through the Ethernet connection. All faults shall be transmitted to the PLC. The conditions that shall cause a drive shutdown fault are as follows:

- Blown fuse.
- Instantaneous overcurrent trip.
- DC bus overvoltage.
- DC bus undervoltage.
- Excessive ambient drive heat sink over temperature.
- External fault input.
- Internally diagnosed, control failure.
- Motor thermal overload.
- Drive thermal overload.

The drives shall employ modular PC board design for ease of troubleshooting. All connectors must be polarized type and clearly marked on both the connector and PC board to ensure proper connection.

Each drive shall be provided with a door-mounted LCD Human Interface module station with the following minimum features:

- Remote versions for panel mount application
- Large and easy to read 7 line x 21 character backlit display
- Alternate function keys for shortcuts to common tasks
- “Calculator-like” number pad for fast and easy data entry
- Control keys for local start, stop, speed, and direction

All drive functions shall be programmable from the door-mounted keypad. The keypad shall be equipped with EEPROM and be removable so that the parameters can be downloaded into another drive.

The drives shall be provided with heavy duty dynamic braking resistors capable of providing 100% braking on a continuous basis and 150% dynamic braking for 60 seconds. The resistors shall be provided with NEMA 3R enclosures.

The drives shall be Allen-Bradley Powerflex 700 series or approved equal from ABB or Emerson

Span Brakes

Furnish and install two 8” electrohydraulic thruster type machinery brakes as shown on the plans. The brakes shall act upon brake wheels press fit onto shafts as called out on the mechanical drawings. See the machinery specifications for details.

Provide spring-set, thruster-released, shoe-type, open brakes with corrosion-resisting fittings. Brake shall have the drum size and torque requirements as listed on the Plans, with permanent torque setting limited as required.

Furnish all brake wheels with the brakes by the brake manufacturer. Leave the bores undersize, and ship the wheels to the machinery manufacturer who shall finish-bore and press the wheels onto the gearbox input shaft.

Equip each brake with a hand release, which will not change the torque setting or require removable levers or wrenches. Locate the hand release mechanism on the side of the brake away from the main reducer. (Right hand and left hand units are required.) Provide each hand release with a lever type limit switch for interlocking purposes as described under "Interlocking." It shall not be possible to set the hand release of the brakes without tripping these switches. Switches shall be Cutler-Hammer Series E50, NEMA 6P+ with epoxy potted cord sets or approved equal.

In addition to the hand release limit switch, mount two lever type limit switches on each brake. One shall indicate that the brake is fully set, the other that the brake is fully released. Assure that the brake

released limit switch (which shall have two normally open contacts) trips when the brake is electrically released or hand released. The brake set limit switch shall have one normally open and one normally closed contact and shall trip when the brake is fully set. Switches shall be Cutler-Hammer Series E50, NEMA 6P+ with epoxy potted cord sets or approved equal.

Each thruster actuator shall be provided with a time delay valve adjustable between 0 and 5 seconds for setting the brake. Only an internal time delay valve constructed of stainless steel is acceptable. Adjustment must be infinitely adjustable between the minimum and maximum settings. These adjustments must be allowable with the brake in full service. Set the down-stroke time delays of the thrusters in such a manner that the brakes will not be applied simultaneously should electric power fail while the span is in motion. Adjust the intervals between the setting of the brakes to obtain smooth stopping of the span in the shortest possible time.

Provide the oil used in the thruster operating chambers of the brakes to be of a grade as recommended by the manufacturer and approved by the Resident. It shall have a free operating temperature range between -40 degrees and 66 degrees Celsius.

Provide 480-volt, three-phase, 60 Hertz, totally enclosed, squirrel cage motors controlled by magnetic contactors with manual-reset thermal overload relays to actuate the thrusters. The rated stalled thrust of each thruster shall be not less than 135 percent of the thrust actually required to release the brake with the torque adjusted to the continuous rated value.

All exposed ferrous material shall be treated with a nitrocarburising process. This process shall improve wear resistance, lower the coefficient of friction and greatly reduce the tendency to weld or seize with a metallic counterpart. It shall also vastly improve corrosion resistance properties. The nitriding process shall produce a thick E-Nitrite layer of at least 12µm. Painting and other finishes are not an acceptable replacement for Nitriding.

Equip each brake with a NEMA 3R enclosure, which encloses the entire brake assembly, including the brake thruster unit, and the brake wheel, and should not prevent brake hand release operation.

The brakes shall be type MBT/E as manufactured by Mondel Engineering or approved equal by Bubenzer or Ametek.

Programmable Logic Controller System (PLC)

Bridge control logic functions shall be performed by a Programmable Automation Controller system, which shall provide for operation of the bridge and its auxiliaries in accordance with the system functioning specified herein and the control logic shown on the Plans.

The Programmable Automation Controller shall be an Allen Bradley (AB) ControlLogix brand PLC with components, hardware and remote input/output drops or approved equal by Modicon or General Electric. The PLC shall be of modular construction, provide high-speed peer-to-peer networking, and be programmable with ladder logic.

The PLC system will consist of redundant CPU's. Only one CPU will be in use at a time, and the other CPU will be offline and de-energized. A selector switch mounted on the door of the control cabinet will select the CPU in use.

Modules are defined herein as devices that plug into a chassis and are keyed to allow installation in only one direction. The design must prohibit upside down insertion of the modules as well as safeguard against the insertion of a module into the wrong slot or chassis via an electronic method for identifying a module. Electronic keying performs an electronic check to insure that the physical module is consistent with what was configured. The Programmable Automation Controller shall have downward compatibility whereby all new module designs can be interchanged with all similar modules in an effort to reduce obsolescence. The Programmable Automation Controller shall have the ability to be updated electronically to interface with new modules.

All hardware of the Programmable Automation Controller shall operate at an ambient temperature of 0 to 60 degrees C (32 to 140 degrees F), with an ambient temperature rating for storage of -40 to +85 degrees C (- 40 to +185 degrees F). The Programmable Automation Controller hardware shall function continuously in the relative humidity range of 5% to 95% with no condensation. The Programmable Automation Controller system shall be described and tested to operate in a high electrical noise environment.

The Programmable Automation Controller shall have the capability of addressing over 100,000 discrete points or 4000 analog points. It shall also have the ability to communicate with up to 500 connections that contain I/O. Each input and output module shall be self-contained and housed within a chassis. These chassis, with their respective modules, shall contain up to 512 (16 modules x 32pts/module, using a 17 slot chassis) unique points. The Programmable Automation Controller shall include as an optional feature the capability of addressing remote input and output modules on ControlNet, DeviceNet, EtherNet/IP, "RIO", HART and Foundation Field Bus.

The Programmable Automation Controller shall use multiple independent, asynchronous scans. These concurrent scans shall be designated for processing of input and output information, program logic, and background processing of other controller functions. Input and output devices located in the same backplane (local I/O) as the CPU will produce at the rate of the configured RPI (Requested Packet Interval), and for discrete input modules enabled for Change Of State (COS), at the time any point changes state.

The Programmable Automation Controller shall have the ability to communicate with multiple remote I/O racks or devices configured with multiple I/O modules. Networks that allow remote I/O include "Remote I/O", ControlNet, EtherNet/IP, DeviceNet, HART, and Foundation Field Bus. It shall be possible to communicate with remote I/O racks or other PACs via fiber optic cable by inserting fiber optic converters into the links. The fiber link must support distances up to 82,000 cable feet (25KM). Redundant fiber optic cabling shall be an option.

The Programmable Automation Controller shall have the ability to support multiple data communications networks in the same chassis by using DH+, DH-485, HART, ControlNet, DeviceNet,

Ethernet/IP, Programmable Multi Vendor Interface (RS232) modules, as well as other commonly used networks.

The Programmable Automation Controller shall have one dedicated 9-Pin D-shell serial port, which supports RS-232-C signals at baud rates from 110bps to 38.4Kbps or a Universal Serial Bus Type B port (USB 2.0) communicating at 12mb/sec The 9-Pin serial port shall be accessible in control logic and provide support for DF1 Master, DF1 Point to point, DF1 Slave, DF1 Radio Modem, Modbus Master/Slave, DH-485 (messaging only) and ASCII Read/Write communication protocols. The USB port is a device only programming port. Both RS-232 and USB ports must be usable for programming and data monitoring purposes.

Controller Hardware

The CPU shall be a self-contained unit, and will provide control program execution and support remote or local programming. This device will also supply I/O scanning and inter-controller and peripheral communication functions. The operating system firmware shall be contained in non-volatile memory. An option shall be possible to store both the user program and system firmware in a removable non-volatile memory for backup/restore purposes. The operating system firmware can be updated via a separate software update tool to allow for easy field updates. The controllers shall allow the operating system to be updated using a suitably configured removable non-volatile memory card. The controller shall contain a minimum of 4 Mbytes of user memory.

In a single chassis system all system and signal power to the controller and support modules shall be distributed on a single backplane. No interconnecting wiring between these modules via plug-terminated jumpers shall be acceptable.

The CPU within the system shall perform internal diagnostic checking and give visual indication to the user by illuminating a “green” (OK) indicator when no fault is detected and a “red” (OK) indicator (Blinking or Solid) when a fault is detected or by way of a display screen scrolling an error code and message. The front panel on the Controller shall include color LED indicators or 4-digit display showing the following status information:

- Program or Run mode of the controller
- The fault status of the controller.
- I/O status
- RS-232 or Secure Digital (SD) activity
- Battery or Energy storage module (ESM) status
- Force LED

The front panel of the Controller shall include a mounted keyswitch. The key shall select the following Controller modes: RUN – No control logic edits possible, program always executing; PROGRAM – Programming allowed, program execution disabled; and REMOTE – Programming terminal can make edits and change controller mode, including test mode, whereby the logic executes and inputs are

monitored, but edits are not permanently active unless assembled. The front panel of the Controller shall include a holder and a connector for a lithium battery or an energy storage module to provide power backup for user programs and data when the main power supply is not available. The front panel of the Controller shall include a 9-pin D-shell serial RS232 port or USB port, to support upload and download, online edits, firmware upgrades, and bridging to other modules in the same chassis.

All system modules, local and remote chassis shall be designed to provide for free airflow convection cooling. No internal fans or other means of cooling, except heat sinks, shall be permitted. All system modules including the controller may be removed from the chassis or inserted in to the chassis while power is being supplied to the chassis without faulting the controller or damaging the modules. This is known as Removal and Insertion Under Power (RIUP). Alternately a software configurable option shall exist to fault the controller if required.

Power Supplies

The Programmable Automation Controller shall operate in compliance with an electrical service of 85 to 265 VAC (120 to 220 VAC nominal), single phase, in the frequency range from 47 to 63 Hz, or 18-32 VDC (24VDC nominal).

A single main power supply shall have the capability of supplying power to the CPU and local input/output modules. Other power supplies shall provide power to remotely located racks. The power supply shall automatically shut down the Programmable Automation Controller system whenever its output power is detected as exceeding 125% of its rated power. The power supply shall monitor the incoming line voltage for proper levels. When the power supply is wired to utilize AC input, the system shall function properly within the range of 85 to 265 VAC. When the power supply is wired to utilize DC input, the system shall function properly within the range of 18 to 32 VDC. The power supply shall provide surge protection, isolation, and outage carry-over of up to 6 cycles of the AC line (120-240VAC, 50/60Hz) or 40ms @ 24VDC. Design features of the Programmable Automation Controller power supply shall include a diagnostic indicator mounted in a position to be easily viewed by the user. This indicator shall provide the operator with the status of the DC power applied to the backplane. In addition, a means of disabling power to the CPU shall be possible from a power disconnect switch mounted in a position easily accessible by the operator. At the time of power-up, the power supply shall inhibit operation of the controller and I/O modules until the DC voltages of the backplane are within specifications. In addition to the electronic protection described above the power supply shall offer a failsafe fuse that is not accessible by the user.

Program Creation and Storage

Memory state shall be selectable to allow for the most economical match to the intended application. It shall be possible to upgrade to a controller with a larger memory size simply by saving the program, upgrading the controller and downloading the program to the new system without having to make any program changes. Memory shall be backed up by either battery or energy storage module and are capable of retaining all stored program data through a power cycle. A low battery condition must be detectable in ladder logic, but shall not automatically generate a major fault. A low energy condition will generate a minor fault and will be detectable in ladder logic.

The controller will write all variable data to internal nonvolatile memory storage (Flash) during the power down cycle. The controller shall provide the capability to use commercially available, removable nonvolatile memory storage. The card shall be available from the supplier as an industrial rated device suitable for use in the same environment as the controller.

The controller will have the ability to store the user program, controller firmware and firmware for all other modules residing in the same chassis to the removable nonvolatile memory card. Additionally when memory is restored a user selectable option to be restored in Run mode or Program mode shall be provided. The controller shall have the capability to insure, that if required modules in the chassis are flashed using the firmware files stored on the removable nonvolatile memory card, to the correct revision level for the project. The removable nonvolatile memory card shall support a Windows file system allowing multiple files to be stored on the card. The user can manually trigger the controller to save or load from the card and also configure the controller to load from the card on power up. The operator should be able to backup volatile memory, including data and program logic onto a personal computer storage device.

All user memory in the controller not used for program storage shall be allocable from main memory for the purpose of data storage. The Programmable Automation Controller system shall be capable of storing 4 data types:

- Predefined
- User-defined
- Module-defined
- Add-on defined

Predefined data types include the following: alarm, axis, bool, cam, cam-profile, control, coordinate system, counter, etc User defined data is limited to structures. Each structure contains one or more data definitions called members. Object includes a structure for each I/O module and system or module specific information (hidden from user). Add-on defined data type includes the Local and Parameter tags of the add-on instruction. It does not include the logic. Any data can be displayed in ASCII, Binary, Octal, Hexadecimal, or Decimal radices. Function-specific data types such as PID, Axis, Axis Group or Message shall have dedicated displays available annotating the meaning of specific control bits and words within them and allowing for selective control where appropriate.

If instructions or entire rungs are intentionally deleted from an existing logic program, the remaining program shall be automatically repositioned to fill this void. Whenever contacts or entire rungs are

intentionally inserted into an existing program, the original program shall automatically be repositioned to accommodate the enlarged program. All rung comments shall maintain their original links.

The number of times a normally open (N.O.) and/or normally closed (N.C.) contact of an internal output can be programmed shall be limited only by the memory state to store these instructions. The number of times a timer or counter can be programmed shall be limited only by the memory state to store these instructions. Controller programs shall have immediate access to the sub elements of control structures by address and sub element mnemonic, such as timer accumulator value, timer done bit, or PID Process Variable value.

Interfacing and Peripherals

The programming software shall be on a Windows 7 workstation. The workstation shall have the capability to be remotely located a maximum of 10,000 cable feet (3048 meters) from the controller over DH+ at 57.6 K-Baud or a maximum of 3280 cable feet (1000 cable meters) from the controller over ControlNet. The workstation shall also be able to connect via Ethernet or RS232 for remote access.

The Programmable Controller system shall be able to interface with a data terminal, which is RS-232-C compatible (up to 38400 baud) or via USB 2.0 @ 12mb/s to generate hard copy messages. The system shall have the capability to interface to a floppy disk, CD-ROM, DVD and/or a hard disk for loading a user program into, or recording the contents of, the controller's memory. It shall be possible to load or record the entire contents of memory.

Communication Interfaces

The Programmable Automation Controller shall have communication interface modules for Ethernet/IP, ControlNet, DeviceNet, DH+, DH-485, Remote I/O (RIO), and RS232, HART and foundation field bus.

The Ethernet/IP interface shall support the following:

- Standard TCP/IP communications
- Standard Ethernet media (10base2, 10base5, 10baseT, 100baseT, fiber)
- CSMA/CD access method
- Subnet masking
- Standard repeaters, bridges, routers, host computers, peer PLCs.
- RJ-45
- Bootp client
- Manual configuration using RSLogix5000, RSLinx, or BootP/DHCP Servers.
- Programmable controller messaging to peer controllers and workstations
- I/O Control

- Device Level Ring (DLR)
- CIP Motion (Motion over Ethernet/ IP)

The Ethernet/IP interface shall support bridging between Ethernet/IP links within a ControlLogix chassis. The Ethernet/IP interface shall support bridging to ControlNet, DH+, DH-485, DeviceNet, and other controllers. Bridging allows for configuration (program up/download) and data collection.

The DH/RIO interface shall support the following:

- Two channels of communications
- Each channel independently configurable for DH+ or RIO
- DH+ baud rate shall be 57.6, 115, 230 Kbaud
- DH+ will support routing tables
- RIO baud rates shall be 57.6, 115.2, 230.4 KBaud
- Message error checking
- Retries of unacknowledged messages
- Diagnostic checks on other stations

The DH+ interface shall support bridging to/from ControlNet, EtherNet and DeviceNet.

Programming

The programming format shall be IEC 1131-3 compliant Ladder Diagram (LD), Function Block Diagram (FBD), Sequential Function Chart (SFC), and Structured Text (ST) languages. The controller shall organize user applications as Tasks, which can be specified as continuous, periodic, or event based.

Periodic tasks shall run via an interrupt at a user-defined interval in one microsecond increments from 1 millisecond to 2000 seconds. The interrupt mechanism of periodic and event tasks shall adhere to the IEC 1131-3 definition of pre-emptive multitasking. The controller shall be able to accommodate a maximum of 32 individual tasks of which one can be continuous. The periodic and event tasks shall have an associated, user assignable priority from one to fifteen (one being the highest priority), which specifies that task's relative execution priority in the multitasking hierarchy. The event task can be triggered by hardware events (an input point) or software events (event instruction). Each task shall have a user settable watchdog timeout which is unique to that task. Each task can include a maximum of 100 programs, which can be prioritized for execution within the task. Each program can include routines programmed in LD, FBD, SFC, or ST languages. One of the routines can be specified as the main routine and one can be specified as an optional fault routine. All routines shall be capable of being edited when on-line. The number of routines which can be contained in a program is limited only by memory.

Variables within the controller shall be referenced as unique, default or user defined tags. Tag naming convention shall adhere to specifications in IEC 1131-2. Tags may be created off-line, on-line and at the same time the routine logic is entered. The system shall have the capability to store user tags names in

the controller. Tags shall be available to all tasks in the controller (Controller Scoped) or limited in scope to the routines within a single program (Program Scoped) as defined by the user. Any tag shall have the ability to be aliased by another tag, which is defined and has meaning to the user. The ability to program control logic via tags of the Programmable Automation Controller shall exist.

It shall be possible to program ladder diagram rungs with the following restrictions:

- Series instruction count limited only by user memory
- Branch extensions limited only by user memory
- Branch nesting to six levels

The capability shall exist to interleave input and output instruction types on the same contiguous rung in the ladder diagram rungs. The capability shall exist to change a contact from normally open to normally closed, add instructions, change referenced tags, etc. It shall not be necessary to delete and reprogram the entire ladder diagram rung. It shall be possible to insert ladder diagram rungs anywhere in the program, even between existing rungs, insofar as there is sufficient memory to accommodate these additions. A single program command or instruction shall suffice to delete an individual ladder diagram rung from memory. It shall not be necessary to delete the rung contact by contact. A clock/calendar feature shall be included within the CPU. Access to the time and date shall be from the programming terminal or user program.

Latch functions shall be internal and programmable. The system shall have the capability to address software timers and software counters in any combination and quantity up to the limit of available memory. All management of these instructions into memory shall be handled by the CPU. Instructions shall permit programming timers in the "ON" or "OFF" delay modes. Timer programming shall also include the capability to interrupt timing without resetting the timers. Counters shall be programmable using up-increment and down-increment. Timer instructions shall have a time base of 1.0 milliseconds. The timing range of each timer shall be from 0 to 2,147,483,648 increments. It shall be possible to program and display separately the timer's preset and accumulated values.

The Programmable Automation Controller shall use a signed double integer format ranging from -2,147,483,648 to +2,147,483,648 for data storage of the counter preset and accumulated values. The Programmable Automation Controller shall store data in the following formats:

- Boolean values (0 or 1).
- Short Integer Numbers ranging from -128 to +127.
- Integer Numbers ranging from -32,768 to +32,767.
- Double Integer Numbers ranging from -2,147,483,648 to +2,147,483,647.
- Floating Point Numbers consisting of eight significant digits. For numbers larger than eight digits, the CPU shall convert the number into exponential form with a range of plus/minus 1.1754944 E -38 to plus/minus 3.402823 E +38.
- Long Integer Numbers consisting of 64 bits.

The capability shall exist to organize data in the form of User Defined Data Structures. All aforementioned data types, as well as others, can be used in such structures along with embedded arrays and other User Defined Structures.

The Programmable Automation Controller shall have support for integer and floating point signed math functions consisting of addition, subtraction, multiplication, division, square root, negation, modulus, and absolute value. Trigonometric instructions supported must include Sine, Cosine, Tangent, Inverse Sine, Inverse Cosine, and Inverse Tangent. These instructions must fully support floating-point math. Additional floating point instructions supported must include Log 10, Natural Log, and Exponential. It shall be possible to complete complex, combined calculations in a single instruction, such as flow totalizing or equations of the format $((A+((B-C)*D))|E)$.

File function instructions supported shall also include Sort, Average and Standard Deviation. Value arrays shall be limited in size only by the amount of available memory. Arrays shall be configurable with one, two or three dimensions. The CPU shall support indexed addressing of array elements. Array element manipulation instructions such "array copy" (COP), "array copy with data integrity" (CSP) and "array fill" (FLL), "array to array" (MOV), "element to array" (FAL), "array to element" (FAL), and "first in-first out" (FIFO) shall be supported by the system. The four function and math instructions and instructions for performing "logical OR", "logical AND", "exclusive OR", and comparison instructions such as "less than", "greater than", and "equal to" shall be included within the system. All instructions shall execute on either single words or array elements.

For any module specifically associated with the Programmable Automation Controller, it shall be possible to configure operation and query the current status of all channels through controller scoped tags without any programming.

The system shall contain instructions, which will construct word shift registers (SQI, SQO, and SQL). Additional instructions shall be provided to construct synchronous bit shift registers (BSR and BSL).

The Programmable Automation Controller shall have a jump instruction which will allow the programmer to jump over portions of the user program to a portion marked by a matching label instruction.

The Programmable Automation Controller shall have an embedded motion planner capable of doing coarse motion planning for up to 100 axes. This planner must be the highest priority task of the controller.

The Programmable Automation Controller shall have a ladder diagram instruction interface to the motion planner which allows the user to request that the motion planner create and execute a specific motion profile. The profile can be changed dynamically through the ladder diagram program.

The Programmable Automation Controller shall have the ability to provide a master system clock and the 1588 PTP v2 CIP Sync object to allow time synchronization and transport and routing of a system clock to the control system and motion axes in a local chassis or on an Ethernet/IP network.

It shall be a function of the CPU to automatically manage all data types. For example, if a word stored in an Integer tag is transferred into a Floating Point tag, the CPU shall convert the integer value into floating point prior to executing the transfer.

In applications requiring repeatable logic it shall be possible to place such logic in a subroutine section. Instructions which call the subroutine and return to the main program shall be included within the system. It shall be possible to program several subroutines and define each subroutine by a unique program file designator. The controller will support nesting of subroutines up to available stack at the moment of the call. It shall be possible to pass selected values (parameters) to a subroutine before its execution. The number of these parameters is limited only by available memory. This allows the subroutine to perform mathematical or logical operations on the data and return the results to the main program upon completion. These subroutines will be accessed by jump-to-subroutine instructions.

The system shall have the capability to enter rung comments above ladder diagram rungs. These comments may be entered at the same time the ladder logic is entered. The program shall be fully commented.

The capability shall exist for adding, removing, or modifying logic during program execution in routines of LD, FBD, SFC, and ST languages. When changes to logic are made or new logic is added it shall be possible to test the edits of such logic before removal of the prior logic occurs. It shall be possible to manually set (force) either on or off all hardwired discrete input or output points from the programming panel. It shall also be possible to manually set (force) an analog input or output to a user specified value. Removal of these forced I/O points shall be achieved either individually or totally through selected keystrokes. The programming terminal shall be able to display forced I/O points.

A means to program a fault recovery routine shall exist. When a major system fault (Controller Fault) occurs in the system, the controller fault recovery routine shall be executed and then the system shall determine if the fault has been eliminated. If the fault is eliminated, program execution resumes. If the fault still exists, the system will shut down. The capability shall exist for each program to have its own fault routine for program fault recovery. Each having the same features as the controller based fault routine. An instruction shall be available to give the control program diagnostic information, state control, and sequencing of a process simultaneously, while allowing the capability of user-friendly state programming techniques.

An instruction shall be supported to incorporate closed loop control systems. The "proportional", "integral", and "derivative" elements shall be accessible to the user in order to tune a closed loop system. This instruction must fully support floating-point math.

The system shall support both bit and word level diagnostic instructions.

To facilitate conditional event detection programming, output instructions shall include "one shot" instructions, which may be triggered on either low-to-high (rising) or high-to-low (falling) rung conditions. To facilitate debugging, an "always false" instruction shall exist which may be utilized to temporarily inhibit the execution of control logic.

The controller shall support Master Control Reset (Relay) type functionality to selectively disable sections of logic.

The controller shall include direct support of FOR-NEXT loop constructions.

Controller files will have the ability to be exported and edited in L5k, (text) format or XML format.

UPS: Furnish and install one UPS unit. The UPS shall be rated for 5KVA (minimum). The UPS shall be rated to provide power for 20 minutes at half load and 10 minutes at full load. The Contractor shall provide UPS sizing calculations for Resident approval. The UPS shall be rated for 120VAC input and 120VAC output. The UPS output shall be a sine wave with less than 3% distortion. The UPS unit shall provide automatic bypass and an audible alarm upon UPS failure. The UPS shall have provisions for hardwired connections.

Noise Filter

The Contractor shall furnish and install one active tracking noise filter on the input of each PLC rack. The noise filter shall be a series connected high frequency noise filter with transient protection. It shall offer hard wired connection to all critical loads and rated for an industrial environment and equipment. It shall reduce mode transient to +/- 2 volts, have a surge capacity of 45,000 amps, provide transient protection in all modes (line to neutral, line to ground, and neutral to ground), have an LED power indication, and be UL approved. The 120VAC MCOV shall be rated 150 VRMS. The line frequency response time shall be less than 0.5 nano-seconds. The operating temperature shall be -40°F to 115°F at full load. The unit shall be capable of protecting against a peak surge current of 15,000amps in all modes. The noise filter shall be the Islatrol® IC+/LRIC+ Series manufactured by Emerson Electric or Resident approved equal.

Laptop Computer

A laptop computer shall be provided to allow the PLC and vector drive programs to be modified as required in the future. It shall have the following features at a minimum:

- 3rd gen Intel® Core™ i7-3520M Processor (2.9GHz, 4M cache, Upgradable to Intel® vPro™ technology)
- Windows 7 Professional, No Media, 64-bit, English
- 14.0" HD (1366x768) Anti Glare LED-backlit
- 4GB2 DDR3 SDRAM at 1600MHz
- 500GB 7200rpm Hard Drive
- 8X DVD
- Express Card

- 1 Year Basic Hardware Service with 1 Year NBD Limited Onsite Service After Remote Diagnosis
Nylon Carrying Case
1Yr Ltd Hardware Warranty

The unit shall be an intelligent terminal, functioning both as a programming and a data terminal. It shall permit PLC programming, including loading, editing, and monitoring ladder diagram programs in memory by entering through the keyboard and monitoring on the display. Program instructions shall be in the form of standard symbols similar to those used for electromagnetic control equipment.

The laptop shall have the latest editions of Microsoft Word and Excel preinstalled, along with software packages required for programming, viewing, and interfacing and any other software tools required for the PLC and vector drives. The Contractor shall include all CD-ROM's, manuals and other materials. The Contractor shall provide all licenses and original CD-ROM or Disk copies with the computer for all software installed.

Monitored Operations

All span operations shall be datalogged, recording both operating parameters and faults/errors. The sequence of operations describes what faults shall be listed. The following parameters at minimum shall be logged:

- Drive motor Kilowatts
- Drive motor RPM
- Span position
- Errors
- Faults
- Any other functions as determined by the Resident

The kilowatt and position data shall be recorded at 10 samples per second, and all faults and errors shall have a time/date stamp at a minimum 1-second resolution. Additional parameters may be added during the shop test and bridge startup – these shall be included as part of this item.

Inclinometers

The inclinometers shall be liquid capacitive gravity based sensors with integrated sensor and excitation electronics. The thermal drift of the primary sensor shall be further compensated by an electronic equalization of the temperature. They shall have internal integrated highly stable voltage regulators making it possible to supply the inclinometer from any unregulated supply or battery as low as + 8V and up to +30V DC. The power shall be obtained from the measurement current loop, enabling operation with a two wire connection. The measuring principle shall assure a linear angle output with 4...20mAs calibrated to equal the measuring range of the sensor.

The inclinometers shall be suited for industrial use where high accuracy and long-term stability are required in a noisy environment and where high temperature changes occur and non-stable supply voltages are present such as bridges, mining, construction equipment and process machinery.

- Temperature compensated
- 4...20mA output
- Non regulated +8...+30 V power supply
- Integrated sensor electronics with 4...20m A excitation
- Linear output characteristics
- 2 wire connection – sensor power obtained from the current loop
- High measurement accuracy
- Very low relative linearity errors
- High long-term stability
- EMC protected
- Vibration and shock insensitive due to non mechanical internal parts
- Hermetically sealed housing to IP67
- Sensor galvanically isolated from housing
- Sensor zero mechanically adjusted with mounting ring
- Current loop limitation
- Hysteresis free measuring signal

Provide inclinometers with the following characteristics:

- Measuring Range: $\pm 80^\circ$
- Resolution: $< 0.01^\circ$
- Sensitivity: $0.1\text{mA}/^\circ$
- Max. Non-Linearity: $< 1 \cdot 10^{-3}$ FS
- Transverse Sensitivity: $< 1\%$ at 45° tilt
- Response Time: < 0.3 Sec.
- Temperature Drift of Sensitivity: $< -0.01\% / ^\circ\text{C}$
- Temperature Drift of Zero: $< \pm 10^{-3} / ^\circ\text{C}$
- Zero Offset: 12mA
- Power Supply: 8...30VDC non-regulated (either polarity)
- Current Consumption: Approx. 10 mA
- Housing: 30% Glass Filled PBT Plastic
- Environmental Protection: IP65
- Mounting: Flat Vertical Surface with Supplied Mounting Ring
- Operating Temperature: -40°F to $+185^\circ\text{F}$ (-40°C to $+85^\circ\text{C}$)
- Storage Temperature: -49°F to $+194^\circ\text{F}$ (-45° to $+90^\circ\text{C}$)

Proximity Switches

Lever-less mechanical limit switches shall be provided for span indication and interlocking. They shall be enclosed in a stainless steel housing rated NEMA 4X and 6P. They shall be provided with single pole, double throw contacts and sensing contacts rated for 10 amperes. The contacts shall be silver cadmium oxide, gold flashed, and shall have a temperature rating of -40 to 221 degrees F. They shall have a repeatability of 0.002", and a response time of 8ms. They shall be provided with six foot epoxy potted cordsets. They shall have a nominal sensing distance of 1/4", and shall be provided with a magnetic sensor that will provide for a 3/4" sensing distance. The lever-less limit switches shall be Model 81 GO switch with model AMP3 magnetic target as manufactured by Topworx or Resident approved equal.

Encoder Buffers

The encoder buffer shall accept 4-26 VDC signals and provide two independent and completely isolated line driver outputs of 5-26 VDC based on user defined voltage levels. It shall be provided with optically isolated inputs that accept quadrature or single channel inputs, with or without their complements, from differential line drivers, open collector, or from proximity probes. The encoder buffer shall also have the ability to repeat and amplify signals. Each output of the encoder buffer shall be user definable from 5 to 26 VDC. In addition to having short circuit protection, outputs shall be ESD protected according to MIL-STD-883. Each connector of the encoder buffer shall be equipped with two positions for +VCC and common, as well as two extra field accessible tie points. The encoder buffer shall be capable of driving the output signal up to 26 VDC, and will function with either output disconnected.

STANDARD OPERATING CHARACTERISTICS:

- Input Signal: 2 or 3 channel quadrature signal, sine or square wave, open collector, differential, or single ended line driver.
- Input Signal Current: 2.2 mA minimum, 3.5 mA typical
- Input Impedance: Optically isolated, 1 kOhm at 4V, 6.8 kOhms at 24V typical. Current limited.
- Frequency Range: 0 - 120 kHz
- Output Signal: Two independent, isolated line driver output sets (A/A, B/B)
- Supply Voltage: 5 - 26 VDC
- Output Current: 150 mA (maximum per channel)
- Wire Gauge Accepted: 26 -16 AWG
- Environmental range: 0°C to 50°C at 98% RH non-condensing

Deceleration check speed switches

The electronic speed switches shall be rotation monitoring systems with two adjustable set points designed to detect unwanted over speed, under speed or stoppage in motors. In the event of rotational failure, the relays can be used for equipment shutdown and to provide an alarm. The sensor receives a pulse output from a motor encoder buffer and measures this frequency signal to determine shaft speed, and compares this to the pre-adjusted set point. The relay output can then be used for equipment shutdown or to provide an alarm, assuring machine protection and process integrity. The sensor shall be fail-safe; any malfunction during operation will de-energize the control circuit.

- Input Power 115 Vac, 60 Hz
- Sensor Input Signal Type NPN Open Collector, Amplitude 5 Vdc, Pull-Up 4.7 KOhms, max Frequency Range 0-666.67 Hz

Set Point Data

- Under or Over Speed Set Point Relays Two form C, SPDT isolated 5A 115V ac resistive
- Set Point Adjustment Rotary Switches: (1) tens and (1) ones digit

General Specifications

- Housing and Cover NEMA1, Approved to UL 508 and CSAC 22.2 #14-95 Standards
- Stand-Alone Mounting

Automatic Transfer Switch

Provide high-speed, double-throw automatic transfer switch with quick-make/quick-break contacts, and operated by a single solenoid mechanism momentarily energized. It shall be inherently interlocked mechanically and electrically. Operating current for transfer shall be taken from the source to which the load is to be transferred. Failure of relays or disarrangement of any part shall not permit the transfer switch to assume a neutral position. The switch shall be positively locked mechanically in either position without the use of hooks, latches, magnets, or springs. Main contacts shall be silver surfaced and shall be protected by magnetic blowouts, arc barriers, and arcing contacts. The main power transfer switches shall be a three-pole, 480-volt switches, ampacity as shown on the plans, with fully rated overlapping neutral contacts in accordance with UL 1008. They shall be furnished in a NEMA 12 enclosure, ready for incorporation into the bridge power distribution.

Include the following features and accessories in the automatic transfer switches:

A time delay to override momentary preferred source outages to delay all transfer switch signals. The time delay shall be field adjustable from 0.5 to 6 seconds and factory set at 3 seconds.

Independent three-phase voltage and frequency sensing of the primary and secondary sources. The pickup voltage shall be adjustable from 95 to 100 percent of nominal. Transfer to secondary source shall occur when secondary source voltage is 95 percent or more of nominal.

A time delay on retransfer to the preferred source. It shall be field adjustable from 1 to 30 minutes.

Red and green pilot lights mounted on the Power Distribution Cabinet door to indicate switch position.

Two sets of normally open and normally closed auxiliary contacts indicating switch position. One set shall be PLC inputs, and the other set shall be a spare.

A test switch mounted on the cabinet door to momentarily simulate normal source failure, with connection for remote testing.

An internal contact to allow a remote switch on the control console to prevent re-transfers.

Remote transfer capability from normal to generator power switched by a remote switch on the control console.

Control Apparatus and Miscellaneous Equipment

Control apparatus shall conform to the applicable requirements of NEMA Publication No. ICS, latest revision, Industrial Control and Systems, rated as shown on the Plans or as required and to the following:

Multi-Functional Power Monitor: The Multi-Functional Power Monitor shall be rugged metal housing with standard switchboard dimensions and cutout per ANSI 39.1. It shall be 300 volts phase to neutral, 600 volts phase to phase, for 277/480 connection. Three (3) current inputs, 5A nominal current input, Continuous overload 10A maximum. Frequency range from 45-75 Hz and a operating temperature of -20C to +70C. All meter setup parameters and Max/Min data should be contained in Non-Volatile RAM. The monitor should measure true RMS and have 64 samples per cycle with 1-second-update time. The Multi-Functional Power Monitor shall be DMMS 350 manufactured by Electro Industries/GaugeTech or equal as approved by the Resident.

Circuit Breakers: All branch circuits from the power buses shall be protected by molded-case circuit breakers mounted on the control panels. All breakers shall have quick-make and quick-break contacts, and the mechanism shall be trip-free and trip indicating. All circuit breakers and motor circuit protectors shall be provided with at least two form C auxiliary contacts for PLC input and status indication. Frame sizes shall not be less than 100 amperes. The breakers shall be equipped with

thermal-magnetic trips or adjustable, instantaneous, magnetic trip units, with trip rating as shown on the Plans or as required. Molded-case circuit breakers shall meet the requirements of the latest revision of NEMA Publication No. AB1. The service entrance circuit breakers are to be 600 volt rated, frame size as indicated on the plans and shall be provided with electronic trip unit with independently adjustable short time pick-up and time delay, set to trip as per the plans. Interrupting capacity shall be no less than 100,000 AIC. Circuit breakers shall be Westinghouse Series C, Type LD with LS trip unit, Type TA or Resident approved equal manufactured by General Electric or Square D Company.

Motor Starters and Magnetic Contactors: The continuous current rating of contactors and starters shall be adequate for the connected loads, and no starters shall be smaller than NEMA Size 0 unless otherwise noted. All starters shall be full voltage types, 600 VAC, 60 Hertz, rated with 120 VAC operating coils. All contact poles shall be provided with arc chutes, and contactors rated 150 amperes and above shall be equipped with magnetic blowouts. Three-element manual reset overload relays shall be provided to protect gate and lock motors and wiring against overheating due to excessive current. Heater elements are to be selected based on motor full-load running current. Each overload relay shall be provided with a set of auxiliary form C contacts for PLC interfacing and indication. Reversing contactors shall be electrically and magnetically interlocked.

Service Disconnect Switches: Unfused safety switches, for use as disconnects, shall be installed where shown on the plans. The switches shall be nonfusible, heavy-duty, 600 VAC safety switches in watertight and dust-tight NEMA 4X, stainless-steel enclosures. Each disconnect shall be furnished with two N.O. auxiliary contacts and phenolic nameplate to identify the switch. The rating shall be as required and/or shown on the plans.

Motor Disconnect Switches: Unfused safety switches for use as disconnects, where required, shall be installed within the range of view of its respective motor, brake, or span lock. The switches for the main motors and span lock motors shall be tag out lockable, non-fusible, heavy-duty, safety switches, rated as shown on the Plans, in waterproof, NEMA 4X, stainless steel enclosures. The span drive motor disconnect switches shall be provided with auxiliary contacts for disconnecting the motor disc brakes. Each disconnect shall be furnished with a N.O./N.C. auxiliary contact and phenolic nameplate to identify corresponding motor.

Brake motor disconnect switches: The disconnects shall be three pole manual motor starting switches rated 30 amperes. They shall be provided with a weatherproof housing and shall be Resident approved equal to the Square D class 2520 type KW2.

Control Relays: Auxiliary control relays shall be multi contact magnetic relays with contacts rated at 10 amperes, 600 volts, on a continuous basis. Relays known to meet the specified requirements are the Square D class 8501 type X or approved equal.

Phase Failure and Reversal Relay: This relay shall prevent energizing operating the span in the event of reversed phase sequence, loss of one phase, or low voltage. The phase failure and reversal relay shall be the Square D Class 8430 Type MPD or approved equal.

Selector Switches and Pushbuttons: Pushbuttons and control switches shall be heavy-duty, oil-tight, contact blocks operated by glove handle selector knobs, key switches and push-button operators as indicated on the Plans. Contacts shall be fine silver, capable of interrupting 6 amperes at 120 volts AC, and of continuously carrying 10 amperes. Switches and pushbuttons shall be Square D class 9001, type K, NEMA 4 or approved equal.

Indicating Lights: Indicating shall be heavy-duty, oil-tight pilot lights with one or two fields as required as per the plans. They shall be provided with LED lamps the color of the lamp lens and shall be rated at 120 VAC. Where group testing cannot be accomplished through the PLC the lights shall be provided with a push to test feature. All lenses shall be glass, with color and marking as shown on the Plans.

Terminal Blocks: Terminal blocks for conductors of Size No. 8 AWG and smaller shall be stud and nut type one-piece blocks of phenolic or 125 °C material recognized under the UL Component Recognition Program. Barriers shall be not less than 13mm high and 3mm thick and shall be spaced 16mm center-to-center. Straps, studs and nuts shall be of brass, nickel plated for use in highly corrosive atmospheres, and shall be rated for 50 amperes for a terminated conductor. The blocks shall provide a withstand voltage rating of 600 volts per IEEE switchgear standards. The terminal blocks shall provide studs and nuts suitable for use with flanged fork wire connectors. Corrosion resistant marking strips shall be provided for conductor identification. At least ten-percent spare terminals shall be provided. Terminal blocks shall be Buchanan Type 2B112, General Electric Series CR 151B or Marathon 1500 Series or Resident approved equal.

Terminal Connectors: Terminal connectors shall be seamless, heavy duty compression locking fork terminals manufactured from pure electrolytic copper tubing. Terminals shall be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools must be approved by the Resident.

Power Distribution Blocks:

Power distribution blocks for all conductors larger than No. 8 AWG, shall be fingersafe, fabricated from copper and approved equal to Ferraz Shawmut FSPDB series, sized as required. Finger-safe fully insulated block shall ensure that no one can touch live parts. They shall be provided with recessed termination screws and wire openings providing IP20 grade protection and qualify as "finger-safe" per IEC 529, integral DIN rail adaptors allowing for quick and easy installations on 35mm DIN rail, and captive termination screws. Provide end anchors for rigid end stops.

Nameplates:

Nameplates shall be provided for all aforementioned devices and shall be made of laminated phenolic plastic with white front and back and black core and shall be not less than 2.3mm thick. The lettering shall be etched through the front layer to show black engraved letters on a white background. Lettering shall be not less than 6mm high, unless otherwise detailed on the Plans. Nameplates shall be securely fastened to the equipment with stainless steel screws.

Transient Voltage Surge Suppression:

The Transient Voltage Surge suppression module shall be an active tracking network (ATN) UL 1283 listed as an EMI/RFI filter. It shall be rated for 300 KA and shall be for a nominal 480 VAC delta electrical system. All components shall be encapsulated to provide a high dielectric and protection from adverse environmental conditions. Large diameter MOVs (Metal Oxide Varistors) shall be provided to protect against high stress transient environments. It shall be provided with comprehensive monitoring of critical system functions, with real-time audible and visual reporting of unit status, phase loss/ protection loss and transient events (alarm with reset and mute). It shall be provided with a dual function surge counter provides non-volatile event history recording. It shall be provided dry form C contacts for remote status monitoring, integral disconnect switch and LED monitoring on each phase. The enclosure shall be NEMA Type 4 (IP66) stainless steel enclosure. It shall be listed UL 1449 2nd Edition for surge suppression devices, and UL 1283 complementary.

The TVSS shall be an Eaton PTE300NN400-SD-D or approved equal by Square D or Siemens.

Transformers

Step Down Transformers

Provide ventilated dry type transformers designed according to the latest revision of NEMA ST-20. Ratings for the transformers shall be as shown on the plans. Provide transformers designed for continuous operation at rated KVA, 24 hours a day, 365 days a year. Required performance must be obtained without exceeding 150° C average temperature rise by resistance or 180° C hot spot temperature rise in a 40° C maximum ambient and 30° C average ambient. Maximum coil hot spot temperature shall not exceed 220° C. Transformers shall be equipped with solid copper cores.

Service Lighting Power and Control

Each panelboard shall be of the dead-front type and shall be provided with quick-make, quick-break, thermal-trip, E-frame, branch circuit breakers. Each breaker shall trip free of the operating handle, and the handle shall indicate the position of the breaker. Each panelboard shall be provided with a circuit breaker in the mains and with a full-sized neutral bar. All branch circuits shall be numbered, and a type written directory shall be provided on the inside of each door. Circuit breakers shall meet the requirements of UL Standard 489.

All panelboards shall be 120/208 volt, 3-phase, 4-wire panels surface or flush mounted as called out on the Plans. Panelboard enclosures shall be code gauge galvanized steel with ANSI 61 light gray enamel finish. Panelboards shall be approved equal to Westinghouse Pow-R-Line Series, General Electric A Series or Square-D Type QO.

All receptacles shall be 20-ampere, 125-volt, three-wire, ground-fault-indicating type, polarized, duplex, convenience outlets. Each receptacle shall be a heat-resistant melamine body, flush or surface mounted in an outlet box, and shall be provided with a waterproof cover plate. Receptacles shall be specification grade Resident approved equal to those manufactured by Hubbell, Arrow Hart or Leviton.

All lights shall be controlled from tumbler switches as shown on the Plans. All tumbler switches shall be specification grade, 20-ampere, 125-volt switches. Switches shall be mounted in waterproof, cast-brass, surface mounted boxes. Switches shall be mounted 4 feet above the adjacent floor or platform. Switches shall be Specification Grade switches manufactured by Hubbell, Arrow Hart, Leviton or approved equal.

The Contractor shall furnish two portable hand lamps. Each hand lamp shall have 50 feet of extra-heavy, Type S0, three-conductor, No. 14 AWG cable. Each cable shall be provided with lamp holder, guard, half-shade, and molded-on rubber cap. A 100-watt rough service lamp shall be furnished with each lamp.

Service lighting within the electrical rooms and the control room shall be under the bridge Architectural Plans and Specifications.

Service lighting on the piers and at access stairwells shall be vaportight marine LED lighting fixtures. The fixtures shall be located to illuminate all stairwells, walkways, and work areas, to the satisfaction of the Resident. The junction box type shall be used for wall mounting. Enclosures are to be cast aluminum.

Bridge Control Cabinets

Control panels enclosed in freestanding cabinets shall be furnished and installed in the operator house and machiner spaces where shown on the Plans. All circuit breakers, UPS, PLC racks, switches, contactors, relays, regulating equipment, and other apparatus for control of the span and its auxiliaries shall be mounted on these enclosed panels. The arrangement and line-up of the individual control cabinets shall be as shown on the Plans.

All equipment in each control cabinet shall be mounted on sheet-steel bases, and each device shall be front-connected, front-wired, and removable from the front. The equipment in all cabinets shall be arranged for ease of access and for safety and convenience of operation. Special care shall be taken to obtain a systematic and neat arrangement of the equipment. Each device shall be suitably named and plainly marked by a laminated nameplate mounted near the device on the panel. Each nameplate shall show an approved descriptive title for the apparatus, together with the device designation appearing on the schematic wiring diagrams.

Each indoor control cabinet shall be a NEMA Type 12 enclosure constructed of No. 12 gauge sheet-steel and shall be reinforced with steel angles or channels to provide a rigid, freestanding structure. Exterior control cabinets shall be NEMA 4X or NEMA 12 stainless steel. The control cabinets shall be provided with hinged doors on the front of each panel section. Door panels shall be gasketed and shall be provided with three-point, vault-type latches. Drive and control panels shall be provided with fan and filter ventilation. All hardware shall be corrosion resistant. Thermostatically controlled strip heaters shall be provided in each cabinet to prevent build-up of excess moisture. Each panel shall be provided with suitable interior light fixtures and a duplex receptacle.

Each control panel enclosure shall be as shown on the plans. If the final cabinet dimensions, as established by the manufacturer, should necessitate rearrangement or modification of the equipment in order to fit in the available space, such rearrangement or modifications shall be made and at no extra cost. The final arrangement of all equipment in the operator house shall be subject to the approval of the Resident.

The indoor control panel enclosures and all metal reinforcing shall be painted inside with two coats and outside with three coats, consisting of one coat of primer followed by one coat of gray enamel on the inside surfaces and two coats of gray enamel outside. The finish coat shall be ANSI 61 light gray enamel.

All contactors, relays, and other devices shall be of required current carrying and interrupting capacity. All apparatus shall be of substantial construction and shall conform to the requirements of NEMA Standards Publications ICS 1 and 2, 2000, for industrial control devices.

All wire shall be flame-retardant, ethylene-propylene insulated, switchboard wire, Type SIS. Conductors shall be stranded copper not smaller than No. 14 American Wire Gauge.

For each assembled control panel, all outgoing wire, No. 8 AWG or smaller, shall be connected to terminal blocks installed at the sides of the cabinet. The control panels shall also provide sufficient extra terminals to allow connection of all wires coming from limit switches and other devices that go on to the bridge control console and other locations as required, even though these wires do not connect to apparatus on the control panels. Spare terminals totaling at least 10 percent of those actually used shall be provided. Each terminal shall be identified per wire number shown on the Contractor's schematic wiring diagrams.

All panel wiring shall be arranged systematically so that circuits can be readily traced. The wiring shall be installed in a network of troughs consisting of horizontal and vertical sections securely bolted to the panels. The troughs shall be fabricated from heavy duty Noryl plastic shaped into a channel cross-section. After installation of the wiring, an insulated, flanged cover shall be snapped over the open side of each trough section.

Motor Control Center (MCC):

The Motor Control Centers (MCC's) shall include, but not be limited to, all parts, materials and associated appurtenances described below, such as MCC enclosures, covers, wireways, mounting hardware, motor control and protection devices.

The MCC's shall be constructed to meet or exceed the requirements within NEMA ICS-2 and UL845 for motor control centers. The MCC's shall be designed, manufactured, and tested in facilities registered to ISO 9001 quality standards. The MCC enclosures shall be NEMA/EEMAC Type 12 rated.

The Motor Control Center(s) shall be 600 Volt class suitable for operation on a three-phase, 60 Hz system. The system operating voltage and number of wires shall be as indicated on the Plans.

Each MCC shall consist of one or more vertical sections of heavy gauge steel bolted together to form a rigid, free-standing assembly, and mounted on top of a 2inch concrete sill or pad, as shown on the Plans. The entire assembly shall be constructed and packaged to withstand all stresses included in transit and during installation. MCC shall be delivered in individually wrapped factory fabricated fiberboard type containers, with lifting angles mounted on each supporting structure. MCC shall be handled with care to prevent internal component damage, and denting or scoring of enclosure finish. The Contractor shall not install damaged MCC.

Structures shall be totally enclosed dead-front, free-standing assemblies. They shall be no more than 90inch high and 20inch deep. Structures shall contain a horizontal wireway at the top, isolated from the horizontal bus and shall be readily accessible through a hinged cover. Adequate space for conduit and wiring to enter the top or bottom shall be provided without structural interference.

Structures shall be capable of being bolted together to form a single assembly. The total width of one section shall be 20inch. Widths of 25inch, 30inch, and 35inch can be used for larger devices.

Each section shall have all the necessary hardware and bussing for modular plug-in units to be added and moved around. All unused space shall be covered by hinged blank doors and equipped to accept future units. Vertical bus openings shall be covered by manual bus shutters.

A vertical wireway with minimum of 35 inches square of cross-sectional area shall be adjacent to each vertical unit and shall be covered by a hinged door. Wireways shall contain steel rod cable supports.

All full voltage starter units shall be of the drawout type. Drawout provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. Drawout units shall have a tin-plated stab assembly for connection to the vertical bus. No wiring to these stabs shall extend into the bus compartment. Interior of all units shall be painted white for increased visibility. Units shall be equipped with side-mounted, positive latch pull-apart type control terminal blocks rated 600 volts. Knockouts shall be provided for the addition of future terminal blocks. All control wire to be 14 AWG SIS type.

All drawout units shall be secured by a fastening device located at the front of the unit. Each unit compartment shall be provided with an individual front door.

An operating mechanism shall be mounted on the primary disconnect of each starter unit. It shall be mechanically interlocked with the unit door to prevent access unless the disconnect is in the OFF position. A defeater shall be provided to bypass this interlock. With the door open, an interlock shall be provided to prevent inadvertent closing of the disconnect. A second interlock shall be provided to prevent removal or reinsertion of the unit while in the ON position. Padlocking facilities shall be provided to positively lock the disconnect in the OFF position with from one (1) to three (3) padlocks with the door open or closed. In addition, means shall be provided to padlock the unit in a partially withdrawn position with the stabs free of the vertical bus.

Each structure shall contain a main horizontal copper tin-plated bus, with minimum ampacity of 600 amperes as shown on the drawings. The horizontal bus shall be rated at 150 degrees F temperature rise over a 104 degree F ambient in compliance with UL standards. Vertical bus feeding unit compartments shall be copper and shall be securely bolted to the horizontal main bus. All joints shall be front-accessible for ease of maintenance. The vertical bus section containing the Main Breaker (CB-MCC) shall be fully rated 600 amperes. Other bus vertical sections shall be rated 300 amperes.

The vertical bus shall be completely isolated and insulated. It shall effectively isolate the vertical buses to prevent any fault-generated gases to pass from one phase to another. The vertical bus shall include a shutter mechanism to provide complete isolation of the vertical bus when a unit is removed.

Buses shall be braced for minimum 42,000 amperes rms symmetrical.

A copper ground bus shall be furnished firmly secured to each vertical section structure and shall extend the entire length of the MCC.

Each structure shall contain tin plated vertical ground bus rated 300 amperes. The vertical ground bus shall be directly connected to the horizontal ground bus via a tin-plated copper connector. Units shall connect to the vertical bus via a tin-plated copper stab.

All combination starters shall utilize a unit disconnect. Magnetic starters shall be equipped with double-break silver alloy contacts. Each starter shall have minimum one (1) NO auxiliary contact or as indicated on the plans. All coils to be color-coded through size 5 and permanently marked with voltage, frequency and part number.

All starters shall be provided with overload relays. Overload relays shall be an ambient compensated bimetallic-type with interchangeable heaters, calibrated for 1.0 and 1.15 service factor motors. Electrically isolated NO and NC contacts shall be provided on the relay. Visual trip indication shall be standard. A test trip feature shall be provided for ease of troubleshooting and shall be conveniently operable without removing components or the motor starter. Overload to have (+/-) 24% adjustability, single-phase sensitivity, and isolated alarm contact. Overload relays shall have manual or automatic reset.

When provided, control circuit transformers shall include primary protection and one secondary fuse in the non-ground secondary conductor. The transformer rating shall be fully visible from the front when the unit door is opened.

When a unit control circuit transformer is not provided, the disconnect shall include an electrical interlock for disconnection of externally powered control circuits.

Auxiliary control circuit interlocks shall be provided where indicated. Auxiliary interlocks shall be field convertible to normally open or normally closed operation.

Minimum starter and contactor size shall be NEMA Size 0.

Motor starters and contactors shall be Cutler-Hammer Freedom Series, Square D type S series, or Resident approved equal.

Motor starters and contactors shall be designed to accommodate two (2) auxiliary contact blocks, each capable of a combination of up to four (4) normally closed or four (4) normally open auxiliary contacts. Contacts to be color-coded; black designating NC and silver designating NO. Contacts to be rated ten (10) amperes continuous, 7200 VA make, 720 VA break for 120 through 600V AC, and 69 VA make and break for 125 through 300V DC. Provide a minimum of one (1) spare NO contact and one (1) spare NC contact in addition to any auxiliary contacts required.

Provide a mechanical interlock on reversing or multispeed contactors of the lever-type mechanism (with electrical contacts included) to prevent closing of one contactor when the other is closed.

Control transformers shall be high voltage regulation type, low temperature rise, rated 480/120VAC. Each transformer shall have a cover to prevent accidental contact with the energized components. The transformer shall be de-energized when the unit operator handle is in the off position.

Each unit door shall have an engraved acrylic nameplate, white with black lettering. A master nameplate shall be provided on each MCC lineup.

Wiring diagrams shall be provided at a centralized location in the MCC. Each modular unit shall also be supplied with wiring diagrams and product data. The diagram shall show the exact devices inside the unit and shall not be a generic diagram.

The entire MCC shall go through a quality inspection before shipment. This inspection will include:

- Physical Inspection of: structure, electrical conductors, including bussing, general wiring, and units.
- General electrical tests including power circuit phasing, control circuit wiring, instrument transformers, ground fault system, device electrical operation.
- AC dielectric tests of power circuits and control circuits.
- Markings/Labels verification, including instructional type, Underwriters Laboratory (UL), and inspector's stamps.
- The manufacturer shall use integral quality control checks throughout the manufacturing process to ensure that the MCC meets operating specifications.
- MCC shall be Cutler-Hammer Freedom & Advantage series, Square D Model 6 series, Allen-Bradley or Resident approved equal.

Raceways

Except for multi conductor, jacketed cables, all wiring shall be installed in conduit or steel wireway as shown in the Plans.

All conduits shall be standard weight, threaded, rigid steel conduit conforming to the requirements of ANSI Standard C80.1. All conduits shall be hot-dip galvanized, inside and out, to meet the requirements of the above standard for protective coating. Conduit couplings and fittings shall be made of malleable iron or steel, hot-dip galvanized.

All conduits to be installed in outdoor locations shall be plastic coated as hereinafter specified. Conduit fittings, including couplings, unions, elbows, expansion and deflection fittings, and other items, shall also be plastic coated. Conduits and fittings, which are to be plastic coated, shall be provided with a factory-applied polyvinyl chloride (PVC) coating in the following manner. The exterior of the galvanized rigid steel conduit or fitting shall be coated with an epoxy acrylic, heat-polymerizing adhesive not to exceed 0.1mm. A PVC plastic coating, 0.8mm to 1mm thick shall be bonded to the outside metal surface the full length of the pipe, except for the threads. The plastic coating shall have an 85+Shore A Durometer rating and conform to NEMA RNI-1998 (Type A), ASTM D746, and Federal Specifications LP406b, Method 2051, Amendment 1 or 25 September, 1952. A two-part red urethane, chemically cured coat shall be applied to the interior of all conduit and fittings. This internal coating shall be at the nominal 2-mil thickness and shall be sufficiently flexible to permit field bending without cracking or flaking. The Plasti-bond, PVC coated, hot-dip galvanized steel conduit shall be UL labeled and listed.

All hollow conduit and fittings, which serve as part of the raceway, shall be coated with the same exterior PVC coating and red interior urethane coating. The plastic exterior coating and the red interior urethane coating shall be factory applied by the same manufacturer who produces the hot-dip galvanized conduit. PVC coated conduit shall be installed in accordance with the manufacturer's installation manual.

Unions to connect sections of conduit that cannot be joined to each other or to boxes in the regular manner shall be of malleable iron or steel, hot-dip galvanized, PVC coated.

Conduits shall not be less than $\frac{3}{4}$ inch in diameter. The interior surfaces shall have a smooth finish and be free of burrs or projections, which might cause injury to the cables. All conduits shall be free from blisters, cracks, or injurious defects and shall be reamed at each end after being threaded. Sections shall be connected to each other with screw couplings made up so that the ends of both conduits will butt squarely against each other inside of the coupling. Conduits shall be installed to be continuous and watertight between boxes and equipment. Conduits shall be protected at all times from the entrance of water or other foreign matter by being well-plugged overnight or when the work is temporarily suspended.

Conduit bends and offsets shall be made by cold bending using approved methods and equipment. The use of a pipe tee or vise for bending conduit will not be permitted. Conduit, which has been crushed or in any way deformed, shall be discarded. All bends shall be long sweep, free from kinks, and of such easy curvatures as to permit the drawing of conductors without injury. Conduit runs shall be made with as few couplings as standard lengths will permit, and the total angle of all bends between any two boxes or cabinets shall not exceed 90 degrees, unless otherwise approved by the Resident. The radius of curvature of pipe bends shall not be less than eight times the inside diameter of said conduit. Long running threads will not be permitted. Pull boxes shall be used whenever necessary to facilitate the installation of the wire.

Except for installation indoors or where specifically permitted by the Resident, condulets or conduit bodies shall not be used for pulling conductors or for making turns in conduit runs or for branching conductors. Condulets or conduit bodies, where permitted, shall consist of malleable iron castings with gasketed covers of the same material and fastened with brass cover screws. The bodies shall be hot-dip galvanized, and PVC coated when used with PVC coated conduit.

Where conduits pass through the floors or walls of the houses, they shall be provided with PVC pipe sleeves for free passage of the conduits. After the conduits are installed, the openings shall be caulked with an elastic compound and escutcheon plates provided on the interior walls, ceilings, and floors.

Conduits and wireway shall be securely clamped and supported at intervals not exceeding five feet in length.

Conduit and wireway runs exposed on the steel structure shall be securely clamped to the steelwork. The conduit clamps, in general, shall consist of U-bolts attached to structural steel supports bolted to the members. The wireway clamps, in general, shall consist of manufacturer recommended stainless steel bracket hangers attached to structural steel supports bolted to the members. The wireway cover shall be on the top or on the side of the wireway and be clear of opening obstructions. The minimum thickness of the structural supports shall be 3/8 inch. Supports shall be arranged so that conduits and wireway rest on top of the support and conduit U-bolts rest on top of the conduits. The use of J-bolts to fasten structural supports or to clamp conduits will not be permitted.

All U-bolts and bracket hangers shall be provided with medium-series lock washers and hexagonal nuts. The bolts, nuts, and washers shall be of stainless steel conforming to the requirements of the Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes, ASTM Designation A276, Type 316.

Where conduits and wireways are to be mounted exposed on non-steel surfaces, they shall be securely clamped to the surface using bent plate pipe supports with back spacers held by not less than two bolts. The stock size for the bent steel plate supports shall be 6mm thick by 51mm wide. Back plates shall be of 10mm thick steel. Supports and spacers shall be hot-dip galvanized. Bolts shall be not less than 1/2" in diameter and shall be of stainless steel conforming to the requirements specified for U-bolts.

At any point where a conduit crosses an expansion joint longitudinally or where movement between adjacent sections of conduit can be expected, conduit expansion fittings shall be installed. The fittings

shall be bronze expansion fittings and shall be provided with flexible bonding jumpers to maintain the electrical continuity across the joints. The fittings shall permit a total conduit movement of 203mm and shall be Resident approved equal to the O.Z./Gedney Type EX, Spring City Type EF, or the Crouse-Hinds Type XJ.

At any point where a conduit crosses a joint laterally or where an offsetting type movement between adjacent sections of conduit can be expected, expansion and deflection fittings shall be installed. The fittings shall permit a movement of ¾" from the normal in any direction. The fittings shall be the O.Z./Gedney Type DX, Spring City Type EDF, Adalet Type STX, or Resident approved equal.

Flexible conduits for the connections between the rigid conduit system, all motors, and limit switches shall be made with sections of PVC coated, flexible, metallic, liquid tight conduit. Each section shall not exceed 18" without prior approval of the Resident.

All conduit embedded in concrete, insofar as possible, shall be completely encased by concrete of not less than 3 inches, measured in any direction, and shall be securely held in place during pouring and construction operations. A group of conduits terminating together shall be held in place by a template.

All conduit, wireway, and fittings shall be carefully examined before being installed, and all pieces having defects shall be set aside and removed from the site. All conduit bends shall be made with standard size conduit elbows. Conduit shall be assembled hand tight and then using strap wrenches tightened two more turns. Wrench marks or chuck marks shall be touched up with the appropriate touch-up compound. All cuttings and threading shall be performed as recommended by the conduit manufacturer. All conduit, enclosures, and fittings shall be mechanically joined together to form a continuous electrical conductor to provide effective electrical continuity.

Ends of abandoned conduits, spare conduits/wireway, and empty conduits/wireway and stubs shall be capped during and after construction, and care shall be taken to ensure that no moisture or other matter is in or enters the conduits.

All conduits shall be pitched not less than 1" in ten feet (except by special permission). Where conduits cannot be drained to pull boxes, a drain "T" with drain fitting shall be installed at the low point and drained to a dry well of broken stone. Drain fittings shall be of stainless steel and shall be capable of passing 1 oz of water per minute.

The ends of all conduits projecting into boxes and equipment enclosures shall be provided with bronze insulated grounding bushings. The insulated portion shall be of molded phenolic compound, and each fitting shall have a screw type combination lug for bonding. Insulated bushings shall be the O.Z./Gedney Type RBLG, Spring City Type GB, or Resident approved equal manufactured by Appleton. All bushings in any box or enclosure shall be bonded together with No. 8 AWG bare copper wire. Where conduit hubs are provided use locking nuts with grounding terminals.

All conduits and wireway shall be carefully cleaned both before and after installation. Upon completion of the conduit and box installation, the Contractor shall clear each conduit by snaking with a steel band, to which shall be attached an approved tube cleaner equipped with a mandrel of a diameter not less than

85 of the nominal inside diameter of the conduit and with a wire brush of the same diameter as the conduit, and shall then draw in the cables.

Both ends of each conduit or wireway run shall be provided with a brass tag having the same number stamped thereon in accordance with the conduit diagrams, and these tags shall be securely fastened to the conduit ends with No. 20 AWG brass wire.

Separate conduits or wireways shall be furnished and installed to carry the circuit wiring to all span driving motors.

All wireways shall be 16 gauge 304 stainless steel bodies with covers and oil-resistant gasket and adhesive. The flanges shall be 10-gauge stainless steel. Wireway fittings, nipples, and elbows shall be 304 stainless steel. A solid oil-resistant gasket shall be positioned between flanges when sections and fittings are bolted together.

Wireways shall not be less than 6" x 6". The seams shall be continuously welded and ground smooth. There shall be no holes or knockouts. The edges on all sections and fittings shall be smooth and rounded to prevent damage to cable and conductor insulation.

The wire way covers shall have heavy butt hinges and external screw clamps to assure complete seal between covers, gaskets, and bodies.

When wireway enters an enclosure, a box connector shall be used on the inside of the enclosure to ensure a tight and stable seal. Closure plates shall seal the end of wireway sections or runs.

At any point where a wireway crosses a joint, where an offsetting type movement between adjacent sections of conduit can be expected, or where movement between adjacent sections of conduit can be expected flexible wireway fittings shall be installed. The fittings shall be the wireway manufacturer's recommended fitting.

All conduits projecting into boxes and equipment enclosures shall be provided with water tight, weather proof, insulated throat conduit hubs. The conduit hubs shall be approved equal to Meyers Watertight Rigid Conduit Hubs except for PVC coated conduit which shall be provided with PVC hubs of the same manufacture as the conduits.l.

Boxes

All surface mounted pull, junction, and terminal boxes shall be of type 316 stainless steel, and shall be provided with full length hinged gasketed, covers held with stainless steel fast operating clamps to provide NEMA 4X watertight construction. They shall be Resident approved equal to the Hoffman bulletin A4S or equivalent by Weiggman or Hammond.

Interior and exterior boxes shall be provided with external mounting lugs and shall be fastened in position with stainless steel through bolts. Conduit entries shall be means of galvanized malleable iron hubs. PVC coated conduit shall use PVC coated hubs. No box shall be drilled for more conduits or

cables than actually enter it. Exterior boxes shall be provided with drain fittings of the same type as specified for conduit drains.

All boxes shall be sized in accordance with the requirements of the National Electrical Code and the dimensions as shown on the Plans.

Terminal boxes shall be of sufficient size to provide ample room for the terminal blocks and interior wiring and for the installation of conduit terminations and multi conductor cable fittings. Interior mounting backpanels with tapped holes shall be provided for mounting the terminal blocks.

Junction and pull boxes to be cast into sidewalks shall be extra heavy duty galvanized cast iron boxes designed for heavy duty pedestrian traffic. They shall have minimum interior dimensions of 12" x 24" by 12" deep. They shall be listed by Underwriters' Laboratories, Inc. as Type 4. They shall be suitable for use outdoors where they would be subjected to rain or dripping or splashing of water. They shall be designed especially for flush mounting in floors and shall be supplied with steel checkered plate covers suitable for foot. The construction shall be cast iron box with 3/8" walls and checkered cover, hot dip galvanized finish, neoprene gasket and stainless steel cover screws. They shall meet UL Standard: 514A , 50 and NEMA 250-1997 Type 4. They shall be OZ Gedney type YR or approved equal by Appleton or Hope.

Hardware and Supports

Supports for conduits, wireways, cables, boxes, cabinets, disconnect switches, small limit switches, and other separately mounted items of electrical equipment shall be fabricated from structural steel not less than 3/8" thick. Clip angles and other supporting members, which are fabricated from structural steel plates and shapes and bolted to the structural members, shall be included with the structural steel. All other supporting members shall be included under the electrical work.

Structural steel brackets, boxes, and other equipment mounted on concrete surfaces shall be provided with a full neoprene gasket not less than 1/8 inch thick between the equipment and the surface of the concrete.

Expansion anchors for fastening equipment or brackets to concrete surfaces shall be wedge type anchor bolts, which shall be locked in place by an expansion wedge as the nut is tightened. All parts of the expansion anchors shall be of Type 303 stainless steel. Holes for the anchors shall be drilled to the size and depth recommended by the manufacturer using carbide tipped masonry drills.

