

Updated 04/08/14

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.

REQUEST FOR INFORMATION

[illegible][illegible]

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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.

MDOTs DBE Directory of Certified firms can also be obtained at <http://www.maine.gov/mdot/civilrights/dbe.htm>

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 FFY 2013-15
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/civilrights/dbe.htm>

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>**

Rev. 05/13

Maine Department of Transportation Civil Rights Office

Directory of Certified Disadvantaged Business Enterprises

Listing can be found at:

<http://www.maine.gov/mdot/civilrights/dbe.htm>

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 listing.

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 Oxford Bridge Replacement in the town of **OXFORD**" 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 May 21, 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. AC-BH-1926(800)X, WIN 019268.00

Location: In Oxford County, project is located on King Street and Pleasant Street/ Route 121 over the Little Androscoggin river approximately 1.1 miles westerly of route 26 Junction.

Scope of Work: Oxford Bridge replacement plus other incidental work.

The basis of award will be Section 1 only.

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 and at the Department of Transportation's Regional Office in Scarborough. 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 \$59.00 (\$64.50 by mail). Half size plans \$29.50 (\$32.75 by mail), Bid Book \$10 (\$13 by mail), Single Sheets \$2, payment in advance, all non-refundable.

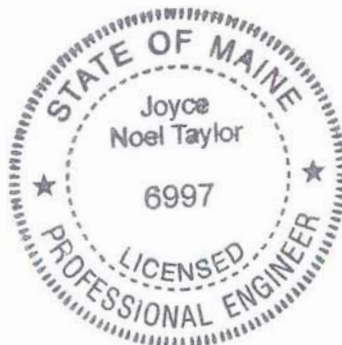
Each Bid must be made upon blank forms provided by the Department and must be accompanied by a bid bond at 5% of the bid amount or an official bank check, cashier's check, certified check, certificate of deposit, or United States postal money order in the amount of \$80,000.00 payable to Treasurer, State 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
April 30, 2014



A handwritten signature in blue ink that reads "Joye Noel Taylor".

JOYE 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)

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0010	201.11 CLEARING	0.600 AC	_____	 _____	_____	 _____
0020	201.23 REMOVING SINGLE TREE TOP ONLY	1.000 EA	_____	 _____	_____	 _____
0030	201.24 REMOVING STUMP	1.000 EA	_____	 _____	_____	 _____
0040	202.08 REMOVING BUILDING NO.: 1	LUMP SUM	LUMP SUM		_____	 _____
0050	202.19 REMOVING EXISTING BRIDGE	LUMP SUM	LUMP SUM		_____	 _____
0060	203.20 COMMON EXCAVATION	4,425.000 CY	_____	 _____	_____	 _____
0070	203.21 ROCK EXCAVATION	100.000 CY	_____	 _____	_____	 _____
0080	203.2318 DISPOSAL OF SPECIAL WASTE	120.000 T	_____	 _____	_____	 _____
0090	203.25 GRANULAR BORROW	820.000 CY	_____	 _____	_____	 _____
0100	206.061 STRUCTURAL EARTH EXCAVATION - DRAINAGE AND MINOR STRUCTURES, BELOW GRADE	50.000 CY	_____	 _____	_____	 _____
0110	206.07 STRUCTURAL ROCK EXCAVATION - DRAINAGE AND MINOR STRUCTURES	100.000 CY	_____	 _____	_____	 _____
0120	206.10 STRUCTURAL EARTH EXCAVATION - PIERS	25.000 CY	_____	 _____	_____	 _____

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Proposal Schedule of Items

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0130	304.10 AGGREGATE SUBBASE COURSE - GRAVEL	2,750.000 CY	_____	_____	_____	_____
0140	403.207 HOT MIX ASPHALT 19.0 MM HMA	620.000 T	_____	_____	_____	_____
0150	403.2081 12.5 MM POLYMER MODIFIED HOT MIX ASPHALT	368.000 T	_____	_____	_____	_____
0160	403.209 HOT MIX ASPHALT 9.5 MM (SIDEWALKS, DRIVES, INCIDENTALS)	45.000 T	_____	_____	_____	_____
0170	403.2131 12.5 MM POLYMER MODIFIED HMA BASE	368.000 T	_____	_____	_____	_____
0180	409.15 BITUMINOUS TACK COAT - APPLIED	212.000 G	_____	_____	_____	_____
0190	501.231 DYNAMIC LOADING TEST	4.000 EA	_____	_____	_____	_____
0200	501.50 STEEL H-BEAM PILES 89 LBS/FT, DELIVERED	440.000 LF	_____	_____	_____	_____
0210	501.501 STEEL H-BEAM PILES 89 LBS/FT, IN PLACE	440.000 LF	_____	_____	_____	_____
0220	501.70 STEEL PIPE PILES, DELIVERED 30" DIA 3/4" WALL	95.000 LF	_____	_____	_____	_____
0230	501.70 STEEL PIPE PILES, DELIVERED 30" DIA 5/8" WALL	135.000 LF	_____	_____	_____	_____

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1 MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0240	501.701 STEEL PIPE PILES, IN PLACE 30" DIA 3/4" WALL	95.000 LF	_____	 _____	_____	 _____
0250	501.701 STEEL PIPE PILES, IN PLACE 30" DIA 5/8" WALL	135.000 LF	_____	 _____	_____	 _____
0260	501.90 PILE TIPS	10.000 EA	_____	 _____	_____	 _____
0270	501.903 PILE TIPS - ROCK INJECTOR POINT	5.000 EA	_____	 _____	_____	 _____
0280	501.91 PILE SPLICES	5.000 EA	_____	 _____	_____	 _____
0290	501.92 PILE DRIVING EQUIPMENT MOBILIZATION	LUMP SUM	LUMP SUM		_____	 _____
0300	502.219 STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS	LUMP SUM	LUMP SUM		_____	 _____
0310	502.239 STRUCTURAL CONCRETE PIERS	LUMP SUM	LUMP SUM		_____	 _____
0320	502.26 STRUCTURAL CONCRETE ROADWAY AND SIDEWALK SLABS ON STEEL BRIDGES	LUMP SUM	LUMP SUM		_____	 _____
0330	502.31 STRUCTURAL CONCRETE APPROACH SLABS	LUMP SUM	LUMP SUM		_____	 _____
0340	502.49 STRUCTURAL CONCRETE CURBS AND SIDEWALKS	LUMP SUM	LUMP SUM		_____	 _____

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1 MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0350	503.12 REINFORCING STEEL, FABRICATED AND DELIVERED	19,100.000 LB	_____	 _____	_____	 _____
0360	503.13 REINFORCING STEEL, PLACING	19,100.000 LB	_____	 _____	_____	 _____
0370	503.14 EPOXY-COATED REINFORCING STEEL, FABRICATED AND DELIVERED	1,100.000 LB	_____	 _____	_____	 _____
0380	503.15 EPOXY-COATED REINFORCING STEEL, PLACING	1,100.000 LB	_____	 _____	_____	 _____
0390	504.702 STRUCTURAL STEEL FABRICATED AND DELIVERED, WELDED	LUMP SUM	LUMP	 SUM	_____	 _____
0400	504.71 STRUCTURAL STEEL ERECTION	LUMP SUM	LUMP	 SUM	_____	 _____
0410	504.905 ROCK ANCHORS	LUMP SUM	LUMP	 SUM	_____	 _____
0420	504.906 ROCK DOWEL	LUMP SUM	LUMP	 SUM	_____	 _____
0430	505.08 SHEAR CONNECTORS	LUMP SUM	LUMP	 SUM	_____	 _____
0440	506.9105 POLYUREA ELASTOMER COATING	LUMP SUM	LUMP	 SUM	_____	 _____
0450	507.0821 STEEL BRIDGE RAILING, 3 BAR	LUMP SUM	LUMP	 SUM	_____	 _____
0460	508.14 HIGH PERFORMANCE WATERPROOFING MEMBRANE	LUMP SUM	LUMP	 SUM	_____	 _____

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Proposal Schedule of Items

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1 MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0470	511.07 COFFERDAM: ABUT NO.2	LUMP SUM		LUMP SUM		
0480	514.06 CURING BOX FOR CONCRETE CYLINDERS	1.000 EA				
0490	515.21 PROTECTIVE COATING FOR CONCRETE SURFACES	LUMP SUM		LUMP SUM		
0500	520.232 EXPANSION DEVICE - ASPHALTIC PLUG JOINT	62.000 LF				
0510	523.52 BEARING INSTALLATION	5.000 EA				
0520	523.5401 LAMINATED ELASTOMERIC BEARINGS, FIXED	5.000 EA				
0530	526.34 PERMANENT CONCRETE TRANSITION BARRIER	4.000 EA				
0540	527.303 ENERGY ABSORBING SYSTEM (ET-PLUS)	1.000 EA				
0550	603.15 12 INCH CULVERT PIPE OPTION I	5.000 LF				
0560	603.17 18 INCH CULVERT PIPE OPTION I	124.000 LF				
0570	603.179 18 INCH CULVERT PIPE OPTION III	66.000 LF				
0580	604.092 CATCH BASIN TYPE B1-C	6.400 EA				

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Proposal Schedule of Items

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0590	604.096 60 INCH CATCH BASIN TYPE B1-C	1.000 EA				
0600	604.245 CATCH BASIN TYPE F4-C	1.000 EA				
0610	604.262 CATCH BASIN TYPE B5-C	1.000 EA				
0620	605.09 6 INCH UNDERDRAIN TYPE B	40.000 LF				
0630	605.11 12 INCH UNDERDRAIN TYPE C	810.000 LF				
0640	605.13 18 INCH UNDERDRAIN TYPE C	43.000 LF				
0650	606.1721 BRIDGE TRANSITION - TYPE 1	4.000 EA				
0660	606.23 GUARDRAIL TYPE 3C - SINGLE RAIL	325.000 LF				
0670	606.232 GUARDRAIL TYPE 3C - OVER 15 FOOT RADIUS	138.000 LF				
0680	606.265 TERMINAL END - SINGLE RAIL - GALVANIZED STEEL	3.000 EA				
0690	606.353 REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	8.000 EA				
0700	606.356 UNDERDRAIN DELINEATOR POST	4.000 EA				

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Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0710	609.31 CURB TYPE 3	1,025.000 LF	_____	_____	_____	_____
0720	610.08 PLAIN RIPRAP	175.000 CY	_____	_____	_____	_____
0730	610.16 HEAVY RIPRAP	1,730.000 CY	_____	_____	_____	_____
0740	610.18 STONE DITCH PROTECTION	14.000 CY	_____	_____	_____	_____
0750	613.319 EROSION CONTROL BLANKET	140.000 SY	_____	_____	_____	_____
0760	615.07 LOAM	220.000 CY	_____	_____	_____	_____
0770	618.1301 SEEDING METHOD NUMBER 1 - PLAN QUANTITY	17.000 UN	_____	_____	_____	_____
0780	618.1411 SEEDING METHOD NUMBER 3 - PLAN QUANTITY	19.000 UN	_____	_____	_____	_____
0790	619.1201 MULCH - PLAN QUANTITY	36.000 UN	_____	_____	_____	_____
0800	620.58 EROSION CONTROL GEOTEXTILE	1,350.000 SY	_____	_____	_____	_____
0810	620.661 DRAINAGE GEOCOMPOSITE INSTALLATION	55.000 SY	_____	_____	_____	_____
0820	627.733 4" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	4,500.000 LF	_____	_____	_____	_____

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Proposal ID: 019268.00

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SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0830	627.75 WHITE OR YELLOW PAVEMENT & CURB MARKING	65.000 SF	_____	_____	_____	_____
0840	627.76 TEMPORARY PAVEMENT MARKING LINE, WHITE OR YELLOW	LUMP SUM	LUMP SUM		_____	_____
0850	629.05 HAND LABOR, STRAIGHT TIME	80.000 HR	_____	_____	_____	_____
0860	631.10 AIR COMPRESSOR (INCLUDING OPERATOR)	40.000 HR	_____	_____	_____	_____
0870	631.11 AIR TOOL (INCLUDING OPERATOR)	40.000 HR	_____	_____	_____	_____
0880	631.12 ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	80.000 HR	_____	_____	_____	_____
0890	631.14 GRADER (INCLUDING OPERATOR)	40.000 HR	_____	_____	_____	_____
0900	631.172 TRUCK - LARGE (INCLUDING OPERATOR)	40.000 HR	_____	_____	_____	_____
0910	631.18 CHAIN SAW RENTAL (INCLUDING OPERATOR)	40.000 HR	_____	_____	_____	_____
0920	631.20 STUMP CHIPPER (INCLUDING OPERATOR)	20.000 HR	_____	_____	_____	_____
0930	631.22 FRONT END LOADER (INCLUDING OPERATOR)	20.000 HR	_____	_____	_____	_____

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 9 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0940	631.32 CULVERT CLEANER (INCLUDING OPERATOR)	10.000 HR	_____	_____	_____	_____
0950	637.071 DUST CONTROL	LUMP SUM	LUMP SUM		_____	_____
0960	639.18 FIELD OFFICE TYPE A	1.000 EA	_____	_____	_____	_____
0970	645.271 REGULATORY, WARNING, CONFIRMATION AND ROUTE MARKER ASSEMBLY SIGNS, TYPE I	140.000 SF	_____	_____	_____	_____
0980	652.312 TYPE III BARRICADE	8.000 EA	_____	_____	_____	_____
0990	652.33 DRUM	75.000 EA	_____	_____	_____	_____
1000	652.34 CONE	75.000 EA	_____	_____	_____	_____
1010	652.35 CONSTRUCTION SIGNS	600.000 SF	_____	_____	_____	_____
1020	652.361 MAINTENANCE OF TRAFFIC CONTROL DEVICES	LUMP SUM	LUMP SUM		_____	_____
1030	652.38 FLAGGER	2,600.000 HR	_____	_____	_____	_____
1040	652.41 PORTABLE CHANGEABLE MESSAGE SIGN	2.000 EA	_____	_____	_____	_____
1050	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP SUM	LUMP SUM		_____	_____

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 10 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 1

MAIN ITEMS

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
1060	658.20 ACRYLIC LATEX COLOR FINISH, GREEN	6.000 SY	_____	_____	_____	_____
1070	659.10 MOBILIZATION	LUMP SUM	LUMP SUM		_____	_____
1080	660.21 ON-THE-JOB TRAINING (BID)	500.000 HR	_____	_____	_____	_____
Section: 1			Total:		_____	_____

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 11 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 2

SEWER FORCE MAIN OPTION

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
1090	659.10 MOBILIZATION SEWER	LUMP SUM				
			LUMP	SUM		
1100	827.30 ROCK EXCAVATION- REMOVE AND REFILL	15.000 CY				
1110	827.31 UNSUITABLE SOIL EXCAVATION, REMOVE AND REFILL- ABOVE GRADE SEWER	15.000 CY				
1120	830.13 SEWER MAIN BRIDGE CROSSING	LUMP SUM				
			LUMP	SUM		
1130	845.10 STRUCTURAL STEEL UTILITY SUPPORT	LUMP SUM				
			LUMP	SUM		
	Section: 2		Total:			

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 12 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 3

OXFORD WATER DISTRICT OPTION

Alt Set ID:

Alt Mbr ID:

Contractor: _____

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 13 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 3

OXFORD WATER DISTRICT OPTION

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
1140	652.35 CONSTRUCTION SIGNS	32.000 SF				
1150	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP SUM		LUMP SUM		
1160	659.10 MOBILIZATION WATER DISTRICT	LUMP SUM		LUMP SUM		
1170	823.311 12 INCH GATE VALVE WITH BOX	2.000 EA				
1180	825.60 12" HIGH DENSITY POLYETHYLENE WATER MAIN	660.000 LF				
1190	825.62 8" HIGH DENSITY POLYETHYLENE WATER MAIN	20.000 LF				
1200	827.301 ROCK EXCAVATION WATER MAIN WATER DISTRICT	10.000 CY				
1210	827.31 UNSUITABLE SOIL EXCAVATION, REMOVE AND REFILL- ABOVE GRADE WATER DISTRICT	25.000 CY				
1220	827.331 TRENCH INSULATION	25.000 SY				
1230	910.30 SPECIAL WORK HYDRANT LATERAL AND VALVE	2.000 EA				
1240	910.301 SPECIAL WORK SERVICE LATERAL	LUMP SUM		LUMP SUM		

4/15/2014

Maine Department of Transportation

Proposal Schedule of Items

Page 14 of 14

Proposal ID: 019268.00

Project(s): 019268.00

SECTION: 3

OXFORD WATER DISTRICT OPTION

Alt Set ID:

Alt Mbr ID:

Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
1250	910.301 SPECIAL WORK CONNECTION B	LUMP SUM	LUMP	SUM	_____	_____
1260	910.301 SPECIAL WORK CONNECTION A	LUMP SUM	LUMP	SUM	_____	_____
Section: 3			Total:		_____	_____
			Total Bid:		_____	_____

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 **019268.00**, for the **Covered Bridge Replacement** in the town of **Oxford**, County of **Oxford**, 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 **September 25, 2015**. 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

Section 1 \$ _____

Section 2 \$ _____

Section 3 \$ _____

Performance Bond and Payment Bond each being 100% of the amount awarded under this Contract (see award amount in Section G below).

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 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 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of: **WIN 019268.00 Covered 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 for (see checked boxes):

Section 1 ☐
Section 2 ☐
Section 3 ☐

Contract Amount: _____

This award consummates the Contract, and the documents referenced herein.

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 **019268.00**, for the **Covered Bridge Replacement** in the town of **Oxford**, County of **Oxford**, 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 **September 25, 2015**. 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

Section 1 \$ _____

Section 2 \$ _____

Section 3 \$ _____

Performance Bond and Payment Bond each being 100% of the amount awarded under this Contract (see award amount in Section G below).

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 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 as updated through advertisement, Supplemental Specifications, Special Provisions, Contract Agreement; and Contract Bonds contained herein for construction of: **WIN 019268.00 Covered 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 for (see checked boxes):

Section 1 ☐

Section 2 ☐

Section 3 ☐

Contract Amount: _____

This award consummates the Contract, and the documents referenced herein.

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

CONTRACTOR

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

(Print Name Here)
(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 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:

Signature.....
Print Name Legibly

Signature
Print Name Legibly

SURETY ADDRESS:

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

TELEPHONE.....

SIGNATURES:

CONTRACTOR:

.....
Print Name Legibly

SURETY:

.....
Print Name Legibly

NAME OF LOCAL AGENCY:

ADDRESS
.....
.....

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

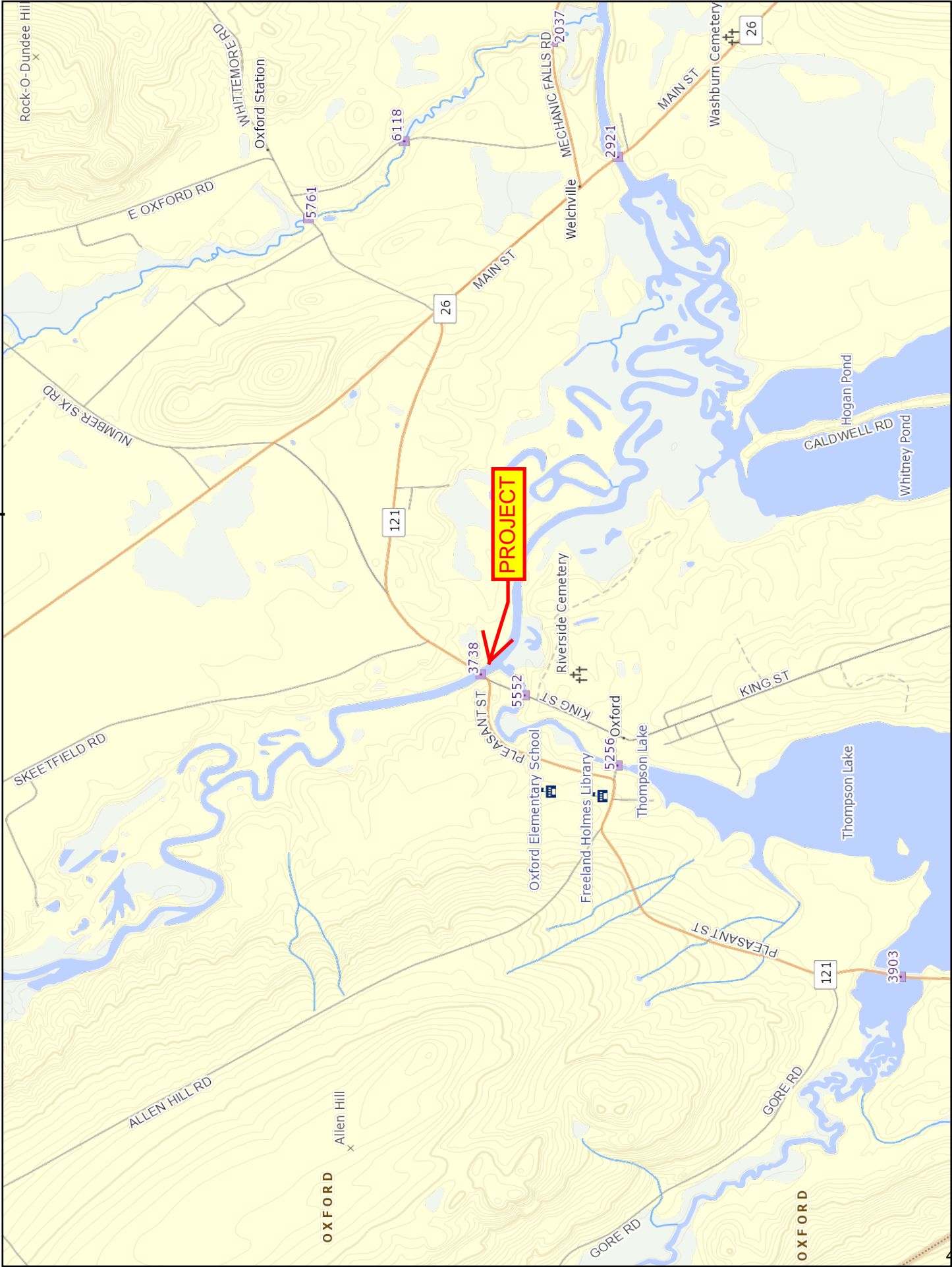
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TELEPHONE

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Maine DOT Map



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: ME140044 01/03/2014 ME44

Superseded General Decision Number: ME20130044

State: Maine

Construction Type: Highway

County: Oxford 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 Publication Date
0 01/03/2014

* TEAM0340-001 08/01/2013

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

* SUME2011-039 09/14/2011

	Rates	Fringes
CARPENTER, Includes Form Work....	\$ 18.34	2.84
INSTALLER - GUARDRAIL.....	\$ 15.76	0.00
IRONWORKER, REINFORCING.....	\$ 18.98	0.00
LABORER: Asphalt Raker.....	\$ 14.71	2.95
LABORER: Flagger.....	\$ 10.34	0.00
LABORER: Landscape.....	\$ 14.42	1.42
LABORER: Pipelayer.....	\$ 14.40	1.87
LABORER: Common or General, Including Highway/Parking Lot Striping.....	\$ 14.90	1.08
OPERATOR: Asphalt Roller.....	\$ 18.76	8.90
OPERATOR: Backhoe.....	\$ 14.51	2.95
OPERATOR: Bobcat/Skid Steer/Skid Loader.....	\$ 16.73	5.57

OPERATOR: Bul l dozer.....	\$ 16. 49	1. 30
OPERATOR: Col d Pl aner.....	\$ 17. 63	0. 00
OPERATOR: Crane.....	\$ 20. 99	6. 40
OPERATOR: Excavator.....	\$ 16. 87	1. 33
OPERATOR: Grader/Bl ade.....	\$ 18. 63	3. 29
OPERATOR: Loader.....	\$ 15. 14	2. 11
OPERATOR: Mechani c.....	\$ 19. 30	7. 60
OPERATOR: Mill ing Machi ne Recl ai mer Combo.....	\$ 13. 00	0. 80
OPERATOR: Paver (Asphal t, Aggregate, and Concrete).....	\$ 20. 22	7. 99
OPERATOR: Screed.....	\$ 16. 92	5. 36
OPERATOR: Rol l er (Earth).....	\$ 15. 74	2. 47
TRAFFIC CONTROL: LABORER -Devi ce Moni tor.....	\$ 14. 80	6. 29
TRUCK DRIVER, Incl udes Al l Dump Trucks.....	\$ 13. 11	1. 10
TRUCK DRIVER: Semi -Trail er Truck.....	\$ 16. 36	9. 09
TRUCK DRIVER: 1, 2, 3 Axle Truck.....	\$ 16. 85	4. 98

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

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.

MaineDOT DBE Project Attainment Target (PAT)
for this Project is 4.0%

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.

OXFORD
COVER BRIDGE
BRIDGE REPLACEMENT
PIN 19268.00

GENERAL NOTE

A Maine Department of Environmental Protection (MDEP) data base review suggested some petroleum contamination issues in the vicinity of the project. In particular the Fire Station/Recreation Hall located at roughly Maine Department of Transportation (MaineDOT) station 51+00 to roughly MaineDOT station 52+50 left of center. However, the scope of work for this project suggests petroleum or hazardous waste should not be encountered. However, in light of the reported spills, 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 additionally 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 MaineDOT'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.

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 PROVISIONS
SECTION 104
Utilities

UTILITY COORDINATION

The contractor has primary responsibility for coordinating their work with utilities after contract award. The contractor shall communicate directly with the utilities regarding any utility work necessary to maintain the contractor's schedule and prevent project construction delays. The contractor shall notify the resident of any issues.

THE CONTRACTOR SHALL PLAN AND CONDUCT WORK ACCORDINGLY.

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	
Northern New England Telephone Operations LLC (FairPoint)	X	
Oxford Water District (OWD)		X
Time Warner Cable (TWC)	X	
Town of Oxford		X

Utility Contact Information				
Utility	Contact Person	Office Phone	Cell Phone	
CMP	Robert Fickett	647-1001	242-1192	robert.fickett@cmpco.com
FairPoint	Harry Loring	797-1832	272-2469	hloring@fairpoint.com
Oxford Water District	Ryan Lippincott	743-2414	890-2624	rlnwd@megalink.net
Time Warner Company	Paul Ouellette	783-9902	458-8102	paul.ouellette@twcable.com
Town of Oxford	Michael Chamings	539-4431		oxfordtnmgr@roadrunner.com

There may be project construction activities which will occur around or beneath existing aerial neutral conductors. The Contractor shall conduct their work accordingly. If the Contractor has a question about line voltage they need to contact Central Maine Power Company.

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.

BUY AMERICA

Utility construction work performed as part this federal-aid project is subject to the requirements of Buy America in accordance with Federal Regulation 23 CFR 635.410 Section 1518. Specific requirements are presented in MaineDOT Standard Specification Section 100, Appendix A, Section 3.A., Buy America.

AERIAL

Summary:

Utility	Pole Set	New Wires/ Cables	Trans. Wires/ Cables	Remove Poles	Estimated Working Days
Central Maine Power Company	X	X		X	5
Northern New England Telephone Operations, LLC (FairPoint Communications)			X		0
Time Warner Cable			X		0
Total:					5

Utility Specific Issues:

Central Maine Power Company

CMP will install Hendrix cable on the downstream side of bridge to the backside of the poles to provide adequate safety clearance for the crane work. The utility will extend the Hendrix cable off Pleasant Street to the pole located at Sta. 52+36.20 RT approximately. CMP will remove pole located at Sta.53+11 to eliminate the aerial utilities within the intersection. CMP estimates five (5) working days to complete their work.

Northern New England Telephone Operations LLC (FairPoint Communications)

FairPoint has 1 fiber and 3 copper lines on the project. The utility may need to transfer if taller poles become necessary, but if not they will not be involved in the project at this time.

Time Warner Cable

The utility has 2 fiber and 1 coax lines on this project. TWC may need to transfer if taller poles become necessary, but if not they will not be involved in the project at this time.

Pole List:

Existing Pole #	Existing Station	Left/Right		Existing Offset	Proposed Station	Left/Right		Proposed Offset	Comments
		LT	RT			LT	RT		
	53+11			@ C/L					Remove

SUBSURFACE

Summary:

Utility	Summary of Work	Estimated Working Days
Oxford Water District	Installation of 12" water main	0
Town of Oxford	Installation of sewer main	0
Total:		0

**** Special Notes to Contractor****

The Contractor shall coordinate the installation of the sewer force main and electrical conduits with the guardrail layout to avoid potential interferences including but not limited to the following locations: in the vicinity of Station 14+40 LT, 14+80 LT and 17+75 RT.

Utility Specific Issues:

Oxford Water District

The Oxford Water District plans to have the Department's Contractor install a 12" ductile iron water main from Sta. 20+16.22 – 10.7' RT to Sta. 14+50.00 – 37.62' RT to Sta. 13+88.86 – 62.26' LT. This also will include installation of two fire hydrants, please refer to Oxford Water District plans and specifications for more detail. If the bid price exceeds the District's estimate by 15% or more, the District reserves the right to remove their work from the Department's contract. If this work is removed they may negotiate with the Contractor or others for the performance of this work. Coordination of the above work will occur between the parties before the installation of the water main begins.

Town of Oxford

The Town plans to have the Department's Contractor install a new elevated sanitary sewer force main bridge crossing over Little Androscoggin River, below grade force main piping, associated structures, insulation, valves, electrical work and other items as described in the Contract documents. The sewer main extends from Sta. 17+50 to Sta. 20+50+/- and from Sta. 50+50 to Sta. 53+71.77. For more information please refer to the plans and specifications documents for more detail. If the bid price exceeds the Town's estimate by 15% or more, the Town reserves the right to remove their work from the Department's contract. If this work is removed they may negotiate with the Contractor or others for the performance of this work. Coordination of the above work will occur between the parties before the installation of the sewer main begins.

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.

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.

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 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 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 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
(Environmental Requirements)

The northern long eared bat (*Myotis septentrionalis*) (hereafter referred to as 'NLE bat') was proposed for listing under the Federal Endangered Species Act (ESA) on October 2, 2013 (Federal Register Vol. 78, No. 191, pages 61046-61080). This species is expected to be listed as Endangered under the ESA around October 2014.

The following conditions must be met to minimize harm to the NLE bat.

I. Special Conditions:

1. **All clearing for the entire project must occur prior to October 1, 2014.**

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 shall not be allowed between the dates of October 2 and July 14.

(In-Water work is allowed from July 15 to October 1)

II. In-Water work window applies to the following water bodies at the following station #'s:

1. Little Androscoggin River at proposed bridge replacement

III. Special Conditions:

1. Special Conditions of Army Corps of Engineers (ACOE) Category II permit apply (see permit and conditions in contract documents).
2. Conditions of DEP Permit-By-Rule Section 11 apply (see permit and conditions in contract documents).

IV. Approvals:

1. Temporary Soil Erosion and Water Pollution Control Plan
2. Permitted Resource Impacts (square feet), see ACOE permit for locations:

Stream:

Permanent: RUS-2326

Temporary: RUS-2500

V. All activities are prohibited (including placement and removal of cofferdams unless otherwise permitted by Regulatory Agencies) below the normal high water mark if outside the prescribed in-water work window, except for the following:

1. Work within a cofferdam constructed according to MaineDOT's Standard Specifications and in adherence with the contractors approved “Soil Erosion and Water Pollution Control Plan”.

VI. No work is allowed that completely blocks a river, stream, or brook without providing downstream flow.

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

SPECIAL PROVISION 105
CONSTRUCTION AREA

A Construction Area located in the **Town of Oxford** 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 Oxford, Oxford County on King Street and Pleasant Street / Route 121 over the Little Androscoggin river.
- (b) (King Street) station 50+50.00 to station 53+29.41 of the construction plus approaches.
- (c) (Pleasant Street / Route 121) over Little Androscoggin river station 11+65.00 to station 20+50.00 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 Oxford** 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 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 Completion Date)

107.1 Contract Completion Date Add the following to this section.

The specified Contract Completion Date is September 25, 2015.

**SPECIAL PROVISION
SECTION 107
TIME**

107.4.2 Schedule of Work Required. This Section is amended by the following:

In addition to the Contractors initial CPM Schedule, the Department will require the Contractor to update the schedule monthly to show current progress. The submittal date for monthly updates shall be determined by the Resident.

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 107

TIME

(Scheduling of Work – Projected Payment Schedule)

Description The Contractor shall also provide the Department with a Quarterly 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 submit the Projected Payment Schedule as a condition of Award.

SPECIAL PROVISION

SECTION 107

TIME

(Supplemental Liquidated Damages for Fabrication Time)

Append Section 107.8 with the following:

107.8.1 Fabrication Time

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

<u>Element</u>	<u>Time</u>	<u>Supplemental LD</u>
1) Structural Steel Fabrication	75 calendar days	\$650 per calendar day

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

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

Inspection is required for the following activities:

For metal fabrication work - welding, including tack welding, heat correcting, non-destructive examination, assembly verification, and galvanizing (see also Special Provision 506).

SPECIAL PROVISION
SECTION 108
PAYMENT
(Asphalt Escalator)

108.4.1 Price Adjustment for Hot Mix Asphalt: For all contracts with hot mix asphalt in excess of 500 tons total, a price adjustment for performance graded binder will be made for the following pay items:

- Item 403.102 Hot Mix Asphalt – Special Areas
- Item 403.206 Hot Mix Asphalt - 25 mm
- Item 403.207 Hot Mix Asphalt - 19 mm
- Item 403.2071 Hot Mix Asphalt - 19 mm (Polymer Modified)
- Item 403.2072 Hot Mix Asphalt - 19 mm (Asphalt Rich Base)
- Item 403.2073 Warm Mix Asphalt - 19 mm
- Item 403.208 Hot Mix Asphalt - 12.5 mm
- Item 403.2081 Hot Mix Asphalt - 12.5 mm (Polymer Modified)
- Item 403.20813 Warm Mix Asphalt - 12.5 mm (Polymer Modified)
- Item 403.2083 Warm Mix Asphalt - 12.5 mm
- Item 403.209 Hot Mix Asphalt - 9.5 mm (sidewalks, drives, & incidentals)
- Item 403.210 Hot Mix Asphalt - 9.5 mm
- Item 403.2101 Hot Mix Asphalt - 9.5 mm (Polymer Modified)
- Item 403.2102 Hot Mix Asphalt - 9.5 mm (Asphalt Rich Base)
- Item 403.2103 Warm Mix Asphalt - 9.5 mm
- Item 403.2104 Hot Mix Asphalt - 9.5 mm (3/4" Surface)
- Item 403.211 Hot Mix Asphalt – Shim
- Item 403.2111 Hot Mix Asphalt – Shim (Polymer Modified)
- Item 403.2113 Warm Mix Asphalt - Shim
- Item 403.212 Hot Mix Asphalt - 4.75 mm (Shim)
- Item 403.2123 Warm Mix Asphalt - 4.75 mm (Shim)
- Item 403.213 Hot Mix Asphalt - 12.5 mm (base and intermediate course)
- Item 403.2131 Hot Mix Asphalt - 12.5 mm (base and intermediate course Polymer Modified)
- Item 403.2132 Hot Mix Asphalt - 12.5 mm (Asphalt Rich Base and intermediate course)
- Item 403.2133 Warm Mix Asphalt - 12.5 mm (base and intermediate course)
- Item 403.214 Hot Mix Asphalt - 4.75 mm (Surface)
- Item 403.2143 Warm Mix Asphalt - 4.75 mm (Surface)
- Item 403.301 Hot Mix Asphalt (Asphalt Rubber Gap-Graded)
- Item 404.70 Colored Hot Mix Asphalt – 9.5mm (Surface)
- Item 404.72 Colored Hot Mix Asphalt – 9.5mm (Islands, sidewalks, & incidentals)
- Item 461.13 Maintenance Surface Treatment

Price adjustments will be based on the variance in costs for the performance graded binder component of hot mix asphalt. They will be determined as follows:

The quantity of hot mix asphalt for each pay item will be multiplied by the performance graded binder percentages given in the table below times the difference in price between the base price and the period price of asphalt cement. Adjustments will be made upward or downward, as prices increase or decrease.

Item 403.102–6.2%			
Item 403.206–4.8%			
Item 403.207–5.2%	Item 403.2071–5.2%	Item 403.2072–5.8%	Item 403.2073–5.2%
Item 403.208–5.6%	Item 403.2081–5.6%	Item 403.20813–5.6%	Item 403.2083–5.6%
Item 403.209–6.2%			
Item 403.210–6.2%	Item 403.2101–6.2%	Item 403.2102–6.8%	Item 403.2103–6.2%
Item 403.2104–6.2%			
Item 403.211–6.2%	Item 403.2111–6.2%		Item 403.2113–6.2%
Item 403.212–6.8%			Item 403.2123–6.8%
Item 403.213–5.6%	Item 403.2131–5.6%	Item 403.2132–6.2%	Item 403.2133–5.6%
Item 403.214–6.8%			Item 403.2143–6.8%
Item 403.301–6.2%			
Item 404.70–6.2%			
Item 404.72–6.2%			
Item 461.13–6.4%			

Hot Mix Asphalt: The quantity of hot mix asphalt will be determined from the quantity shown on the progress estimate for each pay period.

Base Price: The base price of performance graded binder to be used is the price per standard ton current with the bid opening date. This price is determined by using the average New England Selling Price (Excluding the Connecticut market area), as listed in the Asphalt Weekly Monitor.

Period Price: The period price of performance graded binder will be determined by the Department by using the average New England Selling Price (Excluding the Connecticut market area), listed in the Asphalt Weekly Monitor current with the paving date. The maximum Period Price for paving after the adjusted Contract Completion Date will be the Period Price on the adjusted Contract Completion Date.

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)

The following shall be added to the Standard Specifications.

Removing Building No. 1 is for the building located approximately 14+10 left. Removal shall include the structure foundations and filling of remaining cellar cavities. Foundations shall be removed to two feet below finished grade.

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

The Contractor shall not remove a building until the Department 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 Department will re-inspect the building within seven 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 Pay Item under Section 109.3 - Extra Work.

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 – Equitable Adjustments to Compensation. 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 buildings are serviced by a private septic system or cistern. The system shall be pumped out to remove waste material prior to demolition work. The septic system shall be removed or broken up and backfilled to the limits of the surrounding ground.

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

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

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.

The buildings have oil/fuel tanks that will need to be 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.

Method of Measurement

Removing building will be measured for payment as one lump sum.

Basis of Payment

The work under this Section will be paid for at the contract Lump Sum price, complete and in place, which price will include full compensation for all materials, transportation, tools, equipment, and labor required to perform the work as specified herein, as shown on the Contract Drawings, and/or as directed by the Resident.

Payment will be made under:

Pay Item

Pay Unit

202.08 Removing Building No. 1

Lump Sum

SPECIAL PROVISION
SECTION 203
EXCAVATION AND EMBANKMENT
(Dredge Materials)

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

In accordance with CMR 418, one hundred cubic yards or less of Dredge Material Beneficially Used in the area(s) adjacent to and draining into the dredged water body is exempt from Beneficial Use Permits. Work associated with the Covered Bridge Replacement initiative will require the excavation of select Dredge Material from the Little Androscoggin River. It is anticipated that more than 100-cubic yards of Dredge Material will be excavated. There is onsite Beneficial Use for approximately 60 cubic yards of this Dredge Material; the remaining Dredge Material shall be disposed of at an appropriately licensed facility.

The Contractor shall dispose of Dredge Material from the project that is not Beneficially Used at the site of generation at a facility licensed by the Maine Department of Environmental Protection for the management of Special Waste. The Contractor shall be responsible for making all necessary arrangements for dewatering and proper management of the Dredge Material, including any laboratory testing, in accordance with the facility's license. The Contractor shall provide documentation to the Resident that the Dredge Material was managed as specified. The submitted documentation shall consist of truck manifests, waybills, or such documentation as may be acceptable to the Resident and shall clearly document the management site location and the quantity of Dredge Material.

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.

Method of Measurement: Dredge Material will be measured by the cubic yard of material removed. Special Waste properly disposed of will be measured by the ton.

Basis of Payment: Payment for the Beneficial Use of Dredge Material will be incidental to the project.

The accepted quantity of Dredge Material properly disposed of, as Special Waste, will be paid for at the contract unit price bid for Disposal of Special Waste.

Payment shall be full compensation for excavation, dewatering, testing, managing, transporting, disposal or placement, and all associated fees.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
203.2318	Disposal of Special Waste	Ton

SPECIAL PROVISION 400 - PAVEMENTS

SECTION 401 - HOT MIX ASPHALT PAVEMENT

401.01 Description The Contractor shall furnish a uniformly blended, homogeneous 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
				Nominal Maximum Aggregate Size (mm)						
	N _{initial}	N _{design}	N _{max}	25	19	12.5	9.5	4.75		
<0.3	≤91.5	96.0	≤98.0	13.0	14.0	15.0	16.0	16.0	70-80	0.6-1.2
0.3 to <3	≤90.5								65-80	
3 to <10	≤89.0								65-80*	
10 to <30										
> 30										

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

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

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, homogeneous 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 Gyratory 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:

- 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.
- 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.
- 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 sublots, 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.

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
Percent Passing 4.75 mm and larger sieves	Target +/-7%
Percent Passing 2.36 mm to 1.18 mm sieves	Target +/-4%
Percent Passing 0.60 mm	Target +/-3%
Percent 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	Table 1 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.

In addition, for 9.5 mm NMAS 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 8C below shall apply in addition to the other pay adjustments for the given method of testing.

TABLE 8C: 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%.

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:

$$PA = (\text{density PF} - 1.0)(Q)(P) \times 0.50$$

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

$$PA = (\text{voids @ } N_d \text{ PF} - 1.0)(Q)(P) \times 0.20 + (\text{VMA @ } N_d \text{ PF} - 1.0)(Q)(P) \times 0.20 + (\text{PGAB PF} - 1.0)(Q)(P) \times 0.10$$

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:

$$PA = (\text{density PF} - 1.0)(Q)(P) \times 0.50$$

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

$$PA = (\text{voids @ } N_d \text{ PF} - 1.0)(Q)(P) \times 0.20 + (\text{VMA @ } N_d \text{ PF} - 1.0)(Q)(P) \times 0.20 + (\text{PGAB PF} - 1.0)(Q)(P) \times 0.10$$

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:

$$PA = (\text{density PF} - 1.0)(Q)(P) \times 0.50$$

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:

$$PA = (\% \text{ Passing Nom. Max PF} - 1.0)(Q)(P) \times 0.05 + (\% \text{ passing 2.36 mm PF} - 1.0)(Q)(P) \times 0.05 + (\% \text{ passing 0.30 mm PF} - 1.0)(Q)(P) \times 0.05 + (\% \text{ passing 0.075 mm PF} - 1.0)(Q)(P) \times 0.10 + (\text{PGAB PF} - 1.0)(Q)(P) \times 0.25$$

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. The Contractor may dispute the 0.075 mm sieve test result when a 9.5 mm NMAS mixture is used.

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 (Thin Lift 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
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
SECTION 401
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 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 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. 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 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 a 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.

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 center of the taper portion of the wedge (approximately centered 3" from the visible joint).

As part of the project specific QCP, the Contractor shall include details as to methods of construction, rolling and compaction efforts, and action plan to adjust methods or equipment should the Quality level fall below 50 percent within limits. The Contractor shall be required to measure the joint density at randomly selected locations with a minimum frequency of one measurement per 750 linear feet. The Contractor shall have the option to cut calibration/verification cores at a rate not to exceed 1 per day.

If the Quality level for density falls below 50 percent within limits, the Contractor shall make corrective action to the longitudinal joint 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 Quality Level for density remain at or fall below 50 percent within limits, 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 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:

Lot size will be the entire length of longitudinal joint for the given HMA layer for the project, or equal Lots of a size agreed upon at the Pre-paving conference. The maximum subplot size shall be 1500 linear feet of longitudinal joint for density and the minimum number of sublots for any Lot shall be five. The Lot will be divided up into sublots of equal length. There shall be a separate Lot for each lift of HMA pavement, and Lots shall not be comprised of results from more than one HMA layer.

The Department will determine a pay factor using acceptance limits from Table 1.

TABLE 1: LONGITUDINAL JOINT DENSITY ACCEPTANCE LIMITS

PROPERTY	LSL
% TMD (In-place 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
 P = Contract price per ton
 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" – Covered Bridge Deck</u>						
Wearing	12.5 mm	403.2081	N/A	1½"	1	2,5,8,30
Base	12.5 mm	403.2131	N/A	1½"	1	2,5,8,30
<u>6" - Route 121 Travel Way and Approaches</u>						
Wearing	12.5 mm	403.2081	N/A	1½"	1	5,8,30
Base	12.5 mm	403.2131	N/A	1½"	1	54,8,30
Base	19.0 mm	403.207	N/A	3"	1	1,4,8,12
<u>6" – King St.</u>						
Wearing	12.5 mm	403.2081	N/A	1 ½"	1	5,8,30
Base	12.5 mm	403.2131	N/A	1 ½"	1	5,8,30
Base	19.0 mm	403.207	N/A	3"	1	1,4,8,12
<u>2" - Drives, and Incidentals</u>						
Wearing	9.5 mm	403.209	N/A	2"	2/more	2,3,10,11,14

COMPLEMENTARY NOTES

1. The required PGAB for this mixture will meet a **PG 64-28** grading. The Contractor must stipulate which PGAB grading will be used to construct the entire HMA pavement structure prior to starting work.
2. The density requirements are waived. The use of an oscillating steel roller shall be required to compact all HMA pavements placed on bridge decks in addition to the normal roller train.
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**.
5. The aggregate qualities shall meet the design traffic level of 3 to <10 million ESALS for mix placed under this contract. The design, verification, Quality Control, and Acceptance tests for this mix will be performed at **75 gyrations**.
8. Section 106.6 Acceptance, (2) Method B.
10. Section 106.6 Acceptance, (2) Method D.
11. A **"FINE"** 9.5 mm mix with a gradation above or through the restricted zone shall be used for this item.
12. A mixture meeting the gradation of 12.5 mm hot mix asphalt may be used at the option of the contractor.
14. A mixture meeting the requirements of section 703.09 Grading 'D', with a minimum PGAB content of 6%, and the limits of Special Provision 401, Table 9 (Drives and Sidewalks) for PGAB content and gradation may be substituted for this item. A job mix formula shall be submitted to the department for approval.

30. The required PGAB for this mixture will meet a **PG 70-28** grading. Refer to Special Provision 400 - Polymer Modified PGAB for HMA, for additional testing and documentation requirements.

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 501
FOUNDATION PILES

501.01 Description

Add the following paragraph:

This work shall consist of furnishing and driving pipe piles; cleaning out pipe piles; furnishing concrete and filling pipe piles with concrete; and furnishing and placing reinforcing cage in the pipe piles in accordance with the plans and specifications. Drilling, furnishing, installing, testing and tensioning rock anchors in pipe piles and drilling furnishing, installing, testing and tensioning rock dowels in pipe piles shall be in accordance with Special Provision 504, Rock Anchors.

501.02 Materials.

Add the following paragraph:

Pipe pile material shall meet the requirements of Section 711.01 of Special Provision 711 – Miscellaneous Bridge Material.

Add the following paragraph:

Pipe pile tips shall be APF cutting shoe No. 0-14001 or DFP cutting shoe DFP-0140 and shall meet or exceed the strength requirements of ASTM A148, Grade 90-60 for steel casings.

The third paragraph is revised to read:

Concrete for Steel Pile pipe shall be Class A and shall meet the requirements of Section 502 - Structural Concrete.

501.04 Driving Procedures and Tolerances.

Add the following paragraphs:

The following construction tolerances apply: (a) The pipe pile shall be within 2 inches of the plan position in the horizontal plane at the plan elevation for the top to the pile. Pulling of pipe piles into position will not be permitted. (b) Vertical alignment of a pipe pile shall not vary from the plan alignment by more than ¼ inch per foot of length. The alignment of a battered pile shall not vary by more than ½ inch per foot of length from the prescribed batter. (c) After all the concrete is placed, the top of the reinforcing steel cage shall be no more than 3 inches above and no more than 3 inches below plan position. (d) The rock anchor/dowel shall be drilled and installed to the depth shown on the plans in accordance with Special Provision 504, Rock Anchors.

The pipe piles not constructed within the required tolerances are unacceptable. The Contractor shall be responsible for correcting all unacceptable pipe pile installations to the satisfaction of the Resident. Materials and work necessary, including work to correct pipe piles that are out of tolerance shall be furnished without either cost to the Department or an extension of the completion dates of the project.

501.11 Method of Measurement

Add the following paragraphs to Paragraph (c):

No separate payment shall be paid for earth excavation inside the pipe pile. No separate payment shall be made for rock excavation or drilling. Pay Item 501.701 Steel Pipe Piles, in Place, shall include full compensation for the sealing pipe pile on bedrock, and pipe pile cleaning, including temporary casings, augers, drilling equipment, air lifting equipment, jetting equipment, special tools and drilling equipment to clean the pipe pile to the depth indicated on the plans. Pay Item 501.701 Steel Pipe Piles, in Place, shall also include removal from the site and disposal of excavated materials, and furnishing all other labor, materials, and equipment necessary to complete this work. Installation of rock anchors in pipe piles shall be paid under Pay Item 504.905. Installation of rock dowels in pipe piles shall be paid under Pay Item 504.906.

No separate payment shall be made for the removal of obstructions, such as cobbles and boulders. Pay Item 501.701, Steel Pipe Piles, in Place, shall include full compensation for all labor, materials and equipment necessary to remove obstructions and resume excavation.