Mounting bolts, nuts, washers, and other detail parts used for fastening boxes, disconnect switches, small limit switches, conduit clamps, cable supports, brackets, and other electrical equipment shall be of stainless steel conforming to the requirements of ASTM Designation A276, Type 316. Bolt heads and nuts shall be hexagonal and shall be provided with medium-series lock washers. Bolts smaller than 1/2" in diameter shall not be used, except as may be necessary to fit the mounting holes in small limit switches, boxes, and similar standard devices.

Usage of beam clamps for supporting conduits, boxes, or other equipment shall not be acceptable without prior approval of the Resident.

Preformed metal framing channels, such as Kindorf, Unistrut, Superstrut, etc., will not be acceptable for mounting or supporting electrical equipment, conduits, or boxes except where specifically approved by the Resident

Wiring and Cables

Except where otherwise noted, wiring in conduits shall be single-conductor

All wires and their insulation and covering shall be of a nationally recognized brand, acceptable to the Resident, and shall have marks always used on the particular brand for identifying it.

All wiring and cables shall conform to the requirements of NEMA Publication No. WC70-2000. Before wire and cable orders are placed with any manufacturer, the Contractor shall submit for approval typical published test data for the type of insulation proposed, showing that it meets the requirements of NEMA Publication No. WC7. All materials used to fabricate insulated wiring and cables shall be certified to be from stock not more than 1 year old.

All conductors shall be of stranded copper large enough to carry safely the maximum currents required without injurious heating or serious voltage drop. Conductors shall not be smaller than No. 12 AWG, except as approved for control panel and console wiring or for lighting fixtures. All conductors shall be soft-annealed copper wire conforming to the requirements of NEMA Publication No. WC70. All conductors shall have Class B concentric stranding, except for conductors in flexible cables.

The insulation shall be a chemically cross-linked, polyethylene compound conforming to the requirements of Part 3.7 of NEMA Publication No. WC70. The thickness of insulation shall be that required for 600 volts rated circuit voltage listed under Column A of Table 3-1. Insulation type shall be Type XHHW-2.

Equipment ground conductors shall be bare, stranded, coated copper conforming to the requirements of NEMA Publication No. WC70, Part 2.

Single conductor wiring, including the insulating material, shall be tested to demonstrate that it meets specified requirements. The testing shall be done as stipulated in NEMA Publication No. WC70, Part 6. Wiring and cables shall not be shipped from the plant of the manufacturer until certified test reports on the cable properties have been approved by the Resident.

The conductor sizes and number of wires shown on the Plans are the minimum permissible. The Contractor shall provide wiring and cables of sufficient size and number as may be required for the installation in accordance with the wiring diagrams on his approved working drawings. In each conduit

and multi conductor cable containing ten or more conductors, at least one spare wire shall be provided for every ten conductors actually used.

Wiring shall not be installed in any conduit before all joints are made up tightly and the conduits rigidly secured in place. The drawing of cables into conduits shall be done without injury to the wires or their insulation or covering. No lubricant of any kind shall be used for the pulling of wires, unless specifically authorized by the Resident. Sufficient slack shall be left in all cables to permit proper connections in boxes, cabinets, and enclosures.

Both ends of every single length of conductor shall be permanently and clearly tagged in accordance with the same numbers or designations appearing on the approved wiring diagrams. Wire tags for marking the conductors shall be heavy duty, heat shrink, waterproof, permanently marked, and resistant to ultraviolet light deterioration. Numbers and letters shall be black or blue on a white background. . The Contractor shall submit the proposed wire marking system and a sample of the wire markers to be installed to the Resident for approval. Each conductor, except for control and instrument conductors, shall be color coded with colored insulation. Color coding for 120/208 volt conductors shall be black for phase A or 1, red for phase B or 2, blue for phase C or 3, white for neutral, and green for equipment ground. Color coding for three phase 480 volt conductors shall be brown for phase A or 1, purple for phase B or 2, yellow for phase C or 3, gray for neutral, and green for equipment ground. Each conductor shall be marked at panelboard gutters, pull boxes, outlet and junction boxes and each load connection and shall include each branch circuit or feeder and control wire.

Conductors inside terminal boxes, the control console, and control panels shall be neatly formed into cables and laced with approved cable ties, with the individual conductors leaving the cable at their respective terminal points. These conductors shall be looped to allow not less than three inches of free conductor when disconnected. The formed cables shall be held securely away from the terminals and from contact with the enclosure by means of approved insulating supports.

All outgoing wires, No. 8 AWG or smaller, in the control console and control panels and in terminal boxes shall be connected to stud and nut style terminal blocks of molded phenolic compound. Terminals shall be suitable for use with solderless, locking fork, wire connectors. Connectors which extend beyond the ends of terminal block barriers, shall be furnished with an insulating sleeve covering the metal part of the connector. Taping of extended terminals will not be permitted.

Each terminal of all terminal blocks shall be permanently marked to show the same number or designation as appears on the wire connected thereto.

Splicing of wires will not be permitted, except for wiring to service lighting fixtures and receptacles. Wherever it becomes necessary to joint or branch conductors, terminal blocks shall be used, and wires shall be clearly tagged.

Multi conductor cables supported on the steelwork shall be secured thereto by bent plate cable clamps spaced not more than 3 ft on centers. The cable clamps shall be fabricated from stainless steel plates

bent to suit the cables' outside diameters. In general, the clamps shall be fastened to structural brackets bolted to the steelwork.

Where multi conductor cables enter the control console or any cabinets or boxes, they shall be provided with watertight cable terminators. Each cable terminator shall provide a watertight seal by compressing a tapered neoprene-sealing ring around the outer jacket of the cable. Cable terminator parts shall be made of bronze and shall be approved equal to the Series SF-327OB Watertight Cable Entrance Seals as made by O.Z./Gedney.

The Contractor shall take insulation resistance readings on all circuits installed, with electronic equipment disconnected, and furnish to the Resident a complete record of the results obtained. These circuits shall include connected motors when tested. Conductors rated 600 volts, or more, shall be one (1) megohm, or more. Defective circuits shall be replaced at the Contractor's expense.

Flexible Cables:

Flexible cable for specified connections shall be rubber-insulated, multiple-conductor portable cords conforming to the requirements of NEMA Pub. No. WC3, Part 7.7 or NEMA Pub. No. WC8, Part 7.4 for hard service. Each cable shall be provided with a heavy-duty neoprene jacket conforming to the requirements NEMA Pub. No. WC3, Part 7.7.5.1 or NEMA Pub. No. WC8, Part 7.4.5.1. Flexible cables shall conform to the National Electrical Code, Article 400 for hard service. They shall conform to UL 62, CSA Standard 22.2 No. 49, MSHA flame resistance for Mining Applications (P-136-MSHA), FT1 and FT2 Flame Test, Federal Specification J-C-580B, ICEA Method 1, Table 1 Color Code, be OSHA acceptable, and be RoHS compliant. The cables shall be assembled using tinned flexible stranded Class K conductors, and heat, moisture and oil resistant EPDM rubber insulation. The insulated conductors are cabled with non-wicking wax paper fillers, with a tissue-paper separator wrapped around the assembly to promote easier removal of the jacket. A heat, moisture and oil resistant flexible CPE jacket is extruded over the assembly to complete the construction. Flexible cables shall be provided with strain relief fittings and basket weave cable grips at each end. Strain relief fittings shall be malleable iron, liquid tight strain relief fittings. The cable grips shall be stainless steel, heavy long, closed wire mesh, and single weave with a double eye support. All mounting hardware shall be stainless steel.

Instrumentation Cables:

Twisted, shielded pair cable shall be multiconductor PVC insulated, thermoplastic jacketed, 600 volt instrumentation cable for use indoors, outdoors, direct buried, encased in concrete, cable trays, troughs or continuous rigid cable supports. It shall be rated for use on Class 1 remote control and signaling circuits where 600 volts is desired and for use in Classes I, Div 2 hazardous locations. The cable shall be capable of operating continuously at a conductor temperature of 90°C in wet or dry locations.

The cable will conform to ASTM B8, UL 83, UL 1569, and UL 1277.

The conductors will be 16 AWG, 7-strand, bare copper conductor.

The insulation will be PVC with a nylon covering meeting the requirements of the referenced standards. The insulation thickness will be 0.015 inches of PVC with 0.005 inches of nylon. Individual conductors will be color coded with the paired conductors colored black, white and numbered while the triads are color coded black, blue, red and numbered.

The insulated conductors will be twisted pairs or triads, group of pairs or triads, numeric print identification on the groups, aluminum polyester foil with 100% coverage and tinned copper drain wire over each group, overall aluminum polyester foil with 100% coverage, overall tinned drain wire, a nylon ripcord, and a black minus 40°C PVC jacket.

The cable will be covered with a black PVC jacket conforming to the requirements specified for polyvinyl chloride in ICEA. The average thickness will be in accordance with ICEA, and the minimum spot thickness will be not less than 80% of the average thickness. The jacket will be sunlight resistant and will meet the requirements of the IEEE 1202 (70,000 Btu/hr) and ICEA T-29-520 (210,000 Btu/hr) vertical cable tray flame tests. It is suitable for use at a minimum ambient temperature of minus 40°C.

A manufacturer's identification will be printed on the jacket.

Physical and electrical tests will be conducted in accordance with the requirements of the referenced standards.

Ethernet Cables:

All Ethernet cabling shall be by means of industrial grade CAT 6 cables. They shall consist of 23 AWG solid bare copper conductors, bonded pair polypropylene insulation, FRPE spline center member, inner PVC jacket, overall shielding (100% coverage), industrial grade sunlight and oil resistant PVC jacket, and with sequential footage marking every two feet.

It shall meet the following standards:

Telecommunications Standards: Category 6 - TIA 568.C.2.

UL Verified to Category 6

NEC/(UL) Specification: CMR, CMX-Outdoor.

CEC/C(UL) Specification: CMR.

AWM Specification: UL Style 21047

Installation Temperature Range shall be -25°C To +75°C, Operating Temperature Range shall be -40°C To +75°C, and the UL Temperature Rating shall be 75°C. The Ethernet cabling shall be Belden 7953A or approved equal.

Aerial Cable:

The aerial power cable shall be an industrial tray cable intended for use in industrial power or control circuits where small diameter, flame retardant cables are desired. It shall be designed to be supported by a messenger in exterior applications and shall also be listed for direct burial and for use in Class 1,

Division 2 hazardous locations and Class 1 control circuits. Constructions shall be listed for exposed runs (TC-ER) per NEC 336.10. Conductors may be used in wet or dry locations at temperatures not to exceed 90°C.

The tray cable shall meet or exceed the applicable requirements of the following standards and specifications:

- ASTM - (All applicable standards).
- UL 1277 - Electrical Power and Control Tray Cables.
- UL 1685 - UL Flame Exposure Test (70,000 Btu/hr).
- ICEA S-58-679 - Control Cable Conductor Identification Method 1, Table 2
- IEEE 1202 - Flame Testing of Cables for Use in Cable Tray in Industrial and Commercial Occupancies (70,000 Btu/hr).
- ICEA S-95-658 (NEMA WC 70) - Nonshielded 0 - 2 kV Cables, with testing frequencies based on UL requirements.

The cable shall consist of 12 no. 12 AWG type XHHW-2 rated VW-1 conductors. Individual conductors are bare annealed copper covered with a cross-linked polyethylene (XLP). Non wicking fillers shall be added for roundness. The overall jacket consists of a flame retardant, moisture, and sunlight resistant CPE.

The aerial fiber optic cable shall be an outside plant loose tube dry core cable with moisture blocking gel inside a thermoplastic buffer tube. Individually colored 250 µm fibers are to be surrounded by gel for moisture resistance. Each of two 6 fiber group shall be protected with a colored PBT jacket and cabled around a rigid epoxy central strength member. An overall water swellable tape shall provide axial water penetration protection. The core shall be wrapped with Aramid yarn for tensile strength. An outer jacket of black medium density polyethylene shall provide water and UV resistance. The optical fibers shall meet or exceed ISO/IEC 1 1801. The fiber optic cable shall be Mohawk M9W511T or approved equal by Corning or Belden.

Air Horns

For giving the necessary boat signals, one compressed air horn with mounting brackets shall be furnished and installed on the operator house, pointing parallel to the navigable channel.

The horn shall be diaphragm type, 102mm vibratory horn having a frequency of about 300 cycles per second. The horn shall be of weatherproof construction with a projector bell of bronze. The horn shall be provided with a stainless steel bracket for mounting on the maninery house as indicated on the Plans.

The compressed air horn shall be actuated by a rotary air compressor driven by an integral 1-horsepower electric motor. The motor shall be a 120-volt, single-phase, 60-cycle unit. The compressor unit shall be mounted in the operator house, and a brass pipe shall be extended through the house wall to the horn. The compressor unit shall be a B&B Roadway Model 55-51, or Resident approved equal.

The air horn shall produce a minimum 120 decibels and shall be capable of being tuned in the field to produce a tone acceptable to the Resident.

Pier Protection and Mid Span Navigation Lights

Navigation lights shall be provided in accordance with the rules and regulations of the United States Coast Guard as shown on the Plans.

For all navigation lights, the doors and lenses shall be gasketed, and each entire unit shall be completely weatherproof and vandal resistant. Fittings shall be non-corroding, and the sockets shall be of porcelain mounted on shock absorbers. The housings for all units shall be cast-bronze, and an LED 120-volt lamp with brass base shall be installed in each socket.

The bascule span lights shall be controlled by the fully open limit switches so that the green lights shall show when both leaves are fully opened, and the red lights shall show at all other times.

All navigation lights shall be equipped with bronze junction boxes.

The housing shall be of cast bronze and shall be suitable for marine environment. Construction shall be rain-tight and fully gasketed. The light assembly shall be designed for heavy duty, long life service. Design shall provide ready access for lamp service.

The lens shall be heat-resistant fresnel glass. Lens sections shall be 180 degrees red over 180 degrees green. Inside lens diameter shall measure approximately 7 inches. Outside lens diameter shall measure approximately 8 inches.

Lamp fixture head shall be suspended from the swivel on a 2 inch schedule 40 pipe, 2.375 inch outer diameter. Pipe material shall be stainless steel.

Each span navigation light shall be equipped with a swivel. The swivel design shall provide for all wiring to be completely contained inside the light assembly. Gaskets and o-rings shall be used to provide a weather tight assembly. Swivel shall be of heavy duty construction, cast of the same material as the fixture head. Spindle shall be of stainless steel.

The navigation lights shall be equipped with an anti-swivel brake. The brake shall allow the light to pivot under its own weight as the bascule leaf rotates while preventing oscillation of the light during windy conditions.

Base shall be cast of the same material as the fixture head. Light assembly shall mount via four 1/2" diameter bolts through the base, provided by installer to suit installation. A junction box shall be provided at the base of the unit. A cast junction box with gasketed access cover shall be provided. Junction box shall be of the same material as the fixture assembly and shall match the navigation light base footprint. Orientation of junction box shall be capable of rotation in 90 degree increments.

The pier protection lights shall be model PL as manufactured by B&B Roadway. The Bascule span lights shall be model BS as manufactured by B&B Roadway

The navigation light system shall be controlled by photoelectric control device. The photoelectric control unit shall be a completely self-contained, weatherproof device rated 1,800 VA at 120 volts and shall be provided with a time-delay feature and a deluxe, encapsulated lightning arrester for protection against surges and lightning. The unit shall provide turn-on of the pier navigation lighting system at 10.74-lux nominal. The unit shall be suitable for operation within a temperature range of -50 degrees Celsius to 70 degrees Celsius and shall have a fail-safe feature so that the lighting load remains energized in the event of component failure. The unit shall be suitable for installation in a twist lock receptacle with adapter for mounting on PVC-coated rigid metal conduit. Locate the photoelectric controller on the machinery house, as approved by the Resident.

A three-position selector switch shall be provided on the control console for operating the rest pier navigation lights. In the "Auto" position, the lights shall be controlled by the photoelectric control device. The "On" position shall override the photocell and turn the lights on. The lights can be turned to the off position for safety during maintenance.

Closed Circuit Television System (CCTV)

General Requirements

Furnish and install closed circuit television system (CCTV) cameras in the quantity and locations shown on the plans. The cameras will monitor navigable traffic in the vicinity of the movable span leaves and its approaches as well as vehicular and pedestrian traffic in areas not readily visible from the Operator's consoles.

Provide any incidental apparatus, appliance, material, or labor not herein specifically mentioned or included, that may be found necessary to complete or perfect the installation and equipment in a substantial manner satisfactory to the Resident.

The CCTV Color System must consist of remotely located dome cameras mounted in and supported by stationary mounts. The CCTV cameras, with fully adjustable fixed mounts, must be capable to view a specific portion of the waterway, roadway, and sidewalks as shown on the plans or as directed by the Resident. Each CCTV camera must transmit its video signal using shielded coaxial cable, a transmitter, a VCR and receiver or a DVR. To allow viewing multiple camera scenes simultaneously, furnish and install 22-inch LCD monitors located at the operator level next to the control console within the Operator House as shown on the plans. Provide two monitors. Each monitor will show 1 to 4 selectable images from any of the CCTV cameras. One dedicated cabinet at the operator's level must house the all peripherals, and any required power supplies.

System Vendor.

All apparatus and equipment comprising the CCTV system, including cameras, lens, housings, controls, monitors, rack mounting equipment, and all associated appurtenances required to provide a complete functioning system, must be manufactured or furnished by a single qualified system vendor approved by the Resident. For the various system components, model numbers are given for Vicon parts to establish the required features; equivalent components may be provided by ADT, Schneider Electric, Continental Alarm & Detection, or approved equal. The CCTV system vendor must have a demonstrable competence in providing complete functioning systems. Such competence must be demonstrated by identifying a minimum of three outdoor/indoor functioning CCTV systems in the past 5 years. The vendor must submit to the Resident certified documentation of its qualifications and past installations.

The CCTV system vendor must be completely responsible for the integrated functioning of all components to provide a satisfactory assembled system operating in accordance with specified requirements. The CCTV system vendor must be responsible for the detailed design of the total system to ensure compatibility of equipment and suitability for the intended system functioning. The vendor must provide supervisory assistance during the installation of equipment to ensure maximum reliability and ease of maintenance and must be familiar with the operation, installation, and adjustment of CCTV system.

Material Requirements.

Manufacture, furnish, and install all latest equipment models. All materials must be new, and must be manufactured and installed to the satisfaction of the Resident. The Contractor must furnish the Resident a satisfactory guarantee to replace free of charge, any part of the work that may fail or otherwise prove defective within the period of 1 year after the work is officially accepted by the Department. If any departures from the plans or these special provisions are deemed necessary, submit details of such departures and the reasons as soon as practicable for approval. No such changes must be made without prior approval of the Resident.

(1) Provide vandal resistant dome cameras that are impact-resistant, high resolution day/night color camera with a 3.3-12 mm auto iris varifocal lens. It must feature a 24 VAC, an isolated power input, heater, coaxial cable video, smoked lower dome and able to televise in National Television System Committee (NTSC). The dome camera must be VICON Model # V910-W3312DN, or approved equal.

(2) Provide a digital quad splitter that accepts four camera inputs, processes them digitally, and displays all four on a single monitor screen. All operating and programming functions are performed with the front panel keys. The unit must feature real time image processing and 2x digital zoom. It must have a high resolution of 720x480 (720x512 PAL) (500 TV lines). The image must be capable of being put in FREEZE mode. The splitter must feature adjustable dwell time. PIP display, color adjustment and on/off selectable on-screen title, time, and date display. The digital quad splitter must accept both NTSC and PAL signals. The unit must be supplied with a 120 VAC power supply and a rack mounting kit.

- (3) Provide Pendant Mount Adapters suitable for indoor and outdoor applications which must allow the V910 Camera Dome to be installed in a pendant configuration. Use of this unit requires an appropriate mount that can support the weight of both the camera dome and adapter. The mount used with the adapter must adapt to a 1 inch NPT pipe thread. The adapter must be VICON Model # V910-PH, or approved equal.
- (4) Provide wall mount units suitable for either indoor or outdoor applications for the V910 Camera Dome that allows cables to be routed through for a neat appearance. Wall mount units must be VICON Model # SFVT-UWM, or approved equal.
- (5) Provide a 1 Terabyte 16-channel video recorder such as a Vicon VDR-700 Series, or approved equal.
- (6) Provide 22-inch flat panel LCD monitors capable of providing a clear bright display. The resolution ranges must be from 640x480 to 1680x1050 pixels. Monitors must have front panel buttons to allow for easy operation, Monitors must be Vicon Model # VM622LCD, or approved equal.
- (7) Provide rack mount type Uninterruptible Power Supply (UPS) must provide a power backup for all 120 VAC devices and provide surge protection. It must have the capability of providing an automatic self-test, a cold-start, hot-swappable batteries, and an alarm. The UPS must be Model # V1000R-UPS as manufactured by Vicon, or approved equal.
- (8) Provide indoor/outdoor type camera power supplies to convert 120 or 230 VAC input to 24 or 28 VAC output, Vicon Model # S28WPS-1 or approved equal. (9) Provide a 36-inch vertical rack enclosure, including front and rear 16 gauge steel doors finished in black powder coat, with removable conduit knockout panels, KOs in both sides for side-exiting cables, abundant cable passage, and tie off points with side, top, and bottom venting to allow adequate cooling as manufactured by Raxxess Model # KAR-18-28, similar model by Middle-Atlantic, or approved equal.
- (10) Provide power strip for rack, equipped with 12 duplex receptacles. Power strip must be installed in the rear enclosure; the design must allow for ample clearance for mounted equipment and accessories.

Construction Requirements.

- (1) Conduits, Wire, and Incidentals. Furnish and install all conduit, boxes, conductors, and shielded coaxial cables to provide power and video signal interconnection.
- (2) System Operation. The system must allow the Bridge Operator to monitor navigable traffic under the bridge and bridge approaches and vehicular/pedestrian traffic on or approaching the bridge.
- (3) Field Test. Arrange for and provide all necessary field tests required by the Resident to demonstrate that the entire CCTV system is in excellent working order and in accordance with the plans and these Special Provisions.

Conduct operational tests of the complete installation under the supervision of the system vendor in the presence of the Resident to demonstrate to the Resident's satisfaction that all components and systems are installed, connected, and operate in accordance with the plans, special provisions, and approved shop

drawings. Representatives of the manufacturers of CCTV equipment must be made available for adjustment or modification of their equipment, as needed, to the satisfaction of the Resident. Should the tests show that any piece of equipment, in the judgment of the Resident, is defective or functions improperly, such adjustments and/or replacements must be made so as to make the installation satisfactory to the Resident.

Spare Parts

Supply spare parts in accordance with AASHTO requirements and Contract Plans. The spare parts supplied for each bridge shall include, but not be limited to, the following:

- Six fuses of each kind and size installed.
- Two switches of each type provided, and sic contact blocks for each type of switch
- 4 limit switch or proximity switch of each type specified. In addition, a full set of contacts and contacts fingers for each type of limit switch
- A set of contacts and contact fingers for each unit or fractional unit of five or less of each kind or size installed, including contactors and starters. For units that do not incorporate replaceable contacts, furnish a complete unit with coil.
- One coil for every five or less of each size relay, contactor, and motor starter installed.
- One complete relay timer, time delay relay, contactor, and starter for each unit or fractional unit of five or less of each kind and size installed.
- Two heaters for overload relays of each size installed.
- For the machinery brakes:
 - 1 spare thrustor complete with heater and motor.
 - 1 limit switches for hand-release mechanism.
 - 1 limit switches - brake released.
 - 1 limit switches - brake set.
- For the navigation lights:
 - 1 each color and type lens.
 - 2 each color and type LED lamp.
 - 6 lens gaskets.
- For the PLC system:
 - 1 each of every type PLC input card and PLC output card.
 - In addition, a quantity of 4 discrete input cards and 4 relay contact output cards.
 - 1 PLC chassis power supply module.
- One spare drive with all appurtenances.

Arrange the spare parts in uniform size cartons of substantial construction, with typed and clearly varnished labels to indicate their contents, and store them where directed by the Resident. Provide large spare parts with moisture-proof wrapping. Provide a directory of permanent type, describing the parts. In the directory state the name of each part, the manufacturer's number thereof, and the rating of the

device for which the part is a spare. Mark the spare parts to correspond with their respective item numbers as indicated on the elementary wiring diagram.

655.03 Construction Details

Grounding

Bridge steel work on each side of the navigation channels shall be solidly bonded and grounded to 25mm copper plated steel ground rods installed using No. 2/0 AWG bare, stranded, tinned copper cable.

The resistance to ground shall be no higher than 25 ohms. Provide exothermic welds, molded fusion, type as required, as manufactured by Cadweld, Thermoweld, Metalweld, or Resident approved equal.

Bond together and solidly connect to a ground bus in the machinery and/or electrical rooms, grounding conductors in navigation lighting units, all metal framing, cases, and enclosures of the electrical equipment, such as motors, control console, control cabinets, conduits, and all other metal parts in the proximity of current carrying conductors or equipment. Extend a No. 2/0 AWG bridge-grounding conductor connected to this ground bus to the service disconnect.

Ground new utility service neutral conductors in accordance with local utility grounding requirements.

Exothermically weld together the utility service neutral conductor, the bridge grounding conductor and two No. 2/0 AWG grounding electrode conductors.

Provide grounding system terminals that are solderless lugs and that are secured by means of hexagonal-head, copper plated, steel machine bolts with lock washers or lock nuts. Ground system conductors shall be continuous unspliced connections between terminal lugs. Remove paint, rust, and scale over the contact area. Make up all connections as tightly as possible, and spot paint any bare metal or paint undercoat remaining exposed to restore the surface with the same coating and number of coats as applied to the adjacent metal.

Provide equipment ground conductors composed of seven-strand, soft-drawn, bare, tinned copper wire conforming to ASTM B33 and not smaller than No. 10 AWG.

Painting

The requirements for painting structural steel also apply to painting electrical equipment, unless otherwise specified.

Shop Painting

Electrical equipment such as conduits, boxes, supports, and other devices which have a galvanized finish and equipment such as motors, brakes, control console, and control panel frames and enclosures which normally are given a factory finish need not be shop painted. Give all other electrical equipment one shop coat.

Field Painting

Electrical equipment, which is normally given a factory painted finish suitable to the Resident, need not be field painted. Give all other electrical equipment, such as conduits, boxes, device enclosures, supporting clips and brackets, and other devices, two field coats of paint as specified under the requirements for painting structural steel. Before applying the two field coats, clean galvanized surfaces free of all grease, oil, dirt, and foreign material and etch with copper sulfate solution, after which the solution shall be applied. In lieu of etching and a coat of shop paint, the Contractor may use galvanizing primer as a first coat for galvanized surfaces. Apply a final field coat on electrical equipment in the operator house the color and type of paint to match the house interior.

PLC Programming and Sequence of Operation

The following is a general sequence of operation based on the general requirements of AASHTO. During the shop drawing submittal process the operating sequence shall be further refined with input from the Resident and the department.

Step 1: Turn bridge control power on. PLC enables desk controls. Turn oncoming traffic signals from green, through yellow, to red. PLC energizes the gate flashers and gongs.

Step 2: Lower the pedestrian gates. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a gate takes longer than 30 seconds to lower, the operation shall stop and an alarm shall be sent to the HMI. The pedestrian gate lowered bypass shall permit the operation to continue. The operation of the bypass switch shall cause an alarm to be sent to the HMI.

Step 3: Lower the barrier gates. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a gate takes longer than 30 seconds to lower, the operation shall stop and an alarm shall be sent to the HMI.

Step 4: Confirm that with all gates lowered the barrier gate latched limit switches are engaged. If they are not, the operation shall be stopped and an alarm sent to the HMI. PLC de-energizes gongs only. The

barrier gate lowered bypass shall permit the operation to continue. The operation of the bypass switch shall cause an alarm to be sent to the HMI.

Step 5: Withdraw the span locks. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a lock takes longer than 30 seconds to withdraw, the operation shall stop and an alarm shall be sent to the HMI. If the span lock withdrawn limit switches fail to register, the span lock withdrawn bypass switch shall allow the operation to continue and an alarm shall be sent to the HMI.

Step 6: If there is a static drive fault, or a circuit breaker is not closed, the operation shall stop and an alarm shall be sent to the HMI. If any brake is hand released, the operation shall not continue and an alarm shall be sent to the HMI. One brake hand release shall be permitted to be bypassed using the brake hand release bypass and an alarm shall be sent to the HMI. Initiate span raise by momentarily turning the selector switch to raise. The drive shall smoothly ramp to 5% speed at 100% torque with the brakes still set. The system shall verify that the motor shafts are not turning. If the motor shafts turn, the operation shall stop and an alarm shall be sent to the HMI. If the shafts are not turning, the brakes shall release and the drives shall ramp the motors to 100% speed. If after 10 seconds the brakes do not release, the operation shall cease and an alarm shall be sent to the HMI.

Step 7: Once the leaf reaches the nearly open position (to be field determined) the drives shall ramp down to and remain at 5% speed until the span reaches fully open. The drive output torque shall be limited to 80%, the brakes shall set and then the drives shall shut down. An independent electronic speed switch and inclinometer combination shall verify deceleration and shall emergency stop the span if deceleration does not occur. Should deceleration failure occur, an alarm shall be sent to the HMI. If the time to open the span exceeds 120 seconds, the operation shall stop and an alarm shall be sent to the HMI.

Step 8: The span navigation lights shall change from red to green based on the input from the fully open limit switch.

Step 9: Allow navigation traffic to clear.

Step 10: Initiate span lower by momentarily turning the selector switch to lower. The drives shall smoothly ramp to 5% speed at 100% torque with the brakes still set. The system shall verify that the motor shafts are not turning. If the motor shafts turn the operation shall stop and an alarm shall be sent to the HMI. If the shafts are not turning, the brakes shall release and the drives shall ramp the motors to 100% speed. If after 10 seconds the brakes do not release, the operation shall cease and an alarm shall be sent to the HMI.

Step 11: Once the leaf reaches the nearly closed position (to be field determined) the drives shall ramp down to and remain at 5% speed until the span seats. The drive output torque shall be limited to 80%, the brakes shall set and then the drives shall shut down. An independent electronic speed switch and inclinometer combination shall verify deceleration and shall emergency stop the span if deceleration

does not occur. Should deceleration failure occur, an alarm shall be sent to the HMI. If the time to close the span exceeds 120 seconds, the operation shall stop and an alarm shall be sent to the HMI.

Step 12: Drive the span locks. If the span is seated but the limit switches fail to provide proper indication, the span seated bypass switch shall be used to allow the locks to drive and an alarm shall be sent to the HMI. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a lock takes longer than 30 seconds to drive, the operation shall stop and an alarm shall be sent to the HMI. If the span lock driven limit switches fail to register, the span lock driven bypass switch shall allow the operation to continue and an alarm shall be sent to the HMI.

Step 13: PLC energizes the barrier gate gongs. Raise the barrier gates. If the barrier gates are raised but the proper indications are not given, the gate raised bypass switch shall allow the pedestrian gates to raise and alarm shall be sent to the HMI. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a gate takes longer than 30 seconds to raise the operation shall stop and an alarm shall be sent to the HMI.

Step 14: Raise the pedestrian gates. If there is a circuit breaker fault, an overload, or a manual operation interlock fault, the operations shall stop and an alarm sent to the HMI. If a gate takes longer than 30 seconds to raise the operation shall stop and an alarm shall be sent to the HMI. PLC de-energizes both the barrier gate flashers and gongs.

Step 15: Turn traffic signals to green. Turn bridge control power off. PLC disables desk controls.

Step 18: In general, any circuit breaker trip, any overload trip, any drive fault, any bypass switch, any overtime fault or any manual operation interlock fault shall send a fault to the HMI which shall display a message unique to that fault. The vendor shall submit a complete list of proposed fault messages for review and comment and additional messages shall be added as required. These messages shall be recorded in order with the time and date of the fault. Many operations can be bypassed; only one bypass switch can be enabled at any time, if more than one is enabled, the operation shall stop.

Manufacturer's Field Start-Up Service

Included with the furnishing of the major items of electrical equipment by the manufacturer is the furnishing of all necessary field supervisory start-up time by the manufacturer's Service Engineering Department to facilitate proper adjustment of the drive equipment so as to achieve satisfactory functioning of the drives.

The manufacturer's field service engineering personnel are required to be experienced in the adjustment and functioning of the particular control equipment furnished by the manufacturer. The personnel are required to be capable of locating and correcting faults or defects and of obtaining from the

manufacturer, without delay, new parts or replacements for apparatus that, in the opinion of the Resident, does not perform satisfactorily.

Bridge Electrical Testing

The Contractor shall furnish all labor, materials, plant, and equipment and shall do all work necessary, such as adjustments or corrective measures, to properly test all systems included in the field testing and final acceptance testing.

All test results, parameters, data specified herein to be recorded shall reference the appropriate paragraph number and shall be presented in legible, tabular format, listing associated parameters and conditions. For example, motor current shall reference speed (rpm), span height (feet-inches), raise or lower mode, normal or emergency drive control, drive control selector position number, etc. The results of the Normal systems tests shall be presented in a matrix form on an Inspection Report Data Sheet. The proposed format of these sheets shall be submitted to the Resident for acceptance prior to the actual testing. Any parameter value, which falls beyond the recommended range, would require the readjustment or replacement of the defective device.

The table of the test results shall have references to the specific sections of the testing procedure. The precision of the results will depend on the accuracy of recording equipment, the observer and weather conditions. For each stage of testing of the bridge control equipment, the name of the person who will perform the test, instruments used with calibration data if required, the exact date, time and weather conditions shall be recorded.

Some devices such as the transfer switch, lamps, console indicator lights, brake function indicator lights, differential/emergency clutches, console controlled lighting, horn, can be easily tested without performing any bridge opening operation.

The bridge main parameters shall also be observed and visually compared to the control desk indicating meters. Any discrepancy between results should be recorded. A discrepancy between critical measurements like span height and/or skew indication shall be resolved prior to continuing the tests. The testing shall be accomplished sequentially, following the bridge operation instructions for normal operation and emergency operation. The major bridge systems shall be monitored while the bridge operates. All monitored parameters shall be kept for future reference, and a printout copy shall be attached to the Operating and Maintenance (O & M) Manual for reference. Another printout copy shall be provided to the Resident.

The testing of the bridge electrical equipment would necessitate the use of the following recording and testing devices:

1. A computerized 16-bit, data acquisition system providing simultaneous sampling every 0.1 second of span position, motor input power, current, voltage, and motor RPM. Data shall stream to disk at a rate of 10 hertz. The data shall be transferred to graphing software.

2. Portable tachometer
3. Portable ohmmeter
4. Amp-probe
5. Recording ammeter
6. Recording voltmeter
7. Infrared scanner.
8. Measuring tape
9. Stop watch (Timer)
10. All other necessary instrumentation and tools to monitor, adjust and/or replace items during the bridge testing procedure.

All meters shall be calibrated per NIST guidelines within 6 months of the testing.

The Contractor shall arrange for and provide all the necessary field tests and provide a testing procedure subject to the approval of the Resident, to demonstrate that the entire electrical system is in proper working order and in accordance with the Plans and Specifications. The tests shall include, but not be limited to operational testing of traffic signals, warning gates, movable span, navigation lights and signals and manual transfer switch.

Should the tests show that any piece of equipment or cable or wiring connection, in the judgment of the Resident, is defective or functions improperly, such adjustments and/or replacements shall be made by the Contractor as to make the installation satisfactory to the Resident and at no extra cost.

During testing of the electrical systems, it may be found that minor deviations from the performance specification are required for optimum bridge operation. All hardware required for these modifications shall be included in the control system vendor scope of work at no additional cost to the State.

The bridge field tests are intended to confirm each major sub-component acceptance factory tests, and that the subsystem is operational, as well as the complete system. Confirmation of correct operation of sub-components will be demonstrated through successful operation of the particular component. However, the Contractor is still responsible for the factory acceptance tests as required per contract specifications. Examples of subsystems are the span drive systems, control and power wiring, limit switches, starters, span lock system, etc.

This acceptance test is intended to show and/or demonstrate that the normal and emergency control and power systems are operational, trouble free, operating with all interlocks properly functioning, and in compliance with the requirements of the contract plans and specifications.

The bridge acceptance tests are not intended to substitute each sub-component acceptance factory and field tests. Confirmation of correct operation of sub-components shall be demonstrated through successful operation of the total control system. However, the Contractor is still responsible for the factory and field tests acceptance tests as required per contract specifications. For example, it is not the intent to manually operate and test each limit switch. This will have been accomplished by the contractor prior to demonstration of the system under test. The contractor shall be able to prove that the results of the sub-component tests are in conformance with the contract plans and specifications. The recommended values of various device parameters can be found in the appropriate manufacturer's catalog cuts and instruction manuals. Correct operation of the sub-components, and control circuit wiring connections will be verified through the successful completion of the entire bridge control and power systems tests.

This testing procedure will evaluate performance and confirm correct and proper operation of all major subsystems and devices including the control desk meters and HMI, control switches and pushbuttons, traffic signals, warning gates, span locks, brakes, the span drives and motors, bypass switches, manual transfer switch, etc. Visual inspections and physical measurements of some equipment are required for the purpose of recording valid parameter values. Bridge run printouts shall be provided for each test, and kept for the record together with all other recorded data.

The Owner must be in possession of the final, new operating and maintenance (O & M) manuals at least 30 days before acceptance testing may begin. The Contractor shall start approval submissions of the O & M manuals as soon as possible, as several revisions may be required.

There shall be 30 consecutive days of nominal bridge operation using the new permanent systems, with a minimum of five (5) successful openings per day, before the final acceptance test shall be scheduled.

During the field testing period, the Contractor shall arrange to have at the site representatives of the manufacturer of all major pieces of equipment or systems. The representatives shall be capable of supervising all adjustments to the equipment; of locating faults or defects and correcting them if possible; and of obtaining from the manufacturers, without delay, new parts or replacements for apparatus which, in the opinion of the Resident, does not perform satisfactorily.

General:

Results and observations shall be carefully recorded throughout the various tests.

The bridge shall be balanced and strain gage conditions verified by the Contractor prior to any final acceptance testing of the span control system.

Prior to performance of these tests, all temporary PLC forces, bypasses, jumpers, switches, etc., installed during any previous testing must be removed. The control circuits shall be in the state presented in the originally As-Built control wiring diagrams (restored to normal).

All tests and verifications shall be for equipment at both the near and far sides. In addition to all devices listed below, all associated devices should also be tested.

Tests To Be Performed

PLC System:

The bridge primary control system is provided by the PLC system, span drives and power distribution system. Prior to any other test, visually verify the wiring connection integrity of the major components including:

- a. All limit switches
- b. Control cabinets contactors
- c. Traffic signals, warning gates, interlocked heating and ventilating devices, etc.
- d. Control desk indicating lights
- e. Control Desk HMI screens

Control Desk:

The control desk devices (HMI, switches, pilot lights,) will be used throughout the tests, and all irregularities observed shall be noted during and after the tests from the notes and printouts. Special attention shall be given to the desk meters accuracy verification.

Provide one desk multifunctional power monitor verification as follows:

- a. For a determined bridge span opening, at an exact start recording [Time stamp] time, an assigned test technician shall record every 5 seconds, on paper, the meter watt and ampere readings for a designated drive and motor.
- b. The manually recorded values shall be filed. The results shall be compared and the meter accuracy estimated.

Air Horns:

Test that the air horn produces a tone acceptable to the Resident. If necessary, the air horn sound tone shall be re-tuned to an acceptable pitch and level.

Traffic Signals Control:

Test that the traffic signals change state upon activation of the desk selector switch. The duration time of the amber light shall be of an acceptable time to the Resident. If necessary, the TSR timing relay shall be re-set to an acceptable time delay.

Barrier and Pedestrian Gate Control:

Testing of the gates shall demonstrate the balance condition of the gate arms such that a stationery arm remains in the same position when the brake is released.

Proper manual operation and proper normal operation upon activation of the desk selector switches and sidewalk stations shall be demonstrated.

- a. Lower individually, group raise commands, lower/raise sequencing checks
- b. Follow the "Sequence of Operation"
- c. Verify that the gates are lowered in the right sequence and the gongs de-activated at the appropriate time

1. Bypass checks:

Verify that when the Interlock Bypass keyswitch is enabled, the interlocks listed above are overridden

2. Group / Individual Control Operation Interlocks:

Verify that gate operation is prevented when any of the following occur

- a) Gate housing door opened;
- b) Handcrank inserted;
- c) Gate motor disconnect switch opened;
- d) Gate motor overloaded;

Span Locks Control:

Drive/pull commands:

1. Follow the "Sequence of Operation" up to the span operation
2. Pull locks using the control desk marked-up corresponding switches, and verify the locks are pulled
3. Drive back the locks using the control desk marked-up corresponding switches, and verify the locks are driven

Interlock checks:

1. Verify that the gates cannot be raised electrically unless the span locks are driven.
2. Verify that the traffic signals cannot be turned to green when the gates are not raised.
3. Verify that the span cannot be operated electrically unless the span locks are pulled.

Bypass checks:

Verify that when the "Bypass Span Locks Interlocks" keyswitch is enabled, the interlocks listed above are overridden.

Group / Individual Control Operation Interlocks:

Verify that when the span locks are operated by the group drive / pull control switch, any of the following conditions:

1. Manual handcrank inserted;
 2. Lock motor disconnect switch opened;
 3. Lock motor overloaded;
- on any of the span locks, will disable the group drive / pull operation. Verify that any individual span lock operation is disabled by any of the above conditions on that span lock.

Span Brakes Control

The normal automatic set and released operation of the brakes shall be visually recorded during the span raise and lower operations.

The brakes shall be hand released, each brake one at a time, and the hand-released indication monitored through to the control desk.

With the span in non-permissive operation mode (span locks driven, drives not energized), the brake set and release switches can be activated manually and their set/released indication monitored on to the control desk.

Span Normal Operation

Several bridge openings may be required to demonstrate that all the operational parameters are acceptable and interlock functions safe. Subsequent runs will be required to simulate failures, and to test interlocking and bypass functions. The normal sequence of operation as described in the "Sequence of Operation" section of the general specifications shall be followed up to the indicated operational step of the equipment to be tested. All tests shall be performed for both main span motors on each leaf.

Normal Operation:

Follow the full "Sequence of Operation". During the span "Raise" and "Lower" operation, the following parameters shall be monitored and manually recorded:

- a. Span position [degrees];
- b. Motor power [kilowatt];
- c. 3-phase current [amperes];
- d. 3-phase voltage [volts];
- e. Motor speed [RPM];
- f. Manually record maximum height during the "Raise" [degrees];

- g. Manually record Raise” time and “Lower” time;

These parameters shall also be manually recorded at the fully closed, nearly closed, nearly open and fully open position as indicated at the control desk by PLC HMI.

Verify that the span operated normally within the permissible position limits.

Verify that the recorded position, the control desk indicated position and the limit switches indicated position are equal or within the set design tolerances.

Interlock Checks:

1. Verify that the span cannot be operated electrically if more than one brake in each machinery room has been released by hand.
2. Verify that the warning gates, traffic signals cannot be operated unless the span is seated and locked.
3. Verify that the span locks cannot be operated unless the span is fully seated.

Bypass Checks:

Verify that when the “Bypass Span Control Interlocks” switch is enabled, the interlocks listed above are overridden.

Emergency Span Stops:

1. Under normal opening procedures, push the “Emergency Stop” red mushroom head button.
2. Verify that all motor and brake contactors drop out and the span brakes set immediately.

Temporary Span Operations

During construction, the bascule span will be installed but the control house will not be completed. To allow for operations without the permanent control system the contractor shall provide a temporary drive panel to operate one span motor, and provide all traffic control by means of crash trucks. It is anticipated that the contractor shall make use of the spare drive to be provided and provide a temporary power panel and a switch panel to operate the drive. The contractor shall submit for approval his temporary operations plan in detail.

Bridge Operator

Provide persons to supervise the operation of the bridges and to train personnel for a period of 30 consecutive working days after the construction of the permanent control system has been completed, fine-tuned, field tested, and utilized for span operations. Instructors include, but not be limited to, representatives from manufacturers of the major equipment and a Control Engineer.

Provide operators who are skilled persons competent to operate the bridge and who are completely familiar with the operating equipment of the bridge and its auxiliaries, such as bridge security, the

communications system, and fire alarm system. The operators are required to be able to make any adjustments required to the electrical and mechanical equipment.

During the 30-day period specified above, the operator(s) is required to be in attendance at the bridge for the normal working period of 8 hours per day.

Included in the 30-day training and instruction period, provide on-site training of electricians, maintenance workers, and other personnel as indicated by the State on subjects such as troubleshooting, repair of electronic motor controls, drive circuit logic, maintenance and adjustment of all electrical equipment, software, PLC hardware, and other items required for full bridge operation and maintenance. Devote three 8-hour sessions to hardware and maintenance related topics. In addition, devote three 8-hour sessions to software requirements. Offer instruction pertaining to hardware and maintenance on two separate occasions to allow bridge personnel to coordinate the course with their normal activities. Devote one 8-hour session to training on the fire, security, and communications systems and equipment. Furnish all necessary instruction sheets, student training aids, books, paper, and booklets to supplement training. Submit to the State, a minimum of 2 weeks prior to training session, an outline of topics to be covered and training material for review. It is the Contractor's responsibility to coordinate with the State the location where training sessions will be held. Supplying of visual aid equipment and other miscellaneous items required for training shall be the responsibility of the Contractor.

The Contractor shall make the instruction booklet that was specified above, "Operation and Maintenance Manual, Volume 1, Operation of Electrical Equipment", available for use during the training period.

Training of the designated bridge operational personnel shall commence three (3) weeks prior to the official bridge opening date. This will allow training of personnel without interruption of normal traffic flow.

655.04 Method of Measurement The item "Bridge Electrical and Control Systems" will be measured as one lump sum unit.

655.05 Basis of Payment The lump sum price bid for " Bridge Electrical and Control Systems " includes the cost of all labor, materials, operation and maintenance manuals, training and equipment necessary for a complete installation, ready for operation.

The Contractor shall submit to the Resident a detailed breakdown of the Contractor's costs under this item within 30 days of award of the contract. This breakdown will be evaluated by the Resident and utilized as the basis for monthly progress payments for work satisfactorily completed. A minimum of ten-percent of the bid will be retained by the State until final acceptance of the bridge electrical system, the Contractor and Control System Vendor have completed all items on their punchlists, and all aspects of bridge operation, operator and maintenance personnel testing, training, and control are complete. An additional five-percent will be retained until final approval of the operation and maintenance manuals is granted by the Resident.

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.3001 Bridge Electrical and Control Systems	Lump Sum

SPECIAL PROVISION
SECTION 655 – Standby Generator

655.01 Description This specification covers the fabrication and installation of a standby generator for the purpose of opening and closing the bascule span in the event of a power outage.

655.02 General

References and Standards

The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in strict accordance with all applicable standards below:

- CSA C22.2 No14
- CSA 282
- CSA 100
- EN61000-6
- EN55011
- FCC Part 15 Subpart B
- ISO8528
- IEC61000
- UL508
- UL2200
- UL142
- Designed to allow for installed compliance to NFPA 70, NFPA99 and NFPA 110

655.021 Work Included

General

Installation

The work includes supplying and installing a complete integrated generator system. The system consists of a diesel generator set with related component accessories and automatic transfer switches specified under a separate section.

The Contractor shall provide a full tank of diesel fuel for the completion of all testing.

A complete system load test shall be performed after all equipment is installed.

The equipment supplied and installed shall meet the requirements of the NEC and all applicable local codes and regulations. All equipment shall be of new and current production by a manufacturer who has 25 years of experience building this type of equipment. Manufacturer shall be ISO9001 certified.

Submittals

Engine-generator submittals shall include the following information:

1. Factory published specification sheet.
2. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, control panel, enclosure, etc.
3. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories.
4. Weights of all equipment.
5. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems.
6. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, control panel, and remote alarm indications.
7. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, fuel consumption, etc.
8. Generator electrical data including temperature and insulation data, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
9. Generator resistances, reactances and time constants.
10. Generator locked rotor motor starting curves.
11. Manufacturer's documentation showing maximum expected transient voltage and frequency dips, and recovery time during operation of the generator set at the specified site conditions with the specified loads.
12. Manufacturer's and dealer's written warranty.

Requirements, Codes and Regulations

The equipment supplied and installed shall meet the requirements of NEC and all-applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory trained service personnel.

Warranty

Two Year Standby (ISO 8528-1: ESP) Generator Set Warranty

The manufacturer's standard warranty shall in no event be for a period of less than two (2) years from date of initial start-up of the system and shall include repair parts, labor, reasonable travel expense necessary for repairs at the job site, and expendables (lubricating oil, filters, antifreeze, and other service items made unusable by the defect) used during the course of repair. Running hours shall be limited to 500 hours annually for the system warranty by both the manufacturer and servicing distributor. Submittals received without written warranties as specified will be rejected in their entirety.

Service Facility

The engine-generator supplier shall maintain 24-hour parts and service capability within 100 miles of the project site. The distributor shall stock parts as needed to support the generator set package for this specific project. The supplier must carry sufficient inventory to cover no less than 80% parts service within 24hrs and 95% within 48 hours.

Service Personnel

The dealer shall maintain qualified factory trained service personnel.

Genset Requirements

The generator set shall be Standby Duty rated at 40 ekW, 50.0 kVA, N/A RPM, 0.8 power factor, 480 V, 3-Phase, 60 hertz, including radiator fan and all parasitic loads. Generator set shall be sized to operate at the specified load at a maximum ambient of 170.6F (77C) and altitude of 1,640.5 feet (500.0 m).

Standby Power Rating:

Power is available for the duration of an emergency outage

Average Power Output = 70% of standby power

Load = Varying

Typical Hours/Year = 200 Hours

Maximum Expected Usage = 500 hours/year

Typical Application = Standby

Material and Parts

All materials and parts comprising the unit shall be new and unused.

Engine

The engine shall be diesel fueled, four (4) cycle, water-cooled, while operating with nominal speed not exceeding 1800 RPM. The engine will utilize in-cylinder combustion technology, as required, to meet applicable EPA non-road mobile regulations and/or the EPA NSPS rule for stationary reciprocating compression ignition engines. Additionally, the engine shall comply with the State Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 D2 Emissions Cycle at specified ekW / bHP rating. Utilization of the "Transition Program for Equipment Manufacturers (also known as "Flex Credits") to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder. Emissions requirements / certifications of this package: EPA T3. The engine speed shall be governed by a mechanical governor to maintain steady state alternator frequency within +/- 0.8% of rated frequency. Speed droop will be a maximum of 4% from no load to full load.

Generator

The synchronous three phase generator shall be a single bearing, self-ventilated, drip-proof design in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling. The generator shall meet performance class G2 of ISO 8528. The excitation system shall

enable the alternator to sustain 300% (250% for 50Hz) of rated current based on the 125C (Class H) or 105C (Class F) rise rating for ten seconds during a fault condition and shall improve the immunity of the voltage regulator to non-linear distorting loads. The excitation system shall be of brushless construction and be independent of main stator windings (either permanent magnet or auxiliary windings).

Voltage Regulator

The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be a totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, over-excitation protection, shall limit voltage overshoot on startup, and shall be environmentally sealed.

Motor Starting

Provide locked rotor motor starting capability of 136.7 skVA at 30% instantaneous voltage dip as defined per NEMA MG 1. Sustained voltage dip data is not acceptable.

Circuit Breaker

Provide a generator mounted 80% circuit breaker, molded case, Qty.(1) 80 amp trip, 3 pole, NEMA 1/IP22. Breaker shall utilize a solid state trip unit. The breaker shall be UL/CSA Listed and connected to engine/generator safety shutdowns. Breaker shall be housed in an extension terminal box which is isolated from vibrations induced by the generator set. Mechanical type lugs, sized for the circuit breaker feeders shown on drawing, shall be supplied on the load side of breaker.

Generator Set Mounted Controls (EMCP 4.1)

Provide a fully solid-state, microprocessor based, generator set control. The control panel shall be designed and built by the engine manufacturer. The control shall provide all operating, monitoring, and control functions for the generator set.

Environmental

The generator set control shall be tested and certified to the following environmental conditions.

1. -40C to +70C Operating Range
2. 100% condensing humidity, 30C to 60C
3. IP22 protection for rear of controller; IP55 when installed in control panel
4. 5% salt spray, 48 hours, +38C, 36.8V system voltage
5. Sinusoidal vibration 4.3G's RMS, 24-1000Hz
6. Electromagnetic Capability (89/336/EEC, 91/368/EEC, 93/44/EEC, 93/68/EEC, BS EN 50081-2, 50082-2)
7. Shock: withstand 15G

Functional Requirements

The following functionality shall be integral to the control panel.

1. The control shall include a 33 x 132 pixel, 24mm x 95mm, positive image, transfective LCD display with text based alarm/event descriptions.
2. Audible horn for alarm and shutdown with horn silence switch
3. Standard ISO labeling
4. Multiple language capability
5. Remote start/stop control
6. Local run/off/auto control integral to system microprocessor
7. Cooldown timer
8. Lamp test
9. Emergency stop push button

Digital Monitoring Capability

The controls shall provide the following digital readouts for the engine and generator. All readings shall be indicated in either metric or English units.

Engine

1. Engine oil pressure
2. Engine coolant temperature
3. Engine RPM
4. Battery volts

Generator

1. Generator AC volts (Line to Line, Line to Neutral and Average)
2. Generator AC current (Per phase and Average)
3. Generator AC Frequency

2.4.4 Alarms and Shutdowns

The control shall monitor and provide alarm indication and subsequent shutdown for the following conditions. All alarms and shutdowns are accompanied by an engine hour stamp that is stored by the control panel for first and last occurrence.

1. Engine Alarm/Shutdown
2. Low oil pressure alarm/shutdown
3. High coolant temperature alarm/shutdown
4. Loss of coolant shutdown
5. Overspeed shutdown
6. Overcrank shutdown
7. Emergency stop shutdown
8. Low coolant temperature alarm

Generator Alarm/Shutdown

1. Generator phase sequence
2. Generator over voltage

3. Generator under voltage
4. Generator over frequency
5. Generator under frequency

Inputs and Outputs

Programmable Digital Inputs

The control shall include the ability to accept six (6) total with four (4) programmable digital input signals. The signals may be programmed for either high or low activation using programmable Normally Open or Normally Closed contacts.

Programmable Relay Outputs

The control shall include the ability to operate six (6) total with four (4) form A (normally open) programmable relay output signals, integral to the controller. Relay shall be rated for a maximum of 2A @ 30 VDC.

Maintenance

All engine, voltage regulator, control panel and accessory units shall be accessible through a single electronic service tool. The following maintenance functionality shall be integral to the generator set control

1. Engine running hours display
2. 40 events are stored in control panel memory

Cooling System

The generator set shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions and 110 F* ambient air entering the room or enclosure (If an enclosure is specified). The generator set supplier is responsible for providing a properly sized cooling system based on the enclosure static pressure restriction.

Fuel System

The fuel system shall be integral with the engine. In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter/water separator in the fuel inlet line to the engine. All fuel piping shall be black iron or flexible fuel hose rated for this service. No galvanized piping will be permitted. Flexible fuel lines shall be minimally rated for 300 degrees F and 100 psi.

Fuel Sub Base Tank

Provide a double wall sub-base tank constructed to meet all local codes and requirements. A fuel tank base of 48 hour capacity shall be provided as an integral part of the enclosure. It shall be contained in a rupture basin with 110% capacity. The tank shall meet UL142 standards. A locking fill cap, a

mechanical reading fuel level gauge, low fuel level alarm contact, and fuel tank rupture alarm contact shall be provided.

Silencer

A residential grade silencer, companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Mounting shall be provided by the contractor as shown on the drawings. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer.

Starting Motor

A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.

Jacket Water Heater

Jacket water heater shall be provided and shall be sized to insure that genset will start within the specified time period and ambient conditions.

Batteries

Batteries - A lead-acid storage battery set of the heavy-duty diesel starting type shall be provided. Battery voltage shall be compatible with the starting system.

Battery Charger

Battery Charger - A current limiting battery charger shall be furnished to automatically recharge batteries. The charger shall be dual charge rate with automatic switching to the boost rate when required. The battery charger shall be mounted on the genset package or inside the genset enclosure/room.

Generator Set Start Module

Supplied with an AC source from a UPS, the Generator Set Start Module will supply 1725 cold cranking amps @ 24 VDC to assist and backup the generator set starting batteries for improved system reliability. Generator Set Start Module shall have operating temperatures of (-20deg C to 50deg C). Generator Set Start Module to be supplied from generator set equipment supplier. This will ensure system integration.

Enclosure

The complete diesel engine generator set, including generator control panel, engine starting batteries and fuel oil tank, shall be enclosed in a factory assembled, sound attenuated enclosure mounted on the fuel tank base.

A weather resistant, sound attenuated enclosure of steel with electrostatically applied powder coated baked polyester paint. It shall consist of a roof, side walls, and end walls. Fasteners shall be either zinc plated or stainless steel. Acoustical foam shall be provided between all supports and inside doors and sound baffles on air intake and air discharge.

Installation

Install equipment in accordance with manufacturer's recommendations, the project drawings and specifications, and all applicable codes.

Start-Up and Testing

Coordinate all start-up and testing activities with the Resident and Owner. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following: Perform a 4 hour load bank test at a 1.0 PF at full nameplate rating. Loadbank, cables and other equipment required for this test to be supplied by the genset supplier.

Operation and Maintenance Manuals

Provide two (2) sets of operation and maintenance manuals covering the generator, switchgear, and auxiliary components. Include final as-built wiring interconnect diagrams and recommended preventative maintenance schedules.

Training

Provide on-site training to instruct the owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

655.05 Method of Measurement The item "Engine Generator System - Standby" shall be measured as one lump sum unit.

655.06 Basis of Payment The lump sum price bid for "Engine Generator System - Standby " includes the cost of all labor, materials, operation and maintenance manuals, training and equipment necessary for a complete installation, ready for operation.

Payment shall be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.01 Engine Generator System - Standby	Lump Sum

SPECIAL PROVISION
SECTION 656
Temporary Soil Erosion and Water Pollution Control

The following is added to Section 656 regarding Project Specific Information and Requirements. All references to the Maine Department of Transportation Best Management Practices for Erosion and Sedimentation Control (a.k.a. Best Management Practices manual or BMP Manual) are a reference to the latest revision of said manual. The latest version is dated "February 2008" and is available at:

<http://www.maine.gov/mdot/env/documents/pdf/bmp2008/BMP2008full.pdf>

Procedures specified shall be according to the BMP Manual unless stated otherwise.

Project Specific Information and Requirements

The following information and requirements apply specifically to this Project. The temporary soil erosion and water pollution control measures associated with this work shall be addressed in the Soil Erosion and Water Pollution Control Plan (SEWPCP.)

1. Newly disturbed earth shall be mulched by the end of each workday. Mulch shall be maintained on a daily basis.
2. The SEWPCP shall describe the location and method of temporary erosion and sediment control for existing and proposed catch basins, outlet areas and culvert inlets and outlets.
3. **If water is flowing within the drainage system, the water shall be diverted to a stable area or conduit and all work shall be conducted in the dry.** The Contractor's plan shall address when and where the diversions will be necessary. If it is determined by the MaineDOT that work in the wet is required to complete contractual obligations, the **contractor must plan, stage, and phase work such that work in the wet is minimized** to the extent practicable as determined by the MaineDOT resident or representative thereof.
4. Dust control items other than those under Standard Specification 637, if applicable, shall be included in the plan.
5. Permanent slope stabilization measures shall be applied within one week of the last soil disturbance. Temporary slope stabilization is required on a daily basis.

SPECIAL PROVISION
SECTION 656

Temporary Soil Erosion and Water Pollution Control

6. Permanent seeding shall be done in accordance with *Special Provision, Section 618, Seeding* unless the Contract states otherwise.
7. Culvert inlet and outlet protection shall be installed within 48 hours of culvert installation, or prior to a storm event, whichever is sooner.
8. Temporary winter stabilization must be used between November 1st and April 1st or outside of that time period if the ground is frozen or snow covered. Temporary winter stabilization involves, at a minimum, covering all disturbed soils and seeded ground that is not Acceptable Work with an approved method. If temporary winter stabilization practices are used then spring procedures for permanent stabilization shall also be described in the SEWPCP. Use of these methods for over-winter temporary erosion control will be incidental to the contract and be paid for as part of Pay Item 656.75.
9. Construction and demolition debris (including debris from wearing surface removal, saw cut slurry, dust, fresh concrete, concrete debris, etc.) shall be contained and shall not be allowed to discharge to any resource. All construction and demolition debris shall be disposed of in accordance with *Standard Specifications, Section 202.03, Removing Existing Superstructure, Structural Concrete, Railings, Curbs, Sidewalks and Bridges*. Containment and disposal of demolition debris shall be addressed in the Contractor's SEWPCP.
10. If a cofferdam sedimentation basin is used, it shall be located in an upland area where the water can settle and sink into the ground or be released slowly to the resource in a manner that will not cause erosion. The location of such a cofferdam sedimentation basin shall be addressed in the SEWPCP.
11. Prior to release to a natural resource, any impounded water that has been in contact with concrete placed during construction must have a pH between 7.0 and 8.5, must be within one pH unit of the background pH level of the resource and shall have a turbidity no greater than the receiving resource. This requirement is applicable to concrete that is placed or spilled (including leakage from forms) as well as indirect contact via tools or equipment. Water not meeting release criteria shall be addressed in the SEWPCP. Discharging impounded water to the stream must take place in a manner that does not disturb the stream bottom or cause erosion.

SPECIAL PROVISION
SECTION 656
Temporary Soil Erosion and Water Pollution Control

12. The Contractor shall be responsible for monitoring pH with a calibrated meter accurate to 0.1 units. A record of pH measurements shall be kept in the Environmental Coordinator's log (Section 656.4.4.)

SPECIAL PROVISION
CONTROL HOUSE LIGHTING

CHL.01 Description

This work shall consist of the manufacture, delivery and installation of the light fixtures for the control house.

CHL.02 Products

Light fixture LT01:

The fixture shall consist of a 120V, 32W, T8 bulb with a dual circuit and a dimming ballast. All fixtures shall be UL rated and suspended from the ceiling. As manufactured by:
Gammalux (GB35B-1/132T8-120V-DIM-12-S-OP/PBB-WH-2KCT),
Litecontrol (P-ID-46-3x4-12-T8/3x4-12-T8-BW-CWM-DIM-2CWQ-120),
Birchwood (COL-325-1DR-1IN-T8-CR-MW-FBLSS-FC-120-HL3-CSS-2CKT),
or Resident approved equal.

Light fixture LT02:

Fixture shall be clean square pressed glass shade with polished surface suspended from a diecast base. Fixture shall contain one 120V, 10 watt, 800 lumen, 3000K LED module with low voltage electronic dimmer. Must be suitable for damp locations. As manufactured by:
Techlighting (700BX-S-Z-LED3),
Bega (L1818),
Zaneen (D8-3279),
or Resident approved equal.

Light fixture LT03:

Shall be a recessed LED with rectangular aperture for low glare, energy efficient, path, step and accent lighting. Shall have a dimmable 120V, 3000K LED, with an LED/heat sink module. As manufactured by:
Lucifer Lighting (ISL-ALED-3K-W-NL),
Winona (LED-STEP11-RECT-S-30K-ND120V-277V-SGW-X-STD),
Dreamscape (DLED-9010-LED-3000),
or Resident approved equal.

Light Fixture LT04:

Fixture shall be a 120 V, 4', T8 with dimming ballast. T8 fixtures shall have instant-start ballasts. To be UL and damp listed. Maximum ballast size shall be 1.7" width by 1.18" height. Mounting fixture shall be surface-mounted. As manufactured by:
Prudential Lighting (S1-1T8-04'-SAL-TMW-120-SUR-X3),

Bartco (IPR8MS-1-32W-U-IS-P-SM),
Birchwood (NOL-325-1-T8-4-MW-FX-EB-SM),
or Resident approved equal.

Light Fixture LT05:

Fixture shall be a 120 V, 2', T8 with dimming ballast. T8 fixtures shall have instant-start ballasts. To be UL and damp listed. Maximum ballast size shall be 1.7" width by 1.18" height. Mounting fixture shall be surface-mounted. As manufactured by:

Prudential Lighting (S1-1T8-02'-SAL-TMW-120-SUR-X3),
Bartco (IPR8MS-1-17W-U-IS-P-SM),
Birchwood (NOL-325-1-T8-2-MW-FX-EB-SM),
or Resident approved equal.

Light fixture LT06:

Fixture shall be through wall / bulkhead mounted, watertight, and shall be 120v, max 100 watts. Finish shall be natural cast bronze with a screw-type clear globe. Fixture shall be wired from behind bulkhead to eliminate visible cables. As manufactured by:

Oceanic Electrical (5961),
Pace Illumination (AGAM-6000-S-INC100-120-O-TBZ-DL-MWG),
Barn Light Electric (10BW1),
or Resident approved equal.

Light fixture LT07:

Fixture shall be 120v, LED desk lamp with a 120V quick connect cord. Shall have a spring-balanced double arm, a heavy-duty cast aluminum shade with internal reflector and prismatic lens. Shall have a weighted table base for desktop use. Shall be UL listed. As manufactured by:

Lightolier (EGL-LBT),
Kelvin LED (F3320009A),
Berenice LED (1D120-NCL501),
or Resident approved equal.

CHL.03 Method of Measurement

The light fixtures shall not be measured for payment.

CHL.04 Basis of Payment

The manufacture, delivery and installation of the light fixtures shall be incidental to the item "control house".

SPECIAL PROVISION 700 - MATERIALS

SECTION 702 - BITUMINOUS MATERIAL

702.01 Asphalt Cement Performance Graded Asphalt Binder shall conform to the requirements of AASHTO M 320 or AASHTO MP 19, whichever is indicated in the contract documents. For Performance-Graded Asphalt Binder (PGAB), the Contractor shall arrange for the Supplier to furnish the following items to the Department's Materials Testing Engineer.

- a. A Quality-Control Plan for PGAB that conforms to the requirements of AASHTO R 26 "Certifying Suppliers of Performance-Graded Asphalt Binders" and
- b. A CERTIFICATE OF ANALYSIS for all asphalt materials furnished for use on the project. The Certificate shall include the actual test results of the material in storage from which the shipments are being made. Certificates shall be supplied for each lot, batch, or blend of each type and grade of material. A new certificate shall be issued at least every 30 days or upon receiving or manufacture of a new material. The original of each Certificate of Analysis shall be mailed to the Departments Materials Testing Engineer.

The Contractor shall give the supplier sufficient advance notice of orders to permit testing. Material not represented by tests will not be accepted for use on the work.

Deliveries of asphalt materials shall be accompanied by a loading invoice, delivery ticket, or slip, as required under Section 108.1.3 f. The Loading Invoice shall include the applicable certificate number and shall include a printed or stamped statement such as the following:

"THIS IS TO CERTIFY THAT THE ASPHALT MATERIAL REPRESENTED BY THIS LOADING INVOICE CONFORMS TO THE SPECIFICATIONS OF THE PURCHASER FOR THE MATERIAL TYPE AND GRADE STATED THEREON."

In the event an intermediate hauler of the asphalt material is involved, a copy of their own delivery slip shall be furnished, as well as a copy of the supplier's loading invoice. The hauler's delivery slip and the supplier's loading invoice shall be cross-referenced by use of their respective serial numbers.

702.04 Emulsified Asphalt Emulsified Asphalt shall conform to the requirements of AASHTO M 140. Cationic emulsified asphalt shall conform to the requirements of AASHTO M 208.

Use of all emulsified asphalt shall comply with all Department of Environmental Protection (DEP) regulations regarding maximum amount of oil distillate, seasonal limitations, etc.

For emulsified asphalts, the Contractor shall arrange for the Supplier to furnish the following item to the Department's Materials Testing Engineer.

A CERTIFICATE OF ANALYSIS for all asphalt emulsion materials furnished for use on the project. The Certificate shall include the actual test results of the material in storage from which the shipments are being made. Certificates shall be supplied for each lot or batch for each

grade/type of emulsion. A new certificate shall be issued at least every 30 days or upon receiving or manufacture of a new material. The original of each Certificate of Analysis shall be mailed to the Department's Materials Testing Engineer.

Deliveries of emulsion materials shall be accompanied by a loading invoice, delivery ticket, or slip, as required under Section 108.1.3 f. The Loading Invoice shall include the applicable certificate number and shall include a printed or stamped statement such as the following:

“THIS IS TO CERTIFY THAT THE ASPHALT MATERIAL REPRESENTED BY THIS LOADING INVOICE CONFORMS TO THE SPECIFICATIONS OF THE PURCHASER FOR THE MATERIAL TYPE AND GRADE STATED THEREON.”