Add the following Sections:

501.13 Submittals and Construction Methods

No later than 30 days prior to installing the concrete filled pipe piles with rock anchors/dowels, the Contractor shall submit an installation plan for review by the Department. This plan shall provide information on the following:

- (1) list of proposed equipment to be used including driving equipment;
- (2) details of overall construction operation sequence;
- (3) details of cleaning methods in soils and rock, including methods of removing any obstruction such as boulders or cobbles from the pipe piles;
- (4) details of methods to check the cleanliness and soundness of the rock/pipe pile interface and bearing surface;
- (5) details of reinforcement placement including support and centralization methods;
- (6) details of concrete placement.

Submittals for drilling and installing rock anchors/dowels within pipe pile encasements shall be in accordance with Special Provision 504 - Rock Anchors.

The Department will evaluate the pipe pile installation plan, and all procedural approvals given by the Resident shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications.

Failure by the Contractor to demonstrate adequate methods and equipment shall be reason for the Resident to require alterations in equipment and/or method by the Contractor to eliminate unsatisfactory results. Any altered methods or construction equipment shall be at the Contractors expense and incidental to this item.

501.15 Driving and Excavation

The Contractor shall maintain a construction method log during driving, cleaning and rock anchor/dowel drilling activities. The log shall include but is not limited to the following: driving methods, driving resistance, cleaning methods, over breakage, drilling, seepage of groundwater through pipe pile/ledge seal, etc.

Excavated materials which are removed from pipe piles shall be disposed of by the Contractor in accordance with the applicable specifications for disposal of excavated materials.

The piles shall be driven to bedrock, and cleaned out to the top of bedrock. The Contractor shall perform the necessary cleaning and excavation for the pipe pile under Pay Item 501.701. No separate payment will be made for either cleaning out/excavation of materials or different densities or employment of special tools and procedures necessary to accomplish the excavation and in an acceptable fashion.

If after cleaning it is determined by the Resident that the pile is not on bedrock, the pile shall be redriven to the penetration resistance determined by the Wave Equation and verified by the Dynamic Load Test, and cleaned again.

After driving and cleaning, each pipe pile shall be inspected. Any pipe piles showing bends, crushing, kinks or other deformations that would impair the strength, efficiency, or axial capacity of the completed piles shall be replaced or repaired in a manner satisfactory to the Resident. Repairing or replacing any such damaged pipe pile as ordered by the Resident will be at no additional expense to the Department.

During rock anchor/dowel installation, overcutting of the bedrock surface upon which the pipe pile bears will not be permitted. If it occurs, the pipe pile shall be re-driven at no additional cost to the Department. The Contractor shall bear all costs associated with re-driving the pipe pile if overbreakage occurs during airlifting operations or rock anchor/dowel installation operations.

501.16 Pile/Bedrock Seal and Preparation for Rock Anchor/Dowel Installation

Rock anchor and rock dowel installation shall be in accordance with Special Provision 504 – Rock Anchors.

After removal of the overburden from within the pipe pile, the pile shall be further advanced into bedrock, where shown on the plans or directed by the Resident, if necessary to achieve sealing against the entry of overburden. The inside surface of the pipe pile shall be cleaned free of extraneous material prior starting rock anchor/dowel drilling. Rock anchors/dowels shall not be constructed until the pipe pile has been checked for plumbness and the pile is accepted.

During rock anchor/dowel installation the Contractor shall maintain a positive seal of pipe pile in the bedrock to prevent entry of overburden, or piping in of overburden into the anchor/dowel drill hole or pile by installing a grout plug at no additional cost. Overbreakage of the rock surface shall be avoided so as to not destroy the seal at the bottom of the steel pipe pile and not to undercut the pipe pile tip. Pipe piles shall maintain intimate contact with the bedrock surface after installation to preserve the axial load carrying capacity achieved during the final driving penetration resistance.

501.17 Obstructions

Surface and subsurface obstructions at the pipe pile locations, both internal and external, shall be removed by the Contractor. Such obstructions may include but are not limited to cobbles and boulders. Special procedures and/or tools shall be employed by the Contractor after the pipe pile cannot be advanced including, but not limited to, augers, chisels, boulder breakers, core barrels, air tools, etc.

501.19 Inspection

The Contractor shall keep a daily construction record which shall be submitted to the Resident each day. The Contractor shall provide access and equipment for checking the alignment of each pipe pile and for checking the dimension, alignment and cleanliness of installation. The base of each pipe pile shall have no sediment at the time of placement of the concrete. Pipe pile cleanliness will be demonstrated by the Contractor to the satisfaction of the Resident. Concrete placement shall not begin until the Resident's approval has been obtained. The Resident shall be allowed unrestricted access.

501.20 Reinforcing Steel Cage Materials, Construction and Placement

Reinforcing steel for pipe pile cages shall conform to Subsection 709.01. The reinforcing steel cage, consisting of bars, ties, cage stiffener bars, centralizers, and other necessary appurtenances, shall be completely assembled and placed as a unit immediately after the pipe pile and the rock anchor/dowel are accepted, and prior to concrete placement. The clear spacing between the bars of the cage should be at least three (3) times the size of the maximum coarse aggregate. The assembled rebar cage outside diameter must be at least 4 inches smaller than the pipe pile inner diameter. The clear space is necessary both to permit free flow of concrete up the annular space between the cage and the pile perimeter and to provide adequate concrete cover over the reinforcing cage. Concrete spacers or other approved non-corrosive spacing devices shall be used at sufficient intervals to insure concentric spacing for the entire cage length. Spacers shall be constructed of approved material and shall be dimensioned to insure a minimum 2-inch annular space between the outside of the reinforcing cage and the side of the pipe pile. Approved cylindrical concrete feet (bottom supports) shall be provided to insure that the bottom of the cage is maintained at the proper distance above the base.

501.21 Concrete.

Concrete for Steel Pile Piles shall be Class A and shall meet the requirements of Section 502 - Structural Concrete. Concrete shall be placed as soon as possible after reinforcing steel placement is complete. Concrete placement shall meet the requirements of Subsection 501.05. Concrete placement shall be continuous from the bottom to the top elevation of the pipe pile. Concrete shall be placed through a tremie or concrete pump. The tremie discharge end shall be immersed at least 5 feet in concrete at all times after starting the flow of concrete. Any voids occurring in the top portion of the pile concrete shall be filled with dry pack mortar.

SPECIAL PROVISION
SECTION 501
FOUNDATION PILES
(Rock Injector Pile Tip)

Subsection 501.10 Prefabricated Pile Tips of the Standard Specification is amended as follows:

Pile tips for use on all piles at Abutment 1 shall be Rock Injector HP-80500 Pile Point, manufactured by Associated Pile and Fitting or approved equal. Material specifications, attachment of pile tips and seating of the piles shall be in accordance with Manufacturer's recommendations and in accordance with the Standard Specifications.

Payment will be made under:

<u>Pay Item</u>	<u>Description</u>	<u>Pay Unit</u>
501.903	Pile Tips – Rock Injector Point	Each

SPECIAL PROVISION
SECTION 502
STRUCTURAL CONCRETE
(QC/QA Acceptance Methods)

CLASS OF CONCRETE	ITEM NUMBER	DESCRIPTION	P	METHOD
A	502.219	Structural Concrete Abutments and Retaining Walls	400	A
A	502.239	Structural Concrete Piers	400	A
A	502.26	Structural Concrete RD & SW Slabs on Steel Bridge	400	A
A	502.31	Structural Concrete Approach Slabs	-	C
LP	502.49	Structural Concrete Curbs and Sidewalks	-	C
LP	526.34	Permanent Concrete Transition Barrier	-	C

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 subplot 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 ≥ 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 System, Fabricated and Delivered)
(Corrosion Resistant Reinforcing System, Placing)

The following are corrections, additions and revisions to the Standard Specification Section 503, Reinforcing Steel.

503.01 Description:

This work shall consist of furnishing and placing corrosion resistant reinforcing, in accordance with these specifications and in conformance with the Plans, Supplemental Specifications and Special Provisions.

503.02 Materials

Add the following:

Corrosion resistant reinforcing shall consist of any of the following materials:

- a) Epoxy-coated reinforcing steel with a corrosion inhibitor.
- b) Stainless reinforcing steel.
- c) Galvanized reinforcing steel.

Corrosion resistant reinforcing systems shall be placed at the locations shown on the plans or as directed by the Resident.

All corrosion resistant reinforcing systems shall have a minimum yield strength, $F_y = 60$ ksi.

Stainless reinforcing steel shall consist of deformed bars made of solid stainless steel meeting the requirements of ASTM A955.

Galvanized reinforcing steel shall be zinc-coated in accordance with ASTM A767.

503.04 Protection of Material

The first sentence of the first paragraph is modified to read:

Reinforcement shall be stored on skids or other supports a minimum of 12 in above the ground surface and protected at all times from damage and surface contamination.

503.05 Fabrication

The following is added:

Welding to aid fabrication shall not be permitted. Reinforcing bars shall be bent cold and shall not be bent or straightened in a manner that will injure the material. Heating of the bars to facilitate bending shall not be permitted. Bar cutting shall be accomplished by shearing or with a water-cooled saw. Torch cutting reinforcing steel shall not be permitted. Field welding as an aid to installation shall not be permitted.

503.06 Placing and Fastening

The following is added:

Reinforcing bars shall be bent cold and shall not be bent or straightened in a manner that will injure the material. Heating of the bars to facilitate bending shall not be permitted. Bar cutting shall be accomplished by shearing or with a water-cooled saw. Torch cutting reinforcing steel shall not be permitted. Field welding as an aid to installation shall not be permitted.

503.06 Placing and Fastening

The sixth paragraph is modified to include:

Tie wire shall be soft- annealed wire that has been nylon or plastic coated. Non-metallic ties may be used with approval from the Resident.

503.07 Splicing

This section is removed in its entirety and replaced 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 noted otherwise on the plans:

Minimum Lap Splice Length (inches)*									
Bar Type	Bar Size								
	#3	#4	#5	#6	#7	#8	#9	#10	#11
Epoxy Coated	21	27	33	39	50	64	80	103	124
Stainless Steel Galvanized	14	18	22	26	33	43	54	68	83

* Lap splice length are based on the following parameters: Minimum center to center spacing between bars of 6 inch; 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 inches 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:

Couplers shall be made from the same material as the attached reinforcing bars to which they are attached, or shall be approved for use by the manufacturer of the corrosion resistant reinforcing system provided.

a. Tension couplers Coupler 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 bars ends shall be within 1 1/2° of being “square” to the final 12 inches 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.

Welded splices shall not be allowed.

503.10 Method of Measurement

Corrosion resistant reinforcing steel and mechanical splices placed in the cast-in-place portion of the structural concrete slab will be considered incidental to the appropriate Standard Specification Section 502 pay item. All other corrosion resistant reinforcing steel and mechanical splices will be measured as follows:

Corrosion resistant reinforcing steel will be measured per pound complete in place and accepted.
Corrosion resistant mechanical splices will be measured per each unit complete in place and accepted.

503.11 Basis of Payment

Corrosion resistant reinforcing steel and mechanical splices placed in the cast-in-place portion of the structural concrete slab will be considered incidental to the appropriate Standard Specification Section 502 pay item. Basis of payment for all other corrosion resistant reinforcing steel and mechanical splices will be as follows:

The accepted quantity of corrosion resistant reinforcing steel will be paid for at the contract unit bid price per pound. The accepted quantity of corrosion resistant mechanical splices will be paid for at the contract unit price per each unit.

Payment will be full compensation for all materials, labor, equipment and incidentals necessary to furnish and install corrosion resistant reinforcing. Payment will also include all submittals required for approval prior to execution of this work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
503.14 Epoxy- Coated Reinf Steel, Fab'd/Deliv'd	LB
503.15 Epoxy-Coated Reinf Steel, Placing	LB
503.17 Mechanical Welded Splice - Stainless Steel	EA
503.26 Stainless Steel Reinforcement - Fab & Del	LB
503.27 Stainless Steel Reinforcement - Placing	LB

SPECIAL PROVISION
SECTION 504
ROCK ANCHORS

504.01 Description. This work shall consist of drilling, furnishing, installing, testing and tensioning rock anchors and drilling, furnishing, installing, testing, and tensioning rock dowels at the locations shown on the plans and specified herein.

Furnishing, driving, cleaning out and filling the steel pipe piles with reinforcing cages and concrete is included under Section 501-Foundation Piles and Special Provision 501.

504.02 Qualifications. The Contractor shall submit evidence of at least three (3) successful installations within the last three (3) years of work comparable to that shown in the Contract Documents and specified herein. This evidence shall include the owners, names and phone numbers related to the installations. The Contractor shall employ labor and supervisory personnel who are experienced in this type of work. The drilling operator and foremen shall have a minimum of one (1) year experience with installing permanent rock anchors/dowels of highway quality. The Contractor shall submit resumes and work experience of the technical personnel.

504.03 Submittals. At least two (2) weeks prior to the proposed date for beginning the rock anchor/dowel work the Contractor shall submit the following information to the Department for review. The Contractor will not be allowed to begin work until all related submittal requirements are satisfied.

- a) Shop drawings and material certifications of the complete rock anchor/dowel assembly. The drawings shall provide details and dimensions of the threadbar, double corrosion protection systems, anchor/dowel head, bond breaker, grout sleeve, couplings, lengths of smooth and corrugated sheathing and their relations to the steel pipe pile, length of unbonded zone, total anchor/dowel length, design, test and lock-off loads, grout type, grout admixture, and grouting procedures. Detailed procedures for installation of anchors/dowels, including method of drilling, threadbar installation, grouting of anchors/dowels; and certified copies of chemical analyses and tensile strength shall be provided.
- b) List and description of proposed equipment to be used for rock anchor/dowel installation, including drilling rock anchor/dowel holes, cleaning, checking cleanliness of drill holes, centralizing anchors/dowels, installing anchors/dowels, tremie grouting, tensioning, testing and load transfer. Details of methods for the above mentioned rock anchor/dowel installation activities.
- c) Sequence of installation of pipe piles, rock anchors, rock dowels, concreting, grouting, testing, tensioning, load transfer, and method to verify that piles are seated on bedrock.
- d) Plan for controlling and mitigating overbreakage of bedrock surface; methods to ensure seal of pipe pile/bedrock interface is maintained during rock anchor/dowel installation.

- e) Shop drawings detailing the monitoring system for measuring movements during performance and proof load tests; temporary structural testing frame to resist jacking forces; detailed procedures for testing anchors and dowels and procedures for load transfer to anchors and dowels including method for verifying lock-off loads.
- f) Drawing showing layout and location jacks on temporary testing frame and remote reference beam for monitoring of anchor deformation during load tests.
- g) Certificate of Compliance of Conformance for anchor threadbar, dowel rebar and plastic sheathing.
- h) Submittal for pipe pile installation and cleaning in accordance with Special Provision 501.

At least one (2) weeks prior to the proposed date for beginning the rock anchor/dowel proof or performance testing, the Contractor shall submit calibration documentation for jacks and pressure gages or other equipment to be used in testing and stressing. All pressure gages and jacks used shall be calibrated by a certified and approved testing laboratory which shall submit a certificate of calibration which was performed within one month of the start of testing. Proof and performance testing and tensioning will not be permitted until the calibration certificates are submitted. All jacks and gages shall be recalibrated monthly.

504.04 Inspection and Record Keeping.

Field inspection shall be provided as follows:

- 1) The Contractor shall provide personnel, qualified by training and experience, to perform the required rock anchor and rock dowel installation and anchor/dowel tests and to monitor, record and plot the data.
- 2) The Resident shall be allowed unrestricted access.
- 3) The Contractor's qualified rock anchor/dowel installation personnel shall keep a daily construction record during rock anchor and rock dowel installation. The daily record shall be submitted to the Resident each day.
- 4) The Contractors qualified rock testing technician shall conduct performance tests and proof tests as specified in Section 504.07 and submit a tabulation of loads, elongations and rebound reading, indicating times involved, to the Resident
- 5) The Contractor shall be responsible for making prompt evaluations of the test data and, whenever necessary, taking immediate steps to correct any deficiencies in the capacities of individual members or to provide other corrective measures at no additional cost to the Department.

Within one (1) week of completion of the installation of the rock anchors and rock dowels provide as-built information of data for each unit including: identification, location, dates and depths of initial drilling, grouting, tensioning, testing, and final lock-off loads, observed loads

and tendons elongation, grouting pressures, bonded and unbonded anchor/dowel lengths and any unusual events.

MATERIALS

504.05 Materials.

- (a) Anchors. Rock anchors shall consist of continuously threaded bars, Grade 150 ksi conforming to ASTM A722, Type II, cold stretched and stress relieved after the threading process, as manufactured by Dywidag Systems International, or approved equal. The diameter of the threaded bars shall be as shown on the Plans.
- (b) Dowels. Rock dowels shall consist of continuously threaded bars, Grade 75 ksi conforming to ASTM A615, as manufactured by Dywidag Systems International, or approved equal. The diameter of the threadbars shall be as shown on the Plans.
- (c) Corrosion Protection. Threadbar anchors/dowels and all exposed steel components including anchor/dowel head assembly (nuts, bar, bearing plates, wedge plates, etc.) shall be hot dipped galvanized in accordance with ASTM A123 and A153. Exposed ends of the threadbar shall have field applied cold galvanization. Continuously threaded bar shall have double corrosion protection consisting of a grout-filled corrugated sheathing (minimum thickness 0.05 inch) over the bar for its entire length plus an additional smooth sheathing over the unbonded length. Threadbar shall be factory grouted within the corrugated sheathing, meeting the grout requirements in paragraph (h) below. The rock anchor/dowel assembly shall be assembled by the rock/dowel anchor manufacturer.
- (d) Nuts. Anchor and dowel nuts shall be hexagonal head, heavy duty type, conforming to ASTM A325 or to bar manufacturer's specifications.
- (e) Anchor/dowel plates, sealing caps and sealing nuts shall conform to threadbar manufacturer's recommendation. Anchor/dowel heads shall be installed with mastic corrosion inhibitor in accordance with manufacturer's specifications.
- (f) Bond Breaker. Sheathing shall be polyvinylchloride material with a minimum compressive strength of 7,000 psi and a minimum tensile strength of 7,000 psi. Material shall be free of water-soluble chlorides and other ingredients which might enhance corrosion, hydrogen embrittlement or stress corrosion on the prestressing steel. The plastic shall be non-reactive with the grout and its ingredients. The plastic sheathing shall be gas and watertight, and resistant against chemical attacks and aging.
- (g) Couplings shall be capable of developing 95% of the ultimate tensile strength of the threadbar and shall be fully protected within the corrosion protection system.

- (h) Cement grout for grouting the rock anchors and rock dowels shall be neat cement with a non-shrink additive, with a water-cement ratio no-more than 0.45 by weight. Expansion agents shall not be used. Minimum unconfined compressive strength of grout shall be 4,000 psi at time of anchor/dowel testing or stressing, or 28 days. Admixtures shall be submitted to the Resident for approval. Materials for cement grout shall be in accordance with Section 502.
- (i) Welding shall conform to the American Welding Society Standard AWS D1.1.
- (j) Bearing Plates. Steel bearing plates shall conform to ASTM A36.
- (k) Other materials shall be those recommended by the threadbar manufacturer for the intended use.

CONSTRUCTION REQUIREMENTS

504.06 Rock Anchors and Rock Dowels.

- (a) The Contractor shall provide a stable, level working platform or surface to support the rock anchor/dowel drilling equipment and operation to complete the work in this Section. The Contractor shall conduct rock anchor/dowel installation in a manner that does not cause impact or damage to the pipe pile and its coating, or shall cushion or isolate the pile coating to prevent damage to the pile and its coating.
- (b) The rock anchor and rock dowel drilling equipment shall have adequate capacity. The Contractor shall provide drilling equipment including but not limited to percussive rock drills, rock core barrels, rock tools, air tools, grout pumps and other equipment necessary to install rock anchors/dowels to the size and depth shown on the plans.
- (c) The Contractor shall provide sufficient length of grouted anchor/dowel such that the anchor/dowel will develop the test load capacity indicated on the plans, but in no case shall the length of anchor/dowel be less than the minimum bonded length indicated on the plans. Each rock anchor and rock dowel shall be verified by performance or proof tests. Anchors and dowels shall consist of a grouted anchor/dowel zone (bonded length) within the drill hole in bedrock, and a bond-free zone (unbonded length where the threadbar is prevented from bonding to rock or pile) and an anchor/dowel head assembly.
- (d) Pipe Pile Encasement: The rock anchor/dowel shall be installed within an open-ended pipe pile encasement which will be driven and constructed in accordance with Special Provision 501 and Section 501 of the Standard Specifications.

The rock anchors/dowels shall be installed below the bottom of the pile encasement as shown on the plans. If, after cleaning, it is determined by the Resident that the

pile is not to bedrock, the pile shall be redriven to bedrock to the penetration resistance determined by the wave equation and PDA and cleaned again, at no-additional cost, in accordance with Special Provision 501.

Piles shall be cleaned of soil to the rock surface prior to drilling the holes for receiving the rock anchors/dowels. A grout plug shall be installed, at no additional cost in accordance with Special Provision 501.

- (e) **Drill Holes:** After piles are driven to bedrock, cleaned and the grout plug installed, install temporary steel drill casing by spinning, centering the casing as needed using internal pile guides (centralizers). Then drill the holes into bedrock for the rock anchors/dowels. All drill holes shall be made with the temporary steel drill casing spun into the grout plug/bedrock before rock coring.

Drill holes for installation of rock anchors and rock dowels shall not be less than the dimension shown on the drawings. Anchors and dowels shall be fully grouted in bedrock drill holes that extend not less than 12 inches below the bottom of the anchor/dowel tendon.

Drill holes shall have vertical tolerances in accordance with Special Provision 501 Subsection 501.04. Drill holes shall be true to permit installation of rock anchors/dowels without bending the anchors/dowels in any direction.

- (f) **Cleaning, Pre-grouting and Re-drilling the Drill Hole.** Drilled holes shall be cleaned of all drill cuttings, sludge and debris, in accordance with Special Provision 501. The cleanliness of the drill hole shall be approved by the Resident. The drill hole shall be tremie grouted by injecting grout from the bottom of the drill hole to the top of the grout plug above the bedrock. After a minimum 7-day cure, the drill hole shall be re-drilled as specified in Section 504.06 (e) Drill Holes. Clean the hole of all drill cuttings, sludge and debris in accordance with Special Provision 501.
- (g) **Rock Anchor/Dowel Placement and Grouting:** The rock anchor/dowel assembly shall be completely ready for immediate installation prior to beginning the grout operation. The cleanliness of the final drill hole shall be approved by the Resident. Rock anchors and rock dowels shall be centered in the drill holes with centralizers.

Grout placement shall not begin until the Resident's approval is obtained. The grout for the rock anchor/dowel shall be tremie placed by injection at the lowest point of the rock anchor/dowel. The discharge hose end shall be completely submerged in grout at all times. Grout volume shall be sufficient to return neat grout to the top of the grout plug above the bedrock once the anchor/dowel is installed.

- (h) **Grouting tubes** shall be connected to and lowered with the rock anchor/dowel. All equipment used for placing rock anchors and rock dowels shall be such that it will not damage the corrugated sheathing or casing.

- (i) Rock anchor and rock dowel bond lengths shall be tremie grouted by injecting grout approximately 6 inches above the lowest point of the anchor/dowel. Grouting shall continue within the drill casing until the grout level inside the casing is 12 inches above the top of the grout plug above the bedrock and at least 120 percent of the calculated annular volume of the borehole is installed. Retract the temporary drill casing to approximately 12 inches above the top of grout plug. Pump an additional volume of grout sufficient to create an additional 6 inches average thickness grout plug above the initial grout plug.
- (j) Grouting shall be performed with sufficient pressure and volume flow to produce a grouted rock anchor/dowel zone capable of developing the load capacity indicated on the plans. Approved materials and continuous mixing and pumping equipment shall be able to produce a homogeneous in-place cement grout of the desired consistency. All oil and other rust inhibitors shall be removed from the mixing drums and pumps. Once started, grouting shall be continuous until the rock anchor/dowel bond length is completely grouted, unless approved by the Resident. Grout not placed within one (1) hour of mixing shall be wasted in an approved manner.
- (k) Grout Testing: 2-inch test cubes shall be made of each grout mix design used. Six (6) cubes shall be made of each mix design for every 4 anchors/dowels installed or per day of grout placement, whichever results in more cubes. Three (3) cubes shall be tested at 7 days and three (3) cubes shall be tested at 28 days. Testing shall be done in accordance with ASTM C 109.
- (l) During testing and tensioning, the rock anchor/dowel shall be free to move relative to the pile encasement. At no time during tensioning shall the pile compressive load exceed 90 tons, except during testing at which time the pile compressive load shall not exceed 1.5 times the design load or 0.80 times the Guaranteed Ultimate Tensile Strength, whichever is smaller.
- (m) The rock anchor/dowel head assembly shall be installed with mastic corrosion inhibitor in accordance with the manufacturer's recommendations. All exposed surfaces of the rock anchor/dowel and head assembly shall be protected with corrosion inhibitor at all times after installation.
- (n) Each rock anchor and rock dowel head assembly shall be fully encased by the concrete pile cap in accordance with the plans.
- (o) If rock anchor/dowel thread bars must be cut, no torch cutting is permitted. Rock anchor bars shall be sawcut, if necessary, with an abrasive wheel saw, in accordance with manufacturer's recommendations. Torch cutting of anchors/dowels before or after installation shall be grounds for rejection of the anchor/dowel and will require replacement by the Contractor at no additional cost to the Department.

- (p) Any voids occurring in the top portion of pile concrete shall be filled with dry pack mortar.

504.07 Rock Anchor and Rock Dowel Testing Procedures and Criteria.

- (a) Each rock anchor and rock dowel installed shall be tested, as called for on the Plans, to verify and establish its capacity. The Contractor shall be responsible for maintaining the structures during testing, and shall provide adequate shoring and bracing as required. Concrete fill will not be installed in pipe piles at the time of performance and proof testing. The Contractor shall provide a temporary testing frame to resist jacking forces and to prevent damage to pipe piles during rock anchor/dowel testing.
- (b) Performance and Proof Test shall be conducted in accordance with the project plans and herein:
 - (1) The maximum test load shall be 1.33 times the design load shown on the plans or 0.80 times the Guaranteed Ultimate Tensile Strength, whichever is smaller.
 - (2) Deformation measurements shall be made to the nearest 0.001 inch using a dial indicator mounted independent of the stressing system and referenced to a remotely supported reference beam. Vertical movement of the pipe pile encasement and batter pipe piles with respect to the reference beam shall be similarly monitored.
 - (3) An Ames dial shall be used to record the movement of the rock anchor/dowel. The-dial shall be capable of reading movement to 0.001 inch accuracy.
 - (4) In order for proper execution of the test the hydraulic system should be equipped with needle valve control.
 - (5) The Contractor shall maintain test records in accordance with Subsection 504.04 – Inspection and Recordkeeping.
 - (6) Acceptance of rock anchors and rock dowels shall be at the discretion of the Resident. Each rock anchor/dowel which is rejected shall be removed and replaced. Removal and replacement of rock anchors/dowels which are rejected shall be at no additional cost to the Department. Removal and replacement of anchors/dowels shall consist of all work necessary to remove concrete, reinforcement, and additional bedrock as required to complete the rework.
- (c) If at any time during testing a failure of any element (jack, rock anchor/dowel, bearing pile, etc.) occurs which results in a non-symmetrical loading condition, the

load in the jacks shall be reduced to zero as soon as practicable. The cause of the failure shall be rectified by the Contractor prior to restarting the load test.

- (d) No performance or proof test shall be conducted unless the Resident is present. Resident shall be given a minimum of one day's notice of rock anchor/dowel testing.

(e) Testing Procedure:

- (1) The magnitude of applied test loads shall be determined with a calibrated pressure gauge or a load cell. Movements of the anchor, relative to an independent fixed reference point, shall be measured and recorded to the nearest 0.001-inch at each load increment during the load tests. The Contractor shall perform the measuring and an independent inspector appointed by the engineer or the owner representative will do recording. Field test records will be furnished to the Engineer for his review and approval.
- (2) A minimum of one (1) anchor shall be performance tested. The Resident shall determine the location of the anchor to be performance tested.
- (3) The test load shall be held constant for 10 minutes. During the load hold, the movement of the end of the tendon shall be measured at 1, 2, 3, 4, 5, 6, and 10 minutes. If the total movement between one minute and 10 minutes exceeds 0.04 inch, the test load shall be held for additional 50 minutes. During the load hold, the movement of the end of the tendon shall be measures at 15, 20, 25, 30, 45, and 60 minutes. If the load is held for 60 minutes, a creep curve showing the creep movement between one minute and 60 minutes shall be plotted as a function of the logarithm of time.

TESTING SCHEDULES		
PERFORMANCE TEST	PERFORMANCE TEST (CONTD)	PROOF TEST
AL	AL	AL
0.25T	0.25T	0.25T
AL	0.50T	0.50T
0.25T	0.75T	0.75T
0.50T	1.00T	1.00T
AL	1.25T	1.25T
0.25T	AL	1.33T (TEST LOAD)
0.50T	0.25T	1.0T
0.75T	0.50T	
AL	0.75T	
0.25	1.00T	
0.50T	1.25T	
0.75T	1.33T (TEST LOAD)	
1.0T	1.0T	
T	= Design force for the anchor shown on the plans	
AL	= Alignment load=0.1T	

- (4) For performance and proof tests, each increment of load shall be applied in less than one minute and held for at least one minute but not more than 2 minutes or as specified above. The observation period for the load shall start when the pump begins to apply the last increment of load. The jacking equipment, including the tendon movement measuring system, shall be stable during all phases of the tieback loading operations.
- (5) All anchors not performance tested shall be proof tested. If 1.33 times the design force cannot be obtained, the anchor shall be redesigned and replaced. Anchors shall be re-tested. A performance tested anchor is acceptable if:
 - (a) The measured elastic movement exceeds 0.80 of the theoretical elongation of the unbonded length at the maximum test load; and
 - (b) The creep movement between one and ten minutes is less than 0.04-inch.
- (6) A proof tested anchor is acceptable if:
 - (a) The pattern of movements is similar to that of adjacent performance tested tiebacks; and
 - (b) The creep movement between one and ten minutes is less than 0.04-inch.
- (7) Performance tested or proof tested anchors which fail to meet the acceptance criterion No. 2 criteria will be acceptable if the maximum load is held for 60 minutes and the creep curve plotted from the movement data indicates a creep rate of less than 0.08-inch for the last log cycle of time.

504.08 Lock-Off Procedures.

- (a) After acceptance of the tested of the anchors, install the pile reinforcing and permanent anchor bars and fill the piles with concrete to within 1/2" of the top of the pipe pile.
- (b) Dry pack grout under the anchor bar to provide uniform bearing against the concrete fill.
- (c) Final stressing of the rock anchors/dowels shall be started only after installation and filling of all the bearing piles and the grout obtaining sufficient strength. Do not tension rock anchors/dowels until the concrete and dry pack grout in the pile has attained a minimum compressive strength of 4,000 psi, as shown by cube samples taken during filling operations.
- (d) The lock-off force is the load in the jacks, which is maintained while the anchor nuts on the rock anchors/dowels are permanently set.

504.09 Method of Measurement. Rock anchors and rock dowels will be measured by lump sum for anchors and dowels satisfactorily placed and remaining in the completed structure. Additional length required for tensioning or for replacement of unacceptable rock anchors/dowels shall be provided at the Contractor's expense.

504.10 Basis of Payment. Unit bid price shall include cost of furnishing all labor, materials and equipment necessary to complete the work, including but not limited to furnishing equipment for drilling bedrock, installing, testing and tensioning rock anchors and drilling, furnishing, installing, and testing rock dowels. Pay Item 504.905 and 50s4.096 shall include full compensation for any temporary casings, augers, grouting operations, drilling equipment, or specialty tools needed to install anchors/dowels and to maintain pipe pile end bearing capacity.

Payment will be made under:

<u>Pay Item:</u>	<u>Pay Unit</u>
504.905 Rock Anchors	Lump Sum
504.906 Rock Dowel	Lump Sum

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>
Office area (minimum ft ²)	100
Drafting Table Surface (ft ²)	35
Drafting stools-each	1
Office Desk	1
Ergonomic Swivel Chairs	1
Folding Chairs	2
High-speed internet connection (ports) or wireless	1
Fluorescent Lighting of 100 ft-candles minimum for all work areas	2
110 Volt 60 Cycle Electric Wall Outlets	3
Wall Closet	1
Waste Basket with trash bags	1
Broom	1
Dustpan	1
Water Cooler	1
Cleaning materials-floor, surfaces, windows, for duration of the project	

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 process plan including method for cutting of coated pile, method for constraining coated pile in template during driving, method of cushioning of the driving frame and protection of the pile during driving to prevent damage.

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.

Andy Phelan
Rhino Linings Corporation
9151 Rehco Road
San Diego, CA 92121
(858) 205-5188
aphelan@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 Surface preparation shall meet the requirements of Section 506.13 of this Special Provision with the following amendments to Paragraphs 1 and 4:

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 of 3 mils (for Line-X) and 5 mils (for Rhino Extreme).

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 using heated high pressure plural component spray equipment. 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 pipe 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 Construction. The Contractor shall arrange with the selected manufacturer from Section 506.53 to have a manufacturer’s representative on site during pile driving operations that is qualified to evaluate coating damage, including measuring and recording of DFT and qualified to effect repairs to damaged coating in a manner acceptable to the Department. The manufacturer’s representative shall remain on the project during initial pile driving operations unless otherwise directed by the Resident.

The Contractor shall handle the coated piles in a manner that does not cause impact or abrasive damage by the pile driving leads, driving hammer or pile driving frame. The driving frame shall be cushioned or coated to prevent damage to the coating during pile driving. If the 100% solid polyurea elastomer coating is damaged during the driving operation, the Contractor shall cease pile driving and have the damage evaluated by the manufacturer’s representative and repaired as per the submitted and approved field repair

plan or as directed by the Resident. Do not continue driving repaired pile until the coating has cured. 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 cap need not be repaired.

Coating damaged during installation due to pile driving, cutting, welding or 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 on site. When necessary, coated pipe pile 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 A 252, Grade 3 steel or other method approved by the Resident and the manufacturer's representative. A heat sink comprised of wet fabric in contact the coating or as required by the manufacturer, will be required adjacent to areas that will be thermal cut to minimize heat damage to the coating.

If the Resident determines that the pile driving 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. However, the Contractor shall assure that repair personnel are available in a reasonable time period for any necessary repairs.

506.61 Field Repair Repair of damaged coating including, but not limited to scrapes, minor blemishes, scratches and abrasions resulting in less than 80 mils of 100% solid polyurea elastomer coating remaining shall be the responsibility of the Contractor. Repairs shall be performed by the manufacturer 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. Cure the repaired coating as directed the manufacturer's representative. Repaired pile shall not be driven until the coating has cured.

506.62 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.

506.63 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.

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.

Oxford
WIN 19268.00
February 28, 2014

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 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:

Pay Item

Pay Unit

511.07 Cofferdam

Lump Sum

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
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 Parsippany, 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:

Pay Item

Pay Unit

520.232 Expansion Device - Asphaltic Plug Joint

Linear Foot

SPECIAL PROVISION
SECTION 527
ENERGY ABSORBING UNIT
(ET-Plus)

Description: This work shall consist of furnishing and installing an ET-Plus crash cushion as a permanent energy absorbing system in accordance with these specifications at locations shown on the Plans or as directed by the Resident.

Materials: The Energy Absorbing Unit shall be the NCHRP 350 Test Level 3 ET-Plus system as manufactured by Trinity Highway Products as approved and crash tested by the Federal Highway Administration.

Installation: A set of installation drawings shall be submitted to the Resident for the system installed. The system shall be installed according to the manufacturer's recommendations and the installation drawings.

Method of Measurement: Energy Absorbing Units shall be measured by each unit, complete, in place, and accepted.

Basis of Payment: The accepted quantity of Energy Absorbing Units shall be paid for at the contract unit price, such payment being full compensation for all labor, materials, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Unit</u>
527.303	Energy Absorbing System (ET-Plus)	Each

SPECIAL PROVISION
SECTION 604
MANHOLES AND CATCH BASINS

This section is amended by the addition of the following:

Description: This work consists of constructing catch basins and manholes in accordance with the requirements of Section 604 of the Standard Specifications and as shown in the Standard Details.

Method of Measurement: Measurement shall be in accordance with Subsection 604.05.

Basis of Payment: Payment shall be in accordance with Subsection 604.06.

Payment will be made under:

Pay Item		Pay Unit
604.096	60" Catch Basin Type B1-C	EA

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 [½ 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:

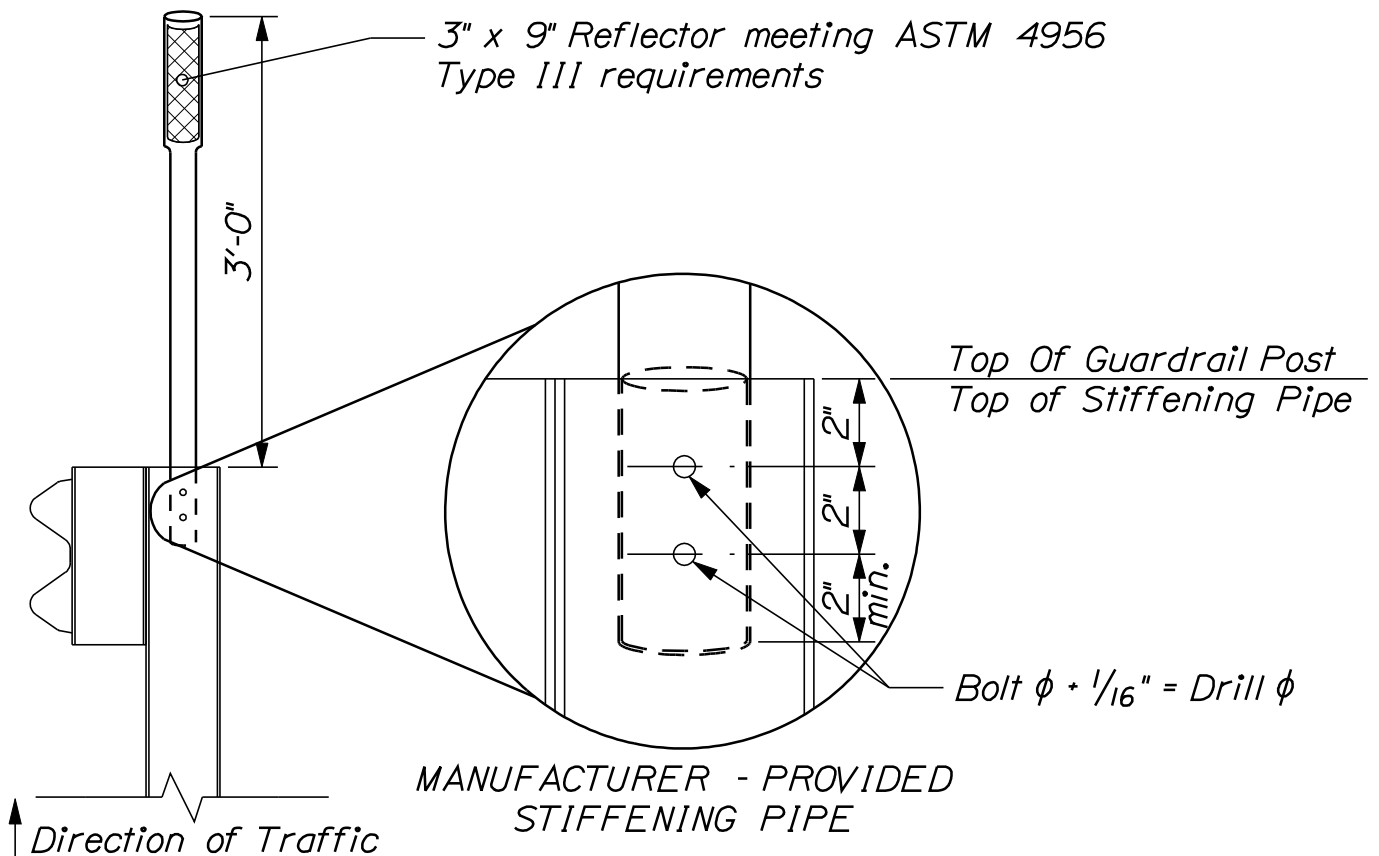
	<u>Pay Item</u>	<u>Pay Unit</u>
606.15	Guardrail Type 3a-Single Rail	meter [Linear Foot]
606.151	Guardrail Type 3aa-Single Rail	meter [Linear Foot]
606.17	Guardrail Type 3b-Single Rail	meter [Linear Foot]
606.1721	Bridge Transition - Type I	Each
606.1722	Bridge Transition - Type II	Each
606.1731	Bridge 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 + $\frac{1}{16}$ ".*
- b. *Wood post attachment - attach marker with 2, $\frac{5}{16}$ " diameter zinc-coated lag bolts, having 2" of embedment into wood post.*
- c. *Steel post attachment - attach marker with 2, $\frac{1}{4}$ " diameter zinc-coated bolt, washer and nut assemblies, having $\frac{1}{2}$ " 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 620
DRAINAGE GEOCOMPOSITE

Description

This work shall consist of furnishing and placing Drainage Geocomposite as specified in this Section and as shown on the plans or as directed by the Resident. Geocomposite Drainage shall consist of a formed polystyrene core covered on one side with a non-woven, needle-punched polypropylene filter fabric.

Material

Drainage Geocomposite must be a composite system consisting of permeable geotextile and three-dimensional polymeric core providing equal flow in two perpendicular directions.

The Contractor shall furnish and install a Drainage Geocomposite as a hydrostatic water relief system. The Drainage Geocomposite shall be tied in to a water discharge system or weep holes.

Drainage Geocomposite work shall consist of furnishing all materials and labor required for placing and securing Drainage Geocomposite material, connection pipes, footing drains, weep holes, and horizontal drains, as shown on the Plans or as directed by the Resident.

Preinstallation Conference: Prior to beginning installation of the prefabricated Drainage Geocomposite material, convene a meeting at the jobsite with a representative of the Drainage Geocomposite manufacturer and any other related subcontractors to clarify and coordinate installation procedure.

Quality Assurance Testing

Drainage Geocomposite must be backed by Letter of Certification from Manufacturer that the flow rate in the plane of the core meets or exceeds the specified flow given herein and determined by ASTM D4716.

Contractor's Experience Requirements

The Contractor performing this installation shall submit proof of at least three (3) projects successfully completed in the past three (3) years involving the installation of Drainage Geocomposite. A brief description of each project with the Owner's name and current phone number shall be included.

Submittals

The required submittals are as follows:

- A. Submit three (3) projects where prefabricated Drainage Geocomposite system has been used.
- B. Submit Letter of Certification that material meets or exceeds physical properties per the following table.
- C. The design layout of the Drainage Geocomposite including type, spacing, overlap, collection drainage, and other information.

Product Specification

The Drainage Geocomposite shall consist of Miradrain 6000, Amerdrain 500, or equal that meets or exceeds the following properties:

TYPICAL PROPERTIES	Typical Value	Test Method
Fabric Properties		
Material	Polypropylene	
Grab tensile strength	100 lbs	ASTM D4632
Puncture strength	65 lbs	ASTM D4833
Trapezoidal tear	50 lbs	ASTM D4533
Mullen burst strength	200 psi	ASTM D3786
AOS	100 sieve	ASTM D4751
Permeability	0.3 cm/sec	ASTM D4491
Core properties		
Material	Polystyrene	
Compressive strength	15,000 psf	ASTM D1621 (Mod.)
Product properties		
Flow capacity per unit width ¹	16 gpm/ft	ASTM D4716

¹ In Plane Flow Rate, Gradient = 0.1

All numeric values in the above table, except AOS, represent minimum average roll values in the weakest principal direction (i.e., average test results of any roll in a lot sampled for conformance or quality assurance testing shall meet or exceed the minimum values). Values for AOS represent maximum average roll values.

Placement Requirements

The Drainage Geocomposite shall be installed by methods approved by the Manufacturer. The Drainage Geocomposite installer shall coordinate installation with the Manufacturer's representative.

The installer shall place the Drainage Geocomposite at the elevations and alignment shown on the Plans and as directed by the Resident. The Drainage Geocomposite shall be installed with the fabric side toward the soil.

When installing the Drainage Geocomposite:

- Start at the low point of the wall and attach the panel to the wall.
- Adjacent panels may be:
 - (1) Joined together with the lateral edge of the next/upper panel placed over the flanged edge of the lower panel;
 - (2) Overlap the dimples of the preceding panel onto the dimples of the previous panel by 2 inches.

The Drainage Geocomposite from the adjacent panels shall overlap the preceding panel. The overlap fabric can be adhered with the Manufacturers approved tape or duct tape. The Drainage Geocomposite shall be attached to non-waterproofed walls with contact adhesive, tape or concrete nails. The Drainage Geocomposite will be permanently secured upon completion of backfilling. Backfilling shall be placed within seven days of Drainage Geocomposite installation. Backfill to at least 6 inches above the top edge of the Drainage Geocomposite.

The top or terminal edge of the Drainage Geocomposite shall be covered by applying a piece of filter geotextile, meeting the requirements of MDOT 722.03, over the edge sufficient in width to prevent soil or other foreign construction materials from intruding into or behind the Drainage Geocomposite panels. The filter geotextile shall be placed to match finished grade.

If necessary, the Drainage Geocomposite and filter geotextile shall be positioned by hand to minimize wrinkles.

Unanticipated subsurface drainage features exposed in the excavation shall be drained independently of the Drainage Geocomposite.

Backfill Requirements

Structural backfill meeting the requirements of MDOT 703.06(a) Type C, shall be placed immediately against the Drainage Geocomposite. Care shall be taken during the backfill operation not to damage the geotextile surface of the drain. The backfill shall be placed and compacted in accordance with the project plans and specifications. Care shall also be taken to avoid excessive settlement of the backfill material. The Drainage Geocomposite, once installed, shall not be exposed for more than seven days prior to backfilling.

Storage Requirements

The Contractor shall check the Drainage Geocomposite upon delivery to ensure that the proper material has been delivered. The Contractor shall be responsible for the storage of the Drainage Geocomposite material at the site.

Drainage Geocomposite shall be provided in rolls wrapped with a protective covering and stored in a manner, which protects the material from temperatures greater than 140° F, mud, dirt, dust, and debris. Protective wrapping shall not be removed until immediately before the Drainage Geocomposite is installed.

Drainage Geocomposite material shall be delivered and stored in original packages bearing the Manufacturer's name. The fabric shall not be exposed to direct sunlight for more than seven days during its storage and installation. The Drainage Geocomposite material shall be stored in a clean, dry environment out of the pathway of construction equipment. Each roll of Drainage Geocomposite material shall be labeled to identify the production run.

Repair Requirements

Prior to the placement of the Drainage Geocomposite each roll shall be inspected for damage resulting from construction.

Any ripped, torn, or damaged areas of the Drainage Geocomposite material shall be removed and patched by placing a patch large enough to cover the damaged area and provide a sufficient overlap on all sides to fasten. The patch shall be secured to the original Drainage Geocomposite material using the Manufacturers approved methods. If the hole width or tear width across the panel is more than 50% of the width of the material, the damaged area shall be cut out and the two portions of the Drainage Geocomposite material shall be joined in accordance with the placement requirement.

If the damage occurs to the Drainage Geocomposite material during shipping, handling, or installation, the damaged areas shall be cut out and a repair section of Drainage Geocomposite shall be installed at the Contractor's expense.

Method of Measurement

Drainage Geocomposite installation shall be measured by the square yard in place and accepted. Measurements will not be made for overlaps, patches, and repairs.

Basis of Payment

The accepted quantity of Drainage Geocomposite installed shall be paid for at the contract unit price per square yard, which shall be full compensation for off-loading, inspection, storage, materials, equipment, and any incidentals necessary to complete the installation.

The cost and placement of the drainage collection pipe will be incidental to the installation of the Drainage Geocomposite.

<u>Pay Item</u>	<u>Description</u>	<u>Pay Unit</u>
620.661	Drainage Geocomposite Installation	Square Yard

SPECIAL PROVISION
SECTION 627
PAVEMENT MARKINGS

The last paragraph of Subsection 627.10, Basis of Payment is revised by the addition of the following:

Pay Item

Pay Unit

627.733 4" White or Yellow Painted Pavement Marking Line

LF

SPECIAL PROVISION
SECTION 652
MAINTENANCE OF TRAFFIC

Approaches Approach signing shall include the following signs as a minimum. Field conditions may warrant the use of additional signs as determined by the Resident.

Road work Next x Miles
Road work 500 Feet
End Road Work

Work Area At each work site, signs and channelizing devices shall be used as directed by the Resident. Signs include:

Road Work xxxx ¹
One Lane Road Ahead
Flagger Sign

Other typical signs include:

Be Prepared to Stop
Low Shoulder
Bump
Pavement Ends

The above lists of Approach signs and Work Area signs are representative of the contract Requirements. Other sign legends may be required.

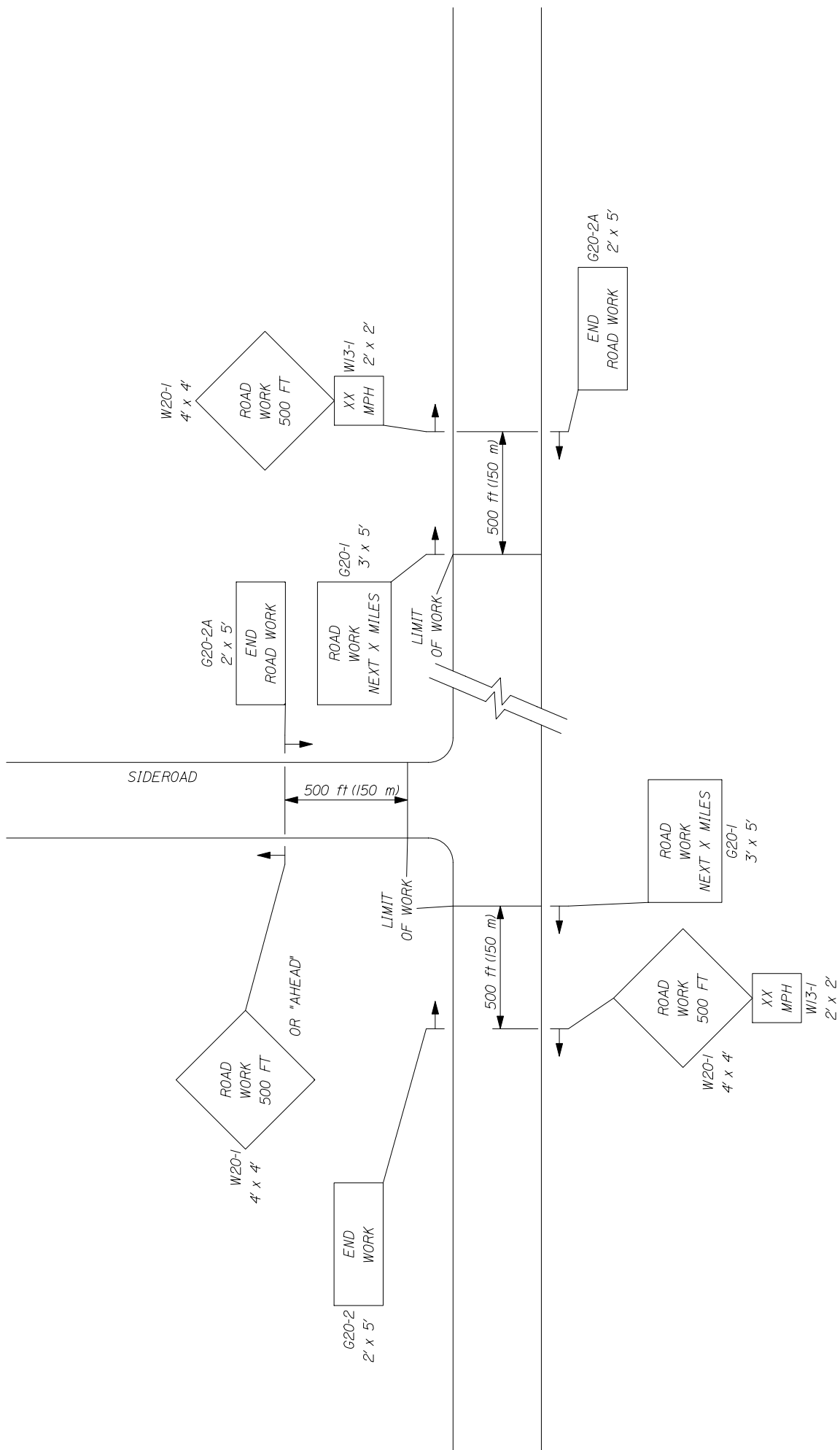
The Contractor shall conduct their operations in such a manner that the roadway will not be restricted to one lane for more than 800 m [2,500 ft] at each work area. To encourage quality paving in warm-weather conditions, the length can be extended to 4,000 ft depending on the traffic impacts. Where more than one work area restricts traffic to one lane operation, these work areas shall be separated by at least 1.6 km [1 mile] of two way operation.

Temporary Centerline A temporary centerline shall be placed each day on all new pavement to be used by traffic. The temporary centerline, when specified of reflectorized traffic paint, shall conform to the standard marking patterns used for permanent markings.

Failure to apply a temporary centerline daily will result in a Traffic Control Violation and suspension of paving operations until temporary markers are applied to all previously placed pavement.

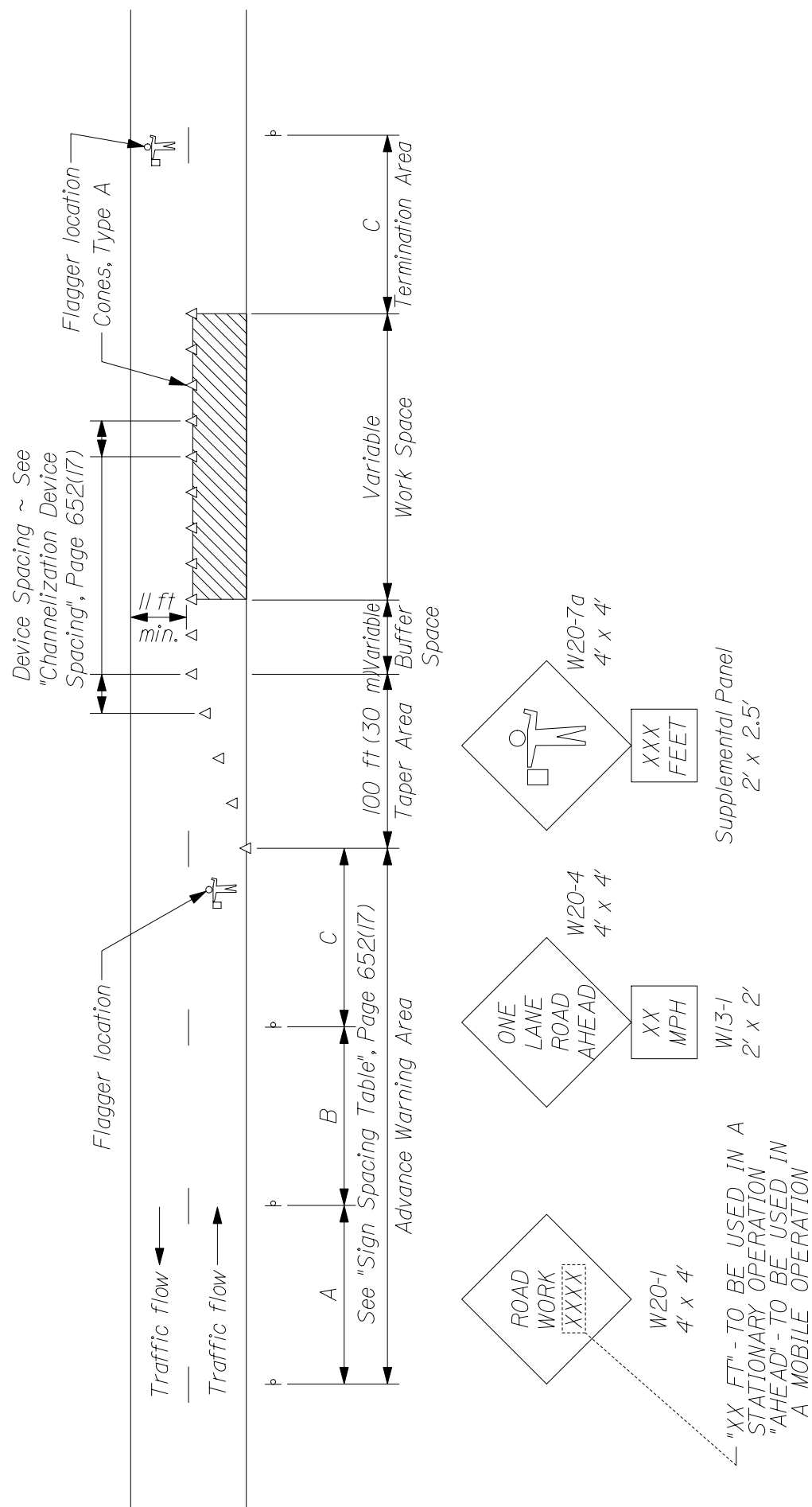
¹ "Road Work Ahead" to be used in mobile operations and "Road Work xx ft" to be used in stationary operations as directed by the Resident.

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1 of 3

-- PROJECT APPROACH SIGNING -- TWO WAY TRAFFIC



TYPICAL APPLICATION: TWO - WAY, TWO LANE ROADWAY,
CLOSING ONE LANE USING FLAGGERS

* Formulas for L are as follows:

For speed limits of 40 mph (60 km/h) or less:

$$L = \frac{WS^2}{60} \quad (L = \frac{WS^2}{155})$$

For speed limits of 45 mph (70 km/h) or greater:

$$L = WS \quad (L = \frac{WS}{1.6})$$

* Formulas for L are as follows:

A minimum of 5 channelization devices shall be used in the taper.

TYPE OF TAPER	TAPER LENGTH (L)*
Merging Taper	at least L
Shifting Taper	at least 0.5L
Shoulder Taper	at least 0.33L
One-Lane, Two-Way Traffic Taper	100 ft (30 m) maximum
Downstream Taper	100 ft (30 m) per lane

CHANNELIZATION DEVICE SPACING

The spacing of channelization devices shall not exceed a distance equal to 1.0 times the speed limit in mph when used for taper channelization, and a distance in feet of 2.0 times the speed limit in mph when used for tangent channelization.

GENERAL NOTES;

1. Final placement of signs and devices may be changed to fit field conditions as approved by the Resident.

SIGN SPACING TABLE			
Road Type	Distance Between Signs**		
	A	B	C
Urban 30 mph (50 km/h) or less	100 (30)	100 (30)	100 (30)
Urban 35 mph (55 km/h) and greater	350 (100)	350 (100)	350 (100)
Rural	500 (150)	500 (150)	500 (150)
Expressway / Urban Parkway	2,640 (800)	1,500 (450)	1000 (300)

**Distances are shown in feet (meters).

SUGGESTED BUFFER ZONE LENGTHS

Speed (mph)	Length (feet)	Speed (mph)	Length (feet)
20	115	40	325
25	155	45	360
30	200	50	425
35	250	55	495

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</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

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 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 6.0 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 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	45		
10 to < 30	95/90			
≥ 30	100/100			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 three 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 711
MISCELLANEOUS BRIDGE MATERIAL

Replace 711.01 Steel Pile Piles in its entirety with the following paragraphs:

711.01 Steel Pipe Piles, Splices And Tips Steel pipe piles shall conform to the requirements of ASTM A252, except as modified herein. The steel pipe piles shall be Grade 3, $F_y = 45$ ksi, with straight or spiral butt-welded seams. Lap welded seams are not acceptable. The steel shall be a Prequalified Base Metal from the AWS D1.1 Structural Welded Code - Steel. The first sentence of ASTM A 252 Subsection 13.2 is hereby deleted and replaced with, "Mill welded splices will only be acceptable if tension test specimens cut from sample splices conform to the tensile strength requirements prescribed in Tables 1 and 2."

Pipe pile lengths shall be furnished from the mill conforming the following

Pipe Pile Segment Length at Mill	Maximum Shop Splices Permitted
10' Min	0
Over 10' – 20'	1
Over 20' – 30'	2
Over 30' – 40'	3
Over 40' – 50'	4
Over 50' – 60'	5

If pipe piles are designated to be coated the surfaces to be coated shall be suitable for coating. Surfaces shall be free of sharp edges, fins, weld spatter or other condition detrimental to protective coating. Welds shall blend smoothly with the pile material and be free of undercut, overlap or other condition injurious to protective coating.

Cast steel points and open end cutting shoes shall conform to the requirements of ASTM A27 Grade 65/35 or ASTM A148 Grade 90/60. Pipe pile splice backup ring material shall be any steel listed in AWS Structural Steel Welding Code D1.1, Table 3.1 with the exception of 100 ksi minimum yield strength steels.

SPECIAL PROVISION
SECTION 845
STRUCTURAL STEEL UTILITY SUPPORT

Description

This work shall consist of furnishing and installing structural steel utility supports and related connection plates, denoted *Utility Support Types U1 and U2* on the plans, and as directed by the Resident.

Materials

Structural steel utility supports shall conform to ASTM A709, Grade 50W. Materials shall meet the requirements of the following Section of Division 700-Materials

Structural Steel	713.01
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Installation

The Contractor shall install utility support angles at each location indicated on the Drawings.

Submittals

The Contractor shall prepare shop detail, erection and other necessary working drawings in accordance with Section 105.7 - Working Drawings. The drawings will be reviewed and approved in accordance with the applicable requirements of Section 105.7.

Method of Measurement

Structural steel utility supports properly placed and accepted shall be measured for payment by the lump sum.

Basis of Payment

The accepted quantity of Structural Steel Utility Support for the bridge crossing shall be full compensation for furnishing and installing structural steel supports and related connection plates as shown on the plans. Price shall include all equipment, tools, labor, and incidental materials related thereto. Compensation for furnishing and installing *Utility Support Types U1 and U2* will be borne by the utility. Furnishing and installing conduits, conduit support assembly systems, force main, force main support assembly systems, force main insulation, steel pipe casing, pipe roller support assembly systems, threaded rods, heat tracing, insulation jacket and attachment hardware shall be paid for under separate items.

Payment will be made under:

Pay Item

Pay Unit

845.10	Structural Steel Utility Support	Lump Sum
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APPENDIX B – SPECIFICATIONS

Revised April 2014

SPECIAL PROVISION

SECTION 830.13

COVERED BRIDGE OVER LITTLE ANDROSCOGGIN RIVER SEWER FORCE MAIN BRIDGE CROSSING & CONSTRUCTION

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830.13 – ES-001	Force Main Bridge Crossing Electrical Site Plan and Details

SECTION 01 20 25

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 DESCRIPTION

- A. Payment procedures are in accordance with all MDOT Requirements.
- B. Measurement: as determined, verified, or approved by Engineer.
- C. The Bid item descriptions are general and may not specifically describe all associated Work or elements thereof. Work described in each Bid item shall be as specified and shown on the Drawings and not included in other Bid items.
- D. Review Work associated with each Bid item. Claims for being unfamiliar with these requirements or of the content of the Specifications and Drawings will not be considered.
- E. The following Work is not specifically described or designated as a Bid item, is considered incidental to all Bid items, and shall not be measured separately for payment.
 - 1. Restoration of unpaved areas disturbed by the Contractor within the limits of Work
 - 2. Restoration of landscaping within the limits of Work.
- F. No compensation will be provided for restoration of paved and unpaved surfaces disturbed by the Contractor outside the limits of Work.
- G. Relocation or replacement for the Contractor's convenience or due to breakage by the Contractor of any other utility services shown on the Drawings, or at locations which could reasonably be assumed, shall be replaced at the Contractor's expense.
- H. Design, installation and removal of excavation support systems, utility/structure support systems temporary and permanent utility/structure support systems be associated with an item of Work shall be considered incidental to that item.
- I. Additional dewatering and erosion control (including installation, operation, maintenance, removal and off Site disposal of erosion control devices) associated with an item of Work shall be considered incidental to that item.

1.02 MEASUREMENT AND PAYMENT BASIS FOR EACH BID ITEM

ITEM 1: ADMINISTRATION (Mobilization/Demobilization)	
Measurement	Not Used
Payment	Lump Sum (LS)
Schedule of Payment	Payment shall be 50% in the first pay application and the remainder will be released upon Substantial Completion. Installation of project signs shall be completed prior to receipt of initial payment at the first pay application
All materials, equipment, services, and construction necessary to deliver and remove equipment, tools and materials to and from the Project Site, obtaining necessary permits, bonds, insurances, temporary facilities, and conducting the necessary pre-construction investigations, project supervision, project meetings, and project management as specified in Division 00 and 01.	

ITEM 2: COVERED BRIDGE FORCE MAIN CROSSING	
Measurement	Progress of Work
Payment	Lump Sum (LS)
Schedule of Payment	Monthly – based on progress of Work.
All work associated with the force main bridge crossing over the Little Androscoggin River. Includes all materials, equipment, services, and construction inherent to the Work. Includes backfill, compaction, pipe, fittings, insulation, thrust blocks, heat tracing, insulation jacketing, pipe supports, conduit supports, shoring, bracing, site restoration, electrical ducts, duct bank cap, electrical wiring, structures, geotextile, testing, rip rap, signage, and all work not included in other bid items.	

ITEM 3: ROCK EXCAVATION AND REFILL	
Measurement	As encountered, in place prior to excavation within the pay limits as specified and as directed by the Engineer.
Payment	Cubic Yard (CY)
Schedule of Payment	Monthly – based on progress of Work.
All materials, equipment, services, and construction inherent to the Work. Includes disposal of rock and boulders greater than 2 cubic yards each and replacement as necessary with suitable material.	

ITEM 4: UNSUITABLE SOIL EXCAVATION, REMOVE AND REFILL	
Measurement	As encountered & as directed by the Engineer
Payment	Cubic Yard (CY)
Schedule of Payment	Monthly – based on progress of Work.
All materials, equipment, services, and construction inherent to the removal and refill of unsuitable soil as determined by the Engineer. Includes remove of existing material and replacement with suitable backfill material, compaction and testing associated to replace unsuitable materials.	

PART 2 - PRODUCTS (Not Used)**PART 3 – EXECUTION (Not Used)****END OF SECTION**

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SECTION 01 91 15

STARTUP AND COMMISSIONING REQUIREMENTS

PART 1 – GENERAL

1.01 SYSTEM DESCRIPTION

- A. To establish a basis of understanding for system description for this Project, observe the following:
1. Definition: A system is defined as an arrangement of items of equipment, components, piping, wiring, materials, or incidentals so related or connected as to form a functional and operational unit.
 2. Project Classified Systems: For this Project, system classifications shall include but not necessarily be limited to the following:
 - Sanitary Sewer Force Main Pressure Piping
 - Sanitary Sewer Force Main Bridge Crossing
 - Electrical Heat Trace System
 - Pre-Cast Concrete Structures

1.02 SYSTEM STARTUP AND DEMONSTRATION REQUIREMENTS

- A. Pre-Startup Requirements
1. Prior to startup, undertake the following procedures, in the order listed:
 - a. Ensure required written statements and/or guarantees from manufacturers per individual Specification Sections comply with Contract Documents. Use a checklist to identify such requirements, by Specification Section, and submit a copy of the completed checklist to the Engineer. Submit such written statements and/or guarantees from manufacturers to the Engineer.
 - b. Ensure Work is complete before startup of any unit or system. Certify to Owner that specifically required services or respective equipment manufacturers' representative per each individual section of specification have been performed in accordance with Contract Documents.

- c. Ensure systems are tested hydraulically, mechanically, and electrically. Ensure systems that require calibration, commissioning, and balancing are fully certified as complete in performance, in accordance with Contract Documents. Ensure required tagging, identification, and/or stenciling is complete.
- d. Schedule startup with a minimum of 30 days prior written notice issued to, but not necessarily limited to, Owner, Engineer, Subcontractors, and applicable regulatory agencies.
- e. Provide labor, supervision, utilities, water, chemicals, equipment, tools, materials, vehicles or any other items necessary to startup, operate, and demonstrate the system.
- f. Provide gauges, meters, recorder and monitors, as required by the Engineer, to supplement or augment the instrumentation system provided under this Contract, to properly demonstrate that the equipment fully satisfies the requirements of the Contract Documents. Select devices employed for the purpose of measuring the performance of the facility's equipment and systems to provide a level of certainty consistent with the variables to be monitored. Provide instruments recently calibrated, and be prepared at all times to demonstrate, through recalibration, the certainty of instruments employed for testing purposes.
 - 1) Calibration procedures: in accordance with applicable standards of ASTM, ISA and IEEE. Adequacy of gauges, meters, recorders and monitors shall be subject to review of the Engineer.
- g. Provide sign off forms for installed and operation testing to be accomplished under this Contract for each item of mechanical, electrical and instrumentation equipment provided or installed under this Contract. Provide sign off forms that contain provisions for recording relevant performance data for original testing, and not less than three retests. Provide separate sections on the form to record values for pre-operation checkout, initials of representatives of the equipment manufacturers, the Contractor, and the Engineer.
- h. Maintain a master file of equipment sign off forms and make available for inspection by the Engineer. Upon completion of equipment testing, furnish the Engineer with the original and two copies of the sign off forms for each equipment item.

B. System Startup and Demonstration

1. Startup, operate and demonstrate specified performance of each item of equipment and each system at full operation without interruption of equipment or system or need of adjustment or repair until the satisfaction of the Engineer has been met.
2. During startup of equipment, provide knowledgeable and experienced person(s) to instruct Owner's designated personnel on the operation and maintenance of each system, in addition to services provided by equipment manufacturer's authorized representative(s) prescribed by individual Sections of the Specifications. Provide a comprehensive "overview," during the startup period; do not simply repeat previous operation and maintenance instructions. Provide a minimum of 8 hours of operation and maintenance instructions on each system per the specific Specification Section in the Contract Documents.
3. Provide or pay for chemicals used during startup.

1.03 EQUIPMENT START-UP & PERFORMANCE TEST PROTOCOL

A. Start-up shall consist of the following items, in the order shown:

1. Equipment Pre-Start-up Check
2. Equipment Start-up and Performance Testing
3. Manufacturer's Equipment Testing
4. Process Start-up

B. Pre-Equipment Start-Up

1. Check out each item of equipment in the presence of the Engineer, to show that it is properly installed, and is functioning and ready for equipment start-up and performance testing.
2. Conduct the following, as a minimum.
 - a. Assure equipment is properly installed, painted, leveled, wired and/or insulated.
 - b. Assure piping is properly installed and that all valves are properly set.
 - c. Assure piping is cleaned and pressure tested, as required.

- d. Assure equipment is properly lubricated.
 - e. Assure safety related accessories are properly installed.
 - f. Bump or momentarily jog equipment to establish operation and proper rotation.
 - 3. Arrange for equipment manufacturers to be present, or verify that these procedures may be done without the manufacturer's representatives being present.
- C. Equipment Start-up
 - 1. Prior to testing any equipment, obtain written certification, from the manufacturer, that the equipment is properly installed, calibrated and ready for safe and efficient operation as intended by the Engineer and manufacturer.
 - 2. Prior to start-up and testing of any item of equipment, thoroughly clean and flush the equipment and associated piping, channels, basins, wet wells, etc.
 - 3. With assistance from the manufacturer's factory trained service engineer, and in the presence of the Engineer, start-up and operate each item of equipment to show it is performing according to the requirements of the Specifications. Assure the equipment is ready for performance testing with this step.
- D. Performance Tests
 - 1. General
 - a. Conduct full tests at the Site on each item of equipment after each item has been properly installed, started and certified ready for operation to demonstrate that each item of equipment will operate properly by itself and in conjunction with other equipment, in accordance with the performance Specifications and manufacturer performance specifications.
 - b. Furnish necessary labor, tools, equipment, power, chemicals and clean water, to perform field tests to determine that the supplied equipment, including controls and alarms, meet hydraulic, electric, mechanical and performance requirements in accordance with the Contract Documents and manufacturer specifications.
 - c. Incomplete and/or unsuccessful tests shall be repeated until conformance with the Contract Documents is to the satisfaction of the Engineer.
 - 2. Sanitary Utility Sewer Force Main Piping Systems

- a. Provide pressure testing of all piping systems
- 3. Sanitary Sewer Manholes & Pre-Cast Concrete Structures
 - a. Provide hydrostatic or vacuum testing as indicated in the Contract Documents
- 4. Heat Tracing Systems
 - a. Provide testing of installed heat tracing systems as indicated in the Contract Documents.
- E. Manufacturers' Training
 - 1. Conduct manufacturers' training in addition to, and exclusive of start-up and performance testing.
 - 2. Refer to Specifications for requirements of manufacturers' training.
 - 3. Do not conduct training until the Owner has received approved Operation & Maintenance Manuals.
 - 4. Owner will not accept any item of equipment prior to receiving approved manufacturer training for equipment when manufacturers' training is required in the Specification.
 - a. Engineer will approve the completeness of training and verify completion by completing a "Verification of Manufacturer's Equipment Training" form.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 03 11 13

STRUCTURAL CONCRETE FORMWORK

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment, labor and appurtenances required for the design, preparation, cleaning, construction, and removal of all concrete formwork and the installation of all concrete embedments provided under other sections, necessary for the proper completion of the Work.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
 - 1. ACI 117 (2010) Specifications for Tolerances for Concrete Construction and Materials and Commentary
 - 2. ACI 301 (2010) Specifications for Structural Concrete
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM C31/C31M (2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. ASTM C39/C39M(2010) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
- D. U.S. ARMY CORPS OF ENGINEERS (USACE)
 - 1. COE CRD-C 572 (1974) Corps of Engineers Specifications for Polyvinylchloride Water Stops

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.
- B. SD-03 PRODUCT DATA

1. Submittals and product data shall include but are not limited to the following items as used for the Work as indicated in the Contract Documents:

- a. Dovetail Slots
- b. Form Liners
- c. Form Ties
- d. Form Release Agent
- e. PVC Reglets
- f. Water Stops

C. SD-04 SAMPLES

1. Provide samples for the following items as used for the Work as indicated in the Contract Documents:

- a. Dovetail Slots
- b. Form Liners
- c. Form Ties
- d. Forms for Chamfers, Rustications and Notches
- e. PVC Reglets
- f. Water Stops

1.04 QUALITY ASSURANCE & HANDLING

- A. All materials shall be delivered, stored, and installed so as not to degrade quality, serviceability and appearance.
- B. Provide design, erection, shoring, bracing, and maintenance of all formwork in accordance with ACI 301 to support all loads, including construction loads, until the concrete structure can support such loads.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Formwork shall conform dimensionally to the concrete work as shown on the Drawings. To minimize the number of panel joints, formwork panels shall be of the largest practicable sizes. Cylindrical walls shall be formed with circular formwork, not straight segmented forms. Formwork shall be sufficiently tight to prevent leakage.
- B. Undamaged smooth form facing materials such as plywood, hardboard, metal and plastic, that will produce a smooth form finish, shall be used. Formwork shall not result in fins or offsets exceeding 1/8 inch. If used, aluminum forms with unoxidized surfaces shall be pretreated with a paste made of calcium hydroxide and water followed by water rinsing, repeated until hydrogen bubbles do not form.

2.02 FORM RELEASE AGENT

- A. Form release agent shall be non-grain-raising, non-staining, and shall not leave a residue on the concrete nor adversely affect bonding of materials to be applied thereto.

2.03 FORM TIES

- A. Form ties shall be adjustable length, sized to withstand construction loads, and upon removal shall prevent concrete spalling. The portion of the tie remaining embedded in the concrete upon removal shall be at least 1-1/2 inches from both concrete faces. Ties for liquid containment structures, any and all structures below the 100-year flood and/or design high groundwater elevation, and in areas where water stops at joints are specified, shall contain a neoprene waterstop.

2.04 PVC WATERSTOPS

- A. PVC waterstops shall meet COE CRD-C 572 except: the tensile strength shall exceed 2,000 psi; the minimum ultimate elongation shall be 300 percent; and they shall be manufactured from virgin polyvinylchloride with no scrap, reclaimed material, or pigment contained therein.
- B. Waterstops for expansion joints shall 9 inch wide, heavy duty, ribbed with center-bulb:
 - 1. Greenstreak 735
 - 2. Vinylex RB9-38H
 - 3. Wirestop CR-9380
 - 4. Engineer Approved Equal
- C. Waterstops for construction joints shall be 6 inch wide, ribbed and flat:
 - 1. Greenstreak 679
 - 2. Vinylex R6-38
 - 3. Wirestop FR-6380
 - 4. Engineer Approved Equal
- D. Waterstops for containment curbs, where shown as 4 inch waterstops, shall be 4 inch wide, ribbed and flat:
 - 1. Greenstreak 781
 - 2. Vinylex R4-316T
 - 3. Wirestop FR-4316
 - 4. Engineer Approved Equal
- E. Retrofit waterstop shall be 3/16 inch thick, "L"-shaped with a 3 inch long ribbed vertical leg and 3 inch long non-ribbed horizontal leg: Greenstreak 655 or Engineer Approved Equal. Stainless steel batten bars with pre-drilled holes 6 inch on-center and approved stainless steel fasteners shall be provided. A bedding epoxy recommended by

the waterstop manufacturer shall also be provided, Greenstreak 7300 Epoxy, or Engineer Approved Equal.

- F. All corners and intersections shall be factory formed and tested. Provide continuous waterstop through all corners and intersections.

2.05 HYDROPHILIC WATERSTOPS

- A. Hydrophilic waterstops, where indicated on the Drawings, shall be rubber. Hydrophilic waterstops shall be a product of the following manufacturer:

1. Greanstreak - Hydrotite CJ-1020-2K
2. De Neef Construction Chemicals, Inc. - Swellseal Joint
3. Concrete Sealants, Inc. – Con Seal CS-231
4. Engineer Approved Equal

2.06 PVC REGLETS

- A. Reglets shall be made of rigid PVC plastic. All reglets shall be a product of the following manufacturer:

1. Heckman
2. Hohmann & Barnard, Inc.
3. Progress Unlimited, Inc.
4. Engineer Approved Equal

2.07 DOVETAIL SLOTS

- A. Dovetail slots shall be made of 22 gauge, galvanized steel with a removable filler: 5/8 inch face by one inch deep by one inch back.

2.08 FORM LINERS

- A. Form liners shall be of the type as shown on the Drawings. Form liners shall be a product of the following manufacturer:

1. Greenstreak
2. Doran
3. Scofield
4. Engineer Approved Equal

PART 3 – EXECUTION

3.01 TOLERANCES & FORM ALIGNMENT

- A. Tolerances shall be in accordance with ACI 117.

- B. At locations where continuous surfaces are formed in successive units, forms shall be tightly fitted over the hardened concrete surface to obtain accurate surface alignment and to prevent leakage of mortar and the formation of fins, ridges, and other defects.

3.02 CHAMFERED EDGES

- A. All exposed concrete corners shall be formed with beveled strips to provide 3/4 inch chamfers unless otherwise shown, specified, or directed by the Engineer.
- B. Where concrete walls, columns, and beams abut masonry walls the chamfer shall be omitted.
- C. Where masonry walls are flush with the face of supporting concrete curbs, the chamfer shall be omitted.
- D. Chamfering by grinding is prohibited.

3.03 OPENINGS

- A. Form openings in concrete where required for other Work. Upon failing to form such openings, provide them in a manner approved by the Engineer at no additional cost to the Owner/Engineer.
- B. Provide a continuous 6 inch PVC waterstop at the perimeter of such openings required to be watertight.
- C. Except as otherwise specified, all such openings shall be filled with concrete after the Work to be installed therein is complete.

3.04 CLEANOUTS & ACCESS PANELS

- A. Temporary openings shall be provided to facilitate cleaning and inspection prior to concrete placement, including at the bottom of wall forms. Cleanout openings are not permitted in exposed concrete (concrete exposed to view upon completion of the Work, whether or not it is painted) without the approval of the Engineer.
- B. All refuse, sawdust, shavings, etc. shall be removed, and the forms broom-cleaned before concrete placement.

3.05 FORM RELEASE AGENT

- A. Forms shall be coated with the approved form release agent before placement of reinforcing steel. Excess agent applied to the forms, and any and all on the reinforcing steel and other surfaces requiring a concrete bond, shall be removed.
- B. Forms for unexposed surfaces may be thoroughly wetted in lieu of the approved form release agent immediately before concrete is placed, however form release agent shall be used in cold weather.

3.06 PVC WATERSTOPS

- A. Random samples of delivered waterstops may be tested for conformance by a testing laboratory selected and paid for by the Owner. Nonconformance will be cause for rejection. Waterstops shall be stored under tarpaulins, protected from sunlight, precipitation, soiling, etc.
- B. Center waterstop in joint and secure in correct position with hog rings or grommets spaced 12 inches apart along both edges of waterstop and wired to adjacent reinforcement prior to concrete placement.
- C. Install retrofit waterstops in accordance with the manufacturer's instructions. Grind or shot blast concrete surface to receive waterstop. Apply approximately 1/8 inch thick, and slightly wider than the waterstop, epoxy bed. Place waterstop in epoxy bed prior to epoxy cure and secure waterstop to substrate with stainless steel batten bars and approved stainless steel anchors 6 inch on center. Fasten vertical leg of waterstop to reinforcement with wire ties every 12 inches prior to concrete placement.
- D. Waterstops shall be continuous throughout. Only straight butt splices shall be made in the field. All field splices shall be heat fused welded using a Teflon coated thermostatically controlled waterstop splicing iron at 380 degrees F, and following the manufacturer's recommendations. Unacceptable field splices include, but are not limited to, the following:
 - 1. Tensile strength less than 80% of parent section.
 - 2. Misalignment of center bulbs and ribs more than 1/16 inch, or that reduces cross section by more than 15%.
 - 3. Visible porosity, bubbles, or inadequate bonding. If while prodding the joint with a penknife, the knife breaks through the outer portion of the weld into a bubble.
 - 4. Visible signs of splice separation when cooled splice is bent by hand at a sharp angle, including bond failure greater than 1/16 inch depth.
 - 5. Combined misalignment and bond failure with net cross sectional reduction of more than 15%.
 - 6. Charred or burnt material.
 - 7. Edge welded tee intersections.

3.07 HYDROPHILIC WATERSTOPS

- A. Hydrophilic waterstop shall be continuous, and installed in strict accordance with the manufacturer's instructions, in double rows with a space between, at each joint. It shall not be permitted to allow any extended contact with standing water, such as puddles.

3.08 EMBEDDED ITEMS – GENERAL

- A. Coordinate the setting of anchor bolts, thimbles, inserts, wall pipe, sleeves, and other embedded items. Before placing concrete ensure that all items are accurately located and firmly secured against displacement.
- B. All items shall be thoroughly cleaned and free of loose rust, mill scale, dirt, grease, etc. Wood used for removable keys shall be thoroughly dampened before concrete is placed against it.

3.09 EMBEDDED ELECTRICAL CONDUIT

- A. Electrical conduit may be embedded in concrete provided the following conditions are met. Conduit runs that cannot satisfy these conditions shall be run exposed.
 - 1. Outside diameter of conduit shall not exceed 1/3 of concrete thickness.
 - 2. Conduit shall not be placed closer than three diameters on center.
 - 3. Conduit shall not significantly impair the strength of the construction.
 - 4. Conduit shall not be embedded in structural concrete slabs less than 4 inches thick.
 - 5. Only two conduits may cross at any point. The sum of the outside diameter of the crossing conduits shall not exceed 1/3 of the concrete thickness.
 - 6. A 1-1/2 inch minimum concrete cover shall be provided for conduits in structural slabs.
 - 7. Conduit shall not be located between bottom of reinforcing steel and bottom of slab.
 - 8. Conduit is not permitted in beams, girders, and columns without the approval of the Engineer.
 - 9. Aluminum conduit shall not be embedded in concrete.
 - 10. Conduit shall be installed such that cutting, bending, and/or displacement of reinforcement from its proper location is not necessary.

3.10 FORM REMOVAL

- A. Forms shall be removed while ensuring the complete safety of the structure. Forms and/or shoring for slabs, beams, and other suspended members shall not be removed until members are of sufficient strength to safely support their own weight and the weight thereon.

- B. Newly unsupported portions of the structure shall not be subjected to heavy construction or material loading. Additional shores or re-shores shall be provided as required to adequately support the members during the construction period.
- C. The Contractor shall be responsible for the proper removal of forms, shores, and bracing.
- D. Spalling of concrete surfaces shall be prevented.
- E. When forms are removed before the specified curing period (as specified in SECTION 03 35 00 CONCRETE PLACING, CURING AND FINISHING) is complete, measures shall be taken to continue curing and providing thermal protection for the concrete.
- F. Forms may be removed when the cumulative time during which the temperature of the air surrounding the concrete is above 50 degrees F are as follows:
 - 1. Walls (except tank and containment walls, and those resisting hydrostatic pressure from groundwater), columns, sides of beams and girders, and similar parts of the Work not supporting the weight of the concrete: Twenty-four hours.
 - 2. Tank and containment walls, and those resisting hydrostatic pressure from groundwater: Seven (7) days. (Loosening forms after 24 hours is permitted, but forms shall remain in place to aid curing).
 - 3. When design superimposed load is less than the self-weight:
 - a. Beam and Girder Soffits:
 - 1) Clear span less than 10 feet: Seven (7) days
 - 2) Clear span 10 feet to 20 feet: Fourteen (14) days
 - 3) Clear span more than 20 feet: Twenty-one (21) days
 - b. Slabs:
 - 1) Clear span less than 10 feet: Four (4) days
 - 2) Clear span 10 feet to 20 feet: Seven (7) days
 - 3) Clear span more than 20 feet: Ten (10) days
 - 4. When design superimposed load is more than the self-weight:
 - a. Beam and Girder Soffits:
 - 1) Clear span less than 10 feet: Four (4) days
 - 2) Clear span 10 feet to 20 feet: Seven (7) days
 - 3) Clear span more than 20 feet: Fourteen (14) days
 - b. Slabs:

- 1) Clear span less than 10 feet: Three (3) days
 - 2) Clear span 10 feet to 20 feet: Four (4) days
 - 3) Clear span more than 20 feet: Seven (7) days
5. Alternatively to the stripping times specified, additional concrete cylinders shall be made using representative concrete, witnessed and approved by the Engineer, and tested at no additional cost to the Owner/Engineer. Such specimens shall be field cured in accordance with ASTM C31/C31M under conditions that are not more favorable than the most unfavorable conditions for the portions of the concrete that the test specimens represent. The supporting forms and shores may be removed when the concrete strength as tested per ASTM C39/C39M is a minimum of 70 percent of the specified design strength, as determined by the field-cured cylinders according to ACI 301.

3.11 TIE HOLES

- A. Filling of form tie holes and concrete finishing are specified in SECTION 03 35 00, CONCRETE PLACING, CURING AND FINISHING.

3.12 CLEANING & REPAIR OF FORMS

- A. Parts of forms reserved for reuse shall be inspected, cleaned and repaired. Any and all parts dented, deformed or otherwise rendered unfit for reuse shall be discarded.

END OF SECTION

SECTION 03 15 00

CONCRETE SPECIALTIES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment and labor necessary for the construction of concrete specialties as specified herein, as shown on the Contract Drawings, and as necessary for the proper completion of the Work.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM C1107/C1107M (2011) Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
 - 2. ASTM D 4832 (2010) Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders
 - 3. ASTM D 6103 (2004) Standard Test Method for Flow Consistency of Controlled Low Strength Material (CLSM)
- C. ICC EVALUATION SERVICE, INC. (ICC-ES)
 - 1. ICC-ES AC58 (2009) Acceptance Criteria for Adhesive Anchors in Masonry Elements
 - 2. ICC-ES AC308 (2009) Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.

B. SD-03 PRODUCT DATA

1. Provide product data for concrete specialty products including but not limited to Non-Shrink Grout and Epoxy Adhesive. Include International Code Council Evaluation Service Reports, ICC-ES AC58 (creep test) and ICC-ES AC308. Include allowable and ultimate loads and storage requirements. Gel and cure times as a function of temperature.

C. SD-06 REPORTS

1. Provide flowable fill 28-day and 90-day compressive strength test results, and flow ability test results per ASTM D 6103.

D. SD-08 MANUFACTURER'S INSTRUCTIONS

1. Include manufacturer's instructions for non-shrink grout and epoxy adhesive. Include installation temperature requirements for cartridges and base material. Provide details regarding the drilling method (diamond drill bit shall be prohibited), drill bit diameter, and depth of hole for each size anchor, hole cleaning procedure and required condition of hole. Provide requirements for discarding initial discharge to ensure proper mixing, hole filling procedure and time period when anchor cannot be contacted or otherwise disturbed.

PART 2 – PRODUCTS

2.01 NON-SHRINK GROUT

- A. Grout shall be non-metallic, cementitious non-shrink grout meeting ASTM C1107/C1107M, grade C. All non-shrink grout shall be a product of the following manufacturer:
1. U.S. Grout Company - Five Star Grout
 2. L&M Construction Chemicals, Inc. - Crystex or Premier
 3. Dayton Superior - Sure-Grip High Performance Grout
 4. Engineer Approved Equal

2.02 CONCRETE FILLS

- A. All concrete fills shall have a 28-day design compressive strength of 4,000 pounds per square inch, maximum water to cementitious materials ratio of 0.45, and shall otherwise meet the requirements of SECTION 03 31 00, CAST-IN-PLACE CONCRETE.
- B. Concrete fills of minimum thickness less than 2-1/4 inches, and those screeded into place by process equipment, shall have a 1/2 inch maximum size aggregate. Concrete fills of minimum thickness from 2-1/4 inches to less than 6 inches shall have a 3/4 inch

maximum size aggregate. Concrete fills of 6 inch or greater minimum thickness shall have 1-1/2 inch maximum size aggregate.

2.03 DUCT BANKS

- A. All underground electrical duct banks shall be concrete encased or capped as indicated on the Drawings. Concrete shall be as specified in SECTION 03 31 00, CAST-IN-PLACE CONCRETE, except it shall have a 3/8 inch maximum aggregate size and a minimum 28-day compressive strength of 3,000 pounds per square inch.
- B. Duct banks shall be reinforced as detailed where crossing under roads, driveways, parking areas, all areas subject to vehicular traffic, and as shown or specified in the Contract Documents. Reinforcing shall extend a minimum of 4 feet beyond the specified areas.

2.04 CONCRETE FILLED STAIR TREAD

- A. Concrete shall be as specified in this section for concrete fills. Reinforcing shall be 2x2 W1.4xW1.4 welded wire fabric.

2.05 EPOXY ADHESIVE

- A. Epoxy adhesive for anchoring reinforcing bars to concrete shall be a two-component solid epoxy based system supplied in manufacturer's standard side-by-side cartridge and dispensed through manufacturer's standard static-mixing nozzle. Epoxy adhesive shall be a product of the following manufacturer:
 - 1. Simpson Strong Tie Co. - Epoxy Tie SET or ET
 - 2. Hilti, Inc. - HIT RE
 - 3. Engineer Approved Equal
- B. Epoxy adhesive shall pass the creep test requirements of ICC-ES AC58.
- C. The embedment depth shall be per the manufacturer's requirements and such that: the ultimate strength exceeds the tensile strength of the reinforcing bar, and the ultimate strength divided by a minimum factor of safety of 3.75 is at least 40 percent of the yield strength of the reinforcing bar.

2.06 FLOWABLE FILL

- A. Flowable fill shall be controlled low strength material. The fill shall be a rigid-setting mixture of portland cement, sand, and water. It shall not require vibration during placing. Flowability shall be measured in accordance with ASTM D 6103: the spread diameter shall be at least 8 inches, without noticeable segregation. Fill shall self-consolidate and be hand-tool-excavatable. Sand gradation shall conform to the following:

U.S. Standard Sieve	Percent Passing
3/8 inch	100
No. 4	95-100
No. 16	45-80
No. 50	10-30
No. 100	2-10
No. 200	0-3

- B. Cement, water, and chemical admixtures shall meet the requirements of SECTION 03 31 00, CAST-IN-PLACE CONCRETE.
- C. The compressive strength shall be measured in accordance with ASTM D 4832 At 28 days it shall be between 30-80 psi, and at 90 days it shall not exceed 100 psi.

PART 3 – EXECUTION

3.01 EQUIPMENT PADS

- A. New concrete surfaces upon which equipment pads are to be built shall receive a scratched finish in accordance with SECTION 03 35 00, CONCRETE PLACING, CURING, AND FINISHING.
- B. All laitance shall be removed and the surface shall be saturated with water for a minimum of six hours. Excess water shall then be removed and an epoxy bonding compound applied as specified in SECTION 03 35 00, CONCRETE PLACING, CURING, AND FINISHING.
- C. All equipment pads shall be sized to suit the approved equipment, and reinforcement shall be as shown on the Drawings.
- D. All exposed faces shall be formed with smooth forms and shall be smooth and free of sands streaks, bug holes, and honeycomb. All exposed surfaces shall have a smooth, even surface, with all exterior corners chamfered. Exposed faces of pads shall receive a rubbed finish as specified in SECTION 03 35 00, CONCRETE PLACING, CURING, AND FINISHING.
- E. All anchor bolts, dowels, sleeves, and other fittings required for the equipment, shall be built in.

3.02 GROUTING

- A. Grouting for structural, mechanical, and electrical items, and shall be in accordance with the manufacturer's recommendations.
- B. Concrete surfaces to receive grout shall be cleaned of all contamination and debris. Surface roughening shall be required if laitance or poor concrete is evident.

- C. Grout placement shall be rapid and continuous such that grout completely fills the space to be grouted, absent of air pockets.
- D. Grout may be placed by gravity or pumped. When practical, grout shall be placed from one side and made to flow to the open side to prevent the formation of air pockets.

3.03 CONCRETE FILLS

- A. New unformed concrete surfaces upon which concrete fills are to be placed shall receive a rough (broom, scratched, rough screed, or rough wood float) finish in accordance with Section 03 35 00, CONCRETE PLACING, CURING, AND FINISHING. However, where concrete fills are to be screeded into place by process equipment (e.g. clarifiers), the concrete surface shall receive a scratched finish in accordance with SECTION 03 35 00.
- B. All laitance shall be removed and the surface shall be saturated with water for a minimum of six hours. Excess water shall then be removed and the epoxy bonding compound applied as specified in SECTION 03 35 00, CONCRETE PLACING, CURING, AND FINISHING. However, where concrete fills are to be screeded into place by process equipment (e.g. clarifiers), it shall be permitted to scrub in a stiff cement slurry immediately prior to placing concrete fill, in lieu of the epoxy bonding compound.

3.04 EXISTING CONCRETE

- A. Where equipment pads are to be constructed, grouting is to be performed, and/or concrete fills are to be placed against existing concrete, the following surface preparation shall be required:
 - 1. The existing concrete surface shall be cleaned of all contamination and debris, and roughened by chipping, abrasive blasting, or scarifying.
 - 2. The existing concrete surface shall be water-saturated for a minimum of six hours, after which the excess water shall be removed immediately prior to placement of new concrete and/or grout.
- B. In areas where equipment pads are to be constructed and/or concrete fills are to be placed, apply epoxy-bonding compound (as specified in Section 03 35 00, CONCRETE PLACING, CURING, AND FINISHING) to prepared concrete surface prior to concrete placement.

3.05 DUCTBANKS

- A. There shall be a minimum of 4 inches of concrete between the outside of a duct and surrounding soil. There shall be not less than 3 inches of concrete between adjacent ducts.

- B. All ductbank concrete placements shall be continuous between manholes and hand holes and between manholes, hand holes and structures.
- C. Where ducts pass through a basement wall, the concrete encasement shall extend through the wall and be flush with inside face per the details on the Drawings. Watertight construction joints shall be provided.

3.06 EPOXY ADHESIVE

- A. Provide the services of a competent manufacturer's field representative who shall be present at the Work site prior to beginning installation in order to instruct the Contractor and the Engineer on proper installation and inspection procedures. Such instruction shall include a full and complete demonstration.
- B. Each installer shall at all times have in their possession the manufacturers complete installation requirements and instructions.
- C. All cartridges shall have the expiration date clearly visible. Material past its expiration date shall not be used, and shall be immediately removed from the site.
- D. Embedded reinforcing steel shall be located with the proper equipment prior to drilling, to ensure that each drilling location does not coincide with a reinforcing bar. Drilling through reinforcement shall be prohibited.
- E. Diamond drill bits shall not be permitted. Hammer drills shall be used.
- F. The initial material extruded from each cartridge shall be discarded in accordance with the manufacturer's instructions, to ensure that all material is properly mixed.
- G. Adhesive and reinforcing bars shall be installed in very strict accordance with the manufacturer's written instructions. Depth stops shall be used to ensure correct drilling depth. Drilled holes shall be blown out with air, thoroughly wire brushed with a repeated back and forth movement, blown out, thoroughly wire brushed, and blown out again. Adhesive shall be injected starting from the bottom of the hole, and slowly withdrawn as filling progresses, in order to avoid air pockets.
- H. Anchored reinforcing bars shall remain completely undisturbed between the manufacturer's specified gel time and the full cure time. Zero loading shall be applied during this time.

END OF SECTION

SECTION 03 20 00

CONCRETE AND MASONRY REINFORCEMENT

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment, and labor necessary for the fabrication and installation of all reinforcing steel as shown on the Drawings, as specified herein, and as necessary for the proper completion of the Work as indicated in the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
 - 1. ACI 117 (2010) Specifications for Tolerances for Concrete Construction and Materials and Commentary
 - 2. ACI SP-66 (2004) ACI Detailing Manual
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A82/A82M (2007) Standard Specification for Steel Wire, Plain, for Concrete Reinforcement
 - 2. ASTM A185/A185M (2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - 3. ASTM A497/A497M (2007) Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete
 - 4. ASTM A615/A615M (2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
- D. AMERICAN WELDING SOCIETY (AWS)
 - 1. AWS D1.4/D1.4M (2011) Structural Welding Code - Reinforcing Steel
- E. CONCRETE REINFORCING STEEL INSTITUTE (CRSI)

1. CRSI 10MSP (2009; 28th Ed) Manual of Standard Practice

1.03 SUBMITTALS

A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.

B. SD-02 SHOP DRAWINGS

1. Provide reinforcement shop drawings in accordance with ACI SP-66. Shop drawings shall include but are not limited to the following information:
 - a. Sizes, dimensions, locations, and arrangement of reinforcement and supports
 - b. Bending diagrams and schedules
 - c. Splices
 - d. Cover and clearances
 - e. Class designation and details of bar supports,
 - f. Pertinent reinforced concrete details with dimensions and elevations,
 - g. Items furnished by other trades and/or under other sections of the specification that are to be cast in concrete where interference with reinforcing may occur,
 - h. Reinforcement of walls shall be shown on wall elevations with required sections; reinforcement of beams on beam elevations with required sections; and reinforcement of slabs on plan views with required sections. Provide plan details where walls intersect.