In the event an intermediate hauler of the asphalt material is involved, a copy of their own delivery slip shall be furnished, as well as a copy of the supplier's loading invoice. The hauler's delivery slip and the supplier's loading invoice shall be cross-referenced by use of their respective serial numbers.

SECTION 703 - AGGREGATES

703.07 Aggregates for HMA Pavements Coarse aggregate and fine aggregate for hot mix asphalt pavements shall be of such gradation that when combined in the proper proportions, including filler, if required, the resultant blend will meet the composition of mixture for the type of pavement specified.

Coarse aggregate, that material retained on the No. 4 sieve, shall be crushed stone or crushed gravel and, unless otherwise stipulated, shall consist of clean, tough, durable fragments free from an excess of soft or disintegrated pieces and free from stone coated with dirt or other objectionable matter. Coarse aggregate, shall not exceed an absorption of 2.0 percent by weight as determined by AASHTO T 85.

Fine aggregate, material that passes the No. 4 sieve, shall consist of natural sand, manufactured sand, or a combination of these. It shall consist of hard, tough grains, free from injurious amounts of clay, loam, or other deleterious substances. Fine aggregate, shall not exceed an absorption of 2.3 percent by weight as determined by AASHTO T 84.

The composite blend, minus any recycled asphalt pavement used (RAP), shall have a Micro-Deval value of 18.0 percent or less as determined by AASHTO T 327. In the event the material exceeds the Micro-Deval limit, a Washington Degradation test shall be performed. The material shall be acceptable if it has a value of 30 or more as determined by Washington State DOT Test Method T 113, Method of Test for Determination of Degradation Value (January 2009 version) except that the reported degradation value will be the result of testing a single composite specimen from that portion of the sample that passes the ½ inch sieve and is retained on the No. 10 sieve, minus any reclaimed asphalt pavement used.

Aggregates shall also meet the following consensus properties, except that aggregates extracted from RAP will not be included in the sand equivalent test. The Department reserves the right to sample and test the composite aggregate for any of the following properties at any time:

TABLE 3: Aggregate Consensus Properties Criteria

Estimated Traffic, Million 18 kip ESALs	AASHTO T 335 Coarse Aggregate Angularity (minimum)	AASHTO T 304 Method A Uncompacted Void Content of Fine Aggregate (min)	ASTM D 4791 (8.4) Flat and Elongated Particles (maximum)	AASHTO T 176 Clay Content/ Sand Equivalent (minimum)
< 0.3	60/60	40	10	45
0.3 to < 3.0	75/60			
3.0 to < 10	85/80			
10 to < 30	95/90			
≥ 30	100/100	45		50

ASTM D 5821 - "85/80 denotes that 85 percent of the coarse aggregate has one fractured face and 80 percent has two fractured faces.

AASHTO T 304 - Criteria are presented as percent air voids in loosely compacted fine aggregate, (U).

ASTM D 4791 - Criteria are presented as maximum percent by weight of flat and elongated particles (5:1 ratio).

The entire HMA wearing course shall come from the same source of material and the same job mix formula, except when permission is obtained from the Department to change sources.

703.08 Recycled Asphalt Pavement Recycled asphalt pavement shall consist of salvaged asphalt materials from milled pavements or production waste that has been processed before use to meet the requirements of the job mix formula. It shall be free of winter sand, granular fill, construction debris, or other materials not generally considered asphalt pavement.

703.081 RAP for Asphalt Pavement Recycled Asphalt Pavement (RAP) may be introduced into hot-mix asphalt pavement at percentages approved by the Department according to the MaineDOT Policies and Procedures for HMA Sampling and Testing. If approved by the Department, the Contractor shall provide documentation stating the source, test results for average residual asphalt content, and stockpile gradations showing RAP materials have been sized to meet the maximum aggregate size requirements of each mix designation. The Department will obtain samples for verification and approval prior to its use.

The maximum allowable percent of RAP shall be determined by the asphalt content, the percent passing the 0.075 mm sieve, and Coarse Micro-Deval loss values as tested by the Department. The numerical average of the percent passing the 0.075 mm sieve values will be used for the approval. The maximum percentage of RAP allowable shall be the lowest percentage as determined according to Table 4 below:

TABLE 4: Maximum Percent RAP According to Test Results

Classification	Maximum RAP Percentage Allowed	Asphalt content standard deviation	Percent passing 0.075 mm sieve	Residual aggregate M-D loss value
Class III	10%	N/A	> 11.0	≤ 18
Class II	20%	≤ 0.5	≤ 11.0	
Class I	30%	≤ 0.3	≤ 8.0	

The Department will monitor RAP asphalt content and gradation during production by testing samples from the stockpile at approximately 15,000 T intervals (in terms of mix production). The allowable variance limits (from the numerical average values used for mix designs) for this testing are determined based upon the maximum allowable RAP percentage, and are shown below in Table 5.

TABLE 5: RAP Verification Limits

Classification	Maximum RAP Percentage Allowed	Asphalt content (compared to aim)	Percent passing 0.075 mm sieve (compared to aim)	Percent passing 0.075 mm sieve
Class III	10%	± 1.5	± 2.0	N/A
Class II	20%	± 1.0	± 1.5	≤ 11.0
Class I	30%	± 0.5	± 1.0	≤ 8.0

For specification purposes, RAP will be categorized as follows:

Class III – A maximum of 10.0 percent of Class III RAP may be used in any base, intermediate base, surface, or shim mixture. A maximum of 20.0 percent of Class III RAP may be used in hand-placed mixes for item 403.209.

Class II – A maximum of 20.0 percent Class II RAP in any base, binder, surface, or shim course.

Class I – A maximum of 20.0 percent Class I RAP may be used in any base, intermediate base, surface, or shim mixture without requiring a change to the specified asphalt binder. A maximum of 30.0 percent Class I RAP may be used in in any base or intermediate base mixture provided that a PG 58-28 asphalt binder is used. A maximum of 30.0 percent Class I RAP may be used in any surface or shim mixture provided that PG 58-34 or 52-34 asphalt binder is used. Mixtures exceeding 20.0 percent Class I RAP must be evaluated and approved by the Department.

The Contractor may use up to two different RAP sources in any one mix design. The total RAP percentage of the mix shall not exceed the maximum allowed for the highest classification RAP source used (i.e. if a Class I & Class III used, total RAP must not exceed 30.0%). The blended RAP material must meet all the requirements of the classification for which the RAP is entered (i.e. 10% Class III with 20% Class I, blend must meet Class I criteria). The Department may take belt cuts of the blended RAP to verify the material meets these requirements. If the

Contractor elects to use more than one RAP source in a design, the Contractor shall provide an acceptable point of sampling blended RAP material from the feed belt.

In the event that RAP source or properties change, the Contractor shall notify the Department of the change and submit new documentation stating the new source or properties a minimum of 72 hours prior to the change to allow for obtaining new samples and approval.

703.09 HMA Mixture Composition The coarse and fine aggregate shall meet the requirements of Section 703.07. The several aggregate fractions for mixtures shall be sized, graded, and combined in such proportions that the resulting composite blends, including RAP aggregate will meet the grading requirements of the following table:

Aggregate Gradation Control Points

Sieve Designation	Nominal Maximum Aggregate Size---Control Points (Percent Passing)					
	Type 25 mm	Type 19 mm	Type 12.5 mm	Type 9.5 mm	Type 9.5 mm Thin Lift Mixture (TLM)	Type 4.75 mm
Percent By Weight Passing - Combined Aggregate						
37.5 mm	100					
25 mm	90-100	100				
19 mm	-90	90-100	100			
12.5 mm		-90	90-100	100	100	100
9.5 mm		-	-90	90-100	95-100	95-100
4.75 mm		-	-	-90	60-95	80-100
2.36 mm	19-45	23-49	28-58	32-67	40-65	40 - 80
1.18 mm		-	-	-	-	-
600 µm		-	-	-	-	-
300 µm		-	-	-	-	-
75 µm	2.0-6.0	2.0-6.0	2.0-6.0	2.0-7.0*	2.0-7.0*	2.0-7.0

* For 9.5 mm nominal maximum aggregate size mixtures, the maximum design aim for the percent passing the 75 µm sieve is 6.5%.

SPECIAL PROVISION
SECTION 703
AGGREGATES

Add the following Section:

703.13 ¾-Inch Crushed Stone Aggregate for ¾-inch crushed stone shall meet the following gradation requirements:

Sieve Designation	Percent of Weight Passing Square Mesh Sieves
1 in	100
¾ in	90 – 100
½ in	20 – 55
⅜ in	0 – 15
No. 4	0 – 5

SPECIAL PROVISION
SECTION 841
(Bollard)

Description This work shall consist of furnishing and installing fixed steel tube bollards, reinforced concrete foundation, and associated hardware necessary to complete the work as detailed on the plans. All earthwork, excavation, concrete, compacted backfill shall be incidental to the bollard.

Materials

1. The main body of the product shall be constructed from ASTM A500 in accordance with Section 713.01 steel and be accompanied with steel mill certifications/test reports for the steel being used to ensure the durability and performance of the product. Secondary and non-ASTM steel may not be substituted.
2. The bollard shall be standard weight pipe with a 6 inch diameter.
3. The reinforced concrete base circular pier footing shall meet the general requirements of Section 502 – Structural Concrete, Class A. The foundation shall have a 12” minimum diameter.

Construction Requirements

Steel Bollards shall be spaced and located as shown on the plans. Final locations shall be adjusted in the field as directed by the resident. The bollards shall extend 4’-6” into the ground below the finished grade and extend 3’ above the finished grade. The Bollard shall be filled with concrete all the way to top of the steel pipe.

Finish

1. The steel bollard shall be galvanized in accordance with Special Provision 506.
2. The steel bollard shall be painted over the galvanizing with the same color used for the bridge.
3. The lid, top plate and fasteners shall be Series 300 stainless steel.

Method of Measurement Bollards and all necessary incidentals to complete the work shall be paid for by each complete and accepted in place.

Basis of Payment The quantity of bollards will be paid for by the contract unit price for each installation. Such payment will be full compensation for all labor, excavation, backfill, tools, associated hardware, and any other incidentals necessary to complete the work. Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
841.48	Bollard	Each

SPECIAL PROVISION
SECTION 845
Utility Access Door

845.01 Description

The item “Utility Access Door” shall consist of furnishing and installing a factory fabricated utility access door for access to each machinery enclosure and to the lock bar enclosure and over the four bascule pier access locations. The utility access doors located at the machinery enclosures shall be double leaf and the others shall be single leaf. All doors shall have a slip resistant surface. The item shall include all materials, equipment and incidentals necessary to complete the work as shown on the plans and in accordance with these specifications.

845.02 Materials

The Utility Access door shall consist of commercially available aluminum Floor, Vault, or Sidewalk Access doors.

Materials shall conform to section 713 and 716 of the Specifications.

All work with steel shall conform to the applicable provisions of Maine DOT’s Standard Specifications - Section 504 – Structural steel. All welding for aluminum shall conform to the current edition of AWS Structural Welding Code – Aluminum D.12.

All hardware required to drain the door frame, as recommended by manufacturer.

A primer or alkali resistant lacquer as approved by the Resident, shall be applied to all aluminum surfaces to be in contact with concrete.

845.03 Drawings

The Contractor shall submit shop detail and other working drawings in accordance with the requirements of Section 105.7 – Working Drawings. These drawings shall be reviewed and approved in accordance with Section 105.7.

845.04 General

The Utility Access door shall be placed as shown on the plans as approved by the Resident.

845.05 Fabrication

The cover shall be reinforced to support a minimum live load of 300psf with a maximum deflection of 1/150th of the span. The frame shall be shaped to form a continuous drainage gutter with a drainage hole and coupling. Concrete anchors are to be provided on the frame. The hinges shall be specifically designed for horizontal installation and shall be through bolted to the cover with tamperproof Type 316 stainless steel lock bolts and shall be through bolted to the frame with Type 316 stainless steel bolts and

locknuts. Heavy forged Type 316 stainless steel hinges, each having a minimum 1/4" diameter Type 316 stainless steel pin, shall be provided and shall pivot so the cover does not protrude into the channel frame. The hinges shall be located on the longer length of the door.

The covers shall be equipped with a hold open arm which automatically locks each cover in the open position. The utility access door shall have the required number and size of compression spring operators enclosed in telescopic tubes to provide smooth, easy, and controlled cover operation throughout the entire arc of opening and as a check in retarding downward motion of the cover when closing. The upper tube shall be the outer tube to prevent accumulation of moisture, grit and debris inside the lower tube assembly. The lower tube shall interlock with a flanged support shoe fastened to a formed 1/4" gusset support plate. The springs and spring tubes shall be Type 316 stainless steel. Operation of the cover shall be smooth and easy with controlled operation throughout the entire arc of opening and closing. Operation of the cover shall not be affected by the temperature.

The entire door, including all hardware components shall be highly corrosion resistant

A 1 1/2" drain coupling shall be located in the right front corner of the channel frame or at another location as approved by the Resident.

A removable exterior turn/lift handle with a spring loaded ball detent shall be provided to open the cover and the latch release shall be protected by a flush, gasketed, removable screw plug. The cover shall be supplied with a Deadbolt cylinder lock that provides keyed exterior access and turn knob interior access. The lock cylinder shall be accessed from the exterior through a gasketed, threaded deck plate. The Contractor shall supply six (6) copies of the key to the Resident.

A Type 316 stainless steel snap lock with fixed handle shall be mounted on the underside of the cover.

All hardware shall be type 316 stainless steel throughout.

Factory finish shall be mill finish aluminum with bituminous coating applied to the exterior of the frame.

The doors shall incorporate an anti-slip aluminum surface covering 100% of substrate consisting of a random hatch matrix and bond strength to the doors of at least 2000 psi. The anti-slip surface shall have a minimum coefficient of friction of 0.6 and be listed as slip resistant by Underwriters Laboratories.

845.06 Storage

Materials shall be stored in a dry, protected, well-vented area. Any damage to the door will be cause for rejection and the Contractor will be required to replace the door at no additional cost to the State.

845.07 Warranty

The manufacturer of the vault access door shall provide the manufacturer's Warranty prior to the end of construction. The warranty shall guarantee materials be free of defects in material and workmanship for

a period of (5) five years from the date of purchase. Should a part fail to function in normal use within this period, the manufacturer shall furnish a new part at no charge.

845.08 Inspection/Installation

Before installation, the surrounding area shall be inspected to be dry, clean, and free of foreign matter.

The Contractor shall comply with the utility access door manufacturer’s installation instructions. The Contractor shall furnish mechanical fasteners consistent with the manufacturer’s instructions.

845.09 Method of Measurement

The item “Utility Access Door” shall be measured by the lump sum, and shall include fabrication, delivery and installation of the doors at the seven (7) locations indicated on the plans, including all labor, tools and equipment required for proper installation.

845.10 Basis of Payment

The accepted quantity of “Utility Access Door” will be paid for at the contract lump sum price, which price shall be full compensation for furnishing and installing seven (7) access doors, including all connections and equipment required.

Payment will be made under:

Pay Item

Pay Unit

845.20 Utility Access Door

Lump Sum

SPECIAL PROVISION
SECTION 860.10 – Bridge Operating Machinery

860.11 Description

The work included under this item shall consist of furnishing, fabricating, erecting, installing, testing, placing in operation, adjusting and painting the new Bridge Operating Machinery. The new machinery components, with quantities shown in parenthesis, include but are not limited to:

1. Rack (2)
2. Main Pinion Shaft (2)
3. Main Reducer (2)
4. Gearmotor Reducer (2)
5. Main Pinion Bearings (4)
6. Couplings (4)

Details and arrangements of all systems are shown on the Plans.

Under this item, the Contractor shall provide all labor, materials, plant, equipment and incidentals required to install and place in operating condition the new Bridge Operating Machinery in accordance with the plans, and specifications.

The work shall also include installing and aligning the drive motors and brakes that are to be supplied under the Bridge Electrical work. The drive motors and motor brakes are to be shop aligned and coupled to the main reducer on the machinery platform, after which the whole sub-assembly is to be shop tested as specified herein. The work shall be in accordance with the requirements specified in Section 860 .40 "General Requirements for Machinery" unless herein noted otherwise.

The Contractor shall coordinate the installation of the Bridge Operating Machinery with all other bridge machinery items, electrical work and structural work, as well as navigational and vehicular traffic closures and restrictions.

860.12 Materials

General

The materials used to fabricate the machinery components shall be as shown on the Plans and in accordance with the requirements specified in Section 860.40 "General Requirements for Machinery".

The combined reduction ratio of gear reducer units R1 and R2 shall be a minimum of 1440:1 and a maximum of 1550:1.

Enclosed Gear Reducers

Gear reducers for the Bridge Operating Machinery have ratings, ratios, dimensions, and construction details as shown on the Plans. Ratings shall be based on a service factor of 1.5 unless otherwise indicated on the Plans.

Gear reducers for the Bridge Operating Machinery shall have mounting holes located such that final field drilling and reaming for permanent fasteners is feasible.

Manufacturers approved to fabricate (R1) gear reducers for the Operating Machinery include:

1. Nuttall Gear, Niagara Falls, NY
2. Earle Gear by Steward Machine Co., Birmingham, AL
3. Overton Gear, Addison, IL

Gearmotors

The motor is to meet requirements stated in the Electrical Plans and under Item 655 "Bridge Electrical System". The gearmotor is paid for under Item 655.

Requirement in Section 860.40 "General Requirements for Machinery" shall apply to gear reducer unit as part of the gearmotor. Permitted exceptions include: AGMA yield strength rating, through hardened gearing, inspection ports, glass oil level indicator, drain and sampling cock valves, and submittal of AGMA design calculations.

The unit is to be foot mounted to a fabricated steel weldment support. The contractor shall size the support based on the actual gearmotor unit submitted and approved and the available space within the sub terrain concrete box.

Manufacturers approved to fabricate (R2) gearmotors for the Operating Machinery include:

1. Bauer Gear Motor, Somerset, NJ
2. SEW-Eurodrive, Inc. Bridgeport, NJ
3. Rexnord Ultramite, Milwaukee, WI
4. Browning, Eden Prairie, MN

Stuffing Box Seal

The stuffing box is heavy-duty marine grade precision machined naval brass components. Use retaining gland with a beveled surface and six compression studs and nuts. Assembly is split for installation over the shaft and held together with six bolts. Provide grease lubrication with high pressure check valve fitting in the middle of four wraps of PTFE fiber packing graphite impregnated. Refer to stuffing box detail provided in the Plans.

Spare Parts and Lubrication

Provide the following spare parts to the Department. Spare parts are considered incidental to the component to which they apply and shall be paid for as such.

1. (6) Lubrication fittings of each size and type used in machinery.
2. Pair of brake shoe and pad assembly for each size brake provided by brake manufacturer
3. (1) Set of grid and seals for C2 grid coupling. (1) Sets of seals for C1 gear couplings.
4. (1) Case of desiccant type breather cartridges for gear reducers.
5. (15) feet of stuffing box packing or (1) 10 lb spool.
6. One permanent storage cabinet. Provide heavy-duty storage cabinet of minimum 36" x 24" x 78" size. Manufacture cabinet frame of steel with 16 gage minimum thickness and 22 gage minimum thickness sides, doors and shelves. Provide cabinets having a minimum of four shelves, hinged doors and key locking handle or heavy-duty key padlocks and hasps. Install cabinet at a location determined by the Department.

Upon acceptance of machinery, the Contractor shall provide the following quantities of additional lubricants for the Bridge Operating Machinery which shall be stored at the site:

- | | |
|----------------------------|---------------------|
| 1. Gear Reducer Oil | 55 gal (208 liters) |
| 2. Open Gear Grease | 100 lb (45 kg) |
| 3. Bearing Grease | 50 lb (23 kg) |
| 4. Grid Coupling Lubricant | 5 lb (2 kg) |
| 5. Gear Coupling Lubricant | 5 lb (2 kg) |

860.13 Method of Construction

Shop Inspection and Testing

All Bridge Operating Machinery components shall be assembled to assure proper fits and verify tolerances specified on the Plans. Assemblies requiring disassembly shall be match marked and documented so that the machinery can be reassembled at the off-site construction area.

Each gear reducer for the Operating Machinery shall receive a spin test of 4 hour duration, (2 hours in each direction). Fill the housing with new oil prior to testing. During the spin test, all components shall be observed for unusual noises. After the spin test is complete, the oil shall be drained from the housing strained for particles before running the load test. Each reducer housing shall then be flushed with solvent and cleaned of any wear particles that may have collected at the bottom of the housing.

After the spin test, each gear reducer shall be load tested by operating at 150% rated full load motor torque and at 100% rated RPM for ½ hour in each direction (1 hour total continuous operation). The Contractor shall supply testing equipment, which shall include test motors. The tests shall be performed in the presence of the Design Engineer and witnessed by a representative of the Department. The acceptance criteria are outline in Section 860.40.

Gearmotors shall be tested as per motor testing under item 655 “Bridge Electrical System” and load tested as required herein except at 100% rated full load motor torque.

The Primary Reducer (R1) shall be aligned and shop mounted to its support. The machinery brakewheel shall be fit to the input shaft in the shop.

The stuffing box seal shall be installed after final alignment of the operating machinery. Do not paint the shaft at its interface with the stuffing box seal.

Suggested Operating Machinery Erection Procedure

1. Prepare the faying surfaces of each bascule girder side at rack support interface as required on the structural drawings. The mounting surface shall be milled flat, and blasted to profile for adhesion of primer coat. Mask mounting area limits during coating of the girder structure. Apply primer coating as specified in 860.40.
2. Install racks on girders. Rack shall be concentric to main trunnion centerline and at proper pitch radius throughout. The Contractor shall design, construct and use a Rotating Jig (Trammel) to accurately measure the rack pitch radius to +/- 0.010 inches. The Trammel shall measure from the trunnion journal surface to the scribe line on the rack teeth. To ensure the rack teeth are parallel to main trunnion centerline, machine the rack mounting surface perpendicular to the rack pitch line to a perpendicularity tolerance as specified on the Plans. Mating surface on the side of the girder shall be prepared prior to installing rack. Machine the side of the girder approximately 1/8 inch deep to level the surface perpendicular to the trunnion centerline at a perpendicularity tolerance of 0.005 inch.
3. Temporarily erect main pinion to mesh properly with rack by using undersized mounting bolts into subdrilled holes in the main pinion bearing base. Align main pinion with rack so that backlash is within tolerance and at least 80% of effective face width of each pair of meshing teeth is in contact.

4. Main reducers and electric gearmotors are to be shop assembled on separate masonry supports. During field erection supports shall be aligned using the detailed jacking screws to manipulate their position. The alignment shall be based on the tolerances of the couplings, and to achieve the optimum alignment between the pinion and the rack.
5. Measure the actual span transverse distance between the racks centerline.
6. Contractor to verify and submit calculations for prior approval by the Resident that all undersize bolts are capable of withstanding the applied loads prior to raising and lowering the span. Applied loads are based on the maximum anticipated span construction imbalance, plus friction and wind on exposed deck when the span is open as defined in AASHTO LRFD Movable.
7. Fully seat the bridge using a separate method without using the driving motors at stalled rotor torque applied to the Bridge Operating Machinery. Ensure that all live load shoes and rack and pinion teeth are in full contact.
8. Raise and lower span at no more than creep speed and check for proper backlash and gear mesh in all gear sets at every 10 degrees.
9. Verify alignment of the gearmotor coupling and pinion shaft coupling prior to final bolting.
10. During installation and alignment of Bridge Operating machinery, all undersized bolts are to be removed and replaced by one at a time, drilling and reaming the sub-drilled holes to final size, and installing the proper bolts as per the approved shop drawings.

Field Testing

The Contractor shall submit to the Resident a testing procedure and schedule in accordance with the requirements specified in Section 860.40.

The alignment and tolerances of all Bridge Operating Machinery components which were shop installed shall be verified and re-adjusted as required to conform to the tolerances specified herein and to the tolerances recommended by the component manufacturers. If any conflict exists between the tolerances specified herein and those recommended by component manufacturers, the more stringent shall apply. Verification and any required re-adjustment shall be done in the presence of the Design Engineer and witnessed by a Department representative. Once all components are verified to be aligned within the proper tolerances, all components shall be secured with full size fasteners as described and specified herein and on the Plans.

Each test run shall verify that the Bridge Operating Machinery is in proper working order and fully meets the requirements of the Contract Plans and Specifications. If any tests show that the Bridge Operating Machinery components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacements required before final acceptance at no additional cost.

860.14 Method of Measurement The item "Bridge Operating Machinery" shall be measured in two units; delivery to site and installation final acceptance.

860.15 Basis of Payment

The lump sum price bid for Item "Bridge Operating Machinery" shall include the cost of furnishing all labor, materials, spare parts, testing, adjusting, and equipment required, including all necessary incidentals for the work herein described and as shown on the Contract Plans, for a complete installation.

The progress of payments and payment percentage for Item 860.10 "Bridge Operating Machinery" shall be made in accordance with the Department.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
860.11 Bridge Operating Machinery Delivered	Lump Sum
860.12 Bridge Operating Machinery Installation	Lump Sum

SPECIAL PROVISION
SECTION 860.20 –Trunnion Machinery

860.21 Description

The general specifications of this work are described under Section 860.40 “General Requirements for Machinery”.

The work included under this section shall consist of furnishing, fabricating, manufacturing, installing, erecting, adjusting, cleaning and painting the trunnion machinery assembly. The components of the trunnion machinery assembly shall include but not be limited to:

1. Trunnions (2)
2. Bushings (4)
3. Hubs (4)
4. Flange Bolts (72)
5. Pedestals (4)

Details and arrangements of all systems are shown on the plans.

The Contractor shall submit a detailed installation, erection and alignment procedure with accompanying drawings as required for the trunnions, bearings, hubs and hub rings for the approval of the Resident.

The Contractor shall coordinate the Trunnion Machinery fabrication and installation with the structural steel bascule girders and pedestal supports furnished and installed under another item with the work in this item.

860.22 Materials

Materials are as indicated on the Plans and as noted in Section 860.40 “General Requirements for Machinery”, with particular attention to the requirements and testing for Forgings, Shafting and Pins, Bearings and Bushings, and Shaft Journals.

Polish trunnion journal surface and complete radius of journal shoulder fillet to 16 micro-inch rms surface finish. Final polishing at the fillets shall be parallel to the trunnion axis.

After the trunnions shafts are finished machined to the final surface finish, perform magnetic particle examination in accordance with ASTM A275 and ASTM E709 on the entire circumference of each shaft

fillet. Fillets shall be free of any discontinuities. Detected surface defects shall be polished out. Submit magnetic particle test results to the Resident.

Trunnion shafts shall have a bored center hole with the inside bore. Each end of the bore shall be located to within +/- 0.001 tolerance with respect to the true center of the shaft, based on the journal diameter.

The Contractor shall take care that the cast bronze trunnion bearing bushings shall be free of cracks, cold shuts, shrink holes, and porosity. The Contractor shall use high quality bronze centrifugal casting in accordance with ASTM B22.

Lubrication

Lubrication requirements are called for under Section 860.40 and apply to the trunnion bearings.

Forty pounds of trunnion bearing lubricant shall be stored at the site.

860.23 Method of Construction

Shop Assembly

Bascule Girder / Hub Assembly – The trunnion hubs and hub rings shall be shop assembled to the bascule girders. Prior to assembly of these parts, the specified interferences shall be verified by accurate measurement of several diameters of each part. The assembly shall be carried out by first shrinking the hub in dry ice and alcohol to reduce its diameter to permit assembly in the girder web. The use of liquid nitrogen on the trunnion shafts or hubs is prohibited.

Trunnion Bearing Assembly – the trunnion bushings shall be fitted into the hubs after installing the hub into the girder. Trunnion shafts shall be match-marked with bearings and shipped to the field for initial installation. The parallelism between the trunnion shaft center bore, hub/bearing center bore, and the bottom of the trunnion pedestals shall be measured and used as a reference for final alignment of the bearings. The Contractor may opt to use a template to accurately measure the shaft parallelism to the pedestal bottom surface.

Trunnion Alignment – The trunnion shaft pairs (tail end of the girders) shall be aligned such that the elevations and co-linearity is established and maintained during shop erection of the bascule span. The Contractor shall submit a procedure for re-erecting the bascule girders in the field (also, millwrights present at the shop). The procedure shall include the instrumentation used for measuring the alignment. Secure a centering adapter into the center of the trunnion hubs (tolerance +/- 0.001 inches from centerline). It is assumed that a piano wire will be strung from the pairs, and adequate tension applied to the wire. The piano wire sag calculations shall be submitted as part of the procedure to establish the tension. The bascule girders shall be supported on falsework meeting the requirements noted on Sheet Number 4, and the girder position adjusted to achieve and maintain the following tolerances:

Elevation +/- 0.008 inches
Co-linearity +/- 0.010 inches in any direction

If the Contractor selects to alternatively stick build the bascule leaf in the field, the same tolerances apply.

Field Construction

Once the trunnion and pinion supports have been erected into the pier, the trunnion pedestals shall be installed, use a precision ground bar to span the distance to the outer edges of the trunnion pedestal split lines. Using feeler gages between the bar and split line surface ensure that the bottom half of the pedestals are aligned. A 0.002 inch feeler gage should not pass between the surfaces at any point.

The initial alignment of the trunnion pedestal shall be completed before lowering the leaf into place. Use the trunnion shafts to check pedestal alignment using a strung piano wire or laser centered through the trunnion center bores. Refer to preceding section "Shop Assembly", "Trunnion Alignment" for duplicating this measurement in the field.

Full contact between the trunnion shaft and the pedestals shall be considered proper alignment. Measure level between trunnion shaft and pedestal split line to +/- 0.002 inch (this is required as part of the shop testing), and verify that the shaft rests flush in the bottom of the pedestal.

Adjust the leaf alignment at the trunnion supports and grout the support into place after final acceptance of the trunnion machinery.

Final acceptance of the trunnion machinery will be based on the following measurements taken with the span in its seated position:

1. Concentricity and elevation of the trunnion shaft center bores
2. Thrust face clearance between the thrust collar and face of trunnion hub measured at top/bottom and sides.

Grout in trunnion supports after final acceptance of trunnion machinery.

860.24 Method of Measurement The item "Bridge Trunnion Machinery" shall be measured in two units; delivery to site and final acceptance of installation.

860.25 Basis of Payment

The lump sum price bid for this Item "Bridge Trunnion Machinery" shall include the cost of furnishing all labor, materials, spare parts, testing, adjusting and equipment required including all necessary

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incidentals for the work herein described and specified and as shown on the Contract Plans, for a complete installation.

The progress of payments and payment percentage for Item 860.20 “Bridge Trunnion Machinery” shall be made in accordance with the Department.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
860.13 Bridge Trunnion Machinery Delivered	Lump Sum
860.14 Bridge Trunnion Machinery Installation	Lump Sum

SPECIAL PROVISION
SECTION 860.30 – Span Lock Machinery

860.31 Description

The work included in this item shall consist of furnishing, fabricating, erecting, testing, adjusting and painting the new Span Lock Machinery. The new components are detailed on the Contract Drawings, which include but are not limited to:

1. Lock Bar (1)
2. Front Guide with Bushing (1 each)
3. Linear Screw Actuator with support (1 each)
4. Receiving Shoe (1)
5. Miscellaneous connecting pins and fasteners

Details and arrangements of all systems are shown on the Plans or specified herein.

Under this item, the Contractor shall provide all labor, materials, equipment and incidentals required to furnish, install and place in operating condition the new Span Lock Machinery in accordance with the plans and specifications.

Alignment and adjustment of receiver shoes shall be performed in the field after erection, balancing of leaf, and installation and alignment of fully seated live load shoe assemblies.

The work shall include installing and aligning the linear actuators integral with electric motors, as well as control instrumentation that is to be supplied under the Electrical Work. The work shall be in accordance with the requirements specified in Section 860 “General Machinery”.

860.32 Materials

The materials used to fabricate the span lock machinery components shall be as shown on the Contract Drawings and in accordance with the requirements specified in Section 860.40 “General Requirements for Machinery”.

Linear Screw Actuator

The linear actuator shall be an Acme screw type, self locking, manual hand wheel with mechanical disengage and electrical interlock, stroke of 12 inches and linear speed of at least 1.5 inches/ second, and push/pull minimum thrust force of 4,000 lbs. A minimum 1.5 inch hardened alloy steel pin connects the

lock bar to the actuator. All component of the actuator including the motor and gear reduction unit is to be provided by one manufacturer. Include the following options:

1. Motor heater
2. Control switches to be adjustable proximity switches and integrated into the leaf controls circuits with interlocks. Refer to Item 655 "Bridge Electrical System". Interlocking indication shall be triggered directly by the lock bar indicating lock "pulled" and "driven".
3. Internal end of travel urethane bumpers
4. Expandable boot rod cover
5. Manufacturer:
 - a. Earle, Steward Machine Co., Birmingham, AL
 - b. Raco International, Bethel Park, PA
 - c. Nook Industries Inc., Cleveland, OH
 - d. Duff-Norton, Charlotte, NC

Spare Parts and Lubrication

General spare parts and lubrication requirements are called for under, Item 860.10 "Span Operating Machinery".

1. (1) Span lock rear guide bushing supplied by actuator manufacturer.
2. (1) span lock receiver shoe with shim pack.
3. Linear Screw Actuator Grease 25 lbs (11 kg)

860.33 Method of Construction

Shop Assembly, Field Installation and Operation

All Span Lock Machinery components shall be shop assembled to assure proper fits and verify tolerances specified on the Plans. Assemblies requiring disassembly shall be match-marked and documented so that the machinery can be reassembled at the on-site construction area.

Suggested Span Lock Machinery Erection Procedure

1. Prior to span lock installation the bascule span structural steel shall be erected, balanced with the counterweight, and live load shoes adjusted to alignment requirements in Bascule Span structural contract documents.
2. Install the receiver shoes with shims into the end of each bascule girder using undersized mounting bolts into subdrilled holes in the shoe and girder.
3. Install the front guide with shims using undersized mounting bolts into subdrilled mounting holes in the guide and support.
4. Assemble linear actuator supports with shims and undersized mounting bolts into sub-drilled holes. Insert the lock bar through the front guide.
5. Adjust all machinery for proper lock bar motion and clearance.
6. Adjust actuator control switches to extend lock bar into the socket at least 1 inch beyond the shoe measured from the radius of the tapered end of the lock bar to the edge of the shoe inside the socket.
7. When lock bar machinery installations have been tested and approved by the Resident, ream holes in steel support for full size bolts, grout steel supports to the concrete pier and tighten anchor bolts.

Field Testing

When the span lock machinery and electrical equipment are ready for final testing, the Contractor shall submit to the Resident a testing procedure and schedule in accordance with the requirements specified in Section 860.40

Each test run shall verify that the Span Lock Machinery is in proper working order and fully meets the requirements of the Plans and Specifications. Testing is to include manual operation. If any tests show that the Span Lock Machinery components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments or replacements required before final acceptance at no additional cost.

All clearances and machinery alignment shall be checked and adjusted as required to conform to the requirements specified herein given on the Plans and recommended by the component manufacturers.

860.34 Method of Measurement The item "Bridge Span Lock Machinery" shall be measured in two units; delivery to site and final acceptance of installation.

860.35 Basis of Payment

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

The lump sum price bid for Item “Bridge Span Lock Machinery” shall include the cost of furnishing all labor, materials, spare parts, testing, adjusting and equipment required, including all necessary incidentals for the work herein described and as shown on the Plans, for a complete installation.

The progress of payments and payment percentage for Item 860.30 “Bridge Span Lock Machinery” shall be made in accordance with the Department.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
860.15 Bridge Span Lock Machinery Delivered	Lump Sum
860.16 Bridge Span Lock Machinery Installation	Lump Sum

SPECIAL PROVISION
SECTION 860.40 – General Requirements for Machinery

860.41 Description

This section is a reference document for pay items for this project and outlines the requirements common to Items; 860.10 "Bridge Operating Machinery", 860.20 "Trunnion Machinery", 860.30 "Span Lock Machinery". This section also covers the general requirements for overlapping pay items, including the installation of electric motors, brakes, limit switches and position transmitters to be mounted with the machinery but supplied under the electrical work.

Work detailed in the Mechanical Drawings, (also referred to as Plans), is to be coordinated with work detailed on the complete set of Contract Drawings, with particular attention to the structural and electrical interface points. It is the Contractor's responsibility to detail the erection, assembly and shop drawings to insure proper clearances are maintained as shown, and to ensure there are no interference points throughout the entire range of motion of the bridge.

Basis of Machinery Design

The new machinery conforms to the applicable requirements of AASHTO Movable Highway Bridge Design Specifications 2nd Edition, 2007, 2008 and 2010 Interim (hereinafter referred to as the AASHTO), except as otherwise noted on the Contract Drawings or otherwise specified herein.

Shop Drawings

The Contractor shall prepare shop drawings in accordance with the requirements for shop drawings as stated in the ME DOT SS (Maine Department of Transportation Standard Specifications), and shall, in addition, meet the following requirements:

1. The Design Engineer review time is in addition to the Departments review time and equal to the stated time periods under 105.7.2 of ME DOT SS.
2. Manufacturer's data and/or shop drawings shall be submitted for all manufactured and purchased items of machinery.
3. The Contractor shall be responsible for coordinating the work of the machinery component manufacturers where components interface. The General Contractor shall review all shop and working drawings to coordinate the proper assembly of the various machinery components prior to submission to the Resident for approval.
4. Shop drawings shall show all parts completely detailed and dimensioned. Reproduction of the Plans shall not be used as foundation sheets for assembly or erection drawings.

5. Materials and material specifications shall be stated for each part. Where ASTM or any other standard specifications are used, the applicable numbers of such specifications shall be given.
6. Required finish machining shall be shown including grade of finish in accordance with ASME B46.1, Surface Texture, and dimensional tolerances and allowances for specific fits in accordance with ASME B4.1, 'Preferred Limits and Fits for Cylindrical Parts'.
7. The fits and finishes used shall conform to the requirements for fits and finishes given on the Plans and as specified herein.
8. For all assemblies and parts, the Contractor shall furnish complete assembly drawings or diagrams showing each part contained therein and the manufacturer's part number assigned to each part. The drawings or diagrams shall be sufficient to enable complete disassembly and reassembly of the assemblies covered. In the event that any part is modified in any manner from the way it is described or delivered by its original manufacturer, the Contractor shall furnish a drawing which details each modification and the part shall be assigned a unique part number to assure the furnishing of replacement parts modified in similar fashion.
9. Shop drawings of assemblies shall show all external dimensions and clearances necessary for installation and operation of all new bridge machinery.
10. Certified prints of each manufactured assembly shall be furnished. Certified prints are manufacturer's drawings of proprietary products on which the manufacturer or supplier states mounting dimensions, ratios, speeds, ratings, and any other details for use on this specific project. In addition to identifying and describing each part, they shall show:
 - a. Dimensions of all principal parts comprising the assembly.
 - b. Certified external dimensions affecting clearances required for installation.
 - c. Capacity and normal operating ratings.
 - d. Recommended lubrication, including location, lubrication fittings and provisions for adding, draining and checking the level of lubricants.
 - e. Inspection openings, seals and vents.
 - f. Details or description of all fasteners required to mount the assembly.
 - g. Gross weight.
 - h. Certified prints shall be signed by an officer of the manufacturing company.
11. All proprietary items shall be shown in outline on shop drawings, which shall also indicate the method and sequence to be employed in assembly of bridge machinery and installation of necessary utilities support and service facilities. The assembly drawings of each item shall, in addition to

identifying and describing each internal part, contain dimensions of all principal elements within the item; certified external dimensions affecting interfaces or installations; gross weight capacity and normal operating ratings, and details of all fasteners used to mount the equipment to its foundation.

12. Complete shop bills of materials shall be made for all machinery parts, and shown on the shop drawings.
13. The weight of each piece of machinery shall be stated on the shop drawing upon which it is detailed or billed.
14. Complete assembly and erection drawings shall be furnished. These drawings shall give part numbers, match marks, and essential dimensions for locating each part or assembled unit with respect to the bridge structure or foundation.
15. Marks or indentations of any type shall be clearly shown and detailed on the drawings. In general die-stamping or scoring shall be avoided unless otherwise called for on the plans. All components and assemblies shall be detailed separately to assure correct fabrication, assembly, and erection. Use of mirror image or opposite hand erection drawings will not be allowed.
16. Each shop drawing shall be given a suitable title to describe the parts detailed thereon and shall state by whom shop inspection will be made.
17. Where equipment or materials are specified to conform to requirements of the standards of an organization, such as 'American Society for Mechanical Engineers' (ASME), or 'Underwriters Laboratories' (UL), that use a label or listing as method of indicating compliance, proof of such conformance shall be submitted and approved. The label or listing of the specified organization will be acceptable evidence. In lieu of the label or listing, the Contractor shall submit a certificate from an independent testing organization adequately equipped and competent to perform such services and approved by the Resident, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code.
18. As used herein, certified test reports refer to reports of tests conducted on previously manufactured materials or equipment identical to that proposed for use.
19. As used herein, factory tests refer to tests required to be performed on the actual materials or equipment proposed for use. Results of the tests shall be submitted in accordance with the provisions of this Contract for laboratory test results.
20. The Contractor shall prepare a list of all machinery items that require lubrication and their recommended cycle for lubrication. The list shall contain the types of lubricant used and the date it was lubricated by the Contractor and shall be given to the Resident prior to start up and testing of the machinery.
21. Lubrication charts shall be prepared and submitted as working drawings.

22. If any departures from the Contract Documents are deemed necessary by the Contractor, details of such departures and the reasons therefore shall be submitted to the Resident in writing as soon as practicable for his approval. No departures from Contract Drawings shall be made without the Resident's approval.
23. If the Contractor has any objection to any feature of the machinery as designed or required by the Plans, he shall state his objection in writing to the Resident at the time of submitting shop drawings or prior thereto; otherwise his objection will not be considered if offered later as an excuse for malfunctioning, defective or broken machinery.
24. It is the Contractor's responsibility to manufacture and install suitable functioning machinery. Review and approval of shop drawings by the Resident does not relieve the Contractor of this responsibility.

Delivery and Storage

Protection for shipment:

1. Machinery parts shall be cleaned of dirt, chips, grit, and all other injurious materials prior to shipping and shall be given a coat of corrosion-inhibiting preservative.
2. Finished metal surfaces and unpainted metal surfaces that would be damaged by corrosion shall be coated as soon as practicable after finishing with a rust-inhibiting preservative, except for unfinished metal surfaces inside of gear reducers. This coating shall be removed from all surfaces prior to lubrication of machinery.
3. Any interface between stainless steel or aluminum and structural steel shall receive a Resident approval coat of zinc-chromate primer prior to assembly.
4. Machinery parts shall be completely protected from weather, dirt, and all other injurious conditions during manufacture, shipment, and storage.
5. Enclosed gear reducer units in storage after delivery to the site shall be filled to very top with oil recommended by its manufacturer. Place a warning label on the unit stating that oil level to be drained to indicated operating level prior to start-up.
6. Shaft journals that are shipped disassembled from their bearings shall be protected during shipment and before erection by a packing of oil-soaked canvas secured in place by burlap and covered with heavy metal thimbles or heavy timber lagging securely attached. Every precaution shall be taken to ensure that the bearing surfaces are not damaged and that all parts arrive at their destination in satisfactory condition.
7. Assembled units shall be mounted on skids or otherwise crated for protection during handling and shipment.

Packaging and delivery of spare parts:

1. Spare parts shall be protected for shipment and prolonged storage by coating, wrapping, and boxing.
2. All spare parts shall be durably tagged or marked with a clear identification showing the designation used on the approved shop drawing.
3. Boxes for spare parts shall be clearly marked on the outside to show their contents.

Guarantee and Warranties

1. Manufacturer's warranties or guarantees on equipment, materials or products purchased for use on the Contract which are consistent with those provided as customary trade practice, shall be obtained by the Contractor and, upon acceptance of the contract, the Contractor shall assign to the owner, all manufacturer's warranties or guarantees on all such equipment, material or products furnished or installed.
2. The Contractor shall warrant the satisfactory in-service operation of the mechanical equipment, material, products, and related components. This warranty shall extend for a period of one year following the date of final acceptance of the Project.

Quality Assurance

Qualifications, personnel, and facilities:

Products used in the work under the Machinery Pay Items shall be produced by manufacturers regularly engaged in the manufacture of the specified products.

For the fabrication, installation, and testing of work required by the machinery items, the Contractor shall use adequate numbers of skilled, trained, and experienced mechanics and millwrights who are thoroughly familiar with the requirements and methods specified for the proper execution of the specified work. The Contractor shall provide personnel and supervisory personnel with a minimum of two movable bridge jobs as previous experience in the installation of bridge machinery. The installation of the machinery shall be directly supervised by a representative of the machinery manufacturer and supplier having at least ten years of prior similar experience.

The Contractor shall provide all reasonable facilities, necessary tools and instruments required for the proper performance of the personnel engaged in the execution of the specified work.

Codes and Standards:

Work shall comply with, but not be limited to, all applicable requirements of the following codes and standards and their abbreviations used in this Specification:

1. American Association of State Highway and Transportation Officials (AASHTO)

2. American Gear Manufacturers Association (AGMA)
3. American Iron and Steel Institute (AISI)
4. American National Standards Institute (ANSI)
5. American Society of Mechanical Engineers (ASME)
6. American Society for Testing and Materials (ASTM)
7. American Welding Society (AWS)
8. Anti-Friction Bearing Manufacturers Association (AFBMA)
9. National Lubricating Grease Institute (NLGI)
10. Society of Automotive Engineers (SAE)
11. Steel Structures Painting Council (SSPC)
12. Steel Construction Manual (SCM)
13. Maine Department of Transportation Standard Specifications (ME DOT SS)

The work shall meet the requirements of all other codes and standards as specified elsewhere in these Specifications. Where codes and standards are mentioned for any pay item, it is intended to call particular attention to them; it is not intended that any other codes and standards shall be assumed to be omitted if not mentioned.

Rules, Regulations and Ordinances:

Work shall comply with all applicable Federal, State and local rules, regulations, and ordinances. In the event of a conflict between these Specifications and the above mentioned codes, standards, rules, regulations, and ordinances, the most stringent requirement shall apply.

Measurements and Verification:

Dimensions indicated on the Contract Drawings are nominal and are intended for guidance only. All variations from the nominal dimensions on the Contract Drawings shall be noted on the shop drawings.

Substitutions:

The terms "approved equal", "of equal quality" and "or equal" which may appear on the Contract Drawings and in these Specifications are intended to allow the Contractor to substitute other manufacturers and model numbers of products of equal quality and rating for those specified.

Prior to the Contractor's ordering of any substitute product, the Resident's approval of the equivalence of the substitute product shall be obtained in writing. The acceptance of the substitute products is at the sole discretion of the Resident who will establish the basis for equivalence and will review the quality of the materials and products described in detail on the submitted shop drawings and product data.

Upon return of Resident rejected shop drawings, the Contractor shall resubmit the shop drawing showing the specified product. Rejection shall not in any way result in any extra cost.

Approval by the Resident of any substitute products submitted by the Contractor shall not relieve the Contractor of responsibility for the proper operation, performance, or functioning of that product.

Where a particular product is specified by a manufacturer's name and catalog or part number in this Specification or on the Contract Drawings, it is so specified to establish quality, configuration, and arrangement of parts. An equivalent product made by another manufacturer may be substituted for the specified product subject to the approval of the Resident; however, all necessary changes required by the substitution in related machinery, structural, architectural and electrical parts, shall be made by the Contractor at no additional cost.

Specialized Machinery Components, Field Installation and Inspection:

For the installation, adjustment, and alignment of all specialized machinery components, the Contractor shall provide the presence at the job site, manufacturer's service personnel skilled in these specialties. Such service personnel shall be properly equipped with all necessary instruments to assure that related components have been provided within acceptable tolerances and to make all necessary adjustments for attaining the specified ratings.

Inspection and Testing:

The Contractor shall give no less than ten (10) working days notice to the Resident of the beginning of work at foundries, forge, and machine shops so that inspection may be provided. No materials shall be cast, forged, or machined before the Resident has been notified where the orders have been placed.

The Contractor shall furnish all facilities for the inspection of material and workmanship in the foundries, forge, and machine shops, and the Inspector designated by the Design Engineer shall be allowed free access to necessary parts of the premises. Work done while the Inspector has been refused access or presented in a manner that prevents adequate inspection will automatically be rejected.

The Inspector shall have the authority to reject materials or workmanship which does not fulfill the requirements of these Specifications.

Inspection at the foundries, forge, and machine shops is intended as a means of facilitating the work and avoiding errors. It is expressly understood that inspection will not relieve the Contractor from any

responsibility in regard to imperfect material or workmanship and the necessity for replacing defective materials or workmanship which are delivered to the job site.

The Contractor shall furnish the Resident with a copy of all orders covering work performed by subcontractors or suppliers.

Unless otherwise provided, the Contractor shall furnish without additional charge test specimens as required, and all labor, testing machines, tools, and equipment necessary to prepare the specimens and to make the physical tests and chemical analyses required by material specifications. A copy of all test reports and chemical analyses shall be furnished to the Resident.

The acceptance of any material or finished parts by the Resident shall not prohibit their subsequent rejection if found defective. Rejected material and workmanship shall be replaced or made acceptable by the Contractor at no additional cost.

Defective Materials and Workmanship:

All machinery rejected during inspection and testing shall be removed from the work site and replaced without additional cost.

Delays resulting from the rejection of material, equipment or work shall not be the basis of any claim.

All defects found during the guarantee period resulting from faulty material, components, workmanship, or installation shall be corrected by the Contractor without cost. The owner reserves the right to make necessary corrections with its own forces and charge the resulting costs to the Contractor.

860.42 Operating and Maintenance Manuals

Operating and maintenance manuals giving complete instructions relative to assembly, installation, operation, adjustment, lubrication, maintenance, disassembly and carrying complete parts list shall be furnished for every item of equipment furnished by the Contractor.

This work will include acquiring, coordinating, assembling, organizing and editing all information required for inclusion in the manuals. As part of this item, the Contractor shall also provide training for bridge operating and maintenance personnel.

The Contractor shall coordinate this work with all bridge field and acceptance testing.

The Contractor shall make all manufacturers, sub-contractors, etc. fully aware of the materials, data and information required of them for submission with and inclusion in the Operating and Maintenance Manuals prior to the start of all work.

Equipment furnished under each Special Provision Section including Electrical Sections is to be included in the Manuals.

Maintenance Manuals shall contain descriptive material, catalog cuts with non-pertinent data blocked out, as-built drawings, spare parts list, troubleshooting techniques and any and all information necessary for successful maintenance of the bridge functional systems and each piece of equipment furnished by the Contractor. Bridge functional systems shall be understood to include all span operating machinery, span lock machinery, gates, electrical service equipment, electrical and control systems, sump pumps and all other equipment for which periodic maintenance and operation is desirable. Subsequent to the break-in period, errata or addenda to the manuals should address any revisions required.

Operations Manuals shall contain written descriptions of the functional systems of the movable bridge, step-by-step operating instructions for each of these systems and any and all information and directions required for their successful operation. Subsequent to the break-in period, errata or addenda to the manuals should address any revisions required.

Printed and Scanned Material

All printed matter, data, drawings, catalog cuts, diagrams, etc., shall be produced by methods so as to result in legible text and figures of permanence and durability, including paper that is water resistant. No materials shall be used which will adversely affect this permanence and durability.

Electronic scans of all documents shall be provided in Adobe® PDF format and include a table of contents with links to each section of the manuals. All text and drawings shall be scanned in color at a minimum of 300 x 300 DPI or screen resolution of 300 x 300 PPI. Documents that are originally in an electronic format can be directly imported into the PDF files for the manuals.

Operating and maintenance manuals shall be bound in heavy-duty nickel-plated three ring binders with double trigger locking D-ring that keeps rings aligned. Back mounted D-rings shall allow sheets to lie flat. Covers shall be stiff heavy vinyl with view sleeve on front cover and outside binding.

The printed material shall be bound into each manual between rigid covers. The manuals shall be approximately 9 inches by 12 inches to contain the drawings without excessive folding so that they may be easily opened. The books shall be labeled with a descriptive title, the name of the project, the location, the year of installation, the name of the manufacturer, the engineering firm and the Contractor. Copies of drawings shall be in black on white background and shall be legible.

Paper used in these manuals shall be 20-pound, punched paper, water resistant, and acid free of a quality suitable for archival use. Paper shall have 5/16-inch minimum diameter holes, reinforced with plastic or cloth at the standard three (3)-hole spacing. The paper shall be standard 8½”x11”, or, in the case of larger foldout diagrams and illustrations, folded to approximately 8½”x11” size. No paper or other material shall extend beyond the manual covers.

Manual Content

The following are suggested tables of contents for each of the manuals. They are not intended to be complete tables of contents and the Contractor shall include all information which may be helpful in maintaining the bridge functional systems, in the case of the Maintenance Manual, or in operating the bridge functional systems, in the case of the Operating Manual. The tables of contents are given here are in general terms and include information and material on items provided under mechanical and electrical pay items. This is done intentionally to call attention to the need for coordination between the Contractor and all mechanical and electrical sub-contractors in the preparation of these manuals.

Each line item of the Table of Contents shall be separated by a polyethylene divider, color coded, with a lettered or numbered tab corresponding to the Table of Contents line item.

Maintenance Manual – Suggested Table of Contents:

1. Description of all bridge functional systems and sub-systems
2. Layout of all bridge functional systems and sub-systems
3. Listing of any warnings, cautions, or safety issues or procedures that must be followed as a part of any maintenance work, either specific or general.
4. Listings of all parts suppliers' local representatives, including suppliers' and representatives' names, addresses, telephone and fax numbers, and websites, if any. The names, addresses, telephone and fax numbers, and websites of the Contractor, all subcontractors installing any of the bridge functional systems or subsystems, and the Engineer shall also be provided.
5. Listing of all spare parts and components provided by the Contractor
6. Preventative maintenance procedures, including the frequency at which the various procedures should be done.
7. Lubrication schedule, charts and diagrams
8. Maintenance testing and procedure equipment lists
9. Troubleshooting procedures and checklists
10. Repair procedures and repair procedure equipment lists, including suggested procedures for installation and removal of machinery, electrical and control items.
11. Description of the proper theoretical approach to installing and aligning machinery and installing and testing electrical and control systems.
12. Ultrasonic and magnetic particle examination of trunnion shafts
13. Mechanical and Electrical as-built Shop Drawings

14. PLC program and I/O tables
15. Conduit and electrical equipment layout and installation drawings, including mounting details
16. Control desk, motor control panels and drive panel layouts and wiring diagrams
17. Schematic-wiring diagrams
18. Certified Drawings
19. Manufacturers' brochures, literature and composite schedule of apparatus, including any suggested installation, alignment, maintenance, troubleshooting and repair procedures.
20. Any and all other material or information which in the opinion of the Resident may be desirable to include in order to assist in maintaining the bridge functional systems and sub-systems

Operating Manual – Suggested Table of Contents:

1. Description of all bridge functional systems and sub-systems
2. Description of functional relationships between bridge functional systems and sub-systems
3. Listing of any warnings, cautions, or safety issues or procedures that must be followed as a part of any bridge functional system or sub-system operation, either specific or general
4. Theory of operation, detailed operating instructions, which shall cover in full the step-by-step sequence of normal operation of the movable bridge functional systems, all precautions required for the correct and safe operation of all bridge functional systems, adjustment instructions, and operational limits and restrictions
5. A similar description for the use of the bypass switches, noting all precautions for their correct and safe operation
6. Description of control, which shall describe in full the functions of all protective devices, limit switches, contactors, relays, and all other equipment used in all bridge functional systems, in connection with each step in the operating sequence. Wire and apparatus numbers appearing on the wiring diagrams shall be used in this description for identifying the various devices and circuits
7. Block diagrams illustrating the sequencing and operation of and functional relationships between all bridge functional systems and sub-systems
8. Any and all other material or information which in the opinion of the Resident may be desirable to include in order to assist in the operation the bridge functional systems and sub-systems

Submittals

Preliminary: Two copies of complete manuals in final form submitted 60 days prior to the earliest of final inspection or acceptance tests.

After the preliminary submittal has been reviewed and returned to the Contractor, necessary corrections shall be implemented. Submit Technical Manuals in accordance with standard submittal procedures as per ME DOT SS. Allow for one of the copies to become the property of the Design Engineer; the remaining copies shall become the property of the Department.

860.43 Training:

After submission of copies of the manuals in their final form and prior to the return of span operation to the Department, the Contractor shall provide instruction and training for Department Operations and Maintenance Personnel.

A course outline shall be submitted to the Department for approval 90 days prior to the earliest of final inspection, acceptance tests or return of span operation to the Department.

Department's personnel shall each receive a minimum of five (5)–eight hour days of instruction and training from the Contractor. The Contractor shall provide five (5) days of instruction to Maintenance personnel. The instruction shall include but not be limited to the following with respect to all machinery components:

1. Lock out and tag out procedures
2. Checking and adding lubricants
3. Purging and replacing lubricants
4. Cleaning; locations where debris collects, and removing excess grease.
5. Normal operation procedures
6. Emergency operation procedures
7. Trouble shooting procedures.
8. Brake use and maintenance; manual release, switch operation, and adjusting shoes
9. Span lock maintenance; lubrication, and adjustment
10. Shaft seal replacement
11. Control switches adjustments

860.44 Materials

Standard Products

Materials and equipment shall be essentially the standard products of manufacturers regularly engaged in production of such materials or equipment and shall be manufacturer's latest standard design that complies with the Contract specification requirements. Materials and equipment shall essentially duplicate items that have been in satisfactory commercial or industrial use at least 3 years prior to bid opening. Where two units of the same class of equipment are required, these units shall be products of a single manufacturer. Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate, securely affixed in a conspicuous place. The name plate of the distributing agent will not be acceptable.

Manufacturer's Recommendations

Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.

Castings

Design mold and riser shape, size, locations, and quantity to limit solidification and cooling shrinkage. Identify surfaces that are to be machined to specified dimensions and allow for excess casting material removed producing the required machined surface texture. At thick sections provide additional risers and/ or add void areas to reduce hot spots. Use internal or external chills, riser heating or insulation to control the rate of cooling.

Weld repair of castings at the foundry shall conform to the required ASTM A488 procedure. Weld repair after start of machining and/or assembly must be approved by the Resident.

Clean all castings free of loose scale and sand, fins, seams, gates, risers, and other irregularities. Neatly cast all unfinished edges of castings with rounded corners, and provide all inside angles with 1/4 inch minimum fillets.

Unless otherwise indicated, perform, in the manufacturer's shop, for each casting:

1. Visual surface examinations per ASTM A802, acceptance criteria of Level II
2. Liquid Penetrant exams in accordance with ASTM E165 and A802 acceptance criteria Level III
3. Ultrasonic exams in accordance with ASTM A609 Quality Level 2.

Where required, perform in the manufacturer's shop for each casting:

1. Radiographic examination of welds per ASTM E94.
2. Magnetic Particle exams in accordance with ASTM E709.

Prior to testing, verify that the casting is free of adhering sand, scale, cracks, and hot tears. Using ASTM Practice A802, identify and remove unacceptable surface discontinuities.

Submit certified material test reports for castings unless otherwise noted. Submit factory test reports if required.

Forgings

All forgings shall be reduced to size from a single bloom or ingot until the cross sectional grain is homogeneous. The blooms or ingots shall have a cross-sectional area at least three times that required after finishing. No forging shall be done at less than a red heat.

Unless otherwise indicated, perform for each forging:

1. Magnetic Particle exams in accordance with ASTM A275 and ASTM E709 performed by fabricator after finish machining.
2. Ultrasonic exams in accordance with ASTM A388 performed by foundry.

Forgings acceptance based on non-destructive test free of indication of discontinuities unless otherwise noted or acceptance criteria of the forging material standard.

Carbon Steel and Alloy Steel Forgings shall meet the requirements of AASHTO Specification M102 (ASTM A668) unless as otherwise approved by the Resident.

ASTM A668 forging class designations with an H suffix shall be Brinell tested to meet the designated hardness. Forgings that are welded for fabrication of the completed machinery part shall have carbon content limited in accordance with Supplementary Requirement S4.

No tack welding on forged materials permitted for lugs to aid with handling materials.

Submit certified material test reports for forgings unless otherwise noted. Submit factory test reports if required.

Shafting and Pins

All shafts and pins shall be accurately finished, round, smooth, and straight and, when turned to different diameters, shall have rounded fillets at the shoulders. Each shaft or pin having a uniform diameter of 8 inches or more and each shaft or pin having several diameters, of which the smallest is 8 inches or more,

shall be bored lengthwise through the center to a diameter approximately one-fifth the smallest body diameter.

All shafts and shall conform to tolerances in ASTM A29 unless otherwise indicated. Turned, ground and polished straightness tolerances shall be 0.002 inches per foot for shafts up to and including 1-1/2 inch in diameter and 0.003 inches per foot for shafts over 1-1/2 inches in diameter.

Each end of all shafts, when finished to the required lengths, shall have a 60 degree lathe center, with clearance hole, at the exact center of the shaft. Shafts that are bored with an inspection hole shall have the ends prepared for the attachment of a centering device equivalent to the lathe center. All such devices shall be furnished as part of the work.

All cold-finished shafting shall be ASTM A108 AISI grade 1045, unless otherwise shown on the Plans and shall be tested for its mechanical properties. A certificate material test shall be furnished to the Resident.

All pins shall be ASTM A668 class G forging unless otherwise shown on the Plans.

All hubs mounted on the ends of cold-finished shafts shall have the fit specified herein or on the drawings. To obtain the required fit between hub and shaft, the Contractor shall furnish the cold-finished shaft 1/16 inch larger than the nominal diameter specified and shall turn the ends to the required dimension for the hub.

Turned, ground, and polished commercial shafting of the grade specified shall be used where shown on the drawings.

After field installation of shafts supported in bearing the circular run-out tolerance shall be measured and recorded. Run-out requirements:

1. Shafts: 0.010-inch FIM (Full Indicator Movement)
2. Pins: 0.003-inch FIM

At any measuring position when the part is rotated 360 degrees about the datum axis with the indicator fixed in a position normal to the true geometric shape.

Bushings

For split bushings, the outside diameter fit between bushing and housing shall be as specified in the Plans. Double flanged bushings shall have the same fit between flanges and the end faces of the base and cap. Finish bores to achieve the fit with the shaft journal as specified in the Plans. Turn bushings with a predetermined gap between halves to suit the liner or shim thickness. The total thickness of liners in each bushing set shall include at least 1/8 inch laminated construction, permitting adjustment in

increments of 0.003 inches. Liners shall be cut to fit shoulder fillets, shall be square with bushing flanges, and shall have bolt holes drilled through them.

All grease lubricated and solid self-lubricating bronze bushings shall have grease grooves cut in a pattern as indicated in the Plans. All grease grooves shall be machine cut and smooth. The corners of all grooves shall be rounded to a minimum 1/8 inch radius, unless otherwise shown on the Plans. In cases of solid or split bushings required to support axial loads, provide flanges with grease grooves connected to the grooves in the bushing bore.

For solid bushings provide fits between the bushing outside diameter and housing and between the bore and the shaft as specified in the Plans.

Self-lubricating bushings where required in the Plans utilize a solid, permanent, synthetic lubricant with a lubricating binder that is compressed into trepanned recesses in the bushing by an extrusion process. Chemical properties of bushing material and solid lubricant shall be compatible and suitable for low speed and static applications. The solid lubricant shall be compatible with lithium based grease. Shop drawings shall show locations of solid lubricant and grease groove pattern in the bushing. Self-lubricating bushings shall be provided by one of the following approved manufacturers or a manufacturer with at least 10 years' experience specialized in the Design and production of self-lubricating bearings.

Lubrite Technologies, Hanover MA
RBC Bearings, Oxford, CT
Kaman, Bloomfield, CT

Plain and Spherical Roller Bearings

Where required, provide spherical or ball Roller Bearings manufactured in accordance with AFBMA Roller Bearing Engineering Committee (RBEC). Bearings shall be of the size, type and mounting configuration shown in the Plans.

Bearing and bearing housing materials shall be determined by the Bearing Manufacturer in accordance with applicable specifications and the design loads shown in the Plans. Unless otherwise shown in the Plans, anti-friction bearings shall be selected for L-10 life of 40,000 hours for the configuration shown on the Plans.

Include in bearing submittals calculations verifying bearing capacity, L-10 life, cap bolt and bearing housing capacity, and recommended maintenance, installation, and lubrication procedures.

Seal bearing lubrication cavities with labyrinth type seals around shaft. Pillow blocks shall be from the same manufacturer as the roller bearing manufacturer.

Pillow Blocks

Provide pillow blocks with turned studs for caps that meet or exceed the requirements of ASTM A449. Bearing housing material shall meet or exceed requirements of carbon steel ASTM A36 or cast steel ASTM A148 Grade 80-40.

Housings and cap bolts shall be capable of withstanding design radial and axial loads including uplift where specified. Split bearing housings shall be keyed or doweled together to establish and maintain the bore for the bearing and to eliminate shear loads on the cap bolts. Provide bearing housings equipped with seals, end covers, bearing retainers, lube fittings, and vents.

Pillow block and flange-mounted roller bearings shall be adaptor mounting, self-aligning expansion and non-expansion types as called for on the Plans. Mounting holes shall be drilled from the solid at assembly with the supporting steel work. Seals shall retain the lubricant and exclude water and debris.

Shaft Journals

All journal bearing areas on shafts and pins shall be accurately machined and polished, with no trace of tool marks or scratches on the journal surface or adjoining shoulder fillets. Burnishing of the shaft journal areas and adjoining shoulder fillets will be acceptable in lieu of polishing provided that the burnishing is done with a Stellite roller or equal, finished to a mirror surface. The surface finish of shaft journals shall be as shown on the drawings. Journal diameters shall be finished to the limits of an ANSI Class RC6 running fit.

Fasteners

All bolts for connecting machinery parts to each other or to supporting members shall be as shown on the plans or specified otherwise and conform to one of the following types:

1. Finished body bolts.
2. Turned bolts, turned cap screws, and turned studs.
3. High strength bolts.

Finished body, high-strength bolts shall meet the requirements of ASTM A449. Finished body bolts shall have finished bodies and regular hexagonal heads. The finished body or shank diameter shall have a tolerance that meets an ANSI LC8 fit with a field reamed hole. Bolt bodies shall have a straightness tolerance of 0.002 inch. Polish or machine the bolt diameter to achieve an overall body diameter deviation within the given shaft tolerance of an LC8 fit for the entire lot of finished body bolts. The finished body diameter shall be equal or greater than the thread major diameter after polishing or machining the bolt.

Turned bolts, turned cap screws, and turned studs shall have turned shanks and cut threads. Turned bolts shall have semi-finished, washer-faced, hexagonal heads and nuts. Turned cap screws shall have finished washer-faced, hexagonal heads. All finished shanks of turned fasteners shall be 1/16 inch larger

in diameter than the diameter of the thread, which shall determine the head and nut dimensions. The shanks of all turned fasteners shall have Class LT1 fit in the finished holes in accordance with ASME Standard B4.1. The material for the turned shank fasteners shall meet the requirements of ASTM A325 unless otherwise noted.

Unless otherwise specified, fasteners used for connecting machinery parts to each other and to supporting steelwork shall be bolts that conform to the minimum specified physical requirements of high strength, ASTM A325 Type 1, ASTM A449 Type 1 cut thread, washer faced, heavy hexagonal head bolts. Use nuts that conform to ASTM A563 or A194, Grade DH or 2H, heavy hex series unless otherwise noted.

The dimensions of all bolt heads, nuts, castle nuts, and hexagonal head cap screws shall be in accordance with ASME Standard B18.2.2, Square and Hexagon Bolts and Nuts. Heads and nuts for turned bolts, screws and studs shall be heavy series.

The dimensions of socket-head cap screws, socket flathead cap screws, and socket-set screws shall conform to ASME Standard B18.3. Unless otherwise noted in the plans, such screws shall be SAE Grade 8, heat treated medium carbon-alloy steel. Unless otherwise called for on the drawings or specified herein, set screws shall be of the headless safety type, and shall have cup points. Set screws shall neither be used to transmit torsion nor as the fastening or stop for any equipment that contributes to the stability or operation of the bridge.

Threads for bolts, nuts, cap screws, and tapped holes shall conform to the coarse thread series unless otherwise noted, and shall have a Class 2A tolerance for external threads and Class 2B tolerance for internal threads in accordance with the ASME Standard B1.1, Unified Inch Screw Threads.

Bolt holes through unfinished surfaces shall be spot faced for the head and nut, square with the axis of the hole.

Provide approved type positive locks for cap screws and nuts on turned bolts unless noted otherwise in the Plans. Use standard thickness nuts where double nuts are required in locations where occasional opening or adjustment is necessary. Use flat jam nuts only where space prohibits use of standard nuts. If lock washers are used for securing, they shall be made of tempered steel and shall conform to the heavy duty dimensions and material properties of ASME B18.21, Lock Washers (Inch Series). The material hardness shall meet Rockwell C35-C46 or equivalent hardness scale. Nuts may be lock-wired using stainless steel wire of a minimum 18-gage diameter.