C. SD-06 REPORTS

1. Provide certified mill reports, including chemical and physical analyses of reinforcement, dowel bar splicers and dowel inserts.

1.04 DELIVERY, STORAGE AND HANDLING

A. Reinforcement shall be delivered to the project site in bundles with tags indicating size, length, and identification mark. Materials shall be stored off the ground to prevent soiling and to facilitate subsequent inspection and handling.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Reinforcement shall be fabricated in accordance with ACI 117. "Steel reinforcement" shall include all bars, anchorages, stirrups, dowels, ties, tie-wire, chairs and other steel supports, and spacers as noted on the Drawings, specified herein, and as required for the proper completion of the Work.
- B. Reinforcing Bars shall be formed from new billet steel conforming to ASTM A615/A615M, Grade 60 except as otherwise specified or indicated on the Drawings.
- C. Plain wire fabric shall conform to ASTM A185/A185M and deformed wire fabric shall conform to ASTM A497/A497M. Flat sheets shall be used; rolls are not permitted.

2.02 TIE WIRE

- A. Provide FS QQ-W-461 annealed black, 16-gauge minimum. For Architectural Concrete provide ASTM A82/A82M galvanized steel, 16-gauge minimum.

2.03 BAR SUPPORTS

- A. Chairs, bolsters, spacers and other supports to properly position reinforcing steel shall conform to the "Bar Support" recommendations of CRSI 10MSP, and shall be of adequate strength and design to prevent displacement of reinforcing and discoloration of concrete.
- B. Supports shall be Class 3, except where concrete surfaces are exposed to view, weather and/or moisture where they shall be Class 1 - Plastic Protected.
- C. Supports for bottom reinforcing of concrete mats and slabs-on-grade shall be precast concrete blocks not less than 4-inches square, with a compressive strength equal to that of the surrounding concrete. They may only be used to support reinforcing within 3-inches of the bottom of the slab.

2.04 FABRICATION

- A. Steel reinforcement shall be fabricated to the sizes, shapes and dimensions shown on the Drawings, details and schedules. All bending shall be in accordance with CRSI 10 MSP. All steel shall be bent cold and shall not be bent or straightened in a manner that will injure the metal. Bars with kinks or bends not so detailed shall not be used.
- B. Bends for stirrups and ties shall be made around a pin having a diameter not less than four times the minimum thickness of the bar. Bends for other bars shall be made around a pin having a diameter not less than six times the minimum thickness of the bar, except that for bars larger than 1-inch the pin shall be not less than eight times the minimum thickness of the bar.

2.05 DOWEL BAR SPLICES & INSERTS

- A. Dowel bar splicers shall be a two-component threaded rebar splice system. The internally threaded component shall be forged from Grade 60 deformed rebar material free of external machining and/or welding. It shall contain an integral flange with nailing holes and be threaded with UNC or UN threads to a depth equal to the nominal diameter of the threads plus 1/4 inch. The externally threaded splice component shall be fabricated from Grade 60 deformed rebar material and supplied with rolled threads corresponding with the internally threaded component. The root diameter of the threads shall provide a minimum cross sectional area equal to the cross sectional area of the nominal rebar size. Manufacturer testing shall indicate ultimate tension failure occurring in the nominal bar diameter, not at the mechanical splice.

PART 3 – EXECUTION

3.01 INSTALLATION – GENERAL

- A. Tolerances shall conform to ACI 117.
- B. All reinforcement within an area of a continuous concrete placement shall be installed, supported, and secured before beginning the concrete placement.
- C. Adjust steel within allowable tolerances to avoid interference with other reinforcing, conduits, and/or embedded items.
- D. Reinforcing shall not be moved beyond allowable tolerances without the Engineer's approval.
- E. Reinforcing shall not be heated, bent or cut without the Engineer's approval.
- F. All reinforcement shall be entirely free from flaking rust, loose mill scale, grease, dirt, etc. that might reduce its bond with the concrete.
- G. Concrete cover for reinforcement shall conform to the dimensions shown on the Drawings.

3.02 PLACEMENT

- A. Reinforcement shall be accurately positioned both horizontally and vertically, and shall be properly secured and sufficiently rigid to prevent displacement during concrete placement.
- B. Reinforcement shall be securely tied at intersections with tie wire or clips in a manner that will keep all metal away from exposed concrete surfaces.

- C. Notify the Engineer at least 24 hours before placing concrete. All reinforcement within the area of one day's concrete placement shall be tied in place, and observed by the Engineer, prior to commencing concrete placement.

3.03 SPLICES

- A. Reinforcement splices shall be as shown on the Drawings. Where not shown, splices shall be located away from areas of maximum stress, and shall be approved by the Engineer.
- B. Welding shall be only when permitted by written approval of the Engineer, and shall be in accordance with AWS D1.4/D1.4M.

3.04 WIRE FABRIC

- A. All wire fabric shall be installed in longest practicable sheet.
- B. Adjoining sheets shall be lapped a minimum of one and one-half wire spacing and securely wired together.
- C. End laps in adjacent sheets shall be offset.

END OF SECTION

SECTION 03 31 00

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment, labor and appurtenances necessary for cast-in-place concrete as shown on the Drawings, as specified herein, and as necessary for the proper completion of the Work.
- B. Concrete Work shall not begin until test results and design mixes have been reviewed by the Engineer. The Engineer's review shall not constitute "approval"; the Contractor shall be responsible for meeting all concrete performance requirements.
- C. ACI 301 is hereby made a part of this specification, except as otherwise modified by the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. ACI INTERNATIONAL (ACI)
 - 1. ACI 117 (2010) Specifications for Tolerances for Concrete Construction and Materials and Commentary
 - 2. ACI 301 (2010) Specifications for Structural Concrete
 - 3. ACI C-10(1990) Repair and Rehabilitation of Concrete Structures
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM C31/C31M (2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
 - 2. ASTM C33/C33M (2011) Standard Specification for Concrete Aggregates
 - 3. ASTM C40 (2011) Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
 - 4. ASTM C88 (2005) Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

5. ASTM C94/C94M (2011a) Standard Specification for Ready-Mixed Concrete
6. ASTM C143/C143M (2010) Standard Test Method for Slump of Hydraulic-Cement Concrete
7. ASTM C150/C150M (2011) Standard Specification for Portland Cement
8. ASTM C173/C173M (2010b) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
9. ASTM C231/C231M (2010) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
10. ASTM C260/C260M (2010a) Standard Specification for Air-Entraining Admixtures for Concrete
11. ASTM C494/C494M (2011) Standard Specification for Chemical Admixtures for Concrete
12. ASTM C618 (2008a) Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
13. ASTM C989 (2010) Standard Specification for Slag Cement for Use in Concrete and Mortars
14. ASTM C 40 (2004) Standard Test Method for Organic Impurities in Fine Aggregates for Concrete
15. ASTM C1260 (2007) Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
16. ASTM C1293 (2008b) Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction
17. ASTM C1567 (2008) Standard Test Method for Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerated Mortar-Bar Method)
18. ASTM C1602/C1602M (2006) Standard Specification for Mixing Water Used in Production of Hydraulic Cement Concrete
19. ASTM E 329 (2011a) Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Constructions

1.03 SUBMITTALS

A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.

B. SD-03 PRODUCT DATA

1. Provide all concrete mix design(s) for each concrete mix proposed for use in the Work. Include all proposed admixtures.

C. SD-06 REPORTS

1. Provide certified mill test reports of all cement.
2. Provide test reports for all fine and coarse aggregate for all aggregates proposed for use. Include sources, sieve analyses per ASTM C33/C33M, potential alkali reactivity per ASTM C1260 (not required if a cement containing less than 0.60% alkalis is used per ASTM C33/C33M), and soundness per ASTM C88. Test data of organic impurities for fine aggregate per ASTM C40 shall also be included.
3. Provide test data supporting proportions of design mixes, for each concrete mix proposed for use in the work, based upon laboratory trial batches or field test records that are in strict accordance with ACI 301 Section 4, "Concrete Mixtures". Data shall include sources of cement and aggregates. Field test data used to determine the standard deviation used for establishing the required average design strength shall be from within the previous twelve (12) months, in accordance with ACI 301. Field test data documenting that the proposed concrete proportions will produce an average compressive strength equal to or greater than the required average compressive strength shall be from within the past twelve (12) months. All data shall be submitted within forty-five (45) days after Notice to Proceed, or at least fourteen (14) days before initial placement of concrete, whichever is earlier.
4. Fly ash source and test reports showing fly ash to be in compliance with these Specifications. Reports shall be for actual fly ash to be used in the Work.
5. Ground granulated blast-furnace slag source and test reports showing slag to be in compliance with these Specifications. Reports shall be for actual slag to be used in the Work.

1.04 QUALITY ASSURANCE

- A. No more than one single commercial ready mix plant shall be used throughout the Work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Concrete shall be supplied from a commercial ready mix plant and shall be mixed and delivered in accordance with the requirements of ASTM C94/C94M and these specifications. Where such plant does not exist within a reasonable distance from the site, when on site batching is performed, the following shall apply.
 - 1. Cement shall be carefully stored immediately upon receipt. Cement sacks shall be stored in a weatherproof structure, as airtight as practical to prevent moisture absorption. Sacks shall be stacked closely to reduce air circulation, and shall not be stacked against exterior walls. Storage shall allow easy access for inspection and shipment identification. Bulk cement shall be transferred to elevated airtight weatherproof bins. When there is doubt as to the quality of cement that has been in storage, it shall be tested to determine its suitability, and shall not be used without approval of the Engineer.
 - 2. Aggregates shall be stored in a manner to prevent contamination by foreign materials. Different size aggregates shall be stored in separate piles. Coarse aggregate stockpiles shall be built in horizontal layers not exceeding four feet in depth to avoid segregation.

PART 2 – PRODUCTS

2.01 CONCRETE MATERIALS - GENERAL

- A. All concrete shall be designed to have a minimum 28-day compressive strength of 4,000 pounds per square inch, except as otherwise noted in the Contract Documents.
- B. Proportions of aggregate to cement shall produce a mixture of the required strength and slump that will produce the specified finishes and not segregate.

2.02 CEMENT

- A. Cement shall meet the requirements of ASTM C150/C150M, Type II.

2.03 FLY ASH

- A. Fly Ash shall conform to ASTM C618, Class F. Maximum loss of ignition shall be 3.0 percent.

2.04 GROUND BLAST FURNACE SLAG

- A. Ground granulated blast furnace slag shall conform to ASTM C989. Slag activity classification shall be Grade 100 or 120.

2.05 AGGREGATE

- A. All aggregates shall conform to ASTM C33/C33M, as amended herein.

- B. The use of crushed hydraulic cement concrete for aggregate shall not be permitted.
- C. Aggregate tested in accordance with ASTM C1260 having a fourteen (14) day expansion greater than 0.10 percent shall be considered to be potentially reactive and shall not be used, except if when tested in accordance with ASTM C1567 the fourteen (14) day expansion is not greater than 0.10 percent, or if when tested in accordance with ASTM C1293 the 2-year expansion is not greater than 0.04 percent, or if a cement containing less than 0.60% alkalies is used per ASTM C33/C33M.

2.06 FINE AGGREGATE

- A. Fine aggregates shall consist of sand or screenings of gravel or crushed stone, well graded from fine to coarse; clean and free from soft particles, clay, loam and organic matter, with the volume removed by sedimentation not more than three percent. When tested in accordance with ASTM C40 for organic impurities, the color of the supernatant liquid above the test sample shall show not darker than organic plate No. 3.
- B. Fine aggregate shall conform to the following criteria:

U.S. Standard Sieve	Percent Passing
3/8 Inch	100
No. 4	95-100
No. 8	80-100
No. 16	50-85
No. 30	25-60
No. 50	5-30
No. 100	0-10

- C. Fine aggregate shall not have more than 45 percent retained between any two consecutive sieves listed above, and the fineness modulus shall not be less than 2.3 or more than 3.1.

2.07 COARSE AGGREGATE

- A. Coarse aggregates shall consist of crushed stone or washed gravel of clean, hard, durable, uncoated particles, free from dust, dirt, or other deleterious substances; and free from thin, flat or elongated particles. Nominal maximum aggregate size shall be 1½ inch for all slabs poured on ground, foundation mats, footings, in addition to walls that are at least 15 inches thick, except where the clear spacing between reinforcing bars is less than 2 inches. Nominal maximum aggregate size shall be ¾ inch at all other locations, except as specified elsewhere or upon written approval of the Engineer.
- B. Coarse aggregate shall conform to the grading given in Table 2 of ASTM C33/C33M for sizes (nominal maximum aggregate sizes) No. 467 (1½"), No. 57 (1"), No. 67 (¾"), No. 7 (1/2"), and No. 8 (3/8").

2.08 WATER

- A. Water shall be clean, fresh and free from oil, acid, salt, alkali, sewage, organic matter, and other deleterious substances, and shall meet the requirements of ASTM C1602/C1602M.

2.09 ADMIXTURES

- A. Admixtures shall be used as follows, and the use of products other than those listed will be allowed only with the written approval of the Engineer.
 - 1. Air-entraining admixtures shall be chloride free conforming to ASTM C260/C260M.
 - 2. Mid-Range Water Reducing Agents shall conform to ASTM C494/C494M, Type. The air entraining effect of the water reducing agent shall be taken into account.
 - 3. Water Reducing-Retarding Agents. When the ambient temperature rises above 70 degrees F., the water reducing agent shall be replaced in whole or in part with a water reducing-retarding agent conforming to ASTM C494/C494M, Type D. The admixture shall be used in such amounts to produce concrete with a set time equal to that which it would have at 70 degrees F. without the retarder.
 - 4. Set Accelerator. Where a set accelerator is allowed under the provisions of SECTION 03 35 00, CONCRETE PLACING, CURING, AND FINISHING, it shall be non-chloride type conforming to ASTM C494/C494M, Type C or E.
 - 5. Superplasticizer may be approved for use in any part of the structure, and shall conform to ASTM C494/C494M, Type F or G. Admixture may be added in plant or field depending on haul time and ambient temperatures.

PART 3 – EXECUTION

3.01 TESTING & INSPECTION

- A. Concrete materials and concreting operations shall be tested and inspected as the Work progresses. Failure to detect defective work or material shall in no way preclude later rejection upon discovery.
- B. The use of testing services shall in no way relieve the Contractor of the responsibility to furnish materials and construction in full compliance with the Contract Documents.

3.02 CONCRETE MIX DESIGNS

- A. Concrete mixes shall be designed in accordance with Section 4, "Concrete Mixtures" of ACI 301.

- B. Ingredient Tests. Prior to making design mixes, a Testing Laboratory conforming to ASTM E 329, shall conduct the following tests in accordance with the References:
1. Cement: Specific gravity and brand name of cement.
 2. Aggregates: Sieve analysis, specific gravity, soundness, absorption, potential alkali reactivity, moisture content of fine and coarse aggregate, dry-rodded weight of coarse aggregate, and fineness modulus of fine aggregate.
 3. Design mixes shall indicate water to cementitious materials ratio, water content, admixture content, cement content, aggregate content, aggregate gradations, slump, air content and strength. Design mixes and related tests shall be in accordance with the procedures referred to in the applicable references cited herein.
 4. The testing laboratory shall recommend the design mixes to be used for each application of concrete that will produce concrete of specified strengths and finishes with slumps and workability to meet all placing conditions.

3.03 WATER TO CEMENTITIOUS MATERIAL RATIO

- A. The water to cementitious materials ratio shall not exceed 0.45 except as otherwise noted in the Contract Documents.

3.04 FLY ASH

- A. Use of fly ash is optional. When used, the amount of fly ash shall not be less than 15 percent or more than 25 percent of the weight of cement plus fly ash.

3.05 GROUND BLAST FURNACE SLAG

- A. The use of ground granulated blast furnace slag (GGBF) optional. When used, the amount of slag shall not be less than 25 percent or more than 50 percent of weight of cementitious material.

3.06 FLY ASH AND SLAG

- A. When both fly ash and GGBF slag are used, the minimum amount of portland cement shall be 337 pounds per cubic yard of concrete. The combined fly ash and GGBF slag shall not exceed 50 percent of the total cementitious materials, and the fly ash shall not exceed 25 percent thereof.

3.07 WATER CONTENT

- A. Any and all residual, wash, or other water in drums shall be completely discharged prior to concrete batching.
- B. The amount of water carried on the aggregate, and the effect of admixtures, shall be included in the water content. The water carried on the aggregate shall be determined

periodically by test, and the amount of free water on the aggregate subtracted from water added to the mix.

- C. In all cases the amount of water to be used shall be not be more than the minimum amount required to produce a plastic mixture of the strength specified and of the required density, uniformity and workability. The consistency of any mix shall be at that required for the specific placing conditions and methods.

3.08 CONCRETE SLUMPS

- A. Unless otherwise specified or indicated on the Drawings, at the point of delivery concrete shall have a slump of 4 inches, determined in accordance with ASTM C143/C143M. Slump tolerances shall meet the requirements of ACI 117.
- B. When Type F or G high-range water-reducing admixture conforming to ASTM C494/C494M is used, concrete shall have a slump of 2 to 4 inches before the admixture is added, and a maximum slump of 8 inches at the point of delivery after the admixture is added.

3.09 AIR ENTRINMENT

- A. All concrete, except as noted below, shall be air entrained. Air entraining admixture shall be used strictly in accordance with the manufacturer's directions and these specifications to produce a total entrained air content, determined in accordance with the procedure given in ASTM C173/C173M or ASTM C231/C231M, as follows:

Nominal Maximum Size Coarse Aggregate (Inches)	Air Content By Volume (+/- 1.5%)
3/8	7.5
1/2	7.0
3/4	6.0
1	6.0
1-1/2	5.5

- B. Interior concrete slabs to be hard-troweled shall have a maximum air content of 3.0 percent. After the curing period, such slabs shall be protected from freezing temperatures for a minimum of 8 weeks. Thereafter, and for the duration of the Contract, if such slabs might be subject to freezing temperatures, they shall be fully sheltered from rain, snow and all other water sources.

3.10 LEAKAGE TESTING

- A. Provide all labor, equipment, and incidentals required for leakage testing of concrete structures. Testing shall conform to ACI 350.1-01 Chapter 2, HST-VIO. The Engineer

shall witness field tests and conduct all field inspections. The Contractor shall give the Engineer ample notice of dates and times scheduled for tests. Structures must be complete for final test acceptance except for items such as shelf and invert brickwork. Testing shall be performed prior to exterior coating and backfilling of structures.

B. HST-VIO Testing shall be in accordance with the following criteria:

1. Plug pipes into and out of structure and secure plugs.
2. Structure penetrations and outlets shall be monitored before and during the test to determine if they are water tight.
3. Groundwater level shall be brought to a level below the top of the base slab.
4. Filling of tank shall not exceed rate of 4ft/h, and continue until water surface is at the design maximum liquid level or 4 inches below any fixed overflow level.
5. The water shall be kept at the test level of unlined concrete tanks for at least three days prior to the actual test.
6. Exterior surfaces of the tank shall be inspected during the period of filling the tank. Any defects causing leaks shall be repaired.
7. No flow or seepage of water that can be smudged by hand shall be present on exterior surface of tank.

END OF SECTION

SECTION 03 35 00

CONCRETE PLACING, CURING AND FINISHING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment, labor and appurtenances required for the placing, curing and finishing of all cast-in-place concrete as shown on the Drawings, as specified herein, and as necessary for the proper completion of the Work.
- B. The Engineer may order load and/or core tests in accordance with ASTM C42/C42M. Such testing shall be paid for by the Owner if the concrete is proven to meet the requirements of the Contract Documents and by the Contractor otherwise. The Contractor shall also pay for all testing costs associated with any and all Work to be replaced.
- C. ACI 306.1 is hereby made a part of this specification, except as otherwise modified within the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN CONCRETE INSTITUTE INTERNATIONAL (ACI)
 - 1. ACI 117 (2010) Specifications for Tolerances for Concrete Construction and Materials and Commentary
 - 2. ACI 301 (2010) Specifications for Structural Concrete
 - 3. ACI 306.1 (1990; R 2002) Standard Specification for Cold Weather Concreting
 - 4. ACI 308.1 (2011) Standard Specification for Curing Concrete
 - 5. ACI 350.1 (2010) Specification for Tightness Testing of Environmental Engineering Concrete Containment Structures
 - 6. ACI 306R(2010) Cold Weather Concreting
- C. ASTM INTERNATIONAL (ASTM)

1. ASTM C31/C31M (2010) Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C39/C39M (2010) Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
3. ASTM C42/C42M (2010a) Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
4. ASTM C1315 (2011) Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete
5. ASTM C143/C143M (2010) Standard Test Method for Slump of Hydraulic-Cement Concrete
6. ASTM C171 (2007) Standard Specification for Sheet Materials for Curing Concrete
7. ASTM C172 (2010) Standard Practice for Sampling Freshly Mixed Concrete
8. ASTM C173/C173M (2010b) Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
9. ASTM C231/C231M (2010) Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
10. ASTM C309 (2011) Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
11. ASTM C578 (2011) Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation
12. ASTM C881/C881M (2010) Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
13. ASTM C920 (2011) Standard Specification for Elastomeric Joint Sealants
14. ASTM C1064/C1064M (2008) Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
15. ASTM D1751(2004; R 2008) Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
16. ASTM D1752 (2004a; R 2008) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion

17. ASTM E96/E96M (2010) Standard Test Methods for Water Vapor Transmission of Materials
18. ASTM D2240 (2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
19. ASTM E1155 (1996; R 2008) Standard Test Method for Determining Floor Flatness and Floor Levelness Numbers
20. ASTM E1745 (2009) Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabss

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.
- B. SD-03 PRODUCT DATA
 1. Provide duplicate delivery tickets, one for the Contractor and one for the Engineer, for each truckload of concrete delivered, with the following information:
 - a. Serial number of ticket.
 - b. Date and Project location.
 - c. Name and location of ready mixed concrete plant.
 - d. Truck number, time loaded, cubic yardage delivered.
 - e. Dispatcher's name.
 - f. Mix design, cement type, and admixtures with brand names.
 - g. Cement, fly ash and/or slag (if included in approved mix design), water, and fine and coarse aggregate quantities, and admixture content. Maximum aggregate size.
 - h. Water added subsequent to plant batching, if any. (Only applicable if total mix water is not added at the plant. Addition of water such that the water content of the approved mix design is exceeded will be strictly prohibited.)
 - i. Concrete temperature upon delivery.
 - j. Unloading time and location.
 2. Provide manufacturer's literature, product data and related information for the following items:
 - a. Bond Breaker
 - b. Curing Paper
 - c. Epoxy Bonding Compound

- d. Evaporation Retardant
 - e. Floor Hardener
 - f. Joint Filler - Self Leveling
 - g. Membrane Curing Compound
 - h. Preformed Joint Filler
 - i. Drainage Board
 - j. Vapor Retarder
 - k. Water Repellent
- 3. Provide methods to be used to protect concrete placed during hot and cold weather. The Engineer's review shall not constitute "approval"; the Contractor shall be responsible for the protection of concrete placed during hot and cold weather.
 - 4. Provide a means of thermal control and temperature monitoring for placements of mass concrete.

C. SD-04 SAMPLES

- 1. Provide samples of Preformed Joint Filler; 12 inches long. Provide samples of Vapor Retarder; 12 inches square.

1.04 PROTECTION OF CONCRETE

- A. Provide all labor, equipment, water and appurtenances for maintaining new concrete in a continuously moist condition for at least seven (7) days after placement. Fresh concrete shall be protected from freezing, premature drying, heavy rain, flowing water, and mechanical injury.

1.05 COLD WEATHER REQUIREMENTS

- A. Cold weather concreting provisions shall be followed during cold weather: any and all periods when for more than three consecutive days the average daily outdoor temperature drops below 40 degrees F. (The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight.) When temperatures higher than 50 degrees F occur during more than half of any 24-hour duration, the period shall not be regarded as cold weather.
- B. When freezing temperatures may occur during periods not defined as cold weather, concrete surfaces shall be protected against freezing for at least the first 24 hours after placing.

- C. Concrete shall not be placed on frozen subgrade. Insulate or heat subgrade to ensure temperature above 32 degrees F when concrete is placed.
- D. All embedments having a cross sectional area of 1.0 square inch or greater, and including #9 reinforcing bars, shall be at a temperature not less than 10 degrees F at time of concrete placement.
- E. Thermal protection must be provided immediately after concrete placement. Procedures for covering, insulating, housing, and/or heating concrete shall be prearranged and provided. Except when supplemental heat is provided, the R-value of the insulation shall be per the recommendations of chapter 9 of ACI 306R.
- F. Accelerating admixtures shall be approved at the Engineer's discretion; however those containing calcium chloride shall not be permitted.
- G. When combustion heaters are used, flue gases shall be vented to the exterior of enclosures.
- H. Concrete shall be placed and maintained at the following minimum concrete placement temperatures (measured at concrete surface):
 - 1. Sections of less than 12 inch minimum dimension: 55 degrees F.
 - 2. Sections of 12 to 36 inch minimum dimension: 50 degrees F.
 - 3. Sections of 36 to 72 inch minimum dimension: 45 degrees F.
- I. The concrete placement temperature shall not be higher than the minimum concrete placement temperature by more than 20 degrees F.
- J. The minimum concrete temperature as mixed shall be: 5 degrees F higher than the minimum concrete placement temperature when the air temperature is above 30 degrees F; 10 degrees F higher when the air temperature is between 0 and 30 degrees F; and 15 degrees F higher when the air temperature is less than 0 degrees F.
- K. The temperature shall be monitored at the surface of the concrete, including at corners and edges, which are more vulnerable to freezing. The concrete surface temperature and the corresponding outside air temperature shall be recorded a minimum of twice per each 24 hour period.
- L. Concrete shall be maintained at the minimum specified temperatures for a protection period of 6 days. When an approved accelerating admixture is used the protection period may be reduced to 4 days.
- M. Slabs shall not be exposed to freezing temperatures when exposed to rain, snow or other water sources, prior to reaching a compressive strength of 3,500 psi.

- N. Concrete shall be cooled gradually at the end of the protection period. The maximum allowable temperature drop at the concrete surface during the first 24 hours after the protection period shall be: 50 degrees F for concrete sections of less than 12 inch minimum dimension; 40 degrees F for concrete sections of 12 to 36 inch minimum dimension; and 30 degrees F for concrete sections of 36 to 72 inch minimum dimension.

1.06 HOT WEATHER REQUIREMENTS

- A. The temperature of the concrete when placed shall not exceed 90 degrees F. When the air temperature is 90 degrees F and above, procedures to cool mix ingredients may be warranted. These include: providing shaded storage for aggregate, frequent sprinkling or fog spraying of coarse aggregate, and using chilled batch water and/or ice. Forms and reinforcement shall be sprinkled with cold water just prior to concrete placement. When possible, placement of slabs should be scheduled after walls and roof structure are in place in order to minimize problems associated with direct sunlight and/or drying winds. Newly placed concrete shall be protected from the direct sunlight.
- B. Records shall be maintained of: time and location of concrete placement, air temperature, weather conditions (i.e. calm, windy, clear, and/or cloudy), relative humidity, and concrete temperature as delivered and after placement.
- C. When the air temperature is 90 degrees F and above: the time between the addition of water to cement or cement to aggregate (whichever occurs first) and the time of concrete placement shall not exceed 60 minutes, except upon approval of the Engineer when all tests for air content, slump, and temperature are acceptable.

1.07 EVALUATION & TESTING OF CONCRETE

- A. Concrete strength shall be evaluated in accordance with ACI 301 Section 1.6.6, "Evaluation of Concrete Strength Tests", and Section 1.6.7, "Acceptance of Concrete Strength". The Engineer may order concrete that fails to meet the acceptance criteria removed and replaced at no additional cost to Owner/Engineer.
- B. During the progress of the Work, an independent, accredited and certified testing laboratory shall conduct concrete testing as specified herein. All such testing shall be paid for by the Contractor. Concrete samples shall be taken in accordance with ASTM C172 for slump, entrained air, unit weight, and strength tests.
- C. Pumped concrete shall be sampled and tested for slump and air content at the point of placement, as opposed to at the point of delivery. Upon the Engineer's approval: once the slump loss and the loss of entrained air due to pumping is established, correlated acceptance limits at the point of delivery, where sampling and testing may then be performed, shall be made applicable. When the pump line configuration is changed significantly, sampling and testing shall again be performed at the point of placement until new acceptance limits at the point of delivery may be determined.

- D. Concrete cylinders shall be prepared in accordance with ASTM C31/C31M and be 6 inches diameter by 12 inches tall. One set of 6 cylinders shall be prepared for each 100 cubic yards, or fraction thereof, of each different mix placed in each single day. Cylinders shall be transported to the testing lab within 48 hours of forming, but not sooner than 8 hours after final set. See Section 03 31 00, CAST-IN-PLACE CONCRETE for initial storage and curing requirements of cylinders. Cylinders shall be tested for compressive strength in accordance with ASTM C39/C39M. One cylinder shall be tested at 7 days, one at 14 days, two at 28 days, one at 56 days, and one shall be retained. Concrete cylinders 4 inches in diameter by 8 inches tall may be prepared provided that 28 day strength test are the average of three cylinders. Test results shall be submitted directly to both the Engineer and the Engineer's on-site representative for review.
- E. Concrete slump shall be measured in accordance with ASTM C143/C143M.
- F. Tests for air content shall be performed in accordance with ASTM C173/C173M or ASTM C231/C231M, every time a set of concrete cylinders is prepared. Tests for air shall be performed after any and all slump adjustments are made.
- G. Temperature shall be measured in accordance with ASTM C1064/C1064M.
- H. Construction will be considered potentially deficient if concrete fails to meet any requirements that affect the strength and durability of the structure, including but not necessarily limited to:
1. Low strength concrete per ACI 301, Section 1.6.6, "Evaluation of Concrete Strength Tests", and Section 1.6.7, "Acceptance of Concrete Strength".
 2. Water-to-cementitious materials ratio higher than that of the specified mix.
 3. Reinforcing steel size, quantity, strength, position or arrangement that does not meet the requirements of the Contract Documents.
 4. Reinforced concrete that differs from the dimensions or locations shown on the Contract Drawings.
 5. Curing that does not meet the requirements of the Contract Documents, including premature formwork removal.
 6. Hot or cold weather concreting that doesn't meet the requirements of the Contract Documents.
 7. Mechanical damage from accidents or fire.
 8. Poor construction practices.

1.08 FIELD CURED CYLINDERS

- A. Field-cured cylinders are required as noted on the Drawings to verify the concrete compressive strength prior to performing water tightness testing. The Contractor may also elect to use them per 03 11 13, STRUCTURAL CONCRETE FORMWORK, to verify that the compressive strength required for removal of supporting forms and shores has been achieved.
- B. Field-cured cylinders shall be in addition to the laboratory cured cylinders required above. They shall be 6 inches diameter by 12 inches tall, and shall be prepared and cured in the field in accordance with ASTM C31/C31M under conditions that are not more favorable than the most unfavorable conditions for the portions of the concrete that the cylinders represent.
- C. When required prior to water tightness testing, one set of 4 field-cured cylinders shall be prepared for each 100 cubic yards, or fraction thereof, of concrete placed in each single day. The compressive strength shall be the average strength of two cylinder breaks per ASTM C39/C39M. If the first such test result is below the specified compressive strength, the two remaining cylinders shall be held and tested at a later date. If the second test result is below the specified compressive strength, all additional testing of the in-place concrete that is required to verify its strength shall be at no additional cost to the Owner.

1.09 WATER TIGHTNESS TESTING

- A. The Contractor shall perform all field tests and provide all labor, equipment, water and incidentals required for field leakage tests. Testing shall conform to ACI 350.1-01 Chapter 2, HST-VIO. The Engineer shall witness all field tests and conduct all field inspections. The Contractor shall give the Engineer ample notice (at least one (1) week) of dates and times scheduled for tests. All precast concrete structures shall also be hydrostatically tested. Refer to Specification 03 41 26 "PRECAST CONCRETE STRUCTURES" for additional details and requirements.
- B. The HST-VIO Test shall include but is not limited to the following sequence. The testing requirements may be modified as approved by the Engineer in writing to accommodate varying field conditions.
 - 1. Plug pipes into and out of structure and secure plugs.
 - 2. Structure penetrations, seals and outlets shall be monitored before and during the testing to determine water tightness.
 - 3. Groundwater level shall be brought to a level below the top of the base slab.
 - 4. Filling of tank or structure shall not exceed rate of 4 ft/h, and continue until water surface is 4 inches below the top of the structure or any designed overflow point.

5. The water shall be kept at the test level of unlined concrete tanks for at least three days prior to the actual test.
6. Exterior surfaces of the tank shall be inspected during the period of filling the tank. Any defects causing leaks shall be marked and repaired.
7. No flow or seepage of water that can be smudged by hand shall be present on the exterior surface of any concrete structure. All such areas which indicate leakage shall be repaired at no additional cost to the Owner. Each respective concrete or precast concrete structure shall then be hydrostatically retested. Prior to commencing repairs, the Contractor shall submit the proposed products and methods for repair to the Engineer for review.

1.10 SAMPLE PANELS

- A. The first completed wall sections of smooth-form and grout-cleaned finishes, approved by the Engineer, each at least 200 square feet, shall be designated the "sample panel" for the corresponding finish. It shall be constructed using the same materials and procedures as the walls it is to represent.
- B. For the finishes listed, construct a sample panel in a location on the Project site designated by the Engineer. Each panel shall include all necessary footings and bracing, and be constructed with the same methods and materials to be used in the Work. Construction joints shall be included.
- C. Work intended to serve as a sample panel shall be approved by the Engineer before the Contractor may proceed with construction of work with the same specified finish. All Work shall closely match the approved sample panels. If the Engineer does not accept the work intended to serve as the sample panel, it shall be demolished and reconstructed, or repaired, as directed by the Engineer.

PART 2 – PRODUCTS

2.01 PRE-FORMED JOINT FILLER

- A. Preformed joint filler shall be asphalt impregnated fiber expansion filler with a thickness as shown on the Drawings, and shall conform to ASTM D1751. Asphalt impregnated fiber expansion filler shall be product of the following manufacturer:
 1. A.C. Horn, Inc. - Horn-Board
 2. W.R. Meadows, Inc. - Fibre Expansion Joint
 3. Engineer Approved Equal
- B. Preformed joint filler shall be closed cell polyethylene foam isolation joint material of the size indicated.

- C. Preformed joint filler for expansion joints in liquid-retaining structures, and elsewhere where shown on the Drawings, shall be self-expanding cork conforming to ASTM D1752, Type III, and thickness as shown on the Drawings. Joint filler for liquid-retaining structures shall be a product of the following manufacturer:

1. A.C. Horn, Inc. - Code 4324
2. W.R. Meadows, Inc.,
3. Engineer Approved Equal

2.02 SELF-LEVELING JOINT FILLER

- A. Joint filler shall be 100% solids, fast-setting, semi-rigid, two component, self-leveling polyurea, having a minimum Shore A hardness of 80 per ASTM D2240. Joint filler shall be product of the following manufacturer:

1. Euco Qwikjoint 200 by The Euclid Chemical Company
2. Joint Tite 750 by L&M Construction Chemicals, Inc.
3. Engineer Approved Equal

2.03 MEMBRANE CURING COMPOUND

- A. Use of membrane curing compound shall be permitted except where prohibited in Part 3 of this Section. It shall conform to ASTM C309, Type 1, and ASTM C1315, Type 1 with minimum 25 percent solids. Curing compound shall be a product of the following manufacturers:

1. Kure 1315, by Sonneborn;
2. Vocomp-25, by W.R. Meadows;
3. Dress & Seal WB 25, by L&M Construction Chemicals, Inc.
4. Engineer Approved Equal

- B. A curing compound that is proposed for use in areas that will be in contact with potable water must be listed in the most recent version of the National Sanitation Foundation (NSF) product listing, of a type that will not contaminate potable water.

2.04 CURING PAPER

- A. Curing paper shall conform to ASTM C171, for regular or white waterproof paper.

2.05 EPOXY BONDING COMPOUND

- A. Epoxy bonding compound shall conform to ASTM C881/C881M, contain 100 percent solids, and be moisture tolerant.

1. Uniweld, by Permagine Industries, Inc.
2. Sikadur 32 Hi-Mod or Sikadur 32 Hi-Mod LPL, by Sika Corporation
3. Sure-Bond (J-58, or J-58 LPL), by Dayton Superior

4. Engineer Approved Equal

2.06 VAPOR RETARDER

- A. Vapor barrier shall meet ASTM E1745 Class "A" requirements, and be 10 mil minimum thickness with water vapor permeance not greater than 0.04 perms per ASTM E96/E96M. Vapor retarder shall be a product of the following manufacturers:
 1. Moistop Ultra 10 by Fortifiber Building Products Systems
 2. Griffolyn T-65 G by Reef Industries
 3. Stego Wrap 10-mil, Perminator 10-mil by W.R. Meadows
 4. VB-250 by Barrier-Bac, Inc.
 5. Engineer Approved Equal

2.07 BOND BREAKER

- A. Bond breaker shall be 15-pound asphalt saturated roofing felt, or approved liquid applied bond prohibitive.

2.08 FLOOR HARDENER

- A. Floor hardener shall be a product of the following manufacturers:
 1. Tammolith as manufactured by Tamms, Inc
 2. Lapidolith by Sonneborn
 3. Fluohard by L&M Construction Chemicals, Inc.
 4. Engineer Approved Equal

2.09 EVAPORATION RETARDENT

- A. Evaporation retardant shall be a product of the following manufacturer:
 1. E-CON as manufactured by L&M Construction Chemicals, Inc.
 2. SikaFilm by Sika Corporation
 3. Confilm by Master Builders
 4. Engineer Approved Equal

2.10 DRAINAGE BOARD

- A. Drainage board shall be rigid extruded polystyrene board insulation conforming to ASTM C578, thickness as shown on the Drawings, with a minimum compressive strength of 1750 psf.
- B. Integral filter fabric shall prevent concrete from filling the drainage grooves in the insulation.
- C. Adhesive for securing drainage board shall compatible with the insulation.

D. Drainage board shall be a product of the following manufacturer:

1. Styrofoam Thermadry as manufactured by Dow Chemical Co.
2. Insul-Drain by UC Industries
3. Engineer Approved Equal

2.11 WATER REPELLENT

A. Water repellent shall be a product of the following manufacturer:

1. Baracade WB 244 as manufactured by Tamms Industries
2. Aquapel as manufactured by L&M Construction Chemicals, Inc.
3. Engineer Approved Equal

PART 3 – EXECUTION

3.01 VAPOR BARRIER INSTALLATION

A. Vapor barrier shall be installed with the long dimension parallel to the direction of concrete placement. Seams shall be lapped a minimum of 6 inches and continuously taped, and all penetrations shall be sealed using wrap, tape, boots, and/or mastic of the same manufacturer. Vapor barrier shall be as clean and dry as possible while sealing seams and penetrations. Any and all punctures and/or other damage shall be repaired prior concrete placement. Concrete shall be placed as soon as practicable after preparation of vapor barrier is complete.

3.02 CONCRETE PLACEMENT AND JOINTING

- A. Tolerances shall conform to all requirements of ACI 117 except as otherwise modified by the Contract Documents.
- B. Concrete shall be handled from the truck to the place of final deposit as rapidly as practicable by methods preventing segregation and/or loss of ingredients.
- C. The time between the addition of water to cement, or cement to aggregates (whichever occurs first), and the placement of concrete shall not exceed 90 minutes. When air temperature is 90 degrees F and above, this time shall be reduced to 60 minutes. These times may be exceeded only upon approval of the Engineer, and only if all tests for air content, slump, and temperature are also acceptable.
- D. Water shall be removed from all forms and excavations and the Work shall be kept dry during placement. No water shall be thrown on, allowed to flow over, or rise upon the concrete until it is thoroughly set.
- E. Prior to placement of slabs on ground, the subgrade shall be moist with no free water and no muddy or soft spots.

- F. The concrete shall be directly deposited as close as possible to its final location, and shall be deposited in such manner so as to maintain a homogeneous, plastic, approximately horizontal surface.
- G. Where concrete may contact soil while being placed, free fall shall be limited to a maximum of 3 feet. Accumulation of concrete on the forms and/or on reinforcement above the level of placement shall be avoided. Concrete that has been contaminated by soil and/or other foreign matter shall be rejected.
- H. Re-tempering of concrete and concrete placement against partially hardened concrete shall not be permitted. A concrete placement, once started, shall be carried out as a continuous operation until the placement of the entire section between construction joints is complete.

3.03 RUNWAYS

- A. Runways shall be provided for wheeled concrete handling equipment which shall not be wheeled over reinforcement. Runways shall not be supported upon reinforcement that is part of the Work.

3.04 CHUTING

- A. Minimum slope shall be 3 horizontal to 1 vertical and maximum slope shall be 2 horizontal to 1 vertical. Between these limits, the slope shall be that which will prevent segregation and ensure continuous flow.
- B. A baffle shall be provided at the end of the chute to prevent segregation. If the end of the chute is more than 3 feet above the surface of deposit, a spout shall be used. The spout shall be kept full of concrete with the end kept as near as practical to the surface of deposit.
- C. The chute shall be steel or steel lined, and sections shall have the same slope throughout. Aluminum chutes are not permitted.
- D. The chute shall be thoroughly flushed with water before and after each use, the water discharged outside the forms.

3.05 PUMPING

- A. The inside diameter of pipes and hoses used to convey the concrete shall be a minimum of three times the maximum size aggregate of the mix. In order to minimize altering the concrete properties, long vertical sections at the end of the pump line shall be avoided. A horizontal hose run, a hose loop, or a slide gate at the end of the hose may be used to reduce loss of entrained air.

3.06 COMPACTION

- A. Provide at least one standby vibrator, and at least one for each three in use.
- B. Concrete shall be placed in layers not exceeding 12 inches in depth. Each layer shall be compacted by mechanical internal vibrating equipment supplemented by hand spading, rodding, and tamping as required.
- C. Vibrators shall be relocated frequently, and over-vibration such that segregation occurs shall be prevented. Vibrators shall not be used to move concrete within the forms. Concrete shall be thoroughly consolidated around reinforcement, embedments, and into the corners of the forms.
- D. Ensure that vibrator is kept several inches clear of waterstops.
- E. Where internal vibration is impractical, the use of form vibrators will be considered, and will be allowed only with the Engineer's written approval. When allowed, the vibrator shall be placed so that motion is horizontal.

3.07 CONSTRUCTION JOINTS

- A. Construction joints shall be located as shown on the Drawings, or where they are not shown, locations shall be approved by the Engineer. Where a construction joint occurs in a joint that must be watertight, waterstops as specified in SECTION 03 11 13, STRUCTURAL CONCRETE FORMWORK shall be used.
- B. Immediately after initial set, laitance on the top surface of construction joints shall be removed, and the surface raked. After the concrete has set to a degree that precludes laitance removal by shovels or scrapers, the remove it by power chipping tools, or other methods.
- C. Before concrete is placed against set concrete, the surface shall be thoroughly cleaned with wire brushes, air blasted, wetted and standing water removed. Where noted on the Drawings, and as approved by the Engineer where an unplanned interruption within a concrete placement has occurred, epoxy bonding compound shall be used in accordance with the manufacturer's instructions.
- D. Reinforcement shall be continuous at construction joints unless otherwise shown on the Drawings. Continuous keyways and waterstops shall be provided where called for in the Contract Documents. All necessary precautions to ensure that the waterstop is properly located and aligned and remains so during concrete placement shall be taken. In the event that the waterstop is improperly located, allowing a tolerance of plus or minus 1/2 inch, the Engineer may order the waterstop extended, or replaced, or such other action as deemed necessary, and at no additional cost to the Owner/Engineer.

3.08 CONCRETE FILLS

- A. New unformed concrete surfaces upon which concrete is placed shall receive a rough (broom, scratched, rough screed, or rough wood float) finish. However, where concrete fills are to be screeded into place by process equipment (e.g. clarifiers), the concrete surface shall receive a scratched finish.

3.09 EXISTING CONCRETE

- A. Where concrete is placed against existing concrete, the following surface preparation shall be required:
 - 1. The existing concrete surface shall be cleaned of all contamination and debris, and roughened by chipping, abrasive blasting, or scarifying.
 - 2. The existing concrete surface shall be water-saturated for a minimum of six hours, after which the excess water shall be removed immediately prior to placement of new concrete.
 - 3. Apply epoxy-bonding compound to prepared concrete surface prior to concrete placement.

3.10 SAWED JOINTS

- A. Joint sawing shall be performed as soon as the concrete has hardened sufficiently to prevent dislodgment of aggregates and edge raveling. Sawing shall be completed within 12 hours of concrete placement except when saws specifically designed for early-entry saw-cutting are used it shall be completed within 4 hours of concrete placement.
- B. Joints shall extend into the slab $\frac{1}{4}$ the slab thickness. However, where saws designed especially for early-entry saw-cutting are used, the depth of the saw cut shall be 1" for slabs up to 8 inches thick, and $\frac{1}{6}$ the slab depth for thicker slabs.
- C. Concrete-sawing machines shall be adequate in number and power, and with sufficient replacement blades to complete the sawing at the required rate. Joints shall be cut to true alignment and shall be cut in sequence of concrete placement. Sludge and cutting debris shall be removed and disposed.

3.11 SELF-LEVELING JOINT FILLER

- A. Sawed joints in slabs shall be provided with self-leveling joint filler, unless otherwise specified or indicated on the Drawings.
- B. Joints shall be clean, dry, and free of oil and other foreign material that could adversely affect the bond between sealant and concrete. Joint preparation and filler installation shall be in accordance with the manufacturer's instructions. Filler shall be installed the

full joint depth. The top of joint shall be overfilled, followed by trimming of excess such that joint filler is flush with concrete slab.

3.12 TEMPERATURE & PROTECTION

- A. When the ambient temperature falls below 40 degrees F or rises above 95 degrees F, a record shall be kept of concrete temperatures and of protection given to concrete during placement and curing.
- B. Except as defined for mass concrete in this section, the temperature of in-place concrete shall be the surface temperature of the concrete. The surface temperature may be determined by placing temperature sensors in contact with concrete surfaces or between concrete surfaces and covers used for curing, such as insulation blankets or plastic sheeting.

3.13 CURING

- A. ACI 308.1 is hereby made a part of this Section, except as otherwise modified within the Contract Documents.
- B. Curing shall be accomplished by the use of curing paper, curing compounds (except as noted below), wet methods (ponding, fog spray, damp sand or burlap, sprinkling, soaker hoses) or other methods. However, ponding, sprinkling, and use of soaker hoses will not be permitted on slabs that are underlain by a vapor retarder. Curing shall commence as soon as possible after final finishing when it will not mar, erode, or stain the concrete surface. Water used for curing shall be no more than 20 degrees F cooler than the concrete surface temperature. Provide all labor, equipment, water, chemicals and appurtenances for maintaining new concrete in a continuously moist condition for a minimum of 7 days.
- C. The use of a curing compound on surfaces to receive applied toppings, chemical hardeners, water repellents, coatings, or a rubbed or bonded finish will not be allowed. Where used, curing compound shall be applied immediately following the disappearance of the surface water sheen after the final finishing pass for slabs, and immediately upon removal of forms for formed concrete. It shall applied uniformly by spray, leaving no pinholes or gaps, at a coverage rate of 250-350 square feet per gallon for the first coat. A second coat of 300-400 square feet per gallon shall be applied after the first coat has dried. The above application rates are based on A.C. Horn; other manufacturer's recommendations may vary.
- D. Curing paper shall also be used to protect newly poured concrete floors from damage.
- E. During cold weather as previously defined, except when a heated protective enclosure is provided, the application of water shall not be required.

3.14 CURING - SLABS

- A. Concrete slabs to receive a coating or bonded finish, that aren't wet cured, shall be covered with curing paper as specified, laid with side joints lapped 4 inches and end joints lapped 6 inches. Paper shall be applied no earlier than 24 hours and no later than 30 hours after finishing the slab and shall be left in place at least seven days. (Wet methods shall be used for the first 24-30 hours.) Joints shall be taped and paper shall be weighted to prevent displacement. Tears during the first 7 days after a slab is completed shall be immediately repaired. Only light traffic will be permitted until 7 days after concrete placement. Slabs shall be protected from damage for the Contract duration, with any and all damage repaired by the Contractor at no additional cost to the Owner/Engineer.
- B. Where heavy tools and/or equipment may be used, provide additional protection as required.

3.15 CURING - WALLS & COLUMNS

- A. Use soaker hoses at tops of walls and columns before forms are removed.

3.16 DEFECTIVE CONCRETE

- A. The Engineer may direct the Contractor to remove and replace, at no additional cost to the Owner/Engineer, concrete Work that is not formed as shown and/or specified in the Contract Documents, or that contains a defective surface.
- B. Upon the Engineer's approval, minor imperfections may be patched as specified herein.

3.17 REPAIR OF SURFACE DEFECTS

- A. Immediately after form removal, all form ties shall be cut off, all fins and irregularities removed, and all defective areas, holes, honeycombs, cavities and irregularities cleaned and patched in accordance with SECTION 03 72 00, CONCRETE REPAIR. (Bugholes larger than 3/4 inch in any dimension shall be considered a defect.) Exposed patchwork shall be rubbed where and as specified herein or otherwise treated to match adjacent surfaces.