High-strength bolts shall be installed with a hardened plain washer meeting ASTM F436 at each end. Plain washer dimensions shall conform to ASME B18.22.1.

All cotters shall conform to ASME B18.8.1 – Clevis Pins and Cotter Pins, standard dimensions and shall be made of half-round stainless steel wire, ASTM A276, Type 316.

Anchor bolts connecting machinery parts to masonry shall be ASTM A193, Grade B7 material. Bolt locations shall be as shown on the shop drawings. Anchor bolts into new concrete shall be cast in place. When these fasteners connect a mechanical component directly to the concrete, there must be a filler material in the annular area between the bolt and the bolt-hole in the machinery component. The filler material may be a non-shrink grout, babbitt metal or zinc.

Eye bolts for lifting are to be provided as required and manufactured according to ASTM A489. Eye bolts are to be Type 2 – shoulder pattern, Style B, and dimensioned in accordance with ANSI/ASME B18.15. Eye bolts are specified by the bolt shank diameter.

Miscellaneous Fasteners and Hardware: Fasteners of 3/8 inch nominal diameter or less including corresponding washers, miscellaneous fasteners and hardware, cotter pins, and lock wire, shall be manufactured from corrosion resistant stainless steel, with material composition of AISI type 304 or 316 unless otherwise noted.

All fasteners shall be of United States manufacture and shall be clearly marked with the manufacturer's designation.

Keys and Keyseats

Keys and keyseats shall conform to the dimensions and tolerances for square and flat keys of ASME Standard B17.1, 'Keys and Keyseats', unless otherwise specified. All keys shall be effectively held in place, preferably by setting them into closed-end keyseats milled into the shaft, or a threaded set screw through the hub against the top of the key. The ends of all such keys shall be rounded to a half circle equal to the width of the key. Keyseats shall not extend into any bearing. If two keys are used in a hub, they shall be located 120 degrees apart and in line with wheel arms where practicable.

The fit between key and keyseats shall be B17.1 Class 2 unless otherwise shown on the plans.

Unless otherwise specified herein or in the drawings, keys shall be machined from carbon steel forgings, ASTM A668, Class K.

Enclosed Gear Reducers

Gear reducers shall be standard models from one manufacturer, with ratios, dimensions, and construction details, shown on the Plans. Ratings shall be based on a service factor of 1.5 unless otherwise noted, and conform to AGMA standard 6013. Reducers shall have nameplates giving the rated horsepower, ratio, speed, service factor, and AGMA symbols.

The AGMA yield strength rating shall be based on a torque equal to 300 percent of full-load motor torque. Gearsets shall be designed for bending strength and pitting resistance as per AGMA standard 2001-D04.

Gears shall have helical or herringbone teeth, bearings shall be anti-friction type, and housings shall be welded steel plate. The inside of the housings shall be sandblast cleaned prior to assembly and be protected from rusting special oil-resistant crankcase paint or approved equal. Exact ratios shall be furnished where specified.

Gearing in enclosed factory assembled gear reducers shall be through hardened and shall conform to AGMA Quality A8 or better. Case-hardened gears shall not be used in gear reducers of the span drive.

Lubrication of the gears and bearings shall be automatic when the unit is in operation. It is preferable that a bath lubrication system be utilized. In a bath lubrication system, all components in the reducer which require lubrication are partially submerged in the oil bath.

When the configuration of gears and bearings prevent bath lubrication, a splash lubrication system should be used. Splash lubrication systems shall continuously lubricate all gears and bearings properly. Oil feed troughs may be used to supply oil to bearings and gears which are above the bath. Splash lubrication systems shall be designed such that equal lubrication is supplied to each internal component for both directions of operation.

Do not use pressurized lubrication systems for gear reducers unless specifically approved by the Resident or specified in the Contract Documents. When a pressurized lubrication system is required for the reducer, provide a redundant lubrication system so that both systems operate concurrently. If a lubrication system malfunction can occur, provide a contact for remote alarm indication.

Inspection ports on gear reducers shall provide for inspection of all gears, bearings and other internal devices. The ports shall be located above the oil level, if practicable, so that oil draining is not required for inspection. The port shall be sized such that minor repairs could be made to gear boxes without requiring housing disassembly. Ports shall be properly sealed with seals that do not require replacement when ports are opened.

Reducers shall be furnished with moisture trap, desiccant type breathers, oil fills, breakproof glass oil level indicators, drains and inspections ports. Moisture-trap breathers shall be located above maximum oil levels in all positions of the reducer during operation, and its piping shall enter the unit at the highest point possible. Breathers shall not be mounted in bearing caps.

Oil level indicators shall be mounted in locations that can be easily viewed by maintenance crews. On reducers in which the oil level varies by more than 1/2-inch per 50 degrees F temperature change, the sight glass shall be graduated. The indicator shall be vented back to the case. Sight glasses shall be of rugged construction and protected against breakage.

Oil drains shall be located at the lowest point possible. The drain shall have a hand-operated lever that can be locked in the closed position.

Oil sampling cocks shall be located in accessible positions on the reducers. There shall be two sampling cocks, one located at the lowest level of oil and one just below the upper oil level.

Gear reducers shall have provisions for oil expansion due to churning and temperature change.

Reducer bearings which are grease lubricated shall be fitted with readily accessible grease fittings. Internal seals between the bearing housing and the gear oil shall prevent interaction between them.

On shaft extensions, bearing shaft ring seals shall be mechanical type oil seals which compensate for wear. Dual lip spring loaded seals are preferred.

Shaft extensions for the various reducers shall be of the arrangement, lengths, and diameters shown on the drawings. Couplings shall be pressed on the shafts in the shop.

The manufacturer shall submit for approval a certified print of each gear reducer showing as a minimum the following:

1. All external mounting dimensions including shaft sizes, bores, keyseats, and reducer weight where required.
2. Internal drawings showing each gear box component with part numbers.
3. The ratings that will appear on the nameplate.
4. Location of all lubricant connections.
5. Lubrication recommendations.

The manufacturer shall submit for approval by the Resident, calculations showing conformity to the requirements of the AGMA Standard Practice specified. The reducer design calculations must be made available to the Resident prior to construction of the unit.

Reducer foundations shall extend past the body of the reducers to allow for mounting bolt hole reaming and bolts installation from above the unit.

The gear reducers for the operating machinery shall be equal to those specified on the Plans and all reducers shall meet the additional requirements set forth on the Plans and in the Specifications.

Gears

Where required, provide spur gears having 20-degree full-depth, involute cut teeth in accordance with ANSI/AGMA 2015-1-A01, Accuracy Classifications System – Tangential Measurements for Cylindrical Gears, unless otherwise specified herein or shown on the Plans.

The teeth of all gears shall be cut from solid rims or blanks. Finish the sides and peripheries of all gears and pinions, and scribe the pitch circle on both sides not less than 0.020 inches deep with a V-pointed

tool. The working surfaces of all gear teeth shall be smooth, and free from milling cutter ridges. Remove cutter burrs from all edges of the teeth, and round the top edges of all teeth to a 0.03 inch radius.

Except as otherwise provided herein or on the Plans, fabricate and mount all gears to meet the requirements for accuracy of ANSI/AGMA 2015-1-A01, Accuracy Classifications System – Tangential Measurements for Cylindrical Gears. The AGMA quality number shall be stated on the applicable Shop Drawings. Open gearing shall conform to AGMA Quality A10 or better, including the tolerance on runout, pitch and profile, unless otherwise noted.

Hubs and Bores

The hubs of all couplings shall be finished on both faces and polished where the hub face performs the function of a collar to prevent shaft movement. The hubs shall be bored concentric with the rims of gears and wheels or with the outside of couplings. All hubs shall have an ANSI Class FN2 medium drive fit on the shafts, unless otherwise specified.

Machinery Supports

Machinery supports shall be fabricated from minimum 3/8" thick structural steel ASTM A709 Grade 50 unless otherwise noted.

Support weldments shall be welded with continuous welds and all joining edges sealed by welding. Use full penetration groove welds on both sides of web plates at joints to top and bottom mounting plates or masonry plates. Use a 5/16 inch minimum fillet weld size all around stiffener plates.

The bottom of masonry plates to have milled grout grooves or welded steel grout lugs. Stress relieve after welding. Mill mounting plate surfaces after stress relieving. All mounting plate surfaces are to be parallel over entire length to within 0.002 inch.

Provide air relief holes through masonry plates for complete grout pad penetration with no voids. Set all grout pads following final machinery alignment.

Shims

Where shown on the drawings, all machinery shims required for leveling and alignment of equipment shall be neatly trimmed to the dimensions of the assembled parts and drilled for all bolts that pass through the shims. In general, sufficient thicknesses shall be furnished to secure 1/64-inch variations of the shim allowance plus one shim equal to the full allowance. Shims used with mounting fasteners greater than 5/8" diameter shall be provided with bolt holes 1/4" larger in diameter than the connecting fastener shank diameter. Shims used with smaller size fasteners shall be provided with bolt holes 1/8" larger in diameter than the connecting fastener shank diameter.

Shim pack thickness of equipment in final alignment shall include one solid plate of thickness equal or greater than 50% of the total shim thickness.

Shim material shall be ASTM A240 type 316 when mounting fasteners are greater than 5/8" diameter. Machinery mounted with fasteners 5/8" diameter or less shall be brass B36 Alloy UNS number C26000 temper H02 unless otherwise noted.

Shim material greater than 3/16" thickness can be ASTM A36 galvanized steel unless otherwise noted.

Shims shall be shown and fully dimensioned as details on the working drawings. Shims with open side or U-shaped holes for bolts will not be permitted. No shims shall have less than two holes for bolts.

The use of peelable laminated shims with solder or resin bonding, will be permitted. Plastic or other non-metallic shims will not be permitted.

Welding

Welding required for machinery shall be done in accordance with the Structural Welding Code AWS D1.1 and all interim revisions as of the bid opening date. All groove welds used to fabricate machinery shall be completely tested by ultrasonic inspection ASTM E164 per AWS D1.1, Section 6, Part F, and are subject to the acceptance criteria of Part C. Perform magnetic particle testing for all other welds used to fabricate machinery in accordance with ASTM E709.

Welding joint sizes and details shall be shown on working drawings. Where multi-pass welds are required, welding procedures shall be submitted on or with shop drawings.

Distortion during fabrication shall be kept to a minimum by the use of welding fixtures and proper welding procedures. Base metals that are forged or heat treated to increase hardness shall be preheated to prevent cracking prior to any welding. All machining shall be performed after welding and stress relieving.

Submit WPS and PQR for each weld type based upon tests which have been performed not more than 60 months in advance of production welding. Test base materials shall be equivalent materials as the production materials.

Machinery Guards

Machinery guards shall be provided for, but shall not be restricted to the following:

1. Couplings without shrouded bolts and operating speed greater than 30 rpm.
2. Unused Shaft Extensions
3. Shafts mounted at floor level

Machinery guards shall be constructed to comply with the applicable requirements of ASME B15.1, Safety Standard for Mechanical Power Transmission Apparatus.

Unless otherwise indicated or specified, all machinery guards shall be constructed of stainless steel having minimum thickness of No. 12 Gauge (0.105 inch) and shall have provision for removal without requiring disassembly of any machinery component.

Machinery guards shall be provided with removable hinged or bolted covers for access to lubrication fittings enclosed by the guard. Phenolic nameplates shall be provided on these covers with lubrication instructions.

Couplings

Gear-type, self-aligning, full-flexible couplings or semi-flexible couplings with floating shafts shall be used to connect all machinery components, except where other types of couplings are called for on the drawings. All couplings shall have shrouded bolts.

The gear-type couplings shall be made of forged steel, have curved face teeth, and shall provide for at least a plus and minus 3/4 degree misalignment per gear mesh.

Grid-type, self-aligning, fully flexible, torsionally flexible couplings shall be used to connect electric motors to machinery components.

The grid-type couplings shall have steel hubs, alloy steel grids and steel or aluminum covers. Bolts in the covers shall be shrouded.

Couplings shall be the standard product of an established manufacturer.

Special couplings shall be as shown on the drawings.

Coupling hubs shall preferably be bored by the machinery fabricator to the required size and tolerances, including keyseats, and each hub shipped to the proper location for installation on its shaft by the manufacturer of the connected component.

All coupling hubs with interference fits shall be provided with tapped holes for a means of removal from the shafts.

Lubrication

Standard grease fittings for a pressure system of lubrication shall be provided for all bearings, and surfaces requiring external lubrication. Not more than two sizes of fittings shall be used. The large size shall be used wherever possible, and the smaller size shall be used for motor bearings and other small devices. Pressure fittings shall be rated at a minimum of 10,000 psi. Fittings shall contain a steel check valve that will receive grease and close against back pressure.

The large fittings shall be connected directly into the bushings by 1/4-inch minimum size, extra strong, threaded steel pipe and forged threaded fittings. The smaller fittings shall be connected with 1/4-inch pipe where pipe extensions are required or by the size pipe thread furnished with the device to be lubricated.

Pipe extensions shall be provided to facilitate access for lubrication but shall be kept as short as practical and shall be rigidly supported at the fittings and at intermediate points.

Immediately after the completion of fabrication, all grease fittings shall be plugged until components are installed and regular lubrication is started. The plugs will then be replaced with the proper grease fittings.

The Contractor shall furnish as a regular submittal lubrication charts and the component manufacturer's lubrication literature for every rehabilitated machinery component which requires lubrication.

The charts shall consist of:

1. A schematic diagram of all machinery showing the location of all lubrication fittings and other points of mechanical and electrical equipment that require lubrication of any kind. These diagrams shall indicate the type of lubrication to be used at each point, the method of application at each point and the frequency of lubrication at each point.
2. A table chart listing each machinery component that requires lubrication, the minimum frequency of inspection, the minimum lubrication frequency, the minimum lubrication change frequency instructions, standards, guidelines and a history of most recent service.
3. One set of charts shall be permanently mounted in each machinery room and one in the control house or as otherwise directed by the Resident. The schematic charts shall be sealed in permanent plastic covers.
4. An extra set of charts shall be furnished to the Design Engineer as a reference set.
5. A Phenolic nameplate matching the number designation shown on the lubrication chart shall be mounted at each lubrication point. Characters on the plates shall be a minimum of 1 inch high. Plates shall be fastened with stainless steel screws.
6. Maintenance and lubrication manuals for each machinery component shall be kept in the operators house in a heavy bound binder.
7. The lubricant for each type of machinery component shall be kept separately in clearly marked containers. All measures shall be taken to prevent lubricant contamination.

During installation, the Contractor shall lubricate all rotating and sliding parts of the machinery and fill all gear reducers and pillow block housings and flexible couplings with lubricants indicated on the approved charts.

Lubricants

Enclosed Gear Reducers:

1. Enclosed gear reducer lubricant shall meet the requirements of the American Gear Manufacturers Association (AGMA) Standard 9005-E02 "Industrial Gear Lubrication".
2. The lubricant shall be manufactured by a reputable and knowledgeable supplier of lubrication and all lubricant shall be recommended for use in each application by the lubricant manufacturer.
3. The lubricant shall be recommended for use by the reducer manufacturer.
4. The lubricant should contain oxidation inhibitors, rust inhibitors, anti-foaming agents and anti wear additives.
5. Enclosed Gear Reducer Lubricant specification to be used in conjunction with AGMA Standard 9005-E02.
6. The maintenance of the lubricant, method of application and re-lubrication intervals, shall be recommended by both the reducer manufacturer and the lubricant manufacturer, and meet the requirements of the AGMA Standard 9005-E02 unless otherwise stated herein.

Open Gears:

The open gear lubricant utilized must bond strongly to gear teeth to maintain a continuous film on bearing surfaces despite high loading and high load repetition, contain an EP (extreme pressure) additive, repel water, resist throw off and dripping, maintain consistency over wide temperature variations, and allow for ease in application and removal.

The lubricant shall have an operating range of 0 degrees F to 110 degrees F and shall be considered a heavy bodied, adhesive type open gear lubricant by a reputable lubricant manufacturer.

Some adhesive lubricants are available in a diluted form for ease of application. This type of lubricant is diluted with solvent that quickly evaporates after application leaving behind an adhesive tacky film. If such a lubricant is desired, the solvent must be non-flammable and the mixture must not pose any hazard to health.

The detailed specifications for open gear lubrications that will satisfy the above requirements do vary. The lubricant chosen shall be comparable to the following lubricants:

Mobil Mobiltac LL
Tribology Tech-Lube T-800 S

Roller Bearings:

The roller bearing lubricant, the maintenance of the lubricant, method of application and re-lubrication intervals shall be recommended or approved by the manufacturer unless otherwise stated herein.

Sleeve Bearings:

The lubricant chosen shall be approved for use in sleeve bearings by the lubricant manufacturer. Recommended Lubricant: NLGI No. 2 grease with rust and oxidation inhibiting additives, 280 Worked Penetration at 77°F, 340°F (or higher) ASTM Drop Point, SUS 900 @ 100° F, water resistant, anti-wear/extreme pressure.

Couplings:

Coupling lubricant and its maintenance shall be specified by the manufacturer. The lubricant chosen shall be approved for use in gear and grid couplings by the manufacturer.

Machinery Paint

Painting of machinery and metal parts shall be high gloss oil-resistant paint for external use resistant to weathering and abrasion and shall comply unless otherwise noted with all applicable requirements of Section M7 of the MHD Standard Specifications, "Paints and Protective Coatings". Paint with a three-coat system consisting of two coats of aluminum epoxy mastic primer and a finish coat of aliphatic polyurethane.

Colors shall be as specified to distinguish between fixed and moving parts. The following colors shall be used for final coat:

FEDERAL SAFETY ORANGE: For all moving parts of the machinery such as shafting, couplings, and the side of gears and brakewheels, except for rubbing surfaces.

FEDERAL SAFETY GREEN: For all stationary parts of the machinery.

Paint for the final coat shall conform to OSHA color requirements of the Safety Color Code for Marking Physical Hazards, ANSI Z535.1. The brand and colors shall be submitted to the Resident for approval.

The Contractor shall place cautionary signs in the Operator's House and at the entrances to the machinery rooms which shall explain the color code. Details of the sign giving text, dimensions and materials shall be placed on a shop drawing.

Paint for painting the interior of gear housings shall be special oil-resistant crankcase paint.

Coatings

In general, fabricated steel parts having thicknesses less than 3/8 inch shall be hot-dip galvanized as per ASTM A123 unless made of corrosion resisting material.

The threads of all mounting bolts shall be coated with anti-seize compound before assembly of the nuts to prevent corrosion or galling and to facilitate future removal if necessary.

Rust inhibiting coatings shall be used for the temporary protection of machined surfaces.

860.45 Method of Construction

Shop Assembly and Operation

Machinery components shall be shop assembled to verify their correct fit prior to shipment. Any components requiring selective assembly shall be match-marked for future assembly.

The gear reducer manufacturer shall shop test each reducer by running it at the normal operating speed at no load for at least four hours in the presence of a representative of the Design Engineer. Half of the run shall be one direction and the other half in the opposite direction. Immediately before the start of the test, and at half-hour intervals thereafter, the following measurements shall be made and recorded and the records shall be submitted with the Certificate of Compliance:

1. Temperature of ambient air.
2. Temperature of oil near bottom of crankcase.
3. Surface temperature of each shaft extension adjacent to shaft seal.
4. Sound level at point above and 3 feet distant from center of unit.

The temperature of the oil shall not rise more than 40 degrees F from ambient during this test and no shaft shall experience a temperature rise of more than 50 degrees F from the ambient. The noise level of the reducer shall not exceed 90db with the microphone held 3 feet from the reducer housing.

During testing each gear reducer shall be checked for unusual noise (thumping or any non-uniformity), excessive bearing clearance, and any other unusual operating characteristics. The units shall operate smoothly, and without excessive vibration or temperature rise. All malfunctions shall be recorded and corrected, and the units retested if necessary before release from the manufacturer's shop. After the unit has passed the test, a Certificate of Compliance shall be submitted by the Contractor to the Resident.

The proper operation of the lubricating system shall be demonstrated during the shop test. In addition to the test specified above, the proper distribution of load on the gear teeth shall be demonstrated by the application of tooth contact tape applied to each gear and these tapes shall be preserved in the records to be submitted with the Certificate of Compliance.

Erection

Construction and installation shall be done in a coordinated manner to ensure that the machinery components fit the adjacent material furnished under other items.

The machinery shall be erected and adjusted by millwrights competent in the type of work involved. They shall be provided with all necessary measuring and leveling instruments as may be required.

The Contractor shall submit calculations and plans detailing his intended scheme for installing the machinery.

In general, the order of assembly and alignment of bridge machinery shall start at the final driven components and worked back to the prime mover.

All open gearing shall be aligned such that backlash is within tolerance and that at least the center 50% of the face width of each pair of meshing teeth is in contact. The cross mesh shall not exceed 0.001 inch per inch face width. All open gear measurements, shall be submitted to the Resident for review and approval. The measurements shall include backlash, cross mesh alignment, tooth valley gap and face contact. The type of bluing or lubricant used for face contact measurements shall be submitted to the Resident for approval prior to any measurements. The measurements shall be performed at a minimum of eight (8) equally spaced leaf positions ranging from fully open to fully closed.

All parts of the machinery shall be match marked for proper assembly and correct orientation. Before final drilling or reaming, all parts shall be adjusted to exact alignment by means of shims. Electric motors, and devices such as limit switches and encoders, shall be included with the machinery for such erection. After final alignment and bolting, all parts shall operate smoothly.

The leaf shall not be operated by the leaf drive machinery until pinions, bearings and all other machinery are in final alignment and bolted as approved by the Design Engineer.

Bolting

Bolt holes in structural steel for connecting machinery shall, in general, be drilled from the solid after final alignment of the machinery. Sufficient erection holes, subdrilled 1/4 inch undersize, for temporary bolts may be used for erection and alignment of the machinery. When the machinery is aligned in its final position, full-size holes for the remaining bolts shall be subdrilled and reamed, the full-size bolts installed, and the temporary bolts removed and the bolt holes for temporary bolts reamed full size and bolts installed.

Wherever possible, high-strength bolts connecting machinery components to structural elements or to other machinery components comprised of different thicknesses shall be installed such that the bolt head is adjacent to the connected element with the least thickness.

Finished body bolts and high strength bolts shall be torqued to the same tension required for ASTM A325 bolts specified in the Standard Specifications.

Torques for turned bolts and other grades of bolts shall be proportioned to develop a preload of 65% of their yield strength, unless otherwise noted, and shall be indicated on the erection drawings.

Determine torque value using the Skidmore-Wilhelm apparatus for each bolt thread size and material variation. Perform the test with the recommended or approved equal thread lubricant to also be used for torquing bolts at installation.

Unless otherwise noted install nuts on bolts with a moly anti-seize lubricant, marine grade to reduce torque applied to bolt, hold the threaded connection, and prevent corrosion.

Contractor's Inspection

After erection is completed, the Contractor shall make a thorough inspection to insure that all gears are clean and free of obstruction, that all parts are properly aligned and adjusted as closely as practicable without actual operation, and that all bolts are properly tightened.

Inspection of tightened fasteners shall be in accordance with The Contractor's inspection and shall also verify that field painting has been performed as specified herein. Touch-up painting shall be performed to correct all painting defects found during this inspection.

The Contractor's inspection shall also verify that all machinery components have been lubricated as specified herein.

The Contractor shall be accompanied by the Design Engineer and Resident, during his final inspection before machinery testing. On the basis of the results of this inspection, the Design Engineer and Resident shall determine whether the bridge is ready for testing.

Cleaning and Painting

The Contractor shall submit for review painting material data sheets from each manufacturer and application requirements, machinery assembly drawings showing the methods of cleaning and painting each part, and the final color of each part. The drawings shall also distinguish what machinery surfaces will not be painted.

New components or refurbished components removed from the site shall be cleaned and painted in the shop unless otherwise noted.

All unfinished machinery external surfaces shall be cleaned with final surface preparation, prior to painting, done by blast cleaning to meet the requirements of SSPC-SP6 "Commercial Blast Cleaning" with the following exceptions:

1. Flexible couplings
2. Roller bearing pillow blocks

3. Sleeve bearings with bushings in place
4. Electric motors
5. Brakes
6. Limit switches
7. Other equipment with shaft seals
8. The equipment excepted by the Resident

The excepted machinery or equipment shall be cleaned with solvent and hand tools to meet the requirements of SSPC-SP2, "Hand Tool Cleaning".

After proper surface preparation, all unfinished machinery surfaces shall be coated with two coats of primer and final paint coat applied inside an environmentally controlled space as per the manufacture's temperature and humidity requirements for application.

Acceptable machinery paints are given under MATERIALS. Colors will be selected from manufacturer's standard samples with the approval of the Resident.

The Contractor shall take special care to avoid painting of machinery surfaces which are in normal rubbing contact. All nameplates, legend plates, and escutcheons mounted on machinery shall be masked for protection from paint. Lubrication fittings shall be kept clog-free.

Field Touch-up Painting: After completion of the operating tests and acceptance of the machinery, all accumulated oil, grease, dirt, and other contaminants shall be washed from exposed machinery surfaces, excepting rubbing surfaces, with an approved high-flash solvent. The cleaned exposed surfaces shall then be hand brush painted one field coat of the same paint and color used for shop painting.

860.46 Field Testing

When the mechanical machinery and electrical equipment is ready for testing, the Contractor shall meet with the Resident to arrange a test schedule, and shall keep available a complete crew of mechanics for a minimum of four working days in order to provide operation of the span for all tests and to make all adjustments and corrections which shall be required to complete the tests.

The Contractor shall prepare a field testing procedure which shall be submitted to the Resident for approval. The testing procedure shall be coordinated with tests required for the electrical equipment and shall include measurements of power and current drawn by the motors when operating under load as required hereinafter.

When the machinery is ready for field testing, the operating machinery shall be driven by the main electrical system through at least ten complete cycles.

Power and current drawn by each span drive motor shall be automatically recorded on a strip chart moving at the rate of 10 inches per minute or faster. Each rotation of an intermediate shaft shall be recorded on the chart by an event marker to define the span opening height. The recording shall be made for complete cycles of opening and closing and the number of cycles during which measurements are made shall be established by the Design Engineer.

During the test runs, the entire operating machinery shall be inspected to determine whether everything is in proper working order and fully meets the requirements of the Contract Drawings and these Specifications. The temperature rise of all electrical components shall not exceed design ratings. If any tests show that any components are defective or inadequate, or function improperly, the Contractor shall make all corrections, adjustments, or replacement required before the final acceptance at no additional cost.

860.47 Method of Measurement

"General Requirements for Machinery" is for machinery reference except for measured in three units; 910.301 Special Work - Operation and Maintenance Manuals, 910.301 Special Work – Bridge Operator Training, and 910.301 Special Work - Field Testing.

860.48 Basis of Payment

The lump sum price bid for Item "General Requirements for Machinery" shall include the cost of time, materials, submittals, training and testing, including all necessary incidentals for measured work described above in 860.47.

The progress of payments and payment percentage shall be made in accordance with the Department.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
910.301 Special Work - Operation and Maintenance Manuals	Lump Sum
910.301 Special Work – Bridge Operator Training	Lump Sum
910.301 Special Work - Field Testing	Lump Sum

SPECIAL PROVISION
SECTION 880 - BALANCING BRIDGE

880.01 Description This work shall include balancing and balance testing the movable span to ensure compliance with the design criteria listed on the Plans and elsewhere herein.

Under the item “Bridge Balancing”, the work includes, but is not limited to:

1. Balance testing performed using the dynamic strain gage procedure described in this provision.
2. Preparation of balance calculations prior to construction based on approved shop drawings and material tests.
3. The development and documentation of the span balance procedure and methods.
4. All other work required to complete the span balance, including placing and adjusting the balance blocks and/or plates and concrete material within the counterweight area or other locations required for balancing the bascule span. This includes fabrication, furnishing, placement, and removal of temporary balance material as required during various phases of construction. This also includes repeated readjustment of balance material as necessary until the span is balanced as specified below. Documentation is required for all balancing work, including temporary balancing during construction.

Under the item “Balance Block - Lead”, the work shall consist of fabricating and furnishing lead blocks and/or plates as shown on the Plans and as required to perform balancing of the bascule span.

Under the Item “Counterweight - Concrete”, the work shall consist of the concrete cast in the counterweight area or other locations required for balancing of the bascule leaf in accordance with the Plans and as required. This shall include furnishing, transporting, mixing, and placing the concrete. This item shall also include furnishing and placing reinforcing in the counterweight as shown on the Plans.

880.02 Materials Materials shall meet the following:

Lead for the Lead blocks and/or plates shall conform to the provisions of ASTM B-29 (density shall be 710 pound per cubic foot).

For” Counterweight - Concrete”, the materials shall comply with the requirements of section 701 of the Specifications and shall meet the requirements of AASHTO LRFD Movable Highway Bridge Design Specifications, 2nd Ed. 2007, 2008 Interim Revision for counterweight concrete. The concrete for the counterweights shall not be air-entrained.

880.03 Construction

All lead blocks and/or plates shall be delivered to the site for installation in the counterweights to a location approved by the Resident. Initial installation and adjustment of the lead blocks and/or plates in the counterweights shall be included in the Item "Bridge Balancing".

The quantity of lead blocks and/or plates shall be the amount required to balance the span, as accepted by the Resident.

The Contractor shall determine the density of his proposed mix for the counterweight concrete prior to submitting balance calculations for review as required under the Item "Bridge Balancing". To determine the density of his proposed mix, the Contractor shall cast and cure three test cubes of counterweight concrete and have them accurately weighed. The test blocks shall be the same mix and from the same plant as the proposed counterweight concrete. The volume of each test cube shall not be less than four cubic feet, and the average unit weight shall be measured after curing for 28 days. The actual average unit weight determined from these test cubes shall be used in the Contractor's balance calculations. Two test blocks shall be made during each counterweight pour to serve as a check on the actual concrete placed.

Counterweight concrete shall be placed in lifts not to exceed 4 feet per lift. At least 24 hours shall elapse between pours. If the Contractor requires additional access or vent holes in the counterweight box, he shall submit drawings detailing their location and box reinforcement for approval.

880.04 Submittals

- A. Balance calculations shall be submitted to the Resident for approval as specified herein. Balance calculations shall be coordinated with structural steel shop drawings, electrical drawings, mechanical drawings, power and signal drawings, and any other miscellaneous or incidental work to be incorporated on the bascule leaf. All balance calculations required within these specifications shall be submitted to the Resident for approval.
- B. Balance summary tables and back up material for weight adjustments required to achieve proper balance during all phases of construction, prior to the initial imbalance measurement, and prior to any subsequent imbalance measurement shall be submitted to the Resident for approval. Documentation of the exact locations and details of the balance material shall accompany all balance calculation submittals. All summary tables required within these specifications shall be submitted to the Resident for approval.
- C. Qualifications of the strain gage testing company to perform the imbalance measurements shall be submitted to the Resident for approval. Required qualifications are specified below.
- D. Detailed descriptions of procedures and equipment to be used by the strain gage testing company shall be submitted to the Resident for approval, as specified herein.

- E. The Contractor shall submit initial and final balance reports in accordance with these specifications.

880.05 Span Balance Calculations

- A. A Professional Engineer licensed in the State of Maine shall perform the balance calculations. The quantity and location of balance material required within the counterweight area and other span balancing locations - including concrete, balance blocks and/or plates, and other balance material - based on the specified balance requirements and the weight and center of gravity of the bascule leaf shall be computed. These calculations shall be based on weights of final approved shop details and material tests for the actual material on the bascule leaf, including the counterweight areas. The balance calculations shall incorporate the distributions of leaf weight in the vertical and horizontal directions. Balance calculations are required to develop balance summary tables required for all phases of work, as specified herein.
- B. Calculate the imbalance magnitude and position of the center of gravity in terms of alpha angle. The alpha angle is defined as the angle of elevation of the center of gravity of the leaf above (minus being below) the horizontal axis through the centerline rotation of the leaf. Location of the center of gravity within this range will yield a closing imbalance moment for the full rotation of the leaf, with maximum imbalance being near the fully closed position and minimum imbalance at the fully open position of the leaf.
- C. Balance summary tables shall be developed and shown on the shop drawings. The format of these tables shall be in accordance with the balance tables shown in the Drawings. Summary tables shall be developed for all phases of the balance and the proposed imbalances. Temporary balance material, if used, shall be accounted for in the summary tables.
- D. For all balance summary table submittals, a narrative shall be included with the outline of the proposed balance phasing, the duration of the imbalance condition, and all other aspects of the work in accordance with the approved construction schedule. This information shall be coordinated with the Contractor's scheduling requirements. The balance calculations and summary tables shall be updated by the Contractor throughout construction and be submitted to the Resident periodically as required to meet the requirements in these Specifications and in the Plans.

880.06 Bridge Balancing

- A. The Contractor shall place and adjust the balance blocks and/or plates, concrete, and other balance material within the counterweight areas and other locations for balance material

specified on the Plans. This includes repeated readjustment of balance material as necessary until the span is balanced as required.

- B. It shall be the Contractor's responsibility to provide temporary bracing and supports and/or temporary balance material as required to stabilize the movable span during construction. Other than as specified herein, this work shall be included in other pay items.
- C. Resident review of the balance calculations, counterweight details, and quantity and location of balance material does not relieve the Contractor from making such changes in the counterweights and balance material as deemed necessary to balance the leaf without. All changes shall be submitted for approval. Bolting or welding ballast plates to the exterior of the counterweight girder is not acceptable.

880.07 Span Imbalance Measurement

- A. The Contractor shall measure the actual imbalance moment and determine the location of the leaf center of gravity a minimum of twice:
 - 1. Initial - After leaf construction is completed to determine the balance condition and to determine the required adjustments. Prior to performing initial balance testing, the Contractor shall submit balance calculations and summary tables to the Resident for review. If the span drive machinery is used to operate the span prior to final alignment for the balance testing procedures described herein, the maximum calculated span imbalance magnitude shall be 180 kip-feet at an alpha angle not more negative than 20 degrees. A maximum of 15 MPH wind speed is allowed for operation during these conditions.
 - a. Subsequent to initial balance testing, the Contractor shall compute the amount and location of weight adjustments required to achieve the final imbalance specified in the Plans and in these Specifications and submit the computations to the Resident for review. After the Resident's review, the Contractor shall make the approved adjustments.
 - 2. Final - After balance block adjustments, to determine if the revised imbalance is within the limits specified on the Plans and in this Specification. Leaf operation for final balance testing shall be performed with the span drive machinery after final alignment and grouting machinery supports. If the second balance testing indicates that the revised imbalance is not within acceptable limits, further balance block and/or plate adjustments and imbalance measurements are to be performed until the criteria specified on the Drawings and herein are met.

- B. The imbalance of the movable span shall be measured using the dynamic strain gauging technique. The Contractor shall furnish and install all equipment, materials, instruments and labor necessary to determine the imbalance by dynamic strain gauging.
1. The Contractor shall employ the services of an established testing company experienced in dynamic strain gage measurement of movable bridge imbalance, subject to approval of the Resident. Such experience shall be demonstrated by identifying a minimum of six movable bridges including at least three trunnion bascule bridges for which the company has provided complete and satisfactory dynamic strain gage measurements and reporting. The measurements shall be made under the immediate direction of a Professional Engineer registered in the State of Maine who has had hands-on experience measuring movable span imbalance by the dynamic strain gage procedure.
 2. The strain gauge testing company shall furnish and install the required strain gages, all cabling and transmission equipment, data acquisition equipment and strip chart recorders and produce fully documented reports detailing the results of the measurements. Acceptable testing companies include SMI Incorporated, Pittstown, NJ; Teledyne Engineering Services, Waburn, MA; and Stafford Bandlow Engineering, Washington Crossing, PA.
 3. The approved testing company shall submit the following items to the Resident for approval:
 - a. Description of experimental procedure including type and method of installation of strain gage rosettes, method of transmission of low level signals, data acquisition equipment and/or strip chart recorders.
 - b. Layout of span drive machinery showing proposed location of strain gages, amplifiers, cable or radio links, data acquisition equipment and all associated cabling.
 - c. Details of method of transmission of signals from shafting to data acquisition units.
 - d. Elementary wiring diagrams of interconnection of strain gages, amplifiers, data acquisition equipment, and strip chart recorders.
 - e. Sample computations of: shaft torque from measured strains, span imbalance, curve fitting and basis for friction correction.
 4. Strain gauge and equipment installation, strain measurement, torque calculations, and span imbalance presentation shall be in accordance with the following:
 - a. Two foil resistance strain gauge rosettes shall be affixed to each of the main pinion shafts, in accordance with the strain gauge manufacturer's installation instructions. They shall be 2-arm 90 degree rosettes mounted such that the grids are oriented at

45 degrees with the shaft axis and the two rosettes shall be affixed “back-to-back”, spaced 180 degrees apart circumferentially. The gauges shall be connected such that any bending strains in the shafts will be canceled and torsional shearing strains will be measured on each pinion shaft. The areas of the shafts where the gages are to be mounted shall be sufficiently cleaned to remove all contaminants. On each shaft, two rosettes shall be mounted at 180 degrees from each other. The two gauges shall be connected such that any direct shear forces in the shafts are neglected and true torsional shear is measured.

- b. The strain gauge leads on each shaft shall be connected to a four arm amplifier. Transmission of signals from the gauges to the data acquisition equipment shall be either through cable links or amplified and then through wireless transmitters.
 - c. Output leads from each channel of the amplifiers shall be connected to either a computer-based data logger provided with a two-channel strain gauge module streaming the amplified data to disk at a minimum 1-kHz sample rate, or a five channel minimum strip chart recorder with at least ten inch wide chart paper. An inclinometer shall be provided to provide continuous leaf angle to either the data logging equipment or the strip chart recorder. The chart speed shall be step-wise adjustable and shall include a setting of at least 10 inches per minute. The recorder shall be capable of recording data from at least 4 channels if it is equipped with a dedicated event marker or 5 channels if a channel is used to record events.
 - d. The strains in both shafts shall be recorded simultaneously versus span opening angle during opening and closing to a suitable scale. The readings for all shafts shall be recorded at the same strain scale and the chart speed, if a strip chart recorder is used. At least 3 opening/closing runs shall be made, when the wind speed is less than 5 MPH and the bridge deck is visibly dry. Wind-up torque in the operating machinery shall be released prior to each run as verified by space between the faces of the engaged teeth of main pinion and gears.
 - e. The strains induced in the shafts shall be numerically converted to torque by applying fundamental stress-strain relationship calculations for each strain plot for both opening and closing. This data shall be processed to give leaf imbalance (kip-feet) versus opening angle, corrected for friction, at each trunnion. From them, plots of total span imbalance shall be prepared.
5. The Contractor shall submit five copies of a report documenting the results of the initial strain gage measurements. The reports shall contain the following:
- a. Description of experimental procedure and equipment used.
 - b. Span drive diagram showing location at which strain gages were attached and all applicable gear ratios.

- c. Photocopies of a sample original strip chart for one complete run of each of the three sets in the case of strip chart recordings or data and chart files in Excel format if recorded by a data logger. They shall be annotated with strain scales, angle of opening, significant ordinates, etc.
 - d. Description of relationships and sample calculations for obtaining shaft torque from strains, span imbalance from shaft torque, curve fitting and basis for friction correction.
 - e. Plots of the following parameters versus degree of opening during each opening/closing run and fitted balance curves corrected for friction.
 - 1) Total imbalance (kip-feet) for span.
 - 2) Frictional moment (kip-feet) for span.
 - f. Tabulation of imbalance moment at seated position for each leaf/run including the average value for each leaf.
 - g. The location of the leaf center of gravity.
6. The Contractor shall submit five copies of the final balance report, similar in content to the initial report.
 7. The initial and final reports will be bound between heavy plastic covers. The report shall include an introductory section giving the name of the bridge, the date of the measurements, weather conditions during measurements and any other information requested by the Resident.

880.08 Final Balance Requirements The final imbalance measured by the procedures described within this Specification shall be considered acceptable if the imbalance magnitude with the leaf in the seated position is between 200 and 350 kip-feet toe-heavy and the center of gravity alpha angle is between plus 5 degrees and minus 20 degrees. If the alpha angle is more negative than 20 degrees than the imbalance magnitude must be proportionally reduced.

880.09 Method of Measurement The Item "Balance Block - Lead" shall be measured for payment by the lump sum and shall include the lead blocks and/or plates installed in the counterweight and retained for future use in balancing the span.

The Item "Counterweight - Concrete" shall be measured for payment by the number of cubic yards of concrete actually placed in the counterweight area. The volume of embedded material within the

counterweight area, including lead blocks and/or plates and structural steel, shall be deducted when computing the total cubic yards of concrete required to be placed. Test cubes that are cast for density determination shall not be measured for payment.

The item "Bridge Balancing" will be measured for payment by the lump sum.

880.10 Basis of Payment The Item "Balance Block - Lead" shall be paid for at the contract lump sum price. Payment will be full compensation for all materials, equipment, tools, and labor incidental thereto as required for fabrication and delivery.

The item "Counterweight - Concrete" shall be paid for at the contract unit price per cubic yard of concrete and shall include the cost of all materials, equipment, tools, forms and form removal, and labor incidental thereto.

The item "Bridge Balancing" shall be paid for at the contract lump sum price, and will include all material, labor, equipment, tools and incidentals necessary to complete the work. Payment will be full compensation for all preparation, incidentals, adjustments, inspections and testing shall be included in the lump sum price.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
880.02 Bridge Balancing	lump sum
880.031 Balance Block – Lead	lump sum
880.12 Counterweight – Concrete	cubic yard

SPECIAL PROVISION
SECTION 910 –Special Work
Staff Gauges

Description

This item shall include furnishing and installing aluminum sign panels and gauges and structural supports as shown on the Contract Plans. The Contractor shall verify and confirm the actual clearance of the bridge in accordance with the United States Coast Guard Bridge Permit Application Guide (COMDTPUB P16591.3B), Chapter 2, Section I “Clearance Gauges”.

The “Nominal Day Visibility” shall be 500 to 750 feet.

Materials

Reflective Sheeting shall meet the requirements of section 719.01.

Black Numerals and Footmarks meeting the requirements of USCG COMDTPUB P16591.3B.

The aluminum sheets shall meet the requirements of section 719.03.

All bolts, nuts and washers shall be stainless steel.

The 10x10 posts shall be composite marine timber, and shall be manufactured from a recycled plastic matrix with glass fiber reinforcement bars, and shall be non-polluting. The 10x10 section shall have a height and width of 10”, shall contain 4 reinforcing bars, shall have a yield strength in each direction of 3440 psi and a weight no greater than 35 plf. The color shall be black or as approved by the Resident.

Construction Methods

The Staff Gauges shall be fabricated as shown on the Plans. Shop Drawings shall be provided in accordance with Section 105.7. The clearance gauges shall be visible to mariners at the locations shown on the Plans. After attachment to the pile, the gauge shall be adjusted vertically to properly indicate the clearance to the “low steel” as stated in USCG COMDTPUB P16591.3B.

Method of Measurement

The work will be measured by the lump sum and shall be payment for all materials, labor, and equipment needed to furnish and install item “Special Work –Staff Gauges”.

South Bristol, Maine
The Gut Bridge, Rt 129
WIN: 016750.00
January 27, 2014

Basis of Payment

The item “Special Work –Staff Gauges” will be paid for at the contract lump sum price, complete in place, which price shall include the cost of all materials, equipment and labor necessary to complete the work in accordance with the contract documents.

<u>Pay Item</u>	<u>Pay Unit</u>
910.301 Special Work - Staff Gauges	LS

PART 1 – GENERAL

1.1 ARCHITECTURAL

A. General

PART 2 - MATERIALS

1.2 PENETRATING CONCRETE SEALER

A. Manufacturers

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hydrozo Coatings
 - b. IPA Systems, Inc.
 - c. Hilliard Chemical Corp.
 - d. Or approved equal.
2. Product: Provide a 20% impregnating liquified silane or siloxane sealer solution as manufactured by one of the specified manufacturers.

1.3 METAL FABRICATIONS

A. Metals

1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
2. Stainless Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 304
3. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.
4. Brackets, Flanges and Anchors: Cast or formed metal of the same type material and finish as supported units unless otherwise indicated

B. Aluminum

1. Aluminum Extrusions: ASTM B 221, Alloy 6063 T6

C. Paint

1. Bituminous Paint: Cold applied asphalt mastic complying with SSPC Paint 12, except containing no asbestos fibers, or cold applied asphalt emulsion complying with ASTM D 1187.

D. Fasteners

1. General: Provide Type 304 or 316 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.
2. Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

3. Anchor Bolts: ASTM F 1554, Grade 36.
4. Machine Screws: ASME B18.6.3.
5. Lag Bolts: ASME B18.2.1
6. Wood Screws: Flat head, carbon steel, ASME B18.6.1.
7. Plain Washers: Round, carbon steel, ASME B18.22.1.
8. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1.
9. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
 - a. Material: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
 - b. Material: Alloy Group 1 or 2 stainless steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
10. Toggle Bolts: FS FF B 588, tumble wing type, class and style as needed.

E. Grout

1. Non-shrink, Metallic Grout: Factory packaged, ferrous aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy duty loading applications.
2. Non-shrink, Non-Metallic Grout: Factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Miscellaneous Materials

1. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded
2. Galvanizing Repair Paint: High zinc dust content paint complying with SSPC Paint 20 and compatible with paints specified to be used over it
3. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

G. Fabrication, General

1. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
2. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
3. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
4. Form exposed work with accurate angles and surfaces and straight edges.
5. Weld corners and seams continuously to comply with the following:
6. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
7. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

8. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
9. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

H. Custom Fabrications And Supports

1. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
2. Pipes and Tubes: Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.
3. Exposed Surfaces: Polished or otherwise finished; all surfaces smooth, free of burrs, barbs, and sharpness; all edges and ends rolled, rounded, or capped.

I. Miscellaneous Framing And Supports

1. General: Fabricate steel for wood frame construction from continuous steel shapes of sizes indicated.
2. Fabricate units from structural steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.
3. Provide bearing plates welded to beams where indicated.
4. Drill or punch plates for field bolted connections where indicated.
5. Reference Structural drawing and additional requirements
6. Galvanize miscellaneous framing and supports where indicated

J. Finishes, General

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish metal fabrications after assembly.
3. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

K. Steel And Iron Finishes

1. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot dip process complying with the following requirements
 - a. ASTM A 153 for galvanizing iron and steel hardware.
 - b. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
2. Galvanize all exterior steel unless otherwise noted.
3. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
 - a. Exteriors (SSPC Zone 1B): SSPC SP 6 "Commercial Blast Cleaning."
 - b. Interiors (SSPC Zone 1A): SSPC SP 3 "Power Tool Cleaning."

4. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, unless otherwise indicated. Comply with requirements of SSPC PA 1 "Paint Application Specification No. 1" for shop painting.
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.

L. Stainless-Steel / Nickel Finish

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Finishes: Polish surfaces to produce uniform finish, free of cross scratches.
3. Run directional finishes with long dimension of each piece.
4. Nickel: Provide nickel plated custom finish to match samples. Base metal shall receive a non-textured smooth finish without imperfections. Color and texture of plating as selected.
 - a. Match Architects sample unless otherwise indicated

1.4 ROUGH CARPENTRY

A. Materials

1. Fasteners, Connectors and Supports

- a. Use hot dipped galvanized steel or stainless steel nails for exterior, high humidity and treated wood locations.
- b. Nails:
 - 1) Use common wire or spike nails.
 - 2) Follow all nail size requirements and nail spacings required by the building code
 - 3) Use hot-dipped galvanized steel nails for exterior work, areas of high humidity or at treated wood.
 - 4) Electro-galvanized nails shall not be used on exterior surfaces.
 - 5) Electro-galvanized nails shall not be used where corrosive staining might mar wood surfaces.
 - 6) Nails into redwood or cedar shall be of stainless steel.
- c. Power-driven nailing shall comply with the following:
 - 1) Power driven nailing shall comply with State and Local building code standards.
 - 2) International Staple, Nail and Tool Association (<http://isanta.org/>) standards as outlined in the ICC Evaluation Services, Inc. Legacy Report (NER-272), January 1, 2004
- d. Bolts:
 - 1) Drill holes 1/16" larger than bolt diameters.
 - 2) Drill straight through from one side.
 - 3) Use washers under all nuts.
 - 4) Do not bear bolt heads on wood use washers.
- e. Hangers, connectors and crossbridging
 - 1) Brand name Simpson or equal
 - 2) Joist hangers

- 3) Metal framing connectors
- 4) Metal crossbridging
- 5) Galvanized steel, sized to suit framing

f. Anchors to adjacent construction:

- 1) Hollow masonry: Use toggle bolt
- 2) Solid masonry or concrete: Use expansion shield and lag bolt
- 3) Steel Use bolt or ballistic fastener

2. Lumber

- a. Select lumber species and grade according to the design needs. Framing lumber shall be grade marked designed for Construction, Standard or Stud use.
- b. Pressure treated lumber shall be labeled to show conformance with AWPA C222-03 "Lumber and Plywood for Permanent Wood Foundations – Preservative Treatment by Pressure Process" and labeled by an inspection agency accredited by the American Lumber Standards Committee.

3. Sheathing and Underlayment

- a. Subflooring: APA rated plywood sheathing, exterior grade or Oriented Strand Board (OSB)
- b. Roof sheathing: APA rated plywood sheathing, exterior grade, Oriented Strand Board)(OSB) or Waferboard with waterproof resin binder.
- c. Underlayment: APA rated underlayment, approved for use under asphalt, vinyl, and resilient tile or sheet flooring.

4. Related construction and materials:

- a. Subfloor glue: APA solvent based, waterproof construction grade adhesive.
- b. Building paper: No. 15 asphalt felt, or spun-bonded polyethylene.
- c. Vapor barrier: 6 mil polyethylene

1.5 EXTERIOR FINISH CARPENTRY

A. Standards

1. Cedar Shingle Standard: Comply with Cedar Shake and Shingle Bureau (CSSB) standards.
2. Softwood Lumber Standards: Comply with American Softwood Lumber Standards: "Simplified Practice Recommendations PS 20", and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
3. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
4. Hardwood Plywood Standard: Comply with requirements of PS 51.
5. Woodworking Standard: Where indicated for a specific product comply with specified provision of Architectural Woodwork Institute (AWI) "Quality Standards".
6. Glued up Lumber Standard: Comply with requirements of PS 56.
7. Cellular PVC Material: Free foam cellular pvc material with a small cell microstructure and density of .55 grams/cm³ and shall have a minimum physical and performance properties specified.

- a. Acceptable Products: AZEK trimboards, soffits, fascia's, frieze boards, rake boards, architectural millwork and door/window trim, manufactured by Vycom Corporation, 801 Corey Street, Moosic, PA 18507, or approved equal.

8. Wood-Plastic Composite: ASTM D 7032

- a. Acceptable Products: TREX Deck Boards, manufactured by The Trex Company, Inc., or approved equal.

B. General

1. All wood shall be sound, flat, straight, well-seasoned, thoroughly dry and free from all defects. The use of warped or twisted wood shall not be permitted.
2. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.
3. Moisture Content of Softwood Lumber: Provide seasoned (kiln dried) lumber having a moisture content from time of manufacture and surfacing until time of installation values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated, but in no case greater than 19%.
 - a. For exterior assemblies and where indicated, pressure treat wood with water borne "CCA Oxide" preservative complying with AWPB LP 2 (.23 lbs/cu. ft. of chemical in wood). After treatment, kiln dry to a maximum moisture content of 15%.
 - b. Treatment shall be "Wolmanized" as manufactured by Koppers Company, Inc., K33 as manufactured by Osmose Wood Preserving Inc., or approved equal.
4. Moisture Content of Hardwood Lumber: Provide seasoned (kiln dried) lumber having a moisture content from time of manufacture and surfacing until time of installation within the ranges required in the referenced woodworking standard, but in no case greater than 15%.

C. Decking: Wood Plastic Composite Deck Boards: ASTM D 7032.

D. Finish Carpentry for Painted Finish:

1. Provide products for back priming and end priming as selected by the Architect and meeting requirements of Section "Painting"

E. Where glued up lumber is used for finish carpentry, use lumber complying with PS 56 for "wet use" and certified so by respective grading and inspecting agency for species and product indicated.

F. Finish Carpentry specified in this section shall be planed and surfaced on all sides, with the smoothest side being exposed, unless otherwise indicated.

G. Cedar Shingles

1. Rebutted and Rejoined Individual Sidewall Shingles: Western Red Cedar #1 Grade Blue Label or #2 Grade Red Label red cedar, kiln dried, 100% edge grain, 100% heartwood, all clear; with natural band saw textured surface. Trimmed for parallel edges with butts sawn at right angles.
 - a. Provide the following, or approved equal:

- 1) 8-inch Certigrade Rebutted and Rejoined Shingles (Premier Forest Products, Inc.).
2. Fasteners:
 - a. Corrosion-resistant. Length as recommended by the shingle manufacturer. Provide one of the following types of fasteners:
 - 1) Stainless steel.
 - 2) Hot-dipped zinc coated steel.
 - 3) Non-corrosive aluminum.

H. Exterior Trim and Facing

1. General: For applied cladding, facing, trim, fascias, exterior window casings/sills and door casings, and any other miscellaneous items, comply with NLGA, WCLIB, WRCLA or WWPA standards and the following requirements:
 - a. Quality Standard: Comply with AWI Section 300.
 - b. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.
 - c. Wide flat members of trim shall be vertical grain.
 - d. Assemble standing and running trim in plant to the greatest extent possible, except where limitations of access to place of installation require field assembly.
2. PVC Material: Free foam cellular pvc material with a small cell microstructure and density of .55 grams/cm³ and shall have a minimum physical and performance properties specified.

I. Exterior Casings And Moldings

1. Quality Standard: Comply with AWI Section 900.
2. Moldings: Profiles to meet requirements.
3. PVC Material: Free foam cellular pvc material with a small cell microstructure and density of .55 grams/cm³ and shall have a minimum physical and performance properties specified.

J. Exterior Soffit

1. Provide soffits as indicated; provide units of dimensional material with concealed galvanized fasteners.
2. PVC Material: Free foam cellular pvc material with a small cell microstructure and density of .55 grams/cm³ and shall have a minimum physical and performance properties specified.

K. Plywood Panels

1. Select and arrange panels on each wall for best match of adjacent panels for paneling. Install with uniform tight joints between panels.
2. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners as recommended by panel manufacturer.
3. Conceal fasteners to greatest extent practical.
4. Provide plywood type exterior panels with various sized solid lumber trims and panels of pattern and profile indicated for painted finish.
 - a. Plywood Type: Exterior, Grade A C; face grade as selected by the Architect.
 - b. Thickness: As indicated.

c. Surface: Smooth.

L. Miscellaneous Materials

1. Structural Supports: Refer to the Structural Drawings for supports for framing members to accommodate requirements.
2. Supplemental Framing and Supports: Plates or hangers shall be made from structural grade extrusions and shapes. Exterior items shall be stainless steel or painted galvanized steel.

M. Fasteners for Finish Carpentry: Stainless steel, noncorrosive aluminum or hot dip galvanized nails, in sufficient length to penetrate minimum of 1 1/2 inches into substrate unless recommended otherwise by manufacturer.

1. Provide stainless steel fasteners for all standing and running trim.
2. Countersink nails and fill surface where face nailing is unavoidable.
3. Provide square drive type stainless steel deck screws/fasteners as recommended by the exterior wood decking manufacturer.
4. Countersink nails and fill surface where face nailing is unavoidable.

N. Stainless Steel Bolts and Nuts: Regular hexagon head type, ASTM A 307, Grade A. Lag Bolts: Square head type, FS FF B 561. Machine Screws: Stainless steel.

O. Stainless Steel Plain Washers: Round, FS FF W 92.

P. Expansion Anchors: FS FF S 325, Group VIII, Type I; and machine bolts complying with FS FF B 575, Grade 5.

Q. Stainless Steel Toggle Bolts: Tumble wing type, FS FF B 588, type, class, and style as required.

R. Fabrication

1. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide finish carpentry with moisture content that is compatible with Project requirements.
2. Fabricate finish carpentry to dimensions, profiles and details indicated. Build up wood members to larger sizes where required.
3. Provide metal framing and lumber framing for finish carpentry, complete with all bracing and fastening devices as required for a rigid installation, and as required to sustain the imposed loads.
4. Do all fabrication from field measurement with provision for scribing as required to meet built in conditions. Coordinate the Work of this Section with the work of other trades.
5. Fabricate units in largest practicable sections. Trial fit in the shop, disassemble for shipment and reassemble with concealed fasteners.
6. Reinforcing shown is minimum. Provide additional reinforcing as required to ensure a rigid assembly. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects. Accurately fit all joints, corners and miters.
7. Provide openings for hardware, appliances, plumbing fixtures and electrical work. Locate openings accurately and use templates or diagrams for proper size and shape. Smooth edges of cutoffs and seal edges of cutouts in countertops with a water resistant coating
8. Complete shop fabrication including assembly, finishing, and hardware application, before shipment to project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary, provide ample allowance for scribing, trimming, and fitting at site.

S. Finishing

1. Painted Finish: Comply with the requirements indicated for finish system and color as specified in Section "Painting". Subject to compliance with requirements, provide the following painted finish system on finish carpentry, except where indicated.
 - a. Match Architects samples for type sheen and color.
2. Unless otherwise indicated, factory prime all wood items to be field finished.
3. Stained Bleaching Oil Finish on Cedar Shingles: Subject to compliance with requirements, provide oil-based bleaching finish system listed below:
 - a. Match Architects samples for type and color.

1.6 INTERIOR ARCHITECTURAL WOODWORK

A. Materials

1. Wood Product Quality Standards
 - a. Softwood Lumber Standards: Comply with American Softwood Lumber Standards: "Simplified Practice Recommendations PS 20", and with applicable grading rules of the respective grading and inspecting agency for the species and product indicated.
 - b. Plywood Standard: Comply with PS 1/ANSI A199.1, Product Standard of the National Bureau of Standards.
 - c. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.
 - d. Hardwood Plywood Standard: Comply with PS 51.
 - e. Hardboard: ANSI/AHA A135.4
 - f. Woodworking Standard: Where indicated for a specific product comply with specified provision of Architectural Woodwork Institute (AWI) "Quality Standards."
 - g. Glued up Lumber Standard: Comply with PS 56.

B. Materials, General

1. All wood shall be sound, flat, straight, well seasoned, thoroughly dry and free from all defects. The use of warped or twisted wood shall not be permitted.
2. Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed or worked and dressed lumber, as applicable, manufactured to the actual sizes as required by PS 20 or to actual sizes and pattern as shown, unless otherwise indicated.
3. Moisture Content of Softwood Lumber: Provide seasoned (KD) lumber having a moisture content from time of manufacture and surfacing until time of installation values required by the applicable grading rules of the respective grading and inspecting agency for the species and product indicated, but in no case greater than 10%.
4. For blocking and where indicated, pressure treat wood with water borne "CCA Oxide" preservative complying with AWPB LP 2 (.23 lbs/cu. ft. of chemical in wood). After treatment, kiln dry to a maximum moisture content of 16%.
 - a. Treatment shall be "Wolmanized" as manufactured by Koppers Company, Inc., or K33 as manufactured by Osiose Wood Preserving Inc., or approved equal.
5. Moisture Content of Hardwood Lumber: Provide kiln dried (KD) lumber having a moisture content from time of manufacture and surfacing until time of installation within the ranges required in the referenced woodworking standard, but in no case greater than 12%

6. Lumber for Painted Finish: At Contractor's option, use pieces which are either glued up lumber or made of solid lumber stock.
7. Where glued up lumber is used for exterior finish carpentry work, use lumber complying with PS 56 for "wet use" and certified so by respective grading and inspecting agency for species and product indicated.

C. Standing And Running Trim And Facing

1. Quality Standard: Comply with AWI Section 300.
2. Rout or groove backs of flat trim members, kerf backs of other wide flat members, except for members with ends exposed in finished work.
3. Wide flat members of trim shall be vertical grain.
4. Trim for painted Finish: Comply with the following requirements:
 - a. Grade: B and better, 1 and 2 Clear.
 - b. Lumber Species: As selected.
 - c. Texture: Surfaced (smooth)

D. Miscellaneous Ornamental Items Sills And Trims

1. Quality Standard: Comply with AWI 700.

E. Ornamental Items for Opaque Finish: Comply with the following requirements:

1. Grade: B and better, 1 and 2 Clear.
2. Lumber Species: Clear Pine.

F. Interior Stairs

1. Treads: Clear, kiln-dried, edge-glued stepping with half-round nosing unless otherwise indicated.
2. Tread Species: Oak with transparent urethane finish to match architects samples.
3. Risers: Clear, kiln-dried, edge-glued stock matching treads, unless otherwise indicated
4. Finished Stringers: finish boards as specified above for interior softwood trim, unless otherwise indicated.

G. Miscellaneous Materials

1. Fasteners for Interior Finish Carpentry: Stainless steel, noncorrosive aluminum or hot dip galvanized nails, in sufficient length to penetrate minimum of 1 1/2 inches into substrate unless recommended otherwise by manufacturer.

H. Fabrication And Finishing

1. Wood Moisture Content: Comply with requirements of specified inspection agencies and manufacturer's recommendations for moisture content of finish carpentry in relation to relative humidity conditions existing during time of fabrication and in installation areas. Provide finish carpentry with moisture content that is compatible with Project requirements.
2. Fabricate finish carpentry to dimensions, profiles and details indicated. Build-up wood members to larger sizes where required.

1.7 PLASTIC LAMINATE COUNTERTOPS

A. Materials

1. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades indicated for construction, installation, and other requirements.
 2. Grade: Custom.
 3. High-Pressure Decorative Laminate: NEMA LD 3, Grade HGS.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Formica Corporation.
 2. Wilsonart International; Div. of Premark International, Inc.
 3. Or approved equal.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
1. As selected by Architect from manufacturer's full range in the following categories:
 - a. Solid colors, matte finish.
- D. Edge Treatment: Hardwood bullnosed nosing, 1 inch by 1-1/2 inches, as shown on the Drawings.
- E. Core Material at Sinks: Medium-density fiberboard made with exterior glue.
- F. Core Thickness: 3/4 inch, unless otherwise indicated.
- G. Build up countertop thickness to 1-1/2 inches with additional layers of core material laminated to top.
- H. Backer Sheet: Provide plastic-laminate backer sheet, NEMA LD 3, Grade BKL, on underside of countertop substrate.
- I. Adhesives: Do not use adhesives that contain urea formaldehyde.
- J. Fabrication
1. Fabricate countertops to dimensions, profiles, and details indicated. Unless otherwise shown, provide front and end overhang of 1 inch over base cabinets. Ease edges to radius indicated for the following:
 2. Complete fabrication, including assembly, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 3. Shop cut openings to maximum extent possible to receive appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- K. Seal edges of openings in countertops with a coat of varnish.
- 1.8 UNDER SLAB VAPOR BARRIER
- A. Manufacturer

1. Available Manufacturer: Subject to compliance with requirements, provide integrally bonded vapor barrier membrane as manufactured by Grace Construction Products, Inc, or approved equal.

B. Slab On Grade Vapor Barriers

1. General: Provide and integrally bonded vapor barrier type membrane consisting of a 0.5mm nominal thickness composite sheet membrane comprising 0.4 mm of polyolefin film, and layers of specially formulated synthetic adhesive layers. The membrane shall comply with ASTM E 1745; and be classified as a Class A material. The membrane shall form an integral and permanent bond to poured concrete to prevent vapor migration at the interface of the membrane and structural concrete. Provide membrane with the following physical properties:
 - a. Minimum Thickness: 0.5mm in accordance with ASTM D3767 Method A.
 - b. Water Vapor Permeance: 0.03 perms in accordance with ASTM E96 Method B.
 - c. Tensile Strength: 65 lb./in in accordance with ASTM E154.
 - d. Elongation: 300% in accordance with ASTM D412.
 - e. Puncture Resistance: 3300 grams in accordance with ASTM D1709.
 - f. Peel Adhesion to Concrete: >4 lb./in in accordance with ASTM D903.
2. Selected Products: Subject to compliance with requirements, provide "Florprufe 120 Membrane" as manufactured by WR Grace Construction Products, or approved equal.

C. Installation Accessories

1. General: Provide installation accessories indicated, if not indicated as recommended by the system manufacturers. Accessories shall include, but not be limited to, fasteners, adhesives, tapes and sealants.
2. Mounting, Seam Sealing and Penetration Tape: Provide the manufacturer's standard pressure sensitive, 35 mil, double sided, asphaltic sealing tape/mastic.
3. Repair and Termination Sealing Tape: Provide the manufacturer's standard pressure sensitive, single sided, vapor resistant sealing tape.
4. Preformed Pipe/Penetration Boots: Provide the prefabricated rubber penetration assemblies (boots) of the types indicated, and as recommended by the vapor barrier manufacturer. Assemblies shall one piece, seamless construction type units complete with integral flashing flanges and stainless steel compression rings. Size as required for each different penetration.
 - a. Selected Product: Provide prefabricated, rubber penetration boot assemblies as manufactured by Portals Plus, or approved equal.

1.9 SELF-ADHERING FOUNDATION SHEET WATERPROOFING

A. Manufacturers

1. Products: Subject to compliance with requirements, provide one of the following products:
 - a. Rubberized-Asphalt Sheet Waterproofing:
 - 1) W. R. Grace & Co.; Bituthene 4000.
 - 2) Or approved equal.
 - b. Molded Sheet Drainage Panel:
 - 1) W. R. Grace & Co.; Hydroduct 220 or equal.

2. Rubberized-Asphalt Sheet Waterproofing
 - a. Rubberized-Asphalt Sheet: 60-mil thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.
 - 1) Physical Properties: As follows, measured per standard test methods referenced:
 - a) Tensile Strength: 325 psi minimum; ASTM D 412, Die C, modified.
 - b) Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c) Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d) Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
 - e) Puncture Resistance: 50 lbf minimum; ASTM E 154.
 - f) Hydrostatic-Head Resistance: 231 feet minimum; ASTM D 5385.
 - g) Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - h) Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.
 - b. Expanding Concrete Joint Water Stop
 - 1) Active synthetic plastic based water stop for installation at concrete perimeter wall cold joints and at intersection joints between the perimeter vertical walls and foundation floor slabs.
 - a) Adcor ES by W.R. Grace & Co.
 - c. Synthetic Plastic-Based, Butyl Adhesive Primer:
 - 1) Adcor Adhesive Primer ES by W.R. Grace & Co.
3. Molded-Sheet Drainage Panels
 - a. Nonwoven-Geotextile-Faced, Drain Panels: Manufactured composite subsurface drainage panels consisting of a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side with a polymeric film bonded to the other side of a studded, nonbiodegradable, molded-plastic-sheet drainage core, with a vertical flow rate of 9 to 15 gpm per ft..
 - 1) Basis of design: Hydroduct 220 by WR Grace.
 - 2) Or approved equal.
4. Auxiliary Materials
 - a. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
 - b. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
 - c. Primer: Liquid solvent-borne primer recommended for substrate by manufacturer of sheet waterproofing material.
 - d. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

- e. Sheet Strips: Self-adhering, rubberized-asphalt composite sheet strips of same material and thickness as sheet waterproofing.
- f. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
- g. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.
- h. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
- i. Detail Tape: Two-sided, pressure-sensitive, self-adhering reinforced tape, 4-1/2 inches wide, with a tack-free protective adhesive coating on one side and release film on self-adhering side.
- j. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.

1.10 BUILDING INSULATION

A. Manufacturers

- 1. Available Manufacturers: Subject to compliance with requirements, provide insulation products and accessories as manufactured by one of the following, or equal acceptable to the Architect:
 - a. Glass-Fiber Insulation:
 - b. CertainTeed Corporation.
 - c. Knauf Fiber Glass.
 - d. Owens-Corning Co.

B. Insulating Materials

- 1. General: Provide insulating materials which comply with requirements indicated for materials, compliance with referenced standards, and other characteristics. Provide insulation of thickness shown.
- 2. Preformed Units: Sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths and lengths.
- 3. Unfaced Glass Fiber Blanket/Batt Insulation: Thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing); and with the following:
 - a. Combustion Characteristics: Passes ASTM E 136 test.
 - b. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
 - c. Thickness: As required to meet the minimum thermal performances indicated, or if not indicated, as required to meet the State of Maine Energy Code.
- 4. Foil Faced Glass Fiber Blanket/Batt Insulation: Thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C 665 for Type III, Class A (blankets with reflective vapor-retarder membrane facing); foil scrim vapor-retarder membrane on one face, respectively; and as follows:
 - a. Combustion Characteristics: Faced blanket/batt passes ASTM E 136 test, unless otherwise indicated.
 - b. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.
 - c. Thickness: As required to meet the minimum thermal performances indicated, or if not indicated, as required to meet the State of Maine Energy Code.

5. Vapor Retarders

- a. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

C. Auxiliary Insulating Materials

1. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.
2. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

D. Insulation Fasteners

1. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

a. Available Products:

- 1) AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
- 2) Eckel Industries of Canada; Stic-Klip Type N Fasteners.
- 3) Gemco; Spindle Type.

2. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.
4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

a. Available Products:

- 1) AGM Industries, Inc.; RC150.
- 2) AGM Industries, Inc.; SC150.
- 3) Gemco; Dome-Cap.
- 4) Gemco; R-150.
- 5) Gemco; S-150.
- 6) Or approved equal.

- b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in the following locations:

- 1) Ceiling plenums.
- 2) Attic spaces.
- 3) Where indicated.

5. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

a. Available Products:

- 1) AGM Industries, Inc.; TACTOO Adhesive.
- 2) Eckel Industries of Canada; Stic-Klip Type S Adhesive.
- 3) Gemco; Tuff Bond Hanger Adhesive.

1.11 FIBERGLASS/ASPHALT ROOF SHINGLES

A. Manufacturers

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

B. Glass-Fiber-Reinforced Asphalt Shingles

1. Laminated-Strip Fiberglass/Asphalt Shingles: 3-Tab, ASTM D 3462, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
2. Available Product: Subject to compliance with requirements, provide the following, or approved equal:
 - a. Timberline- Royal Sovereign Shingles by GAF Materials Corporation, or approved equal.
 - 1) Butt Edge: Straight cut.
 - 2) Strip Size: Manufacturer's standard.
 - 3) Algae Resistance: Granules treated to resist algae discoloration.
 - 4) Color: Charcoal.
 - b. Hip and Ridge Shingles: Manufacturer's standard units to match fiberglass/asphalt shingles.

C. Underlayment Materials

1. Self Adhering, Polyethylene Faced Underlayment: ASTM D 1970, 40 mils thick minimum, consisting of slip resisting polyethylene film reinforcing and top surface laminated to SBS modified asphalt adhesive, with release paper backing; cold applied.
 - a. Basis of Design Products: Grace Ice and Water Shield, as manufactured by Grace, W. R. & Co., or approved equal.

D. Accessories

1. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
2. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized steel wire shingle nails, minimum 0.120-inch- diameter, barbed shank, sharp-pointed, with a minimum 3/8-inch- diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.
 - a. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

E. Metal Flashing And Trim

1. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item, and as follows:

1.12 SHEET METAL FLASHING AND TRIM

A. Sheet Metals

1. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

2. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - a. Surface: Smooth, flat.
3. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 - a. Finish: 2D (dull, cold rolled).
 - b. Surface: Smooth, flat.

B. Underlayment Materials

1. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

C. Miscellaneous Materials

1. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
2. Fasteners: Screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
3. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
4. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
5. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
6. Fasteners :Series 300 stainless steel.
7. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
8. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
9. Solder:
 - a. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - b. For Zinc-Tin Alloy-Coated Copper: ASTM B 32, 100 percent tin.
10. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
11. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
12. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
13. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
14. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

D. Manufactured Sheet Metal Flashing And Trim

1. Termite Shield: 17.2 oz./sq. ft.; where indicated on drawings, provide lead coated copper termite shield. Joints to be lapped 3/4 inch and soldered or flat locked. Corners to be notched, filled, and soldered.

E. Fabrication, General

1. General: Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
6. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
7. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
8. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
9. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
10. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
11. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
12. Do not use graphite pencils to mark metal surfaces.

F. Roof Drainage Fabrications

1. Gutters: Fabricate to dimensions required with closure flange trim Fabricate from the following materials:
 - a. Face shall be plumb, level, with watertight
 - b. and shall be pitched to leaders, fastened with gutter brackets and spacers as required.
 - c. Sizes and profiles of such fabrications shall be per the Drawings; but not less than required to adequately remove rain water form roofs.
 - d. Form Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
 - e. Fabricate assemblies complete with cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - f. Subject to compliance with requirements, provide gutters and downspouts as indicated.
 - g. Style: Circular unless otherwise indicated
 - h. Downspouts: 4" round downspout unless otherwise indicated
 - i. Fittings: All accessories for drainage to drywell.

G. Soffit System

1. System: Perforated panels with concealed fasteners in a pattern and size as shown. Required sizes and profiles are based upon details by manufacturer of assemblies. Comply with size and profile requirements, and performance criteria as specified.
2. Provide secondary framing and attachment devices as necessary to attach soffit, panels to structural steel framework.
3. Carefully match profiles to produce continuity of line, design and finish. Joints in exposed work, unless otherwise required for thermal movement, shall be accurately fitted, rigidly secured and sealed watertight. Cutouts required for items shall be factory made from field dimensions.
4. Coordinate with fiberglass/asphalt shingle roofing.
5. Product: PVC to match color of cedar wall shingles.

H. Roof Sheet Metal Fabrications

1. Base Flashing: Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
2. Counterflashing: Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
3. Flashing Receivers: Fabricate from the following materials:
 - a. Stainless Steel: 0.016 inch thick.
4. Roof- Penetration Flashing: Fabricate from the following materials:
 - a. Stainless Steel: 0.018 inch thick.

I. Trim Fabrication

1. Formed Units: Provide a exterior trim and and comprised of formed aluminum or steel sheet. All joints shall be formed by flanges integral with the panels. The corners of all panels shall be welded and ground smooth prior to finishing. Form panels with 0.0625" radius bends and corners with no evidence of grain separation.
2. Provide extruded stiffeners and reinforcements as required to meet or exceed the specified performances. Weld stiffeners and reinforcements to the back of the plates in the fabricators shop.
3. Factory weld all corners and seams from the concealed (back) side of the assemblies. Welds shall be full penetrating type, and shall not telegraph through to the exposed portions of the installed system.
 - a. Grind smooth welds, seams, and other contact surfaces. Match finish of aluminum panel faces, unless otherwise indicated.

1.13 JOINT SEALANTS

A. Elastomeric Joint Sealants

1. Elastomeric Sealant Standard: Comply with ASTM C 920.
2. One Part Non Acid Curing Silicone Sealant: Type S; Grade NS; Class 25; Medium modulus and complying with the following requirements:
 - a. Uses: For all joints except as otherwise indicated.

- b. Additional Capability: When tested per ASTM C 719, to withstand 50 percent increase and decrease of joint width.
 - c. Products: Subject to compliance with requirements, provide one of the following one part non acid curing silicone sealants:
 - 1) "Dow Corning 790/795"; Dow Corning Corp.
 - 2) "Silpruf"; General Electric Co.
 - 3) "Spectrum 2"; Tremco, Inc.
 - 4) Approved equal.
3. One Part Mildew Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses: Non traffic, formulated with fungicide for sealing interior joints with nonporous substrates at vertical surfaces of ceramic tile and stone in toilets, kitchens, other interior wet areas and between plumbing fixtures and tile.
- a. Products: Subject to compliance with requirements, provide one of the following mildew resistant sealants.
 - 1) "Dow Corning 786"; Dow Corning Corp.
 - 2) "SCS 1702"; General Electric Co.
 - 3) "Proglaze White"; Tremco, Inc.
 - 4) Approved equal.
4. Two Part Pourable Urethane Sealant: Type M; Grade P; Class 25; Uses: Traffic, for floor joints and exterior pavements.
- a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) "Chem Calk 550"; Bostik Construction Product Div.
 - 2) "THC 900"; Tremco Corp.
 - 3) Approved equal.
- B. Latex Joint Sealants
1. Acrylic Emulsion Sealant: One part, nonsag sealant complying with ASTM C 834, paintable and recommended for interior applications with joint movement of not more than plus or minus 5 percent.
- a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) "Chem Calk 600"; Bostik Construction Products Div.
 - 2) "AC 20"; Pecora Corp.
 - 3) "Tremco Acrylic Latex 834"; Tremco Inc.
 - 4) Approved equal.
- C. Adhesives
1. Construction Adhesive
- a. Products: Subject to compliance with requirements, provide the following:
 - 1) Bostic Heavy Duty Construction Adhesive (HDCA): One component, moisture cure polyurethane for joist and panel assemblies.
- D. Miscellaneous Joint Sealants

1. Butyl Polyisobutylene Sealant: Manufacturer's standard, solvent release curing, butyl polyisobutylene sealant complying with AAMA 809.2, for concealed metal to metal joints.

E. Joint Sealant Backing

1. Cylindrical Sealant Backings: ASTM C 1330, Type C closed cell material with a surface skin of types as approved in writing by joint sealant manufacturer for joint application indicated], and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
2. Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint. Provide self adhesive tape where applicable.

F. Miscellaneous Materials

1. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant substrate tests and field tests.
2. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
3. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

1.14 METAL DOORS AND FRAMES

A. Manufacturers

- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Fleming Door Products Ltd.; an Assa Abloy Group company.

C. Hollow Metal Doors

1. General: Provide doors not less than 1-3/4 inches thick, of seamless hollow construction unless otherwise indicated. Construct doors with smooth surfaces without visible joints or seams on exposed faces. Comply with ANSI/NAAMM-HMMA 861.
2. Design: Flush panel.
3. Hollow Metal Doors: ANSI A250.8, 1-3/4 inch thick. Level 2 - Heavy Duty, Model 2, seamless welded design with core. Interior doors factory-primed; Steam Tunnel doors factory hot dip galvanized.
4. Door Face Sheets at Wet Areas: Fabricated from galvanized metallic-coated steel sheet, minimum 0.053 inch thick.
5. Core Construction: Provide thermal/sound -resistance-rated cores for exterior or interior mechanical doors and where indicated.
6. Steel-Stiffened Core: 0.026-inch- thick, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart, spot welded to face sheets a maximum of 5 inches o.c. Spaces filled between stiffeners with glass- or mineral-fiber insulation.
7. Fire Door Core: As required to provide fire-protection ratings indicated.

8. Thermal-Rated (Insulated) Doors: Where indicated, provide doors fabricated with thermal-resistance value (R-value) of not less than 4.0 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.
9. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches.
10. Top and Bottom Channels: Closed with continuous channels, minimum 0.053 inch thick, of same material as face sheets and spot welded to both face sheets.
11. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as door face sheets.

D. Hollow Metal Frames

1. General: Fabricate frames of construction indicated. Close contact edges of corner joints tight with faces mitered and stops butted or mitered. Continuously weld faces and soffits and finish faces smooth. Comply with ANSI/NAAMM-HMMA 861.
2. Door Frames for Openings 48 Inches Wide or Less: Fabricated from 0.053-inch- thick (16 gauge) steel sheet.
3. Door Frames for Openings More Than 48 Inches Wide: Fabricated from 0.067-inch- thick (14 gauge) steel sheet.
4. Frames in Wet Ares: Formed from galvanized metallic-coated steel sheet.
5. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 861 with reinforcing plates from same material as frame.

E. Frame Anchors

1. Jamb Anchors:
2. Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
3. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
4. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

F. Fabrication

1. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
2. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.
3. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
4. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Section "Door Hardware."

G. Steel Finishes

1. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
2. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer

manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure

1.15 WOOD DOORS

A. Manufacturers

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Algoma Hardwoods, Inc.
 - b. Ipik Door Company
 - c. Marshfield Door Systems, Inc.
 - d. Or approved equal.

B. Doors, General

1. Provide factory assembled custom wood doors and pre hang in factory made frames, as indicated. Provide field applied paint grade finish, of colors as selected by the Architect, unless otherwise indicated.
2. Quality Standards: Comply with the applicable requirements that meet or exceed AWI Quality Standard.

C. Flush Wood Doors

1. Solid Core Doors for Opaque Finish: Comply with Architectural Woodwork Quality Standards including Section 1300 Architectural Flush Doors of Architectural Woodwork Institute (AWI) and with the following requirements:
 - a. AWI Grade: Premium.
2. Door Construction and Wood Species: Medium Density Fiberboard, or any closed grain hardwood to receive paint finish; applied to particleboard core, 5-ply in accordance with recommendations of AWI Quality Standards.
3. Door Thickness: 1-3/4", unless otherwise indicated.
4. Solid Core Doors for Transparent Finish: Comply with Architectural Woodwork Quality Standards including Section 1300 Architectural Flush Doors of Architectural Woodwork Institute (AWI) and with the following requirements:
 - a. Grade: Custom.
 - b. Faces: Sound closed grain hardwood of mill option, Hardboard or MDF. Face veneer minimum 1/50-inch thickness at moisture content of 12% or less.
 - c. Hardboard Faces: AHA A135.4, Class 1 (tempered) or Class 2 (standard).
 - d. MDF Faces: ANSI A208.2, Grade 150 minimum.
5. Vertical Edges: Any closed grain hardwood. Wood or composite material, one piece, laminated, or veneered. Minimum requirements per WDMA section P-1, Performance Standards for Architectural Wood Flush Doors.
6. Horizontal Edges: Solid wood or structural composite material meeting the minimum requirements per WDMA Section P-1, Performance Standards for Architectural Wood Flush Doors 2 Match Between Veneer Leaves: Book matched, unless otherwise indicated.
7. Refer to Section Door Hardware and the Drawings for additional blocking and concealed reinforcement for specified hardware required and proper installation.

D. Interior Wood Frames

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. The Maiman Company.
 - b. Or approved equal.
2. Non-Rated and 20 Minute Fire Rated Wood Door Frames: Frames, with or without casings, complete with transom and sidelite frames, fabricated from veneered structural composite lumber for transparent finish or solid lumber close grained hardwood for opaque finish.
3. Fire Rated (45, 60 and 90 Minute) Wood Door Frames: Frames, with or without casings, fabricated from veneered high density composite fire resistant board, with fire rating duration indicated.

E. Fabrication

1. Fabricate wood doors to produce doors complying with following requirements:
2. Factory prefit and premachine doors to fit frame opening sizes indicated with the following uniform clearances and bevels:
 - a. Comply with tolerance requirements of AWI for refitting. Comply with final hardware schedules and door frame shop drawings and with hardware templates.
3. Fitting Clearances for Doors: Provide 1/8" at jambs and heads; 1/16" per leaf at meeting stiles for pairs of doors; and 1/8" from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4" clearance from bottom of door to top of threshold, unless otherwise indicated.
 - a. Prior to installation of wood doors, review undercutting of indicated wood doors with the Architect
4. Factory premachine wood doors for hardware; comply with final hardware schedule, door frame shop drawings and hardware templates. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

F. Door Finishes

1. Quality Standard: Comply with Architectural Woodwork Quality Standards including Section 1500 Factory Finishing of Architectural Woodwork Institute (AWI).
2. Factory Finishing: To the greatest extent possible, finish wood doors at factory. Defer only final touch-up, cleaning and polishing for time after delivery and installation.
3. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces and similar preparations for finishing of architectural woodwork, as applicable to each unit of work.
4. Opaque Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, matching Architect=s approved samples:
 - a. Grade: Premium, unless otherwise indicated.
 - b. Finish: AWI Finish System Catalyzed Lacquer.
 - c. Color: To match Architects approved samples.
 - d. Sheen: 40 Satin (30 deg. to 50 deg.).
5. Transparent Finish: Comply with requirements indicated below for grade, finish system, color, effect, and sheen, matching Architect=s approved samples:

- a. Grade: Premium.
 - b. Finish: Meet or exceed WDMA I.S. 1A TR6 Catalyzed Polyurethane finish performance requirements.
 - c. Staining: As selected by Architect from manufacturer's full range.
 - d. Sheen: Satin 2. Grade: Premium, unless otherwise indicated.
6. Stain/Color: Matching the Architect=s approved sample; use water soluble aniline stains to achieve desired colors.
 7. Sheen: Medium/satin (hand rubbed) gloss matching the Architect=s approved sample. Final finishing and rubbing shall be achieved by hand using 100% Carnauba wax and fine grade steel wool, unless otherwise indicated.
 8. Refer to Section Painting for materials and requirements of field applied finishes of wood doors.

1.16 VINYL CLAD WOOD WINDOWS

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, provide vinyl-clad-wood window assemblies as manufactured by one of the following:
 - a. Anderson Windows, Andersen Corporation.
 - b. Weather Shield Manufacturing, Inc.
 - c. Or approved equal.
2. Provide the following window types at locations indicated:
 - a. Casement-Project Out windows.
 - b. Horizontal sliding windows.
 - c. Custom corner horizontal sliding window.
3. All wood members of entire window assembly shall be treated with the manufacturer's standard water repellent preservative materials and methods to conform with the requirements of the National Woodwork Manufacturers Association.
4. Frames, jamb liners, and sashes shall be made in accordance with the details, with all parts constructed with mortise and tenon joints to make them rigid and tight. They shall be thoroughly braced, to prevent racking; which shall not be removed until frames are secured to permanent construction. Anchor into walls with the manufacturer's standard windbreak/anchoring flanges, unless otherwise indicated. Provide the following components, unless otherwise indicated.
 - a. Frames: Manufacturer's standard aluminum reinforced polyvinyl chloride outer frame, factory clad/let into the preservative treated pine members. Provide locked corner construction for additional strength.
 - b. Jamb Liners: Manufacturer's standard extruded rigid vinyl jamb liner, with integral extruded vinyl fin.
 - c. Sill: Manufacturer's standard aluminum reinforced polyvinyl chloride exterior, factory clad/let into the preservative treated solid wood sill members. Provide vinyl end caps.
5. Wood: Clear ponderosa pine or other suitable fine-grain lumber, kiln dried to a moisture content of 6 to 12 percent at time of fabrication and free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch wide by 2 inches long.
 - a. Lumber shall be water-repellent preservative treated after machining in accordance with NWWDA I.S. 4.

6. Vinyl Cladding: Manufacturer's standard vinyl cladding, consisting of a rigid polyvinyl chloride sheath, complying with ASTM D 1784, Class 14344-C, not less than 35-mil average thickness, in permanent white paintable finish, mechanically bonded to exterior wood sash and frame members.
 - a. Trim Members: Vinyl-clad wood; exterior seamless vinyl-clad-wood casings and trims; 3/4" thick x profiles indicated on the drawings.
7. Sash: All sash, transoms and fixed assemblies required shall be furnished, fitted, set, hung and finished complete, as indicated on the Drawings and as specified herein. The vertical stiles shall be framed 1-1/4 inches into the rails, sealed and doweled, pinned, or otherwise mechanically fastened and permanently glued with a phenyl resorcinol waterproof adhesive. Glue all joints of sash with specified waterproof adhesive. Face dimensions of sash are manufacturer's standard. Provide the manufacturer's standard thickness sash assemblies, accommodating a 1" thick insulated glass assembly.
 - a. Provide the manufacturer's standard low maintenance/high performance polyurea oven-cured paint finish system on all sash surfaces; color as selected by the Architect.
8. Anchors, Clips, and Accessories: Fabricate anchors, clips and window accessories of aluminum, nonmagnetic stainless steel, or hot-dip zinc-coated steel or iron complying with the requirements of ASTM B 633 for SC 3 (severe) service condition; provide strength sufficient to withstand design pressure indicated. Anchors, clips and window accessories shall be provided by the window manufacturer.
9. Fasteners: Comply with NWWDA I.S.2 for fabrication and with manufacturer's recommendations and standard industry practices for type and size of installation fasteners.
 - a. Use zinc-coated or nonferrous nails and screws for window fabrication and installation.
 - b. Use solid brass screws for hardware and accessory installation.
10. Aluminum Wire-Mesh Insect Screen: 18-by-16 aluminum wire insect screen cloth with the manufacturer's standard gun-metal finish.
11. Glass and Glazing Materials: Provide the manufacturer's standard high performance low emissivity (HP), inert gas filled, 1 inch thick insulating glass units complying with the following requirements:
 - a. Outboard Glass Lite: ASTM C 1036, Type 1, Class 1, q3, 1/4-inch thick clear annealed glass lite.
 - b. Inboard Glass Lite: ASTM C 1048, Type 1, Class 1, q3, Kind HS, 1/4-inch thick clear heat strengthened glass lite.
 - c. High Performance Coating: Provide the manufacturer's standard sputter-deposited Low-E coating on the #3 surface.
 - d. Air-Space: Provide the manufacturer's standard inert gas (argon) filled 1/2-inch thick space between the inboard and outboard glass lites. Provide not less than 97% initial fill.
 - e. Glazing Seal: Provide manufacturer's standard extruded, vinyl, or butyl glazing gasket providing weathertight seal.
12. Compression Weatherstripping: Provide compressible weatherstripping, designed for permanently resilient sealing under bumper or wiper action, completely concealed when sash is closed.

- a. Weatherstripping Material: Molded, expanded, EPDM or neoprene gaskets complying with ASTM C 509, Grade 4.
13. Sliding-Type Weatherstripping: Provide woven-pile weatherstripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric. Comply with AAMA 701.2.
- a. Provide weatherstripping with integral, centerline barrier fin of semi rigid, plastic, polypropylene sheet.

B. WINDOW PERFORMANCE REQUIREMENTS

1. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 2. Window Certification: WDMA certified with label attached to each window.
 3. Performance Class and Grade (All window types indicated): AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - a. Minimum Performance Class: CW.
 - b. Minimum Performance Grade: 40.
 4. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.35 Btu/sq. ft. x h x deg F.
 5. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30.
 6. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
 7. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.
 8. Windborne-Debris Resistance: Capable of resisting impact from windborne debris based on testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 and requirements of authorities having jurisdiction.
- C. Exterior Finish: Vinyl-clad, Manufacturer's standard factory-prime coat unfinished wood.
- D. Interior Exposed Unfinished Wood Surfaces: Manufacturer's standard paint-grade Pine.
- 1) Color: As selected by Architect from manufacturer's full range.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from stainless steel, designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
- 1) Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
 - 2) Projected-Out Window Hardware:
 - a. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - b. Hinges: Stainless-steel hinges with stainless-steel-reinforced, sliding nylon shoes.

- c. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
- 3) Horizontal-Sliding Window Hardware:
- a. Sill Cap/Track: Extruded-aluminum track with natural anodized finish, of dimensions and profile indicated; designed to comply with performance requirements indicated and to drain to the exterior.
 - b. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.
 - c. Roller Assemblies: Low-friction design.
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
- H. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.
- I. Accessories
- 1. Insect Screens: Provide insect screens for each operable exterior sash. Locate screens on outside of window sash. Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches.
 - 2. Screen Frames: Fabricate frames of tubular-shaped, extruded- or formed-aluminum members of 0.040-inch- minimum wall thickness, with mitered or coped joints and concealed mechanical fasteners. Provide removable PVC spline/anchor concealing edge of screen frame. Comply with requirements of SMA 1004.
 - a. Finish: Baked-on organic coating in manufacturer's standard color.
- J. Fabrication
- 1. General: Fabricate wood window units to comply with indicated standards. Include a complete system for assembly of components and anchorage of window units.
 - 2. Comply with requirements of NWWDA I.S. 2 for moisture content of lumber at time of fabrication.
 - 3. Provide openings and mortises precut, where possible, to receive hardware and other items.
 - 4. Provide weatherstripping at perimeter of each operating sash.
 - 5. Provide removable insect screen for each operating sash, with location determined by manufacturer.
 - 6. Factory-Glazed Window Units: Except for light sizes in excess of 100 united inches, glaze window units in the shop before delivery. Comply with requirements of these Specifications and NWWDA I.S. 2.
 - 7. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to the Project site, to the maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- K. Shop Finishing

1. General: Provide the following finish on exposed wood components of the vinyl-clad-wood window units:
2. Shop-Finished Units: Provide manufacturer's standard shop applied finish, consisting of a primer and finish coat of a high performance/low maintenance, oven cured polyurea (polyester urethane) type finish system. Provide not less than 1.5 mil dry film thickness, applied to all exposed wood surfaces.
 - a. Color: As selected by the Architect.

1.17 DOOR HARDWARE

- A. Refer to Drawings.

1.18 GYPSUM BOARD ASSEMBLIES

A. Manufacturers

1. Manufacturers: Subject to compliance with requirements, provide products by the following or equal acceptable to the Architect:
 - a. Gold Bond Building Products Division
 - b. Georgia Pacific Corp.
 - c. United States Gypsum Co.
 - d. Or approved equal.

B. Ceiling Supports

1. General: Size ceiling support components to comply with the Building Code of the State of Maine and with ASTM C 754.

C. Wall And Partition Framing

1. Non Load Bearing: Construction or No. 2.
 - a. Application: Interior partitions not indicated as load bearing.
 - b. Species:
 - 1) Northern species; NLGA.
2. Load Bearing: No. 2.
 - a. Application: Exterior walls and interior load bearing partitions.
 - b. Species:
 - 1) Douglas fir larch; WCLIB or WWPA.
3. Load Bearing Partitions: Any species and grade with a modulus of elasticity of at least 1,600,000 psi and an extreme fiber stress in bending of at least 850 psi for 2 inch nominal thickness and 12 inch nominal) width for single member use.
4. Flat Reinforcing Strips: 16 gage by 8" wide minimum (unless otherwise noted) galvanized strip for wall mounted items and accessories such as handrails, wall panels , towel bars, grab bars and kitchen and bath cabinets and counters and all wall hung items.

D. Gypsum Board

1. Mold Resistant Gypsum Board (All exterior wall Locations,): ASTM C 1396, and ASTM D 3273, of type indicated, as required to resist the growth of mold, 5/8" thick.

- a. Provide "Sheetrock Humitek", as manufactured by U.S. Gypsum Co., or approved equal.
2. All gypsum board product shall be mold resistant.
3. Gypsum Wallboard: ASTM C 36, "Type Regular" in standard lengths as required with conventional tapered edges, 5/8" thick.
 - a. Provide sag resistant type for ceiling surfaces.
4. Gypsum Wallboard: ASTM C 36, "Type X" fire rated assemblies in standard lengths as required with conventional tapered edges, 5/8" thick.
 - a. Provide sag resistant type for ceiling surfaces.
 - b. All material shall be mold resistant type.

E. Trim Accessories

1. General: ASTM C 840 and C 1047; standard trim accessories of types required for drywall work, formed of galvanized steel and beaded for concealment of flanges in joint compound. Provide corner beads at external corners, L type and LC type expanded flange type edge trim beads, and one piece control joint bead will not be permitted.
2. Cornerbead and Edge Trim for Interior Installation: ASTM C 840; formed from zinc alloy, with flanges knurled and perforated or of fine mesh expanded metal.
 - a. Steel Edge trim formed from galvanized steel, types per Fig. 1 of ASTM C 840 as follows:
 - 1) "L" Bead where indicated.
 - 2) "U" Bead where indicated.

F. Joint Treatment Materials

1. General: ASTM C 475, of type recommended by the manufacturer.
2. Joint Tape: Fiberglass reinforcing tape, of type recommended by the manufacturer.
3. Joint Compound: Ready mixed vinyl type for interior use. Provide 2 separate grades; one specifically for bedding tapes and filling depressions, and one for topping and sanding.
4. Water Resistant Joint Materials: Water resistant types for use at moisture resistant gypsum board and ceramic tile backer board, as recommended by manufacturer(s).

G. Miscellaneous Materials

1. General: Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the manufacturer of the gypsum board.
2. Gypsum Board Screws: Comply with ASTM C 1002.
3. Concealed Acoustical Sealant: Non drying, nonhardening, nonstaining, non bleeding sealant for concealed applications per ASTM C 919.
4. Exposed Acoustical Sealant: Nonoxidizing, skinnable, paintable, gunnable sealant for exposed applications per ASTM C 919.
5. Acoustical Insulation: ASTM C 665, Type I; mineral fiber blanket without membrane, Class 25 flame spread, minimum thickness shall be 2 1/2 inches or as required to meet STC ratings.
 - a. Mineral Fiber Type: Fibers manufactured from glass.

6. Laminating Adhesive: Water resistant adhesive as recommended by gypsum board manufacturer for laminating gypsum boards.

1.19 WOOD FLOORING

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, the following:
 - a. Parkett Deitrich.
 - b. Or approved equal.
 - c. As scheduled or selected by Architect.
2. Selected Product: Parkett Deitrich - ¾" Series, species and finish as indicated.

B. Engineered Strip Flooring

1. Engineered Strip Flooring: Provide engineered wood flooring system, complying with the following:
 - a. Species: White Oak.
 - b. Thickness: ¾"
 - c. Length: As selected .
 - d. Face Width: As selected.
 - e. Micro Bevel edge: None.
 - f. Backs: As standard with the manufacturer=s product.
 - g. Finish: Match Samples.

C. Accessory Materials

1. Fasteners: As recommended by NWFA.
2. Cork Expansion Strip: FS HH C 576, Type I B, Class 2.
3. Wood Trim: Provide wood base trims. Refer to the Drawings for sizes, profiles and configurations.
4. Wood Flooring Adhesive: One-part moisture-cured urethane premium wood floor adhesive as recommended by flooring and adhesive manufacturers for application indicated.
5. Sleeper Shims: Size and type recommended in writing by flooring manufacturer for application indicated
6. Subflooring: Refer to Section 2.7 - for additional requirements.

D. Wood Flooring Finishing Materials:

1. General: Provide the manufacturer's prefinished system, in number of coats as recommended by the manufacturers for the application indicated.
2. Floor Wax: Liquid, solvent type, slip resistant, FS P W 158, Type I, Class 2.

1.20 PAINTING

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, provide paint products as manufactured by one of the following, or equal acceptable to the Architect:

- a. Benjamin Moore and Company.
- b. Con-Lux Coatings.
- c. Sherman Williams.
- d. Tnemec Company, Inc.

B. Materials

1. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best grade product will not be acceptable.
2. Volatile Organic Materials: Provide paint and coating products to comply with applicable environmental regulations and local authorities. Federal numbers, where specified or referred to, are for guidelines only.
3. Primers and Undercoaters: Provide primers and undercoaters recommended by the finish coating manufacturer for suitability with the substrate and compatibility with finish coats.
4. Color Pigments: Pure, non fading, to suit substrates and service.
 - a. Lead content in pigment, if any, is limited to contain not more than 0.5% lead, as lead metal based on the total non volatile (dry film) of paint by weight.

1.21 TOILET ACCESSORIES

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, the following:
 - a. Selected Products and Manufacturers: Refer to Schedules for all products and manufacturers.

B. Materials, General

1. Stainless Steel: AISI Type 304, with No. 4 satin finish, 22 gage (.034") minimum thickness, unless otherwise indicated.
2. Sheet Steel: ASTM A 366, cold rolled, commercial quality, 0.0359" minimum nominal thickness; surface preparation and metal pretreatment as required for applied finish.
3. Brass: ASTM B 19, leaded and unleaded flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; ASTM B 30, castings. As scheduled
4. Mirror Glass: ASTM C 1036, Type I, Class 1, Quality q2, nominal 1/4" thick, with silvering, electroplated copper coating, and protective organic coating complying with FS DD M 411.
5. Galvanized Steel Mounting Devices: ASTM A 153, hot dip galvanized after fabrication.
6. Fasteners: Screws, bolts, and other devices of same material as accessory unit, tamper and theft resistant when exposed, and of galvanized steel when concealed.
7. Chromium Plating: ASTM B 456, Service Condition Number SC 2 (moderate service), nickel plus chromium electrodeposited on base metal.
8. Mounted Accessories, General: Provide concealed anchorage and blocking wherever possible.

1.22 IDENTIFYING DEVICES

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, provide identification device products as manufactured by one of the following, or an equal acceptable to the Architect:
 - a. Panel Signs:
 - 1) American Graphics Inc.
 - 2) ASI Sign Systems, Inc.(specified)
 - 3) Best Manufacturing Co.
 - 4) Innerface Sign Systems, Inc.
 - 5) Mills Manufacturing, Inc.
 - 6) Signature Signs, Inc.
 - 7) Or approved equal.

B. Materials

1. Aluminum Sheet and Plate: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with at least the strength and durability properties of Alloy 5005-H32.
2. Acrylic Sheet: ASTM D 4802, Category A-1 (cell-cast sheet), Type UVA (UV absorbing).
3. Polycarbonate Sheet: Of thickness indicated, manufactured by extrusion process, coated on both surfaces with abrasion-resistant coating:
 - a. Impact Resistance: 16 ft-lbf/in. per ASTM D 256, Method A.
 - b. Tensile Strength: 9000 lbf/sq. in. per ASTM D 638.
 - c. Flexural Modulus of Elasticity: 340,000 lbf/sq. in. per ASTM D 790.
 - d. Heat Deflection: 265 deg F at 264 lbf/sq. in. per ASTM D 648.
 - e. Abrasion Resistance: 1.5 percent maximum haze increase for 100 revolutions of a Taber abraser with a load of 500 g per ASTM D 1044.
4. Panel Signs
 - a. Panel Signs: Comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 - b. Produce smooth, even, level sign panel surfaces, constructed to remain flat under installed conditions within a tolerance of plus or minus 1/16 inch measured diagonally.
 - c. Graphic Content and Style: Provide sign copy that complies with the requirements indicated for size, style, spacing, content, position, material, finishes, and colors of letters, numbers, ADA compliant Braille, and other additional graphic devices.
 - d. Products: Provide "Emboss" acrylic plaques with molded plastic frames "Series SPF with Series 390 Frames" as manufactured by ASI Sign Systems Inc. or an equal acceptable to the Architect.
 - 1) Type style(Font): Optima (capitals).
 - 2) Colors: As selected by the Architect
 - e. Changeable Signs with Message Inserts: Fabricate signs and frame to allow insertion of changeable messages in the form of slide-in inserts, transparent covers with paper inserts printed by Owner.
5. Accessories
 - a. Mounting Methods: Use concealed fasteners or adhesive fabricated from materials that are not corrosive to sign material and mounting surface, unless otherwise recommended by the manufacturer.

- b. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

6. Finishes, General

- a. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- b. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- c. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

7. Aluminum Finishes

- a. Clear Anodic Finish: Manufacturer's standard clear anodic coating, 0.018 mm or thicker, over a satin (directionally textured) mechanical finish.

1.23 FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES

A. Manufacturers

- 1. Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. J.L. Industries.
 - b. Larsen's Manufacturing Co.
 - c. Potter-Roemer, Inc.
 - d. Samson Metal Products, Inc.
 - e. Or approved equal.

B. Fire Extinguishers

- 1. General: Provide fire extinguishers for each extinguisher cabinet and other locations indicated, in color and finishes selected by Architect from manufacturer's standard which comply with requirements of governing authorities.
- 2. Fill and service extinguishers to comply with requirements of governing authorities and manufacturer.
- 3. Abbreviations indicated below to identify extinguisher types related to UL classification and rating system and not necessarily to type and amount of extinguishing material contained in extinguisher.
- 4. Multi-Purpose Dry Chemical Type Extinguisher: UL-rated 4-A:60:B:C, - 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires as indicated.

C. Fire Protection Cabinets

- 1. General: Provide fire protection cabinets where indicated, of suitable size for housing fire extinguishers and hose valve assemblies of types and capacities indicated.

2. Fire-Rated Cabinets: UL listed with UL listing mark with fire-resistance rating of wall where installed.
3. Recessed Cabinet Type: Provide cabinets without trim design, fully recessed in walls of sufficient depth to accommodate door construction.
4. Cabinet Construction: Manufacturer's heavy gauge, white baked enameled steel box. Cabinet door shall cover the flange of the steel tub, with concealed door hinge and pin. Weld joints and grind smooth.
5. Dimensions (Inside Box): As indicated by product selections or as selected by the Architect.
6. Door Material: Cabinet door of thickness as indicated; fabricated from one piece sheet metal set in steel frame, with continuous steel hinge. Fabricate door and frame with finish to match cabinet box. Provide full laminated safety glass infill for doors, unless otherwise indicated.
7. Metallic Finish Materials: Provide Type 304 stainless steel sheets with a factory applied directional satin finish.
8. Identification: Provide fire extinguisher cabinet doors with die-cut letters applied vertically reading the words "FIRE EXTINGUISHER", in color as indicated below:
9. Die-Cut Letter Color: As selected by the Architect.
10. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
11. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handles.
12. Unless otherwise acceptable to the Architect, provide the manufacturer's "non-destructive" locking cam handle which permits fire extinguisher access without breaking of the glass door insert;

D. Mounting Brackets

1. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with galvanized finish.
2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
3. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in letter decals applied to mounting surface.
4. Orientation: Vertical, unless otherwise indicated.

E. Factory Finish

1. General: Factory finish fire extinguishers, brackets and cabinets to comply with NAAMM "Metal Finishes Manual" after products are assembled. Protect finishes with plastic or paper covering, prior to shipment.
2. Cabinet Box and Door, Painted Finish:
 - a. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturer's standard 2-coat baked enamel finish consisting of prime coat and thermosetting topcoat. Comply with paint manufacturer's instructions for application and baking to achieve a minimum dry film thickness of 2. mils.
 - b. Color and Gloss: As selected by the Architect, from the manufacturer's full range.

1.24 RESIDENTIAL APPLIANCES

A. Manufacturers

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:
 - a. Selected Products and Manufacturers: Refer to schedules for all products and manufacturers.
2. Provide all accessories for each unit as selected by Architect,

B. General Finish Requirements

1. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
2. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finishes

1. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Finish: Provide appliances with scheduled finish.

1.25 KITCHEN CASEWORK

A. Manufacturer/Fabricator

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, the following:
 - a. As selected by the Architect.
2. Fabricator shall be as approved by Architect.
3. Product: Stock casework as scheduled or as selected by Architect for type and finish.

B. Colors, Textures, And Patterns

1. Colors, finish, Textures, and Patterns: As selected by Architect from manufacturer's full range for these characteristics.
 - a. Match Architects samples.

C. Cabinet Materials

1. Exposed Materials: Comply with the following:
2. Solid Wood Species:
 - a. Kitchen Hardwood plywood with finish to match approved samples.
3. Plywood: Hardwood plywood complying with HPVA HP 1 with hardwood face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.

- a. Edge band exposed edges with minimum 1/8 inch thick, solid wood edging of same species.
 - b. Semi-exposed Materials: Unless otherwise indicated, provide the following:
 - 1) Plywood: Hardwood plywood complying with HPVA HP 1 with Grade C faces stained to be compatible with exposed surfaces and Grade 3 backs of same species as faces.
4. Concealed Materials: Comply with the following:
- a. Solid Wood or Plywood: Any hardwood or softwood species, with no defects affecting strength or utility. Hardwood and softwood lumber kiln dried to 7 and 10 percent moisture content, respectively.

D. Casework Hardware

1. General: Manufacturer's standard units complying with BHMA A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.
2. Hinges: Concealed European style hinges.
3. Drawer Guides: Epoxy coated metal, self closing drawer guides; designed to prevent rebound when drawers are closed; with nylon tired, ball bearing rollers; and complying with BHMA A156.9, Type B05091.
4. Pulls and Knobs: As selected by Architect.

E. Cabinet Construction

1. Face Style: Reveal overlay; door and drawer faces partially cover cabinet body or face frames.
2. Face Frames: 3/4 by 1 5/8 inch solid wood with glued mortise and tenon or doweled joints, unless otherwise indicated.
3. Provide frameless cabinets for the medicine cabinets or as detailed.
4. Door and Drawer Fronts: Solid wood stiles and rails, 5/8 inch thick, with 3/4 inch thick, solid wood and glass center panels, and unless otherwise indicated.
5. Exposed Cabinet Ends: Veneer faced plywood.
6. Factory Finishing: To greatest extent possible, finish casework at factory. Defer only final touchup until after installation.

F. Factory / Shop Finishing

1. Quality Standard: Comply with AWI Section 1500.
2. General: The entire finish of interior woodwork is work of this section, regardless of whether factory-applied or applied after installation.
3. Factory Finishing: To the greatest extent possible, finish woodwork at factory. Defer only final touch-up, cleaning and polishing for time after delivery and installation.
4. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing of concealed surfaces and similar preparations for finishing of custom woodwork, as applicable to each unit of work.
 - a. Finish: Provide AWI System , Premium Grade, with finish and sheen to match approved sample.
 - b. Use pigments to achieve desired colors.
 - c. Use lacquer top coats as required to achieve the necessary build, but no less than 1 sealer coat and 3 finish coats; to match approved samples.
5. Factory Prime: Provide prime coat paint as specified in "Painting", for wood with field painted finish.

6. Concealed Portions: All concealed portions shall be finished to adequately balance the construction and control warpage. Concealed portions shall have one coat sealer minimum.

1.26 WINDOW TREATMENT

A. Manufacturers

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, one of the following or an approved equal:
 - a. MechoShade.
 - b. Comfortex.
 - c. Or approved equal.
2. Product: Window shades MechoShade "Room Darkening + AV", or selected by Architect.

B. Roller Shades

1. General: Roller shades shall be a single roller, single fabric-type system with a manually operated continuous-loop bead chain, clutch, tensioner and bracket system, as standard with the selected product.
2. Shade Cloth: Provide room darkening vinyl coated fabric as approved by Architect, dimensionally stable enough to hang flat without buckling or distortion.
 - a. Product: "Classic Blackout" No. 0700 Series by MechoShade. Color as selected by Architect.; or approved equal.
3. Shade Roller: Extruded 6063-XT6 aluminum tube, 1-1/2" diameter. Provide single and double width units as indicated on drawings.
4. Mounting Brackets: 1/8" thick sheet steel; wall jamb or ceiling mounted as indicated. Center support brackets as required to span or weight loads.
5. Side Channels: Provide manufacturer's standard extruded aluminum side channels, of sizes indicated. For black-out applications provide channels with light deflecting ribs and nylon brushes to eliminate light leakage around the fabric, unless otherwise indicated.
6. Drop Rail: The drop rail shall be extruded aluminum, of size required and as approved by the Architect, with a groove in the top of the extrusion to accept the bottom hem of the darkening fabric.
7. Hems: Top and bottom hems shall have a high frequency weld made with a special tape. Hems shall receive a PVC cord for attachment to the roller tube and drop rail.
8. Stiffening Bars: According to the size of the shade, the fabric shall have horizontally welded pockets to receive flat stiffening bars, 24" to 36" on center, to assure stability of the darkening fabric within the side channels.
9. Shade Operation: Manual; with continuous loop bead chain, clutch, and cord tensioner and bracket lift operator.
 - a. Position of Clutch Operator: As indicated on Drawings.
 - b. Clutch: Capacity to lift size and weight of shade; sized to fit roller or provide adaptor.
 - c. Lift Assist Mechanism: Manufacturer's standard spring assist for balancing roller shade weight and lifting heavy roller shades.
 - d. Loop Length: Length required making operation convenient from floor level.
 - e. Bead Chain: Nickel-plated metal, unless otherwise indicated or selected, match approved samples.
 - f. Cord Tensioner Mounting: As indicated on the Drawings, if not indicated at a location convenient for operation, as approved by the Architect.

C. Fabrication And Operation

1. Prior to fabrication, verify actual opening dimensions by accurate site measurements. Adjust dimensions for proper fit at openings.
2. Coordinate with other trades for securing tracks to substrates and other finished surfaces.
3. Fabricate window treatment components from noncorrosive, nonstaining, nonfading materials that are completely compatible and do not require lubrication during normal expected life.
4. Fabricate shade units to openings; fill openings from head to sill and jamb to jamb.
5. Fabricate "black-out" units with manufacturer's removable recessed jamb channels to prevent light leakage as specified.

6. For continuous installations, fabricate units so that breaks between units occur only at mullions or other defined vertical separation.
7. No vertical seams are permitted in shade fabric; where horizontal seams are required, fabric shall be "railroaded" and seam shall occur as close to top of shade as possible when shade is fully extended.

- D. Pocket-Style Head box: U-shaped, formed-steel sheet or extruded aluminum; long edges returned or rolled; with a bottom cover consisting of slot opening of minimum dimension to allow lowering and raising of shade and a removable or openable, continuous metal access panel concealing shade roller, brackets, and operating hardware and operators within.

1.27 ENTRANCE MAT AND FRAME

A. Acceptable Manufacturer

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include the following:
 - a. Construction Specialties, Inc.
 - b. Balco, Inc.
 - c. Kaydee.
 - d. Or approved equal.

- B. Product: "KD 58 Stainless Steel Recessed Entry Mat and Frame".

C. Materials

1. Recessed Mat Frames: Provide manufacturer's standard design, of size and style to fit floor mat type and match approved sample for permanent recessed installation in floor, complete with corner pins or reinforcing and installation anchorages.
2. Provide frames of stainless steel, Type 304. Coat surface of frame with #4 Satin finish.
3. Provide frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and with pieces spliced together by means of straight connecting pins.
4. Grate Type Floor Mats: Provide manufacturer's standard satin finish stainless steel, Type 304, self cleaning design grate type floor mats complete with concealed lock down fasteners. Grates shall be fabricated of .071" x .177" stainless steel wire and .070 x .5" stainless steel support rods spaced 1" o.c. (slot opening shall be .005", unless otherwise indicated). Mats to be removable to allow cleaning of substrate.
5. Stainless steel grate type floor mats shall be capable of supporting 300 lbs. per square foot.

6. Bituminous Coating: SSPC Paint 12, solvent type, bituminous mastic, nominally free of sulphur and containing no asbestos fibers, compounded for 15 mil dry film thickness per coat.

D. Frames

1. General: Provide manufacturer's standard frame of size and style to fit mat type and to match finish for permanent recessed installation in concrete; complete with installation anchorages and accessories.
2. Provide frames produced by the same manufacturer as the mat.
3. Provide all required sub-framing, support framing, and hardware for condition indicated. Provide manufacturer's compatible material and fasteners.

E. Fabrication

1. Shop fabricate mats to greatest extent possible in sizes as indicated. Where not otherwise indicated, provide each mat as a single unit, not exceeding manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in mats are necessary, space symmetrically and away from normal traffic lanes.
2. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by means of straight connecting pins.

2 - CONSTRUCTION

2.1 PENETRATING CONCRETE SEALER

A. Examination

1. Examine substrates, with Installer present, for conditions affecting performance of concrete floor topping.
2. Proceed with application only after unsatisfactory conditions have been corrected.

B. Surface Conditions

1. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

C. Application

1. Preparation: The concrete deck shall be clean and free of debris, oils or particles which would prevent proper penetration of the sealer.
2. Installation: The sealer shall be applied at the rate of 350 square feet per gallon of material. Water curing and vinyl protection of the concrete is required with this system. If results appear to be spotty, apply additional coat at 50 sq. ft. per gallon to needed areas. Follow manufacturers recommended practices.

2.2 METAL FABRICATIONS

A. Coordination With Other Trades

1. Coordinate this Work with the various trades who may have ducts, pipes, conduits, or other Work in the spaces above, in order that anchors, hangers and running channels may be properly placed to avoid such ducts, pipes, conduits, and other obstructions. Any changes required to be made in the locations of anchors, hangers, and running channels by reason of the Contractor's failure to observe this requirement corrections shall be made by the Contractor without additional cost to The Owner.

B. Preparation

1. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete construction. Coordinate delivery of such items to Project site.

C. Installation, General

1. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
2. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot dip galvanized after fabrication and are for bolted or screwed field connections.
3. Field Welding: Comply with the following requirements:
 - a. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
4. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in place construction. Provide threaded fasteners for use with concrete masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
5. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or similar construction.
6. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

D. Installing Miscellaneous Framing And Supports

1. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
2. Anchor supports securely to and rigidly brace from building structure.

E. Adjusting And Cleaning

1. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC PA 1 for touching up shop painted surfaces.
2. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.
3. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.
4. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

2.3 ROUGH CARPENTRY

A. Installation

1. Wood Framing – Preparation and Preconstruction
 - a. Examine and verify that job conditions are satisfactory for speedy and acceptable work.

B. Coordination

1. Maintain a copy of the Scope at the job site.
2. Maintain and use up-to-date trade standards
3. Identify actual dimensions of all rough openings in framing: Doors, windows, other framed openings
4. Cross-coordinate rough framing members with existing and new mechanical (Electrical, plumbing, HVAC) installation requirements.

C. Operations

1. Provide framing, bracing and shoring as necessary to safely complete the work.
2. Provide lifts, cranes, ladders or scaffolding to assist high-level framing work.
3. Verify that materials are stored so as to not overload or interfere with construction in terms of: Quantities and weights, locations, or traffic.

D. Rough Carpentry, Wood Framing – General

1. Installation of framing members shall be:
 - a. Straight with a side variation tolerance of $\frac{1}{4}$ " per 10 linear feet.
 - b. Plumb within $\frac{1}{4}$ " per 10 linear feet.
 - c. Square
 - d. Top of plate elevations correct and consistent with existing elevations.
 - e. Aligned vertically and horizontally with existing framing.

E. Rough Carpentry, Wood Framing – At Grade and Foundations

1. Use foundation grade or preservative-treated lumber as outlined in the building code and as specified herein:
 - a. Do not use untreated wood wedges or shims in any location subject to moisture or decay.
 - b. Provide ventilation space for girders that will be set in foundation wall pockets or directly above earth.

F. Installation of Foundation Framing Member

1. Foundation fasteners shall not be located underneath any studs.
2. Shims for mudsills shall be of preservative treated lumber.

G. Rough Carpentry, Framing Member – Floor Joists

1. Install floor framing members as required by the building code and as specified herein:
 - a. Set with crowns upwards.

- b. Set with full bearing on plates, 3" minimum
- 2. Install joist hangers as per the building code, manufacturer's instructions and as specified herein:
 - a. Set straight
 - b. Aligned
 - c. Substantially braced.
 - d. Secured with correct size and type fastenings.
- H. Rough Carpentry, Wood Framing – Exterior and Interior Walls
 - 1. Install stud framing as required in the building code and as specified herein:
 - a. Substantially braced
 - b. Secure with correct sizes and types of fastenings.
 - c. Install fire stop so as to provide complete, snug blocking between studs.
 - d. Install special framing as require for:
 - 1) Position studs at corners to provide ample nailing backing for exterior interior panels
 - 2) Provide blocking and double top plate headers for wall openings
 - 3) Lap top plates and set butt joints so they don't occur over openings
 - 4) Install top plates to provide for uninterrupted, ample nailing backing for exterior and interior panels
 - e. Install headers and lintels as per the building code and as specified herein:
 - 1) Ample bearing
 - 2) Secure connection to supports
 - 3) Provide complete and temporary bracing
 - f. Nailing and top plates at floors and slabs
 - g. Double-sided proper bracing at walls
 - h. Diagonal horizontal cross bracing at plates of intersecting walls
 - i. Braced walls won't move, waver or shake when force is applied to them.
 - 2. Framing for Related Work
 - a. Prepare stud framing for waterproof finishes as outlined in the Scope
 - 3. Construct stud framing and blocking to support wall-mounted fixtures, cabinets railings and equipment.
- I. Rough Carpentry, Wood Framing – Ceiling and Roof
 - 1. Install ceiling and roof framing members as required in the building code and as specified herein:
 - a. Install ample bracing
 - b. Set with crowns upward
 - c. Set with ample bearing on plates
 - d. Securely anchored to plates
 - e. Install rafters with proper slope for roof drainage
 - f. Make angled rafter cuts that are tightly fitted and securely anchored

J. Framing for Related Work

1. Provide adequate framing for fascia and soffit materials.
2. Provide blocking for the installation of roofing materials, flashing, vents, etc.

K. Subfloor Sheathing

1. Install plywood subflooring as required in the building code and as specified herein:
2. Stagger subflooring butt joints

L. Nailing Pattern

1. Blocking with 100% support at all butt edges and support as required at intermediate spans.
2. Install fasteners as required in the building code and as specified herein:
3. Subfloor to joist connections must be sufficient to prevent any squeaking of flooring
4. Glue and secure subflooring to floor joists with screws or screw-type nails.
5. Completed flooring shall be:
 - a. Level within 1/4" per 10 linear feet
 - b. Free of depressions or humps
 - c. Patched to repair holes, splits, or construction damage

M. Sheathing, Siding and Finish-Up Work

1. Install sheathing as required in the building code and as specified herein:
2. Stagger wall sheathing butt joints
3. Install wall sheathing panels so that edges have full bearing on framing
4. Include 1/8" expansion joints between sheathing panels
5. Install siding as required in the building code, per manufacturer's instructions and as specified herein:
 - a. All joints are square
 - b. Joints are staggered or per manufacturer's instructions
 - c. Prepare plywood surfaces for paint or stain according to manufacturer's instructions

N. Wood Framing – Coordination

1. Coordination with other work-mechanicals, fixtures, equipment, finishes:
2. Coordinate location of electrical fixtures with rough framing
3. Coordinate location of plumbing work with rough framing
4. Coordinate location of HVAC work with rough framing
5. Do not allow HVAC ducts or plumbing components in wall framing to protrude beyond the face of framing.
6. Supply and install rough framing members for in wall fixture and equipment supports such as blocking, anchors, brackets and frames
7. Provide and install in wall blocking, anchors, brackets, and frames for plumbing fixtures, electrical fixtures, HVAC equipment, bathroom accessories, handrails, guardrails, shelves, closet poles, etc.

O. Movement Joints and Clearances

1. Provide joints and connectors for non-wood construction to allow for movement such as lumber shrinkage and normal thermal expansion and contraction of building components.

2. Provide clearance between framing and other construction subject to fired hazard such as chimneys and appliance vent piping
 3. Waterproofing, water barriers, and vapor barriers
 4. Prepare framing for waterproof finishes where waterproofing is required.
- P. Install water barriers, vapor barriers, and flashing as per manufacturer's instruction and as specified in Flashing and Sheet Metal
- Q. Coordination and Quality Control
1. Provide all necessary blocking for fire stopping including under enclosed stairs
 2. Do not allow trades to impair framing strength by cutting or drilling through members
- R. Wood Framing – Between Phases and at Conclusion of Framing
1. Inspection and cleanup
 - a. Remove all unusable wood scraps from site daily and between each phase of framing
 - b. Clean up sawdust, dirt, etc. daily
 2. When rough carpentry work involves removal or disturbance of existing painted or otherwise coated surfaces cleanup shall be as outlined in Demotion and Lead Dust Hazards
 3. Do not bury and scraps or other trash on site
 4. Schedule all required interior inspections prior to closing up concealed work
- S. Fasteners, Connections and Supports-Installation
1. Nailing and Connectors
 - a. Confirm that quantities, spacing and patterning of fasteners meet building code requirements and are as specified herein
 - b. Provide correct sizes and types of nails for use in pneumatic nailing equipment per manufacturer's instructions, building code requirements and as outline in International Staple, Nail and Tool Association standards
 - c. Nail at sufficient edge distanced to avoid splitting wood
 - d. Predrill as required
 - e. Remove and replace split framing members
 - f. Check nailing at each stage of framing before installing subsequent framing
 - g. Nail heads flush or recessed as required
 - h. Bent or used nails shall not be reused
 - i. Use pneumatic nailing equipment according to manufacturer's instructions
 - j. Recheck and tighten all bolt connections before final construction is completed.
 - k. Install joist hangers as per building code requirements and manufacturer's instructions:
 - 1) Set straight
 - 2) Aligned
 - 3) Completely secured at all connection points
 - 4) Secured with correct size and type of fasteners
 2. Install bridging as per the building code and manufacturer's instructions
 - a. Placed so as to provide full bearing
 - b. Set at joist midpoints or otherwise correctly spaced at minimum 8 foot on center

- c. Bottoms are not nailed until the roof sheathing is laid
- d. Secured with the correct size and type fasteners

2.4 EXTERIOR FINISH CARPENTRY

A. Examination

- 1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Preparation

- 1. Clean substrates of projections and substances detrimental to application.
- 2. Back prime and end prime exterior finish carpentry for painted finish exposed at miter joints and other locations indicated on the exterior. Comply with requirements for surface preparation and application in Section "Painting"

C. Installation, General

- 1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns and replace with acceptable units.
- 2. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8' 0" for plumb and level; and with 1/16" maximum offset in flush adjoining 1/16" maximum offsets in revealed adjoining surfaces.
- 3. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.
- 4. Miscellaneous Items: Install miscellaneous items with minimum number of joints possible. Match location of joints as indicated on shop drawings. Cope at returns, miter at corners to produce tight fitting joints. All items shall be accurately set in position, plumbed, aligned, and anchored securely.
- 5. Anchor exterior finish carpentry to anchorage devices or blocking built in or directly attached to substrates. All blocking, furring and nailers shall be continuous wherever required, whether or not indicated as such. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation, unless otherwise indicated. Use fine stainless steel finishing nail for exposed nailings, countersunk and filled flush with finished surface.

D. Installation Of Dimensional Lumber

- 1. Install sleepers/joists, grounds, sleepers, blocking, and nailers where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- 2. Install nailers and sleepers to allow for alignment of exposed fasteners.
- 3. Install all framing and accessories on shim pads compatible with any substrate finishes, waterproofing, roofing membrane and other assemblies requiring protection.
- 4. Do not penetrate building envelope substrates, including waterproofing / roofing with any construction attachment devices.
 - a. Provide blocking as required to allow for clear drainage beneath framing members
- 5. Attach items to steel stair substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

6. Install sleepers and nailers with crown edge up and attach ends of each member with not less than 1 1/2 inches of bearing supported to metal angles indicated.
7. Apply field treatment complying with AWP A M4 to cut surfaces of preservative treated lumber and plywood.

E. Installation Of Cedar Shingles

1. Install cedar shingles over air barrier and plywood sheathing. Double the starting course at the base of the wall.
2. Apply with 1/8-inch to 1/4-inch keyway space between shingles, giving a pronounced individual effect to each course.
3. Offset the side joints in any one course at least 1-1/2 inch over joints in adjacent courses.
4. For cedar shingles up to 10 inches wide, place 2 nails in each shingle 3/4-inch inboard of each edge. For cedar shingles wider than 10 inches, drive 2 additional nails approximately 1 inch apart near the center of the shingle.
5. Apply selected bleaching oil finish in accordance with manufacturer's recommendations and allow finish to dry.

F. Standing And Running Trim Installation

1. Facing and Trim (Exterior): Install with minimum number of joints possible, using full length pieces (from maximum length of lumber available) to the greatest extent possible. Match location of joints as indicated. If not indicated, stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use ship lap joints for end to end joints.
 - a. Make exterior joints water resistant by careful fitting.
2. Use scarf joints for end to end joints.
3. Stagger end joints in adjacent and related members.
4. Comply with approved setting drawings for location and sizes.
5. Frames and surrounds: Set accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.
6. Install flat grain lumber with smooth side exposed to weather. Cope at returns and miter at corners to produce tight fitting joints with full surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.
7. Unless otherwise indicated, countersink fasteners, fill surface flush, and sand where face fastening is unavoidable.

G. Paneling

1. Plywood Paneling: Select and arrange panels on each wall for best match of adjacent panels. Install with uniform tight joints between panels.
2. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners as recommended by panel manufacturer.
3. Conceal fasteners to greatest extent practical.

H. Cellular Pvc Thermal Expansion And Contraction

1. Cellular PVC products will expand and contract with changes in temperature.
2. Fasten PVC products along the entire length to minimize expansion and contraction.
3. Allow for 1/8 inch per 18 feet of product for expansion and contraction.
4. Glue joints between pieces of cellular PVC products to eliminate joint separation. When gaps are glued on a long run, allow expansion and contraction at ends of the run.

I. Adjustment, Cleaning, Finishing And Protection

1. Repair damaged and defective exterior finish carpentry wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace finish carpentry as directed by the Architect. Adjust joinery for uniform appearance.
2. Clean exterior finish carpentry work on exposed surfaces.
3. Protection: Installer of exterior finish carpentry work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

2.5 INTERIOR ARCHITECTURAL WOODWORK

A. Examination

1. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting installation and performance of exterior finish carpentry. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Preparation

1. Clean substrates of projections and substances detrimental to application.
2. Back prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Section "Painting."

C. Installation

1. Discard units of material which are unsound, warped, bowed, twisted, improperly treated, not adequately seasoned or too small to fabricate work with minimum of joints or optimum jointing arrangements, or which are of defective manufacture with respect to surfaces, sizes or patterns and replace with acceptable units.
2. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8" in 8' 0" for plumb and level; and with 1/16" maximum offset in flush adjoining 1/16" maximum offsets in revealed adjoining surfaces.
3. Scribe and cut work to fit adjoining work, and refinish cut surfaces or repair damaged finish at cuts.

D. Standing And Running Trim:

1. Install with minimum number of joints possible, using full length pieces (from maximum length of lumber available) to the greatest extent possible. Match location of joints as indicated. If not indicated, stagger joints in adjacent and related members. Cope at returns, miter at corners, to produce tight fitting joints with full surface contact throughout length of joint. Use ship lap joints for end to end joints.
 - a. Make joints by careful fitting.
2. Comply with approved setting drawings for location and sizes.

E. Stair And Railing Installation

1. Treads and Risers: Secure treads and risers by gluing and nailing to rough carriages. House treads and risers into wall stringers, glue, and wedge into place.
2. Stringers: Miter risers and stringer. Extend tread and finish with bullnose edge cut from tread stock and fitted to tread with mitered return at nosing.
3. Railings: Secure wall rails with metal brackets at walls with countersunk-head wood screws and glue.

F. Miscellaneous Items

1. Anchor finish carpentry work to anchorage devices or blocking built in or directly attached to substrates. All blocking, furring and nailers shall be continuous wherever required, whether or not indicated as such. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation, unless otherwise indicated. Use fine stainless steel finishing nail for exposed nailings, countersunk and filled flush with finished surface.

G. Adjustment, Cleaning, Finishing And Protection

1. Repair damaged and defective interior finish carpentry, work wherever possible to eliminate defects functionally and visually; where not possible to repair properly, replace woodwork as directed by the Architect. Adjust joinery for uniform appearance.
2. Clean finish carpentry and wood work on exposed surfaces.
3. Protection: Installer of finish carpentry and wood work shall advise Contractor of final protection and maintained conditions necessary to ensure that work will be without damage or deterioration at time of acceptance.

2.6 PLASTIC LAMINATE-CLAD COUNTERTOPS

A. Preparation

1. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
2. Before installing countertops, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

B. Installation

1. Grade: Install countertops to comply with same grade as item to be installed.

C. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.

D. Provide cutouts for plumbing fixtures and similar items.

E. Seal edges of cutouts by saturating with varnish.

F. Field Jointing: Where possible, make in the same manner as shop jointing, using dowels, splines, adhesives, and fasteners recommended by manufacturer. Prepare edges to be joined in shop so Project-site processing of top and edge surfaces is not required. Locate field joints where shown on Shop Drawings.

G. Secure field joints in plastic-laminate countertops with concealed clamping devices located within 6 inches of front and back edges and at intervals not exceeding 24 inches. Tighten according to manufacturer's written instructions to exert a constant, heavy-clamping pressure at joints.

H. Install countertops level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.

I. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- J. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
- K. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
- L. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.
- M. Seal junctures of tops, splashes, and walls with mildew-resistant silicone sealant or another permanently elastic sealing compound recommended by countertop material manufacturer.
- N. Adjusting And Cleaning
 - 1. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.
 - 2. Clean countertops on exposed and semi exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

2.7 UNDER SLAB VAPOR BARRIER

A. Installation, General

- 1. General: Extend vapor barriers to extremities of areas to be protected from vapor transmission. Secure in place as per the manufacturer's instructions, and as indicated. Extend barriers to cover miscellaneous voids in insulated substrates.
- 2. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643 98, including but not limited to, the following:
 - a. Apply membrane with the HDPE film facing the prepared substrate. Remove the release liner during application.
 - b. Apply succeeding sheets by overlapping the previous sheet 2 inches along the marked lap line. End Laps should be staggered to avoid a build up of layers.

B. Under Slab Vapor Barrier Installation

- 1. General: Place one uninterrupted layer of the specified vapor barrier material in position with longest dimension parallel with direction of pour. Overlap all side seams and end laps with not less than 6 inches of sheet material. Upturn the selvage edges of the vapor barriers so after the concrete has cured, the barrier can be field trimmed flush with the finish slabs.
- 2. Coordinate the installation of the vapor barrier with the Work of "Cast in place Concrete" and Mechanical and Electrical Work".
- 3. Install prefabricated boot assemblies in accordance with the manufacturer's instructions. Seal joints about vapor barriers and similar items penetrating membranes with double faced asphaltic tape to create an airtight seal between vapor barrier and boot; secure with stainless steel clamping/compression rings.
 - a. Provide ample amounts of slack, in order to successfully install barrier without puncturing film.
 - b. Seal joints caused by conduits with vapor retarder tape to create an airtight seal between penetrating objects and barrier. Provide ample amounts of slack, in order to successfully install barrier without puncturing film. Seal wire penetrations with approved sealant.

- c. Mix and apply manufacturer's liquid detailing compound to carefully seal around penetrations through the membrane.
4. Install and secure vapor barrier membranes in the locations specified, and as indicated on the Drawings. Unless otherwise acceptable to the Architect, the membranes shall be installed utilizing the manufacturer's standard double sided adhesive tapes for seams, laps and detailing of penetrations through the membrane, as follows:
 - a. Taped Lap Method: Secure and seal side, end and over laps, and other such penetrations/detailing through the membrane. Install manufacturer's recommended overband; lap with the 4 inch wide manufacturer's recommended detailing tape using the lap line for membrane alignment. Remove plastic release liner to ensure bond to concrete.
 - b. Mix and apply manufacturers liquid detailing compound to carefully seal around penetrations through the membrane.
5. Repair small punctures and tears in vapor retarders immediately before concealment by other work. Install single sided, pressure sensitive (vapor resistant) tape as recommended by the manufacturer.
 - a. Repair large tears with a "scab" application of the specified vapor barrier installed and sealed with the specified double sided mastic sealing tape.

C. Protection

1. General: Protect installed vapor barriers from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
2. Place concrete within 30 days of the installation of the vapor barrier membrane. Inspect membrane and repair any damage in accordance with the manufacturer's instructions and recommendations.
3. Ensure all liner/release films are removed from vapor barrier membrane and tape before concrete placement.

2.8 SELF-ADHERING FOUNDATION SHEET WATERPROOFING

A. Examination

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
2. Verify that concrete has cured and aged for minimum time period recommended by waterproofing manufacturer.
3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
4. Verify that compacted subgrade is dry, smooth, and sound; ready to receive HDPE sheet.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Surface Preparation

1. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
2. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
3. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

4. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
5. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.
6. Install sheet strips and center over treated construction and contraction joints and cracks exceeding a width of 1/16 inch.
7. Bridge and cover isolation joints, expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.
8. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.
9. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
10. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
11. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
12. At concrete slab-to-wall intersections, extend liquid membrane or sheet strips onto deck waterproofing and to finished height of sheet flashing.
13. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

C. Rubberized-Asphalt Sheet Application

1. Install self-adhering sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
2. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
3. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
4. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, rubberized-asphalt sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
5. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.
6. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.
7. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic or sealant.
8. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.
9. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheets extending 6 inches (150 mm) beyond repaired areas in all directions.
10. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements, repair substrates, reapply waterproofing, and repair sheet flashings.

D. Molded-Sheet Drainage Panel Installation

1. Place and secure molded-sheet drainage panels according to manufacturer's written instructions. Use adhesives that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
2. For vertical applications, install board insulation used as a protection course before installing drainage panels.

E. Protection And Cleaning

1. Do not permit foot or vehicular traffic on unprotected membrane.
2. Protect waterproofing from damage and wear during remainder of construction period.
3. Protect installed insulation drainage panels from damage due to ultraviolet light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
4. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

2.9 BUILDING INSULATION

A. Examination

1. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Preparation

1. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

C. Installation, General

1. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
2. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
3. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
4. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
5. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

D. Installation Of General Building Insulation

1. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
2. Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.
 - a. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

E. Installation Of Vapor Retarders

1. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates.
2. Before installing vapor retarder, apply urethane sealant to flanges of wood framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.
4. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

F. Protection

1. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

2.10 FIBERGLASS/ASPHALT ROOF SHINGLES

A. Examination

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
3. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through fiberglass/asphalt shingles.
4. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
5. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Underlayment Installation

1. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install at locations indicated, lapped in direction to shed water. Lap sides not less than 3-1/2 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Roll laps with roller. Cover underlayment within seven days.
2. Prime surfaces to receive self-adhering sheet underlayment.
3. Eaves: Extend from edges of eaves 36 inches beyond interior face of exterior wall.
4. Rakes: Extend from edges of rake 36 inches beyond interior face of exterior wall.
5. Valleys: Extend from lowest to highest point 18 inches on each side.
6. Hips: Extend 18 inches on each side.
7. Ridges: Extend 36 inches on each side without obstructing continuous ridge vent slot.
8. Roof-Penetrating Elements: Extend beyond penetrating element 18 inches and return vertically against penetrating element not less than.
9. Roof Slope Transitions: Extend 18 inches on each roof slope.

C. Metal Flashing Installation

1. General: Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and fiberglass/asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."