3.18 PATCHING

- A. Defective areas where patching is permitted shall be cleaned of all dust, dirt, grease, laitance, and loose or spalling concrete.
- B. Patching mortar shall be as specified in SECTION 03 72 00, CONCRETE REPAIR. Patching shall be finished to match adjoining concrete, and cured and protected as specified for concrete.

- C. Tie holes shall be filled solid with mortar in the same manner as specified under patching above.

3.19 FINISH OF FORMED SURFACES

- A. All concrete surfaces that are to receive the application of Type II waterproofing membrane or a protective lining shall receive an initial abrasive blast to fully expose bug holes prior to finishing.
- B. All interior and exterior concrete surfaces that: are exposed, or are to receive the application of a waterproofing membrane or protective lining, or that contact wastewater or septage, shall receive a grout cleaned (sack rubbed) finish and shall have a smooth and even surface, free of bug holes, when completed.
- C. "Exposed" surfaces shall be defined as those exposed to view upon completion of the Work, whether or not a painted finish is specified. Surfaces which will be covered by fill, such as exterior faces of walls, shall not be considered exposed. Interior surfaces of tanks and channels to receive a cover (including grating), or that are more than one foot below the design water level, shall not be considered exposed.

3.20 GROUT CLEANED FINISH

- A. While the concrete is still damp, a thin coat of medium consistency neat cement slurry shall be applied to the concrete surface by means of bristle brushes to provide a bonding coat. Before the slurry has dried or changed color, relatively dry grout comprising one part cement to 1-1/2 parts sand shall be applied. Cement shall be that used in the concrete mix, adjusted with white cement to match color at exposed concrete. Grout shall be applied with slightly damp pads of coarse burlap approximately 6 inches square used as a float, and shall be well scrubbed into the surface to provide a dense mortar.
- B. The mortar shall be allowed to partially harden for 1 to 2 hours depending upon weather conditions. Work in direct hot sunlight shall be avoided. In hot dry conditions the concrete shall be kept damp during this period with a fine fog spray. Grout shall not be allowed to remain on the surface too long as it will become very difficult to remove. Grout shall not be left on the concrete overnight.
- C. After the grout has hardened sufficiently, all that can be removed with a trowel shall be.
- D. The surface shall then be allowed to dry thoroughly, and be rubbed vigorously with clean, dry burlap to completely remove any dried grout. There should be no visible film of grout remaining after rubbing.
- E. The entire rubbing operation shall be completed in a single working day. Sufficient time shall be allowed for this.

- F. On the following day the concrete shall again be wiped clean with dry burlap to remove dust. The use of burlap containing old hardened mortar may be used since it will act as a mild abrasive. After this treatment no build-up film should remain on the surface, but if it does, a fine abrasive stone shall be used to remove it without breaking through the surface film of the parent concrete. Do not work up lather.
- G. After application of the surface grout, the surface shall be thoroughly washed down with stiff brushes and the concrete maintained in a continuously damp condition for at least three days above 50 degrees F by the periodic application of a fine fog spray, the use of damp fabric covered with polyethylene or other methods.

3.21 FINISH OF UNFORMED SURFACES

- A. Tops of exposed walls and similar unformed surfaces shall be struck off smooth and hand steel troweled to produce a smooth hard level surface. Line and elevation shall be pre-established by means of preset wood screeds which shall be removed during the troweling operation.
- B. After troweling is completed and after the curing period, the surface shall be dry honed to a smooth non-directional surface texture satisfactory to the Engineer.

3.22 FINISH OF SLABS

- A. Slabs shall be true to the gradient and elevation shown on the Contract Drawings. Flat Slabs shall be level with a tolerance of 1/8 inch in 10 feet. Sloped slabs shall be true to the gradient shown, within a tolerance of 1/8 inch in 10 feet. Slabs shall be pitched to drains as indicated on the Drawings.
- B. Where a dry shake application of cementitious waterproofing is applied, it shall be incorporated into the finishing operation.
- C. The evaporation retardant specified may be used in accordance with manufacturer recommendations to control plastic shrinkage cracking and as an aid in slab finishing operations. Conditions that may warrant its use include: high temperature, low humidity, high winds, and direct sunlight.
- D. Loss of bleed water and surface drying shall be allowed to proceed naturally. Means to accelerate drying such as applying dry cement, sand, or other materials shall be prohibited.

3.23 FLOATED FINISHING

- A. Slabs to receive a seamless floor finish or roofing, and all tank bottom slabs, shall receive a floated finish. Floating shall also precede troweling, where a troweled finish is required as specified below. After consolidating, screeding and leveling, the slab shall not be worked further until it is ready for floating.

- B. Floating shall begin when the water sheen has disappeared, and when the slab has stiffened sufficiently to allow proper operation of a power-driven float. Hand floating with wood, aluminum or magnesium floats shall be used at locations inaccessible to the power-driven float.
- C. Surface trueness shall be verified at this stage with a 10 foot straightedge applied in multiple angles. High spots shall be cut down and low spots filled so that the finished surface is true. The slab shall then be immediately refloated to a uniform, smooth, granular texture.

3.24 TROWELED FINISHING

- A. All interior slabs left exposed (except as otherwise specified elsewhere) and slabs to receive carpeting, resilient tile, and ceramic tile, shall receive a troweled finish.
- B. The surface shall be finished with power floats as specified above for floated finish, followed by power trowels, and finally hand trowels. The first power troweling shall produce a smooth surface relatively free of defects but which may contain trowel marks. Subsequent trowelings shall be by hand after the surface has sufficiently hardened. The surface shall be thoroughly consolidated by the hand troweling, and final troweling shall be done when a ringing sound is produced as the trowel is moved over the surface. The finished surface shall be free of trowel marks and uniform in texture and appearance.

3.25 BROOM FINISH

- A. A broom finish shall be provided for all exterior slabs, sidewalks, platforms, ramps, exterior stairs and as specified herein or shown on the Drawings. After floating, and between initial and final set, the surface shall be given a coarse transverse scored texture by drawing a broom across the surface.

3.26 SCRATCHED FINISH

- A. After consolidating, screeding and leveling, the surface shall be roughened with stiff brushes or raked before final set. At sloped surfaces scratches shall be made parallel to the direction of slope, to facilitate subsequent cleaning.

3.27 WIDE FLOAT FINISH

- A. A wood float finish, a broom finish with open pores, or a finish as otherwise required by the waterproofing manufacturer shall be provided for concrete slabs that will receive a wet slurry application of cementitious waterproofing.

3.28 FLOOR HARDENER

- A. Floor hardener shall be applied where specified for exposed interior concrete slabs. It shall be applied at a coverage rate recommended by the manufacturer for heavy-duty

traffic. It shall be applied per the manufacturer's Specifications after curing. Slabs to receive hardener shall be wet cured or cured using curing paper.

3.29 WATER REPELLENT

- A. Water repellent shall be applied to exterior slabs, sidewalks, platforms, ramps, exterior stairs and as specified herein or shown on the Drawings and in accordance with the manufacturer's recommendations. Surfaces to receive repellent shall be wet cured, or cured using curing paper.

3.30 CONCRETE FILLED STAIR TREAD

- A. Concrete filled pan treads, channel treads and intermediate landings shall be troweled to a smooth, dense finish with 1/4 psf Alundum, Aluminum Oxide, or carbide grit troweled in.

3.31 CONCRETE CLEANING

- A. Cleaning during progress of the Work shall not be permitted. Cleaning shall not commence until the structure is entirely completed.
- B. Rust and other stains and discolorations shall be removed with a non-etching cleaning agent used in accordance with the manufacturer's instructions. Cleaning of all surfaces to receive a painted finish is also required.
- C. Rust stains may be removed by applying a bleaching agent such as oxalic acid. Acid etching, sandblasting, or cleaning by other methods may be used as approved by the Engineer.

3.32 MASS CONCRETE

- A. Each monolithic concrete placement with a configuration such that a 3 foot diameter hypothetical sphere could fit wholly within its volume shall be considered mass concrete.
- B. The maximum concrete temperature at point of placement shall not be greater than 70 degrees F.
- C. The maximum temperature within the interior of the concrete shall not be greater than 160 degrees F.
- D. The concrete temperature shall be monitored. The difference between the maximum temperature at the interior (measured at the geometric center), and the temperature at the exterior surface (measured at 2 to 3 inches below the surface) shall not exceed 36 degrees F.

- E. Provide all necessary means to maintain the concrete within the permitted temperature restrictions including:
1. Using insulation.
 2. Use of Type II cement as opposed to Type I/II.
 3. Use of fly ash and/or ground granulated blast furnace slag.
 4. Cooling the concrete prior to placement using methods similar to those used for hot weather concreting.
 5. Use of construction joints to reduce size of concrete placements.

END OF SECTION

SECTION 03 41 26

PRECAST CONCRETE STRUCTURES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, tools, equipment, and labor necessary to manufacture install and test; precast concrete, precast concrete structures and precast concrete box structures complete with steps, frames, covers, hatches, and stainless steel anti-buoyancy hardware as specified herein and as shown on the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
 - 1. AASHTO HB-17 (2002; Errata 2003; Errata 2005, 17th Edition) Standard Specifications for Highway Bridges
 - 2. AASHTO T 111(2010) Standard Method of Test for Mineral Matter or Ash in Asphalt Materials
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A185/A185M (2007) Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - 2. ASTM A48/A48M (2003; R 2008) Standard Specification for Gray Iron Castings
 - 3. ASTM A615/A615M (2009b) Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 - 4. ASTM C 33/C 33M (2008) Standard Specification for Concrete Aggregates
 - 5. ASTM C144 (2011) Standard Specification for Aggregate for Masonry Mortar
 - 6. ASTM C150/C150M (2011) Standard Specification for Portland Cement
 - 7. ASTM C207 (2006; R 2011) Standard Specification for Hydrated Lime for Masonry Purposes

8. ASTM C260/C260M (2010a) Standard Specification for Air-Entraining Admixtures for Concrete
 9. ASTM C32 (2011) Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
 10. ASTM C33/C33M (2011) Standard Specification for Concrete Aggregates
 11. ASTM C478 (2009) Standard Specification for Precast Reinforced Concrete Manhole Sections
 12. ASTM C494/C494M (2011) Standard Specification for Chemical Admixtures for Concrete
 13. ASTM C857 (2011) Standard Practice for Minimum Structural Design Loading for Underground Precast Concrete Utility Structures
 14. ASTM C890 (2006) Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures
 15. ASTM C990 (2009) Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants
 16. ASTM D 113 (2007) Standard Test Method for Ductility of Bituminous Materials
 17. ASTM D 1227 (1995; R 2007) Emulsified Asphalt Used as a Protective Coating for Roofing
 18. ASTM D 217 (2010) Cone Penetration of Lubricating Grease
 19. ASTM D 4 (1986; R 2010) Bitumen Content
 20. ASTM D 6 (1995; R 2006) Loss on Heating of Oil and Asphaltic Compounds
 21. ASTM D 71 (2004) Standard Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)
- D. FEDERAL SPECIFICATIONS (FED)
1. FED SS-S-210A(1981) Sealing Compound, Preformed Plastic, for Expansion Joints And Pipe Joints

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.

B. SD-02 SHOP DRAWINGS

1. Provide shop drawings of all precast concrete structures, slabs, box structures including construction details, dimensions, rebar placement, openings, etc.
2. Shop drawings shall show layouts, dimensions, major components, key alignment locations and locations of bolt holes. Drawings shall show critical field dimensions identified by the Manufacturer and obtained by Contractor. All drawings shall show locations and sizes of penetrations and related appurtenances.

C. SD-03 PRODUCT DATA

1. Provide Manufacturer's descriptive data, technical literature, and catalog cuts. Product data shall also include catalog cut sheets and dimensional data for all precast structures and accessories. Include product data on joint sealants, aluminum hatches, anchorage hardware, damp-proofing, pipe seals and related appurtenances.

D. SD-05 DESIGN DATA

1. Provide Structural and Buoyancy Design Calculations sealed by a professional engineer registered in the state of the project location. Provide a submittal of design calculations a minimum of two weeks prior to scheduled manufacture.

1.04 QUALIFICATIONS OF MANUFACTURER

- A. Materials and equipment shall be the standard products of a Manufacturer regularly engaged in the production of such products and shall essentially duplicate items that have been in satisfactory use in identical applications in other wastewater treatment applications. The Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of precast structures of "all types", and not less than five (5) years of experience in the production of equal or larger sized models or designs of the exact products as specified herein.
- B. The Manufacturer shall provide an installation list of at least ten (10) similar installations, including contact names and phone numbers. Products shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Products shall be shipped, stored and handled in a manner consistent with the written recommendations of the manufacturer and so as not to degrade quality, serviceability and/or appearance. Any component or precast structure found to be defective either before or after installation shall be removed from the project site and replaced with a sound unit at no additional cost to the Owner.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All precast structures shall have minimum interior and exterior dimensions as shown on the Drawings. Unless otherwise specified or indicated on the Drawings, provide circular, square or rectangular precast structures as shown. Proposals for the use of alternative structure shapes shall be submitted to the Engineer in writing.

2.02 PRE-CAST CONCRETE

- A. All concrete used for precast concrete structures shall conform to the following design criteria and conditions:
1. Concrete compressive strength shall be 5,000 psi (minimum) after 28 days.
 2. Unless otherwise specified or indicated on the Drawings the minimum concrete structure thickness shall be 6 inches. Provide increased thicknesses to accommodate loadings from vehicles or mechanical equipment. Provide increased thicknesses to accommodate H20 load ratings.
 3. Portland cement shall be Type II conforming to ASTM C 150 standards.
 4. Fine aggregate shall consist of natural sand conforming to ASTM C 33/C 33M standards.
 5. Coarse aggregate shall consist of well graded crushed stone conforming to ASTM C 33/C 33M.
 6. Air entrainment admixture shall conform to ASTM C 260. The air-entrained content shall be not less than 4 percent, nor greater than 7 percent.
 7. A superplasticizer shall be used and shall conform to ASTM C 494/C 494M type F or G. Concrete shall be placed at a slump of between 5 and 8 inches.

2.03 REINFORCEMENT

- A. All concrete reinforcement shall conform to the following design conditions and criteria:
1. Wire fabric shall conform to the requirements of ASTM A 185/A 185M.
 2. Reinforcing bars shall be new billet steel, deformed, conforming to the requirements of ASTM A 615/A 615M, Grade 60.
 3. Minimum clear concrete cover to reinforcement shall be 1-1/2 inches.

2.04 DESIGN LOADS

- A. Unless otherwise specified or indicated on the Drawings, the design shall meet the requirements of AASHTO HB-17, including a HS-20 vehicle load. A lateral vehicle surcharge load of 125 psf shall be applied. Unless otherwise specified or indicated on the Drawings, water and wastewater structures shall be designed for the loads prescribed in ASTM C 890. Unless otherwise specified or indicated on the Drawings, utility structures shall be designed for the loads prescribed in ASTM C 857.
- B. The equivalent lateral fluid pressure shall be 100 psf/lf below flood and/or the design groundwater elevation and 60 psf/lf above such elevation. The specified lateral vehicle surcharge load shall be added to this load.

2.05 BUYOYANCY

- A. Each structure shall be designed with a minimum factor of safety of 1.15 against buoyancy with an assumed flood elevation at the top of the structure. Frictional resistance in this calculation shall not be permitted. Where the structure is composed of successive vertical segments, the weight of the segments shall be such as to provide the same factor of safety for buoyancy, or stainless steel mechanical connections shall be used to connect the segments together. The design shall include positive anchorage to a reinforced concrete anti-buoyancy slab of the required size.
- B. If the Engineer determines, at his sole discretion, that the submitted buoyancy calculations are incorrect, the Engineer shall direct the Contractor to implement specific measures to counteract buoyancy to the Engineer's satisfaction. Any and all costs associated with such measures shall be at no additional cost to the Owner and Engineer.

2.06 JOINTS

- A. Pre-cast concrete sections shall be provided with bell and spigot or tongue-in-groove ends to ensure proper connection of the joints. Provide flat joints only where specified or indicated on the Drawings.
- B. All joints shall be sealed with a minimum of two rows of butyl rubber sealant. A compatible primer shall be applied as recommended by the manufacturer. All seals shall be applied in accordance with the manufacturer's recommendations. Joint seals shall meet the hydrostatic performance requirements set forth in ASTM C 990, Section 10.1. Sealant properties shall meet or exceed the following criteria:
 - 1. Hydrocarbon Blend Content: 50% (Minimum), per ASTM D4
 - 2. Inert Mineral Filler: 30% (Minimum) by weight, per AASHTO T 111
 - 3. Volatile Matter: 2% (Maximum) by weight, per ASTM D6
 - 4. Specific Gravity: 1.15-1.50, per ASTM D71
 - 5. Ductility: 5.0 (Minimum), per ASTM D 113
 - 6. Penetration Cone: 50-100 mm, per ASTM D 217 at 77 °F, 150 gm. 5 Sec.

7. FED SS-S-210A: No deterioration, no cracking and no swelling after 30 days immersion in 5% solutions of HCl, H₂SO₄, NaOH, KOH, and H₂S
- C. Precast structure joint sealants shall be a product of the following manufacturer:
1. Concrete Sealants, Inc. - Conseal CS-102 or CS-202 (Per Temperature)
 2. Hamilton Kent – Kent Seal No. 2
 3. Press-Seal Gasket Corporation – Pro-Stik
 4. Engineer Approved Equal

2.07 DAMPROOFING & WATER SEALING

- A. Provide a two coat bituminous damp-proofing (water sealing) system for all precast structures. All exterior coatings shall conform to ASTM D 1227 and ASTM D 1187 standards. Concrete sealants shall be designed for use both above and below grade. Exterior concrete sealants shall be a product of the following manufacturer:
1. BASF Construction Chemicals, Inc. Hydrocide 600, 700 or 700B
 2. Karnak Corporation – 100AF
 3. Engineer Approved Equal

2.08 JOINT WRAP

- A. Provide exterior joint wrap for all precast structure joints. The joint seal (wrap) shall be manufactured of a self-shrinking EPDM rubber material with a minimum thickness of 30 mils. The back side of the seal shall be coated with a cross-linked reinforced non-hardening butyl adhesive. The sealant shall be a minimum of 30 mils thick. The sealing system shall be designed to stretch entirely around each structure along the joint and then be overlapped to create a fused bond. The width of the joint wrap shall be 6 inches (minimum) and each wrap shall be overlapped by at least two times the width of the wrap.
- B. The butyl component of the tape shall consist of 50% (minimum) butyl rubber and it shall contain 2% or less volatile matter. Provide primer and/or adhesive as recommended by the manufacturer. Joint wrap shall conform to ASTM C 877 (Type III). All joint wrap shall be a product of the following manufacturer:
1. Press-Seal Gasket Corporation – EZ-Wrap
 2. Sealing Systems, Inc. – Infi-Shield Gator Wrap
 3. Engineer Approved Equal

2.09 STEPS

- A. Steps shall be constructed of aluminum or steel reinforced copolymer polypropylene conforming to ASTM C 478, cast-in-place or installed utilizing inserts approved by the Engineer. All steps shall be 12 inches on center with abrasive step surface and safety

edge, drop front design, one (1) inch diameter and 16 inches wide. Metal items embedded in concrete shall be provided with a bituminous coating.

2.10 PIPE CONNECTIONS

- A. Provide seals for all piping penetrations in precast structures as indicated on the Drawings. In cases where the pipe sealing system has not been specifically indicated, provide pre-molded elastomeric (boot type) sealed joints between the pipe and precast sections. Where specified or indicated on the Drawings provide mechanical link type seals for piping penetrations.
- B. Pre-molded elastomeric seals shall be manufactured of EPDM with 300 series stainless steel pipe clamps, bands and wedges. Each seal shall also be designed in accordance with the following criteria:
 - 1. Head Pressure: 13 psi for 10 minutes at 0⁰, per ASTM C 923
 - 2. Head Pressure: 10 psi for 10 minutes at 0⁰, per ASTM C 923
 - 3. Deflection: 70, in any direction, per ASTM C 923
 - 4. Load Test: 150 lbs/in pipe diameter, per ASTM C 923
- C. All flexible seals shall be a product of the following manufacturer:
 - 1. Trelleborg Pipe Seals, Inc. – Kor-N-Seal
 - 2. A-Lok Products, Inc.
 - 3. Press-Seal Gasket Corporation
 - 4. Engineer Approved Equal

2.11 BRICK & MORTAR

- A. Brick shall conform to ASTM C 32, and shall be new, first quality, whole, sound brick.
- B. Mortar shall be composed of one part portland cement and two parts sand with 20% hydrated lime. Portland cement shall conform to ASTM C 150. Sand shall conform to ASTM C 144. Hydrated lime shall conform to ASTM C 207.

2.12 HATCHES

- A. Provide hatches of the styles, types and sizes as shown on the Drawings. All hatches shall be from the same manufacturer. The manufacturer shall guarantee proper operation and against defects in material or workmanship for a period of five (5) years. Unless otherwise specified or indicated on the Drawings, all hatch frames and covers shall be 6063-T5 aluminum. Where specified or indicated on the Drawings provide insulated hatches with an aluminum protective covering/liner.
- B. Hatches shall have single leaf or double leaf covers as indicated on the Drawings. Hatches shall include a watertight gasket seal around the entire perimeter with self-draining type frames. Doors shall be 1/4-inch thick (minimum) aluminum diamond

- pattern plates reinforced with aluminum stiffeners as required to withstand a live load of 300 lbs/ft². Provide hatches rated for H20 loading as specified or indicated on the Drawings. The channel frame shall be 1/4-inch thick aluminum with an anchor flange around the perimeter.
- C. Each door leaf shall be equipped with a minimum of two (2) hinges, with stainless steel pins, compression spring operators enclosed in telescopic tubes to afford easy operation, and an automatic hold-open arm with release handle. Snap or slam locks with removable handle and safety chains shall be provided. A 1-1/2-inch drainage coupling shall be provided in the channel frame.
 - D. Hardware shall be stainless steel with factory mill finish. Provide a bituminous coating to the exterior of the frame as well as all surfaces in contact with concrete. Hatches that are not shown connected to a drainage system on the Drawings shall be provided with extensions to the drainage coupling to allow drainage to the area below.
 - E. Hatches shall include a flush lifting handle and heavy duty 316 stainless steel hinges. All hold open arms shall be 316 stainless steel with a red vinyl grip. Provide a staple or recessed hasp on each hatch for a padlock.
 - F. Each hatch shall include a fall protection system. Provide safety netting or safety grating as specified or indicated on the Drawings. Safety netting shall be manufactured of super strong polyester. The netting shall be attached to aluminum angle anchors on the hatch frame via 316 stainless steel hardware. The netting shall be equipped with stainless steel quick release hooks to allow for removal. The netting shall be designed to comply with OSHA standard 1926.502, drop testing. Netting shall be safety orange or yellow in color.
 - G. Where specified or indicated on the Drawings, hatch covers shall be equipped with a fall protection grating system of fiberglass or aluminum construction with 316 stainless steel hardware. Fall protection system shall have a live load capacity of 300 lb/ft² and shall be a safety color of orange or yellow. Safety grating shall have a spring loaded lifting handle and an aluminum or stainless steel hold open arm and release handle. The grating shall automatically lock in a 90 degree open position, and shall be lockable in the closed position by a padlock.
 - H. All access hatches shall be a product of the following manufacturer:
 - 1. Bilco Company
 - 2. Halliday Products, Inc.
 - 3. U.S.F. Fabrication, Inc.
 - 4. Engineer Approved Equal

PART 3 – EXECUTION

3.01 GENERAL

- A. Precast structures shall be installed as shown on the Drawings and as recommended by the pre-cast structure manufacturer. Precast sections shall be installed so that the entire structure is vertically plumb, aligned and level. If a structure is not plumb, aligned and level it shall be removed and reset. All erection holes and/or lift pin holds shall be filled solid with non-shrink grout. The Contractor shall provide and use suitable slings, hooks and cables for the proper handling of the sections.

3.02 LEAKAGE TESTING

- A. Perform all field tests and provide all labor, equipment, water and incidentals required for field leakage testing of precast structures. Testing shall conform to ACI 350.1-01 Chapter 2, HST-VIO. The Engineer shall witness all field tests and conduct all field inspections of testing. Provide the Engineer ample notice (at least one (1) week) of dates and times scheduled for tests. Manhole structures shall be complete for final test acceptance except for shelf and invert brickwork. Testing shall be performed prior to backfilling of all structures. Concrete structures shall be complete with all piping penetration seals in place prior to testing. Valves and equipment shall not be installed until testing has been completed. All precast structures shall be hydrostatically tested in accordance with the following HST-VIO Testing:
1. Plug pipes into and out of structure and secure the plugs.
 2. Structure penetrations, seals and outlets shall be monitored before and during the test to ensure water tight seals.
 3. Groundwater level shall be brought to a level below the top of the base slab
 4. When possible, filling of the structure shall not exceed rate of 4 ft/h, and continue until water surface is 4 inches below the top of the structure, any designed overflow point or a test level as directed by the Engineer. Provide a controlled filling of the structure at all times.
 5. The water shall be kept at the test level of unlined concrete tanks or structures for at least three days prior to the actual test. Top off any water which may evaporate or become absorbed into new (green) concrete.
 6. Exterior surfaces of the tank shall be inspected during the period of filling the tank as well as throughout the test period. Any defects causing leaks shall be marked and repaired.
 7. No flow or seepage of water that can be smudged by hand shall be present on the exterior surface of any concrete structure. All such areas which indicate leakage shall be repaired at no additional cost to the Owner. The structure shall then be

hydrostatically retested. Prior to commencing repairs, submit the proposed products and methods for repair to the Engineer for review.

3.03 APPLICATION OF DAMP PROOFING

- A. Application of dampproofing shall be in strict accordance with the manufacturer's recommendations. Application shall not be permitted in spaces exposed to inclement weather or when air temperatures are below 40 °F, or are expected to go below 40 °F within 24 hours after application. Damp proofing can be applied to "green" or slightly damp surfaces only if permitted by the Manufacturer.
- B. Apply damp proofing at a rate of 4 to 6 gallons per 100 square feet. If applying 2 coats, each coat shall be 2 to 3 gallons per 100 square feet. First coat shall be allowed to dry prior to the application of the second coat. Coating must be continuous and free from breaks and pinholes. The coating shall provide a water tight sealing surface.

END OF SECTION

SECTION 03 72 00

CONCRETE REPAIR

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The work of this section includes all labor, materials, tools and equipment necessary to repair new concrete areas when permitted by the Engineer, to fill form tie holes, and to repair deteriorated concrete areas as defined on the drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
1. AASHTO T 277 (2007) Standard Method of Test for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- C. ASTM INTERNATIONAL (ASTM)
1. C109/C109M (2011) Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or (50-mm) Cube Specimens)
 2. ASTM C1202 (2010) Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
 3. ASTM C78/C78M (2010) Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
 4. ASTM C496/C496M (2011) Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
 5. ASTM C882/C882M (2005e1) Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear
 6. ASTM G109 (2007) Determining the Effects of Chemical Admixtures on the Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments E(2000)

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.
- B. SD-03 PRODUCT DATA
 - 1. Trowel-grade polymer modified Portland cement repair mortar
 - 2. Non-sag polymer modified Portland cement repair mortar
 - 3. Reinforcing steel primer
- C. SD-09 MANUFACTURER'S INSTRUCTIONS
 - 1. Trowel-grade polymer modified Portland cement repair mortar
 - 2. Non-sag polymer modified Portland cement repair mortar
 - 3. Reinforcing steel primer

1.04 QUALITY ASSURANCE

- A. Provide a notarized certificate stating that the repair material meets the specified requirements and have the manufacturer's current printed literature on the specified product.
- B. The manufacturer shall provide a field representative as per Part 3 of this Specification.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver the specified product in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers.
- B. Store and condition the specified product as recommended by the manufacturer.

1.06 JOB CONDITIONS

- A. Environmental Conditions
 - 1. Do not apply material if it is raining or snowing or if they appear to be imminent.
- B. Protection
 - 1. Precautions should be taken to avoid damage to an surface near the work zone due to mixing and handling of the specified repair material.

PART 2 – PRODUCTS

2.01 GENERAL

- A. SikaTop 122 Plus (trowel grade mortar), SikaTop 123 Plus (non-sag mortar), and Sika Armatec 110 EpoCem (reinforcing steel primer), as manufactured by Sika Corporation; Certi-Vex All Patch Kit (trowel grade mortar), by VEXCON Chemicals, Inc., or approved equal are considered to conform to the requirements of this specification. Approval of other products will be considered if they meet or exceed the specified performance criteria when tested in accordance with the specified test standards.

2.02 MORTAR PERFORMANCE CRITERIA

A. Mixed Properties

1. Application Time: Approximately 15 minutes
2. Finishing Time: 20-60 minutes
3. Color: Concrete grey

B. Cured Properties

1. Compressive Strength (ASTM C109/C109M)
 - a. 1 day: 3,000 psi min.
 - b. 28 day: 7,000 psi min.
2. Splitting Tensile Strength (ASTM C496/C496M) at 28 days: 750 psi min.
3. Flexural Strength (Modulus of Rupture) (ASTM C78/C78M) at 28 days: 2,000 psi min.
4. Bond Strength (ASTM C882/C882M) at 28 days: 2,200 psi min.
5. Thermal Compatibility (ASTM C884/C884M): passes test
6. Permeability (ASTM C1202, AASGTO T277) at 28 days: approximately 500 coulombs
7. Cracked Beam Corrosion Tests (ASTM G109, modified): Reduced corrosion rates 63% versus control specimens.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION

A. General

1. Areas to be repaired shall be mechanically prepared, clean, sound and free of contaminants. All loose and deteriorated concrete shall be removed by mechanical means. Remove all dirt, oil, grease and all bond-inhibiting materials from the surface. Except where tie holes are filled, saw cut perimeter 1/8 inch minimum when a neat mortar is to be applied, and 1 inch minimum when an extended mortar is to be applied. Prepare concrete substrate to obtain a minimum surface profile of 1/16 inch in depth with a new aggregate fractured surface. Be sure the area to be repaired is not less than 1/8 inch in depth. The substrate shall be saturated surface dry with no standing water.

B. Reinforcing Steel Primer

1. Where reinforcing steel with active corrosion is encountered, the following procedures shall be used. Sandblast reinforcing steel to remove all contaminants and rust. Pressure wash. Apply primer. Determine section loss and splice new reinforcing steel where there is more than 15%-25% loss, as directed by the Engineer. If half or more of the diameter of the rebar is exposed, chip out behind the reinforcing steel 1/2 inch minimum.

C. Cracks

1. Cracks in the substrate in the area of the patching or overlay work shall be treated as directed by the Engineer.

3.02 MIXING AND APPLICATION

A. General

1. Mix and apply in strict accordance with, and adhere to all limitation and cautions within, the manufacturer's printed literature. The following describes the specific procedures applicable for the Sika products.
2. SikaTop 122 Plus (trowel-grade) or approved equal shall be used for horizontal and vertical surfaces. SikaTop 123 Plus (non-sag) or approved equal shall be used for overhead surfaces.

B. Trowel-Grade Polymer Mortar

1. Pour all of Component "A" into mixing container. Add all of the Component "B" while mixing. For extended mix, introduce 3/8 inch coarse aggregate at desired quantity. Mix to uniform consistency, maximum 3 minutes. Addition rate must not

exceed 42 pounds per bag. The aggregate must be non-reactive, clean, well-graded, saturated surface dry, and have low absorption/high density.

2. Scrub mortar into the substrate, filling all pores and voids. Force material against edge of repair, working toward center. After filling repair, consolidate, then screed. Allow mortar or concrete to set to desired stiffness, and finish with wood or sponge float for a smooth surface. The minimum application thickness is 1/8 inch for a neat mortar, and 1 inch if extended. The maximum application thickness in a single lift is 1 inch for a neat mortar, and 3 inches if extended. Multiple lifts may be required in some areas of application. Where multiple lifts are required, the top surface of the preceding lift shall be scored to produce a roughened surface. The preceding lift shall be allowed to reach final set prior to applying the next lift.

C. Non-Sag Polymer Mortar

1. Pour all of Component "A" into mixing container. Add all Component "B" while mixing. Mix to uniform consistency, maximum 3 minutes.
2. Scrub mortar into the substrate, filling all pores and voids. Force material against edge of repair, working toward center. After filling repair, consolidate, then screed. Allow mortar or concrete to set to desired stiffness, and finish with wood or sponge float for a smooth surface. The minimum application thickness is 1/8 inch. The maximum application thickness in a single lift is 1-1/2 inches. Multiple lifts may be required in some areas of application. Where multiple lifts are required, the top surface of the preceding lift shall be scored to produce a roughened surface. The preceding lift shall be allowed to reach final set, 30 minutes minimum, before applying the next lift.

D. Curing

1. Curing is required. Moist cure with wet burlap and polyethylene, a fine mist of water or a water based compatible curing compound. Curing compounds adversely affect the adhesion of following layers of mortar. Do not use solvent-based curing compounds. Moist curing should commence immediately after finishing. Protect newly applied material from direct sunlight, wind, rain and frost.

3.03 CLEANING

- A. Leave finished work and work area in a neat, clean condition without evidence of spillovers on adjacent areas.

3.04 MANUFACTURER'S SERVICES

- A. The Contractor shall furnish the services of a competent field representative of the manufacturer as required by the Engineer. The field representative shall be present at the Work site prior to commencement of application to instruct the Contractor and

Engineer, to demonstrate proper application and inspection procedures, and to inspect the finish of the prepared surfaces prior to application.

END OF SECTION

SECTION 09 90 00

PAINTS & COATINGS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

A. The following specification section includes, surface preparation and painting for the following types of painting work and as included in the schedule at the end of this Section. All or a portion of the painting work indicated may be required as part of the Contract Documents:

1. Painting of steel doors and frames.
2. Painting of interior concrete masonry units.
3. Painting of interior gypsum board walls
4. Painting of miscellaneous metal items.
5. Painting of interior and exterior structural steel.
6. Painting of ductile iron pipes, steel pipes, copper pipes, PVC/CPVC pipes, electrical conduit and fittings where indicated.
7. Painting of equipment, valves & appurtenances where indicated.
8. Touch-up painting of factory coated equipment.
9. Painting of HVAC equipment and ducts.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. The latest version of all references at the time of bid shall apply.

B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

1. ANSI A13.1 (1996; R 2002) Scheme for Identification of Piping Systems

1.03 SUBMITTALS

A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.

B. SD-03 PRODUCT DATA

1. Provide product data for each paint system specified, including but not limited to block fillers and primers.
2. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
3. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.

C. SD-04 SAMPLES

1. Provide samples for initial color selection in the form of manufacturer's color charts.
2. After color selection, the provide color chips of selections made for surfaces to be coated.
3. Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate:
4. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
5. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
6. Submit samples on the following substrates for the review of color and texture only:
 - a. Concrete Masonry: Provide two 4-by-8-inch samples of masonry, with mortar joint in the center, for each finish and color.
 - b. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

D. SD-07 CERTIFICATES

1. Provide certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

1.04 QUALITY ASSURANCE

- A. Provide an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.

- B. Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

1.05 FIELD SAMPLES

- A. On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
- B. Final acceptance of colors will be from job-applied samples.
- C. The Engineer will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.

1.06 DELIVERY, STORAGE & HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
 - 1. Product name or title of material.
 - 2. Product description (generic classification or binder type).
 - 3. Manufacturer's stock number and date of manufacture.
 - 4. Contents by volume, for pigment and vehicle constituents.
 - 5. Thinning instructions.
 - 6. Application instructions.
 - 7. Color name and number.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 °F (7 °C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.
- C. Protect all paints and coatings from freezing: Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.07 SITE CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 °F (10 °C) and 90 °F (32 °C).

- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 °F (7 °C) and 95 °F (35 °C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces.
- D. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

1.08 COLOR SELECTION

- A. Colors of finish coats shall be as indicated or specified. Where not indicated or specified, colors shall be selected by the Engineer. Manufacturers' names and color identification are used for the purpose of color identification only. Named products are acceptable for use only if they conform to specified requirements. Products of other manufacturers are acceptable if the colors approximate colors indicated and the product conforms to specified requirements.
- B. Provide color selections from the manufacturer's full range of colors.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

- A. Subject to compliance with the requirements of the Contract Documents, provide products as specified in the painting schedule. Paints and coatings shall be a product of the following manufacturer:
 - 1. Tnemec
 - 2. Sherwin Williams (S-W)
 - 3. Devoe
 - 4. Engineer Approved Equal
- B. Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.

2.02 MATERIALS

- A. Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

- B. Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

2.03 PIPE, VALVE & EQUIPMENT COLOR CODING

- A. Provide identification of pipes, valves, pumps and equipment by color as specified in the Section 40 05 13 PROCESS PIPE AND FITTINGS. Color selections for each system shall be provided by the Engineer and Owner.

PART 3 – EXECUTION

3.01 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
 - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
 - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
 - 1. Notify the Engineer about anticipated problems using the materials specified over substrates primed by Others or previously primed surfaces.

3.02 PREPARATION - GENERAL

- A. Remove hardware and hardware accessories, plates, machined surfaces, and similar items that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items replaced.
- B. Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

3.03 SURFACE PREPARATION

- A. Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.

- B. Provide barrier coats over incompatible primers or remove and re-prime. Notify Engineer in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
- C. Existing painted surfaces shall be structurally sound, dry, clean, and free of oil, grease, dirt, mildew, form release agents, curing compounds, efflorescence, loose and flaking paint, or other foreign material. The Engineer shall approve condition of prepared substrate prior to application of coating system. Old coatings should be tested for lifting per coating manufacturer's recommendations.
- D. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel 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.
 - 1. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
 - 2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
- E. Ferrous Metals: Clean non-galvanized 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 (SSPC).
- F. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

3.04 MATERIALS PREPARATION

- A. Carefully mix and prepare paint materials according to manufacturer's directions.
 - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - 2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
- B. Use only thinners approved by the paint manufacturer and only within recommended limits.

3.05 APPLICATION – GENERAL

- A. Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
- B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
- C. Provide paint colors, surface treatments, and finishes as indicated in the Contract Documents.
- D. Provide finish coats that are compatible with primers used. Provide finish coats from the same manufacturer as the prime coat.
- E. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where required to produce a smooth even surface according to the manufacturer's directions.
- F. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
- G. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
- H. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
- I. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
- J. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
- K. Finish exterior doors on tops, bottoms, and side edges same as exterior faces.
- L. Sand lightly between each succeeding enamel or varnish coat.
- M. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
- N. Prime CMU walls and apply (1) finish coat prior to installation of any wall mounted equipment, piping, conduits, or fixed objects that would limit access for application of

coating system and/or conceal portions of the wall surface. Apply second finish coat after all work of other trades is completed.

3.06 SCHEDULING OF PAINTING

- A. Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
- B. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

3.07 APPLICATION PROCEDURES

- A. Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
 - 1. Brushes: Use brushes best suited for the material applied.
 - 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 - 3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.
- B. Apply materials no thinner than the manufacturers recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

3.08 MECHANICAL & ELECTRICAL WORK

- A. Painting mechanical and electrical work is limited to items exposed in mechanical equipment rooms and in occupied spaces. Mechanical items to be painted include but are not limited the following:
 - 1. Piping
 - 2. Heat Exchangers
 - 3. Tanks
 - 4. HVAC Ductwork
 - 5. Insulation
 - 6. Supports

7. Motors and Mechanical Equipment.
 8. Accessory Items
- B. Electrical items to be painted include but are not limited to the following:
1. Electrical Conduit & Fittings

3.09 BLOCK FILLERS

- A. Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

3.10 PRIME COATINGS

- A. Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by Others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing. Apply prime coat to all previously painted surfaces if finish coats are not compatible with existing coating.

3.11 PIGMENTED (OPAQUE) FINISHES

- A. Completely cover to provide a smooth, opaque 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.

3.12 COMPLETED WORK

- A. Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

3.13 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure up to four times during the period when paint is being applied:
1. The Contractor shall engage the services of an independent testing agency with five (5) years of experience to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 2. The testing agency shall perform appropriate tests at no additional cost to the Owner for the following characteristics as required by the Owner:
 - a. Quantitative materials analysis
 - b. Abrasion resistance

- c. Apparent reflectivity
 - d. Flexibility
 - e. Washability
 - f. Absorption.
 - g. Accelerated weathering
 - h. Dry opacity
 - i. Accelerated yellowness
 - j. Recoating
 - k. Skinning
 - l. Color retention
 - m. Alkali and mildew resistance
3. If test results show material being used does not comply with specified requirements, the Contractor shall stop painting, remove noncomplying paint, repaint surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

3.14 CLEANING

- A. At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
- B. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Adjacent finished surfaces shall not be scratched or damaged.

3.15 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Engineer.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

3.16 PAINT SCHEDULE

- A. The number of coats scheduled is the minimum. Notwithstanding anything in the following schedule to the contrary, painting and finishing shall conform to the applicable laws and building codes regarding fire hazard classifications and volatile organic content of finish materials. Provide products by the manufacturers named or Engineer Approved Equal.
- B. The paint and coating systems listed below shall be provided where the Contract Documents refer to this specification section or reference any item to be painted or

coated, unless a specific paint or coating system is specified elsewhere. All the paint and coating systems listed below may not be included within the scope-of-work of the Contract Documents. The following listing is intended to cover all potential conditions that may require painting.

C. Interior Galvanized Steel: (where listed on Drawings to be field painted) for Epoxy Coating:

1. Galvanizing Repair at Field Welds

- a. Tnemec "Series 90-97 Tneme-Zinc" DFT 3-4 mils
- b. S-W "Corothane 1 Galvapac Zinc Primer" DFT 3-4 mils
- c. Devoe "Cathacoat 302H" DFT 3-4 mils

2. Field Applied Prime Coat

- a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Devran 203" DFT 2-4 mils

3. Field Applied Finish Coat

- a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Bar-Rust 235H" DFT 4-7 mils

D. Exterior Galvanized Steel: (where listed on Drawings to be field painted) for Epoxy-Polyurethane coating:

1. Galvanizing Repair at Field Welds

- a. Tnemec "Series 90-97 Tneme-zinc" DFT 3-4 mils
- b. S-W "Corothane 1 Galvapac Zinc Primer" DFT 3-4 mils
- c. Devoe "Cathacoat 302H" DFT 3-4 mils

2. Field Applied Prime Coat

- a. Tnemec "Series 27 Typoxy" DFT 2-3 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Devran 203" DFT 3-4 mils

3. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils/ct
- b. S-W "High-Solids Polyurethane 100" DFT 3-4 mils/ct
- c. Devoe "Devthane 379H" DFT 3-5 mils/ct

E. Factory/Shop Primed Steel Per Following Section, Previously Painted Surfaces Interior Exposure for Epoxy Coating:

1. Shop Applied Prime Coat
 - a. Manufacturer's Standard Primer
2. Field Applied – Two (2) Finish Coats
 - a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 4-6 mils
 - b. S-W "Macropoxy 646" DFT 3-5 mils/ct
 - c. Devoe "Bar-Rust 235H" DFT 4-7 mils/ct

F. Factory/Shop Primed Steel Per Paragraph 3.16, E, Previously Painted Surfaces- Exterior Exposure for Epoxy / Polyurethane Coating:

1. Shop Applied Prime Coat
 - a. Manufacturer's Standard Primer
2. Field Applied Intermediate Coat
 - a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 4-6 mils
 - b. S-W "Macropoxy 646" DFT 3-5 mils
 - c. Devoe "Bar-Rust 235H" DFT 4-7 mils
3. Field Applied – Two (2) Finish Coats
 - a. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils/ct
 - b. S-W "High Solids Polyurethane 100" DFT 3-4 mils/ct
 - c. Devoe "Devthane 379H" DFT 2-3 mils/ct

G. Ferrous Metals, Structural Steel, and Miscellaneous Metals Interior Exposure for Epoxy Coating:

1. Shop Applied Prime Coat
 - a. Tnemec "Series 27 Typoxy" DFT 2-3 mils
 - b. S-W "Recoatable Epoxy Primer" DFT 4-6 mils
 - c. Devoe "Devran 223" 4-6 mils
2. Field Applied – Two (2) Finish Coats
 - a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils/ct
 - b. S-W "Macropoxy 646" DFT 3-5 mils/ct

- c. Devoe "Bar-Rust 235H" DFT 4-7 mils/ct

H. Ferrous Metals, Structural Steel, and Miscellaneous Metals Exterior Exposure for Epoxy Coating:

1. Shop Applied Prime Coat

- a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Bar-Rust 235H" DFT 4-7 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 175 Endura-Shield" DFT 2-5 mils/ct
- b. S-W "High Solids Polyurethane 100" DFT 3-4 mils/ct
- c. Devoe "Devthane 379H" DFT 2-3 mils/ct

I. Ductile Iron, Cast Iron, Copper, Aluminum or PVC - Interior or Exterior Exposure for Epoxy/Polyurethane Coating:

1. PVC Surface Preparation – Scarify

2. Field Applied Prime Coat

- a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 2-3 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Devran 224HS" DFT 4-8 mils

3. Field Applied Intermediate Coat

- a. Tnemec "Series N69 Hi-Build Epoxoline" DFT 4-6 mils
- b. S-W "Macropoxy 646" DFT 3-5 mils
- c. Devoe "Devran 224HS" DFT 4-8 mils

4. Field Applied Finish Coat

- a. Tnemec Series 175 Endura-Shield" DFT 2-5 mils
- b. S-W "High Solids Polyurethane 100" DFT 3-4 mils
- c. Devoe "Devthane 379H" DFT 2-3 mils

J. Insulated Pipe Interior or Exterior Exposure for Acrylic:

1. Field Applied Prime Coat

- a. Tnemec "Series 151-1051 Elasto-Grip Primer" DFT 1-1.5 mils
- b. S-W "DTM Acrylic/Primer" DFT 2.5-4 mils
- c. Devoe "Devflex 4020PF" DFT 2.2-3.5 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 1029 Enduratone" DFT 2-3 mils/ct
- b. S-W "Sher-Cryl HPA" DFT 2.5-4 mils/ct
- c. Devoe "Devflex 4216HP" DFT 1.5-4 mils/ct

K. Interior Gypsum Drywall for Waterborne Epoxy:

1. Field Applied Prime Coat

- a. Tnemec "Series 151-1051 Elasto-Grip FC" DFT 1-2 mils
- b. S-W "Premium Wall and Wood Primer" DFT 1-2 mils
- c. Devoe "Gripper 3210" DFT 2-3 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 113 Tufcoat" DFT 2-3 mils/ct
- b. S-W "Waterbased Tile-Clad Epoxy" DFT 2-4 mils/ct
- c. Devoe "Tru-Glaze-WB 4406" DFT 2-5 mils/ct

L. Interior Wood for Waterborne Epoxy:

1. Field Applied Prime Coat

- a. Tnemec "Series 151-1051 Elasto-Grip FC" DFT 1-2 mils
- b. S-W "Premium Wall and Wood Primer" DFT 1-2 mils
- c. Devoe Devflex 4020PF" DFT 2.2-3.5 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 113 Tufcoat" DFT 2-3 mils/ct
- b. S-W "Waterbased Tile-Clad Epoxy" DFT 2-4 mils/ct
- c. Devoe "Tru-Glaze-WB 4406" DFT 2-5 mils/ct

M. Interior CMU walls for Waterborne Epoxy:

1. Field Applied Prime Coat

- a. Tnemec "Series 130 Envirofill" 60-80 sf/gal
- b. S-W "Cement-Plex 875" 60-100 sf/gal
- c. Devoe "Tru-Glaze-WB 4015" DFT 10-15 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 113 Tufcoat" DFT 4-6 mils/ct
- b. S-W "Waterbased Tile-Clad Epoxy" DFT 2-4 mils/ct
- c. Devoe "Tru-Glaze-WB 4406" DFT 2-5 mils/ct

N. Interior Concrete Floors for 100% Solids Epoxy:

1. Field Applied Prime Coat

- a. Tnemec "Series 201 Epoxoprime" DFT 8 mils
- b. S-W "ArmorSeal 33 Epoxy Primer/Sealer" DFT 8 mils
- c. Devoe "Devfloor 525" DFT 8 mils

2. Field Applied Finish Coat

- a. Tnemec "Series 280 Tneme-Glaze" DFT 10 mils
- b. S-W "ArmorSeal 650 SL/RC" DFT 10 mils
- c. Devoe "Devfloor 525" DFT 10 mils

O. Interior Concrete Ceilings and Walls for Waterborne Epoxy:

1. Field Applied Prime Coat

- a. Tnemec "Series 114 Tufcoat" DFT 4-6 mils
- b. S-W "Waterbased Tile-Clad Epoxy" DFT 2-4 mils
- c. Devoe "Tru-Glaze-WB 4408" DFT 10-15 mils

2. Field Applied – Two (2) Finish Coats

- a. Tnemec "Series 114 Tufcoat" DFT 4-6 mils/ct
- b. S-W "Waterbased Tile-Clad Epoxy" DFT 2-4 mils/ct
- c. Devoe "Tru-Glaze-WB 4408" DFT 2-5 mils/ct

P. All mechanical, electrical, HVAC, process equipment, and other utility items shall be painted as indicated in Contract Documents. Paint all items throughout the project according to this specification, except for items that are factory painted with an approved manufacturer's painting system that shall meet or exceed the performance, quality, thickness and warranty of the coating systems indicated in this specification. Factory applied coating systems shall be as indicated where the product or item is specified.