D. Fiberglass/Asphalt Shingle Installation

1. Install fiberglass/asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and asphalt shingle recommendations in NRCA's "The NRCA Roofing and Waterproofing Manual."
2. Install starter strip along lowest roof edge, consisting of a fiberglass/asphalt shingle strip at least 7 inches wide with self-sealing strip face up at roof edge.
 - a. Extend fiberglass/asphalt shingles 3/4 inch over fascia at eaves and rakes.
 - b. Install starter strip along rake edge.
3. Install fiberglass/asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full length first course followed by cut second course, repeating alternating pattern in succeeding courses.
4. Fasten fiberglass/asphalt shingle strips with a minimum of four roofing nails located according to manufacturer's written instructions.
5. Where roof slope is less than 4:12, seal fiberglass/asphalt shingles with asphalt roofing cement spots.
6. When ambient temperature during installation is below 50 deg F, seal fiberglass/asphalt shingles with asphalt roofing cement spots.
7. Ridge and Hip Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

2.11 SHEET METAL FLASHING AND TRIM

A. Sheet Metals

1. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
2. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.
 - a. Surface: Smooth, flat.
3. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.
 - a. Finish: 2D (dull, cold rolled).
 - b. Surface: Smooth, flat.

B. Underlayment Materials

1. Slip Sheet: Building paper, 3-lb/100 sq. ft. minimum, rosin sized.

C. Miscellaneous Materials

1. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

2. Fasteners: Screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.
3. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
4. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
5. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
6. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
7. Fasteners :Series 300 stainless steel.
8. Solder:
 - a. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
 - b. For Zinc-Tin Alloy-Coated Copper: ASTM B 32, 100 percent tin.
9. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
10. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
11. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
12. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.
13. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

D. Manufactured Sheet Metal Flashing And Trim

1. Termite Shield: 17.2 oz./sq. ft.; where indicated on drawings, provide lead coated copper termite shield. Joints to be lapped 3/4 inch and soldered or flat locked. Corners to be notched, filled, and soldered.

E. Fabrication, General

1. General: Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

- F. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

- G. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.
- H. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- I. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- J. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" for application, but not less than thickness of metal being secured.
- K. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- L. Do not use graphite pencils to mark metal surfaces.
- M. Roof Drainage Fabrications
 - 1. Gutters: Fabricate to dimensions required with closure flange trim Fabricate from the following materials:
 - a. PVC
 - 2. Face shall be plumb, level, with watertight and shall be pitched to leaders, fastened with gutter brackets and spacers as required.
 - 3. Sizes and profiles of such fabrications shall be per the Drawings; but not less than required to adequately remove rain water form roofs.
 - 4. Form Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
 - 5. Fabricate assemblies complete with cleats and attachment devices from same material as sheet metal component being anchored or from compatible, noncorrosive metal recommended by sheet metal manufacturer.
 - 6. Subject to compliance with requirements, provide gutters and downspouts as indicated.
 - a. Style: Circular unless otherwise indicated.
 - b. Downspouts: 4" round downspout unless
 - c. Fittings: All accessories for drainage to drywell
- N. Soffit System
 - 1. System: Perforated panels with concealed fasteners in a pattern and size as shown. Required sizes and profiles are based upon details by manufacturer of assemblies. Comply with size and profile requirements, and performance criteria as specified.
 - 2. Provide secondary framing and attachment devices as necessary to attach soffit, panels to wood framework.
 - 3. Carefully match profiles to produce continuity of line, design and finish. Joints in exposed work, unless otherwise required for thermal movement, shall be accurately fitted, rigidly secured and sealed watertight. Cutouts required for items shall be factory made from field dimensions.
 - 4. Coordinate with fiberglass/asphalt shingle roofing.
 - a. Product: PVC to match color of cedar wall shingles.

O. Roof Sheet Metal Fabrications

1. Base Flashing: Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
2. Counterflashing: Fabricate from the following materials:
 - a. Aluminum: 0.050 inch thick.
3. Flashing Receivers: Fabricate from the following materials:
 - a. Stainless Steel: 0.016 inch thick.
4. Roof- Penetration Flashing: Fabricate from the following materials:
 - a. Stainless Steel: 0.018 inch thick.

P. Trim Fabrication

1. Formed Units: Provide a exterior trim and and comprised of formed aluminum or steel sheet. All joints shall be formed by flanges integral with the panels. The corners of all panels shall be welded and ground smooth prior to finishing. Form panels with 0.0625" radius bends and corners with no evidence of grain separation.
2. Provide extruded stiffeners and reinforcements as required to meet or exceed the specified performances. Weld stiffeners and reinforcements to the back of the plates in the fabricators shop.
3. Factory weld all corners and seams from the concealed (back) side of the assemblies. Welds shall be full penetrating type, and shall not telegraph through to the exposed portions of the installed system.
 - a. Grind smooth welds, seams, and other contact surfaces. Match finish of aluminum panel faces, unless otherwise indicated.

2.12 JOINT SEALANTS

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
- D. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- E. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Do not leave gaps between ends of sealant backings.
 2. Do not stretch, twist, puncture, or tear sealant backings.

3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- F. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- G. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- H. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
- I. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- J. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

2.13 METAL DOORS AND FRAMES

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.
- D. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with HMMA 840.
- E. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 4. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- F. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

- G. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.
- H. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- I. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

2.14 WOOD DOORS

- A. Examine rough openings and pre hung door frame assemblies prior to hanging.
 - 1. Verify that openings and assemblies comply with indicated requirements for type, size, location, and swing characteristics and have been prepared plumb and level.
 - 2. Reject doors and frames with defects.
- B. Do not proceed with installation until unsatisfactory conditions have been corrected.
- C. Subject to compliance with requirements, install custom wood doors and frames to comply with manufacturer's instructions, applicable requirements of referenced standard, and as indicated.
- D. Prefit Doors: All doors to be fit to frames for uniform clearance at each edge.
- E. Hanging Doors: Install doors plumb, level, true and straight with no distortions; anchor securely to substrates, use countersunk concealed fasteners and blind nailing.
- F. Do not install doors and frames until tile work and other wet trades are completed and dried in the areas to receive wood doors.
- G. Condition doors and frames to the average prevailing humidity of the installation area prior to installation. Doors and frames shall not be subjected to abnormal heat, dryness or humidity.
- H. Cutting, trimming, fitting and machining of prefinished doors will not be permitted, unless finish can be restored.
- I. Apply hardware in accordance with hardware manufacturer's instructions and Section ADoor Hardware. @ Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Remove and replace doors which are defective.
- J. Operation: Re-hang or replace doors which do not swing or operate freely.
- K. Finished Doors: Refinish or replace doors and frames damaged during installation.
- L. Protect doors, frames and hardware as recommended by manufacturers to ensure that wood doors, and frames will be without damage or deterioration at time of Substantial Completion.

2.15 VINYL CLAD WOOD WINDOWS

- A. Examine openings before installation. Verify that opening is correct and sill plate is level. Do not proceed with installation until unsatisfactory conditions have been corrected.
 - 1. Surfaces shall be dry and free of construction debris.

2. Wood frame walls shall be dry, clean, sound, well-nailed, free of voids, and without offsets at joints. Ensure that nail heads are driven flush with surfaces in opening and within 3 inches of corner.
 3. Coordinate window installation with wall flashings and other built-in components.
- B. Comply with manufacturer's instructions and recommendations for installing window units, hardware, operators, accessories, and other components of the Work.
 - C. Set window units plumb, level, true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.
 - D. Set sill members in a bed of sealant or with joint fillers or gaskets, as indicated, to provide weathertight construction.
 - E. Adjust operating sash and hardware to provide a tight fit at contact points and weatherstripping for smooth operation and a weathertight closure. Lubricate hardware and moving parts.
 - F. Clean interior and exterior surfaces immediately after installation. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealants, dirt, and other substances.
 - G. Clean glass of factory-glazed units immediately after installing windows. Wash and polish glass on both faces before Substantial Completion. Comply with manufacturer's recommendations for final cleaning and maintenance. Remove nonpermanent labels from glass surfaces.
 - H. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during the construction period.
 - I. Touch-up marred and damaged finishes with the finish manufacturer's recommended field applied topcoat materials, matching the factory finished work.
 - J. Protect window units from damage or deterioration until the time of Substantial Completion.

2.16 DOOR HARDWARE

- A. Refer to Drawings.

2.17 GYPSUM BOARD ASSEMBLIES

- A. Examine substrates to which drywall construction attaches or abuts, preset hollow metal door frames, cast in anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of drywall construction. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Where required, attach offset anchor plates to surfaces indicated. Provide continuous units fastened to building structure not more than 24 inches o.c. and to ceiling runners.
- C. Installation Standard: Comply with ASTM C 754 and ASTM C 840. Provide support for all edges of gypsum board. Use screw fasteners only.
- D. Install supplementary framing and bracing at terminations in the work and for support of toilet accessories and other construction.

- E. Where handrails, and millwork are attached to drywall, provide a flat galvanized steel strip behind gypsum board.
- F. Framing location tolerance shall not exceed 1/2". Install framing and furring with adjacent fastening surfaces aligned within 1/8 inch of each other.
- G. Construction Tolerances: In addition to the reference standards specified, construct framing and substrates to comply with the following maximum tolerances.
- H. Ceiling Support Systems
 - 1. Secure directly to wood structure where possible, otherwise connect to inserts, clips or other anchorage devices or fasteners. Provide acoustical isolation hangers where indicated.
 - 2. Level main runners to a tolerance of 1/8" in 12' 0", measured both lengthwise on each runner and transversely between parallel runners.
 - 3. Space ceiling furring members 16" o.c. maximum except at water resistant board the furring shall be spaced 12" o.c. maximum.
- I. Wall And Partition Framing
 - 1. Install base at floors, ceilings and structural walls where gypsum drywall stud system abuts other work.
 - 2. Space studs and wall furring 16" o.c. maximum, unless otherwise indicated.
 - 3. Frame door openings to comply with recommendations of gypsum board manufacturer, or with "Gypsum Construction Handbook" by United States Gypsum Co. Screw studs to jambs of door frames; install runner track at head of frame and secure to jamb studs.
 - 4. Frame openings, other than door openings, in same manner as required for door openings; and install framing below sills of openings to match framing above door heads.
 - 5. Reinforce all studs cut for passage of pipes and conduit.
 - 6. Install insulation between framing or furring members where indicated. Until gypsum board is installed, hold insulation with wire staples.
- J. Gypsum Board Application And Finishing
 - 1. Application and Finishing Standards: ASTM C 840.
 - 2. Install acoustical insulation prior to gypsum board unless readily installed after board has been installed.
 - 3. Locate exposed end butt joints away from center of walls and ceilings, and stagger not less than 1' 0" in alternate courses. Install boards to form smooth curved surfaces where shown.
 - 4. Install ceiling boards to minimize the number of end butt joints, and to avoid end joints in the center of each ceiling. Stagger end joints at least 24".
 - 5. Install wall and partition boards vertically to avoid end butt joints wherever possible. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs.
 - 6. Install gypsum board with face side out. Do not install defective or damp boards. Butt boards tightly together with not more than 1/16" space between boards. Do not force into place.
 - 7. Locate edges and ends over supports, so that like edges abut, tapered edges against tapered edges and cut ends against cut ends. Stagger joints over different studs on opposite sides of partitions.
 - 8. Provide framing and blocking for support at openings and cutouts.
 - 9. Cover both faces of partition framing with gypsum board in concealed spaces, except in chase walls which are braced internally.

10. Fit gypsum board tightly around ducts, pipes and conduit. Provide firestopping at fire rated walls and ceilings.
11. Isolate perimeter of non load bearing partitions from the structure. Provide 1/4" to 1/2" space and trim edge with L type or LC type edge trim. Seal joints with acoustical sealant.
12. Space fasteners in gypsum boards in accordance with referenced standards and manufacturer's recommendations.

K. Installation Of Drywall Trim

1. Where feasible, use the same fasteners to anchor trim as required to fasten gypsum board. Fasten flanges of trim in accordance with manufacturer's instructions. Closely fit and align ends of trim.
2. Install metal corner beads at external corners of drywall work.
3. Install edge trim at exposed or semi exposed edges of drywall. Install L type or LC type trim where gypsum board abuts other materials, and where edge is exposed, revealed, gasketed, or sealant filled.

L. Finishing Of Drywall

1. Treat gypsum board joints, trim accessories, penetrations, fastener heads, surface defects and elsewhere as required for applied finishes. Prefill open joints using proper compound.
2. Apply joint tape between gypsum boards, except at trim.
3. Apply joint compound in 3 coats, not including prefill in joints, and sand between last 2 coats and after last coat.
4. Tape and finish all partitions whether exposed to view or not.
5. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:
 - a. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges for all drywall surfaces exposed to view.

- M. Provide final protection and maintain conditions, in a manner suitable to Installer, which ensures gypsum drywall work being without damage or deterioration at time of Substantial Completion.

2.18 WOOD FLOORING

A. Installation

1. General: Comply with flooring assembly manufacturer's written instructions, but not less than recommendations of NOFMA and ANSI/HPVA LF, as applicable to flooring type indicated.
 - a. Unless otherwise indicated or directed, engineered wood flooring system and radiant floor systems shall be mechanically fastened to wood subfloors as detailed on the Architectural Drawings and approved shop drawings, and in accordance with the manufacturer's written instructions.
2. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and NOFMA and ANSI/HPVA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
3. Install underlayment system in accordance with the manufacturer's instructions; and in accordance with the approved Shop Drawings.
4. Installation Tolerances: 1/8 inch in 10 feet variance from level.

B. Installation Wood Subfloor

1. Place channels 16 inches on center end to end staggering end joints in adjacent rows, unless otherwise indicated.
2. Anchor channels at predetermined locations using powder actuated or pneumatic anchoring method.
3. Install plywood subfloor parallel to sleeper channels and securely fasten subfloor 6" on center along each channel sleeper.
4. Machine fasten flooring at least 12" on center, perpendicular to sleeper channels with end joints properly driven up and provide proper spacing for humidity conditions. Provide 2 inch expansion void at perimeter and at all vertical obstructions.

C. Protection

1. Protect wood flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

2.19 PAINTING

A. Inspection

1. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.
2. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.
3. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.
4. It shall be the responsibility of the Contractor to see that all mixed colors match the color selections made by the Architect prior to application of paint or finish.

B. Surface Preparation

1. General: Perform preparation and cleaning in accordance with paint manufacturer's instructions and as herein specified.
 - a. Provide barrier coats over incompatible primers or remove and reprime as required. Notify Architect in writing of any anticipated problems with substrates primed by others.
 - b. Remove hardware, accessories, lighting fixtures, and similar items not to be field painted, or provide suitable protection. Remove items if necessary, for painting of items or adjacent surfaces. Reinstall removed items on completion of painting.
 - c. Clean surfaces to be painted. Remove oil and grease prior to other cleaning. Be sure that cleaning materials do not fall onto newly painted surfaces.
2. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.
 - a. Ferrous Metals: Clean nongalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council.
 - b. Blast steel surfaces clean as recommended by the paint system manufacturer and in accordance with requirements of SSPC specification SSPC-SP 10 for interior surfaces and SSPC-SP 6 for exterior surfaces.

- c. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - d. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
3. Galvanized Surfaces: Clean galvanized surfaces that have not been shop primed and/or intermediate coated with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- a. Touch-up bare and damaged areas of the shop-applied prime coat that have been damaged; wire brush, mechanically clean and/or solvent clean such areas in compliance with the manufacturers recommendations.
 - b. Use the coating materials identical to those applied in the shop. Refer to other Sections of these specifications for materials and other requirements.
4. Cementitious Materials: Prepare concrete surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
- a. Use abrasive blast cleaning methods if recommended by the paint manufacturer.
5. Wood: Clean wood surfaces to be painted, of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sandpaper smooth when dried.
- a. Prime, stain, or seal wood required to be field painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood.

C. Materials Preparation

1. Mix and prepare painting materials in accordance with manufacturer's directions
2. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.
3. Stir materials before application to produce a mixture of uniform density, and stir as required during application. Remove surface film and, if necessary, strain material before using.

D. Application

1. General: Apply paint in accordance with manufacturer's directions. Use techniques best suited for substrate and type of material being applied.
 - a. Apply additional coats when undercoats show through final coat of paint, until paint film is of uniform finish, color and appearance, including edges, corners, crevices, welds, and fasteners.
2. Sand lightly between each succeeding enamel coat.
3. Omit first coat (primer) on metal surfaces which have been shop primed and touch up painted.

- E. Scheduling Painting: Apply first coat material to surfaces that have been prepared for painting as soon as practicable after preparation. Allow sufficient time for proper drying. Do not recoat until paint feels dry and firm.
- F. Minimum Coating Thickness: Apply materials to establish a total dry film thickness (DFT) as indicated or, if not indicated, as recommended by coating manufacturer.
- G. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.
 - 1. Prime Coats: Apply prime coat on material which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of defects in first coat, to assure a finish coat without defects.
- H. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable.
- I. Completed Work: Match approved samples for color and texture. Repaint work not in compliance with specified requirements.
- J. At mechanical equipment indicated to be painted, verify that signage, grilles or air intake systems have not been clogged due to application of paint system specified.
- K. Clean Up And Protection
 - 1. Clean Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.
 - 2. Upon completion of painting work, clean paint spattered surfaces. Remove spattered paint by proper methods, with care not to scratch or otherwise damage finished surfaces.
 - 3. Protection: Protect work of other trades against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
 - a. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.
 - 4. At completion of work of other trades, touch up and restore all damaged or defaced surfaces.
- L. Exterior Paint Schedule
 - 1. Primed and unprimed ferrous metal, including: Exposed lintels and support framing; (interior and exterior surfaces) at exterior locations; steel framing supporting mechanical equipment; exposed structural steel where shown:
 - a. (1) Coat; Tnemec 66; 4.0 to 6.0 dry mil thickness.
 - b. Finish (2) Coat; Tnemec 70 or 71 as selected; 1.5 to 2.5 dry mil thickness.
 - 2. Shop Primer for Ferrous Metal: Fast curing, lead and chromate free, universal modified alkyd primer complying with performance requirements of FS TT P 664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems

indicated, and capability to provide a sound foundation for field applied topcoats despite prolonged exposure.

3. Galvanized Metal:
 - a. (1) Coat; Tnemec 66; 4.0 to 6.0 dry mil thickness.
 - b. Finish (2) Coat; Tnemec 70 or 71 as selected; 1.5 to 2.5 dry mil thickness.
4. Metal, Ferrous:
 - a. High Gloss Alkyd Enamel
 - 1) Prime Coat: IronClad Retardo Rust Inhibitive Paint, (163).
 - 2) Two Coats: Impervo Enamel, (133).

M. Interior Paint Schedule

1. General: Provide the following interior paint systems by Benjamin Moore, or approved equal, of colors as selected by the Architect.
 1. Reference finish schedule on Contract Drawings for locations types and colors.
2. Gypsum Drywall, Ceilings:
 - a. Flat Finish, Vinyl Acrylic Latex
 - 1) Primer Coat: Latex primer sealer.
 - 2) Two Coats: Vinyl latex paint flat finish.
3. Gypsum Drywall, Walls:
 - a. Semi-Gloss Alkyd Enamel
 - 1) Primer Coat: Prime Seal.
 - 2) Two Coats: Alkyd enamel.
 - b. Satin Gloss Acrylic Latex
 - 1) Primer Coat: Latex primer sealer.
 - 2) Two Coats: Vinyl latex paint Satin finish.
 - c. Acrylic Latex, Eggshell Enamel Finish:
 - 1) Primer Coat: Latex primer Sealer.
 - d. Acrylic Latex, Semi-Gloss Enamel Finish:
 - 1) Primer Coat: Latex primer Sealer.
 - 2) Two Coats: Vinyl latex paint Semi-Gloss Enamel.
 - e. High gloss Waterborne Acrylic Epoxy (EP):
 - 1) Primer Coat: Latex Quick dry Prime seal equal; Waterborne Epoxy Enamel.
 - 2) Finish Coat: Acrylic Epoxy Enamel:

4. Opaque Painted Wood: Including standing and running trim; shelving; miscellaneous trim; back prime standing and running trim prior to installation:
 - a. 1 coat enamel undercoat/primer.
 - b. 2 coats odorless alkyd enamel; semigloss.
5. Opaque Painted Wood; Doors, Base, Trim, and locations indicated:
 - a. Vinyl Acrylic Latex Finish: 2 finish coats over a primer.
 - 1) Primer: Latex-based interior primer.
 - 2) Finish Coats: Two coats of Latex-Based Interior Semi-gloss Finish
6. Galvanized Steel:
 - a. 1 coat galvanized steel primer.
 - b. 2 coats alkyd enamel, semi gloss.
7. Electrical and telephone back panels, interior of ductwork behind grilles and registers, and where indicated:
 - a. 2 Coats: Suitable flat black paint.
8. Ferrous Metal (Doors, Frames, Etc):
 - a. Semi-Gloss, Alkyd
 - 1) Prime Coat: Ironclad Retardo Rust Inhibitive Paint.
 - 2) Two Coats: Moore's Alkyd Dulamel, (207)
9. Ferrous Metal, Conduits and Mechanical Piping:
 - a. Satin Finish Polyamide Epoxy
 - 1) Surface Preparation:SSPC-SP 6
 - 2) Primer Coat:Tnemec 90-97; 2.5 to 4.0 mils d.f.t.
 - 3) Intermediate Coat:Tnemec Series 66 Epoxoline; 3.0 to 5.0 mils d.f.t.
 - 4) Finish Coat:Tnemec Series 66 Epoxoline; 2.0 to 3.0 mils d.f.t.

2.20 TOILET ACCESSORIES

A. Installation

1. Provide concealed blocking, sheet metal grounds and additional items as necessary and as indicated on the Drawings.
2. Install accessory units according to manufacturers' instructions, using fasteners appropriate to substrate as recommended by unit manufacturer. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Adjusting And Cleaning

1. Adjust accessories for proper operation and verify that mechanisms function smoothly. Replace damaged or defective items.
2. Clean and polish all exposed surfaces after removing protective coatings.

2.21 IDENTIFYING DEVICES

A. Examination

1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
2. Verify that items provided under other sections of Work are sized and located to accommodate signs.
3. Examine supporting members to ensure that surfaces are at elevations indicated or required to comply with authorities having jurisdiction and are free from dirt and other deleterious matter.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation

1. General: Locate sign units and accessories where indicated, using mounting methods of the type described and in compliance with the manufacturer's instructions.
2. Install signs level, plumb, and at the height indicated, with sign surfaces free from distortion or other defects in appearance.
3. Wall Mounted Panel Signs: Attach panel signs to wall surfaces using the methods indicated below:
4. Vinyl-Tape Mounting: Use double-sided foam tape, of thickness indicated, to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces.
5. Mechanical Fastening: Mount signs using concealed fastening methods as recommended by the manufacturer. Provide heavy paper template to locate holes for fasteners.

C. Mounting Locations: Mount signs as directed by the Architect to comply with the Americans with Disabilities Act (ADA) and with code provisions as adopted by authorities having jurisdiction.

1. Typical Locations: Mount signs not more than 60 inches above finished floor and not more than 12 inches adjacent to latch side of door. Where doors have sidelights, center sign on doors. Center elevator signs between elevator jambs.

D. Cleaning And Protection

1. At completion of the installation, clean soiled sign surfaces in accordance with the manufacturer's instructions. Protect units from damage until acceptance by the Owner.

E. Identifying Devices Schedule

1. Acrylic Plaques
 - a. Room Name Signs: Provide room name signs at each public, utility and mechanical room, 8 inches x 8 inches, in addition to signs required by code.
 - b. Typical Sign Layout Optima (Capitals) 5/8-inch caps, centered lettering, Grade 2 Braille.
 - c. Colors: As selected by the Architect.
2. The following schedule shall be verified with the Owner prior to fabrication. Provide a sign at each room and each occurrence of room , whether or not listed below:
 - a. As per approved schedule.

3. Include a diagram indicating location of sign and stairs on floor (artwork to be provided by Architect).
4. Stair Identification Sign: Provide a stair identification sign on the occupancy side of each stair door, identifying the stair by alphabetic letter and coordinated with elevator landing sign, in accordance with The State Of Maine Building Code (Grade 2 Braille).
5. Sign size to be 8 x 8-inch, with 3-1/2-inch high character. Layout and colors as selected by Architect.

2.22 FIRE EXTINGUISHERS, CABINETS and ACCESSORIES

A. Examination

1. Examine walls and partitions for thickness and framing for cabinets to verify cabinet depth and mounting prior to cabinet installation. Examine rough-in for cabinets to verify locations of connections prior to cabinet installation.
2. Do not proceed until unsatisfactory conditions have been corrected.

B. Installation

1. Follow manufacturer's printed instructions for installation.
2. Install units in locations and at heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities. Fasten cabinets to structure, square and plumb.
3. For units to be fully recessed, prepare recesses in walls for cabinets as required by type and size of cabinet and style of trim and to comply with manufacturer's instructions.
4. Provide surface mounted fire extinguisher cabinets for assemblies mounted to precast concrete walls, and other locations indicated.
5. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
6. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
7. Identification: Apply decals or pressure-sensitive vinyl letters at locations indicated.

C. Adjusting, Cleaning, And Protection

1. Adjust cabinet doors that do not swing or operate freely. Refinish or replace cabinets and doors damaged during installation.
2. Provide final protection and maintain conditions that ensure that cabinets and doors are without damage or deterioration at the time of Substantial Completion.

2.23 RESIDENTIAL APPLIANCES

A. Examination

1. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, power connections, and other conditions affecting installation and performance of residential appliances.
2. Examine roughing in for systems to verify actual locations of piping connections before appliance installation.
3. Examine walls, ceilings, and roofs for suitable conditions where exhaust hoods or vented exhaust fans will be installed.
4. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation, General

1. General: Comply with manufacturer's written instructions.
2. Built in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.
3. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.
4. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.
5. Utilities: See plumbing and electrical requirements.

C. Field Quality Control

1. Perform tests and inspections.
2. Manufacturer's Field Service: Engage a factory authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
3. Tests and Inspections: Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance performance parameters.
 - a. Gas Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
 - b. Operational Test: After installation, start units to confirm proper operation.
 - c. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.
 - d. An appliance will be considered defective if it does not pass tests and inspections.
 - e. Prepare test and inspection reports.

D. Demonstration

1. Engage a factory authorized service representative to train Owner or his representative to adjust, operate, and maintain residential appliances.

2.24 KITCHEN CASEWORK

A. Installation

1. Install casework with no variations in flushness of adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
2. Install casework without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
3. Install casework level and plumb to a tolerance of 1/8 inch in 8 feet.
4. Fasten cabinets to adjacent units and to backing.
5. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer head screws sized for 1 inch penetration into wood framing, blocking, or hanging strips.
6. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with toggle bolts through metal backing behind gypsum board.

B. Adjusting And Cleaning

1. Adjust casework and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

2. Clean casework on exposed and semi-exposed surfaces. Touch up factory applied finishes to restore damaged or soiled areas.

2.25 WINDOW TREATMENT

A. Examination

1. Examine the site at which window treatment units will be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Installation

1. Install window treatment units in manner indicated to comply with manufacturer's written installation instructions. Position units level, plumb; secure at proper height and location relative to adjoining window units and other related work. Securely anchor units with proper clips, brackets, and anchorages, suited to type of mounting indicated.
2. Install track plumb and level, and at the proper height and location to adjoining window units. Securely anchor with clips, brackets, and anchors suited to the type of mounting indicated.
3. Make provision for unencumbered operation of window sash.
4. Isolate metal parts of units from concrete or mortar to prevent galvanic action.

2.26 ENTRANCE MAT AND FRAME

A. Installation

1. Install recessed frames and mats to comply with manufacturer's instructions at locations indicated and with top of frames and mats in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set mat tops at height for most effective cleaning action and coordinate top of mat surfaces with doors that swing across mats to provide clearance under door.

B. Protection

1. After completing frame installations, provide temporary filler of plywood or fiberboard in mat recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

2.27 PLUMBING

A. GENERAL

1. GENERAL REQUIREMENTS

- (1) Install all new work in a neat workmanlike manner readily accessible for operation, maintenance and repair.

- (2) Codes, Permits and Inspections:

- (a) All work shall comply with requirements of Maine Building Code, Maine Building Department, State of Maine DOT, and all authorities having jurisdiction. Applicable national, state and local codes, laws and regulations governing or relating to any portion of this work shall be incorporated into and made a part of these specifications. Contractor is to inform engineer, of any existing work

or materials which violate any of the above laws and regulations. Any work by the contractor causing such violation shall be corrected at contractor's expense by this contractor and at no expense to the owner.

- (b) This contractor shall perform all controlled inspections if required and obtain all equipment use permits as required by state and local authorities. Permits shall be turned over to owner at job completion.

(3) Site Verification

- (a) Prior to submission of the bid, this contractor shall visit the job site to ascertain the actual field conditions as they relate to the work as indicated on the drawings and described herein. Discrepancies, if any, shall be brought to the engineer's attention prior to submission of the bid, and if not resolved to satisfaction, shall be submitted as a written qualification of the bid. Submission of a bid shall be evidence of site verification has been performed as described above.

(4) Contract Documents:

- (a) Prior to submission of a formal bid, this contractor shall review all drawings of the entire project including general construction, demolition, architectural, mechanical and electrical and he shall notify the construction manager of work required in the bid which is indicated or implied in other sections of the work.
- (b) Drawings are diagrammatic and indicate general arrangement of work and approximate location of equipment. Refer to architectural drawings for all dimensions and coordinate final locations of all plumbing fixtures. All work shall be coordinated with other trades to avoid conflicts.
- (c) If a conflict occurs in the specifications and/or on the drawings, the more stringent situation shall apply.
- (d) Any equipment, parts, materials or labor that is necessary for proper installation and performance of the plumbing work, although not specifically mentioned herein or shown on the drawings, shall be furnished and installed as if called for in detail without additional cost.

(5) Guarantee:

- (a) All materials and workmanship shall be guaranteed for a period of one year from date of final acceptance of this work. Final acceptance shall be defined as the time at which the plumbing work is taken over and accepted by the owner, and is under care, custody, and control of the owner. Engage the services of various manufacturers supplying the equipment for the proper startup and operation of all systems installed. Instruct the owners personnel in the proper operation and servicing of the system.
- (b) The contractor shall guarantee to replace or repair promptly and assume responsibility for all expenses incurred for any workmanship and equipment in which defects develop within the guarantee period. This work shall be done as directed by the owner. This guarantee shall include responsibility for all expenses incurred in repairing and replacing work of other trades affected by defects, repairs or replacements in equipment supplied by this contractor.

- (c) This contractor is responsible for the maintenance and operation of all systems until the final acceptance of the work.

- (6) The "General Conditions of the Contract for Construction" AIA Document A201, Latest Edition, or as required by the architect documents, and/or the architect's and structural engineer's documents, as applicable, are part of this contract.

- (7) Definitions:
 - (a) "Plumbing Contractor", "This Contractor" - the party or parties have been duly awarded the contract for and are thereby made responsible for the plumbing work as described herein.
 - (b) "This Contract", "The Contract" - the agreement covering the work to be performed by "This Contractor".
 - (c) "Approved", "Equal", "Satisfactory", "Accepted", "Acceptable", "Equivalent" - acceptable for use on the project, as determined by the engineer based on documents presented for such determination.
 - (d) "These Specifications", "This Section, Part, Division" (of the specification) - the document specifying the work to be performed by "This Contractor".
 - (e) "The Plumbing Work", "This Work", - all labor materials, equipment, apparatus, controls, accessories, and other items required for a proper and complete installation by the plumbing contractor.
 - (f) "Architect", "Engineer", "Owner's Representative" the party or parties responsible for interpreting, accepting and otherwise ruling on the performance under this contract.
 - (g) "Furnish" - purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the plumbing work.
 - (h) "Install" - Unload at the delivery point at the site and perform every operation necessary to establish secure mounting installation and correct operation at the proper location in the project, all as part of the plumbing work.
 - (i) "Provide" - "Furnish" and "Install".
 - (j) "New" - Manufactured within the past two years and never before used.
 - (k) "Relocate" - Move existing equipment and all accessories as required.
 - (l) "Remove" - dismantle and cart away from site including all related accessories. All other equipment and operations in any way effected by the removal is to remain in full operation. Provide all necessary components to maintain such operation.

2. SCOPE OF WORK

- (1) Provide all labor, materials, equipment, and contractor's services necessary for complete, safe installation of all plumbing work the scope of work shall include but not be limited to the following:

- (a) Installation of new plumbing work, piping supports and related components.
- (b) Cutting and patching.
- (c) Shop drawings.
- (d) As-built drawings.
- (e) Operating and maintenance manuals.
- (f) Full coordination with other trades.
- (g) Warranty and guaranty.
- (h) Phasing as required by owner, construction manager, general contractor or building management.
- (i) Premium time for work to be performed after-hours as required by building management and/or owner.
- (j) Filing, permits, controlled inspections.
- (k) Full testing and startup of all systems.

3. SHOP DRAWINGS

- (1) Submit shop drawings certified by all trades that coordination has been completed. Submit all certified equipment cuts with construction wiring diagrams. Shop drawings submission shall include, but not be limited to, the following:
 - (a) Plumbing fixtures and equipment.
 - (b) Valves.
 - (c) Pipe and fittings.
1.00
 - (d) Hangers.
1.00
 - (e) Insulation.
1.00
 - (f) Hot water heater.
1.00
 - (g) Vacuum breakers.
1.00
- (2) The quantity of shop drawings shall as a minimum be four (4) copies of 8-1/2"x11" submissions and one (1) sepia and one (1) print of all drawings. Specific job requirements may be more stringent and contractor is responsible to obtain requirements from construction manager, general contractor or architect.

4. MAINTENANCE MANUALS

- (1) Submit four (4) loose-leaf bound operating and maintenance manuals with index and index tabs to include the following:
 - (a) Operating and maintenance instructions on all systems.
 - (b) Manufacturers' catalog cuts on all equipment.
 - (c) All items submitted for review in shop drawing section.

5. AS-BUILT DRAWINGS

- (1) Contractor shall maintain record drawing prints on job site and record, at time of occurrence, deviations from contract documents due to field coordination, bulletins, or addenda.
- (2) Contractor shall revise shop drawings to conform to record drawings and submit an as-built condition (piping) drawings upon completion of the project. Final submission of reproducible as-built drawings are to be signed and certified by installing contractor that this is the as-built condition of the work.

6. ACCESS DOORS IN GENERAL CONSTRUCTION

- (1) This contractor shall submit to architect for approval a plan indicating the size (minimum 18" x 18") and location of all access doors required for operation and maintenance of all concealed equipment, devices, valves, and controls. This contractor shall arrange for the furnishing and installation of all access doors in finished construction and include all costs in the bid.

7. ABBREVIATIONS

1.00 (ENGINEER NOTE: ADD/DELETE AS REQUIRED)

1.00 F F	1.00	ABOVE FINISHED FLOOR	1.00 E	1.00	INVERT ELEVATION
1.00 W R	1.00	HOT WATER RETURN	1.00 M	1.00	ICE MAKER
1.00 O P	1.00	BOTTOM OF PIPE	1.00 A V	1.00	LAVATORY
1.00 M	1.00	COFFEE MAKER	1.00 R	1.00	MOP RECEPTOR
1.00 F H	1.00	CUBIC FEET PER HOUR	1.00 O	1.00	PLUGGED OUTLET
1.00 O D P	1.00	CLEANOUT DECK PLATE	1.00 R V	1.00	PRESSURE REDUCING VALVE

1.00 V	1.00 CHECK VALVE	1.00 S	1.00 PANTRY SINK
1.00 W	1.00 COLD WATER	1.00 D	1.00 ROOF DRAIN
1.00 C V	1.00 DOUBLE CHECK VALVE	1.00 E	1.00 RELOCATED POSITION OF EXISTING EQUIPMENT
1.00 D C V	1.00 DOUBLE DETECTOR CHECK VALVE	1.00	1.00 SOIL
1.00 F	1.00 DRINKING FOUNTAIN	1.00 A	1.00 SHOCK ARRESTER
1.00	1.00 EXISTING	1.00 A N	1.00 SANITARY
1.00 R	1.00 EXISTING TO BE RELOCATED	1.00 H	1.00 SHOWER
1.00 L	1.00 ELEVATION	1.00 O V	1.00 SHUT OFF VALVE
1.00 W C	1.00 ELECTRIC WATER COOLER	1.00 S	1.00 SERVICE SINK
1.00 D	1.00 FLOOR DRAIN	1.00 T	1.00 STORM
1.00 F D	1.00 FUNNEL FLOOR DRAIN	1.00 & P	1.00 TEMPERATU RE AND 1.00 PRESSURE
1.00 P W H	1.00 FROST PROOF WALL HYDRANT	1.00 R	1.00 URINAL
1.00 S	1.00 FLOOR SINK	1.00	1.00 VENT
1.00 U	1.00 FIXTURE UNIT	1.00 B	1.00 VACUUM BREAKER
1.00	1.00 GAS	1.00 O	1.00 VALVED OUTLET
1.00 P F	1.00 GALLONS PER FLUSH	1.00	1.00 WASTE

1.00 P M	1.00	GALLON PER MINUTE	1.00 C	1.00	WATER CLOSET
1.00 B	1.00	HOSE BIBB	1.00 C	1.00	HANDICAPP ED
1.00 W	1.00	HOT WATER	1.00	1.00	

B. PRODUCTS/APPLICATION

1. GENERAL

- (1) The plumbing systems shall be complete with all pipes, fittings, traps, supplies, valves, hangers and supports, insulation, etc. And all other items necessary for complete, satisfactory operating and approved type system.
- (2) All pipe fittings, valves, fixtures, hangers, supports, insulation, etc. shall conform to the requirements of the Maine Building Code.

2. SOIL, WASTE, AND VENT PIPE AND FITTINGS (ABOVE GROUND)

- (1) All above ground soil, waste, and vent piping shall be "No-Hub" cast iron pipe and fittings except as noted otherwise.
- (2) All joints and connections shall be assembled by means of sealing sleeves and stainless steel clamps and shield assemblies.
- (3) Pipe and fittings shall be Central Foundry Company, Tyler Pipe Company, East Penn Foundry or approved equal.

3. SOIL, WASTE, VENT AND LEADER PIPE AND FITTINGS (UNDERGROUND AND WHERE INDICATED):

- (1) All underground soil, waste, vent and leader piping shall be approved Bell and Spigot cast iron soil pipe and fittings.
- (2) All joints and connections shall be made by the use of double-seal neoprene cast iron soil pipe gaskets. Alabama pipe company "Dual-Tite" approved other.
- (3) Pipe and fittings shall be Central Foundry Company, Alabama Pipe Company, East Penn Foundry, or approved other.

4. COLD WATER AND HOT WATER PIPE AND FITTINGS

- (1) Domestic cold water, hot water and hot water circulation pipe shall be type "L" hard drawn, copper tubing with wrought bronze fittings for 150 pound water working pressure and with joints of 95-5 (tin-antimony) solder. No solder containing lead is permitted.

- (2) All supplies through walls to fixtures shall be 85% red brass with threaded brass fittings. All exposed piping in finished spaces shall be chrome plated 85% red brass.

5. EXPANSION JOINTS AND ANCHORS

- (1) Proper provisions shall be made for expansion and contraction of all pipes and the piping shall be arranged with all necessary pipe expansion loops and swing joints.
- (2) Mains and branches must be so installed with swing connections so as to permit free expansion of piping.

6. HANGERS AND SUPPORTS:

- (1) Furnish and install all necessary hangers, supports, inserts, clamps, etc. as required. All hangers and supports shall be of heavy construction and suitable for the size of pipe to be supported. All inserts and hangers shall be installed to clear work of other trades.
- (2) All horizontal cast iron piping shall be supported on five (5) foot centers and at all joints. All horizontal screwed piping shall be supported by hangers spaced not over ten (10) feet apart. All branches shall have separate hangers. Hangers shall be clevis type, constructed of heavy bar steel stock, with proper size suspension rod and locknuts. Where piping is supported from the floor, provide adjustable pipe saddle support with U-Bolt.
- (3) Where pipes are to be insulated, the hangers shall be of ample size to provide for the covering specified and be provided with galvanized steel insulation shields.
- (4) All hangers, rods, beam clamps, etc. shall be shop zinc coated.
- (5) All horizontal copper tubing shall be supported by hangers not over six (6) feet apart for piping 1-1/4 inch and smaller and not over ten (10) feet apart for piping 1-1/2 inch and larger. All branches shall have separate hangers, hangers shall be clevis type with copper bottom support. If channel of Angle iron trapeze hangers are used, the space on hangers for the copper tubing shall be wrapped with lead shields to isolate tubing.
- (6) In areas of steel construction, pipe hangers shall be supported by beam clamps. Coordinate with engineer for maximum loading. Beam clamps shall be steel with bolt, nut and socket threaded for rod connection and shall be F & S Manufacturing Company Fig. #45, Central Iron, Grinnel Company, or approved equal.
- (7) If the building is located in Seismic Zone 2 and has an occupancy importance factor of 1.0, piping shall be restricted in accordance with the requirements of the BOCA National Building Code.
- (8) All Seismic Restraint Devices shall be provided with the Qualified Engineer's Approval and Z Value of .15 for a Seismic Zone Type 2A.
- (9) All anchor bolts shall be installed a minimum of 8" from the edge of a house keeping pad.
- (10) All pipes required seismic restraint hangers shall be supported with a threaded rod. The threaded rod shall be reinforced with A 1/2" X 1/2" angle iron. The threaded rod be

attached to the steel members by an approved spring isolator with neoprene bushing. Each clevis hanger shall be anchored on both sides with A 1/4" diameter wire cable. Cable shall have wire loops to prevent bending across sharp edges. Attach wire cable at 45 degree angles to steel beam, with a bracket welded to the web of the beam.

- (11) All dunnage steel supporting equipment on the first floor shall have cross trusses to sustain vertical, horizontal and moment forces, anchor steel to the floor with an expansion type anchor bolt, provide neoprene bushing between anchor bolts and brackets.
- (12) Seismic restraints shall not be required for the following installations:
 - (a) All piping suspended by the individual hangers that are 12 inches or less in length from the top of the pipe to the bottom of the support hanger.

7. INSULATION:

- (1) Cover all hot water and hot water recirculation pipe with 1 inch thick and all cold water pipe with 1/2 inch thick Manville Micro-lok Ap-t plus fiberglass insulation. Fittings and valves shall be insulated with Manville Zeston 2000 PVC insulated fitting covers. Install all insulation as per manufacturer's recommendations. All insulation material shall comply with the Maine Building Code Requirement of a flame per rating not to exceed 25 and a smoke developed rating not to exceed 50.

8. VALVES:

- (1) Stop valves, except fixture stops, on hot and cold water lines 2 in. and smaller shall be full port 400 lb. Non-shock bronze ball valves, NIBCO T-595-Y for threaded connections, and NIBCO S-580 for copper to copper solder connections.
- (2) Globe valves up to and including 3 in. shall be screw-over bonnet, composition disc, brass, NIBCO T-211 for threaded connections and S-211 for solder connections.
- (3) Check valves shall be of the Swing-type, sizes up to and including 3 in. shall be all brass, 200 PSI WOG 125 PSI SWP. NIBCO T-413 for threaded connections and NIBCO S-413 for solder connections.

9. VALVE TAGS AND CHART:

- (1) Each valve, except valves at fixtures, shall have a 2 inch diameter brass tag with 1 inch high numeral stamped thereon, secured to the valve by means of brass S hook or brass chain. Each system to have a letter designation as well.
- (2) The contractor shall furnish an approved, neatly drawn valve chart, properly framed, showing the use and location of each valve that is tagged.

10. SHOCK ARRESTORS:

- (1) Shock arrestors shall be Jonespec Model #55000 series. Refer to drawings for further information.

11. BACKFLOW PREVENTION DEVICES

- (1) Provide Watts 909-QT-S reduced pressure zone backflow preventors at connections to HVAC equipment and where indicated on the plans. Provide 909-AG air gap fitting and 909-EL vent elbow and spill discharge to floor drain.
- (2) Vacuum Breaker "A" - Anti Siphon vacuum breaker shall be Watts Series 288A. Install 6" above highest. Point of downstream piping. Where exposed to view vacuum breaker shall be polished chrome.
- (3) Vacuum Breaker "B" - Anti-siphon pressure vacuum breaker shall be Watts Series 800M4QT. Install 12" above highest point of downstream piping. Device must be installed in exposed location.

12. CONNECTION TO MISCELLANEOUS EQUIPMENT

- (1) Provide all necessary pipe, fittings, vacuum breaker, valves, etc., and make all final plumbing piping connections, including waste, vent, hot and cold water, etc., to all equipment requiring same that is furnished "Under Another Section of the Specifications" .
- (2) Kitchen equipment contractor will provide, for installation by the plumbing contractor, all faucets, overflow and drain assemblies, vacuum breakers, etc., except as herein specified.

13. DRAINS

- (1) In general, drains shall be Josam, Zurn, or Jay R. Smith.
- (2) Unless otherwise noted drains shall be Duco Coated, Cast Iron, Double Drainage Patterns, Hub and Spigot, unless otherwise noted. Drains shall be equipment to the figure numbers shown and of size required.
- (3) General area floor drains shall be Jay R. Smith FIG. NO 2005-A with sediment bucket, under-deck clamp and 8" Diameter nickel bronze top, with hub & spigot outlet connection.
- (4) Floor drains in mechanical rooms shall be Jay R. Smith, FIGURE 2350 with sediment bucket.
- (5) Indirect waste floor drains shall be J.r. Smith FIG. 33510-F11-B with 8" Round top, and sediment bucket.
- (6) Floor sink shall be Jay R. Smith FIG.3430-13 porcelain enameled indirect waste floor drain with 3/4 acid resistant porcelain enameled grating with flashing flange and bottom dome strainer. Set rim 1" above finished floor.

14. FILTERS

- (1) Cuno "Aqua-pure" Model AP51T carbon filter with AP117 cartridge. Furnish one additional replacement cartridge for each filter provided. Provide shut off valve on inlet and outlet.

15. HOSE BIBBS

- (1) Hose bibbs shall be Chicago Faucet Co., No. 293-6, Polished chrome, or approved other, with Watts Regulator Co. No BAC, 3/4" hose end vacuum breaker

16. PRESSURE REDUCING VALVES

- (1) Size ½" - 2-1/2" threaded bronze body construction renewable stainless steel seat. High temperature resisting diaphragm, spring cage construction and strainer, Watts No. 223S or approved equal. See drawings for psi settings.

17. COFFEE MAKER (FURNISHED BY OTHERS)

- (1) Install coffee maker where indicated on the drawings. Provide ½" cold water connection with vacuum breaker, check valve and gate valve. Vacuum breaker to be installed 6" above flood level rim level of coffee maker.

18. PLUMBING FIXTURES AND EQUIPMENT

- (1) Plumbing contractor shall furnish and install all plumbing fixtures and appliances, unless otherwise noted, and make all final connections as required.
 - (a) Water Closets (WC) - American Standard "Afall" No. 2257.103 Siphon Jet, Elongated Bowl, 1-1/2" Top Spud, Vitreous China Water Closet with Olsonite No. 95 White, Solid Plastic, Open Front, Toilet Seat. Sloan "Royal" No. 111 C.P. Flush Valve. Water closet shall be supported on J.r. Smith, or approved other, fixture support with horizontal fittings and bases bolted to floor slab.
 - (b) Water Closets for the Physically Handicapped (HC - WC) - same as water closet above except that rim of fixture shall be set at 18" above the finished floor.
 - (c) Water Closets -(WC) American Standard "Madera" No. 2234.015 Floor Mounted, White Siphon Jet, Elongated Bowl, 1-1/2" Top Spud, Vitreous China Water Closet with Olsonite No. 95 White, Solid Plastic, Open Front, Toilet Seat. Sloan "ROYAL" NO. 111 C.P. Flush Valve.
 - (d) Water Closets for the Physically Handicapped (HCWC) - American Standard "MADERA" (17" High) NO. 3043.102, Floor Mounted, Siphon Jet, Elongated Bowl, 1-1/2" Top Spud, Vitreous China Water Closet with Olsonite No. 95 White, Solid Plastic, Open Front, Toilet Seat. Sloan "Royal" No. 111 C.P. Flush Valve.
 - (e) Urinals (UR) - American Standard "Washbrook" No. 6501.010 White Vitreous China, Washout Wall Hung Urinal; 3/4" Inlet, 2" Outlet; Sloan "Royal"; 186 Flush Valve; Jay R. Smith chair carrier with block base bolted to floor slab.
 - (f) Urinals for the Physically Handicapped (HCUR) same as above except that lip of fixture is to be set 17" AFF.
 - (g) Lavatory (LAV) - American Standard "Aqualyn" No. 0475.020 with polished chrome finish, Mcguire Mfg. Co., Inc. or Approved Other, No. 201 C.P. Trap and No. 2127 C.P. nipple to wall and escutcheon; offset supply tailpieces; and pair of No. 2158 LK angle supply assemblies with loose key stops. Conform to all ANSI and Handicapped Code requirements.
 - (h) Lavatory for the Physically Handicapped (H.C. LAV.) - American Standard "Lucerne" No. 0356.015 with polished chrome finish. Faucet must remain open for at least 10 seconds. McGuire Manufacturing Co., or Approved Other. No. 201 C.P. Trap, No. 155-WC Offset Drain and No. 2127 C.P. nipple to wall and es-

cutcheon; offset supply tailpieces; and pair of No. 2158 LK angle supply assemblies with loose key stops.

- (i) Mop Receptor (MR) - Florestone Model MSR-2424. 24" X 24" Molded Mop Service Basin, No. MR-373 stainless steel rim guards, No. MR-371 chrome plated combination faucet with vacuum breaker, integral stops, adjustable wall brace, pail hook, 3/4" Hose thread on spout and No. MR-370 rubber hose.
 - (j) Shower (SH) - Symmons "Temptrol" No. S-96-1 Pressure balanced shower valve, polished chrome. Shower floor to have A6 LB shower pan flashed into a J.r. Smith floor drain #2005-B-B with chrome plated strainer.
 - (k) Pantry sink (P.S.) - furnish and Install, Elkay Manufacturing Co. GEGR-2521-L single compartment, 20 gauge type 302 stainless steel sink, underside of sink shall be fully undercoated for sound deadening. Sink shall be trimmed with LK-232-S-BH-5 Faucet, Model LK-99 crumb cup strainer; 2" rough brass p-trap (set back to provide Handicap Accessibility as per ANSI requirements) with nipple to wall and escutcheon and pair of 1/2" rough angle stop valves with flexible risers, nipples to wall and escutcheons.
- (2) Install individual stop valve in each water supply to each fixture.
 - (3) Install Escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep pattern escutcheons where required to conceal protruding pipe fittings.
 - (4) Seal joints between fixtures and walls, floors, and counters using Sanitary-type. 1-part, mildew resistant, silicone sealant. Match sealant color to fixture color.
 - (5) Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.
 - (6) Include "Trap-wrap" fitting insulation kits for accessible fixtures according to the following:
 - (a) Lavatories: cover hot and cold water supplies, stops and handles, drain, trap, and waste-to-wall.
 - (b) Sinks, cover hot and cold water supplies, stops and handles, drain trap, and waste-to-wall.

19. WATER HEATER

- (1) A.O. Smith Model DEN-6, 3KW, 208V, 1 Phase. Provide ASME T&P relief valve, dial type combination temperature and pressure gauge, and low water cut-off.
- (2) Approved equal

C. EXECUTION

1. INSPECTION AND TESTING

- (1) The plumbing system shall be inspected and tested in accordance with the requirements of the Maine Building code and all local authorities having jurisdiction.
- (2) Contractor shall perform all cutting necessary for the installation of plumbing work. Accurately layout work for which cutting beams, joists, floors or walls of the building will not be permitted except after receiving approval of the architect and the building manager.
- (3) Rough patching will be done by this contractor in a manner to accommodate finished patching work. Finished patching will be done "Under Another Section of the Specifications".

2. CLEANING

- (1) All piping, fixtures, equipment, etc., installed under this contract shall be thoroughly cleaned and protected during construction and put into first-class operating condition before being offered for acceptance.
- (2) Upon completion of all work, the plumbing contractor shall thoroughly clean all plumbing fixtures, sinks and trim and leave all items ready for use by the owner. All floor drains shall be cleaned and manufactures protective coverings shall be removed.

3. DISINFECTION

- (1) The potable water system shall be disinfected prior to use by a method of disinfection in accordance with the Maine Building Code RS 16, P107-27. The potable water purity test result from a Maine certified tester shall be submitted for engineer's review and approval.

4. FIRE STOPPING

- (1) Openings around penetrations through fire resistance rated walls, partitions, floors, or ceilings shall be fire stopped using approved methods. Sealant shall be rated for 3 hours.

2.28 MECHANICAL

A. GENERAL REQUIREMENTS

1. Install all new work in a neat workmanlike manner readily accessible for operation, maintenance and repair.
2. Codes, Permits and Inspections:
 - (1) All work shall comply with requirements of Maine Building Code, local Building Department, Maine DOT, and all authorities having jurisdiction and applicable national, state and local codes, laws and regulations governing or relating to any portion of this work shall be incorporated into and made a part of these specifications. Contractor is to inform engineer of any existing work or materials which violate any of the above laws and regulations. Any work done by the contractor causing such vio-

lation shall be corrected at contractor=s expense by this contractor and at no expense to the owner.

- (2) This contractor shall perform all controlled inspections if required and obtain all equipment use permits as required by state and local authorities. Permits shall be turned over to owner at job completion.

3. Site Verification:

- (1) Prior to submission of the bid, this contractor shall visit the job site to ascertain the actual field conditions as they relate to the work indicated on the drawings and described herein. Discrepancies, if any, shall be brought to the engineer=s attention prior to submission of the bid, and if not resolved to satisfaction, shall be submitted as a written qualification of the bid. Submission of a bid shall be evidence of site verification has been performed as described above.

4. Contract Documents:

- (1) Prior to submission of a the bid, this contractor shall review all drawings of the entire project including general construction, demolition, architectural, mechanical, electrical, plumbing and sprinkler and shall include any work required in the bid which is indicated or implied to be performed by this trade in other sections of the work.
- (2) Drawings are diagrammatic and indicate general arrangement of work and approximate location of equipment. Refer to architectural drawings for all dimensions and coordinate final locations of diffusers, grilles, registers, thermostats, sensors, switches and any wall mounted devices. All work shall be coordinated with other trades to avoid conflict.
- (3) If a conflict occurs in the specifications and/or on the drawings, the more stringent situation shall apply.
- (4) Any equipment, parts, materials, accessories, or labor that is necessary for proper performance of the mechanical work although not specifically mentioned herein or shown on the drawings, shall be furnished and installed without additional costs.

5. Guarantee:

- (1) All materials and workmanship shall be guaranteed for a period of one year from date of final acceptance of this work. Final acceptance shall be defined as the time at which the mechanical work is taken over and accepted by the owner, and is under care, custody, and control of the owner. Engage the services of various manufacturers supplying the equipment for the proper startup and operation of all systems installed. Instruct the owner=s personnel in the proper operation and servicing of the system.
- (2) The contractor shall guarantee to replace or repair promptly and assume responsibility for all expenses incurred for any wOrkmanship and equipment in which defects develop within the guarantee period. This work shall be done as directed by the owner. This guarantee shall include responsibility for all expenses incurred in repairing and replacing work of other trades affected by defects, repairs or replacements in equipment supplied by this contractor.
- (3) This contractor is responsible for the maintenance and operation of all systems until the final acceptance of the work.

- (4) All air conditioning unit compressors and refrigeration components shall have a 5-year warranty.
6. The "General Conditions of the Contract for Construction" AIA Document A201, latest edition, or as required by the architect documents, and/or the structural engineer=s documents, as applicable, are part of this contract.
7. Definitions:
 - (1) Mechanical contractor, AThis Contractor@ - the party or parties have been duly awarded the contract for and are thereby made responsible for the mechanical work as described herein.
 - (2) AThis Contract@, AThe Contract@ - the agreement covering the work to be performed by AThis Contractor@.
 - (3) AApproved@, AEqual@, ASatisfactory@, AAccepted@, AAcceptable@, AEquivalent@ - suitable for use on the project, as determined by the engineer based on documents presented for such determination.
 - (4) AThese Specifications@, AThis Section, Part, Division@ (of the specification) - the document specifying the work to be performed by AThis Contractor@.
 - (5) AThe Mechanical Work@, AThis Work@, - all labor materials, equipment, apparatus, controls, accessories, and other items required for a proper and complete installation by the mechanical contractor.
 - (6) AArchitect@, AEngineer@, AOwner=s Representative@ - the party or parties responsible for interpreting, accepting and otherwise ruling on the performance under this contract.
 - (7) AFurnish@ - purchase and deliver to the project site complete with every necessary appurtenance and support, all as part of the mechanical work.
 - (8) AInstall@ - unload at the delivery point at the site and perform every operation necessary to establish secure mounting installation and correct operation at the proper location in the project, all as part of the mechanical work.
 - (9) AProvide@ - AFurnish@ and AInstall@.
 - (10) ANew@ - manufactured within the past two years and never before used.
 - (11) ARelocate@ - move existing equipment and all accessories as required.
 - (12) ARemove@ - dismantle and cart away from site including all related accessories. All items shall be legally disposed of. All other equipment and operations in any way effected by the removal is to remain in full operation. Provide all necessary components to maintain such operation.

B. SCOPE OF WORK

1. Provide all labor, materials, equipment, and contractor's services necessary for complete, safe installation of all mechanical work. The scope of work shall include but not be limited to the following:
 - (1) Ductwork and ductwork accessories.
 - (2) Air distribution system (air outlets, etc.).
 - (3) Piping and piping accessories including all valving.
 - (4) Equipment (pumps, air conditioning units, fans, etc.)
 - (5) Insulation of piping, equipment and ductwork.
 - (6) Sound attenuators and sound lining.
 - (7) Automatic temperature controls.
 - (8) Testing and balancing.
 - (9) Cutting and patching.
 - (10) Shop drawings.
 - (11) As-built drawings.
 - (12) Operating and maintenance manuals
 - (13) Full coordination with other trades.
 - (14) Warranty and guaranty.
 - (15) Phasing as required by owner, construction manager, general contractor or building management.
 - (16) Premium time for work to be performed after-hours as required by building management and/or owner. Filing, permits, controlled inspections.
 - (17) Full testing and startup of all systems.

C. SHOP DRAWINGS

1. Submit shop drawings certified by all trades that coordination has been completed. Submit all certified equipment cuts with construction wiring diagrams and automatic temperature control requirements. Shop drawings submission shall include, but not be limited to, the following:
 - (1) Ductwork - provide duct shop standards and leakage test certification, as required, and 3/8 scale duct layout.
 - (2) Piping layout and appurtenances - provide piping, valving, chemical treatment, shop standards and 3/8 scale piping layout with all valving.
 - (3) Insulation for ductwork, piping and equipment.
 - (4) Certified air and water balancing report.
 - (5) Equipment catalog cuts for all items to be utilized on project (fans, pumps, ac units, variable frequency drives, VAV boxes, etc.)
 - (6) Air outlets (diffusers, registers, grilles, etc.)
 - (7) Automatic temperature control diagrams, devices and sequence of operation.
 - (8) As-built drawings at project completion of the installed condition of work.
2. The quantity of shop drawings shall as a minimum be four (4) copies of 8-1/2"x11" submissions and one (1) reproducible and one (1) print of all drawings. Specific job requirements may be more stringent and contractor is responsible to obtain requirements from construction manager, general contractor or architect.

D. MAINTENANCE MANUALS

1. Submit four (4) loose-leaf bound operating and maintenance manuals with index and index tabs to include the following:
 - (1) Operating and maintenance instructions on all systems.
 - (2) Manufacturers' catalog cuts on all equipment.

- (3) Automatic temperature control systems with sequence of operations, catalog cuts of all devices and point-to-point wiring diagrams.
- (4) Certified final air and water balancing report.
- (5) Duct and piping as-built drawings with valve chart and key plan drawings inserted in binder.
- (6) All items submitted for review in shop drawing section.

E. AS-BUILT DRAWINGS

1. Contractor shall maintain record drawing prints on job site and record, at time of occurrence, deviations from contract documents due to field coordination, bulletins, or addenda.
2. Contractor shall revise shop drawings to conform to record drawings and submit an as-built condition (piping and ductwork) drawings upon completion of the project. Final submission of reproducible as-built drawings are to be signed and certified by installing contractor that this is the as-built condition of the work.

F. SERVICE AND WARRANTY (MAINTENANCE CONTRACT)

1. This contractor shall provide as an add alternate price, a full one year service and warranty of all mechanical components and systems, with prices for years 2, 3 and 4 following this first year. At the time of acceptance of project, the tenant or owner=s representative will decide to accept which alternate, if any.

G. ACCESS DOORS IN GENERAL CONSTRUCTION

1. This contractor shall submit to the architect for approval a plan indicating the size (minimum 18" x 18") and location of all access doors required for operation and maintenance of all concealed equipment, devices, valves, dampers and controls. Contractor shall arrange for furnishing and installation of all access doors in finished construction and include costs in the bid.

H. PRODUCTS/APPLICATIONS

1. DUCTWORK AND ACCESSORIES

- (1) All ductwork shall be fabricated and installed in accordance with SMACNA HVAC Duct Construction Standards - metal and flexible, 1995 OR latest edition, SMACNA HVAC Air Duct Leakage Test Manual, 1991 OR latest edition, and Maine Building Code (NFPA 90A-1981 modified). The more stringent requirement of any codes shall apply.
- (2) Provide all supporting and hanging devices in accordance Maine Code and SMACNA.
- (3) Ductwork layout and routing is schematic and the mechanical contractor is responsible for all duct size changes and relocations to accommodate space and structural conditions. Offsets and transformations shall preserve the full inside cross-sectional area of ductwork shown on the drawings.
- (4) Ductwork shall have pressure classification, sealing requirements and leakage testing in accordance with SMACNA and as listed below unless otherwise specified or shown on the drawings:

(a) 2" Class: All other low pressure ductwork. Seal Class AC@, Leakage Class 24 (Rectangular) or Class 12 (Round).

(b) Leakage Testing

All testing shall be done in the presence of the engineer or owner=s representative. The contractor is responsible for providing all collars, caps, electric power, etc. necessary to perform the tests. The contractor is also responsible for scheduling the test no less than three (3) business days prior to its intended occurrence. Low pressure ductwork (2" Class) shall be tested on an as-needed basis at the engineer=s direction. Leakage test procedures shall follow the outlines and classifications in the SMACNA HVAC Duct Leakage Test Manual. If specimen fails to meet allotted leakage level, the contractor shall modify to bring it into compliance and shall retest it until acceptable leakage is demonstrated. Tests and necessary repair shall be completed prior to concealment of ducts.

(5) Materials:

(a) Sheet Metal: unless otherwise specified or indicated, ducts shall be constructed of hot-dipped galvanized sheetmetal with G60 Commercial Coating According to ASTM A653 & A924.

(b) Stainless Steel: Provide ductwork of stainless steel construction, where indicated. Ductwork shall be 316/No. 4 finish for exposed duct. 304/No. 1 finish for concealed ducts. Provide for all corrosive exhaust systems including fume hoods.

(c) Aluminum: provide ductwork of aluminum construction, where indicated. Ductwork shall be alloy 3003- H14, of thickness required by the SMACNA duct construction standards. Provide for all ductwork exposed to weather and moisture including outside air ducts within 10 feet of louvers and dishwasher exhaust.

(d) Flexible connections at fans shall be neoprene coated, flame retardant glass fabric (complying with NFPA 90), 30oz./sq. yd. with sewed and cemented seams.

(e) Flexible ductwork shall not be used on this project.

(6) Fabrication:

(a) Conform to SMACNA requirements for metal thickness, reinforcing, joints, and sealing for maximum static pressures involved. All seams and joints shall be sealed and taped.

(b) Elbows shall conform to SMACNA requirements and the following:

Provide long radius type with centerline radius minimum 1.5 times duct width. Provide short radius or square elbows where indicated or where required to fit restricted spaces. Provide double thickness turning vanes on all short radius and mitered elbows. Conform to SMACNA for the number of vanes for fittings.

(c) Branch Connections: Provide 45 degree entry or conical taps. Provide radius type fittings for divided flow branches.

(7) Acoustically Lined Ductwork:

- (d) Provide mat-faced glass duct liner, 1-inch thick -2 lb/cf density. Duct dimensions indicated are clear (net) inside dimensions. For duct velocities greater than 2,000 FPM, face ductliner with 24 gauge perforated aluminum or galvanized steel, fully covering ductliner, and supported 12" on center. Do not externally insulate acoustically lined ductwork. Conform to SMACNA requirements for installation. Provide acoustically lined duct where listed below and/or shown on the drawings:
 - (i) Within minimum 20 feet of all AC unit discharges

(8) Volume Dampers:

- (a) Galvanized steel or same as duct construction. Conform to SMACNA HVAC Duct Construction Standards, 1995 or latest edition, opposed blade type. Provide bearing at both ends of damper rod and quadrant, with lever and lock-screw, at one end. Install with levers accessible through insulation. Splitter damper or air extractors shall not be used on this project.
- (b) Provide manual balancing volume dampers as required to properly balance the air distribution system. If the location of balancing dampers are not defined on the drawings, the following minimum standards shall govern:
 - (i) Low Pressure: All supply air main branches from trunk, each split, and all sub-branches from mains shall be provided with balancing dampers.
 - (ii) Low Pressure: all exhaust and return branches from trunk, each split and all sub-branches from mains shall be provided with balancing dampers.
 - (iii) As noted on plans.

(9) Duct Access Doors

- (a) Conform to SMACNA with piano type hinges, two sash locks and door gaskets. Screwed access panels are not permitted. Provide removable access doors where door swing cannot be accommodated.
- (b) Size: Minimum 20" X 14" except ducts less than 16", one dimension 20" and the other dimension, 2" less than the duct width.
- (c) Provide Access Doors: At entering and leaving sides of coils in ducts; automatic dampers on linkage side, manual volume dampers 2 sq. ft. and larger, fire dampers, smoke dampers, combination fire/ smoke dampers, smoke detection heads, fan bearings enclosed in ducts, suction and discharge sides of ceiling mounted fans, filters, reheat coils, at all equipment requiring access and as indicated on drawings.

(10) Fire Dampers:

- (a) Fusible link fire dampers shall be installed as indicated on drawings and as required by The New York City Building Code. Damper shall be UL listed and labeled and in conformance with NFPA.

- (b) Fire dampers shall be factory fabricated with fusible link shutter type mechanism out of air-stream. The HVAC contractor shall provide an access door at each damper. Damper shall be manufactured by Imperial, Model FD-150 (1 2 HR RATED) or Model FD350 (3HR RATED) AS REQUIRED, TYPE AB®, MEA #300-93-M or approved equal.
- (11) Seal openings around ducts through walls with mineral wool or other non-combustible material. Seal all duct penetrations through walls airtight.
- (12) All ducts exposed to moisture shall be aluminum, sloped and drained and shall not be internally lined.
- (13) Automatic Control Dampers:
 - (a) Provide dampers with parallel blades for 2-position control, or opposed blades for modulating control of constant or variable volume system.
 - (b) Automatic dampers are to be very low leaking type with jamb and blade seals rated for smoke damper application. Construct blades of 16 gauge galvanized steel, provide heavy-duty molded self-lubricating nylon bearings, 1/2" diameter steel axles spaced on 9" centers, blades to be maximum 0" high. Frame shall be constructed of 16 gauge x 4 3/8" galvanized hat shaped steel properly braced with galvanized steel finish and aluminum touch-up.
 - (c) Dampers installed in aluminum ducts shall be aluminum with weatherproof components.
 - (d) Damper to be manufactured by Imperial or approved equal.
- (14) Exposed Ductwork:
 - (a) Where ductwork is indicated to be exposed to view in occupied spaces, provide materials which are free from visual imperfections, including pittings, seam marks, stains, discolorations, and other imperfections. Provide finishes which will allow painting. Provide flat type seams and joints for all exposed duct construction.

2. PIPING AND ACCESSORIES

- (1) Provide all piping, fittings, valves, specialties, thermometers, and pressure gauges required for the operating and maximum pressure and temperature of the piping systems.
- (2) All piping shall be new, standard size, free from scale or rust with ends capped for delivery and storage. Each length of piping shall be properly marked at the mill for proper identification with name or symbol of manufacturer
- (3) Pipe Application Schedule:

SERVICE	SIZE	MATERIAL	WEIGHT	STANDARD	JOINT TYPE
Cold Condensate Drains,	All	Hard Cop-	Type L	ASTM A88	Braze or

SERVICE	SIZE	MATERIAL	WEIGHT	STANDARD	JOINT TYPE
Miscellaneous Drains and Overflows		per			Sliver Solder
Refrigerant (Air Cooled and Commercial Refrigeration)	All	Hard Copper	Type ACR Refrigerant or Type L	ASTM B280 OR ASTM B-88	Braze

(4) Fitting Materials and Application Schedule:

- (a) All fitting joint type shall be the same as the piping joint type required for service, based on the piping application schedule.
- (b) Fitting class shall meet the pressure and temperature requirement of the piping system based on its maximum operating pressure and temperature or test pressure, whichever if more stringent. Pressure and temperature ratings of a fitting shall be determined by its class and the corresponding ANSI Standard.