Q. All ferrous metals indicated in Contract Documents to be painted shall be provided with a shop primer that is compatible with the coatings contained herein. All ferrous metals including but not limited to structural steel and miscellaneous metals that are not galvanized and indicated to be painted on the contract documents shall be painted as previously indicated.

END OF SECTION

225546.01

Issue Date: February, 2014

Revised April 2014

Covered Bridge Over Little Androscoggin River

Town of Oxford, ME

SECTION 10 14 00

SIGNAGE

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide safety signage, graphics, directories, identification, labels, tags and related appurtenances as specified and as indicated on the Drawings, including required anchorage hardware, posts, post foundations, adhesives and related appurtenances.

1.02 REFERENCES

- A. Maine DOT Utility Accommodation Rules

1.03 SUBMITTALS

- A. The following shall be submitted:

- 1. SD-02 SHOP DRAWINGS

- a. Provide shop drawings for fabrication, installation and erection of all signs. Provide large scale layout of sign wording, spacing, type size and style. Provide plans, elevations, and details of anchorages, connections and accessory items. Provide location template drawings for items supported or anchored to permanent construction.

- 2. SD-03 PRODUCT DATA

- a. Submit manufacturer's product data, installation instructions, use limitations and recommendations for each material used. Submit color charts for each sign. Include available finishes, colors, surface textures and materials of construction.

- 3. SD-04 SAMPLES

- a. Submit samples showing complete range of colors, textures, and finishes available for each material used.
 - b. Submit representative samples of each material that is to be exposed in the finished work, showing the full range of color and finish variations expected. Provide samples having a minimum area of 144 square inches.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials and products in unopened factory labeled packages. Store and handle in strict compliance with manufacturer's instructions and recommendations and protect from damage. Sequence deliveries to avoid delays, but minimize on-Site storage.

PART 2 – PRODUCTS

2.01 MATERIALS - GENERAL

- A. Plastic laminate signage shall be high pressure plastic laminate engraving stock with face and core plies in contrasting colors, finishes and color combinations as specified and as indicated on the Drawings. If not specifically indicated combinations shall be as selected from the manufacturer's standard range.
- B. Aluminum castings shall be alloy and temper as recommended by the aluminum producer or caster for the use and finish as indicated.
- C. Provide concealed attachment hardware unless otherwise specified or indicated on the Drawings. Attachment hardware shall be 316 stainless steel unless otherwise specified or indicated on the Drawings. Provide attachment hardware which is compatible with the signage material and is non-corrosive to the signage or the mounting surface.

2.02 ELECTRICAL HEAT TRACE SIGNS

- A. Provide self-adhesive anodized aluminum electrical heat trace labels to the outside of the thermal insulation jacket on all exposed sections of the force main bridge crossing. Provide signage inside valve access manholes. Labeling shall indicate the presence of electrical heat tracing. Use one label for every 10 linear feet of pipe. Attach labels in locations for maximum visibility as directed by the Engineer.
- B. Heat trace labels shall be designed in accordance with the following:
 - 1. Signal Word: "Warning"
 - 2. Word Message: "Electrical Heat Trace Cables Present. Disconnect Prior to Servicing"
 - 3. Size: 4 inch wide by 2 inch high (minimum)
 - 4. Corners: Square
 - 5. Background Color: White
 - 6. Lettering: Black

2.03 MDOT UTILITY IDENTIFICATION SIGNS

- A. Provide utility identification signage at each end of the bridge crossing in accordance with Section 12.1.D of the Maine DOT Utility Accommodation Rules. Signs shall be 0.080 mm reflective aluminum specifically designed for outdoor installation. Signs shall include radius corners. Provide sign posts, anchorage footings, 316 stainless steel

attachment hardware and all related appurtenances. Signs shall be designed in accordance with the following:

1. Line #1 (Authorized Entity): Town of Oxford
2. Line #2 (Type of Attachment): Sanitary Sewer Force Main & Electrical Utilities
3. Line #3 (Contact Telephone Number): Contact: 207-539-4431
4. Background: White
5. Lettering: Black
6. Size: Size signage to accommodate text required by MDOT. Minimum size shall be 24 inches high by 18 inches wide.

2.04 PIPE LABELS

- A. Provide pipe labels for all exposed (not buried) piping systems as indicated in Specification 40 05 13, Process Pipe and Fittings.

2.05 VALVE IDENTIFICATION TAGS

- A. Provide identification tags for all valves including valves provided as part of process equipment as indicated in Specification 40 05 23, Process Valves and Strainers.

2.06 EQUIPMENT IDENTIFICATION TAGS

- A. Each item of equipment (including all instrumentation) shall have an engraved nameplate bearing the alphanumeric tag number and the descriptive name of the equipment as it is referenced on the Drawings. Refer to Specification 40 00 00, Basic Process Materials and Methods, for additional details and requirements.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Fabricate signage to be straight, plumb, level and square with smooth flat surfaces and sharp corners, except where indicated otherwise. Precisely form work to sizes, shapes, and profiles indicated on approved shop drawings. Fabricate metal work with uniform, invisible joints.
- B. Examine substrates, supports, and conditions for installation of signage. Notify the Engineer in writing, of conditions detrimental to the proper completion of the Work. Do not proceed with Work until unsatisfactory conditions are corrected.
- C. Strictly comply with manufacturer's instructions and recommendations, except where more restrictive requirements are specified in this section. Install signage, level, in true plane alignment. Provide signs and graphics as specified or as indicated on the Drawings using mounting methods indicated.

- D. The following allowable installed tolerances are allowable variations from locations and dimensions indicated by the Contract Documents and shall not be added to the allowable tolerances indicated for other work.
1. Allowable Variation from True Plumb, Level and Line: $\pm 1/8$ inch in 10'-0"
 2. Allowable Variation from True Plane of Adjusted Surfaces: $\pm 1/16$ inch
- E. Adjust work to present the best possible appearance. Touch-up damaged finishes and repair damage to eliminate evidence of repair. Clean exposed surfaces using materials and methods recommended by manufacturer of material or product being cleaned. Remove and replace work that cannot be successfully repaired or cleaned.

3.02 PROTECTION

- A. Provide temporary protection to ensure work being without damage or deterioration at time of final acceptance. Remove protections and re-clean as necessary immediately before final acceptance.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE WIRE & CABLES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, tools, equipment, and materials necessary to install wires, cables, and connectors in accordance with the Drawings and as specified herein. This section includes wires, cables, and connectors for power, lighting, signal, control, and related systems rated 600 volts and less. Provide all testing for wiring systems as specified and as indicated on the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. National Fire Protection Association (NFPA) 70
- C. National Electrical Code (NEC).
- D. Underwriter's Laboratories, Inc. (UL) Compliance.
 - 1. UL Standard 83 Thermoplastic Insulated Wires and Cables.
 - 2. UL Standard 486A Wire Connectors and Soldering Lugs for Use with Copper Conductors.
 - 3. UL Standard 854 Service Entrance Cable.
- E. National Electrical Manufacturers Association (NEMA) Compliance.
 - 1. WC 5 Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 2. WC 7 Cross Linked Thermosetting Polyethylene Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
 - 3. WC 8 Ethylene Propylene Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
- F. Institute of Electrical and Electronic Engineers (IEEE) Compliance.

1. Standard 82 Test Procedure for Impulse Voltage Tests on Insulated Conductors.

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.
- B. SD-03 PRODUCT DATA
 1. Provide manufacturer's product data, test reports, and materials certifications. Product data for electrical wires, cables, and connectors. Product data for Megger insulation testing instrument. Report sheets for Megger testing.
- C. SD-06 REPORTS
 1. Provide performance test report sheets for megger testing.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver wire and cable properly packaged in factory fabricated type containers, or wound on NEMA specified type wire and cable reels.
- B. Store wire and cable in clean dry space in original containers. Protect products from weather, damaging fumes, construction debris, and traffic.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide factory-fabricated wires of sizes, ampacity ratings, and materials for applications and services indicated. Where not indicated, provide proper wire selection to comply with the project's installation requirements, NEC and NEMA standards. Select from the following UL types those wires with construction features which fulfill project requirements.
- B. Provide color-coding for phase identification as specified herein.
- C. Provide factory applied nylon or polyvinyl chloride (PVC) external jackets on wires and cables for pulls in raceways over 100 feet in length, for pulls in raceways with more than three equivalent 90 degree bends, for pulls in conduits underground or under slabs on grade, and where indicated.

2.02 SERVICE & DISTRIBUTION WIRE

- A. Service and distribution wire shall be in accordance with the following unless otherwise specified or indicated on the Drawings.
 1. 98 percent conductivity copper.

2. 600 volt insulation, type XHHW.
3. U.L. listed for underground use in wet locations at 75° C.
4. Use XHHW for #4 and larger and THHN/THWN or XHHW for #6 and smaller.

2.03 BUILDING WIRING

- A. Building wire shall be in accordance with the following unless otherwise specified or indicated on the Drawings.
1. 98 percent conductivity copper.
 2. 600 volt insulation, type, THWN/THHN, or XHHW.
 3. Stranded conductor: #14 AWG and larger.
 4. Minimum branch circuit: #12 AWG.
 5. Minimum #10 AWG for 120 volt circuits more than 100 feet long.
 6. Minimum #10 AWG for 277 volt circuits more than 230 feet long.

2.04 CONTROL WIRING

- A. Control wiring for digital/discrete signal wiring, shall be 600V, minimum #14 AWG, THHN/THWN, copper stranded, unless specifically indicated otherwise.
- B. Instrument cable for analog signal wiring (4-20mA DC) shall be shielded, 2-conductor, 300 volt rated, minimum #18 AWG, Belden No. 8760, Alpha Wire, or Engineer Approved Equal. Provide 600 volt rated cable where cable occupies the same enclosure and/or raceway with voltages greater than 300 volt as specified below.

2.05 SINGLE SHIELD PAIR INSTRUMENT CABLE

- A. Tinned copper, XLPE insulated stranded conductors, No. 18 AWG minimum, twisted pair with overall shield, stranded tinned No. 18 AWG copper drain wire and overall PVC jacket. Rated for 600 volts minimum and conforming to UL 1581. Cables shall be rated for tray cable "TC" use where installed within a cable tray.
1. Beldon Company
 2. Okonite Company
 3. Dekoron Wire and Cable Company
 4. Engineer Approved Equal

2.06 MULTI-PAIRED SHIELDED INSTRUMENT CABLE

A. Tinned copper, XLPE insulated stranded conductors, No. 16 AWG minimum, twisted pairs with shield over each pair, stranded tinned No. 18 AWG copper drain wire, and overall PVC outer jacket. Rated for 600 volts minimum and conforming to UL 1581 or UL 13. Cables shall be rated for tray cable "TC" use where installed within a cable tray.

1. Beldon Company
2. Okonite Company
3. Dekoron Wire and Cable Company
4. Engineer Approved Equal

2.07 VFD CABLE

- A. VFD load-side power cable shall be shielded type specifically listed for use with Variable Frequency Drives.
- B. VFD cable shall be UL listed with 600V black XLPE insulation.
- C. Cable shall be equipped with 100% foil shield.
- D. Cables shall be stranded type with number and sizes of conductors as indicated on the Drawings.

2.08 SPLICES

- A. No. 10 and smaller with 600-volt pressure type insulated connector of wire-nut type, or equal; soldered and crimped type shall not be allowed. Ideal type "wire nut" Buchanan type "B-Cap" and Minnesota Mining (3M) type "Scotchlok" or Engineer Approved Equal.
- B. No. 8 and larger with solderless lugs or solderless connectors of Lock-tite or similar type properly taped with plastic insulating tape, then two half-lap servings of friction tape.
- C. Wire connector systems for use with underground conductors shall be UL listed specifically for such use.
- D. Service entrance conductors shall be installed without splices. Electrical equipment feeders shall be spliced only where shown or specifically approved by the Engineer. Control and metering conductors shall be installed without splices.
- E. All splices shall be made only by specific permission of the Engineer and then only in manholes or pull boxes and shall be sealed watertight with a heat-shrunk insulation.

- F. Tighten electrical connectors and terminals in accordance with manufacturer's published torque tightening values. Where manufacturer's torque requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and 486B.
- G. Use UL listed splice for all underground wires, ducts buried, in conduit and in ducts. Connectors and splices shall be waterproof.

PART 3 – EXECUTION

3.01 WIRE & CABLE INSTALLATION

- A. All wire and cables shall be installed in conduit of size and type indicated on the drawing and specifications.
- B. Install electrical cables, wires, and connectors in compliance with NEC.
- C. Pull conductors simultaneously where more than one is being installed in same raceway. Use UL listed pulling compound or lubricant, where necessary.
- D. Use pulling means including, fish tape, cable, rope, and basket weave wire/cable grips which will not damage cables or raceways. Do not use rope hitches for pulling attachment to wire or cable.
- E. Conceal all cable in finished spaces.
- F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours, where possible.
- G. Conductors shall be sized such that voltage drop does not exceed 3 percent for branch circuits or 5 percent for feeder/branch circuit combination.
- H. Provide adequate length of conductors within electrical enclosures and train the conductors to terminal points with no excess. Bundle multiple conductors, with conductors larger than No. 10 AWG cabled in individual circuits. Make terminations so there is no bare conductor at the terminal.
- I. All feeder and branch circuit wiring shall be color coded at all termination and splice locations. System neutrals shall be designated in addition to phase conductors. Equipment grounds shall be green.
- J. The number of conductors shown on the Drawings is not necessarily the correct number required. As many conductors as are required in each case shall be installed. In general, grounding conductors are not scheduled.
- K. In general, wiring for the following systems shall be installed in separate conduits. Do not mix categories in a single raceway.

1. 120 volt power wiring.
 2. 120 volt control wiring, including, digital input and output signals.
 3. 24 volt DC control wiring, including, digital input and output signals.
 4. 24 volt DC analog control wiring (4-20mA).
 5. Communications wiring.
 6. Special & Emergency Systems
- L. Conductors 600 volts and below shall be color coded in accordance with the following:

CONDUCTOR	120/208V (120/240V)	480/277V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	N/A
Equipment Grounds	Green	Green

3.02 FIELD QUALITY CONTROL

- A. Provide testing for each electrical circuit after permanent cables are in place with terminators installed, but before cable or wire is connected to equipment or devices to demonstrate that each circuit is free from improper grounds and short circuits.
- B. Megger Test the insulation resistance between phases and from each phase to ground for each of the following feeder and motor branch circuits:
 1. Secondary Service Entrance
 2. Distribution Equipment
 3. Generator and ATS
 4. Transformers
 5. Variable Frequency Drives.
 6. Motors
- C. The Megger Testing shall be witnessed by the Engineer. The Engineer shall be notified at least 48 hours in advance of testing.

- D. Measure the insulation resistance with a digital "Megger" insulation testing instrument in accordance with manufacturer's recommendations. All test instruments are to be provided by the Contractor.
- E. If any insulation resistance measures less than 50 megohms, the cable shall be considered faulty with the cable failing the insulation test. In moist environments, bag the ends of the cable to prevent a faulty Megger test.
- F. Any cable which fails the insulation tests or which fails when tested under full load conditions shall be replaced with new cable for the full length and retested at no additional cost to Owner.
- G. The below grade service or feeder splice shall be water immersion Megger tested in the presence of the Engineer. Each splice shall be immersed in a grounded water immersion bath for 24 continuous hours prior to and during the test. Criteria for failure shall be as described for cable above.

END OF SECTION

SECTION 26 05 26

GROUNDING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, tools, equipment, materials and appurtenances necessary to furnish and install grounding materials in accordance with the Drawings and as specified herein. This section includes solid grounding of electrical systems and equipment.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. "National Electrical Code" (NEC), as applicable to electrical grounding and bonding, Art. 250.
- C. Underwriters' Laboratories, Inc. (UL). UL 467 "Electrical Grounding and Bonding Equipment."
- D. Institute of Electrical and Electronic Engineers (IEEE) IEEE 81 and 142.
 - 1. 1-1983, "IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounded System (Part 1)."
 - 2. 141-1993, "IEEE Recommended Practice for Electric Power Distribution for Industrial Plants."
 - 3. 142-1991, "IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems."

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.
- B. SD-03 PRODUCT DATA
 - 1. Provide product data for all grounding equipment and appurtenances, including but not limited to; wires, connectors, lugs, clamps, ground rods, bonding jumpers and accessories.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide each electrical grounding system with assembly of materials required for complete installation including wires/cables, connectors, lugs, clamps, ground rods, bonding jumpers and accessories.
- B. Provide electrical grounding conductors for grounding connections matched to power supply wiring materials and sized according to NEC.
- C. Provide electrical connectors, lugs, clamps, bonding jumpers and accessories as recommended by the respective manufacturer for the particular application, unless other indicated.
- D. Ground Rods: Solid copper clad, 3/4-inch diameter by 10 feet long.
- E. Insulated Conductors: Green in color.
- F. Ground Bus. Bare annealed copper bars of rectangular cross section, 1/4-inch x 3-inch x length as required, with 98 percent conductivity, rigidly attached to structure.
- G. Bonding Strap Conductor/Connectors: Soft copper, 0.05 inch thick and 2-inches wide, except as indicated.
- H. Pressure Connectors: High conductivity plated units.
- I. Bolted Clamps: Heavy-duty units listed for the application.
- J. Exothermic Welded Connections: Provided in kit form and selected for the specific types, sizes, and combinations of conductors and other items to be connected.

PART 3 – EXECUTION

3.01 GROUNDING & BONDING

- A. Ground main service entrance ground bus or lug to neutral of incoming service, to enclosure, to building steel, to ground rods/grounding ring, to rebar in concrete footing, and to main cold water pipe. Install grounding bushings or service conduits. Use exothermic style ground connections to the ground rods and building steel.
- B. Use of conduit system for ground conductor shall not be allowed.
- C. Provide and install 600 volt insulated bonding conductors throughout the distribution system with connection to bonding (or grounding) terminal on each panel and panel board with connections to other equipment where specifically indicated and noted.

- D. Bonding conductors shall be continuous where possible. Where splices are required, provide compression connectors of approved pattern. Insulate connectors to equivalent thickness of conductors.
- E. Provide grounding system for grounded circuit conductors of dry type transformer secondaries as indicated and required. Use exothermic style ground connections to building steel. Enclose grounding conductors in schedule 40 PVC conduit.
- F. Provide equipment grounding conductors in all conduits containing power, control, or instrumentation conductors on the load side of the service equipment or on the load side of a separately derived system.
- G. Comply with NEC Article 250 for sizes and quantities of equipment grounding conductors, except that larger sizes indicated or shown on the Contract Documents shall take precedence. Use of metallic conduit systems for equipment grounding as recognized by the NEC shall not be permitted under this specification.
- H. Install grounding bushings on conduits at both primary and secondary entrances to transformers. Ground transformer enclosures to bushings.
- I. Install bonding jumper for flexible metal conduit unless fittings are approved for grounding or otherwise comply with NEC.
 - 1. Size jumper to match over-current device.
 - 2. Green insulation.
 - 3. Connect to grounding bushing at each end.
- J. Ensure that entire electrical system is electrically continuous and permanently and effectively grounded, including all electrical equipment and motors.
 - 1. Locate ground rods with a minimum of two rod length from each other and at least the same distance from any other grounding electrode. Connect ground conductors to ground rods by means of exothermic welds except at test wells and as otherwise indicated. Drive rods until tops are 24 inches below finished floor or final grade except as otherwise indicated.
- K. Route grounding electrode conductors along the shortest and straightest paths possible without obstructing access or placing conductors where they may be subjected to strain, impact, or damage, except as indicated.
- L. Ensure that grounding electrode conductor connections to interior piping, structural members, and the like are accessible for periodic inspection during the life of the structure.

3.02 BONDING FOR OTHER TRADES

- A. Signal raceways, water piping, heating piping and metallic air ducts shall be bonded together and to the grounding conductor with No. 8 soft drawn bare solid conductors. Connections to pipes shall be made with cast clamps of like material as the pipes to which attached, to ducting terminated in a secure manner by best practical means, bonding across any flexible or insulated connections.
- B. All bonding conductors shall be installed in a neat manner properly shaped for contour of surface involved and properly supported. At locations remote from the main service entrance panel boards, bond to the largest raceway nearby.

3.03 FIELD TESTING

- A. Measure ground resistance without the soil being moistened by any means other than natural precipitation or natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance. Perform tests by the three-point fall of potential method in accordance with Section 9.03 of IEEE 81. Simple moisture addition is not acceptable.
- B. Ground/resistance maximum values shall be as follows:
 - 1. Equipment rated 500 kva and less: 10 ohms.
 - 2. Equipment rated 500 kVA to 1000 Kva: 5 ohms.
 - 3. Equipment rated over 1000 kVA: 3 ohms.
 - 4. Unfenced substations and pad mounted equipment: 5 ohms.
 - 5. Fence Grounds: 10 ohms.
- C. Where ground resistances exceed specified values, and if directed, modify the grounding system to reduce resistance values.

END OF SECTION

SECTION 26 05 33

RACEWAYS, BOXES & SUPPORTING DEVICES

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, tools, equipment, materials and incidentals necessary to furnish and install raceways, boxes and supporting devices in accordance with the Drawings and as specified herein.
- B. The types of products specified in this section include but are not limited to Conduit, Raceways & Fittings, Supporting Devices and Boxes.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. Underwriter's Laboratories, Inc. (UL) Listing and Labeling.
 - 1. Items provided under this section shall be listed and labeled by UL.
- C. National Electrical Code (NEC).
- D. National Electrical Manufacturers Association (NEMA)

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.
- B. SD-02 SHOP DRAWINGS
 - 1. Provide shop drawings for floor boxes and boxes, enclosures and cabinets that are to be shop fabricated (non-stock items). Provide shop drawings for all below grade electrical pull boxes, conduit supports and related appurtenances.
- C. SD-03 PRODUCT DATA
 - 1. Provide product data for cabinets and enclosures with classification higher than NEMA 1. Provide product data for all conduit, fittings, expansion joints and pull boxes.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide conduit with ¾-inch diameter minimum, except where specifically shown smaller on the Drawings. Provide larger conduits as specified and as indicated on the Drawings.
- B. Conduit, connectors, and fittings shall be approved for the installation of electrical conductors.
- C. Refer to subsequent sections of this specification for approved conduit installation guidelines based on project location.

2.02 ELECTRICAL METALLIC TUBING (EMT)

- A. EMT shall be rigid metallic conduit of the thin wall type in straight lengths, elbows, or bends and shall conform to NEMA C80.3 and the requirements of UL 797.
- B. Couplings and connectors shall be steel compression fittings. Where EMT enters outlet boxes, cabinets, or other enclosures, connectors must be the insulated-throat type, with a locknut. Fittings shall meet the requirements of NEMA FB 1.

2.03 RIGID GALVANIZED STEEL CONDUIT (RGS)

- A. Rigid steel conduit (RGS), including couplings, elbows, bends, and nipples, shall conform to the requirements of UL 6 and NEMA C80.1 Steel fittings shall be galvanized by the hot-dip process.
- B. Fittings for rigid steel conduit shall be threaded and shall conform to NEMA FB 1.
- C. Gaskets shall be solid for fittings sized 1-1/2 inches and less. Conduit fittings with blank covers shall have gaskets except in clean, dry areas or at the lowest point of a conduit run where drainage is required.
- D. Covers shall have captive screws and be accessible after the work has been completed.

2.04 PVC-COATED RIGID METAL CONDUIT

- A. Rigid galvanized metal conduit coated with 40 mils thick polyvinylchloride coating.
- B. Fittings, elbows, supporting devices and accessories shall include factory applied 20 mils thick polyvinylchloride coating and be manufactured by the same as that of the conduit.
- C. Use tools as recommended by the manufacturer so as not to damage PVC coating. Where coating is damaged, touch-up with PVC paint in the field after installation.

2.05 RIGID PLASTIC CONDUIT (PVC)

- A. PVC Conduit - Schedule 40: Conduit shall be made of polyvinyl chloride compound that shall be homogeneous plastic material free from cracks, holes or foreign inclusions. Conduit shall be rated for use with 90 degree C conductors, UL Listed. Provide solvent cement to join conduits per the same manufacturer as the conduit manufacturer.
- B. PVC Conduit - Schedule 80: Heavy wall PVC conduit that shall be made of polyvinyl chloride compound that shall be homogeneous plastic material free from cracks, holes or foreign inclusions. Conduit shall be rated for use with 90 degree C conductors, UL Listed. Use solvent cement to join conduits from the same manufacturer as the conduit manufacturer.

2.06 FLEXIBLE METALLIC CONDUIT

- A. Flexible metallic (FM) conduit shall meet the requirements of UL 1.
- B. Liquid-tight flexible metallic conduit shall be provided with a protective jacket of PVC extruded over a flexible interlocked galvanized steel core to protect wiring against moisture, oil, chemicals, and corrosive fumes.
- C. Fittings for flexible metallic conduit shall meet the requirements of UL 514B, Type I box connector, electrical, Type III coupling, electrical conduit, flexible steel, or Type IV adapter, electrical conduit.

2.07 ALUMINUM CONDUIT

- A. Rigid aluminum conduit shall be 6063 alloy, T-1 temper (former designation T-42) aluminum. Aluminum conduit shall conform to Federal Specification WW-C-54-c, Underwriter's Laboratories UL-6A, latest revision and American National Standards Institute (ANSI) C80.5.
- B. Provide color coded thread protectors for conduit to designate size.

2.08 CONDUIT EXPANSION JOINTS

- A. Provide conduit expansion joints as specified and as indicated on the Drawings. Provide conduit expansion joints to couple together two (2) sections of conduit subject to longitudinal movement, in long conduit runs to permit linear movement caused by thermal expansion and contraction, on long conduit runs to prevent conduit from buckling and ensuing circuit failures, indoors or outdoors where conduit expansion occurs and there are wide temperature ranges, in conduit runs that cross structural joints and in conduit runs to prevent damage to conduit supports such as in a building or on a bridge.

- B. Expansion joints shall be designed for indoor or outdoor installation. Conduit expansion fittings shall conform to UL Standard: 514B, NEC Articles 250-77 and 300-7 (b) and NEMA FB1
- C. Conduit expansion joints shall be designed in accordance with the following criteria:
 - 1. Body: Galvanized steel. Provide aluminum expansion joints for aluminum conduit.
 - 2. Reducer: Galvanized steel. Provide aluminum for use with aluminum conduit systems
 - 3. Gland Nut: Galvanized steel. Provide aluminum for use with aluminum conduit systems
 - 4. Packing: Teflon
 - 5. Gasket: Vellum
 - 6. Bushing: Galvanized steel. Provide aluminum for use with aluminum conduit systems
 - 7. Maximum Movement: 4 Inches

2.09 WIREWAYS

- A. Wire ways and auxiliary gutters for use in exposed, dry locations shall be a prefabricated channel-shaped sheet metal trough with hinged or removable covers, associated fittings, and supports for housing, and protecting electrical wires and cables in accordance with UL 870.
- B. Straight sections of trough, elbows, tees, crosses, closing plates, connectors, and hanging brackets shall be constructed from sheet steel of commercial quality not less than 16-gage. Sheet metal component parts shall be cleaned, phosphatized, and coated with a corrosion-resistant gray paint.
- C. Straight sections of wire ways and auxiliary gutters shall be solid or have knockouts as indicated in both sides and bottom, 3 inches on center.
- D. Straight sections shall be not more than 5-feet long, with covers held closed with screws.

2.10 CONDUIT SEALS

- A. Provide factory fabricated watertight conduit sealing bushing assemblies suitable for sealing around conduit, or tubing passing through concrete floors and walls. Provide a cast in place water stop wall sleeve with a mechanical pipe seal between the conduit and the sleeve. Construct seals with steel sleeve, malleable iron body, neoprene sealing grommets or rings, metal pressure rings, pressure clamps, and cap screws.
- B. Provide E.Y.S. seal fittings with appropriate potting material where conduits enter or leave a Class 1, Division 1 or 2 environments or a Class 2, Division 1 or 2 environment, and chemical rooms.

2.11 SUPPORTING DEVICES

- A. Supports, support hardware, and fasteners shall be protected with zinc coating or with treatment of equivalent corrosion resistance using approved alternative treatment, finish, or inherent material characteristic. Products for use outdoors shall be 304 stainless steel or aluminum unless otherwise specified or indicated on the Drawings.
- B. Refer to Part 3 for conduit support materials of construction per each location in the project.

2.12 CONDUIT SUPPORTS

- A. Single Run Hangers: Galvanized steel conduit straps or clamps, or cast metal beam clamps. Perforated straps and spring steel clips and clamps will not be permitted.
- B. Group Run Hangers: Minimum 12-gauge galvanized performed U-channel rack with conduit fittings; 25 percent spare capacity.
- C. Hanger Rods: Threaded steel, 3/8-inch diameter, or as identified on the Drawings.
- D. Vertical Run Supports: Minimum 12-gauge galvanized performed U-channel struts with conduit fittings.

2.13 EQUIPMENT & LIGHTING SUPPORTS

- A. U-channel: 12-gauge galvanized performed U-channel struts with fixture and conduit fittings, as applicable, unless indicated otherwise on the Drawings.

2.14 CORROSIVE AREA SUPPORTS

- A. Clamp Hangers, Pipe Straps, and Clamp Back Spacers for use with PVC-coated rigid metal conduit shall have 40 mil gray PVC exterior coating.
- B. Clamp Hangers, Pipe Straps, etc. for use with PVC nonmetallic conduit shall be of nonmetallic PVC material.
- C. Hanger Rods: 20 mil gray PVC exterior coated rod with threaded ends only 3/8" and 1/2" sizes as required.
- D. Strut Support: 20 mil gray PVC exterior coating strut. Standard channel, slotted channel, and back to back channel are acceptable.
- E. Provide stainless steel or aluminum supports and accessories in lieu of PVC coated supports when indicated in the table below.

Support Materials of Construction Table

Location/Equipment	Acceptable Support Type
Little Androscoggin River Bridge Crossing	304 S.S. or Aluminum
Valve Access Manholes	304 S.S. or Aluminum

2.15 BOXES & FITTINGS

- A. Boxes shall have sufficient volume to accommodate the number of conductors entering the box in accordance with the requirements of NFPA 70 and UL 514A.
- B. In general, boxes that are exposed to weather, process areas, normally wet locations, and locations exposed in mechanical spaces shall be cast-metal. Boxes in all other finished areas shall be sheet metal. Boxes installed in corrosive areas, such as chemical feed and chemical storage areas shall be non-corrodible 316 stainless steel, or reinforced PVC electrical enclosures.
- C. Refer to the following table for enclosure types based on Area.

2.16 SHEET METAL OUTLET BOXES

- A. Sheet Metal Outlet Boxes: Standard type galvanized steel, minimum four inch square or octagon by 1-1/2 inch deep.
- B. Luminaire and Equipment Supporting boxes: Rated for weight of equipment supported; include 2 inch male fixture studs where required.
- C. Single Wall Type: Minimum size, four inch square by 1-1/2 inch or 2-1/8 inch deep, except as noted. Provide dry wall device covers raised 3/4 inch minimum to insure flush finish mounting.
- D. Ganged Wall Type: Minimum depth three inches except as noted, ganged as required under common plate to contain devices shown. On 277 volt circuits ganged boxes for switches shall contain only one circuit or equip box with permanent barriers per NEC Art 404-8.

2.17 CAST OUTLET BOXES

- A. Type FS shallow and type FD deep, cast fer alloy.
- B. Provide number of threaded hubs as required.
- C. Use in all exterior, damp and locations exposed in mechanical spaces.
- D. Provide gasketed cover and accessories by box manufacturer for complete weatherproofing. Provide correct box to accept weatherproof covers as specified.

2.18 SHEET METAL PULL & JUNCTION BOXES

- A. Sheet metal boxes shall be standard type galvanized steel and shall conform to UL 50.
- B. Box dimensions shall be minimum four inch square or octagon by 2 1/2 inch deep.
- C. Sizes up to 12x12x6 inch: Provide screw-type or hinged covers.
- D. Sizes greater than 12x12x6 inch: Provide hinged covers.
- E. Boxes shall be sized to accommodate all incoming raceways.

2.19 NON-METALLIC BOXES

- A. Conform to NEMA OS 2, "Nonmetallic Outlet Boxes, Device Boxes, Covers, and box Supports," and UL 514C, "Nonmetallic Outlet Boxes, Flush Device Boxes and Covers." Boxes shall be molded polyvinyl chloride (PVC), or fiberglass units of type, shape, size, and depth to suit location and application.
- B. Boxes shall be equipped with threaded screw holes for device and cover plate mounting. Each box shall have a molded cover of matching material suitable for the application and location installed.

Location	Enclosure Type
Exterior	NEMA 4X
Valve Access Manholes	NEMA 7/9 (Explosion Proof)-C1/D2

PART 3 – EXECUTION

3.01 CONDUIT USES

- A. Use liquid tight flexible metal conduit for the final 24 inches of connections to motors or control items subject to movement or vibration.
- B. Use RGS for all exterior aboveground installations unless otherwise noted.
- C. Use PVC coated rigid steel conduit, or as scheduled below, for installation in corrosive areas, and other areas as identified on the Contract Drawings.
- D. Exposed raceways in Manufacturing Area's, Utility Rooms, Mechanical Rooms, Warehouse Area's, etc., shall be Rigid Galvanized Steel below 15 ft.
- E. Conduit and raceway runs in finished areas concealed in or behind walls, above ceilings, or exposed on walls and ceilings 15 feet or more above finished floors and not subject to mechanical damage may be electrical metallic tubing (EMT).
- F. Unless otherwise specified or indicated on the Drawings, use Schedule 40 PVC conduit for exterior direct buried installations. Use Schedule 40 PVC conduit for exterior

concrete encased installations. Use Schedule 80 PVC conduit for underground installations under driveways and paved surfaces. The transition from underground and from concrete encasement to riser shall be PVC coated rigid steel conduit to a minimum of 12 inches above finished floor and/or finished grade elevation. All elbows shall be prefabricated Rigid Steel to prevent wire burn through.

- G. Install conduit seals for conduit penetrations of slabs on grade and exterior walls below grade and where indicated. Tighten sleeve seal screws until sealing grommets have expanded to form watertight seal. Provide seals for the interior of conduits that penetrate exterior or water bearing walls, consisting of gland type sealing bushings or RTV closed cell silicone foam.
- H. The following table provides a listing of conduit types per project area:

Location	Conduit Type
Little Androscoggin River Bridge Crossing (Exposed)	Rigid Aluminum
Below Grade	Schedule 80 PVC

- I. Power, lighting, control, emergency light and power, and special-service systems and all related components shall be installed in accordance with NFPA 70, and shall be enclosed in separate conduit or separate conduit systems as indicated on the Contract Drawings and as specified herein.
- J. Any run of conduit between outlet and outlet, between fitting and fitting, or between outlet and fitting shall contain not more than the equivalent of three 90-degree bends, including those bends located immediately at the outlet or fitting. Field bends shall be made in accordance with the manufacturer's recommendations, which normally require use of a one-size-larger bender than would be required for uncoated conduit. Installed conduit and fittings shall be free of dirt and trash and shall not be deformed or crushed. Empty conduit shall have a pull rope stalled.
- K. Conduit shall be installed with a minimum of 3 inches of free air space separation from mechanical piping.
- L. Conduit in finished areas shall be installed concealed. Conduit passing through masonry or concrete walls shall be installed in sleeves. Conduit shall be securely clamped and supported at least every 10 feet vertically and 8 feet horizontally. Galvanized pipe straps shall be fastened to structure with bolts, screws, and anchors. Wooden masonry plugs shall not be used.
- M. Install exposed conduits, parallel or perpendicular to walls, ceilings, or structural members. Do not run through structural members. Avoid horizontal runs within partitions or sidewalls. Avoid ceiling inserts, lights, or ventilation ducts or outlets. Do not run conduits across pipe shafts or ventilation duct openings and keep conduits a minimum of 6 inches from parallel runs of flues, hot water pipes, or other sources of heat. Wherever possible, install horizontal raceway runs above water and steam piping.

- N. Do not run conduits exposed on the exterior surface of buildings. Conduits penetrating exterior walls below grade, at grade floors, or below grade floors shall be sealed to prevent moisture migration. The exterior of the conduit shall be sealed with a mechanical pipe seal. The interior conduit seal shall be a gland type sealing bushing or RTV closed cell silicone foam. Ensure that conduits do not retain water against these seals.
- O. Raceways penetrating fire rated walls, floors, and partitions shall be sealed with a fire rated sealant.
- P. All conduits shall be supported with materials specifically made for this purpose. Do not use wire hangers. Do not attach any parts of the raceway system to ventilation ducts. Conduit supports shall be attached to the building. Support conduits on each side of bends and on a spacing not to exceed the following: 6 feet for conduits smaller than 1 1/4 inches and 8 feet for conduits 1 1/4 inches and larger. Support riser conduits at each floor level with clamp hangers. All underground conduits shall be securely anchored to prevent movement during placement of concrete or backfill. Use precast separators and heavy gauge wire ties or other approved fasteners.
- Q. Provide E.Y.S. seal fittings with appropriate potting material where conduits enter or leave a Class 1, Division 1 or 2 environments or a Class 2, Division 1 or 2 environment, and chemical rooms.
- R. Conduit connections to boxes and fittings shall be supported not more than 36 inches from the connection point. Conduit bends shall be supported not more than 36 inches from each change in direction. Conduit shall be installed in neat symmetrical lines parallel to the centerlines of the building construction and the building outline. Multiple runs shall be parallel and grouped whenever possible on common supports. Exposed ends of conduit without conductors shall be sealed with watertight caps or plugs.
- S. Bonding wires shall be used in flexible conduit for all circuits. Flexible conduit shall not be considered a ground conductor.
- T. Liquid tight flexible metallic conduits shall be used in wet and oily locations and to complete the connection to motor-driven equipment.
- U. Electrical connections to vibration-isolated equipment shall be made with flexible metallic conduit in a manner that will not impair the function of the equipment.
- V. A polypropylene pull rope with a tensile strength not less than 130 pounds shall be installed in empty conduit.
- W. Electrical conduit may be embedded in concrete according to the provisions of Article 6.3 of ACI 318 "Building Code Requirements for Reinforced Concrete", provided the following conditions are met:

1. Outside diameter of conduit shall not exceed 1/3 of concrete thickness. Maximum conduit outside diameter shall not exceed 3 inches when embedded in slab.
2. Conduit shall not be placed closer than three diameters on center. Route conduit to minimize crossing of different conduit runs.
3. Conduit shall not be embedded in structural concrete slabs less than four inches thick.
4. A 1-1/2 inch minimum concrete cover shall be provided for conduits in structural concrete slabs.

3.02 INSTALLATION OF UNDERGROUND CONDUIT

- A. Provide a minimum of 3/4 inch conduit in or under concrete slab on grade.
- B. Where conduits are installed in concrete slabs, on the ground, underground, or exposed to the weather, make all joints liquid tight and gas tight.
- C. Bury all underground conduit, except under concrete slabs placed on fill, to a depth of at least 30 inches below finished grade unless otherwise indicated on the Drawings.
- D. Slope ducts to drain away from buildings into manholes and/or hand-holes. Adjust final slopes to coordinate with existing site utilities.
- E. Install on undisturbed soil where possible. Concrete encase conduits as shown on Drawings. Use pit run gravel and sand, placed 8 inch lifts and compacted for backfill.

3.03 INSTALLATION OF RIGID METAL CONDUIT

- A. Ends of conduit shall be cut square, reamed and threaded, and joints shall be brought butt-to-butt in the couplings. Joints shall be mechanically tight. Conduit shall be protected against damage and the entrance of water or foreign material during construction.
- B. Ninety-degree bends of conduit with a diameter larger than 1 inch shall be made with factory-made elbows. Conduit elbows larger than 2 1/2 inches shall be long radius. Field-made bends and offsets shall be made with an approved hickey or conduit-bending machine. Changes in directions of runs shall be made with symmetrical bends or cast-metal fittings.
- C. At connections to sheet metal enclosures and boxes, a sufficient number of threads shall project through to permit the bushing to be drawn tight against the end of the conduit, after which the locknut shall be pulled up sufficiently tight to draw the bushing into firm electrical contact with the box. Conduit shall be fastened to sheet metal boxes and cabinets with two locknuts where required by NFPA 70 where insulating bushings are

used, where bushings cannot be brought into firm contact with the box, and where indicated.

- D. Conduit joints shall be made with tapered threads set firmly. Each length of conduit cut in the field shall be reamed before installation. Where conduit is threaded in the field, each threaded end shall consist of at least five full threads. Corrosion-inhibitive compound (cold galvanizing paint) shall be used on all conduit threads or any locations where the original hot galvanized surface has been compromised.
- E. Conduit stubbed-up through concrete floors for connections to free-standing equipment except motor-control centers, cubicles, and other such items of equipment shall be provided with a minimum of a 12" riser above the floor slab is of sufficient thickness; if not, a floor box shall be provided and set flush with the finished floor. Conduits installed for future use shall be terminated with a coupling and plug set flush with the floor.

3.04 SUPPORTING DEVICES

- A. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements.
- B. Coordinate with the building structural system and with other electrical installations.
- C. Conform to manufacturer's recommendations for selection and installation of supports.
- D. Install individual and multiple (trapeze) raceway hangers and riser clamps as necessary to support raceways. Provide U bolts, clamps, attachments, and other hardware necessary for hanger assembly and for securing hanger rods and conduits.
- E. Support parallel runs of horizontal raceways together on trapeze type hangers.
- F. Support individual horizontal raceways by separate pipe hangers. Spring steel fasteners may be used in lieu of hangers only for 1-1/2 inch and smaller raceways serving lighting and receptacle branch circuits above suspended ceilings only. For hanger rods with spring steel fasteners, use 1/4 inch diameter or larger threaded steel. Use spring steel fasteners that are specifically designed for supporting single conduits or tubing.
- G. In vertical runs, arrange support so the load produced by the weight of the raceway and the enclosed conductors is carried entirely by the conduit supports with no weight load on raceway terminals.
- H. Support miscellaneous electrical components as required to produce the same structural safety factors as specified for raceway supports. Install metal channel racks for mounting cabinets, panel boards, disconnects, control enclosures, pull boxes, junction boxes, transformers, and other devices.

- I. Install sleeves in concrete slabs and walls and all other fire rated floors and walls for raceways and cable installations. For sleeves through fire rated wall or floor construction, apply UL listed fire-stopping sealant in gaps between sleeves and enclosed conduits and cables.

3.05 BOXES & FITTINGS

- A. Pull boxes shall be furnished and installed where necessary in the conduit system to facilitate conductor installation. Conduit runs longer than 100 feet or with more than three right-angle bends shall have a pull box installed at a convenient intermediate location.
- B. Boxes and enclosures shall be securely mounted to the building structure with supporting facilities independent of the conduit entering or leaving the boxes.
- C. Bonding jumpers shall be used around concentric or eccentric knockouts.

3.06 INSTALLATION OF OUTLET BOXES

- A. Use nonmetallic boxes in corrosive areas such as chemical feed area and as designated on the plans.
- B. Use explosion proof boxes in Hazardous areas as identified on the Drawings.
- C. Use cast metal boxes in all other locations. Each box with associated covers and fittings shall have a NEMA rating for each location installed.

3.07 INSTALLATION OF PULL & JUNCTION BOXES

- A. Use general purpose boxes (NEMA 1) in finished areas with framed construction.
- B. Use dust-tight and oil-tight boxes (NEMA 12) in other dry interior areas.
- C. Use explosion proof boxes (NEMA 7) in hazardous areas as designated on the plans.
- D. Use watertight boxes (NEMA 4) for exterior and wet locations on outdoor structure where moisture is present.
- E. Use corrosion resistant watertight boxes (NEMA 4X) for wet locations and corrosion filled areas, such as the chemical feed area, and as identified on the Drawings.

END OF SECTION

SECTION 26 05 43

UNDERGROUND ELECTRICAL CONSTRUCTION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment and incidentals for underground duct banks, manholes, hand holes, conduit, fittings and related appurtenances. Provide all necessary excavation, backfill, concrete, reinforcement and surface restoration. Provide underground conduit duct banks with manholes and pull boxes for power, and lighting circuits as shown on the Drawings.
- B. Duct bank routing as shown on the Drawings is diagrammatic. Coordinate installation with piping and other underground systems and structures and locate clear of interferences. Coordinate manhole and hand hole installation with piping, sheet piling and other underground systems and structures and locate clear of interferences.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
 - 1. National Electrical Manufacturers Association (NEMA).
 - 2. The American National Standards Institute (ANSI).
 - 3. The Institute of Electrical and Electronic Engineers (IEEE).
 - 4. Insulated Cable Engineers Association (ICEA).
 - 5. National Electrical Code (NEC).
 - 6. National Electrical Safety Code (NESC).
 - 7. ASTM A 48, Gray Iron Castings.
 - 8. ANSI A14.3, Safety Requirements for Fixed Ladders.
 - 9. OSHA.

1.03 SUBMITTALS

A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.

B. SD-02 SHOP DRAWINGS

1. Provide layouts showing the proposed routing of duct banks and the locations of manholes, hand holes and areas of reinforcement.
2. Profiles of duct banks showing crossings with piping and other underground systems.
3. Typical cross sections.
4. Installation procedures.
5. Manufacturer's technical information for manholes, hand holes and accessories proposed for use.
6. Drawings showing interior and exterior manhole and hand hole dimensions and details of openings, jointing, inserts, reinforcing, size and locations of openings, and accessory locations.
7. Certificate of concrete and steel used in underground pre-cast concrete utility structures, according to ASTM C858.
8. Product Data for nonmetallic conduit and manhole accessories.
9. Provide record drawings of layouts showing the actual routing of duct banks including the dimensions and depth of the top of duct bank below grade. Record drawings for duct banks should also include cross sections of the duct bank indicating the circuit, use, conduit size, orientation and number of conduits. Include the locations of manholes, hand holes and areas of reinforcement.

1.04 DEFINITIONS

- A. Duct: Electrical conduit and other raceway, either metallic or nonmetallic, used underground, embedded in earth or concrete.
- B. Duct Bank: 2 or more conduits or other raceway installed underground in the same trench or concrete envelope.
- C. Hand Hole: An underground junction box in a duct or duct bank with cover accessible from grade.

- D. Manhole: an underground utility structure, large enough for a person to enter, with facilities for installing and maintaining cables. Where required manholes shall comply with the Utility Companies requirements.

1.05 QUALITY ASSURANCE & COORDINATION

- A. Locate all existing underground utilities through the use of an underground utility piping location service company. Locate the existing underground utilities and piping before any excavation is to begin.
- B. Coordinate conduit routing, duct bank and manholes with other new and existing underground utilities. Revise locations and elevations as required to suit field conditions and ensure that conduits, duct runs, manholes and hand holes do not interfere with existing and new underground utilities and piping.

PART 2 – PRODUCTS

2.01 DUCT BANK CONDUIT

- A. Duct: Provide Schedule 40 and Schedule 80 PVC conduit and fittings as specified and as indicated on the Drawings. Conduit and fittings shall be in accordance with Specification 26 05 33 RACEWAYS, BOXES & SUPPORTING DEVICES.
- B. Rigid Steel Conduit: Rigid steel conduit and fittings in accordance with Specification 26 05 33 RACEWAYS, BOXES & SUPPORTING DEVICES.
- C. All shielded instrumentation and communications cable shall be installed in ferrous metal, steel conduit throughout the entire run of conduit from end to end.

2.02 MANHOLES

- A. Manholes shall conform to the requirements as shown and detailed on the Drawings.
- B. Material and Construction:
 - 1. Pre-cast reinforced concrete.
 - 2. Minimum interior dimensions as indicated on the Drawings or required by the Utility Company.
 - 3. Duct entrances sized and located to suit duct banks. Duct-bank penetration shall be watertight.
 - 4. Modular sections with tongue-and-groove joints. Joints shall be gasketed and water tight.
 - 5. Nominal inside dimensions as shown.

6. Base Section: Shall include sump and grate and ground rod openings.
7. Sump Covers; ASTM A48; Class 30B galvanized iron.

2.03 MANHOLE FRAMES & COVERS

- A. Material: Cast iron conforming to ASTM A 48, Class 30A.
- B. Covers: minimum diameter as indicated on the Drawings, watertight, sealed type marked "ELECTRICAL" in raised two inch letters.
- C. Frame shall be grouted on the manhole.
- D. Manufacturer: Provide frames and covers of one of the following:
 1. Neenah Foundry Company.
 2. Flockhart Foundry Company.
 3. Campbell Foundry Company.
 4. Engineer Approved equal.

2.04 PULLING IRONS

- A. Material: Galvanized steel.
- B. Cast in the wall opposite to the centerline of each incoming duct bank and 12 inches below centerline of bottom line of ducts.
- C. Product and Manufacturer: Provide one of the following:
 1. Cat. No. DU2T3 by McGraw Edison Company.
 2. Cat. No. 8119 by A.B. Chance Company.
 3. Engineer Approved equal.

2.05 CABLE RACKS

- A. Cable racks shall adequately support cables with space allowed for future cables. Provide as indicated to support mounting channels and racks. Cast-in Place anchors with minimum rated pullout working capacity of 2,000 pounds. Provide insert with 5/8-11 hex head cap screw made from 316 stainless steel.
- B. Each rack shall be a vertical assembly of 24 inch cable racks extending from within 6 inches of the manhole roof slab to within 6 inches of the manhole floor.
- C. Cable Rack Mounting Channel: Heavy duty non-metallic stanchions. Underground Devices, Inc. model C36 or Engineer Approved Equal.
- D. Cable Racks: Heavy duty non-metallic racks. 8, 14, 20 inches as indicated.