(c) Fitting Application Table

PIPE MATERIAL	PIPE SIZE (INCHES)	JOINT TYPE	FITTING MATERIAL	FITTINGS CLASS
COPPER TUBING HARD DRAWN TYPE AK@ OR AL@	4" AND SMALLER	SOLDER 95-5 TIN-ANTIMONY ASTM B32 GR 95TA OR	WROUGHT COPPER OR CAST COPPER	300 PSIG AT 100EF, 150 PSIG AT 250EF
		SILVER SOLDER ASTM B32 GR 95TS		
		BRAZING	WROUGHT COPPER	450 PSIG AT 100EF TO 200EF, 150 PSIG AT 250EF
COPPER TUBING HARD DRAWN REFRIGERANT SYSTEMS TYPE ACR	4" AND SMALLER	SOLDER 15-5-80 SILVER PHOSPHOROUS COPPER AWS A5.8 OR BRAZING	WROUGHT COPPER	STANDARD
RED BRASS	ALL SIZES	THREADED	CAST BRONZE	125 AND 250

Provide dielectric fitting at all piping connections joining dissimilar metals, such as steel and copper.

5. Valves:

- (1) Valves shall have name of manufacturer and guaranteed working pressure cast or stamped on bodies. Valves of similar type shall be by a single manufacturer. Valves located 7 feet or more above operating floor or platform shall be provided with chain operated handwheels, rustproof chain and chain guide. Gaskets and packings shall not contain asbestos.

- (2) All valving and valve materials shall be suitable for the operating test and maximum pressure and temperature requirements of the piping system for which they are being utilized.
- (3) All valving shall be rated as follows for each system type:

SYSTEM	PRESSURE RATING
Condensate Drains	150 PSIG
Refrigerant (R410a)	600 PSIG

- (4) Valving shall be as shown on the drawings and include but not be limited to the following:
 - (a) Globe Valves (Stockham)
Swing Check Valves (Stockham)
Ball Valves (Apollo)
Plug Valves (Rockwell-nordstrom)
Strainers (Mueller/muessco)
Vent Valves (Sarco)
Drain Valves (Stockham)
 - (b) All valve manufacturers shall be as listed or approved equal by the engineer.
 - (c) Valves used for throttling or controlling flow shall be globe, ball, or plug type valves. Valves for shut-off or other purpose shall be gate type unless otherwise specified. Butterfly valves shall be lug type and may be substituted for gate valves for sizes 4" and larger. Butterfly valves shall not be used for modulating service or steam service, use only for 2 position isolation on water systems. Ball valves may be substituted for gate and globe valves for sizes up to 2 1/2".
- (5) Control valves refer to automatic temperature control section.

6. Refrigerant Systems:

- (1) Provide all refrigerant piping required for a complete refrigeration system, with all valves, fittings and specialties necessary for satisfactory operation in accordance with ASHRAE standard 15-1994 or latest edition and all authorities having jurisdiction. Refrigeration system shall include all required items for charging, draining and purging the system.
- (2) Joints in refrigeration piping shall be brazed. Refrigerant piping shall be of the size recommended by the manufacturer and as approved by the engineer.
- (3) Horizontal piping of the compressor suction and discharge lines and the condenser discharge lines shall be pitched a minimum of 1/2" in 10', in the direction of refrigerant flow. Each suction gas vertical riser shall be trapped at its evaporator with a trap as recommended by the compressor manufacturer.
- (4) Install refrigerant piping to prevent excessive oil from being trapped in the system. Any additional risers or equalizer lines required by the manufacturer of equipment for the proper system operation shall be installed as part of this contract. Provide a

fully piped oil separator for each refrigerant system as per manufacturer=s recommendations.

- (5) Valves shall be designed for refrigerant service. Shutoff valves shall be brass packless type. Unions, flanged valves or fittings shall be provided for disconnecting equipment, controls, etc., for making repairs. Piping shall be run in a single layer, with each line isolated from another to prevent rubbing. Provision shall be made for expansion and contraction of piping. All piping passing through walls, partitions, etc., shall be furnished with sleeves as required.
 - (6) Refrigerant piping passing through rated floors or demising walls shall be enclosed in a rigid and gas-tight continuous fire-resisting pipe duct or shaft vented to the outside, in accordance with ASHRAE Standard 15-1994 or latest edition. Pipe conduit shall be copper tube type I with soldered fittings.
6. All instrumentation (pressure gauges and thermometers) shall be rated for the same pressure and temperature as piping system and rated specifically for the same service as the piping. Pressure gauges are to be liquid filled with 1% accuracy. Select gauges and thermometers so that the mid-point is at the working pressure and temperature. Instruments to be manufactured by Weiss instruments or approved equal.
 - (1) Provide thermometers in piping as indicated on the drawings and at the inlet and outlet of each hydronic coil, heat exchanger and piece of equipment that involves a differential temperature.
 - (2) Provide pressure gauges in piping as indicated on the drawings and at suction and discharge of each pump and at inlets and outlets of each hydronic coil, heat exchanger and piece of equipment that involves a differential pressure.
 7. All piping to be vented at high points and provided with associated drain valves at low points. Provide automatic air vents with gate valves piped to discharge to nearest drain unless drawings indicate manual air vents.
 8. Provide core drilled openings with pipe sleeves at all slab and shaft penetrations. Provide fireproofing as required to maintain wall, shaft and slab fire ratings.
 9. Provide waterproof sleeves (link seal (ls) type) at all exterior wall, floor penetrations and as required or as noted on plans.
 10. Provide labeling of all piping (both exposed and concealed) in accordance with ansi standards and color coded as per building management standards. Labels to be securely fastened to piping with lettering of sufficient size for easy identification by operating personnel.
 11. All piping to be maintained at highest elevations possible so as not to interfere with existing operations and service/maintenance requirements.
 12. Hangers and Supports:
 - (1) Provide all pipe hangers, hangar rods supports, inserts, attachments, clamps, guides, supplemental steel and anchors as required to install piping system sized to accommodate the system loads. Hangers and supports are to be in accordance with MSS recommendations and to be manufactured by Grinnell or approved equal.
 - (2) Provide insulated protective saddles for insulated piping.

- (3) Piping shall be supported in accordance with recommendations of MSS SP-69 and all applicable codes. All threaded rod is to be galvanized. Provide 2" vertical adjustment for all hangers. Provide additional supports at changes in direction, branch piping over 5 feet, and concentrated loads due to valves, strainers and other accessories.

13. Expansion Compensation:

- (1) All piping shall be installed to compensate for expansion to protect the building, equipment and piping systems. Provide all guides, anchors, expansion loops, supplemental steel and approved type expansion joints as indicated or required for control of expansion.

14. Testing:

(1) General

- (a) Tests shall be conducted after completion and assembly of piping system, before any insulation or paint is applied to joints, including welds and prior to making the system operable. Insulating materials installed prior to the tests shall be removed.
- (b) The mechanical contractor shall provide all necessary temporary piping connections, tees, valves, equipment, and labor to pressure test piping and equipment.
- (c) Equipment that is not to be subjected to the pressure test shall be either disconnected from the system or isolated by a blank or similar means. Valves may be used for this purpose provided that valve closure is suitable for the proposed test pressure.
- (d) Submit to the engineer and owner representative a record of test pressure applied to each piping system.

(2) Refrigerant Piping

- (a) Test refrigerant piping for tightness and leaks under pressure or vacuum. The duration of each test shall be twenty-four (24) hours.
- (b) Test joints in accordance with ASHRAE 15-1994. There shall be no observable leaks or changes in pressure. If either is observed, seal leaks, and repeat test procedures.

15. Water Treatment and Pipe Cleaning:

- (1) New piping systems shall be isolated, cleaned and chemically treated when the installation is completed to remove any construction debris and provide corrosion protection.
- (2) Provide the necessary apparatus, complete with relief valves, isolating valves, check valves, piping, power, wiring, chemicals, feed tanks, and service to provide proper water treatment for the control of scale, corrosion and microbiological growths in the piping systems. All chemicals used shall comply with pollution controls established by all authorities having jurisdiction. Chlorates shall not be used.
- (3) Pipe Cleaning

- (a) Furnish all required pipe cleaning chemicals, portable pumps, chemical feed equipment, materials, and labor necessary to clean all project piping systems.
- (b) Provide a pre-startup non-foaming, liquid detergent dispersant cleaner for cleaning of all systems to remove oil and foreign matter from the piping and equipment prior to the final filling of the systems. Use chemical that is not injurious to persons, piping, pipe joint compounds, packing, coils, valves, pumps and their mechanical seals or other parts of the system. After final fill, perform a chemical test to test that the ph of the new system is within 0.5 of fresh incoming water.
- (c) Provide all bypass piping and valving to isolate all new and existing to be reused equipment (chillers, coils, etc.) from cleaning process.
- (d) The mechanical contractor shall provide all necessary temporary piping connections, tees, valves, equipment and labor to perform pipe cleaning.

I. INSULATION

- 1. All insulation shall meet the requirements of ASTM, NFPA New York State Energy Code and all authorities having jurisdiction. All mechanical insulation, (jacketing, coverings, adhesives, mastics, facings, tapes, etc.), shall have ratings not exceeding a Δ flame spread Δ of 25 or less and Δ smoke developed Δ index of 50 or less.
- 2. Before applying insulation, all pressure and leak tests shall be completed and approved. Furnish and install as per manufacturers requirements.
- 3. Insulation for fittings or accessories requiring servicing or inspection shall have insulation removable and replaceable without damage.
- 4. Pipe Insulation:
 - (1) Fiberglass pipe insulation: one-piece molded sectional fiber glass insulation, conforming to ASTM C-547, Class 1, 2, 3 to 850EF with 4 LB/CU. FT. density with a thermal conductivity of not over 0.23 at 75EF mean. Provide with factory-applied all service jacket and double adhesive self-sealing lap. Cold water pipe insulation jacket shall be of the continuous vapor barrier type. The insulation shall be similar to Owens-corning fiberglass ASJ/SSL-II Pipe insulation.
 - (2) Flexible Elastomeric pipe insulation: one-piece molded sectional Elastomeric insulation, conforming to ASTM C-534, Type I, Tubular Grade 1, , ASTM E 84, NFPA 255, UL 723, NFPA 90A, 90B 3.0-6.0 density with a thermal conductivity of not over 0.27 at 75EF mean. Provide with factory-applied all outdoor service jacket and double adhesive self-sealing lap. Cold water pipe insulation jacket shall be of the continuous vapor barrier type. The insulation shall be similar to Armacell AP/Armaflex Pipe insulation.
 - (3) FOAMGLAS pipe insulation: molded FOAMGLAS pipe insulation, conforming to ASTM C-552, 900EF maximum temperature, asbestos free, shall have a nominal 7.5 lb./cu. Ft. density with a thermal conductivity of not over 0.29 at 70EF mean temperature. Wire on pre-molded section of FOAMGLAS and apply skim coat of finishing cement to smooth out surface of insulation. The insulation shall be similar to Pittsburgh-corning FOAMGLAS.

- (4) Insulation for fittings, flanges, and valves: provide insulation for fittings, flanges, and valves pre-molded, precut, or job fabricated of the same thickness and conductivity as used on adjacent piping.
- (5) Provide insulation for piping, fittings, flanges and valves of the thicknesses listed below:

(ENGINEER NOTE: EDIT AS REQUIRED. TABLE CONFORMS WITH NEW YORK STATE ENERGY CODE, EDIT FOR APPLICABLE CODE)

SERVICE	MATERIAL	INSULATION THICKNESS FOR PIPE SIZES (INCHES)	
		less than 2"	2" OR LARGER
Refrigerant	Flexible Elastomeric	1"	2"
Cold Water Makeup	Flexible Elastomeric	1/2"	1"
Cold Condensate Drains	Flexible Elastomeric	1"	1"

- (6) Outdoor Piping
 - (a) Insulation thickness for outdoor piping: insulation on outdoor piping shall be twice the thickness listed for indoor pipe but not more than 4". Heat traced if used in winter or not drained.
 - (b) Provide jackets made of 0.016" aluminum held with a friction Type, Z-lock and aluminum bands. Provide a moisture barrier lining.
 - (c) Coordinate with electrical contractor for all heat tracing requirements and piping length requirements. Electrical to provide cabling and thermostat.

5. Duct Insulation:

- (1) General
 - (a) Insulation shall be applied with mastics, adhesives, coatings, with covers, weather-protection and other work as required by manufacturer=s recommendations. Do not insulate sound lined ductwork. Materials shall meet requirements of adhesive and sealant council standards and SMACNA.
- (2) Concealed Ductwork
 - (a) Insulate supply and fresh air ducts and plenums in concealed spaces and return duct not in ceiling plenum with at least 1 1/2" thick fibrous glass duct wrap, with foil-kraft flame resistant vapor barrier. R-5 minimum.
- (3) Exposed Ductwork
 - (a) Insulate exposed supply, return and fresh air ducts and exposed plenum with 1" thick, semi-rigid fibrous glass boards with factory applied fire retardant foil reinforced kraft vapor barrier facing. Provide weld pins and vapor seal all joints with tape.

(4) Outdoor Ductwork

- (a) For outdoor ductwork or ductwork exposed to the elements in addition to insulation and finishes specified for indoor ductwork, apply two (2) coats of weatherproof mastic and embed into wet coat two (2) layers of glass cloth over insulation jacket. Smooth membrane to avoid wrinkles and overlap all seams at least 3". Apply a second coat of same coating to the entire surface. Top center of rectangular duct shall pitch to each side to avoid trapping of water in the center. R-8 minimum.

J. ELECTRICAL WORK

1. General:

- (1) Electrical power wiring shall be provided by the electrical contract; control wiring shall be by the HVAC contractor. Control wiring shall be defined as any 12V, 24V, OR 120V wiring installed for purposes other than providing primary electrical power to equipment.
- (2) All electrical control wiring shall comply with Local Electrical Code, all authorities having jurisdiction and the project electrical specifications.
- (3) Mechanical contractor to obtain quantity of controllers required and coordinate with electrical contractor for all operating requirements, interlocks and connections for starters.
- (4) The mechanical contractor shall prepare and submit for approval point to point, completely coordinated wiring diagrams and indicate all source power requirements and all field wiring to be performed by the electrical contractor.

2. Motors:

- (1) Motors shall have the electrical characteristics as listed on the drawings. Coordinate all requirements with electrical contractor. All motors shall comply with NEMA MG-1 standard and shall be of the high efficiency type and meet the 1992 EPA energy efficiency act and utility company rebate requirements.
- (2) Motors for variable frequency drives (VFD) shall be suitable for use with variable frequency drives and comply with NEMA MG-1 Part 31.40.4.2. the mechanical contractor shall be responsible for coordinating all requirements of the motor and VFD manufacturer.
- (3) If contractor elects to substitute or increase motor horsepower over that specified, the cost of motor and electrical changes shall be borne by this contractor.

3. Starters:

- (1) Each motor except as noted, shall be provided with a combination fused disconnect and across-the-line magnetic starter with push button stations mounted on cover. Coordinate requirements with electrical contractor. For automatically or remotely controlled motors, furnish hand off auto (HOA) selector switches in place of the push buttons.
- (2) Furnish manually operated motor starters of the proper size for all motors less than 1/2 HP which are not automatically controlled. Starters for motors 175 Watts or less

shall consist of a snap switch with thermal overload protection where such protection is not an integral part of the motor.

- (3) Combination magnetic starters for all motors shall have thermal overload, pilot light, low voltage protection in all three phases. Include a control transformer for each magnetic starter to provide 120 Volt control power with 3 sets of spare normally closed or normally open contacts.
 - (4) All starters shall be assembled and internally wired with all devices in conformance with NEMA Standards.
 - (5) Disconnect switches are provided by the electrical contractor if not integral with equipment.
4. Enclosures:
- (1) Provide enclosures for starters and VFD=s suitable for operating environment. Enclosure=s shall be NEMA 1 ventilated sheetmetal for indoor application, NEMA 3R with additional gasketing weatherproof raintight enclosure for exposed outdoor service or indoor service exposed to moisture. Provide disconnect switch on enclosure as required for service.

K. VIBRATION ISOLATION PRODUCTS

1. Furnish and install all necessary vibration isolators, vibration hangers, mounting pads, rails, etc., to isolate vibration and sound from being transmitted to the building construction. All vibration isolation products shall be specifically designed for their intended use.
2. Manufacturer of vibration isolation equipment shall have the following responsibilities:
 - (1) Determine vibration isolator sizes and locations.
 - (2) Provide suitable piping and equipment vibration isolation systems.
 - (3) Guarantee specified isolation system attenuation and deflection.
 - (4) Provide installation instructions, drawings and field supervision to assure proper installation and performance. Starters shall be selected to suit motor running and starting characteristics.
3. Isolation systems shall be manufactured by mason industries or approved equal by the engineer.
4. Mounting types:
 - (1) Static deflection of isolators shall be a minimum of 90% efficient. Provide corrosion protection for equipment mounted outdoors.
 - (2) Floor and pad mounting of factory assembled condensing units, - spring isolators (pad mounted equipment type SLR).
 - (3) Mounting of ceiling-supported fans, in-line pumps, heat exchangers, and air handling units - spring isolators - (Type DNHS).
 - (4) Provide flexible connections between all fans and ductwork (refer to ductwork section for specifications).

L. TESTING AND BALANCING

1. General

- (1) Testing and balancing work shall be performed by an independent company (not associated with the HVAC contractor), AABC Certified or as approved by the engineer before commencement of work.
- (2) After all project HVAC work is complete, tested and in full working order, the agency shall perform the balancing and testing of the project heating, ventilating and air conditioning systems.
- (3) Upon the completion of the air conditioning system, the balancing agency shall perform testing and balancing and compile all test data in a certified report and submit four (4) copies for review and approval to the engineer.
- (4) The report shall include design and actual readings for all equipment and location plan indicating where all work has been performed, and methods of balancing and details of instruments used.
- (5) If discrepancies exist in the report that require field verification, the testing and balancing company in the presence of the engineer shall visit the jobsite for field verification of the report.
- (6) After submission of the field verified balancing report, the air balancing company shall return to the job site to perform two (2) occupant comfort balances as directed by the owner or engineer.
- (7) The final report after the comfort balance is to be included in project operating and maintenance manual.
- (8) The testing and balancing agency shall include as part of their work an extended warranty of 90 days after completion of test and balance work. The engineer at his discretion during the warranty period may request a recheck, or resetting of any equipment. The mechanical contractor and the balancing contractor shall provide the necessary technicians to facilitate this work.
- (9) Balancing agency shall permanently mark all adjustment devices (valves, dampers, etc.,) to enable the setting to be restored.

2. Air Balancing

- (1) HVAC contractor shall ensure that a first set of air filters are in place, whenever fans are running and replaced with a new clean set of filters before testing is commenced.
- (2) Test, adjust, replace sheaves, and balance all equipment and air distribution systems to provide air quantities indicated on plans within plus or minus 5 percent.
- (3) Test report shall include, but not be limited to the following:
 - (a) Flow, leakage class, temperature, static pressure of air at all trunk ducts serving areas of work.
 - (b) Temperature of air leaving outlets at two (2) typical air outlets.

- (c) Quantity of air at each air inlet and outlet after balancing.
- (d) Provide for all fans, fan motor hp, amps, volts, fan rpm, cfm, inlet and discharge static pressure, sheave position.
- (e) Provide for all air conditioning units, supply CFM, outside air CFM, return air CFM, mixed air CFM. Provide outside air, mixed air and supply air temperatures (dry bulb - cooling and heating, wet-bulb-cooling.) indicate unit operating mode during test.
- (f) Calibrate all new and existing to be reused terminal boxes (VAV, fan powered or dual duct) as required to meet specified minimum/maximum cfm.
- (g) Listing of design and actual readings as well as all manufacturer=s data for equipment.

M. EQUIPMENT

1. Provide all equipment and accessories of the sizes and capacities as scheduled and as indicated on the drawings.
2. Install equipment in accordance with approved shop drawings, manufacturers recommendations, instructions, and all authorities having jurisdiction.
3. Provide equipment supports and/or mountings as indicated on the drawing, in vibration specification and as follows:
 - (1) Floor mounted equipment - provide dimensions for a 4" concrete housekeeping pad with all required waterproofing to the construction manager.
 - (2) Ceiling mounted equipment - provide supports with approved suitable anchors suspended directly from building steel structure.
 - (3) Provide supplemental steel as required to adequately support the equipment load.
4. Equipment shall be installed with vibration isolation, refer to vibration isolation section.
5. Diffusers, Grilles and Registers:
 - (1) General
 - (a) Grilles, registers and diffusers shall be tested in accordance with ASHRAE Standard 70-1991 or latest edition. The manufacturer shall provide published performance data for all air inlets and outlets to be used on project as part of submission.
 - (b) Mechanical contractor to coordinate the location of diffusers, grilles and registers with other trades and with ceiling and wall construction. The mechanical contractor to verify that all diffusers, grilles and registers are compatible with ceiling construction to which they are to be installed. Coordinate all work with general contractor and refer to architectural drawings for exact location, lengths and for framing and mitering arrangements that may differ from those shown on HVAC drawings. Provide all required general construction, framing, blocking, plastering and supports to match ceiling, soffit or wall construction as part of project.

- (c) Inlets and outlets shall handle air quantities indicated at operating velocities with sound pressure level not to exceed NC-30, unless noted otherwise.
 - (d) Diffusers, grilles and registers shall be installed with faces set level and plumb and mounted tightly against mounting service.
 - (e) All air inlets and outlets to be steel or aluminum if exposed to moisture unless otherwise indicated. Finishes to be selected by architect.
 - (f) Diffusers, grilles and registers shall be manufactured by Titus or Anemostat.
 - (g) Submit for approval a complete schedule of all air inlets and outlets to be used on project including manufacturers models, sizes, performance, accessories, acoustic information, finishes, etc., before release for fabrication. Note any deviations from specifications and schedules shall be indicated on submittal.
- (2) Air Inlet and Outlet Devices
- (a) Provide diffusers, grilles and registers for supply, return and exhaust inlets and outlets, of the size, type, and design indicated on drawings.
 - (b) All supply return and exhaust air inlets and outlets shall be provided with an opposed blade damper and grid (adjustable through the face) for trim balancing.
 - (c) Supply registers shall have two sets of directional control blades.
 - (d) Only 4 way diffusers shall be used, provide blank off sheetmetal baffle for all 1-way, 2-way and 3-way diffusers.
 - (e) All linear diffusers shall be provided with cable operated opposed blade damper adjustable through the face of the diffuser. Dampers and plenum taps shall be spaced at a maximum of 4 feet on center. Provide diffusers with adjustable air pattern control vanes.

N. AUTOMATIC TEMPERATURE CONTROLS

1. General:

- (1) Furnish and install as herein specified, a complete automatic temperature control system of the DDC./Electronic as required manufactured by the HVAC equipment manufacturer or approved equal by the engineer. Manufacturer shall be approved by engineer before commencing work.
- (2) All temperature control systems and components under this subcontract are to be fully modulating type, except where noted otherwise. The system shall be complete in all respects including all associated control equipment, thermostats, control valves, valve actuators, damper operators, relays, pilot positioners, control wiring, control air piping, switches, interlock wiring, electrical or pneumatic control components and associated piping or wiring, appurtenances, etc., to provide the functions described in these specifications and plans, regardless of whether or not said device relay, etc., is specifically mentioned hereafter.
- (3) The system shall be supervised and checked out completely in all respects by competent mechanics, regularly employed by the manufacturer.

- (4) The control systems shall be in accordance with the following description of system operations and/or detail information shown on the plans and as described herein.
 - (5) The manufacturer of the automatic control equipment shall submit the following for approval: a schematic diagram of each control system which shall indicate the proper sequence of operation and range of the controls for all cycles. A complete description of the automatic operation of each system. The description should include the duty of each thermostat, valve, switch, etc., incorporated in the control system with a schedule and illustration of all control instruments and equipment including control panels and devices for each system.
2. Electric Wiring:
- (1) All electrical work (except for motor feeders, wiring between motors, motor controllers, feeder panels, fuses, circuit breakers and bus bars) required for the automatic temperature control system shall be provided by this contractor. Work shall include but not be limited to time switches, damper motors, damper switches, electric thermostats, electric relays, e/p switches, interlocking wiring, wire, conduit, etc.
 - (2) All 115 Volt power required for control purposes shall be provided by the control contractor from a source established by the electrical contractor.
 - (3) The control manufacturer shall include wiring diagrams in his shop drawings submittals fully coordinated with the electrical contractors work. It shall be the automatic temperature control contractor=s responsibility to provide all wiring and conduit as required to achieve the function called for in these specifications, conforming with local codes for material and installation. The electrical specification for the project electrical work is to be followed.
 - (4) Furnish a certificate indicating method of wiring compliance with local codes as part of first shop drawing submittal.
3. Room Thermostat and Switch Locations:
- (1) All room thermostats and switch locations (whether shown on plans or not) shall be selected and submitted by the temperature control manufacturer for approval by the architect and engineer prior to actual installation.
4. Automatic Dampers:
- (1) Provide controls for all the automatic dampers, as specified in the ductwork section, and shown on the drawings.
 - (2) Control motors or actuators shall be of the electronic or pneumatic type, unless otherwise noted, of appropriate size and quantities to provide two-position or proportioning control action as specified. Proportioning type shall be equipped with pilot type positioners. Pilot positioners shall be selected for varied spring ranges and adjustable without dismantling positioner and control motor.
 - (3) Automatic dampers exposed to the elements shall have electric actuators with all required accessories.
5. Control Panels:

- (1) Furnish and install in the mechanical room, as herein specified, control panels of steel, with welded angle iron brackets, for wall or floor mounting.
- (2) The basic background color of the panel shall be as approved by the architect and engineer.
- (3) Panels should be fully enclosed, with hinged locking front door for each panel. The panel shall contain all controllers, relays, switches, etc. provide engraved nameplates to label the controlled equipment and for each panel mounted control device. Plastic laminated control schematic drawings for the system shall be hung at each local control panel.
- (4) Details of each of these panels shall be submitted for approval prior to fabrication. Locations of each panel are to be convenient for adjustment and service and all such locations are to be approved prior to installation.

6. Sequence of Operations:

- (1) The new heat pump units will be provided with the manufacturer=s integrated controls and thermostats. A central controller and individual fan coil specific Thermostat shall be provided.
- (2) The heat pump units shall automatically switch over from heating to cooling based on space demand. The master unit will control the other units with respect to heating or cooling operation.
- (3) The thermostat shall include programmable occupied and unoccupied periods (minimum 2 per day).
- (4) The toilet exhaust fan shall be controlled by a timer switch with button type control selecting between 10 , 20 , 30 and 60 minutes run times.
- (5) The electric baseboard units shall be controlled by the air-conditioning unit thermostats and shall be utilize as a secondary heat source in the event the fan coils cannot provide adequate heat.
- (6) The bathroom wall heater shall be provided with a local thermostat.

O. EXECUTION

1. CHASING, CHOPPING OR CORE DRILLING

- (1) Prior to any chasing, chopping, or core drilling being performed, this contractor shall field investigate existing conditions and coordinate with all appropriate trades and building management to ensure that work will be in harmony with other work and not affect any existing building systems. This work must be approved by building management prior to proceeding.

2. SYSTEM COMMISSIONING

- (2) Prior to full operation, a complete demonstration and testing of the system operating functions and alarms shall be performed by this contractor in the presence of the owner=s representative and engineer. This testing shall take place after having satisfactorily met the requirements of shop drawing acceptance. Commissioning of the systems shall be scheduled before space is occupied leaving enough time to correct

system deficiency=s and after shop drawing acceptance. Upon successful completion of system operation, the contractor shall submit a statement stating that the full operation of all systems, functions and alarms has been demonstrated and are operational as well as a listing of all systems, alarms and functions that have been commissioned. All items shall be submitted for review and acceptance to the owner, owner=s representative and engineer before final acceptance can take place.

2.29 ELECTRICAL

A. GENERAL REQUIREMENTS

1. All work shall comply with requirements of the National Electrical Building Code, State of Maine Building Department, Maine DOT, and all authorities having jurisdiction and applicable national, state and local codes, laws and regulations governing or relating to any portion of this work shall be incorporated into and made a part of these specifications. Contractor is to inform engineer, of any existing work or materials which violate any of the above laws and regulations. Any work done by the contractor causing such violation laws and regulations. Any work done by the contractor causing such violation shall be corrected at contractor=s expense by this contractor and at no expense to the owner.
2. Prior to submission of bid, this contractor shall visit the job site to ascertain the actual field conditions as they relate to the work as indicated on the drawings and described herein. Discrepancies, if any, shall be brought to the engineer=s attention prior to submission of his bid, and if not resolved to satisfaction, shall be submitted as a written qualification of the bid. Submission of a bid shall be evidence that site verification has been performed as described above.
3. Drawings are diagrammatic and indicate general arrangement of work and approximate location of equipment. Refer to architectural drawings for all dimensions and coordinate final locations of switches, light fixtures, receptacles, etc. Work shall be coordinated with other trades to avoid conflicts. If a conflict occurs in the specifications and/or on the drawings, the more stringent situation shall apply.
4. Prior to submission of bid, this contractor shall review all drawings of the entire project including general construction, demolition, architectural, mechanical, electrical, plumbing, and sprinkler and shall include any work required in the bid which is indicated or implied to be performed by this trade in other sections of the work.
5. Any equipment, parts, materials, accessories, or labor that is necessary for proper performance of the electrical work, although not specifically mentioned herein, or shown on the drawings, shall be furnished and installed as if called for in detail without additional cost.
6. All materials and workmanship shall be guaranteed for a period of one year from date of final acceptance of this work. Final acceptance shall be defined as the time at which the electrical work is taken over and accepted by the owner, and is under care, custody, and control of the owner. Engage the services of various manufacturers supplying the equipment for the proper startup and operation and servicing of the equipment.
7. Provide all labor, materials, equipment and contractor=s services necessary for complete, safe installation of all electrical work. The scope of work shall include, but not be limited to the following:
 - a. Installation of light fixtures and lamps including exit and emergency lighting.
 - b. Installation of wall switches, receptacles, voice/data, outlets, etc.
 - c. Installation of new raceway and conductors for lighting and power.

- d. Cutting, channeling and chasing required to accommodate the electrical installation and rough patching.
 - e. Addition or modification of existing electrical distribution equipment.
 - f. Installation of HVAC power wiring and final connections to HVAC equipment.
 - g. Installation of conduit, junction boxes, pull boxes, etc., required for the aforementioned equipment.
 - h. Maintenance and proper operation of existing base building systems within the contract area in accordance with the requirements of building management.
 - i. Temporary light and power during construction.
 - j. Grounding of all equipment as required by code and as specified.
 - k. Modification of existing fire alarm system.
8. This contractor is to obtain a copy of the building rules and regulations prior to bid submission to determine requirements and the extent of premium time work required by building management. For the purpose of the bid, assume any noisy work (e.g., chopping, core drilling, etc.) and base building system interruptions are to be performed outside normal business hours.
- a. The General Conditions of the Contract for Construction@ AIA Document A201 latest edition, or as required by the architects documents and/or the structural engineers documents, as applicable, are part of this contract.
 - b. Submit shop drawings certified by all trades that coordination has been established. Submit all certified equipment cuts with construction wiring diagrams. Provide a minimum of four (4) copies of 8 2 x 11 submissions and one (1) reproducible and one (1) print of all drawings. Specific job requirements may be more stringent and contractor is responsible to obtain requirements from construction manager, general contractor or architect.
 - c. Submit four (4) loose-leaf bound operating and maintenance manuals with index and index tabs to include all shop drawings and operating and maintenance instructions on all systems.
 - d. Contractor shall revise shop drawings to conform to record drawings and submit an as-built condition (devices, equipment, circuitry, etc.), drawings upon completion of the project. Final submission of reproducible as-built drawings are to be signed and certified by installing contractor that this is the as-built condition of the work.
 - e. No substitute material or manufacturer of equipment shall be permitted without a formal written submittal to the engineer which includes all dimensional, performance and material specifications. Any changes in layout, electrical characteristics, structural requirements, or design due to the use of a substitution shall be submitted to the engineer as part of this proposal. The contractor takes full responsibility for the substitution and all changes resulting from substitution.
 - f. This contractor shall submit to the architect for approval, a plan indicating the size and location of all access doors required for operation and maintenance of all concealed equipment, devices, junction boxes, pull boxes, etc. This contractor shall arrange for furnishing and installation of all access doors in finished construction and include costs in the bid.
 - g. Removal, temporary connections and relocation of certain existing work will be necessary for the installation of the new systems. All existing conditions are not completely detailed on the drawings. The contractor shall survey the site and make all necessary changes required based on existing conditions for proper installation of new work.
 - h. Plan installation of new work and connections to existing work to insure minimum interference with regular operation of existing facilities. All system shutdowns affecting other areas shall be coordinated with building management. Provide temporary feeders, circuitry, etc., as required to minimize downtime.

A. ACCEPTABLE MANUFACTURERS

1. PANELBOARDS: Seimans, ITE, Westinghouse, GE or Square AD@
2. DISCONNECT SWITCHES: ITE, Westinghouse, GE or Square AD@
3. CIRCUIT BREAKERS: ITE, Westinghouse, GE or Square AD@
4. FUSES: Bussman, Gould Shawmutt
5. RACEWAY: National Wire Products, Triangle or Republic
6. WIRE/CABLE: Rome Phelps Dogge, General Cable, Simplex
7. METAL CLAD CABLE: AFC
8. JUNCTION/PULL BOXES: Appletown Electric, Crouse Hinds or O.Z./ Gedney Co.
9. TRANSFORMERS: ITE, Westinghouse, GE or Square AD@
10. FIRE STOP MATERIAL: HILTI, 3M (Note: Material must be Acceptable to Local AHJ) FITTINGS, COUPLINGS
11. BUSHINGS,CONNECTORS: OZ Gedney, Burndy, NEPCO, Thomas and Betts
12. LAMPS: GE, Sylvania, Phillips
13. BALLASTS: Motorola, ESB, Universal
14. OCCUPANCY SENSORS: Novitas, Watt Stopper
15. LIGHT SWITCHES: Hubbell, Leviton
16. DIMMER SWITCHES: Lutron T-star (NT/NTLV Series)
17. RECEPTACLES: Hubbell, Leviton

B. PANELBOARDS

1. Panelboard boxes shall be made of sheet steel >bent- up= or riveted or bolted together with exterior angle iron frame. Box shall be of sufficient size to allow a gutter at least 5-3/4" in width entirely surrounding each section of board. Increase gutter size to accommodate feeder size. Panelboards shall be surface or flush type as noted on the drawings. Panel box and cover shall be given two coats of grey enamel paint.
2. Panelboards bus bars shall be proportioned for a current density of 1000 Amperes per square inch of cross sectional area. Provide a copper ground bus in each panel. Provide an isolated ground bar in panel as indicated on panel schedules.
3. Panelboard front cover shall be >door within a door= type. The outer door (trim) shall be attached directly to the back box by a full length piano hinge.
4. Provide typewritten list of loads served by the panelboard on the inside of the door.

C. SWITCHES, FUSES AND CIRCUIT BREAKERS

1. >Quick-break= heavy duty type in NEMA 1 enclosure fused or unfused as indicated on the drawings. Fuses for switches shall be current limiting type with an interrupting capacity of 200,000 RMS Amperes and of the continuous current rating as shown on the drawings.
2. Circuit breakers shall be >thermal magnetic= type, quick-make, quick-break with non-welding contacts compensated for ambient temperatures and shall have a minimum short circuit rating of 10,000 Amperes symmetrical for 120/280V panels.

D. RACEWAY

1. Conduit shall be thin wall tubing (EMT) Sized per drawing 3/4" minimum. (Maximum 3 circuits per homerun except as noted). Metal clad cable (Type MC) is permissible for concealed branch circuitry where permitted by code and building management. Conduit in electrical closets and mechanical space shall be rigid threaded regardless of size.
2. Empty conduit for new communication and data outlets in partitions shall be 1" EMT wall run concealed in walls, terminated and bushed 6" into accessible hung ceiling and directed towards the particular communication/data closet or room. Furnish drag line.

E. WIRE AND CABLE

1. All conductors shall be copper, Type THHN/THWN insulated. All conductors shall have 600 Volt rated insulation, unless otherwise noted. Unless specified all wire #10 AWG and smaller shall be solid. Conductors and 8 AWG and larger shall be stranded.
2. Branch circuit wire size: the minimum wire size for branch circuit shall be No. 12 AWG except 120 volt circuits over 100 feet in length shall be 10 AWG.

F. WIRING DEVICES

1. Wiring devices shall be of the specification grade unless otherwise noted. All devices and plates shall be plumb and flush mounted, unless otherwise noted. Refer to symbol list. Switches shall be 120/277 Volts, rated at 20 Amperes, quiet operation type, color and toggle and devices plates as directed by architect.
2. Dimmer shall be rated at 120 volt, wattage size as required. Finish as directed by architect. Where dimmer switches are located next to single pole or variable speed type switches, the single pole/variable speed switches shall match the dimming switch styles.
3. Standard receptacles shall be 120 Volt, 15 AMP, 2 Pole grounding type.

G. PULL BOXES, JUNCTION BOXES AND OUTLET BOXES

1. Pullboxes, junction boxes and outlet boxes shall be manufactured from galvanized industry standard gauge sheet steel.
2. Provide pull boxes and junction boxes in long straight runs of raceway to assure that cables are not damaged when they are pulled, to fulfill requirements as to the number of

bends permitted in raceway between cable access points, the accessibility of cable joints and splices, and the application of cable supports.

3. Pullboxes and junction boxes shall be sized so that the minimum bending radius criteria specified for the wires and cable are maintained.
4. All equipment, device boxes, junction boxes, pullboxes and outlet boxes shall be installed so as to allow access to the box. If necessary and approved by architect, provide access door or coverplates in areas where unobstructed access is not possible.

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STANDARD DETAIL UPDATES

Standard Details and Standard Detail updates are available at:

http://www.maine.gov/mdot/contractor-consultant-information/ss_standard_details_updates.php

<u>Detail #</u>	<u>Description</u>	<u>Revision Date</u>
203(03)	Backslope Rounding	1/29/08
502(03)	Concrete Curb - Bituminous Wearing Surface	8/08/11
502(03)A	Concrete Curb - Concrete Wearing Surface	2/2/09
502(07)	Precast Concrete Deck Panels - Layout Plan	2/2/09
502(07)A	Precast Concrete Deck Panels - Layout Plan	2/2/09
502(08)	Precast Concrete Deck Panels - Panel Plan	2/2/09
502(09)	Precast Concrete Deck Panels - Blocking Detail	2/2/09
502(10)	Precast Concrete Deck Panels	2/2/09
502(11)	Precast Concrete Deck Panels	2/2/09
502(12)	Precast Concrete Deck Panels - Notes	10/28/09
502(12)A	Precast Concrete Deck Panels - Notes	2/2/09
504(15)	Diaphragms	5/19/11
504(21)	Tension Flange Connection for Diaphragm and Cross Frames	10-11-12
504(22)	Diaphragm & Crossframe Notes	10/11/12
504(23)	Hand-Hold Details	12/08/05
502(24)	Hand-Hold Details	10/11/12
507(04)	Steel Bridge Railing	2/05/03
507(04A)	Steel Bridge Railing	7/3/13
507(09)	Steel Bridge Railing	5/19/11
507(09)A	Steel Bridge Railing	5/19/11

526(06)	Permanent Concrete Barrier	2/2/09
526(08)	Permanent Concrete Barrier – Type IIIA	10/07/10
526(08)A	Permanent Concrete Barrier – Type IIIA	12/07/10
526(13)	Permanent Concrete Barrier – Type IIIB	2/2/09
526(14)	Permanent Concrete Barrier – Type IIIB	2/2/09
526(21)	Concrete Transition Barrier	2/2/09
526(29A)	Concrete Transition Barrier	5/1/13
526(29B)	Concrete Transition Barrier	5/1/13
526(29C)	Concrete Transition Barrier	5/1/13
526(33)	Concrete Transition Barrier	5/1/13
526(39)	Texas Classic Rail – Between Window	2/2/09
526(40)	Texas Classic Rail – Through Window	2/2/09
526(41)	Texas Classic Rail – Through Post	2/2/09
526(42)	Texas Classic Rail – Through Nose	2/2/09
535(01)	Precast Superstructure - Shear Key	10/12/06
535(02)	Precast Superstructure - Curb Key & Drip Notch	5/20/08
535(03)	Precast Superstructure - Shear Key	12/5/07
535(04)	Precast Superstructure - Shear Key	12/05/07
535(05)	Precast Superstructure - Post Tensioning	5/20/08
535(06)	Precast Superstructure - Sections	10/12/06
535(07)	Precast Superstructure - Precast Slab & Box	10/12/06
535(08)	Precast Superstructure - Sections	10/12/06
535(09)	Precast Superstructure - Sections	10/12/06
535(10)	Precast Superstructure - Sections	10/12/06
535(11)	Precast Superstructure - Sections	10/12/06

535(12)	Precast Superstructure - Sections	10/12/06
535(13)	Precast Superstructure - Sections	10/12/06
535(14)	Precast Superstructure - Stirrups	10/12/06
535(15)	Precast Superstructure - Plan	10/12/06
535(16)	Precast Superstructure - Reinforcing	10/12/06
535(17)	Precast Superstructure - Notes	12/05/07
604(01)	Catch Basins	11/16/05
604(05)	Type "A" & "B" Catch Basin Tops	11/16/05
604(06)	Type "C" Catch Basin Tops	11/16/05
604(07)	Manhole Top "D"	11/16/05
604(09)	Catch Basin Type "E"	11/16/05
604(18)	Utility Structures	11/29/13
606(02)	Multiple Mailbox Support	11/16/05
606(03)	Guardrail Standard Detail	9/19/12
606(07)	Reflectorized Beam Guardrail Delineator Details	11/16/05
606(20)	Guardrail - Type 3 - Single Rail - Bridge Mounted	2/2/09
606(21)	Guardrail - Type 3 - Single Rail - Bridge Mounted	2/2/09
606(22)	Guardrail - Type 3 - Single Rail - Bridge Mounted	2/2/09
606(23)	Guardrail - Type 3 - Single Rail - Bridge Mounted	2/2/09
609(03)	Curb Type 3	6/27/06
609(06)	Vertical Bridge Curb	2/12/09
609(07)	Curb Type 1	6/27/06
609(08)	Precast Concrete Transition Curb	2/2/09

610(02)	Stone Scour Protection	8/9/11
610(03)	Stone Scour Protection	5/19/11
610(04)	Stone Scour Protection	5/19/11
620(05)	Geotextile Placement for Protection of Slopes Adjacent to Stream & Tidal Areas	5/19/11
626(09)	Electrical Junction Box for Traffic Signals and Lighting	8/27/10
645(06)	H-Beam Posts – Highway Signing	7/21/04
645(09)	Installation of Type II Signs	7/21/04
801(01)	Drives on Sidewalk Sections	12/13/07
801(02)	Drives on Non-Sidewalk Sections	12/13/07

SUPPLEMENTAL SPECIFICATION
(Corrections, Additions, & Revisions to Standard Specifications - Revision of December 2002)

SECTION 101
CONTRACT INTERPRETATION

101.2 Definitions

Closeout Documentation Replace the sentence “A letter stating the amount..... DBE goals.” with “DBE Goal Attainment Verification Form”

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

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

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

SECTION 102
DELIVERY OF BIDS

102.7.1 Location and Time Add the following sentence “As a minimum, the Bidder will submit a Bid Package consisting of the Notice to Contractors, the completed Acknowledgement of Bid Amendments form, the completed Schedule of Items, 2 copies of the completed Agreement, Offer, & Award form, a Bid Bond or Bid Guarantee, and any other Certifications or Bid Requirements listed in the Bid Book.”

102.11.1 Non-curable Bid Defects Replace E. with “E. The unit price and bid amount is not provided or a lump sum price is not provided or is illegible as determined by the Department.”

SECTION 103
AWARD AND CONTRACTING

103.3.1 Notice and Information Gathering Change the first paragraph to read as follows: “After Bid Opening and as a condition for Award of a Contract, the Department may require an Apparent Successful Bidder to demonstrate to the Department’s satisfaction that the Bidder is responsible and qualified to perform the Work.”

SECTION 104
GENERAL RIGHTS AND RESPONSIBILITIES

104.3.14 Interpretation and Interpolation In the first sentence, change “...and Geotechnical Information.” to “...Environmental Information, and Geotechnical Information.”

SECTION 105 GENERAL SCOPE OF WORK

Delete the entire Section 105.6 and replace with the following:

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

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

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

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

105.6.3 Survey Quality Assurance It is the Department's prerogative to perform construction survey quality assurance. Construction survey quality assurance may, or may not, be performed by the Department. Construction survey quality assurance is generally defined as an independent check of the construction survey quality control. The construction survey

quality assurance process may involve physically checking the Contractor's construction survey layout using independent survey data, or may simply involve reviewing the construction survey quality control written documentation. If the Department elects to physically check the Contractor's survey layout, the Contractor's designated surveyor may be required to be present. The Department will provide a minimum notice of 48 hours to the Contractor, whenever possible, if the Contractor's designated surveyor's presence is required. Any errors discovered through the quality assurance process shall be corrected by the Contractor, at no additional cost to the Department.

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

SECTION 106 QUALITY

106.4.3 Testing Change the first sentence in paragraph three from "...maintain records of all inspections and tests." to "...maintain original documentation of all inspections, tests, and calculations used to generate reports."

106.6 Acceptance Add the following to paragraph 1 of A: "This includes Sections 401 - Hot Mix Asphalt, 402 - Pavement Smoothness, and 502 - Structural Concrete - Method A - Air Content."

Add the following to the beginning of paragraph 3 of A: "For pay factors based on Quality Level Analysis, and"

106.7.1 Standard Deviation Method Add the following to F: "Note: In cases where the mean of the values is equal to either the USL or the LSL, then the PWL will be 50 regardless of the computed value of s."

Add the following to H: "Method C Hot Mix Asphalt: $PF = [55 + (Quality\ Level * 0.5)] * 0.01$ "

SECTION 107 TIME

107.3.1 General Add the following: "If a Holiday occurs on a Sunday, the following Monday shall be considered a Holiday. Sunday or Holiday work must be approved by the Department, except that the Contractor may work on Martin Luther King Day, President's Day, Patriot's Day, the Friday after Thanksgiving, and Columbus Day without the Department's approval."

107.7.2 Schedule of Liquidated Damages Replace the table of Liquidated Damages as follows:

From More Than	Up to and Including	Amount of Liquidated Damages per Calendar Day
\$0	\$100,000	\$225

\$100,000	\$250,000	\$350
\$250,000	\$500,000	\$475
\$500,000	\$1,000,000	\$675
\$1,000,000	\$2,000,000	\$900
\$2,000,000	\$4,000,000	\$1,000
\$4,000,000	and more	\$2,100

SECTION 108
PAYMENT

Remove Section 108.4 and replace with the following:

“108.4 Payment for Materials Obtained and Stored Acting upon a request from the Contractor and accompanied by bills or receipted bills, the Department will pay for all or part of the value of acceptable, non-perishable Materials that are to be incorporated in the Work, including Materials that are to be incorporated into the Work, not delivered on the Work site, and stored at places acceptable to the Department. Examples of such Materials include steel piles, stone masonry, curbing, timber and lumber, metal Culverts, stone and sand, gravel, and other Materials. The Department will not make payment on living or perishable Materials until acceptably planted in their final locations.

If payment for Materials is made to the Contractor based on bills, only, then the Contractor must provide receipted bills to the Department for these Materials within 14 days of the date the Contractor receives payment for the Materials. Failure of the Contractor to provide receipted bills for these Materials within 14 days of the date the Contractor receives payment will result in the paid amount being withheld from the subsequent progress payment, or payments, until such time the receipted bills are received by the Department.

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

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

SECTION 109
CHANGES

109.1.1 Changes Permitted Add the following to the end of the paragraph: “There will be no adjustment to Contract Time due to an increase or decrease in quantities, compared to those estimated, except as addressed through Contract Modification(s).”

109.1.2 Substantial Changes to Major Items Add the following to the end of the paragraph: “Contract Time adjustments may be made for substantial changes to Major Items when the change affects the Critical Path, as determined by the Department”

109.4.4 Investigation / Adjustment Third sentence, delete the words “subsections (A) - (E)”

109.5.1 Definitions - Types of Delays

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

109.7.2 Basis of Payment Replace with the following: “Adjustments will be established by mutual Agreement based upon Unit or Lump Sum Prices. These agreed Unit or Lump Sum prices will be full compensation and no additions or mark-ups are allowed. If Agreement cannot be reached, the Contractor shall accept payment on a Force Account basis as provided in Section 109.7.5 - Force Account Work, as full and complete compensation for all Work relating to the Equitable Adjustment.”

109.7.3 Compensable Items Delete this Section entirely.

109.7.4 Non-Compensable Items Replace with the following: “The Contractor is not entitled to compensation or reimbursement for any of the following items:

- A. Total profit or home office overhead in excess of 15%,
- B.”

109.7.5 Force Account Work

C. Equipment

Paragraph 2, delete sentence 1 which starts; “Equipment leased....”

Paragraph 6, change sentence 2 from “The Contractor may furnish...” to read “If requested by the Department, the Contractor will produce cost data to assist the Department in the establishment of such rental rate, including all records that are relevant to the Actual Costs including rental Receipts, acquisition costs, financing documents, lease Agreements, and maintenance and operational cost records.”

Add the following paragraph; “Equipment leased by the Contractor for Force Account Work and actually used on the Project will be paid for at the actual invoice amount plus 10% markup for administrative costs.”

Add the following section;

“F. Subcontractor Work When accomplishing Force Account Work that utilizes Subcontractors, the Contractor will be allowed a maximum markup of 5% for profit and overhead on the Subcontractor’s portion of the Force Account Work. If the Department does not accept the Subcontractor quote, then the Subcontractor work will be subject to the Force Account provisions with a 5% markup for profit & overhead..”

SECTION 110

INDEMNIFICATION, BONDING, AND INSURANCE

Delete the entire Section 110.2.3 and replace with the following:

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

The bond shall be in the full amount for all Pay Items for work pursuant to Sec 621, Landscape, payable to the “Treasurer - State of Maine,” and on the Department’s forms, on exact copies thereof, or on forms that do not contain any significant variations from the Department’s forms as solely determined by the Department.

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

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

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

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

SECTION 202 REMOVING STRUCTURES AND OBSTRUCTIONS

202.02 Removing Buildings Make the following change to the last sentence in the final paragraph, change “...Code of Maine Regulations 401.” to “...Department of Environmental Protection Maine Solid Waste Management Rules, 06-096 CMR Ch. 401, Landfill Siting, Design and Operation.”

SECTION 203 EXCAVATION AND EMBANKMENT

203.01 Description Under b. Rock Excavation; add the following sentence: “The use of perchlorate is not allowed in blasting operations.”

Delete the entire Section 203.041 and replace with the following:

“203.041 Salvage of Existing Hot Mix Asphalt Pavement All existing hot mix asphalt pavement designated to be removed under this contract must be salvaged for utilization. Existing hot mix asphalt pavement material shall not be deposited in any waste area or be placed below subgrade in any embankment.

Methods of utilization may be any of the following:

1. Used as a replacement for untreated aggregate surface course on entrances provided the material contains no particles greater than 50 mm [2 in] in any dimension. Payment will be made under Pay Item 411.09, Untreated Aggregate Surface Course or 411.10, Untreated Aggregate Surface Course, Truck Measure. Material shall be placed, shaped, compacted and stabilized as directed by the Resident.

2. Used as the top 3” of gravel. Recycled Asphalt Pavement (RAP) shall be process to 1½” minus and blending will not be allowed. When this method is utilized, a surcharge will not be required

3. Stockpiled at commercial or approved sites for commercial or MaineDOT use.

4. Other approved methods proposed by the Contractor, and approved by the Resident which will assure proper use of the existing hot mix asphalt pavement.

The cost of salvaging hot mix asphalt material will be included for payment under the applicable pay item, with no additional allowances made, which will be full compensation for removing, temporarily stockpiling, and rehandling, if necessary, and utilizing the material in entrances or other approved uses, or stockpiling at an approved site as described above. The material will also be measured and paid for under the applicable Pay Item if it is reused for aggregate in entrances, or other approved uses.”

SECTION 502 STRUCTURAL CONCRETE

502.05 Composition and Proportioning; TABLE #1; NOTE #2; third sentence; Change “...alcohol based saline sealer...” to “alcohol based silane sealer...”. Add NOTE #6 to Class S Concrete.

502.0502 Quality Assurance Method A - Rejection by Resident Change the first sentence to read: “For an individual subplot with test results failing to meet the criteria in Table #1, or if the calculated pay factor for Air Content is less than 0.80.....”

502.0503 Quality Assurance Method B - Rejection by Resident Change the first sentence to read: “For material represented by a verification test with test results failing to meet the criteria in Table #1, the Department will.....”

502.0505 Resolution of Disputed Acceptance Test Results Combine the second and third sentence to read: “Circumstances may arise, however, where the Department may

502.10 Forms and False work

D. Removal of Forms and False work 1., First paragraph; first, second, and third sentence; replace “forms” with “forms and false work”

502.11 Placing Concrete

G. Concrete Wearing Surface and Structural Slabs on Precast Superstructures Last paragraph; third sentence; replace “The temperature of the concrete shall not exceed 24° C [75° F] at the time of placement.” with “The temperature of the concrete shall not exceed 24° C [75° F] at the time the concrete is placed in its final position.”

502.15 Curing Concrete First paragraph; replace the first sentence with the following; “All concrete surfaces shall be kept wet with clean, fresh water for a curing period of at least 7 days after concrete placing, with the exception of vertical surfaces as provided for in Section 502.10 (D) - Removal of Forms and False work.”

Second paragraph; delete the first two sentences.

Third paragraph; delete the entire paragraph which starts “When the ambient temperature....”

Fourth paragraph; delete “approved” to now read “...continuously wet for the entire curing period...”

Fifth paragraph; second sentence; change “...as soon as it is possible to do so without damaging the concrete surface.” to “...as soon as possible.”

Seventh paragraph; first sentence; change “...until the end of the curing period.” to “...until the end of the curing period, except as provided for in Section 502.10(D) - Removal of Forms and False work.”

502.19 Basis of Payment First paragraph, second sentence; add "pier nose armor" to the list of items included in the contract price for concrete.

SECTION 503

REINFORCING STEEL

503.06 Placing and Fastening Change the second paragraph, first sentence from: “All tack welding shall be done in accordance with Section 504, Structural Steel.” to “All tack welding shall be done in accordance with AWS D1.4 Structural Welding Code - Reinforcing Steel.”

SECTION 504

STRUCTURAL STEEL

504.09 Facilities for Inspection Add the follow as the last paragraph: “Failure to comply with the above requirements will be consider to be a denial to allow access to work by the Contractor. The Department will reject any work done when access for inspection is denied.”

504.18 Plates for Fabricated Members Change the second paragraph, first sentence from: “...ASTM A 898/A 898 M...” to “...ASTM A 898/A 898 M or ASTM A 435/A 435 M as applicable and...”

504.31 Shop Assembly Add the following as the last sentence: “The minimum assembly length shall include bearing centerlines of at least two substructure units.”

504.64 Non Destructive Testing-Ancillary Bridge Products and Support Structures Change the third paragraph, first sentence from “One hundred percent...” to “Twenty five percent...”

SECTION 535

PRECAST, PRESTRESSED CONCRETE SUPERSTRUCTURE

535.02 Materials Change “Steel Strand for Concrete Reinforcement” to “Steel Strand.” Add the following to the beginning of the third paragraph; “Concrete shall be Class P conforming to the requirements in this section. 28 day compressive strength shall be as stated on the plans. Coarse aggregate....”

535.05 Inspection Facilities Add the follow as the last paragraph: “If the above requirements are not met, the Contractor shall be considered to be in violation of Standard Specification 104.2.5 – Right to Inspect Work. All work occurring during a violation of this specification will be rejected.”

535.26 Lateral Post-Tensioning Replace the first paragraph; “A final tension...” with “Overstressing strands for setting losses cannot be accomplished for chuck to chuck lengths of 7.6 m [25 ft] and less. In such instances, refer to the Plans for all materials and methods. Otherwise, post-tensioning shall be in accordance with PCI standards and shall provide the anchorage force noted in the Plans. The applied jacking force shall be no less than 100% of the design jacking force.”

SECTION 603

PIPE CULVERTS AND STORM DRAINS

603.0311 Corrugated Polyethylene Pipe for Option III Replace the Minimum Mandrel Diameter Table with the following:

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

SECTION 604

MANHOLES, INLETS, AND CATCH BASINS

604.02 Materials Add the following:

“Tops and Traps

712.07

Corrugated Metal Units	712.08
Catch Basin and Manhole Steps	712.09”

SECTION 605
UNDERDRAINS

605.05 Underdrain Outlets Make the following change:

In the first paragraph, second sentence, delete the words “metal pipe”.

SECTION 606
GUARDRAIL

606.02 Materials Delete the entire paragraph which reads “The sole patented supplier of multiple mailbox...” and replace with “Acceptable multiple mailbox assemblies shall be listed on the Department’s Approved Products List and shall be NCHRP 350 tested and approved.” Delete the entire paragraph which reads “Retroreflective beam guardrail delineators...” and replace with “Reflectorized sheeting for Guardrail Delineators shall meet the requirements of Section 719.01 - Reflective Sheeting. Delineators shall be fabricated from high-impact, ultraviolet and weather resistant thermoplastic.

606.09 Basis of Payment First paragraph; delete the second and third sentence in their entirety and replace with “Butterfly-type guardrail reflectorized delineators shall be mounted on all W-beam guardrail at an interval of every 10 posts [62.5 ft] on tangents sections and every 5 posts [31.25 ft] on curved sections as directed by the Resident. On divided highways, the delineators shall be yellow on the left hand side and silver/white on the right hand side. On two-way roadways, the delineators shall be silver/white on the right hand side. All delineators shall have retroreflective sheeting applied to only the traffic facing side. Reflectorized guardrail delineators will not be paid for directly, but will be considered incidental to the guardrail items.”

SECTION 609
CURB

609.04 Bituminous Curb f., Delete the requirement “Color Natural (White)”

SECTION 610
STONE FILL, RIPRAP, STONE BLANKET,
AND STONE DITCH PROTECTION

Add the following paragraph to Section 610.02:

“Materials shall meet the requirements of the following Sections of Special Provision 703:

Stone Fill	703.25
Plain and Hand Laid Riprap	703.26
Stone Blanket	703.27
Heavy Riprap	703.28

Definitions

703.32”

Add the following paragraph to Section 610.032.a.

“Stone fill and stone blanket shall be placed on the slope in a well-knit, compact and uniform layer. The surface stones shall be chinked with smaller stone from the same source.”

Add the following paragraph to Section 610.032.b:

“Riprap shall be placed on the slope in a well-knit, compact and uniform layer. The surface stones shall be chinked with smaller stone from the same source.”

Add the following to Section 610.032: “Section 610.032.d. The grading of riprap, stone fill, stone blanket and stone ditch protection shall be determined by the Resident by visual inspection of the load before it is dumped into place, or, if ordered by the Resident, by dumping individual loads on a flat surface and sorting and measuring the individual rocks contained in the load. A separate, reference pile of stone with the required gradation will be placed by the Contractor at a convenient location where the Resident can see and judge by eye the suitability of the rock being placed during the duration of the project. The Resident reserves the right to reject stone at the job site or stockpile, and in place. Stone rejected at the job site or in place shall be removed from the site at no additional cost to the Department.”

SECTION 615

LOAM

615.02 Materials Make the following change:

Organic Content

Humus

Percent by Volume

“5% - 10%”, as determined by Ignition Test

SECTION 618

SEEDING

618.01 Description Change the first sentence to read as follows: “This work shall consist of furnishing and applying seed” Also remove “,and cellulose fiber mulch” from 618.01(a).

618.03 Rates of Application In 618.03(a), remove the last sentence and replace with the following: “These rates shall apply to Seeding Method 2, 3, and Crown Vetch.”

In 618.03(c) “1.8 kg [4 lb]/unit.” to “1.95 kg [4 lb]/unit.”

618.09 Construction Method In 618.09(a) 1, sentence two, replace “100 mm [4 in]” with “25 mm [1 in] (Method 1 areas) and 50 mm [2 in] (Method 2 areas)”

618.15 Temporary Seeding Change the Pay Unit from Unit to Kg [lb].

SECTION 620

GEOTEXTILES

620.03 Placement Section (c)

Title: Replace “Non-woven” in title with “Erosion Control”.

First Paragraph: Replace first word “Non-woven” with “Woven monofilament”.
Second Paragraph: Replace second word “Non-woven” with “Erosion Control”.

620.07 Shipment, Storage, Protection and Repair of Fabric Section (a)

Replace the second sentence with the following: “Damaged geotextiles, as identified by the Resident, shall be repaired immediately.”

620.09 Basis of Payment

Pay Item 620.58: Replace “Non-woven” with “Erosion Control”

Pay Item 620.59: Replace “Non-woven” with “Erosion Control”

SECTION 621
LANDSCAPING

621.0036 Establishment Period In paragraph 4 and 5, change “time of Final Acceptance” to “end of the period of establishment”. In Paragraph 7, change “Final Acceptance date” to “end of the period of establishment” and change “date of Final Acceptance” to “end of the period of establishment”.

SECTION 626
HIGHWAY SIGNING

626.034 Concrete Foundations Add to the following to the end of the second paragraph: “Pre-cast and cast-in-place foundations shall be warranted against leaning and corrosion for two years after the project is completed. If the lean is greater than 2 degrees from normal or the foundation is spalling within the first two years, the Contractor shall replace the foundation at no extra cost.”

SECTION 627
PAVEMENT MARKINGS

627.10 Basis of Payment Add to the following to the end of the third paragraph: “If allowed by Special Provision, the Contractor may utilize Temporary Bi-Directional Yellow and White(As required) Delineators as temporary pavement marking lines and paid for at the contract lump sum price. Such payment will include as many applications as required and removal.”

SECTION 637
DUST CONTROL

637.06 Basis of Payment Add the following after the second sentence of the third paragraph: “Failure by the Contractor to follow Standard Specification or Special Provision - Section 637 and/or the Contractor’s own Soil Erosion and Pollution Control Plan concerning Dust Control and/or the Contractor’s own Traffic Control Plan concerning Dust Control and/or visible evidence of excessive dust problems, as determined by the Resident, will result in a reduction in payment, computed by reducing the Lump Sum Total by 5% per occurrence per day. The Department’s Resident or any other representative of the Department reserves the right to

suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item. Additional penalties may also be assessed in accordance with Special Provision 652 - Work Zone Traffic Control and Standard Specification 656 - Temporary Soil Erosion and Water Pollution Control.”

SECTION 639 ENGINEERING FACILITIES

639.04 Field Offices Change the forth to last paragraph from: “The Contractor shall provide a fully functional desktop copier...” to “....desktop copier/scanner...”

Description Change “Floor Area” to “Floor Area (Outside Dimension)”. Change Type B floor area from “15 (160)” to “20 (217)”.

639.09 Telephone Paragraph 1 is amended as follows:

“The contractor shall provide **two** telephone lines and two telephones,....”

Add- “In addition the contractor will supply one computer broadband connection, modem lease and router. The router shall have wireless access and be 802.11n or 802.11g capable and wireless. The type of connection supplied will be contingent upon the availability of services (i.e. DSL or Cable Broadband). It shall be the contractor’s option to provide dynamic or static IP addresses through the service. **The selected service will have a minimum downstream connection of 1.5 Mbps and 384 Kbps upstream.** The contractor shall be responsible for the installation charges and all reinstallation charges following suspended periods. Monthly service and maintenance charges shall be billed by the Internet Service Provider (ISP) directly to the contractor.”

SECTION 652 MAINTENANCE OF TRAFFIC

652.2.3 Flashing Arrow Board Delete the existing 5 paragraphs and replace with the following: Flashing Arrow Panels (FAP) must be of a type that has been submitted to AASHTO’s National Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportations’ Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels.

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

FAP elements shall be capable of at least a 50 percent dimming from full brilliance. Full brilliance should be used for daytime operation and the dimmed mode shall be used for nighttime operation. FAP shall be at least 2.4 M x 1.2 M [96” x 48”] and finished in non-

reflective black. The FAP shall be interpretable for a distance not less than 1.6 km [1 mile].

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

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

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

Controller and battery compartments shall be enclosed in lockable, weather-tight boxes. The FAP shall be mounted on a pneumatic-tired trailer or other suitable support for hauling to various locations, as directed. The minimum mounting height of an arrow panel should be 2.1 M [7 feet] from the roadway to the bottom of the panel.

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

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

652.2.4 Other Devices Delete the last paragraph and add the following:

“652.2.5 Portable Changeable Message Sign Trailer mounted Portable Changeable Message Signs (PCMS) must be of a type that has been submitted to AASHTO’s National Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportation’s Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels. The PCMS unit shall meet or exceed the current specifications of the Manual on Uniform Traffic Control Devices (MUTCD), 6F.55.

The front face of the sign should be covered with a low-glare protective material. The color of the LED elements shall be amber on a black background. The PCMS should be visible from a distance of 0.8 km [0.5 mile] day and night and have a minimum 15° viewing angle. Characters must be legible from a distance of at least 200 M [650 feet].

The message panel should have adjustable display rates (minimum of 3 seconds per phase), so that the entire message can be read at least twice at the posted speed, the off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed. Each message shall consist of either one or two phases. A phase shall consist of up to eight characters per line. The unit must be capable of displaying at least three lines of text with eight characters per line. Each character shall be 457 mm [18”] high. Each character module shall use at least a five wide and seven high pixel matrix. The text of the messages shall not scroll or travel horizontally or vertically across the face of the sign.

Units shall automatically adjust their brightness under varying light conditions to maintain legibility.

The control system shall include a display screen upon which messages can be reviewed before being displayed on the message sign. The control system shall be capable of maintaining memory when power is unavailable. Message must be changeable with either a notebook computer or an on-board keypad. The controller shall have the capability to store a minimum of 200 user-defined and 200 pre-programmed messages. Controller and battery compartments shall be enclosed in lockable, weather-tight boxes.

PCMS units shall have the capability of being made programmable by means of wireless communications. PCMS units shall also be fully capable of having an on-board radar system installed if required for a particular application.

PCMS' primary power source shall be solar with a battery back-up to provide continuous operation when failure of the primary power source occurs. Batteries must be capable of being charged from a 110 volt AC power source. The unit must also be capable of being operated solely from a 110 volt AC power source and be equipped with a cable for this purpose.

The PCMS shall be mounted on a trailer in such a way that the bottom of the message sign panel shall be a minimum of 2.1 M [7 ft] above the roadway in urban areas and 1.5 M [5 ft] above the roadway in rural areas when it is in the operating mode. PCMS trailers should be of a heavy duty type with a 51 mm [2"] ball hitch and a minimum of four leveling jacks (at each corner). The sign shall be capable of being rotated 360° relative to the trailer. The face of the trailer shall be delineated on a permanent basis by affixing retro-reflective material, known as conspicuity material, in a continuous line as seen by oncoming drivers."

652.3.3 Submittal of Traffic Control Plan In item e. change "A list of all certified flaggers..." to "A list of all the Contractor's certified flaggers..."

Change a. in the list of requirements to: "a. The name, telephone number, and other contact numbers (cellular phone, pager, if any) of the Contractor's Traffic Control Supervisor (the person with overall responsibility for following the TCP), who has received Work Zone Traffic Control Training commensurate with the level of responsibility shown in the requirements of the Contract, and who is empowered to immediately resolve any work zone traffic control deficiencies or issues. Provide documentation that the Traffic Control Supervisor has completed a Work Zone Traffic Control Training Course (AGC, ATSSA, or other industry-recognized training), and a Supervisory refresher training every 5 years thereafter. Submit the course name, training entity, and date of training.

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

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

The Traffic Control Supervisor, or designee directly overseeing physical installation, adjustment, and dismantling of work zone traffic control, will ensure all personnel performing

those activities are trained to execute the work in a safe and proper manner, in accordance with their level of decision-making and responsibility.”

Add the follow to the list of requirements: “k. The plan for unexpected nighttime work along with a list of emergency nighttime equipment available on-site.”

In the last paragraph add the following as the second sentence: “The Department will review and provide comments to the Contractor within 14 days of receipt of the TCP.” Add the following as the last sentence: “The creation and modification of the TCP will be considered incidental to the related 652 items.”