E. Product and Manufacturer: Provide one of the following:

1. Underground Devices, Inc. model RA 08, RA14, RA20
2. Engineer Approved equal.

2.06 INSULATORS

A. Material: Porcelain.

B. Product and Manufacturer: Provide one of the following:

1. Cat. No. J 5122 by Joslyn Manufacturing and Supply Company.
2. Cat. No. 2120 by Hubbard and Company.
3. Engineer Approved equal.

2.07 MANHOLE STEPS

A. Material: Extruded aluminum.

B. Steps spaced evenly at approximately twelve to sixteen inch centers and shall project evenly from manhole walls.

C. Manufacturer: Provide manhole steps of one of the following:

1. Flockhart Foundry Company.
2. Neenah Foundry Company.
3. Engineer Approved Equal.

2.08 HAND HOLES

A. The pull/splice box underground enclosures shall be constructed of polymer concrete consisting of sand and aggregate bound together with a polymer resin. Internal reinforcement may be provided by means of steel, fiberglass, or a combination of the two. Hand holes for installation in roadways or paved areas shall be concrete reinforced with an H20 traffic load rating.

2.09 HAND HOLE ENCLOSURE

A. The enclosure shall be manufactured with an open or closed bottom and a removable cover. The enclosures shall be green or concrete gray in color.

B. The enclosures shall be designed to be installed flush to grade with the cover fitting flush to the box.

C. The enclosures shall be suitable for installation in either direct or buried native soil, embedded in concrete, or embedded in asphalt surfacing. (A concrete collar shall be required for installation in asphalt).

- D. The enclosures shall be of a stackable design for greater installation flexibility.
- E. All covers shall be equipped with a minimum of two stainless steel lockdown mechanisms. All covers shall have a logo recessed into the cover and it shall read electric.
- F. All enclosure covers shall have some type of recessed access point to allow removal of the cover with a hook. The access points shall be placed in such a location to allow for the greatest amount of leverage and safety possible.
- G. Enclosures shall be designed and suitable for installation and use through a temperature range of -40°C (-40°F) to 60°C (140°F).
- H. A certified copy of all test reports shall be signed and stamped by a registered professional engineer and submitted prior to shipment of products.

2.10 HAND HOLE MATERIALS OF CONSTRUCTION

- A. Permanent deflection of any surface shall not exceed 10 percent of the maximum allowable static design load deflection.
- B. The covers shall be skid resistant and have a maximum coefficient of friction of 0.50 on the top surface of the cover. Coatings shall not be allowed.
- C. Any point on the covers must be able to withstand a 70 foot-pound impact administered with a 12 pound weight having a "C" tup (ASTM D-2444) without puncturing or splitting. The test shall be performed with the cover resting on a flat, rigid surface such as concrete or a 1 inch steel plate.
- D. Covers shall have molded lettering, ELECTRIC or COMM as applicable.
- E. Fastening devices used to secure the cover to the box shall be capable of withstanding a minimum torque of 15 foot-pounds and a minimum straight pullout strength of 750 pounds.
- F. The material is tested according to the requirements of ASTM D543, Section 7, Procedure 1, for chemical resistance. The manufacturer is responsible for proof of compliance with the latest version of the ASTM standards.
- G. Materials of construction shall also be in accordance with the following:
 - 1. ASTM D756, Procedure E: Accelerated Service Exposure.
 - 2. ASTM G53 Recommended Practice for Operating Light and Water Exposure on Nonmetallic Materials (with a U.V.A. 340 bulb).
 - 3. ASTM D570 Section 5, 6.1, 6.5: Water Absorption.

4. ASTM D790: Flexural Properties
5. ASTM D635 Flammability Test

PART 3 – EXECUTION

3.01 GENERAL

- A. Provide not less than 3 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts. Refer to the Drawings for spacing requirements. Provide side forms for each duct bank.
- B. All duct line concrete pours shall be continuous between manholes or hand holes and between manholes or hand holes and structures.
- C. Where duct lines pass through concrete walls, concrete envelopes shall be extended through and finished flush with inside surfaces. Watertight construction joints shall be provided.
- D. Duct banks shall be reinforced when laid on backfill covering new pipelines, roads, parking lots or any are subject to vehicular traffic. Beneath these areas, install reinforcing bars as shown on the Drawings, extending 10 ft beyond area needing protection.
- E. Duct lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded.
- F. All electrical duct banks shall be colored red for safety purposes.
- G. Install raceways to drain away from buildings. Raceways between manholes or hand holes shall drain toward the manholes or hand holes. Raceway slopes shall not be less than 3 inches per 100 feet.
- H. Make raceway entrances to buildings and vaults with hot dipped rigid galvanized steel conduit not less than 10 ft long. Conduits which are not concrete encased for runs below floor slabs in slab-on-grade construction shall be hot dipped rigid galvanized steel conduit. Conduits which are concrete encased for runs below floor slabs in slab-on-grade construction shall be encased under the slab to their respective equipment.
- I. Raceway terminations at manholes shall be with end bells for PVC conduit and insulated throat grounding bushings with lay-in type lugs for metal conduit.

3.02 INSTALLATION

- A. Provide excavation, backfilling, compaction, and surface restoration required for ductbank, manhole and hand hole installation.
- B. Make duct bank installations and penetrations through foundation walls watertight.

- C. Assemble duct banks using non-magnetic saddles, spacers and separators. Position separators to provide a 3 inch minimum separation between the outer surfaces of the ducts.
- D. Firmly fix ducts in place during pouring of concrete. Carefully spade and vibrate the concrete to insure filling of all spaces between ducts.
- E. Make bends with sweeps of not less than a 48 inch radius or 5 degree angle couplings.
- F. Make a transition from non-metallic to PVC coated rigid steel conduit where duct banks enter structures or turn upward for continuation above grade. Terminate the ducts in insulated grounding bushings. Continue ducts inside buildings with steel, metallic conduit.
- G. Where ducts enter manholes and hand holes, terminate the ducts in suitable end bells.
- H. Provide expansion/deflection fittings in accordance with the requirements specified in Division 26, Section "Raceways, Boxes and Supporting Devices".
- I. Do not backfill with material containing large rock, paving materials, cinders, large or sharply angular substances, corrosive material or other materials which can damage or contribute to corrosion of ducts or cables or prevent adequate compaction of fill.
- J. Slope duct runs for drainage toward manholes and away from buildings with a slope of approximately 3 inches per 100 feet.
- K. After completion of the duct bank and prior to pulling cable, pull a mandrel, not less than 12 inches long and with a cross section approximately one fourth inch less than the inside cross section of the duct, through each duct. Then pull a rag swab or sponge through to make certain that no particles of earth, sand or gravel have been left in the duct.
- L. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system. Terminate ground conductor at last manhole or hand hole for outlying structures.
- M. Install a warning ribbon approximately 12 inches below finished grade over all underground duct banks. The identifying ribbon shall be a PVC tape, 4 inches wide, red color, permanently imprinted with "CAUTION BURIED ELECTRIC LINE BELOW" in black letters.

- N. Plug and seal all empty spare ducts entering buildings and structures. Seal all ducts in use entering buildings and structures. Seal shall be watertight, O-Z/Gedney Type Dux Duct Sealing Compound or Engineer Approved Equal.
- O. Install duct banks in conformance with National Electrical Code and National Electrical Safety Code.
- P. Install manholes and hand holes where shown on the Drawings. Verify final locations in field.
- Q. Complete installation of manholes and hand holes so that structures are watertight. Provide expansion/deflection fitting for each conduit entry into the manholes.
- R. Provide sump opening in manhole floor.
- S. Provide grading rings or brick stacks for manholes when required to adjust manhole cover to proper grade. Stacks shall be minimum of 12 inches in height, constructed on the roof slab or cone section on which the manhole frame and cover shall be placed. The height of the stack shall be such as is necessary to bring the manhole frame to the proper grade.
- T. Cable Racks:
 - 1. Provide cable hooks to support each cable on each rack along the cable run within the manholes.
 - 2. Individually support each cable at each hook on porcelain insulators.
 - 3. In the manhole securely tie each cable in place at each insulator block to prevent excessive movement of insulators, cables, or fireproof tape. Tie cables with non-metallic 3/4 inch strapping tape or tie down with nylon straps.
- U. Conduits shall extend 3 inches above concrete slab surface, unless otherwise indicated. All conduits shall be bushed to protect cables and provide means for grounding.
- V. Duct Bank Conduit Spacers: Non-metallic, snap together intermediate and bottom pieces, sized for conduit diameter and code spacing. Separators shall be compatible with the conduit utilized. The joints of the conduits shall be staggered by rows and layers so as to provide a duct line having the maximum strength. During construction, partially completed duct lines, shall be protected from the entrance of debris such as mud, sand, and dirt by means of suitable conduits plugs. As each section of a duct line is completed, a testing mandrel not less than 12 inches long with a diameter 1/4 inch less than the size of the conduit, shall be drawn through each conduit, after which a brush having the diameter of the duct, and having stiff bristles shall be drawn through until the conduit is clear of all particles of earth, sand and/or gravel; conduit plugs shall then be immediately installed. Provide a plastic pull rope, having a minimum of 3 additional feet at each end, in all spare ducts.

3.03 DUCT BANK INSTALLATION

- A. All bends shall have a radius greater than 36 inches or 12 times conduit inside diameter whichever is greater.
- B. Install duct with minimum slope of 3 inches per 100 feet. Slope duct away from building entrances.
- C. Install no more than equivalent of three 90-degree bends between pull points.
- D. Provide suitable fittings to accommodate expansion and deflection where required.
- E. Use suitable separators and chairs installed not greater than 4 feet on centers. Conduit separation shall be per code, and not less than 3 inches.
- F. Securely anchor duct to prevent movement during concrete placement. Use reinforcement holders at spacers and secure with #4 reinforcement driven into the earth a minimum of 1 foot.
- G. Connect to manhole wall using No. 6 re-bar dowels. Dowels shall be located at each corner, and 12 inches on center. Insert dowels minimum 3 inches into manhole and 3 feet into duct bank.
- H. Tops of concrete-encased ducts shall be:
 - 1. Not less than 24 inches and not less than shown on the Drawings, below finished grade.
 - 2. Not less than 30 inches and not less than shown on the drawings, below roads and other paved surfaces.
- I. Tops of direct burial ducts and conduits shall be:
 - 1. Not less than 24 inches and not less than shown on the drawings, below finished grade.
 - 2. Not less than 30 inches and not less than shown on the drawings, below roads and other paved surfaces.

3.04 PRE-CAST MANHOLE INSTALLATION

- A. Install and seal pre-cast sections in accordance with manufacturer's instructions.
- B. Install manholes plumb.
- C. Attach cable racks to inserts after manhole installation is complete.

- D. Provide 12 inches minimum $\frac{3}{4}$ inch crushed stone bedding under manholes, and 12 inches gravel fill around manholes.
- E. Conduit/Ductwork penetration shall be grouted and sealed. Penetration shall be watertight.

3.05 CONDUIT WATERPROOFING

- A. Waterproofing of conduit joints shall conform to the following:
 - 1. Non-metallic PVC Conduit, temperature rated for 90 degrees C. The end of the conduit shall be liberally coated with approved wall weather quick-set clear cement before joining. Joint shall be inserted into the coupling, pushing firmly and rotating conduit until it reaches the pre-formed stopping ridge within the coupling.
 - 2. The entire work area of the joint, plus a minimum distance of 6 inches both ways, shall be thoroughly cleaned (with a solvent if recommended by the respective manufactures) removing all foreign debris such as dirt, sand and mud prior to the following work being started.
 - 3. Pipe insulating putty shall be applied to the entire circumference of the coupling ends to provide a smooth tapered surface.
 - 4. Apply a quick-drying, non-sag, rubber based primer to the conduit joints, extending the primer application the entire length of the proposed tape wrap.
 - 5. Apply an all-weather, corrosion protection tape to the conduit joint area providing two full half-lap wraps the entire length of the joint; which is considered a minimum distance of 4 inches past the end of the coupling in both directions.
 - 6. Install a heat-shrinkable tubing to the conduit joint area. Tubing shall extend a minimum distance of 2 inches past the end of the tape wrap in both directions.

3.06 CABLE PULLING

- A. The inspection, handling, storage, temperature conditioning prior to installation, bending and training limits, pulling limits, and calculation parameters for installation of all cables must comply with the manufacturer's recommendations. For ease of installation and prevention of cable damage, the Contractor shall utilize quadrant blocks located properly along the cable run. Failure to comply with any of the above shall make the Contractor responsible for any cable failures that occur within the manufacturer's warranty period.
- B. Cable lubricant shall be soapstone, graphite or talc for rubber or plastic jacketed cables.
- C. Lubricants for assisting in the pulling or jacketed cables shall be those specifically recommended by the cable manufacturer.

- D. Cable pulling tensions shall not exceed the maximum pulling tensions recommended by the cable manufacturer.
- E. All medium voltage cables shall be individually fire/arc proofed.

3.07 CABLE TERMINATIONS

- A. Terminations of insulated power and lighting cables shall be protected from accidental contact, deterioration of coverings and moisture by the use of terminating devices and materials. Terminations shall be made using materials and method as indicated or specified herein or as designed by the written instruction of the cable manufacturer and termination kit manufacturer.

3.08 GROUNDING

- A. Duct banks shall be grounded with a bare stranded copper ground wire that is run within the duct bank and is bonded and grounded at both ends. Conduit shall not be used as the ground conductor.
- B. Manholes shall be grounded with ground rods. A bare stranded copper ground wire from the ground wire loop shall be used to bond together and ground the manhole cover frame, ladder support bracket, concrete inserts, cable racks, duct bank ground conductors, and the shields of any medium voltage cables that are spliced in the manhole.
- C. Grounding: Install a ground rod for each manhole. Bond all exposed metal manhole accessories and the concrete reinforcing rods with bare copper wire and connect to the ground rod and to the ductbank ground cable. Provide foam sealant for rod penetration in manhole floor for water tight seal.
- D. Install a bare stranded copper duct bank ground cable in each duct bank envelope. Make ground electrically continuous throughout the entire duct bank system. Connect ground cable to building and station ground grid or to equipment ground buses. In addition, connect ground cable to steel conduit extensions of the underground duct system, manholes and hand holes. Provide ground clamp and bonding of each steel conduit extension, where necessary to maintain continuity of the ground system.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 – GENERAL

1.01 SUMMARY OF WORK

- A. Provide all excavation, filling, back filling, removal of materials, surface repair and related appurtenances for the Work as specified and as indicated on the Drawings. Earthwork for utilities is included in this section.

1.02 REFERENCES

A. NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- 1. NFPA 495: Code for the Manufacturer, Transportation, Storage, and Use of Explosive Materials.

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.

B. SD-06 REPORTS

- 1. Provide test reports for all materials which are used as part of the Work. Include material gradations from a certified testing laboratory for all materials.
- 2. Provide field compaction testing results for fill areas, paved subgrade areas, utility trenches, etc. as specified and as directed by the Engineer for an independent testing laboratory.

1.04 REGULATORY REQUIREMENTS

- A. Conform to applicable codes & NFPA 495 for explosive disintegration of rock.
- B. Obtain permits from authorities having jurisdiction before explosives are brought to the project site or drilling is started.

1.05 PROTECTION

- A. Do not operate equipment on paved surfaces which will cause damage.
- B. Maintain excavations with approved barricades, lights, and signs to protect life and property until excavation is filled and graded to a condition acceptable to the Engineer.

- C. Protect structures, utilities, sidewalks, pavement, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations.

1.06 EXISTING SITE CONDITIONS

- A. Data on indicated subsurface conditions are not intended as representations or warranties of accuracy or continuity between soil borings. It is expressly understood that Owner will not be responsible for interpretations or conclusions drawn therefrom by the Contractor. Data is made available for convenience of Contractor. Additional test borings and other exploratory operations may be made by Contractor at no cost to the Owner.
- B. Demolish and completely remove from the site, all existing underground utilities indicated to be demolished or removed. Provide services of utility companies for shut-off of utilities, services and related systems if lines are active.
- C. Provide test pits where shown on the Drawings or as directed by the Engineer. Comply with all requirements of this section and the Contract Documents.
- D. The use of explosives is permitted but requires written authorization from the Engineer.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Suitable Materials: Suitable materials shall be as shown on the Drawings or as specified.
- B. Unsuitable Materials: Material containing excessive plastic clay, vegetation, organic matter, debris, pavement, stones or boulders over 6 inches in greatest dimension, frozen material, concrete, pavement, CMU, demolition debris and material which, according to the Engineer, will not provide a suitable foundation or subgrade.
- C. On-Site Material: Any suitable material from on-site excavation.
- D. Material for embankments and general fills may contain pieces of excavated ledge having a greatest dimension of up to 6 inches if approved by the Engineer.
- E. Inspection: The Engineer may inspect off-site sources of materials and order tests of these materials to verify compliance with these Specifications.

2.02 AGGREGATE BASE

- A. Hard durable gravel containing only particles passing the 2-inch sieve. All material shall meet MDOT “Standard Specification” Section 703.06, Type A aggregate. The material shall have the following sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
2-inch	100
½-inch	45-70
¼-inch	30-55
No. 40	0-20
No. 200	0-5

2.03 AGGREGATE SUBBASE (GRAVEL)

- A. Hard, durable stone with coarse to fine sand. All particles shall pass the 6-inch sieve and meet MDOT “Standard Specification” Section 703.06, Type D aggregate. That portion which passes the 3-inch sieve shall have the following sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
3-inch	100
¼-inch	25-70
No. 40	0-30
No. 200	0-7

2.04 SAND

- A. All sand shall meet the following sieve analysis by weight:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
3/8-inch	100
No. 4	95-100
No. 16	50-85
No. 200	2-10

2.05 ¾” CRUSHED STONE

- A. Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight shall be as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1.5 - inch	100
¾-inch	90-100
½-inch	0-55
3/8-inch	0-25
No. 4	0-10
No. 200	0-2

2.06 2" CRUSHED STONE

- A. Durable, clean angular rock fragments obtained by breaking and crushing rock material. Sieve analysis by weight shall be as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
2-inch	100
1-inch	35-70
No. 4	0-5
No. 200	0-1

2.07 REFILL MATERIAL

- A. Provide $\frac{3}{4}$ inch crushed stone for refilling excavation below grade or rock excavation unless otherwise directed by the Engineer.

2.08 COMMON BORROW

- A. Earth suitable for embankment construction free from frozen material, perishable rubble, peat and other unsuitable material.

2.09 MOISTURE CONTENT

- A. Moisture content shall be sufficient to provide required compaction and stable embankment but not exceeding 4% above optimum as determined using AASHTO T180, method C or D.

2.10 SELECT BACKFILL

- A. Use aggregate base as specified above.

2.11 GRANULAR FILL

- A. Soil material free from organics, frozen material and other deleterious substances meeting the following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
6-inch	100
No. 4	25-90
No. 40	0-50
No. 200	0-20

2.12 STRUCTURAL FILL

- A. Soil for placement adjacent to building foundations (interior and exterior) and exterior foundations and structures shall be a clean, free draining, granular material meeting the following gradation:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
4-inch	100
3-inch	90-100
No. 4	25-90
No. 40	0-30
No. 200	0-5

2.13 UNDER DRAIN FILTER SAND

- A. Granular material for under drain filters shall be free from organic matter and shall conform to the MDOT "Standard Specifications" Section 703.22 for under drain Type. Sieve analysis by weight shall be as follows:

<u>Sieve Size</u>	<u>% Passing by Weight</u>
1-inch	100
½-inch	75-100
No. 4	50-100
No. 20	15-80
No. 50	0-15
No. 200	0-5

2.14 RIP RAP

- A. Provide sound, durable rock, which will not disintegrate due to exposure to water or weather; angular in shape such as rough, unhewn quarry stone or fragments obtained by blasting, breaking or crushing natural rock. Rounded boulders or cobbles shall not be permitted.
- B. Rip Rap: Stone size shall conform to a grain diameter of $D_{50} = 8$ -inch, with a maximum stone size of 12-inch. That is, 50% of the stone, by weight, shall be larger than 8 inches in diameter and 50% of the stone by weight shall be small than 8 inches in diameter.
- C. Heavy Rip Rap: Minimum weight of 500 pounds each and at least 50 percent of the stones, by volume, shall exceed 1,000 pounds each.

2.15 WOVEN FILTER FABRIC

- A. Provide woven geotextile for applications for subgrade separation and confinement of base materials. Filter fabric shall be composed of high-tenacity polypropylene yarns, which are woven into a stable network such that the yarns retain their relative position. Geotextile shall be inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids. Provide materials in accordance with MDOT "Standard Specification," Section 722.

2.16 NON-WOVEN FILTER FABRIC

- A. Provide a needle-punched nonwoven geotextile composed of polypropylene fibers, which are formed into a stable network such that the fibers retain their relative position. Geotextile shall be inert to biological degradation and resists naturally encountered chemicals, alkalis, and acids. The geotextile shall meet AASHTO M288-06 Class 2. Provide materials in accordance with MDOT "Standard Specification," Section 722.

2.17 POLYETHYLENE LINER

- A. Provide a U.V. Resistant liner with a minimum thickness of 6 mils.

PART 3 – EXECUTION

3.01 EXCAVATION – GENERAL

- A. Remove all materials encountered to the limits shown on the Drawings, or designated in the Specifications.
- B. Do not perform rock excavation or excavation of unsuitable materials until material to be excavated has been cross-sectioned and classified by the Engineer. Predrilling and blasting of bedrock through overburden will not be allowed. However, if this method is used, the rock excavation quantities will be adjusted downward in proportion to the ground swell from this blasting method.

3.02 EARTH EXCAVATION

- A. Removal and disposal of pavements and other obstructions visible on ground surface, underground structures and utilities indicated to be demolished and removed, and other materials encountered that are not classified as rock excavation or unauthorized excavation.

3.03 EXCAVATION FOR STRUCTURES

- A. Conform to elevations and dimensions shown within a tolerance of plus or minus 0.10', and extending a sufficient distance from footings and foundations to permit placing and removal of concrete formwork, installation of services, other

construction, and for inspection. In excavating for footings and foundations, take care not to disturb bottom of excavation. Excavate by hand to final grade just before concrete reinforcement is placed. Trim bottoms to required lines and grades to leave solid base to receive other Work.

3.04 ROCK EXCAVATION

- A. Removal and disposal of materials that cannot be excavated without drilling and blasting, or requiring use of special equipment, except such materials that are classified as earth excavation.
 - 1. Typical materials classified as rock are solid rock, rock in ledges, and rock hard cementitious aggregate deposits.
 - 2. Intermittent drilling or ripping performed to increase production and not necessary to permit excavation of material encountered will be classified as earth excavation.
 - 3. Rock excavation shall not include; removal of material which can be removed with a hand pick or power shovel or loose or previously blasted rock or broken stone in rock fills or elsewhere.
- B. Rock excavation payment limits shall be in accordance with the following unless otherwise specified or indicated on the Drawings:
 - 1. Two feet outside of concrete Work for which forms are required, except footings and base slabs.
 - 2. Manholes & Precast Concrete Structures: As shown on the Drawings for manholes and precast structures.
 - 3. Pipe & Utility Trenches: As shown on the drawings for piping, utilities including pipe and bedding materials.
 - 4. Concrete Work (No Forms): Neat outside dimensions of concrete Work where no forms are required.
 - 5. Slabs on Grade: 6 inches below bottom of concrete slabs unless otherwise specified or as shown on the Drawings.

3.05 EXCAVATION IN PAVED AREAS

- A. Saw cut pavement prior to excavation to provide a clean, uniform edge. Minimize disturbance of remaining pavement. Cut and remove the minimum amount of pavement required to do the Work. Use shoring and bracing where sides of excavation will not stand without undermining pavement.

3.06 EXCAVATION FOR TRENCHES

- A. Produce an evenly graded flat trench bottom at the subgrade elevation required for installation of pipe and bedding material. Load excavated material directly into trucks unless otherwise permitted by the Engineer. Place backfill material directly into trench or excavation. Do not stockpile material to be used as backfill in roadways or along edges of trenches.

3.07 UNAUTHORIZED EXCAVATION

- A. Removal of materials beyond indicated subgrade elevations or dimensions without specific direction of the Engineer. Unauthorized excavation, as well as all remedial Work directed by the Engineer including refilling, shall be at the Contractor's expense.

3.08 REFILLING UNAUTHORIZED EXCAVATIONS

- A. Trenches: Use crushed stone or gravel as directed by Engineer.
- B. Elsewhere, backfill and compact unauthorized excavations as specified for authorized excavations of same classification, unless otherwise directed by the Engineer.

3.09 EXCAVATION OF UNSUITABLE MATERIALS

- A. When excavation has reached required subgrade elevations, notify the Engineer who will make an inspection of conditions. If unsuitable bearing materials are encountered at required subgrade elevations, carry excavations deeper as directed by the Engineer and replace excavated material with select backfill.

3.10 MATERIAL STORAGE

- A. Stockpile and maintain suitable surplus excavated materials for re-use as backfill anywhere within the Project limits as directed by the Engineer. Place, grade and shape stockpiles for proper drainage. Locate and retain soil materials away from edge of excavations.

3.11 BLASTING

- A. Refer to Specification 31 71 16, CONTROLLED BLASTING for additional details and requirements.

3.12 STABILITY OF EXCAVATIONS

- A. General: Slope sides of excavations to comply with OSHA Regulations and Local Codes. Shore and brace where sloping is not possible due to space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition until completion of backfilling.

- B. Refer to Specification 31 40 00, SHORING & BRACING for additional shoring and bracing requirements.

3.13 DEWATERING

- A. Refer to Specification 01 00 10, OVERALL GENERAL REQUIREMENTS for additional details and requirements.

3.14 RIPRAP PLACEMENT

- A. Place required rip-rap to full depth shown on the Drawings in one operation without special handwork. Depth shall be measured perpendicular to the face of the slope to obtain a uniform appearance true to line and grade. Place larger stones at bottom of slope. Place stones in close contact, with interlocking of face stones and backing stones. Fill openings between stones with smaller rocks or coarse gravel

3.15 BACKFILL AND FILL

- A. General: Place acceptable soil material in layers to required elevations as shown on the Drawings and as listed below. Fill, backfill, and compact to produce minimum subsequent settlement of the material and provide adequate support for the surface treatment or structure to be placed on the material. Place material in approximately horizontal layers of beginning at lowest area to be filled. Do not impair drainage.
- B. Ground Surface Preparation: Remove vegetation, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placement of fills. Scarify surfaces so that fill material will bond with existing surface. When existing ground surface has a density less than that specified under "Compaction" for particular area classification, break up ground surface, pulverize, moisture-condition to optimum moisture content, and compact to required depth and percentage of maximum density.
- C. Place backfill and fill materials in layers not more than 12 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6" in loose depth for material compacted by hand-operated tampers.
- D. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
- E. Place backfill and fill materials evenly adjacent to structures, to required elevations. Take care to prevent wedging action of backfill against structures by carrying material uniformly around structure to approximately same elevation in each lift.
- F. Do not allow heavy machinery within 5 feet of structures during backfilling and compacting
- G. Backfill excavations as promptly as Work permits, but not until completion of the following:

1. Acceptance of construction of below grade finishes including but not limited to, damp proofing, waterproofing, perimeter insulation, pipe insulation, insulation jacket, etc.
 2. Inspection and recording locations of underground utilities.
 3. Removal of concrete formwork.
 4. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in manner to prevent settlement of the structure or utilities, or leave in place if approved by the Engineer.
 5. Removal of trash and debris.
 6. Permanent or temporary horizontal bracing is in place on horizontally supported walls.
 7. Backfill cast-in-place concrete structures when the concrete has developed adequate strength.
 8. Use care in backfilling to avoid damage or displacement of underground structures and pipe.
 9. Backfill under all existing utility pipes crossed by sewer construction with 3/4" crushed stone. The crushed stone back- fill will extend continuously from the bedding of the new sewer to the utility pipe crossed, including a 6" thick envelope of crushed stone all around the existing utility pipes.
 10. The 3/4" crushed stone backfill shall stand at its own angle of repose. No "haunching" or "forming" with common fill will be allowed.
- H. Backfilling of Trenches shall be in accordance with the trench details on the Drawings. Bed pipe in accordance with details on the Drawings and as specified for the applicable type of pipe. Limits of bedding and requirements for remaining trench backfill shall be as described in the applicable pipe specification or as indicated on the Drawings.
- I. Trenches in cross-country runs shall receive surface restoration to existing conditions prior to construction unless otherwise specified or indicated on the Drawings. Mound trench 6 inches above existing grade if required by the Engineer.
- J. Replacement of unsuitable materials shall be as previously specified for below normal grade conditions. In above normal grade conditions, replace unsuitable material with suitable stored onsite material. All excess suitable on-site material shall be used before additional off-site material is used. If additional material is required provide Select Backfill.

3.16 COMPACTION

- A. Methods: Utilize methods which produce the required degree of compaction throughout the entire depth of material placed without damage to new or existing facilities and which are approved by the Engineer. Adjust moisture content of soil as required. Remove and replace material which is too wet to compact to required density. Compact each horizontal layer of fill and slopes as Work progresses.
- B. Degree of Compaction: Compact to the following minimum densities unless otherwise specified or indicated on the Drawings:

<u>Fill and Backfill Location</u>	<u>Density</u> (% of maximum, see below)
Under structure foundations	95%
2 feet under pavement and above	95%
2 feet under pavement and below	92%
Trenches through unpaved areas	90%
Embankments (including slopes)	90%
Pipe bedding	92%
Beside structure walls, foundation walls, retaining walls, tank walls	90%
Under pipes through structure fills	90%

1. Maximum Density: ASTM D1557, modified.
2. Field Density Tests: ASTM D1556 (sand cone) or ASTM D2167 (rubber balloon), or ASTM D2922 (nuclear methods).

3.17 DENSITY TESTING

- A. Determine actual in place densities using field tests as directed by the Engineer. Tests shall be made by an independent laboratory. Perform additional Work to obtain proper compaction if in-place densities do not meet the specified densities. Retesting may be required by the Engineer and shall be at no additional cost to the Owner.
- B. The Minimum Number of Tests shall be in accordance with the following criteria:
1. Paved Areas and Building Subgrade: Provide at least one field density test of subgrade for every 2,000 sq. ft. of paved area or building slab, but in no case less than 3 tests.
 2. Other Fill Areas: In each compacted fill layer, make one field density test for every 2,000 sq. ft. of overlaying building slab or paved area, but in no case less than 3 tests per fill area.
 3. Pipe Trenches: At least one test per 100 linear feet of trench per fill layer.

3.18 GRADING

- A. Grading: Provide uniform grading of areas within limits as specified or as indicated on the Drawings, including adjacent transition areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grading Outside Structure Lines: Grade areas adjacent to structure lines to drain away from structures and to prevent ponding.
- C. Finish surfaces free from irregular surface changes, and as follows:
 - 1. Lawn or Unpaved Areas: Finish areas to receive topsoil to within not more than 0.10' above or below required subgrade elevations.
 - 2. Pavements: Shape surface of areas under pavement to line, grade and cross-section, with finish surface not more than ½ inch above or below required subgrade elevation.
 - 3. Fill Under Slabs: Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of ½ inch when tested with a 10 foot straightedge.
- D. Compaction: After grading, compact subgrade surfaces to the percentage of maximum density for each area classification.

3.19 MAINTENANCE

- A. Protection of Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris. Repair and re-establish grades in settled, eroded, and rutted areas to specified tolerances.
- B. Reconditioning Compacted Areas: Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify surface, re-shape, and compact to required density prior to further construction.

3.20 DISPOSAL OF EXCESS MATERIALS

- A. Remove excess excavated material, and dispose of it in approved spoils areas. Provide removal and disposal of all excess material from the project site.
- B. Grade material to the satisfaction of the Engineer and Owner of the property on which the material is deposited.
- C. Keep roads free of debris. Use suitable watertight vehicles for hauling wet materials over roads and streets. Clean up materials dropped from or spread by vehicles promptly or when directed by the Engineer.

END OF SECTION

SECTION 31 40 00

SHORING & BRACING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide shoring and bracing to protect existing buildings, utilities, structures and other improvements. Provide shoring and bracing to prevent excavations against caving due to unstable soils. Provide shoring and bracing in accordance with OSHA safety requirements of shoring and bracing. Provide measures to dispose of water in excavations accordance with all local, state, and federal regulations. Provide removal and disposal of all shoring and bracing unless otherwise specified or indicated on the Drawings.
- B. Shoring and bracing systems include, but are not limited to, movable boxes and sheet piling. Provide movable box systems where a shoring system is required but sheet piling is not called for. Provide sheet piling where a shoring system is required but a moveable box is not sufficient.

1.02 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-07 CERTIFICATES
 - 1. Provide design and submit shoring and bracing systems sealed by a registered professional Engineer in the state of the project location.
 - 2. Submit certification indicating trench box application recommendations and applications for each trench box. Certifications shall be either sealed by a Professional Engineer registered in the state of the project location or shall be provided by the trench box manufacturer.

1.03 QUALITY ASSURANCE

- A. Design of shoring and bracing systems shall be provided by a registered Professional Engineer in State of the Project location. Design of shoring and bracing systems shall comply with local codes and OSHA requirements.

1.04 SITE CONDITIONS

- A. Before starting Work, check and verify governing dimensions and elevations. Survey condition of adjoining properties, structures, utilities, etc. with the Engineer. Take

- photographs, recording any prior settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by the Contractor, Engineer and others conducting the investigation.
- B. Survey adjacent structures and improvements, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations. Locate datum level used to establish benchmark elevations sufficiently distant so as not to be affected by excavation operations.
 - C. During excavation, resurvey benchmarks weekly, employing a licensed Land Surveyor or registered Professional Engineer in the state of the project location. Maintain accurate log of surveyed elevations for comparison with original elevations. Notify Engineer if changes in elevations occur or if cracks, sags or other damage is evident.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but should be in serviceable condition.
- B. Steel sheet piling and shapes (corners, etc.) shall be continuous interlocking type. Provide section modules and type of sections as required by design.
- C. Bracing members shall be wood timbers or A36 steel members.
- D. Bolts shall be in accordance with ASTM A307.

PART 3 – EXECUTION

3.01 GENERAL

- A. Provide shoring and bracing systems to resist earth and hydrostatic pressures, including surcharges from surface loads and construction equipment.
- B. Locate shoring and bracing to clear permanent construction and to permit forming and finishing of concrete.
- C. Maintain shoring and bracing while excavation is open.
- D. Remove systems in stages to prevent disturbance of soils and damage to structures and improvements. Fill voids as soon as sheeting is withdrawn.

3.02 STEEL SHEET PILING AND BRACING

- A. Drive sheet piling prior to excavation where possible. Fill and compact voids outside sheeting to hold sides of excavation in place.

- B. Brace as required to prevent distortion of piling and other bracing members. If necessary to move a brace, install new bracing prior to removal of original brace.
- C. Cut off sheet piling to be left in place at least two feet below finish grade.

END OF SECTION

SECTION 31 71 16

CONTROLLED BLASTING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. All rock (ledge) excavated using drilling and blasting techniques shall be performed in accordance with the requirements of this specification and the Contract Documents. Employ controlled blasting procedures in order to maintain ground vibration readings below the maximum levels specified in this section, and to minimize stressing and fracturing of the rock (ledge) beyond the limits of excavation as specified of as indicated on the Drawings.
- B. A Pre-blast Survey shall be the responsibility of the Contractor. Provide a pre-blast survey prior to any blasting or blasting related operations.
- C. All owners of dwellings or residences located within 300 feet of the blasting location shall be notified, in writing, by the Contractor a minimum of 30 days prior to the scheduled blasting date regarding the proposed blasting and how to request a pre-blast survey. Upon request, the Contractor shall determine the pre-blasting condition of any structure located within this area and prepare a written report. The pre-blast survey shall be limited to the surface conditions of the structures but shall comply in all respects with 30 CFR Section 816.62.
- D. The Pre-blast Survey shall include, but is not limited to the following:
 - 1. Provide video and still photos of each structure within 300 feet of the blasting location to show pre-blast conditions. Highlight existing defects in structures pavements and related site conditions. Provide some means of establishing scale of existing defects (i.e. include tape measure or folding ruler at defect during videotaping).
 - 2. Videotaping shall be done with commercial grade equipment to allow equipment still viewing without distortion of the viewed area.
 - 3. Still photos and DVD videos shall be retained by the pre-blast surveyor and shall be available for viewing by the Owner and Engineer within 24 hours upon request.
- E. Notification: The Contractor shall be responsible for publishing notice of the blasting schedule in a newspaper of local publication and circulation. Provide notifications by certified-mail to all property owners within 300 feet of the property at least seven (7) days prior to the start of blasting. Copies of the blasting schedule shall also be distributed to residences and public utilities within a half mile of the blasting activity.

- F. Blast Monitoring: Provide a seismograph capable of providing time-history waveform recording of particle motion, and acoustical data to monitor blasting events. Monitor at locations designated by the Engineer. Air blast and particle velocities shall not exceed standards specified. Immediately notify the Engineer if the standards are exceeded.
- G. Documentation: Submit an accurate record of the blasting operation to the Engineer. A copy shall be retained by the blasting firm for at least 3 years. This record shall consist of information as listed in 30 CFR Section 816.68., including but not limited to the following:
1. Name of the firm conducting the blast.
 2. Location, date, and time of the blast.
 3. Name, signature, and certification number of the blaster conducting the blast.
 4. Location of blast points and distances from existing structures.
 5. Weather conditions, including those which may cause possible adverse blasting effects.
 6. Type of material blasted.
 7. Sketches of the blast pattern including number of holes, burden, spacing, decks, and delay pattern.
 8. Diameter and depth of holes.
 9. Types and total weight of explosives used.
 10. Types of detonators used and delay periods.
 11. Height or length of stemming.
 12. Mats or other protections used.
 13. Seismographic and air blast records, which shall include: type of instrument, sensitivity, and calibration signal or certification of annual calibration; exact location of instrument, date, time, distance from the blast; and the peak particle velocities and frequencies) and air blast pressures recorded.
- H. Prior to commencement of production blasting, establish site-specific relationship between charge weight, distance and response by using small charges and the required monitoring instruments.
- I. Prior to the commencement of production blasting, the Contractor shall perform a test blasting program to determine maximum peak particle velocities and frequencies, which will allow the Contractor to perform the work without damaging adjacent

property. One week in advance submit details of the test blasting program including but not limited to a detailed description of the test blasting program and monitoring. It is possible that maximum peak particle velocities and frequencies specified may be changed pending the results of the test blast program. If these values require modification, it shall result in no additional cost to the Owner for the Work.

- J. In the event that a blasting round results in ground vibrations or air blast overpressures that exceed the blasting limit criteria specified herein, prior to any subsequent rounds, revise the round design as required to appropriately reduce the vibrations and air blast pressures to fall within the specified limits.
- K. Review by the Owner's Representative of documents submitted by the Contractor shall not relieve the Contractor of his sole responsibility for the means, methods, procedures or techniques of the blasting, or the accuracy, adequacy, and safety of the blasting, exercising proper supervision and field judgment, and producing the results within the blasting limits required by these specifications.

1.02 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:

- B. SD-02 SHOP DRAWINGS

- 1. At least two (2) weeks prior to commencing drilling and blasting operations, submit a plan of proposed blasting operations, including but not limited to the following:
 - a. Details of the Test Blasting Program.
 - b. The general method of developing the excavation, lift heights, sequence of blasting, mucking, scaling installation activities, and approximate duration of each activity.
- 2. Details of typical production round (away from the perimeter of excavation) and specifics of all pre-split blasting at the perimeter of the excavation, including:
 - a. Diameter, spacing, burden, depth and orientation of drill holes.
 - b. Type and nomenclature of detonators, and delay pattern(s).
 - c. Type, nomenclature, and weight per cartridge of explosives to be used, weight and distribution of charge to be used within each hole, as well as total weight of explosive charge on each delay, and the total weight for the blast round.
 - d. Type and distribution of stemming to be used.
 - e. Estimates of vibration levels at nearest adjacent structures.

3. Methods of matting or covering of the blast area to prevent fly rock particles and air blast pressure.
 4. Name and qualifications of the person responsible for designing and directing the blasting. This designated individual must be present and responsible for all blasts. This requirement is mandatory.
 5. A copy of the blasting permit obtained to conduct blasting on the site.
 6. A plan showing the proposed locations of blast monitoring instruments.
 7. A general schedule of all blasting activities.
- C. Notify, at least seven (7) days prior to commencement of blasting operations, those identifiable persons, companies, corporations, or public utilities contacted that own, lease, or occupy property or structures in the proximity to the site of the work in which it is the intention to use explosives. Submit records of each notice delivered.
- D. Progress Submittals: Within 24 hours following each blasting day, the Contractor shall submit a Blasting Report, which shall include the following items:
1. Details of the round as shot, including blast number, drill holes diameter, spacing, burden, depths, delay pattern used with charge weights for each delay, and loading configuration of typical holes.
 2. A plan drawing, to scale, showing the locations and elevations of each blast monitoring instrument, as well as the location of each round.
 3. Results of blast monitoring at each instrument location, including peak particle velocity in inches per second (in./sec.), frequency in hertz (Hz) and peak air blast overpressure in pounds per square inch (psi). Aforementioned data to be obtained from a Contractor's testing agency and incorporated into the report.

1.03 BLAST SCHEDULING

- A. Coordinate the general blasting schedule with the Owner and Engineer. The Owner will provide a direct phone number to the Town Office. The Contractor shall contact the Town Office with this direct line phone five minutes in advance of each blast round. This requirement is mandatory.
- B. Blasting Hours: 7:30 a.m. to 3:30 p.m. / Monday – Friday. Blasting on weekends and holidays is strictly forbidden unless the Contractor receives advanced written permission from the Owner and Engineer.

1.04 SAFETY PRECAUTIONS

- A. Any site where electric blasting caps are located or where explosive charges are being placed or have been placed shall be designated as a “Blasting Area”. A “Blasting Area” within 300 feet of any traveled way shall be marked with information similar to the following:

“BLASTING AREA. TURN OFF ALL TRANSMITTERS AND TWO WAY
RADIOS”

and on the reverse side:

“END OF BLASTING AREA”

The Contractor will be required to conduct a stray current check, in the presence of the Owner and Engineer at all blasting zones and adjacent areas to evaluate potential electrical interference prior to test blasting program.

- B. No blasting shall be permitted until all personnel in the danger zone have been moved to a place of safety. A suitable warning system shall be implemented and tested prior to live blasting.
- C. Explosives shall be stored, handled, and employed in accordance with federal, state, and local regulations and in accordance with NFPA 495.
- D. Determine any and all other safety requirements unique to the blasting operation on this particular site so as not to endanger life, property, utility services, any existing or new construction, or any property adjacent to the site.
- E. No requirements of, or omission to require, any precautions under this Contract shall be deemed to limit or impair any responsibility of obligations assumed by the Contractor under or in connection with this Contract, and the Contractor shall at all times maintain adequate protection to safeguard the public and all persons engaged in the work, and shall take such precautions as will accomplish such end, without undue interference with the public. The Contractor shall be solely liable and responsible for and pay for all damage to adjacent structures, other property damages, bodily injury and death resulting from conducting blasting.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of all applicable safety codes including without limitation the following Codes and Standards:
1. National Fire Protection Association (NFPA) 495 Code for manufacturing Transportation, Storage and Use of Explosive Materials.

2. Occupational Safety and Health Act of 1970 (Public Law 91-596 of the United States, 29 USC Section 651 et. seq.)
3. State of Maine Department of Public Safety - "Rules and Regulations for Keeping, Dispensing or Transporting of Explosives".
4. State of Maine Department of Transportation "Standard Specifications" Section 107.12, Use of Explosives.
5. Associated General Contractors of America, Inc. "Manual of Accident Prevention in Construction".
6. Applicable provisions of local law and ordinances, and any requirements of the of the local Fire department, related to storage and handling of explosives.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

3.01 BLASTING REQUIREMENTS

- A. Blast only after written approval has been given by the Owner and Engineer to proceed with blasting operations.
- B. Blasting shall be done by authorized, skilled operators with a minimum of five (5) years' experience in a manner which complies with all federal, state and local regulations related to the work. All necessary precautions shall be taken to avoid damage to persons and property.
- C. All necessary precautions shall be taken in blasting operations to preserve the rock (ledge) outside the lines of excavation in the soundest possible condition. Blast only to the lines and grades as specified, as shown on the Drawings or as approved by the Engineer. Blasting operations shall not be carried out within 10 feet of existing structures except where specifically indicated. Rock (ledge) removal within ten feet of existing structures shall be removed by line drilling in close patterns with the use of minimal blasting charges or by manual/ mechanical methods.
- D. The explosives used shall be of such quality and power and shall be used at such locations as will neither open seams or crack or damage the rock outside of the prescribed limits of excavation. The firing of system blasts shall be controlled by the use of delay exploders. Millisecond delay firing shall be used in all blasting operations except in holes in a single delay for pre-splitting, unless otherwise approved by the Engineer.
- E. As the excavation approaches the final grade lines, the depth of the holes for blasting and the amount of explosives used per hole shall be progressively reduced. Whenever further blasting may injure the rock (ledge), rock slopes, or existing structures, the use

of explosives shall be discontinued and the excavation shall be completed by wedging, barring, channeling, line drilling, broaching, or other suitable methods.

3.02 FLY ROCK

- A. Fly rock shall be controlled so that it does not present a hazard to people working on the site or other personnel outside the site. Fly rock shall not be cast beyond the site limits or more than one half the distance to the nearest structure or paved sidewalk or roadway. Blasting mats shall be utilized at all times to prevent fly rock.

3.03 VIBRATION

- A. Conduct all blasting operations in such a manner that peak particle velocities (ppv) shall not exceed two (2.0) inches per second. Displacements shall not exceed 0.008 inches. Ground displacements shall be computed from measured ppv and frequency by the following formula.

$$\text{Displacement (in.)} = \frac{\text{ppv (in/sec)}}{6.28 \times \text{frequency (Hz)}}$$

The ground vibration shall not exceed the frequency dependent peak particle velocity limits shown on the Drawings, U.S. Bureau of Mines RI 8507. A copy of that figure has been included at the end of this Section.

- B. New Concrete: Blasting shall be conducted such that the peak particle velocity at new concrete or grout with an age of 7 days shall not exceed 1.0 inch per second.

3.04 AIR BLAST PRESSURES

- A. Conduct all blasting operations in such a manner that peak air blast overpressures of 0.014 psi are not exceeded. The sound level at the nearest property line shall not exceed 129 dBL. Blasting shall occur no more than 4 times per day. If multiple blasting operations are to occur in one day the noise level at the nearest property line shall not exceed the following limits per blast:

<u>Number of Blasts per Day</u>	<u>Sound Level Limit</u>
1	129 dBL
2	126 dBL
3	124 dBL
4	123 dBL

- B. Blast sound shall be measured in peak linear sound level (dBL) with a linear response down to 5 Hz.

3.05 SUB-DRILLING

- A. Sub-drilling in excavations to grade without prior written approval by the Engineer is prohibited.

3.06 LIFTERS & SNAKE HOLES

- A. Do not use lifters or snake holes without express written approval of the Engineer.

3.07 ROCK REMOVAL

- A. Blasting shall not be used as a method of removing rock (ledge) from the excavation.

3.08 LIABILITY

- A. The Contractor shall be liable for all damages to property caused by blasting or explosives or arising from neglect to properly guard and protect the excavations and all portions of the Work, and shall wholly indemnify the Owner against any claims on such account. No additional compensation shall be permitted to the Contractor in any event, or under any circumstances, for loss incurred or arising from neglect to fully comply with these requirements, the Contract Documents and all applicable blasting regulations.