652.3.5 Installation of Traffic Control Devices In the first paragraph, first sentence; change “Signs shall be erected...” to “Portable signs shall be erected..” In the third sentence; change “Signs must be erected so that the sign face...” to “Post-mounted signs must also be erected so that the sign face...”

652.4 Flaggers Replace the first paragraph with the following; “The Contractor shall furnish flaggers as required by the TCP or as otherwise specified by the Resident. All flaggers must have successfully completed a flagger test approved by the Department and administered by a Department-approved Flagger-Certifier who is employing that flagger. All flaggers must carry an official certification card with them while flagging that has been issued by their employer. Flaggers shall wear safety apparel meeting ANSI 107-2004 Class 2 risk exposure that clearly identifies the wearer as a person, and is visible at a minimum distance of 300 m [1000 ft], and shall wear a hardhat with 360° retro-reflectivity. For nighttime conditions, Class 3 apparel, meeting ANSI 107-2004, shall be worn along with a hardhat with 360° retro-reflectivity. Retro-reflective or flashing SLOW/STOP paddles shall be used, and the flagger station shall be illuminated to assure visibility in accordance with 652.6.2.”

Second paragraph, first sentence; change “...have sufficient distance to stop before entering the workspace.” to “...have sufficient distance to stop at the intended stopping point.” Third sentence; change “At a spot obstruction...” to “At a spot obstruction with adequate sight distance,...”

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

Add the following:

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

When lane shifts or lane closures require traffic to cross a permanent longitudinal rumble strip for more than 7 calendar days, the Contractor shall pave in the rumble strips in the area that

traffic will cross, unless otherwise directed by the Resident. Rumble strips shall be replaced prior to the end of the project, when it is no longer necessary to cross them.”

652.6 Nightwork Delete this section entirely and replace with the following:

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

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

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

The Contractor shall have available portable floodlights for special areas.

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

The Contractor shall submit, as a subset of the Traffic Control Plan, a lighting plan at the Preconstruction Conference, showing the type and location of lights to be used for night work. The Resident may require modifications be made to the lighting set up in actual field conditions.

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

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

Night Work lighting requirements:

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

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

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

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

All workers shall wear safety apparel labeled as meeting the ANSI 107-2004 standard performance for Class 3 risk exposure.

The Contractor shall apply 2- inch wide retro-reflective tape, with alternating red and white segments, to outline the front back and sides of construction vehicles and equipment, to define their shape and size to the extent practicable. Pickup trucks and personal vehicles are exempt from this requirement. The Contractor shall furnish approved signs reading "Construction Vehicle - Keep Back" to be used on trucks hauling to the project when such signs are deemed necessary by the Resident. The signs shall be a minimum of 30 inches by 60 inches, Black and Orange, ASTM D 4956 - Type VII, Type VIII, or Type IX (prismatic).

All vehicles used on the project, including pickup trucks and personal vehicles, shall be equipped with amber flashing lights, visible from both front and rear, or by means of single, approved type, revolving, flashing or strobe lights mounted so as to be visible 360°. The vehicle flashing system shall be in continuous operation while the vehicle is on any part of the project.

The Resident or any other representative of the Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item. Failure to follow the approved Lighting Plan will result in a Traffic Control violation.

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

652.8.2 Other Items Replace the first paragraph with the following: "The accepted quantities of flagger hours will be paid for at the contract unit price per hour for each flagging station occupied excluding lunch breaks, and for each approved breaker flagger. Overtime hours, as reported on the certified payrolls, will be paid an additional 30% of the bid price for 652.38. The computation and additional payment for overtime hours will occur during the project close-out process and will be paid as additional hours of 652.38 to the nearest ¼ hour. The contract unit price shall be full compensation for hiring, transporting, equipping, supervising, and the payment of flaggers and all overhead and incidentals necessary to complete the work." Replace the last paragraph with the following: "There will be no payment made under any 652 pay items after the expiration of the adjusted total contract time."

SECTION 653 POLYSTYRENE PLASTIC INSULATION

653.05 Placing Backfill In the second sentence; change "...shall be not less than 150 mm [6 in] loose measure." to "...shall be not less than 250 mm [10 in] loose measure." In the third sentence; change "...crawler type bulldozer of not more than 390 kg/m² [80 lb/ft²] ground contact pressure..." to "...crawler type bulldozer of not more than 4875 kg/m² [2000 lb/ft²] ground contact pressure..."

653.06 Compaction In the last sentence; change "...not more than 390 kg/m² [80 lb/ft²] ground contact..." to "...not more than 4875 kg/m² [2000 lb/ft²] ground contact..."

SECTION 656

TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL

656.5.1 If Pay Item 656.75 Provided Replace the second paragraph with the following: "Failure by the Contractor to follow Standard Specification or Special Provision - Section 656 and/or the Contractor's own Soil Erosion and Water Pollution Control Plan (SEWPCP) will result in a violation letter and a reduction in payment as shown in the schedule below. The Department's Resident or any other representative of The Department reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Department shall not be held responsible for any delay in the work due to any suspension under this item.

ORIGINAL CONTRACT AMOUNT

<u>From</u> <u>More Than</u>	<u>Up to and</u> <u>Including</u>	<u>Amount of Penalty Damages per Violation</u>		
		<u>1st</u>	<u>2nd</u>	<u>3rd & Subsequent</u>
\$0	\$1,000,000	\$250	\$500	\$1,250
\$1,000,000	\$2,000,000	\$500	\$1,000	\$2,500
\$2,000,000	\$4,000,000	\$1,000	\$2,000	\$5,000
\$4,000,000	and more	\$2,000	\$4,000	\$10,000"

SECTION 701

STRUCTURAL CONCRETE RELATED MATERIALS

701.10 Fly Ash - Chemical Requirements Change all references from "ASTM C311" to "ASTM C114".

SECTION 703

AGGREGATES

703.05 Aggregate for Sand Leveling Change the percent passing the 9.5 mm [3/8 in] sieve from "85 - 10" to "85 - 100"

703.06 Aggregate for Base and Subbase Delete the first paragraph: "The material shall have..." and replace with "The material shall have a minimum degradation value of 15 as determined by Washington State DOT Test Method T113, Method of Test for Determination of Degradation Value (January 2009 version), except that the reported degradation value will be the result of testing a single specimen from that portion of a sample that passes the 12.5 mm [½ in] sieve and is retained on the 2.00 mm [No. 10] sieve, minus any reclaimed asphalt pavement used."

703.07 Aggregates for HMA Pavements Delete the forth paragraph: “The composite blend shall have...” and replace with “The composite blend, minus any reclaimed asphalt pavement used, shall have a Micro-Deval value of 18.0 or less as determined by AASHTO T 327. In the event the material exceeds the Micro Deval limit, a Washington Degradation test shall be performed. The material shall be acceptable if it has a value of 30 or more as determined by Washington State DOT Test Method T 113, Method of Test for Determination of Degradation Value (January 2009 version) except that the reported degradation value will be the result of testing a single composite specimen from that portion of the sample that passes the 12.5mm [1/2 inch] sieve and is retained on the 2.00mm [No 10] sieve, minus any reclaimed asphalt pavement used.”

703.09 HMA Mixture Composition The coarse and fine aggregate shall meet the requirements of Section 703.07. The several aggregate fractions for mixtures shall be sized, graded, and combined in such proportions that the resulting composite blends will meet the grading requirements of the following table.

AGGREGATE GRADATION CONTROL POINTS

SIEVE SIZE	Nominal Maximum Aggregate Size---Control Points (Percent Passing)				
	TYPE 25 mm	TYPE 19 mm	TYPE 12.5 mm	TYPE 9.5 mm	TYPE 4.75 mm
	PERCENT BY WEIGHT PASSING - COMBINED AGGREGATE				
37.5 mm	100				
25 mm	90-100	100			
19 mm	-90	90-100	100		
12.5 mm		-90	90-100	100	100
9.5 mm		-	-90	90-100	95-100
4.75 mm		-	-	-90	80-100
2.36 mm	19-45	23-49	28-58	32-67	40 - 80
1.18 mm		-	-	-	-
600 µm		-	-	-	-
300 µm		-	-	-	-
75 µm	1-7	2-8	2-10	2-10	2-10

Gradation Classification---- The combined aggregate gradation shall be classified as coarse-graded when it passes below the Primary Control Sieve (PCS) control point as defined in the following table. All other gradations shall be classified as fine-graded.

GRADATION CLASSIFICATION

PCS Control Point for Mixture Nominal Maximum Aggregate Size (% passing)				
Nominal Maximum Aggregate Size	TYPE 25 mm	TYPE 19 mm	TYPE 12.5 mm	TYPE 9.5 mm
Primary Control Sieve	4.75 mm	4.75 mm	2.36 mm	2.36 mm
PCS Control Point (% passing)	40	47	39	47

If a Grading “D” mixture is allowed per Special Provision Section 403, it shall meet the following gradation and the aggregate requirements of Section 703.07.

Sieve Designation	Percentage by Weight Passing Square Mesh Sieves
½ inch	100
¾ inch	93-100
No. 4	60-80
No. 8	46-65
No. 16	25-55
No. 30	16-40
No. 50	10-30
No. 100	6-22
No. 200	3.0-8.0

703.18 Common Borrow Replace the first paragraph with the following: “Common borrow shall consist of earth, suitable for embankment construction. It shall be free from frozen material, perishable rubbish, peat, and other unsuitable material including material currently or previously contaminated by chemical, radiological, or biological agents unless the material is from a DOT project and authorized by DEP for use.”

703.22 Underdrain Backfill Material Change the first paragraph from “...for Underdrain Type B...” to “...for Underdrain Type B and C...”

Replace subsections 703.25 through 703.28 with the following:

703.25 Stone Fill Stones for stone fill shall consist of hard, sound, durable rock that will not disintegrate by exposure to water or weather. Stone for stone fill shall be angular and rough. Rounded, subrounded, or long thin stones will not be allowed. Stone for stone fill may be obtained from quarries or by screening oversized rock from earth borrow pits. The maximum allowable length to thickness ratio will be 3:1. The minimum stone size (10 lbs) shall have an average dimension of 5 inches. The maximum stone size (500 lbs) shall have a maximum dimension of approximately 36 inches. Larger stones may be used if approved by the Resident. Fifty percent of the stones by volume shall have an average dimension of 12 inches (200 lbs).

703.26 Plain and Hand Laid Riprap Stone for riprap shall consist of hard, sound durable rock that will not disintegrate by exposure to water or weather. Stone for riprap shall be angular and rough. Rounded, subrounded or long thin stones will not be allowed. The maximum allowable length to width ratio will be 3:1. Stone for riprap may be obtained from quarries or by screening oversized rock from earth borrow pits. The minimum stone size (10 lbs) shall have an average dimension of 5 inches. The maximum stone size (200 lbs) shall have an average dimension of approximately 12 inches. Larger stones may be used if approved by the Resident. Fifty percent of the stones by volume shall have an average dimension greater than 9 inches (50 lbs).

703.27 Stone Blanket Stones for stone blanket shall consist of sound durable rock that will not disintegrate by exposure to water or weather. Stone for stone blanket shall be angular and rough. Rounded or subrounded stones will not be allowed. Stones may be obtained from

quarries or by screening oversized rock from earth borrow pits. The minimum stone size (300 lbs) shall have minimum dimension of 14 inches, and the maximum stone size (3000 lbs) shall have a maximum dimension of approximately 66 inches. Fifty percent of the stones by volume shall have average dimension greater than 24 inches (1000 lbs).

703.28 Heavy Riprap Stone for heavy riprap shall consist of hard, sound, durable rock that will not disintegrate by exposure to water or weather. Stone for heavy riprap shall be angular and rough. Rounded, subrounded, or thin, flat stones will not be allowed. The maximum allowable length to width ratio will be 3:1. Stone for heavy riprap may be obtained from quarries or by screening oversized rock from earth borrow pits. The minimum stone size (500 lbs) shall have minimum dimension of 15 inches, and at least fifty percent of the stones by volume shall have an average dimension greater than 24 inches (1000 lbs).”

Add the following paragraph:

“703.32 Definitions (ASTM D 2488, Table 1).

Angular: Particles have sharp edges and relatively plane sides with unpolished surfaces

Subrounded: Particles have nearly plane sides but have well-rounded corners and edges

Rounded: Particles have smoothly curved sides and no edges”

SECTION 706

NON-METALLIC PIPE

706.06 Corrugated Polyethylene Pipe for Underdrain, Option I and Option III Culvert Pipe Change the first sentence from “...300 mm diameters to 900 mm” to “...300 mm diameters to 1200 mm” Delete, in its’ entirety, the last sentence which begins “This pipe and resins...” and replace with the following; “Manufacturers of corrugated polyethylene pipe must participate in, and maintain compliance with, AASHTO’s National Transportation Product Evaluation Program (www.ntpep.org) which audits producers of plastic pipe. A certificate of compliance must be provided with each shipment.”

SECTION 708

PAINTS AND PRESERVATIVES

708.03 Pavement Marking Paint Change the first sentence from “...AASHTO M248” to “...the Maine DOT Maintenance Fast-Dry Water-Based Traffic Paint on file at the Traffic Section in Augusta”. Delete, in its’ entirety, the last sentence.

SECTION 709

REINFORCING STEEL AND WELDED STEEL WIRE FABRIC

709.03 Steel Strand Change the second paragraph from “...shall be 12mm [½ inch] AASHTO M203M/M203 (ASTM A416/A416M)...” to “...shall be 15.24 mm [0.600 inch] diameter AASHTO M203 (ASTM A416)...”

SECTION 710

FENCE AND GUARDRAIL

710.03 Chain Link Fabric Add the following sentence: “Chain Link fabric for PVC coated shall conform to the requirements of AASHTO M181, Type IV-Class B.”

710.04 Metal Beam Rail Replace with the following: “Galvanized steel rail elements shall conform to the requirements of AASHTO M 180, Class A, Type II.

When corrosion resistant steel is specified, rail shall conform to AASHTO M 180, Class A, Type IV. Beams of corrosion resistant steel shall not be painted or galvanized. They shall be so handled and stored that the traffic face of these beams, used in a continuous run of guardrail, shall not show a distinctive color differential.

When metal beam rail is to be installed on a curve having a radius of curvature of 150 ft. or less, the beam sections shall be fabricated on an arc to the required radius and permanently stamped or embossed with the designated radius.

The engineer may take one piece of guardrail, a backup plate, and end or buffer section from each 200 pieces in a lot, or from each lot if less than 200 pieces are included therein for determination of compliance with specification requirements. If one piece fails to conform to the requirements of this specification, two other pieces shall be tested. If either of these pieces fails to conform to the requirements of this specification, the lot of material represented by these samples shall be rejected. A lot shall be considered that quantity of material offered for inspection at one time that bears the same heat and coating identification.”

710.07 Guardrail Posts Section b. change “...AASHTO M183/M183M...” to “...AASHTO M 270M/M 270 Grade 250 (36)...”

SECTION 712 MISCELLANEOUS HIGHWAY MATERIALS

712.04 Stone Curbing and Edging Delete the existing and replace with the following: “Stone for curbing and edging shall be approved granite from acceptable sources. The stone shall be hard and durable, predominantly gray in color, free from seams that would be likely to impair its structural integrity, and of a smooth splitting character. Natural grain size and color variations characteristic of the source deposit will be permitted. Such natural variations may include bands or clusters of mineral crystallization provided they do not impair the structural integrity of the curb stone. The Contractor shall submit for approval the name of the quarry that is the proposed source of the granite for curb materials along with full scale color photos of the granite. Such submission shall be made sufficiently in advance of ordering so that the Resident may have an opportunity to judge the stone, both as to quality and appearance. Samples of curbing shall be submitted for approval only when requested by the Resident. The dimensions, shape, and other details shall be as shown on the plans.”

712.06 Precast Concrete Units In the first paragraph, change “...ASTM C478M...” to “...AASHTO M199...” Delete the second paragraph and replace with the following; “Approved structural fibers may be used as a replacement of 6 x 6 #10 gauge welded wire fabric when used at an approved dosage rate for the construction of manhole and catch basin units. The material used shall be one of the products listed on the Maine Department of Transportation’s Approved Product List of Structural Fiber Reinforcement.” Delete the fifth paragraph and replace with the following; “The concrete mix design shall be approved by the Department. Concrete shall contain 6% air content, plus or minus 1½% tolerance when tested according to AASHTO T152. All concrete shall develop a minimum compressive strength of 28 MPa [4000 psi] in 28 days when tested according to AASHTO T22. The absorption of a

specimen, when tested according to AASHTO T280, Test Method “A”, shall not exceed nine percent of the dry mass.”

Add the following:

“712.07 Tops, and Traps These metal units shall conform to the plan dimensions and to the following specification requirements for the designated materials.

Gray iron or ductile iron castings shall conform to the requirements of AASHTO M306 unless otherwise designated.”

712.08 Corrugated Metal Units The units shall conform to plan dimensions and the metal to AASHTO M36/M36M. Bituminous coating, when specified, shall conform to AASHTO M190 Type A.

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

- (a) Aluminum steps-ASTM B221M, [ASTM B211] Alloy 6061-T6 or 6005-T5.
- (b) Reinforced plastic steps Steel reinforcing bar with injection molded plastic coating copolymer polypropylene. Polypropylene shall conform to ASTM D 4101.

712.23 Flashing Lights Flashing Lights shall be power operated or battery operated as specified.

- (a) Power operated flashing lights shall consist of housing, adapters, lamps, sockets, reflectors, lens, hoods and other necessary equipment designed to give clearly visible signal indications within an angle of at least 45 degrees and from 3 to 90 m [10 to 300 ft] under all light and atmospheric conditions.

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

The lamps shall be 650 lumens, 120 volt traffic signal lamps with sockets constructed to properly focus and hold the lamp firmly in position.
The housing shall have a rotatable sun visor not less than 175 mm [7 in] in length designed to shield the lens.

Reflectors shall be of such design that light from a properly focused lamp will reflect the light rays parallel. Reflectors shall have a maximum diameter at the point of contact with the lens of approximately 200 mm [8 in].

The lens shall consist of a round one-piece convex amber material which, when mounted, shall have a visible diameter of approximately 200 mm [8 in]. They shall distribute light and not diffuse it. The distribution of the light shall be asymmetrical in a downward direction. The light distribution of the lens shall not be uniform, but shall consist of a small high intensity portion with narrow distribution for long distance throw and a larger

low intensity portion with wide distribution for short distance throw. Lenses shall be marked to indicate the top and bottom of the lens.

(b) Battery operated flashing lights shall be self-illuminated by an electric lamp behind the lens. These lights shall also be externally illuminated by reflex-reflective elements built into the lens to enable it to be seen by reflex-reflection of the light from the headlights of oncoming traffic. The batteries must be entirely enclosed in a case. A locking device must secure the case. The light shall have a flash rate of not less than 50 nor more than 60 flashes per minute from minus 30 °C [minus 20 °F] to plus 65 °C [plus 150 °F]. The light shall have an on time of not less than 10 percent of the flash cycle. The light beam projected upon a surface perpendicular to the axis of the light beam shall produce a lighted rectangular projection whose minimum horizontal dimension shall be 5 degrees each side of the horizontal axis. The effective intensity shall not have an initial value greater than 15.0 candelas or drop below 4.0 candelas during the first 336 hours of continuous flashing. The illuminated lens shall appear to be uniformly bright over its entire illuminated surface when viewed from any point within an angle of 9 degrees each side of the vertical axis and 5 degrees each side of the horizontal axis. The lens shall not be less than 175 mm [7 in] in diameter including a reflex-reflector ring of 13 mm [$\frac{1}{2}$ in] minimum width around the periphery. The lens shall be yellow in color and have a minimum relative luminous transmittance of 0.440 with a luminance of 2854° Kelvin. The lens shall be one-piece construction. The lens material shall be plastic and meet the luminous transmission requirements of this specification. The case containing the batteries and circuitry shall be constructed of a material capable of withstanding abuse equal to or greater than 1.21 mm thick steel [No. 18 U.S. Standard Gage Steel]. The housing and the lens frame, if of metal shall be properly cleaned, degreased and pretreated to promote adhesion. It shall be given one or more coats of enamel which, when dry shall completely obscure the metal. The enamel coating shall be of such quality that when the coated case is struck a light blow with a sharp tool, the paint will not chip or crack and if scratched with a knife will not powder. The case shall be so constructed and closed as to exclude moisture that would affect the proper operation of light. The case shall have a weep hole to allow the escape of moisture from condensation. Photoelectric controls, if provided, shall keep the light operating whenever the ambient light falls below 215 lx [20 foot candles]. Each light shall be plainly marked as to the manufacturer's name and model number.

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

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

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

712.34 Non-metallic Pipe, Rigid Non-metallic pipe shall be Schedule 40 polyvinylchloride (PVC) that meets the requirement of ASTM D1785. Fittings shall be of the same material.

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

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

712.35 Epoxy Resin Epoxy resin for grouting or sealing shall consist of a mineral filled thixotropic, flexible epoxy resin having a pot life of approximately one hour at 10°C [50°F]. The grout shall be an approved product suitable for cementing steel dowels into the preformed holes of curb inlets and adjacent curbing. The sealant shall be an approved product, light gray in color and suitable for coating the surface.

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

The mineral constituents of the bituminous mixture shall be sized and graded and combined in a composite blend that will produce a stable durable curbing with an acceptable texture.

Bituminous material for curb shall meet the requirements of Section 403 - Hot Bituminous Pavement.

712.37 Precast Concrete Slab Portland cement concrete for precast slabs shall meet the requirements of Section 502 - Structural Concrete, Class A.

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

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

The granite slabs shall be scabble dressed or sawed to an approximately true plane having no projections or depressions over 13 mm [½ in] under a 600 mm [2 ft] straightedge or over 25 mm [1 in] under a 1200 mm [4 ft] straightedge. The arris at the intersection of the top surface and exposed front face shall be pitched so that the arris line is uniform throughout the length of the installed slabs. The sides shall be square to the exposed face unless the slabs are to be set

on a radius or other special condition which requires that the joints be cut to fit, but in any case shall be so finished that when the stones are placed side by side no space more than 20 mm [3/4 in] shall show in the joint for the full exposed height.

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

SECTION 717 ROADSIDE IMPROVEMENT MATERIAL

717.03 C. Method #3 - Roadside Mixture #3 Change the seed proportions to the following:

Crown Vetch	25%
Perennial Lupine	25%
Red Clover	12.5%
Annual Rye	37.5%

717.05 Mulch Binder Change the third sentence to read as follows:

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

SECTION 720 STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS

720.08 U-Channel Posts Change the first sentence from “..., U-Channel posts...” to “..., Rib Back U-Channel posts...”

SECTION 722 GEOTEXTILES

722.01 Stabilization/Reinforcement Geotextile Add the following to note #3; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”

722.02 Drainage Geotextile Add the following to note #3; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”

722.01 Erosion Control Geotextile Add the following note to Elongation in the Mechanical Property Table; “The strengths specified in the columns labeled”<50%” and “≥ 50%” refer to the elongation at which the geotextile material was tested. For example; if a fabric is tested at 15% elongation then it must meet or exceed the minimum strength shown in the “<50%” column. Submittals must include the percent elongation at which the material was tested.”

APPENDIX A TO DIVISION 100

SECTION 1 - BIDDING PROVISIONS

A. Federally Required Certifications By signing and delivering a Bid, the Bidder certifies as provided in all certifications set forth in this Appendix A - Federal Contract Provisions Supplement including:

- Certification Regarding No Kickbacks to Procure Contract as provided on this page 1 below.
- Certification Regarding Non-collusion as provided on page 1 below.
- Certification Regarding Non-segregated Facilities as provided by FHWA Form 1273, section III set forth on page 21 below.
- "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion" as provided by FHWA Form 1273, section XI set forth on page 32 below.
- "Certification Regarding Use of Contract Funds for Lobbying" as provided by FHWA Form 1273, section XII set forth on page 35 below.

Unless otherwise provided below, the term "Bidder", for the purposes of these certifications, includes the Bidder, its principals, and the person(s) signing the Bid. Upon execution of the Contract, the Bidder (then called the Contractor) will again make all the certifications indicated in this paragraph above.

CERTIFICATION REGARDING NO KICKBACKS TO PROCURE CONTRACT Except expressly stated by the Bidder on sheets submitted with the Bid (if any), the Bidder hereby certifies, to the best of its knowledge and belief, that it has not:

(A) employed or retained for a commission, percentage, brokerage, contingent fee, or other consideration, any firm or person (other than a bona fide employee working solely for me) to solicit or secure this contract;

(B) agreed, as an express or implied condition for obtaining this contract, to employ or retain the services of any firm or person in connection with carrying out the contract, or;

(C) paid, or agreed to pay, to any firm, organization, or person (other than a bona fide employee working solely for me) any fee, contribution, donation, or consideration of any kind for, or in connection with, procuring or carrying out the contract;

By signing and submitting a Bid, the Bidder acknowledges that this certification is to be furnished to the Maine Department of Transportation and the Federal Highway Administration, U.S. Department of Transportation in connection with this contract in anticipation of federal aid highway funds and is subject to applicable state and federal laws, both criminal and civil.

CERTIFICATION REGARDING NONCOLLUSION Under penalty of perjury as provided by federal law (28 U.S.C. §1746), the Bidder hereby certifies, to the best of its knowledge and belief, that:

the Bidder has not, either directly or indirectly, entered into any agreement, participated in any collusion, or otherwise taken any action in restraint of competitive bidding in connection with the Contract.

For a related provisions, see Section 102.7.2 (C) of the Standard Specifications - "Effects of Signing and Delivery of Bids" - "Certifications", Section 3 of this Appendix A entitled "Other Federal Requirements" including section XI - "Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion" and section XII. - "Certification Regarding Use of Contract Funds for Lobbying."

B. Bid Rigging Hotline To report bid rigging activities call: **1-800-424-9071**

The U.S. Department of Transportation (DOT) operates the above toll-free "hotline" Monday through Friday, 8:00 a.m. to 5:00 p.m., eastern time. Anyone with knowledge of possible bid rigging, bidder collusion, or other fraudulent activities should use the "hotline" to report such activities.

The "hotline" is part of the DOT's continuing effort to identify and investigate highway construction contract fraud and abuse and is operated under the direction of the DOT Inspector General. All information will be treated confidentially and caller anonymity will be respected.

SECTION 2 - FEDERAL EEO AND CIVIL RIGHTS REQUIREMENTS

Unless expressly otherwise provided in the Bid Documents, the provisions contained in this Section 2 of this "Federal Contract Provisions Supplement" are hereby incorporated into the Bid Documents and Contract.

A. Nondiscrimination & Civil Rights - Title VI The Contractor and its subcontractors shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. The Contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the Department deems appropriate. The Contractor and subcontractors shall comply with Title VI of the Civil Rights Act of 1964, as amended, and with all State of Maine and other Federal Civil Rights laws.

For related provisions, see Subsection B - "Nondiscrimination and Affirmative Action - Executive Order 11246" of this Section 2 and Section 3 - Other Federal Requirements of this "Federal Contract Provisions Supplement" including section II - "Nondiscrimination" of the "Required Contract Provisions, Federal Aid Construction Contracts", FHWA-1273.

B. Nondiscrimination and Affirmative Action - Executive Order 11246 Pursuant to Executive Order 11246, which was issued by President Johnson in 1965 and amended in 1967 and 1978, this Contract provides as follows.

The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its efforts to achieve maximum results from its actions. The Contractor shall

document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

Ensure and maintain a working environment free of harassment, intimidations, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all forepersons, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its union have employment opportunities available, and to maintain a record of the organization's responses.

Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.

Provide immediate written notification to the Department's Civil Rights Office when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Design-Builder's efforts to meet its obligations.

Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under B above.

Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligation; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review

of these items with on-site supervisory personnel such as Superintendents, General Forepersons, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractor's and Subcontractors with whom the Contractor does or anticipates doing business.

Direct its recruitment efforts, both orally and written to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above describing the openings, screenings, procedures, and test to be used in the selection process.

Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth, both on the site and in other areas of a Contractor's workforce.

Validate all tests and other selection requirements.

Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

Ensure that all facilities and company activities are non segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction Contractor's and suppliers, including circulation of solicitations to minority and female Contractor associations and other business associations.

Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

C. Goals for Employment of Women and Minorities Per Executive Order 11246, craft tradesperson goals are 6.9% women and .5% minorities employed. However, goals may be

adjusted upward at the mutual agreement of the Contractor and the Department. Calculation of these percentages shall not include On-the-Job Training Program trainees, and shall not include clerical or field clerk position employees.

For a more complete presentation of requirements for such Goals, see the federally required document "Goals for Employment of Females and Minorities" set forth in the next 6 pages below.

Start of GOALS FOR EMPLOYMENT OF FEMALES AND MINORITIES
Federally Required Contract Document

§60-4.2 Solicitations

(d) The following notice shall be included in, and shall be part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of \$10,000 to be performed in geographical areas designated by the Director pursuant to §60-4.6 of this part (see 41 CFR 60-4.2(a)):

Notice of Requirement for Affirmative Action to Ensure Equal Opportunity (Executive Order 11246)

1. The Offeror's or bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Specifications" set forth herein.
2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

<u>Goals for female participation in each trade</u>	6.9%
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Goals for minority participation for each trade

Maine

001 Bangor, ME	0.8%
Non-SMSA Counties (Aroostook, Hancock, Penobscot, Piscataquis, Waldo, Washington)	
002 Portland-Lewiston, ME	
SMSA Counties: 4243 Lewiston-Auburn, ME (Androscoggin)	0.5%
6403 Portland, ME (Cumberland, Sagadahoc)	0.6%
Non-SMSA Counties: (Franklin, Kennebec, Knox, Lincoln, Oxford, Somerset, York)	0.5%

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs

construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the contractor also is subject to the goals for both its federally involved and non federally involved construction.

The contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be in violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor, employer identification number of the subcontractor, estimated dollar amount of the subcontract; estimated started and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this Notice, and in the Contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any).

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

1. As used in these specifications:
 - a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;
 - b. "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - c. "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department form 941;
 - d. "Minority" includes:
 - (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);

- (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of the North America and maintaining identifiable tribal affiliations through membership and participation or community identification).
2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.
 3. If the contractor, is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors for Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
 4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7 a. through p. of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in contractors performing construction work in geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical areas where the work is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specific.
 5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant, thereto.
 6. In order for the non working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of

employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as expensive as the following:
 - a. Ensure and maintain a working environment free of harassment, intimidation, coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, when possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - b. Establish and maintain a current list of minority and female recruitment sources provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organization's responses.
 - c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment sources or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with whatever additional actions the Contractor may have taken.
 - d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.
 - e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7b above.
 - f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female

employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- i. Direct its recruitment, efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing prior to the date for the acceptance of applications for apprenticeship or the openings, screening procedures, and tests to be used in the selection process.
- j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on site and in other areas of a Contractor's work force.
- k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- n. Ensure that all facilities and company activities are non segregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.
- o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of

solicitation to minority and female contractor associations and other business associations.

- p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7 a through p.). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under 7 a through p. of these specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program and reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions take on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.
9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, specific minority group of women is underutilized.)
10. The Contractor shall not use the goals and timetables or affirmative action even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if standards to discriminate against any person because of race, color, religion, sex, or national origin.
11. The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.
12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementation regulations by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.
13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the

requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.6.

- 14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g. mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and location at which the work was performed. Records be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.
- 15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

End of GOALS FOR EMPLOYMENT OF FEMALES AND MINORITIES
 Federally Required Contract Document

D. Disadvantaged Business Enterprise (DBE) Requirements The Department has established an annual Disadvantaged Business Enterprise goal to be achieved through race neutral means. This goal will be adjusted periodically and will be provided by Supplemental Provision. The Contractor shall comply with all provisions of this section regarding DBE participation and the Department’s latest version of the Disadvantaged Business Enterprise Program Manual, said Manual being incorporated herein by reference. In the case of conflict between this Contract and said Manual, this Contract shall control. The Department reserves the right to adjust DBE goals on a project-by-project basis by addendum.

Policy. It is the Department’s policy that DBEs as defined in 23 CFR Part 26 and referenced in the Transportation Equity Act for 21st Century of 1998, as amended from the Surface Transportation Uniform Relocation Assistance Act of 1987, and the Intermodal Surface Transportation Efficiency Act of 1991. The intent hereto remains to provide the maximum opportunity for DBEs to participate in the performance of contracts financed in whole or in part with federal funds.

The Department and its Contractors shall not discriminate on the basis of race, color, national origin, ancestry, sex, age, or disability in the award and performance of DOT assisted contracts.

Disadvantaged Business Enterprises are those so certified by the Maine Department of Transportation Civil Rights Office prior to bid opening date.

The Department has determined that elements of a good faith effort to meet the contract goal include but are not limited to the following:

1. Whether the Contractor advertised in general circulation, trade association, and minority/women's-focus media concerning the subcontracting opportunities;
2. Whether the Contractor provided written notice to a reasonable number of specific DBEs that their interest in the contract is being solicited;
3. Whether the Contractor followed up on initial solicitations of interest by contacting DBEs to determine with certainty whether the DBEs were interested;
4. Whether the Contractor selected portions of the work to be performed by DBEs in order to increase the likelihood of meeting the DBE goals;
5. Whether the Contractor provided interested DBEs with adequate information about the plans, specification and requirements of the contract;
6. Whether the Contractor negotiated in good faith with interested DBEs, not rejecting the DBE as unqualified without sound reasons based on a thorough investigation of their capabilities;
7. Whether the Contractor made efforts to assist interested DBEs with other appropriate technical/financial assistance required by the Department or Contractor;
8. Whether the Contractor effectively used the services of available minority/women's community organizations, minority/women's business assistance offices; and other organizations that provide assistance in the recruitment and placement of DBEs.

Substitutions of DBEs. The following may be acceptable reasons for Civil Rights Office approval of such a change order:

- The DBE defaults, voluntarily removes itself or is over-extended;
- The Department deletes portions of the work to be performed by the DBE.

It is not intended that the ability to negotiate a more advantageous contract with another certified DBE be considered a valid basis for such a change in DBE utilization once the DBE Bid Submission review has been passed. Any requests to alter the DBE commitment must be in writing and included with the change order.

Failure to carry out terms of this Standard Specification shall be treated as a violation of this contract and will result in contract sanctions which may include withholding of partial payments totaling the creditable dollars amount which would have been paid for said DBE participation, termination of this contract or other measures which may affect the ability of the Contractor to obtain Department contracts.

Copies of the Maine Department of Transportation's DBE Program may be obtained from:

Maine Department of Transportation
Civil Rights Office
#16 State House Station
Augusta, Maine 04333-0016
tel. (207) 624-3519

Quarterly Reporting Requirement. The Contractor must submit Semi-annual reports of actual dollars paid to Disadvantaged Business Enterprises (DBE's) on this Project to the MaineDOT Civil Rights Office by the end of the third week of April and October for the period covering the preceding six months considered Federal Fiscal Year periods. The reports will be submitted directly to the Civil Rights Office on the form provided in the latest version of the DBE Program Manual. Failure to submit the report by the deadline may result in a withholding of approval of partial payment estimates by the Department.

SECTION 3 - OTHER FEDERAL REQUIREMENTS

Unless expressly otherwise provided in the Bid Documents, the provisions contained in this Section 3 of this "Federal Contract Provisions Supplement" are hereby incorporated into the Bid Documents and Contract.

A. Buy America

If the cost of products purchased for permanent use in this project which are manufactured of steel, iron or the application of any coating to products of these materials exceeds 0.1 percent of the contract amount, or \$2,500.00, whichever is greater, the products shall have been manufactured and the coating applied in the United States. The coating materials are not subject to this clause, only the application of the coating. In computing that amount, only the cost of the product and coating application cost will be included.

Ore, for the manufacture of steel or iron, may be from outside the United States; however, all other manufacturing processes of steel or iron must be in the United States to qualify as having been manufactured in the United States.

United States includes the 50 United States and any place subject to the jurisdiction thereof.

Products of steel include, but are not limited to, such products as structural steel, piles, guardrail, steel culverts, reinforcing steel, structural plate and steel supports for signs, luminaries and signals.

Products of iron include, but are not limited to, such products as cast iron grates.

Application of coatings include, but are not limited to, such applications as epoxy, galvanized and paint.

To assure compliance with this section, the Contractor shall submit a certification letter on its letterhead to the Department stating the following:

“This is to certify that products made of steel, iron or the application of any coating to products of these materials whose costs are in excess of \$2,500.00 or 0.1 percent of the original contract amount, whichever is greater, were manufactured and the coating, if one was required, was applied in the United States.”

B. Materials

a. Convict Produced Materials References: 23 U.S.C. 114(b)(2), 23 CFR 635.417

Applicability: FHWA's prohibition against the use of convict material only applies to Federal-aid highways. Materials produced after July 1, 1991, by convict labor may only be incorporated in a Federal-aid highway construction project if: 1) such materials have been produced by convicts who are on parole, supervised release, or probation from a prison; or 2) such material has been produced in a qualified prison facility, e.g., prison industry, with the amount produced during any 12-month period, for use in Federal-aid projects, not exceeding the amount produced, for such use, during the 12-month period ending July 1, 1987.

Materials obtained from prison facilities (e.g., prison industries) are subject to the same requirements for Federal-aid participation that are imposed upon materials acquired from other sources. Materials manufactured or produced by convict labor will be given no preferential treatment.

The preferred method of obtaining materials for a project is through normal contracting procedures which require the contractor to furnish all materials to be incorporated in the work. The contractor selects the source, public or private, from which the materials are to be obtained (23 CFR 635.407). Prison industries are prohibited from bidding on projects directly (23 CFR 635.112e), but may act as material supplier to construction contractors.

Prison materials may also be approved as State-furnished material. However, since public agencies may not bid in competition with private firms, direct acquisition of materials from a prison industry for use as State-furnished material is subject to a public interest finding with the Division Administrator's concurrence (23 CFR 635.407d). Selection of materials produced by convict labor as State-furnished materials for mandatory use should be cleared prior to the submittal of the Plans Specifications & Estimates (PS&E).

b. Patented/Proprietary Products References: 23 U.S.C. 112, 23 CFR 635.411

FHWA will not participate, directly or indirectly, in payment for any premium or royalty on any patented or proprietary material, specification, or process specifically set forth in the plans and specifications for a project, unless:

- the item is purchased or obtained through competitive bidding with equally suitable unpatented items,
- the STA certifies either that the proprietary or patented item is essential for synchronization with the existing highway facilities or that no equally suitable alternative exists, or
- the item is used for research or for a special type of construction on relatively short sections of road for experimental purposes. States should follow FHWA's procedures for "Construction Projects Incorporating Experimental Features" ([expermnt.htm](#)) for the submittal of work plans and evaluations.

The primary purpose of the policy is to have competition in selection of materials and allow for development of new materials and products. The policy further permits materials and products that are judged equal may be bid under generic specifications. If only patented or proprietary products are acceptable, they shall be bid as alternatives with all, or at least a

reasonable number of, acceptable materials or products listed; and the Division Administrator may approve a single source if it can be found that its utilization is in the public interest.

Trade names are generally the key to identifying patented or proprietary materials. Trade name examples include 3M, Corten, etc. Generally, products identified by their brand or trade name are not to be specified without an "or equal" phrase, and, if trade names are used, all, or at least a reasonable number of acceptable "equal" materials or products should be listed. The licensing of several suppliers to produce a product does not change the fact that it is a single product and should not be specified to the exclusion of other equally suitable products.

c. State Preference References: 23 U.S.C. 112, 23 CFR 635.409

Materials produced within Maine shall not be favored to the exclusion of comparable materials produced outside of Maine. State preference clauses give particular advantage to the designated source and thus restrict competition. Therefore, State preference provisions shall not be used on any Federal-aid construction projects.

This policy also applies to State preference actions against materials of foreign origin, except as otherwise permitted by Federal law. Thus, States cannot give preference to in-State material sources over foreign material sources. Under the Buy America provisions, the States are permitted to expand the Buy America restrictions provided that the STA is legally authorized under State law to impose more stringent requirements.

d. State Owned/Furnished/Designated Materials References: 23 U.S.C. 112, 23 CFR 635.407

Current FHWA policy requires that the contractor must furnish all materials to be incorporated in the work, and the contractor shall be permitted to select the sources from which the materials are to be obtained. Exceptions to this requirement may be made when there is a definite finding, by MaineDOT and concurred in by Federal Highway Administration's (FHWA) Division Administrator, that it is in the public interest to require the contractor to use materials furnished by the MaineDOT or from sources designated by MaineDOT. The exception policy can best be understood by separating State-furnished materials into the categories of manufactured materials and local natural materials.

Manufactured Materials When the use of State-furnished manufactured materials is approved based on a public interest finding, such use must be made mandatory. The optional use of State-furnished manufactured materials is in violation of our policy prohibiting public agencies from competing with private firms. Manufactured materials to be furnished by MaineDOT must be acquired through competitive bidding, unless there is a public interest finding for another method, and concurred in by FHWA's Division Administrator.

Local Natural Materials When MaineDOT owns or controls a local natural materials source such as a borrow pit or a stockpile of salvaged pavement material, etc., the materials may be designated for either optional or mandatory use; however, mandatory use will require a public interest finding (PIF) and FHWA's Division Administrator's concurrence.

In order to permit prospective bidders to properly prepare their bids, the location, cost, and any conditions to be met for obtaining materials that are made available to the contractor shall be stated in the bidding documents.

Mandatory Disposal Sites Normally, the disposal site for surplus excavated materials is to be of the contractor's choosing; although, an optional site(s) may be shown in the contract provisions. A mandatory site shall be specified when there is a finding by MaineDOT, with the concurrence of the Division Administrator, that such placement is the most economical or that the environment would be substantially enhanced without excessive cost. Discussion of the mandatory use of a disposal site in the environmental document may serve as the basis for the public interest finding.

Summarizing FHWA policy for the mandatory use of borrow or disposal sites:

- mandatory use of either requires a public interest finding and FHWA’s Division Administrator's concurrence,
- mandatory use of either may be based on environmental consideration where the environment will be substantially enhanced without excessive additional cost, and
- where the use is based on environmental considerations, the discussion in the environmental document may be used as the basis for the public interest finding.

Factors to justify a public interest finding should include such items as cost effectiveness, system integrity, and local shortages of material.

C. Standard FHWA Contract Provisions - FHWA 1273

Unless expressly otherwise provided in the Bid Documents, the following “Required Contract Provisions, Federal Aid Construction Contracts”, FHWA-1273, are hereby incorporated into the Bid Documents and Contract.

Start of FHWA 1273 REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS (As revised through May 1, 2012)

FHWA-1273 -- Revised May 1, 2012

**REQUIRED CONTRACT PROVISIONS
FEDERAL-AID CONSTRUCTION CONTRACTS**

- I. General
- II. Nondiscrimination

- III. Nonsegregated Facilities
- IV. Davis-Bacon and Related Act Provisions
- V. Contract Work Hours and Safety Standards Act Provisions
- VI. Subletting or Assigning the Contract
- VII. Safety: Accident Prevention
- VIII. False Statements Concerning Highway Projects
- IX. Implementation of Clean Air Act and Federal Water Pollution Control Act
- X. Compliance with Governmentwide Suspension and Debarment Requirements
- XI. Certification Regarding Use of Contract Funds for Lobbying

ATTACHMENTS

A. Employment and Materials Preference for Appalachian Development Highway System or Appalachian Local Access Road Contracts (included in Appalachian contracts only)

I. GENERAL

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (excluding emergency contracts solely intended for debris removal). The contractor (or subcontractor) must insert this form in each subcontract and further require its inclusion in all lower tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services).

The applicable requirements of Form FHWA-1273 are incorporated by reference for work done under any purchase order, rental agreement or agreement for other services. The prime contractor shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Form FHWA-1273 must be included in all Federal-aid design-build contracts, in all subcontracts and in lower tier subcontracts (excluding subcontracts for design services, purchase orders, rental agreements and other agreements for supplies or services). The design-builder shall be responsible for compliance by any subcontractor, lower-tier subcontractor or service provider.

Contracting agencies may reference Form FHWA-1273 in bid proposal or request for proposal documents, however, the Form FHWA-1273 must be physically incorporated (not referenced) in all contracts, subcontracts and lower-tier subcontracts (excluding purchase orders, rental agreements and other agreements for supplies or services related to a construction contract).

2. Subject to the applicability criteria noted in the following sections, these contract provisions shall apply to all work performed on the contract by the contractor's own organization and with the assistance of workers under the contractor's immediate superintendence and to all work performed on the contract by piecework, station work, or by subcontract.

3. A breach of any of the stipulations contained in these Required Contract Provisions may be sufficient grounds for withholding of progress payments, withholding of final payment, termination of the contract, suspension / debarment or any other action determined to be appropriate by the contracting agency and FHWA.

4. Selection of Labor: During the performance of this contract, the contractor shall not use convict labor for any purpose within the limits of a construction project on a Federal-aid highway unless it is labor performed by convicts who are on parole, supervised release, or probation. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 are applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more. The provisions of 23 CFR Part 230 are not applicable to material supply, engineering, or architectural service contracts.

In addition, the contractor and all subcontractors must comply with the following policies: Executive Order 11246, 41 CFR 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The contractor and all subcontractors must comply with: the requirements of the Equal Opportunity Clause in 41 CFR 60-1.4(b) and, for all construction contracts exceeding \$10,000, the Standard Federal Equal Employment Opportunity Construction Contract Specifications in 41 CFR 60-4.3.

Note: The U.S. Department of Labor has exclusive authority to determine compliance with Executive Order 11246 and the policies of the Secretary of Labor including 41 CFR 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, and related regulations including 49 CFR Parts 21, 26 and 27; and 23 CFR Parts 200, 230, and 633.

The following provision is adopted from 23 CFR 230, Appendix A, with appropriate revisions to conform to the U.S. Department of Labor (US DOL) and FHWA requirements.

1. Equal Employment Opportunity: Equal employment opportunity (EEO) requirements not to discriminate and to take affirmative action to assure equal opportunity as set forth under laws, executive orders, rules, regulations (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 27) and orders of the Secretary of Labor as modified by the provisions prescribed herein, and imposed pursuant to 23 U.S.C. 140 shall constitute the EEO and specific affirmative action standards for the contractor's project activities under this contract. The provisions of the Americans with Disabilities Act of 1990 (42 U.S.C. 12101 et seq.) set forth under 28 CFR 35 and 29 CFR 1630 are incorporated by reference in this contract. In the execution of this contract, the contractor agrees to comply with the following minimum specific requirement activities of EEO:

a. The contractor will work with the contracting agency and the Federal Government to ensure that it has made every good faith effort to provide equal opportunity with respect to all of its terms and conditions of employment and in their review of activities under the contract.

b. The contractor will accept as its operating policy the following statement:

"It is the policy of this Company to assure that applicants are employed, and that employees are treated during employment, without regard to their race, religion, sex, color, national origin, age or disability. Such action shall include: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship, pre-apprenticeship, and/or on-the-job training."

2. EEO Officer: The contractor will designate and make known to the contracting officers an EEO Officer who will have the responsibility for and must be capable of effectively administering and promoting an active EEO program and who must be assigned adequate authority and responsibility to do so.

3. Dissemination of Policy: All members of the contractor's staff who are authorized to hire, supervise, promote, and discharge employees, or who recommend such action, or who are substantially involved in such action, will be made fully cognizant of, and will implement, the contractor's EEO policy and contractual responsibilities to provide EEO in each grade and classification of employment. To ensure that the above agreement will be met, the following actions will be taken as a minimum:

a. Periodic meetings of supervisory and personnel office employees will be conducted before the start of work and then not less often than once every six months, at which time the contractor's EEO policy and its implementation will be reviewed and explained. The meetings will be conducted by the EEO Officer.

b. All new supervisory or personnel office employees will be given a thorough indoctrination by the EEO Officer, covering all major aspects of the contractor's EEO obligations within thirty days following their reporting for duty with the contractor.

c. All personnel who are engaged in direct recruitment for the project will be instructed by the EEO Officer in the contractor's procedures for locating and hiring minorities and women.

d. Notices and posters setting forth the contractor's EEO policy will be placed in areas readily accessible to employees, applicants for employment and potential employees.

e. The contractor's EEO policy and the procedures to implement such policy will be brought to the attention of employees by means of meetings, employee handbooks, or other appropriate means.

4. Recruitment: When advertising for employees, the contractor will include in all advertisements for employees the notation: "An Equal Opportunity Employer." All such advertisements will be placed in publications having a large circulation among minorities and women in the area from which the project work force would normally be derived.

a. The contractor will, unless precluded by a valid bargaining agreement, conduct systematic and direct recruitment through public and private employee referral sources likely to yield

qualified minorities and women. To meet this requirement, the contractor will identify sources of potential minority group employees, and establish with such identified sources procedures whereby minority and women applicants may be referred to the contractor for employment consideration.

b. In the event the contractor has a valid bargaining agreement providing for exclusive hiring hall referrals, the contractor is expected to observe the provisions of that agreement to the extent that the system meets the contractor's compliance with EEO contract provisions. Where implementation of such an agreement has the effect of discriminating against minorities or women, or obligates the contractor to do the same, such implementation violates Federal nondiscrimination provisions.

c. The contractor will encourage its present employees to refer minorities and women as applicants for employment. Information and procedures with regard to referring such applicants will be discussed with employees.

5. Personnel Actions: Wages, working conditions, and employee benefits shall be established and administered, and personnel actions of every type, including hiring, upgrading, promotion, transfer, demotion, layoff, and termination, shall be taken without regard to race, color, religion, sex, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure that working conditions and employee facilities do not indicate discriminatory treatment of project site personnel.

b. The contractor will periodically evaluate the spread of wages paid within each classification to determine any evidence of discriminatory wage practices.

c. The contractor will periodically review selected personnel actions in depth to determine whether there is evidence of discrimination. Where evidence is found, the contractor will promptly take corrective action. If the review indicates that the discrimination may extend beyond the actions reviewed, such corrective action shall include all affected persons.

d. The contractor will promptly investigate all complaints of alleged discrimination made to the contractor in connection with its obligations under this contract, will attempt to resolve such complaints, and will take appropriate corrective action within a reasonable time. If the investigation indicates that the discrimination may affect persons other than the complainant, such corrective action shall include such other persons. Upon completion of each investigation, the contractor will inform every complainant of all of their avenues of appeal.

6. Training and Promotion:

a. The contractor will assist in locating, qualifying, and increasing the skills of minorities and women who are applicants for employment or current employees. Such efforts should be aimed at developing full journey level status employees in the type of trade or job classification involved.

b. Consistent with the contractor's work force requirements and as permissible under Federal and State regulations, the contractor shall make full use of training programs, i.e., apprenticeship, and on-the-job training programs for the geographical area of contract performance. In the event a special provision for training is provided under this contract, this subparagraph will be superseded as indicated in the special provision. The contracting agency may reserve training positions for persons who receive welfare assistance in accordance with 23 U.S.C. 140(a).

c. The contractor will advise employees and applicants for employment of available training programs and entrance requirements for each.

d. The contractor will periodically review the training and promotion potential of employees who are minorities and women and will encourage eligible employees to apply for such training and promotion.

7. Unions: If the contractor relies in whole or in part upon unions as a source of employees, the contractor will use good faith efforts to obtain the cooperation of such unions to increase opportunities for minorities and women. Actions by the contractor, either directly or through a contractor's association acting as agent, will include the procedures set forth below:

a. The contractor will use good faith efforts to develop, in cooperation with the unions, joint training programs aimed toward qualifying more minorities and women for membership in the unions and increasing the skills of minorities and women so that they may qualify for higher paying employment.

b. The contractor will use good faith efforts to incorporate an EEO clause into each union agreement to the end that such union will be contractually bound to refer applicants without regard to their race, color, religion, sex, national origin, age or disability.

c. The contractor is to obtain information as to the referral practices and policies of the labor union except that to the extent such information is within the exclusive possession of the labor union and such labor union refuses to furnish such information to the contractor, the contractor shall so certify to the contracting agency and shall set forth what efforts have been made to obtain such information.

d. In the event the union is unable to provide the contractor with a reasonable flow of referrals within the time limit set forth in the collective bargaining agreement, the contractor will, through independent recruitment efforts, fill the employment vacancies without regard to race, color, religion, sex, national origin, age or disability; making full efforts to obtain qualified and/or qualifiable minorities and women. The failure of a union to provide sufficient referrals (even though it is obligated to provide exclusive referrals under the terms of a collective bargaining agreement) does not relieve the contractor from the requirements of this paragraph. In the event the union referral practice prevents the contractor from meeting the obligations pursuant to Executive Order 11246, as amended, and these special provisions, such contractor shall immediately notify the contracting agency.

8. Reasonable Accommodation for Applicants / Employees with Disabilities: The contractor must be familiar with the requirements for and comply with the Americans with

Disabilities Act and all rules and regulations established there under. Employers must provide reasonable accommodation in all employment activities unless to do so would cause an undue hardship.

9. Selection of Subcontractors, Procurement of Materials and Leasing of Equipment: The contractor shall not discriminate on the grounds of race, color, religion, sex, national origin, age or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The contractor shall take all necessary and reasonable steps to ensure nondiscrimination in the administration of this contract.

a. The contractor shall notify all potential subcontractors and suppliers and lessors of their EEO obligations under this contract.

b. The contractor will use good faith efforts to ensure subcontractor compliance with their EEO obligations.

10. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The contractor shall carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted contracts. Failure by the contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the contracting agency deems appropriate.

11. Records and Reports: The contractor shall keep such records as necessary to document compliance with the EEO requirements. Such records shall be retained for a period of three years following the date of the final payment to the contractor for all contract work and shall be available at reasonable times and places for inspection by authorized representatives of the contracting agency and the FHWA.

a. The records kept by the contractor shall document the following:

(1) The number and work hours of minority and non-minority group members and women employed in each work classification on the project;

(2) The progress and efforts being made in cooperation with unions, when applicable, to increase employment opportunities for minorities and women; and

(3) The progress and efforts being made in locating, hiring, training, qualifying, and upgrading minorities and women;

b. The contractors and subcontractors will submit an annual report to the contracting agency each July for the duration of the project, indicating the number of minority, women, and non-

minority group employees currently engaged in each work classification required by the contract work. This information is to be reported on [Form FHWA-1391](#). The staffing data should represent the project work force on board in all or any part of the last payroll period preceding the end of July. If on-the-job training is being required by special provision, the contractor will be required to collect and report training data. The employment data should reflect the work force on board during all or any part of the last payroll period preceding the end of July.

III. NONSEGREGATED FACILITIES

This provision is applicable to all Federal-aid construction contracts and to all related construction subcontracts of \$10,000 or more.

The contractor must ensure that facilities provided for employees are provided in such a manner that segregation on the basis of race, color, religion, sex, or national origin cannot result. The contractor may neither require such segregated use by written or oral policies nor tolerate such use by employee custom. The contractor's obligation extends further to ensure that its employees are not assigned to perform their services at any location, under the contractor's control, where the facilities are segregated. The term "facilities" includes waiting rooms, work areas, restaurants and other eating areas, time clocks, restrooms, washrooms, locker rooms, and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing provided for employees. The contractor shall provide separate or single-user restrooms and necessary dressing or sleeping areas to assure privacy between sexes.

IV. DAVIS-BACON AND RELATED ACT PROVISIONS

This section is applicable to all Federal-aid construction projects exceeding \$2,000 and to all related subcontracts and lower-tier subcontracts (regardless of subcontract size). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

The following provisions are from the U.S. Department of Labor regulations in 29 CFR 5.5 "Contract provisions and related matters" with minor revisions to conform to the FHWA-1273 format and FHWA program requirements.

1. Minimum wages

a. All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to

such laborers or mechanics, subject to the provisions of paragraph 1.d. of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, That the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

b. (1) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(i) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(ii) The classification is utilized in the area by the construction industry; and

(iii) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(2) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(3) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall be paid to all workers performing work in the

classification under this contract from the first day on which work is performed in the classification.

c. Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, after written notice to the contractor, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the

registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b. (1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at <http://www.dol.gov/esa/whd/forms/wh347instr.htm> or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a “Statement of Compliance,” signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(iii) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the “Statement of Compliance” required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the

contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. Apprentices and Trainees (programs of the U.S. DOT).

Apprentices and trainees working under apprenticeship and skill training programs which have been certified by the Secretary of Transportation as promoting EEO in connection with Federal-aid highway construction programs are not subject to the requirements of paragraph 4 of this Section IV. The straight time hourly wage rates for apprentices and trainees under such programs will be established by the particular programs. The ratio of apprentices and trainees to journeymen shall not be greater than permitted by the terms of the particular program.

5. Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

7. Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

8. Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of eligibility.

a. By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

The following clauses apply to any Federal-aid construction contract in an amount in excess of \$100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

1. Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (1.) of this section, the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages.

Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of \$10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1.) of this section.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

1. The contractor shall perform with its own organization contract work amounting to not less than 30 percent (or a greater percentage if specified elsewhere in the contract) of the total original contract price, excluding any specialty items designated by the contracting agency. Specialty items may be performed by subcontract and the amount of any such specialty items performed may be deducted from the total original contract price before computing the amount of work required to be performed by the contractor's own organization (23 CFR 635.116).

a. The term "perform work with its own organization" refers to workers employed or leased by the prime contractor, and equipment owned or rented by the prime contractor, with or without operators. Such term does not include employees or equipment of a subcontractor or lower tier subcontractor, agents of the prime contractor, or any other assignees. The term may include payments for the costs of hiring leased employees from an employee leasing firm meeting all relevant Federal and State regulatory requirements. Leased employees may only be included in this term if the prime contractor meets all of the following conditions:

(1) the prime contractor maintains control over the supervision of the day-to-day activities of the leased employees;

(2) the prime contractor remains responsible for the quality of the work of the leased employees;

(3) the prime contractor retains all power to accept or exclude individual employees from work on the project; and

(4) the prime contractor remains ultimately responsible for the payment of predetermined minimum wages, the submission of payrolls, statements of compliance and all other Federal regulatory requirements.

b. "Specialty Items" shall be construed to be limited to work that requires highly specialized knowledge, abilities, or equipment not ordinarily available in the type of contracting organizations qualified and expected to bid or propose on the contract as a whole and in general are to be limited to minor components of the overall contract.

2. The contract amount upon which the requirements set forth in paragraph (1) of Section VI is computed includes the cost of material and manufactured products which are to be purchased or produced by the contractor under the contract provisions.

3. The contractor shall furnish (a) a competent superintendent or supervisor who is employed by the firm, has full authority to direct performance of the work in accordance with the contract requirements, and is in charge of all construction operations (regardless of who performs the work) and (b) such other of its own organizational resources (supervision, management, and engineering services) as the contracting officer determines is necessary to assure the performance of the contract.

4. No portion of the contract shall be sublet, assigned or otherwise disposed of except with the written consent of the contracting officer, or authorized representative, and such consent when given shall not be construed to relieve the contractor of any responsibility for the fulfillment of the contract. Written consent will be given only after the contracting agency has assured that each subcontract is evidenced in writing and that it contains all pertinent provisions and requirements of the prime contract.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

VII. SAFETY: ACCIDENT PREVENTION

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

1. In the performance of this contract the contractor shall comply with all applicable Federal, State, and local laws governing safety, health, and sanitation (23 CFR 635). The contractor shall provide all safeguards, safety devices and protective equipment and take any other needed actions as it determines, or as the contracting officer may determine, to be reasonably necessary to protect the life and health of employees on the job and the safety of the public and to protect property in connection with the performance of the work covered by the contract.

2. It is a condition of this contract, and shall be made a condition of each subcontract, which the contractor enters into pursuant to this contract, that the contractor and any subcontractor shall not

permit any employee, in performance of the contract, to work in surroundings or under conditions which are unsanitary, hazardous or dangerous to his/her health or safety, as determined under construction safety and health standards (29 CFR 1926) promulgated by the Secretary of Labor, in accordance with Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 3704).

3. Pursuant to 29 CFR 1926.3, it is a condition of this contract that the Secretary of Labor or authorized representative thereof, shall have right of entry to any site of contract performance to inspect or investigate the matter of compliance with the construction safety and health standards and to carry out the duties of the Secretary under Section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C.3704).

VIII. FALSE STATEMENTS CONCERNING HIGHWAY PROJECTS

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

In order to assure high quality and durable construction in conformity with approved plans and specifications and a high degree of reliability on statements and representations made by engineers, contractors, suppliers, and workers on Federal-aid highway projects, it is essential that all persons concerned with the project perform their functions as carefully, thoroughly, and honestly as possible. Willful falsification, distortion, or misrepresentation with respect to any facts related to the project is a violation of Federal law. To prevent any misunderstanding regarding the seriousness of these and similar acts, Form FHWA-1022 shall be posted on each Federal-aid highway project (23 CFR 635) in one or more places where it is readily available to all persons concerned with the project:

18 U.S.C. 1020 reads as follows:

"Whoever, being an officer, agent, or employee of the United States, or of any State or Territory, or whoever, whether a person, association, firm, or corporation, knowingly makes any false statement, false representation, or false report as to the character, quality, quantity, or cost of the material used or to be used, or the quantity or quality of the work performed or to be performed, or the cost thereof in connection with the submission of plans, maps, specifications, contracts, or costs of construction on any highway or related project submitted for approval to the Secretary of Transportation; or

Whoever knowingly makes any false statement, false representation, false report or false claim with respect to the character, quality, quantity, or cost of any work performed or to be performed, or materials furnished or to be furnished, in connection with the construction of any highway or related project approved by the Secretary of Transportation; or

Whoever knowingly makes any false statement or false representation as to material fact in any statement, certificate, or report submitted pursuant to provisions of the Federal-aid Roads Act approved July 1, 1916, (39 Stat. 355), as amended and supplemented;

Shall be fined under this title or imprisoned not more than 5 years or both."

IX. IMPLEMENTATION OF CLEAN AIR ACT AND FEDERAL WATER POLLUTION CONTROL ACT

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

X. CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY AND VOLUNTARY EXCLUSION

This provision is applicable to all Federal-aid construction contracts, design-build contracts, subcontracts, lower-tier subcontracts, purchase orders, lease agreements, consultant contracts or any other covered transaction requiring FHWA approval or that is estimated to cost \$25,000 or more – as defined in 2 CFR Parts 180 and 1200.

1. Instructions for Certification – First Tier Participants:

- a. By signing and submitting this proposal, the prospective first tier participant is providing the certification set out below.
- b. The inability of a person to provide the certification set out below will not necessarily result in denial of participation in this covered transaction. The prospective first tier participant shall submit an explanation of why it cannot provide the certification set out below. The certification or explanation will be considered in connection with the department or agency's determination whether to enter into this transaction. However, failure of the prospective first tier participant to furnish a certification or an explanation shall disqualify such a person from participation in this transaction.
- c. The certification in this clause is a material representation of fact upon which reliance was placed when the contracting agency determined to enter into this transaction. If it is later determined that the prospective participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the contracting agency may terminate this transaction for cause of default.

d. The prospective first tier participant shall provide immediate written notice to the contracting agency to whom this proposal is submitted if any time the prospective first tier participant learns that its certification was erroneous when submitted or has become erroneous by reason of changed circumstances.

e. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

f. The prospective first tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency entering into this transaction.

g. The prospective first tier participant further agrees by submitting this proposal that it will include the clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transactions," provided by the department or contracting agency, entering into this covered transaction, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

h. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

i. Nothing contained in the foregoing shall be construed to require the establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of the prospective participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

j. Except for transactions authorized under paragraph (f) of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency may terminate this transaction for cause or default.

* * * * *

2. Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion – First Tier Participants:

a. The prospective first tier participant certifies to the best of its knowledge and belief, that it and its principals:

(1) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency;

(2) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(3) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (a)(2) of this certification; and

(4) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

b. Where the prospective participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

2. Instructions for Certification - Lower Tier Participants:

(Applicable to all subcontracts, purchase orders and other lower tier transactions requiring prior FHWA approval or estimated to cost \$25,000 or more - 2 CFR Parts 180 and 1200)

a. By signing and submitting this proposal, the prospective lower tier is providing the certification set out below.

b. The certification in this clause is a material representation of fact upon which reliance was placed when this transaction was entered into. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal Government, the department, or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

c. The prospective lower tier participant shall provide immediate written notice to the person to which this proposal is submitted if at any time the prospective lower tier participant learns that its certification was erroneous by reason of changed circumstances.

d. The terms "covered transaction," "debarred," "suspended," "ineligible," "participant," "person," "principal," and "voluntarily excluded," as used in this clause, are defined in 2 CFR Parts 180 and 1200. You may contact the person to which this proposal is submitted for assistance in obtaining a copy of those regulations. "First Tier Covered Transactions" refers to any covered transaction between a grantee or subgrantee of Federal funds and a participant (such as the prime or general contract). "Lower Tier Covered Transactions" refers to any covered transaction under a First Tier Covered Transaction (such as subcontracts). "First Tier Participant" refers to the participant who has entered into a covered transaction with a grantee or subgrantee of Federal funds (such as the prime or general contractor). "Lower Tier Participant" refers any participant who has entered into a covered transaction with a First Tier Participant or other Lower Tier Participants (such as subcontractors and suppliers).

e. The prospective lower tier participant agrees by submitting this proposal that, should the proposed covered transaction be entered into, it shall not knowingly enter into any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated.

f. The prospective lower tier participant further agrees by submitting this proposal that it will include this clause titled "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion-Lower Tier Covered Transaction," without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions exceeding the \$25,000 threshold.

g. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows that the certification is erroneous. A participant is responsible for ensuring that its principals are not suspended, debarred, or otherwise ineligible to participate in covered transactions. To verify the eligibility of its principals, as well as the eligibility of any lower tier prospective participants, each participant may, but is not required to, check the Excluded Parties List System website (<https://www.epls.gov/>), which is compiled by the General Services Administration.

h. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required by this clause. The knowledge and information of participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

i. Except for transactions authorized under paragraph e of these instructions, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal Government, the department or agency with which this transaction originated may pursue available remedies, including suspension and/or debarment.

* * * * *

**Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--
Lower Tier Participants:**

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

2. Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

XI. CERTIFICATION REGARDING USE OF CONTRACT FUNDS FOR LOBBYING

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts which exceed \$100,000 (49 CFR 20).

1. The prospective participant certifies, by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

a. No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

b. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any Federal agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

2. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by 31 U.S.C. 1352. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

3. The prospective participant also agrees by submitting its bid or proposal that the participant shall require that the language of this certification be included in all lower tier subcontracts, which exceed \$100,000 and that all such recipients shall certify and disclose accordingly.

**ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR
APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL
ACCESS ROAD CONTRACTS**

This provision is applicable to all Federal-aid projects funded under the Appalachian Regional Development Act of 1965.

1. During the performance of this contract, the contractor undertaking to do work which is, or reasonably may be, done as on-site work, shall give preference to qualified persons who regularly reside in the labor area as designated by the DOL wherein the contract work is situated, or the subregion, or the Appalachian counties of the State wherein the contract work is situated, except:

a. To the extent that qualified persons regularly residing in the area are not available.

b. For the reasonable needs of the contractor to employ supervisory or specially experienced personnel necessary to assure an efficient execution of the contract work.

c. For the obligation of the contractor to offer employment to present or former employees as the result of a lawful collective bargaining contract, provided that the number of nonresident persons employed under this subparagraph (1c) shall not exceed 20 percent of the total number of employees employed by the contractor on the contract work, except as provided in subparagraph (4) below.

2. The contractor shall place a job order with the State Employment Service indicating (a) the classifications of the laborers, mechanics and other employees required to perform the contract work, (b) the number of employees required in each classification, (c) the date on which the participant estimates such employees will be required, and (d) any other pertinent information required by the State Employment Service to complete the job order form. The job order may be placed with the State Employment Service in writing or by telephone. If during the course of the contract work, the information submitted by the contractor in the original job order is substantially modified, the participant shall promptly notify the State Employment Service.

3. The contractor shall give full consideration to all qualified job applicants referred to him by the State Employment Service. The contractor is not required to grant employment to any job applicants who, in his opinion, are not qualified to perform the classification of work required.

4. If, within one week following the placing of a job order by the contractor with the State Employment Service, the State Employment Service is unable to refer any qualified job applicants to the contractor, or less than the number requested, the State Employment Service will forward a certificate to the contractor indicating the unavailability of applicants. Such certificate shall be made a part of the contractor's permanent project records. Upon receipt of this certificate, the contractor may employ persons who do not normally reside in the labor area to fill positions covered by the certificate, notwithstanding the provisions of subparagraph (1c) above.

5. The provisions of 23 CFR 633.207(e) allow the contracting agency to provide a contractual preference for the use of mineral resource materials native to the Appalachian region.

6. The contractor shall include the provisions of Sections 1 through 4 of this Attachment A in every subcontract for work which is, or reasonably may be, done as on-site work.

End of FHWA 1273