3.09 BLASTING MONITORING

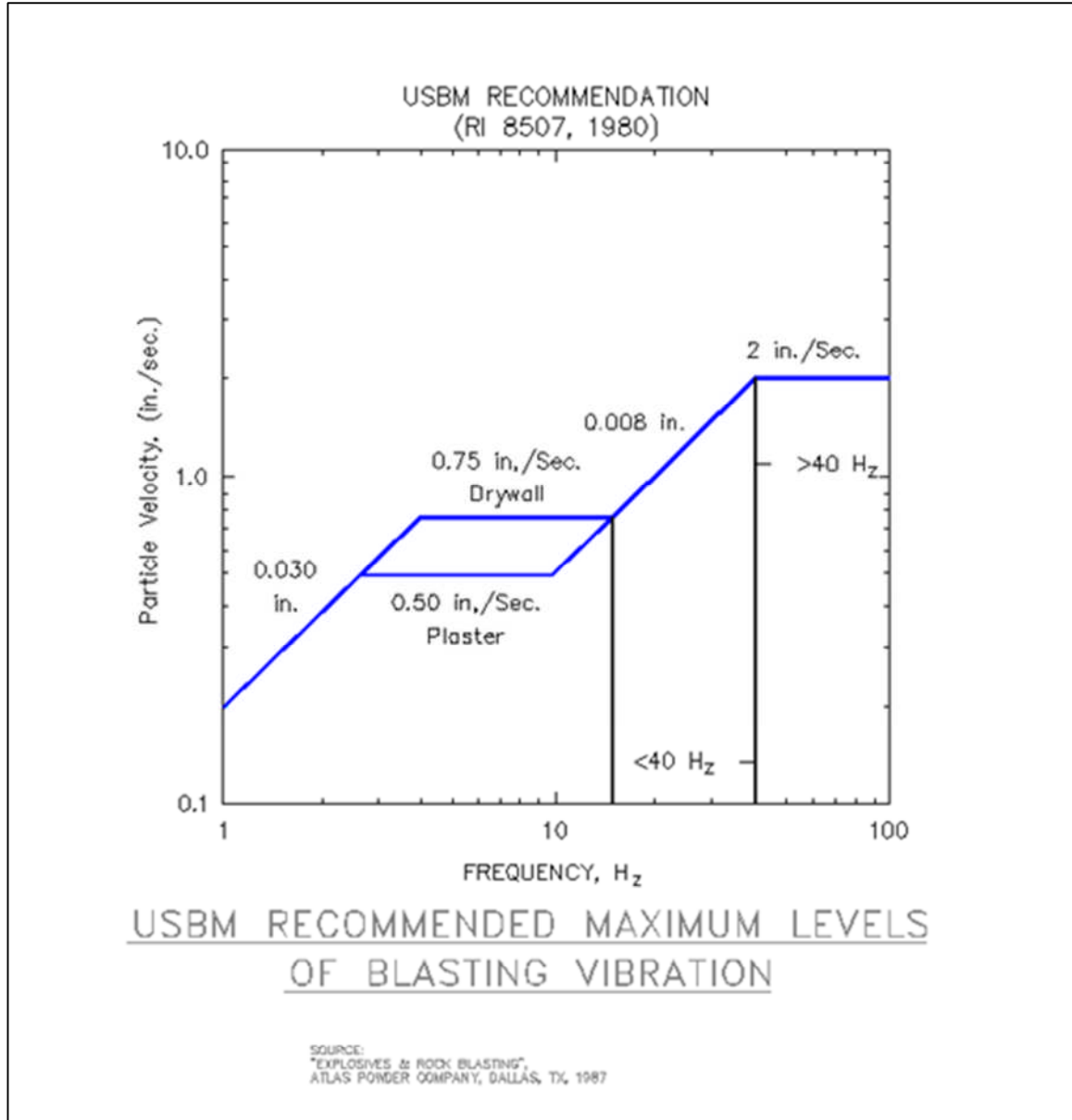
- A. The effects of the blasting and excavation on instrumentation placed for monitoring soil and rock slope movement and excavation closure shall be monitored by the Blasting Contractor. Indications of movement and the Contractor's proposed remedy for eliminating the movement shall be reported to the Engineer. No remedial construction shall occur without approval of the Engineer.
- B. At a minimum, the Contractor shall establish vibration monitors at the nearest adjacent structures. Site specific scaled distance relationships shall be developed from the Contractor's test blast rounds to determine the allowable charge weight of explosives to be detonated in any 8-millisecond period (to be considered on delay). The scaled distance (DS) is computed by the following equation: $DS = D/(W^{1/2})$ where, D equals the distance from the charge to the recording instrument in feet. W equals the weight of explosive charge in pounds per single delay.

3.10 SPECIAL PERIMETER CONTROL BLASTING

- A. When blasting at the perimeter of the excavation, care shall be taken at the excavation limits to minimize over break and fracturing of remaining rock (ledge).
- B. The specific requirements of this section are not intended and should not interfere with the ability of the Contractor to alter spacing of holes and explosive loading so that adequate rock breakage may be obtained.

- C. Pre-Splitting blast holes shall be loaded and fired separately before production blasting within excavation limits to create a fracture plane along the perimeter of the excavation.

3.11 PEAK PARTICLE VELOCITY LIMITS



END OF SECTION

SECTION 33 31 00

SANITARY UTILITY SEWERAGE PIPING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide new sanitary sewer, storm drain and pressure piping systems as specified and as indicated on the Drawings. The Work may include but is not limited to sanitary sewer piping, wastewater force main pressure piping, sewer services, storm drains, culverts, under drains and drain piping associated with clay dams. Provide all related appurtenances including but not limited to pipe fittings, thrust blocks, restraints, pipe supports, couplings and related items for complete systems.
- B. The piping included in this specification section may or may not all be required for the work outlined in the Contract Documents. Provide all piping that is indicated on the Drawings, is specified, and/or is required to complete the work outlined in the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)
 - 1. AASHTO M 252(2009) Standard Specification for Corrugated Polyethylene Drainage Pipe
 - 2. AASHTO M 294(2009) Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter
- C. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM D 3350 (2010) Polyethylene Plastics Pipe and Fittings Materials
 - 2. ASTM D 3034 (2008) Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
 - 3. ASTM D 3212 (2007) Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

4. ASTM F 477 (2008) Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
5. ASTM F 405 (2005) Corrugated Polyethylene (PE) Tubing and Fittings

D. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C104/A21.4 (2008; Errata 2010) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. AWWA C110/A21.10 (2008) Ductile-Iron and Gray-Iron Fittings for Water
3. AWWA C111/A21.11 (2007) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C150/A21.50 (2002; Errata 2003; 2008) Thickness Design of Ductile-Iron Pipe
5. AWWA C151/A21.51 (2009) Ductile-Iron Pipe, Centrifugally Cast, for Water
6. AWWA C906 (2007) Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) through 63 In., (1,575 mm) for Water Distribution and Transmission

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units.

B. SD-03 PRODUCT DATA

1. Provide Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Product data shall also include dimensional data for each type of pipe, tube, and fitting.
2. Prior to shipment of pipe, submit a certified affidavit of compliance from the pipe Manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance with AWWA and ASTM standards as well as the requirements specified herein.

C. SD-06 REPORTS

1. The Contractor shall submit test reports for each section of piping tested for pressure and leakage.
2. Construction Records: Record depth and location of the following:
 - a. Sewers

- b. Service capped ends, cleanouts, bends in services, connection points to sewer main.
- c. Repairs to existing pipes.
- d. Force Main Pressure Piping
- e. Record all records neatly in a permanently bound notebook and submit to Engineer at Substantial Completion. Provide access to records for the Engineer at all times. Submit progress copies to the Engineer on a weekly basis.

1.04 QUALITY ASSURANCE

- A. Provide removal and disposal of all damaged pipe from the project site.
- B. All piping utility work shall be in accordance with the Maine Department of Transportation; Utility Location, Road Opening and Entrance Permits.

1.05 SITE CONDITIONS

- A. Weather and seasonal limitations shall be in accordance with MDOT "Standard Specification" Section 401.07.

PART 2 – PRODUCTS

2.01 PIPE AND FITTINGS - GENERAL

- A. Unless otherwise indicated, all fittings and appurtenances shall be of the same type and grade of materials as the connecting pipe. All products provided under this section shall conform to current AWWA and ANSI specifications as appropriate to the type of pipe specified.
- B. Provide commercially manufactured wyes or tees for service connections. Fittings shall have single piece gasket.

2.02 CULVERTS & STORM DRAINS

- A. Provide culverts, culvert replacement and storm drain piping as specified and as indicated on the Drawings. Pipe and fittings shall be corrugated exterior polyethylene drainage pipe, smooth wall interior, highway grade in accordance with AASHTO M294 and ASTM D3350.
- B. Pipe shall be joined using a bell & spigot joint meeting AASHTO M252, AASHTO M294, or ASTM F2306. The joint shall be soil-tight and gaskets, when applicable, shall meet requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and shall be covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant supplied by the manufacturer shall be used on the gasket and bell during assembly.

- C. Fittings shall conform to AASHTO M252, AASHTO M294, or ASTM F2306. Bell and spigot connections shall utilize a spun-on or welded bell and valley or saddle gasket meeting the soil-tight joint performance requirements of AASHTO M252, AASHTO M294 or ASTM F2306.
- D. Virgin material for pipe and fitting production shall be high-density polyethylene conforming with the minimum requirements of cell classification 424420C for 4 inch through diameters, and 435400C for 12 inch through 60 inch diameters, as defined and described in the latest version of ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Sections 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectively.
- E. High density polyethylene storm drain and culvert piping shall be a product of the following manufacturer:
 - 1. Hancor, Inc. – Surelock
 - 2. ADS, Inc. - N-12 WT IB
 - 3. Engineer Approved Equal

2.03 GRAVITY SEWER PIPE & FITTINGS – TYPE (PVC/5)

- A. All “TYPE (PVC/5)” gravity sewer piping shall be PVC, SDR 35 in accordance with ASTM D3034 for sizes 4 inch to 15 inch and ASTM F679 for sizes 18 inch to 48 inch. Pipe and fittings shall be PVC in accordance with ASTM D1784 Cells Class 12454 or 12364. Gaskets shall be Nitrile (NBR/Buna-N) in accordance with ASTM F477. Joints shall be push-on integral bell and spigot in accordance with ASTM D3212. Pipe stiffness shall be in accordance with ASTM D2412 with $F/\Delta Y = 46$ psi or 115 psi. Provide factory pre-fabricated wyes and fittings which match the properties of the connecting pipe. All gravity sewer piping shall be a product of the following manufacturer:
 - 1. J-M Manufacturing Company – Ring-Tite
 - 2. North American Pipe Corporation
 - 3. Engineer Approved Equal

2.04 DUCTILE IRON PIPE & FITTINGS – TYPE (DI/2)

- A. All "TYPE (DI/2)" Ductile Iron Piping shall be of Class 350 mechanical joint pipe and fittings for "Buried" force main pressure pipe applications as per AWWA C151/A21.51 standards. Refer to Specification 40 05 13 PROCESS PIPE AND FITTINGS for additional details and requirements for “TYPE (DI/2)” pipe and fittings.

2.05 PERFORATED UNDERDRAIN PIPE & FITTINGS

- A. Provide non-pressure perforated PVC piping for underdrain applications as specified and as indicated on the Drawings. Piping shall be perforated PVC, per ASTM D3034 or ASTM D3033, SDR 35, with push-on joints per ASTM D3212 and gaskets per ASTM F-477.

2.06 HIGH DENSITY POLYETHYLENE PRESSURE PIPE – TYPE (PE/4)

- A. High Density Polyethylene Pressure Pipe - Type (PE/4), shall be High Density Polyethylene (HDPE), DR 11, PE 3408 pipe with Iron Pipe Size (IPS) outside diameter. Pipe and fittings shall conform to the requirements of AWWA C906. Provide transition couplings, mechanical joint adaptors and stiffeners as required, as indicated on the Drawings as specified and as recommended by pipe manufacturers. Provide fusion welded connections and molded fittings for all Type (PE/4) piping.

2.07 PVC PRESSURE PIPE & FITTINGS – TYPE (PVC/6)

- A. PVC Pressure Pipe - (Type PVC/6): Pipe, couplings and fittings shall be manufactured of materials conforming to ASTM D 1784, Class 12454B. Pipe shall conform to AWWA C900 or AWWA C905-10 standards and shall be plain end or gasket bell end, Pressure Class 235 psi (FM 150 psi), (DR 18), with ductile-iron-pipe-equivalent outside diameter. Fittings shall be PVC with push-on joint ends. All pipe bells shall incorporate gaskets which meet the requirements of ASTM F477. All gaskets shall be locked into the pipe bell. The assembled joint shall meet the requirements of ASTM D3139 standards. Pipe shall be designed for pressurized wastewater applications. All PVC pressure pipe shall be a product of the following manufacturer:

1. J-M Manufacturing Company
2. North American Pipe Corporation
3. Engineer Approved Equal

2.08 CLAY DAM DRAIN PIPE

- A. Provide corrugated polyethylene drainage pipe, highway grade, AASHTO M 252, ASTM F 405-74 as shown on the Drawings or directed by the Engineer.

2.09 COUPLINGS

- A. Provide couplings, adapters and fittings for pipe transitions as specified and as indicated on the Drawings. Refer to Specification 40 05 14, PROCESS PIPE COUPLINGS AND CONNECTORS for additional details and requirements.

2.10 PIPE SUPPORTS

- A. Provide pipe supports (within structures) as specified and as indicated on the Drawings. Unless otherwise specified or indicated on the Drawings, all pipe supports shall be 304

stainless steel with 316 stainless steel hardware. Refer to the details on the Drawings as well as Specification 40 05 15, PROCESS PIPE SUPPORTS for additional details and requirements.

2.11 NON-WOVEN FILTER FABRIC

- A. Provide non-woven filter fabric for a Working Mat. Filter fabric shall be a nonwoven, needle punched geotextile made of 100% polypropylene slit film yarns. The filter fabric shall be designed in accordance MDOT "Standard Specification", Section 722.

2.12 DETECTABLE UNDERGROUND MARKING TAPE

- A. Provide four (4) inch wide detectable underground metallic marking tape for all buried utilities including but not limited to force main pressure piping and gravity sewer piping systems. Provide detectable marking tape as follows:
 - 1. Gravity Sewer Systems - Detectable tape shall be green and shall read "Caution - Buried Sewer Line Below".
 - 2. Sanitary Pressure Piping Systems - Force Mains - Detectable tape shall be brown and shall read "Caution - Buried Force Main Below".
- B. Underground marking tape shall be detectable marking tape, with a minimum 5.0 mil overall thickness. Tape shall be manufactured using a 0.8 mil clear virgin polypropylene film, reverse printed and laminated to a 0.35 mil solid aluminum foil core, and then laminated to a 3.75 mil clear virgin polyethylene film. Tape shall be printed using a diagonally striped design for maximum visibility, and meet the APWA Color-Code standard for identification of buried utilities.

2.13 TRENCH DAMS

- A. Provide trench dams (trench baffles) as specified and as indicated on the Drawings for utility piping systems. Baffles shall be self-supporting and provide a watertight seal around the pipe by use of an appropriately sized elastomeric PVC flexible coupling. Baffles shall form an impenetrable barrier in the pipe envelope to the flow of water. Baffles shall be constructed of ABS or PVC plastic. Baffles shall be designed and constructed in accordance with the following:
 - 1. Specific Gravity: 1.05, per ASTM D 792
 - 2. Izod Impact: 6.0 ft-lbs/inch at 73⁰F, per ASTM D 256
 - 3. Tensile Strength: 4,800 psi, per ASTM D 638
 - 4. Tensile Modulus: 280,000 psi, per ASTM D 638
 - 5. Flexural Strength: 7,000 psi, per ASTM D 790
 - 6. Flexural Modulus: 300,000 psi, per ASTM D 790
 - 7. Deflection Temperature: 190⁰F, per ASTM D 648
 - 8. Gardner Gloss: 10-15% at 60⁰ Angle, per ASTM D 523
 - 9. Hardness: 85 Rockwell R, per ASTM D 785

2.14 THRUST BLOCKS

- A. Provide concrete thrust blocks at all pressure pipe fittings as specified, as indicated on the Drawings and as directed by the Engineer. Thrust blocks shall be 3,000 psi (minimum) compressive strength concrete. Cast-in-place concrete thrust blocks shall be ready mixed concrete from a concrete truck. Pre-cast concrete thrust blocks shall also be acceptable. Refer to the Drawings for additional details and requirements.

2.15 RIGID INSULATION

- A. Provide rigid insulation as specified, as indicated on the Drawings or as directed by the Engineer. Insulation shall be rigid, cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base resin in an extrusion process to comply with ASTM C 578. Insulation shall have a minimum compressive strength of 100 psi. Insulation shall conform to the following properties:
 - 1. Thermal Resistance: $5.0 \text{ ft}^2\text{-h-}^0\text{F/Btu}$, per ASTM C 518 & ASTM C 177
 - 2. Compressive Strength: 100 psi (minimum), per ASTM D 1621
 - 3. Water Absorption: 0.3% by volume, per ASTM C 272
 - 4. Water Vapor Permeance: 0.8 perms, per ASTM E 96
 - 5. Maximum Use Temperature: 165°F
 - 6. Coefficient of Linear Expansion: $3.5 \times 10^{-5} \text{ in/in-}^0\text{F}$, per ASTM C 203
 - 7. Insulation Type: V, per ASTM C 578
- B. Provide 4-inch minimum compacted sand layers directly above and below insulation, or as directed by the Engineer.

PART 3 – EXECUTION

3.01 INSTALLATION OF GRAVITY SEWER PIPE

- A. Install gravity sewer pipe and fittings in accordance with manufacturer's recommendations and the trench details as indicated on the Drawings. Use a laser beam for line and grade unless otherwise permitted by the Engineer. Secure each length of pipe with bedding before placing next length. Plug open ends of pipe when Work is suspended. Bed pipe as shown on the Drawings. A 30-inch minimum cover over the top of PVC pipe should be provided before the trench is wheel-loaded.
- B. Lay pipe to alignment and grade shown on the Drawings. If grade is not shown, determine elevations of start and finish points for each run of pipe. Lay pipe to a uniform grade between these points. Line and grade may be adjusted by the Engineer as required by field conditions. Install a mechanical water stop for every 10 vertical feet of sewer main elevation change.
- C. Lay pipe in the dry. Do not use installed pipe to remove water from work area.

- D. Flush all piping and remove all debris. Flushing method used shall be approved by the Engineer. Gravity flushing shall not be acceptable. Provide all labor, water, pumps and related appurtenances for pipe flushing.
- E. Connections to manholes and catch basins: Provide short length of pipe so that joints are located within 3 feet of inside surface of manholes and catch basins for piping other than PVC pipe.
- F. Unless otherwise specified or indicated on the Drawings residential house service fittings and leads shall be six (6) inch. Provide larger service connections as indicated on the Drawings. Depth and location of service shall be as specified or as indicated on the Drawings unless otherwise directed by the Engineer in the field. Provide pre-fabricated tee/wye or wye fittings on main line pipe. Extend services to property line. Cap and stake ends of new services. Provide stake which extends from cap to one (1) foot above ground surface. Provide assistance and labor to Engineer in measurement of pipe installed and in obtaining swing ties to ends of leads.
- G. Provide pre-cast sewer chimneys as specified and as indicated on the Drawings. Install chimneys in accordance with the manufacturer's instructions. Provide services of a Manufacturer's representative to provide a one day site visit to assist and instruct in the proper installation of sewer chimney products.
- H. Provide backwater valves as specified and as indicated on the Drawings. Provide adaptors to transition to solvent weld pipe connection to push-on pipe with flexible adapter.

3.02 INSTALLATION OF FORCE MAIN PRESSURE PIPE

- A. Install force main pressure piping in accordance with the manufacturer's recommendations and the details as shown on the Drawings. Installation of HDPE pressure pipe "Type (PE/4) shall conform to the Plastic Pipe Institute (PPI) Handbook of PE Pipe and the manufacturer's recommendations. Thermal butt fusion or electro-fusion methods are acceptable provided the Contractor has submitted evidence of training by a manufacturer's representative.
- B. Lay pipe to line and grade shown on the Drawings. Do not allow positive-negative grade discontinuities. Line and grade may be adjusted by the Engineer as required by field conditions.
- C. Flush all piping and remove all debris. Flushing method used shall be approved by the Engineer. Gravity flushing shall not be acceptable. Provide all labor, water, pumps and related appurtenances for pipe flushing.
- D. Lay pipe in the dry. Do not use installed pipe to remove water from work area.
- E. Install warning tape continuously from pumping stations to the end of each force main. At ends of rolls and repairs, splice tape with 3 foot overlap connected with tape.

Provide the Owner with one full roll for future repairs. Extend to grade at each access manhole and at pump stations.

- F. Provide thrust protection via concrete thrust blocks at all bends in force main pressure piping systems in accordance with the Drawings.

3.03 UTILITIES TO BE ABANDONED

- A. Provide closure of abandoned utilities as specified and as indicated on the Drawings. Provide caps, or watertight plugs on open ends of abandoned underground utilities which are not indicated to be removed or demolished. Provide closures to withstand hydro-static or earth pressure which may result after ends of abandoned utilities have been closed.

3.04 INSULATION

- A. Provide rigid insulation as shown on the Drawings or directed by the Engineer.

3.05 TESTING OF SANITARY SEWERS

- A. Test all sanitary sewer pipes after backfilling. Install all house service leads on main line before testing. Perform tests in the presence of the Engineer. A maximum of 1,000 linear feet of pipe may be installed but not tested at any time. Provide low pressure air testing of all gravity sewer piping systems as follows:
1. Plug all ends of sections to be tested.
 2. Supply air slowly to the pipe to be tested until the air pressure inside the pipe is 4.0 psi greater than the average back pressure of any groundwater submerging the pipe.
 3. Disconnect air supply and allow a minimum of two minutes for stabilization of pressure.
 4. Following stabilization period measure drop in pressure over the test period based on piping size.

Nominal Pipe Size (Inches)	Test Period (Minutes)
4	4
6	4
8	6
10	6
12	7
15	8
18	9
21	11
24	13

- 5. Acceptable Drop: Pressure drop shall not exceed more than 1.0 psi.
- B. Deflection Test for PVC Gravity Sewer Pipe: Provide testing of all pipe with "GO-NO-GO" gauge allowing a 5% maximum deflection.
- C. Special Testing for Gravity Sewer Replacing Existing Sewer: For all new sewer replacing existing sewer and requiring an immediate tie-in of existing services, provide sewer TV inspection and joint testing services per NASSCO specifications. Provide two (2) DVD copies of inspections to the Engineer upon completion of testing: Provide TV work during low flow periods (1:00 a.m.- 4:00 a.m.) unless otherwise directed by the Engineer.
- D. Provide repair and retesting of all piping systems which do not pass tests using materials and methods approved by the Engineer.

3.06 TESTING OF FORCE MAIN PRESSURE PIPING

Testing of force main pressure piping systems shall be as indicated in Specification 40 05 13, PROCESS PIPE AND FITTINGS.

END OF SECTION

SECTION 40 00 00

BASIC PROCESS MATERIALS AND METHODS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The following specification outlines general requirements for process equipment and appurtenances specified in Division 40 as well as general information and requirements which pertains to the Contract Drawings. Refer to the individual equipment and product specifications in Division 40 for additional details.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM A 123/A 123M (2008) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 - 2. ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- C. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
 - 1. NEMA MG 1 (2007; Errata 2008) Standard for Motors and Generators
 - 2. NEMA MG 11 (1977; R 2007) Energy Management Guide for Selection and Use of Single Phase Motors

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-03 PRODUCT DATA
 - 1. Qualifications of Manufacturers
 - 2. Warranties
 - 3. Submittal Deviations
 - 4. Contract Drawing Modifications
 - 5. Special Tools

6. Spare Parts
 7. Nameplates
 8. Equipment Tag Nameplates
 9. Field Painting of Equipment
- C. All submittals shall include but are not limited to all deviations from the Contract Documents, any and all necessary modifications to the Contract Drawings, all special tools required for maintenance and operation, all spare parts required for normal maintenance of equipment during the Manufacturer's warranty period, and samples of information which will be included on equipment/tank nameplates.
- D. The Contractor shall provide an engraved equipment tag nameplate on all equipment, (including associated instrumentation), bearing the alphanumeric tag number and the descriptive name of the equipment as it is referenced on the Drawings.
- E. The Contractor shall provide a "coordinated process system color scheme" finished coating of all ferrous metallic and painted surfaces of new/existing equipment; including but not limited to pipes, valves, motors, gearboxes, supports, base plates, drive guards, enclosures, etc., and all associated appurtenances. All painting shall be in accordance with specification 09 90 00 "PAINTS & COATINGS".

1.01 QUALIFICATIONS OF MANUFACTURERS

- A. All materials and equipment specified shall be the standard products of a Manufacturer regularly engaged in the production of such products and shall essentially duplicate items that have been in satisfactory use in identical applications in other waste water treatment facilities.
- B. Unless otherwise indicated in the individual specification sections or indicated on the Drawings; the Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of product(s)/equipment of all types, and not less than five (5) years of experience in the production of equal or larger sized models of the exact product(s)/equipment specified in each individual section.
- C. Unless otherwise specified or indicated on the Drawings, all product/equipment Manufacturer's shall provide an installation list of at least ten (10) similar United States installations, including contact names and phone numbers. Products/equipment shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.
- D. The term "installations" shall mean individual projects/contracts. Multiple equipment units for a project will be considered as one (1) installation toward meeting the experience requirements. Installations shall be only those in the United States (fifty contiguous states). "Installations" shall include but are not limited to the following:
1. Name and location of installation.

2. Name of person in direct responsible charge for the product(s) and/or equipment.
 3. Address and phone number of person in direct responsible charge.
 4. Month and year the equipment was placed in operation.
 5. Brief description of equipment
 6. Provide the name, address, and phone number of the contact person at the company that provided service (both warranty period and post-warranty period) for the unit to the Owner.
- E. To ensure quality, conformance, and reliability with regard to the manufacturing and production of the equipment, the Manufacturer shall meet or exceed all the requirements outlined in the Contract Documents for each respective product and/or piece of equipment.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. The equipment Manufacturers shall coat all machined surfaces subject to corrosion with an easily removable rust preventive compound prior to shipment. Ship fabricated assemblies in the largest sections permitted by carrier regulations. All products shall be properly labeled to ensure proper field erection. Deliver all equipment in the Manufacturer's original, unopened and undamaged packages, unless mounted on the respective equipment assemblies. The Contractor shall store and maintain all equipment in strict accordance with the Manufacturer's written short term and long term storage requirements.
- B. The Contractor shall store all products in a manner to protect items with epoxy shop coatings from exposure to UV light which may cause chalking of the epoxy. Length of acceptable exposure prior to providing UV protective measures shall be in accordance with the coating Manufacturer's recommendations. This shall include protection from UV light after installation while awaiting covering or filling of tanks, or prior to field painting for items scheduled to be "finish coated". Should damage occur, the Contractor shall immediately make all repairs and replacements necessary to the satisfaction of the Engineer at no additional cost to the Owner.

1.05 WARRANTIES

- A. The Manufacturer of each piece of equipment shall provide a full & comprehensive warranty for all equipment as specified in Division 40. Unless otherwise specified or indicated on the Drawings, the equipment shall be warrantied to be free from defects in workmanship, design, and materials for a minimum period of one (1) year. If the Manufacturer's standard warranty is greater than one (1) year; (e.g. two (2) years, etc.); then that warranty shall be provided as standard. In no case shall the warranty for any equipment and/or products be less than one (1) year. If any parts of the equipment supplied under this section should fail during the Manufacturer's warranty period,

replacement of parts or the unit itself shall be provided. The units shall be restored to active working service at no expense to the Owner of the equipment. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling required for restoration of equipment to active service as required under the Manufacturer's warranty.

- B. Warranties shall commence at the date of substantial completion or partial utilization.
- C. The Contractor shall obtain a warranty from the equipment Manufacturers in the name of the Owner. The Contractor shall submit the equipment Manufacturer's warranties to the Engineer for review. Equipment that is supplied by a system supplier and is intended to function as a complete and integrated system shall be warrantied as set forth in each specification section. The Contractor shall be required to coordinate and rectify all warranty problems during the one (1) year warranty period following substantial completion.

1.06 NAMED PRODUCT AND EQUIPMENT MANUFACTURERS

- A. Acceptable manufacturers may be listed in each specification section within Division 40. Manufacturer's names listed in each specification within Division 40 are intended to indicate the type and quality of materials desired. Where the words "Engineer Approved Equal" are indicated, other Manufacturers of equal quality that "Comply Fully" with the Contract Documents shall be allowed.
- B. The Contract Documents direct attention to certain required features of the equipment but do not purport to cover all details entering into its design and construction. Nevertheless, provide products and/or equipment complete in all details and ready for operation for the intended purpose.
- C. The Specifications in Division 40 are intended to provide standard products and/or equipment of a recognized Manufacturer meeting all the requirements of the Contract Documents. Due to differences in equipment and/or products of various Manufacturers, provide complete and detailed submittals for the Engineer to review.
- D. All equipment and/or products of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the Contract Documents. The Contract Drawings are typically based upon a single product and/or piece of equipment. As such, the physical installation, all services, all connections, and all appurtenances are designed around the characteristics of a single product and/or piece of equipment. Other named Manufacturers of products and/or equipment as well as "Engineer Approved Equal" Manufacturers will be considered.
- E. However, "Named" Manufacturers' products and/or equipment other than the "Design Basis"; as well as "Engineer Approved Equal" Manufacturers' products and equipment will differ slightly from the Contract Documents. Modifications, including but not limited to, piping, wiring, controls, foundations, other services, and structures shall be required. Coordinate these modifications with the Engineer. Any additional costs

required for these modifications shall be at no additional cost to the Owner or Engineer. No change in Contract Time shall be granted for these modifications.

1.07 SUBMITTAL DEVIATIONS

- A. Provide submittals to the Engineer of all products and/or equipment for compliance with the Contract Documents. Submittals for "Design Basis" products; "Named" products and/or equipment other than the design basis; as well as "Engineer Approved Equal" products and/or equipment shall specifically outline "All" deviations from the Contract Documents. Submittals which do not specifically outline "All" deviations from the Contract Documents will be "Rejected".

PART 2 – PRODUCTS

2.01 GENERAL ELECTRICAL REQUIREMENTS

- A. The Contractor shall furnish motors, with their respective pieces of equipment. Motors and controllers shall conform to and have electrical connections as described in the Contract Documents. Furnish internal wiring for components of packaged equipment as an integral part of the equipment. Extended voltage range motors shall not be permitted under any circumstances.
- B. Controllers and contactors shall have a maximum of 120 volt control circuits, and shall have auxiliary contacts for use with the controls furnished. All electrical work shall conform to NFPA 70 standards and the Contract Documents.

2.02 ELECTRICAL CLASSIFICATIONS AND HAZARD RATINGS

- A. Electrical information including but not limited to motor horsepower values, voltage, phase, cycle, hazard classification rating, inverter duty, etc., have been listed for each respective product and/or piece of equipment in the respective specification sections for ease in bidding, construction, reference, and submittal review.
- B. The Contract Documents specifically outline electrical hazard classifications by area. In the case that a discrepancy between the hazard classification listed in the respective product and/or equipment section and the Contract Documents or Specifications should arise; the Drawings shall govern the electrical hazard classification of the associated equipment/product and all related appurtenances. It shall be the responsibility of the Contractor and the product/equipment Manufacturers to ensure all such items furnished meet the electrical hazard classification ratings which are shown on the Contract Drawings or as indicated in the Specifications.

2.03 ELECTRIC MOTORS - GENERAL

- A. Unless otherwise specified or indicated on the Drawings, all electric motors shall conform to the requirements hereinafter set forth. All electric motors shall be of sufficient capacity to operate the products and/or equipment under all load and

operating conditions without exceeding rated nameplate current, power, or specified temperature limit.

- B. When the horsepower rating is specified for a motor, the motor furnished shall meet the requirements of the output specified. In the event a horsepower rating is not specified, the motor provided shall have sufficient capacity to operate the driven products/equipment as outlined in the detailed Specifications.
- C. All electric motors shall have either UL or FM approval ratings. All electric motors shall have a minimum service factor of 1.15, unless otherwise specified or indicated on the Drawings. Motors for use with variable frequency drives shall have a minimum service factor of 1.15 as be specifically designed for "Inverter Duty Service".

2.04 ELECTRIC MOTOR DESIGN STANDARDS

- A. Unless otherwise indicated, all motors shall be NEMA Design B. Motors shall have starting characteristics and ruggedness as required under the actual conditions of operation and, unless otherwise specified, shall be suitable for full-voltage starting.
- B. All electric motors shall be manufactured by General Electric Co., Baldor-Reliance, Toshiba, Siemens, WEG or an "Engineer Approved Equal" product that meets all the specified requirements herein.
- C. Unless otherwise indicated, all electric motors shall have Class F insulation with a temperature rise in accordance with NEMA Standards at a maximum ambient temperature of 40 degrees C.
- D. Provide electric motors rated for "Explosion Proof" service in all electrically classified areas Class 1 Division 1 or 2 and comply with all requirements of Class 1, Division 1, Groups C&D, as defined by the National Electrical Code, as well as all other safety codes pertaining thereto.
- E. Unless otherwise indicated, all electric motors shall be "Premium Efficiency" type. The nominal and/or minimum guaranteed efficiency shall be specifically printed on the motor nameplate. The values shall conform to NEMA standards for "Premium Efficiency" motors.

2.05 GENERAL DESIGN OF MOTORS

- A. Electric motors shall comply with the latest NEMA Standards for Motors and Generators, unless otherwise specified or indicated on the Drawings. Motor windings shall be braced to withstand successfully the stresses resulting from the specific method of starting. The windings shall be treated thoroughly with acceptable insulating compound suitable for protection against moisture, acidic or alkaline conditions. All motor bearings shall be of the self-lubricating type, designed to ensure proper alignment of rotor and shaft and to prevent leakage of lubricant.

- B. All bearings for open motors shall be of the sleeve or ball type, as specified under the respective items of mechanical products/equipment. Bearings for "Totally Enclosed" and "Explosion Proof" motors shall be ball type. Vertical motors shall be provided with thrust bearings adequate for all potential thrust forces which could be subjected to the motors during operation.
- C. Vertical electric motors of the open type shall be provided with drip hoods of acceptable shape and construction. If the drip hood is too heavy to be easily removed the drip hood shall be designed and constructed with provisions for access for testing.

2.06 WOUND ROTOR INDUCTION MOTORS

- A. Wound rotor electric induction motors shall be designed for operation of the motor-driven equipment under the conditions specified in the Contract Documents. Motors shall be of the wound-rotor, induction type suitable for speed control by rotor resistance. The collector rings shall be constructed of hard composition metal of sufficient conductivity and ample contact surface. The rings shall be mounted accurately and securely on the shaft by means of acceptable insulating construction. The leads to the collector rings shall be fastened to and insulated from the shaft.
- B. The collector rings and brushes for the wound-rotor induction motors shall be suitable for operation in atmospheres containing moisture. The brushes shall be of the electrographite type, or other suitable type, of sufficient hardness and conductivity with ample contact surfaces. Brush holders shall be provided with adjustable, spring-tension devices. Brushes shall be connected to the holders with tinned, flexible, copper-wire pigtailed so arranged that no appreciable current shall be carried through the sliding contacts or springs. Brushes shall operate without noise or chattering. Rings and brushes shall be located on top of the motor, and shall be easily accessible for inspection and maintenance.

2.07 SYNCHRONOUS MOTORS

- A. Synchronous motors shall comply in all respects with the latest NEMA Standards for Motors and Generators, and ANSI Standard C50 for Rotating Electrical Machinery. Synchronous motors shall be designed for operation of the motor-driven equipment under the conditions dictated in the Detail Specifications. The temperature rise shall be based on a cooling temperature not exceeding 40 degrees C and an altitude not exceeding 3,300 feet in the various parts of the motors, when operating continuously at rated voltage, frequency, and power factor, shall conform to the applicable requirements of NEMA Standards.

2.08 SINGLE PHASE MOTORS

- A. Unless otherwise indicated, single-phase fractional-horsepower alternating-current motors shall be "High Efficiency" type corresponding to the applications listed in NEMA MG 11 standards.

- B. Single-phase motors requiring switching devices and auxiliary starting resistors, capacitors, or reactors shall be furnished as combination units with such auxiliaries either incorporated within the motor housings or housed in suitable enclosures mounted upon the motor frames. Each combination unit shall be mounted upon a single base and shall be provided with a single conduit box.

2.09 INVERTER DUTY MOTORS

- A. Electric motors which are rated for inverter duty shall be provided for all applications where used with variable frequency drives. All motors shall be suitable for operation over the entire speed range indicated without causing motor overheating at any condition. Forced ventilation type inverter duty rated motors with a separate external continuously operating fan shall not be acceptable. Inverter duty motors installed in a Class 1, Division 1, Groups C&D hazardous, "Classified" locations shall be identified and be specifically designed for variable speed when used in "Classified" locations.
- B. Inverter duty motors shall have Class F insulation with a Class B temperature rise and shall be motor nameplated, stamped and labeled as "Inverter Duty Rated". All motors shall be designed with a minimum service factor of 1.15. Motors shall be wound with inverter duty wire and phase paper and shall be multi-dipped and baked in polyester, Class H varnish.
- C. All inverter duty motors (motors run by VFD's) shall be equipped with a grounding ring to eliminate VFD induced bearing currents. Permanent magnet DC motors shall not require a grounding ring. The grounding ring shall eliminate all destructive electrical currents which manifest themselves through pitting of the bearings, scoring of the shaft, and eventual bearing failure.
- D. When motors are controlled by PWM variable frequency drives (VFDs) the pulse switching causes high dv/dt (high frequency voltage changes) which results in a capacitive induced shaft voltage. These voltages may cause bearing failures and substantially decrease bearing life by electrically discharging through the motor bearings to ground causing pitting and fluting failure. In accordance with NEMA MG 1 standards, the capacitive induced voltage results in peak pulses as high as 10-40 volts from the motor shaft to ground. Mitigation for all inverter duty motor bearing damage shall be provided by shaft grounding brushes which shall divert all current around the motor bearings.
- E. All motors controlled by Variable Frequency Drives (VFD's) shall be equipped with a shaft grounding ring kit. The grounding ring kit shall be installed by the motor Manufacturer or equipment Manufacturer. Each shaft grounding Ring (SGR) shall be bolted directly to the motor end bracket or installed with conductive epoxy to ensure ground connection from the grounding ring to the motor frame.
- F. All grounding rings of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the

Contract Documents. All inverter duty motor grounding rings shall be a product of the following Manufacturer:

1. AEGIS SGR Bearing Protection Ring
2. Engineer Approved Equal

2.10 DRIVE COUPLINGS

- A. All drive couplings shall be all metallic, flexible, and designed for both angular and parallel misalignment. Drive couplings shall be provided with guards and a means for lubrication. Close-coupled connections shall have machined shouldered joints for the motor and pump motor support. High torque couplings shall be all metal gear couplings with external grease fittings. A service factor of 1.50 shall be used based on the motor nameplate rating.
- B. Drive couplings for mixers which differ from the above referenced coupling types shall be of metallic construction. Couplings shall be standard integral parts of mixer Manufacturer's equipment.

2.11 BELT DRIVES

- A. All v-belt drives shall be provided with front removable guards.
- B. Removing of the guards shall not require disturbing of the sheaves. All belt drive assemblies shall be designed for up-sizing and/or downsizing the sheaving. All belt drives shall be designed for a minimum 1.5 service factor, unless otherwise indicated.
- C. Variable-speed transmission in belt drive systems shall consist of a self-contained drive, totally enclosed variable speed motor, a housing on which the motor is mounted and which encloses an adjustable, heavy duty v-belt drive between two variable-pitch pulleys and the output shaft.

2.12 SCR CONTROLLERS

- A. All SCR controllers shall be completely solid state assemblies consisting of an electronic switching amplifier, silicon controlled full wave rectifier, and associated circuitry. Bridge and gate trigger circuitry shall employ printed circuit boards. Provide all required power transformers. All SCR units shall be heavy duty type suitable for handling the full current rating of the motors and brief acceleration currents. The assembly shall be mounted on a heat sink but insulated there from.
- B. Power supply to the SCR controllers shall be 115 volt, single phase, 60 hertz. Each unit shall be factory wired and tested with all leads brought out to terminal strips to facilitate connections to the motors and local control stations. Each SCR controller shall be designed and constructed with functionality including but not limited to the following:

1. Full wave rectification.
2. Power cube containing all power semi-conductors in a single component.
3. Annature contactor with auxiliary normally open and normally closed contacts.
4. Circuit breaker to provide overload protection.
5. Surge suppressers to protect semi-conductors from line surges and transient voltages.
6. Adjustable current limit.
7. Adjustable IR compensation.
8. Voltage level and current capacities shall meet the requirements of the connected equipment (e.g. 90V DC output for 90V DC motors).

2.13 GEAR REDUCTION UNITS

- A. Gears of gear reduction units shall be manufactured of alloys treated for hardness and rated for severe service duty. All gear reduction units on equipment shall be selected for a minimum Class II service, as classified by the American Gear Manufacturers Association (AGMA).
- B. Unless otherwise specified, the complete reduction unit shall be fully enclosed in a heavy cast-iron or fabricated steel housing with gears running in oil. All bearings shall be anti-friction type.
- C. The actual and rated horsepower, torque, overhang capacity, or bearing capacity of each reduction unit shall be not less than the horsepower rating of the drive motor, nor less than that which will be encountered under full load or under the most severe loading conditions of the equipment.
- D. Unless otherwise specified, all gear reduction units shall be helical or spiral bevel helical combinations. Planetary gear units and worm gear type units shall be used only where specified. Class of service shall be Class II or heavier, as determined by the Manufacturer or as directed by the Engineer.
- E. The equipment Manufacturer shall furnish the Engineer with complete, detailed, information, catalog data, design features, loading capacities, and mechanical efficiency ratings for every gear reduction unit incorporated in the work.

2.14 LUBRICATION FITTINGS

- A. All lubrication fittings shall be readily accessible from the outside of all equipment, without the need to remove covers, plates, housings, or guards, or without creating

falling hazards by unusual elevations. All lubrication fittings shall be buttonhead type. All lubrication fittings shall be mounted together wherever possible.

- B. Pressure grease lubricated fittings shall be "Zerk Hydraulic" type or "Alemite" type. Housings of grease-lubricated bearings shall be automatically exhausted to the atmosphere to prevent over-greasing.
- C. All oil drains shall be piped to a location outside of equipment frames for ease of draining. Provide a 316 stainless steel ball valve for positive shutoff. All drain piping shall be 316 stainless steel tubing.

2.15 SPECIAL TOOLS

- A. Each Manufacturer shall furnish one set of all special tools required to completely assemble, disassemble, or maintain their respective pieces of equipment or systems. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items.

2.16 SPARE PARTS

- A. For each piece of equipment furnished, provide spare parts, as specified in the respective specification sections of each Division. All spare parts shall be delivered at the same time as the equipment to which they pertain. The Contractor shall properly store and safeguard such spare parts until completion of the work, at which time they shall be delivered to the Owner. All spare parts shall be appropriately labeled and shall be properly packaged for long-term storage.

2.17 EQUIPMENT DRIVE GUARDS

- A. All equipment driven by open shafts, belts, chains, or gears shall be provided with metallic or rigid fiberglass OSHA approved guards enclosing the drive mechanism. Guards shall be securely installed but shall be "easily" removable with quick open latches. Guards shall be constructed of two part epoxy coated sheet steel, epoxy coated steel woven wire, or expanded metal set in a frame of epoxy coated steel members, unless otherwise specified.
- B. All guards shall be secured in position by stainless steel braces or straps which shall permit "Easy" removal for servicing the respective equipment. All guards shall conform in all respects to all applicable safety codes, OSHA standards, and local regulations.

2.18 NAMEPLATES

- A. Each piece of equipment shall be provided with a 304 stainless steel nameplate, securely fastened in place with 316 stainless steel hardware. All nameplates shall be clearly and permanently inscribed with the Manufacturer's name, model or type designation, serial number, principal rated capacities, electrical or other power characteristics, and similar information as appropriate.

- B. Nameplates for process chemical storage tanks shall be non-metallic and resistant to the chemical being stored. Chemical storage tank nameplates shall include but are not limited to the following information; Manufacturer's name, serial number, rated capacity, name/tag number, etc.
- C. An enlarged paper copy of all nameplate data on equipment and motors shall be provided in the submittals as well as the Operation and Maintenance Manuals.

2.19 EQUIPMENT TAG NAMEPLATES

- A. Each item of equipment (including all instrumentation) shall have an engraved nameplate bearing the alphanumeric tag number and the descriptive name of the equipment as it is referenced on the Drawings. The nameplate shall be securely affixed in a conspicuous place as approved by the Engineer and Owner. The Contractor shall coordinate the final tag numbers and descriptive names with the Engineer prior to ordering. The Contractor shall install all equipment tag nameplates in a location as directed by the Engineer and Owner.
- B. All nameplates shall be resistant to abrasion, heat, and chemicals. Each nameplate shall be manufactured from stain resistant multi-layered acrylic specifically designed for both indoor and outdoor applications. Each nameplate shall be a minimum of 1/16 inch thick, 3-ply, scratch resistant, low glare satin phenolic finish. All nameplates shall conform to Mil Spec LP-387A Type N.D.P. LP 509. The nameplates shall be manufactured of a rigid thermoset material which is electrically non-conductive (lamicoid). Provide contrasting background and lettering colors as selected by the Engineer and Owner.

2.20 FASTENERS AND HARDWARE

- A. Provide all necessary fasteners and hardware including but not limited to bolts, anchor bolts, nuts, washers, lock washers, locking nuts, plates, bolt sleeves, etc. as required by the work outlined in the Contract Documents. All anchor bolts shall have suitable washers, lock washers and, where so required, their nuts shall be hexagonal.
- B. All fasteners and hardware shall be a minimum of 304L grade stainless steel unless otherwise specified or shown on the Drawings. All fasteners and hardware utilized in "Submerged Applications" shall be 316L grade stainless steel. All fasteners and hardware in areas including but not limited to the headworks, dewatering rooms, chemical rooms, clarifiers, process tankage, splitter structures, septage areas, equalization tanks, storage tanks, valve vaults, wet wells, chlorine contact tanks, etc., shall be 316 grade stainless steel.
- C. Expansion bolts shall have stainless steel composition elements of the required number of units and size. All threads shall be clean cut and shall conform to ANSI B 1.1 for Unified Inch Screw Threads (UN and UNR Thread Form).

- D. All fasteners and hardware specified to be galvanized, shall be zinc coated, after being threaded, by the hot-dip process in conformity with the latest revisions of ASTM A 123/A 123M or ASTM A 153/A 153M standards. Galvanized fasteners and hardware shall only be utilized where specified or indicated in the Contract Documents.
- E. All anchor bolts and expansion bolts shall be set accurately. If anchor bolts are set before the finished concrete has been placed, they shall be carefully held in suitable templates of Engineer approved design. Where indicated on the Drawings, specified, or as required, anchor bolts shall be provided with square plates at least 4 inches by 4 inches by 3/8 inches or shall have square heads and washers and be set in the concrete forms with suitable pipe sleeves, or both. If anchor or expansion bolts are set after the concrete has been placed, all necessary drilling and grouting or caulking shall be provided by the Contractor and care shall be taken not to damage the structure or finish by cracking, chipping, spalling, or otherwise during the installation.
- F. All fasteners and hardware shall be suitable size for the intended purpose, with direct input from the equipment or product Manufacturer. In no case shall anchor bolts have a diameter less than 3/8 inches.

2.21 OILS AND LUBRICANTS

- A. Prior to startup and testing, the Contractor shall ensure all motor driven equipment and appurtenances are provided with the appropriate oils and lubricants. The respective equipment Manufacturer's shall provide detailed instructions for proper lubrication and oil filling of all products. The use of special and/or proprietary oils and lubricants shall not be acceptable under any circumstances. All oils and lubricants shall be readily available from a local source within the United States to ensure ease of maintenance for the Owner. Provide oils and lubricants of types and grades as recommended by the respective equipment manufacturers for startup, testing and initial operation of equipment.

PART 3 – EXECUTION

3.01 INSPECTION

- A. The Contractor shall carefully inspect receiving structures and anchor supports for defects in workmanship prior to arrival of all equipment. Carefully inspect all equipment for any damage in shipping, defects in workmanship and materials, and tightness of all fastening hardware.
- B. The Contractor shall examine all equipment upon delivery for structural soundness, correctness of setting, alignment, and relative arrangement of various parts, adequacy and correctness of packing, sealing and lubricants.
- C. Prior to startup and testing, the Contractor shall ensure all motor driven equipment and appurtenances are furnished with the appropriate oils and lubricants. Provide all oils

and lubricants in strict accordance with the recommendations of the respective equipment Manufacturer.

3.02 FIELD PAINTING OF EQUIPMENT

- A. All field painting shall be provided by the Contractor. All ferrous metallic and painted surfaces of new/existing equipment; including but not limited to pipes, valves, motors, gearboxes, supports, base plates, drive guards, enclosures, etc., and all associated appurtenances shall be provided with a corrosion resistant field applied finished coating system with a "coordinated process system" color scheme.
- B. For retrofit projects the color scheme shall match the existing designations for each process system. In all cases (New/Retrofit), the color for each process system shall be as directed by the Engineer. Field applied coatings shall be in accordance with section 09 90 00 PAINTS AND COATINGS. Stainless steel, brass, bronze, plastic, and galvanized surfaces shall not be painted unless specifically indicated or directed by the Engineer.

3.03 FACTORY PAINTING

- A. The Manufacturer's standard factory painting systems shall be provided, unless otherwise specified or indicated on the Drawings. The Manufacturer shall provide a certification that the factory painting system applied for equipment located indoors shall withstand 125 hours in a salt-spray fog test. Equipment located outdoors shall withstand 500 hours in a salt-spray fog test. Salt-spray fog test shall be in accordance with ASTM B 117 standards.
- B. Immediately after completion of the testing, the paint shall show no signs of blistering, wrinkling, cracking, or loss of adhesion. The paint shall show no signs of rust creepage beyond 0.125 inches on either side of the scratch mark.
- C. The film thickness of the factory painting system applied on the equipment shall not be less than the film thickness used on the test specimen. All Manufacturers' standard factory painting systems shall be designed for the maximum surface temperatures expected to occur on each respective piece of equipment.

3.04 FACTORY PAINTING OF METALLIC SURFACES

- A. Clean, pre-treat, prime and paint all metal surfaces. Stainless steel, aluminum, brass, bronze, copper, and plastic surfaces shall not be painted unless specifically indicated in the Contract Documents. Apply all coatings to clean dry surfaces. Clean all surfaces to remove dust, dirt, rust, oil and grease prior to application of paint. Surfaces subject to temperatures in excess of 120 degrees F shall be cleaned to bare metal prior to painting.
- B. Where more than one coat of paint is required, apply the second coat after the preceding coat is thoroughly dry. Lightly sand damaged painting and retouch before

applying the succeeding coat. Color of finish coat shall be the Manufacturer's standard unless otherwise specified or indicated on the Drawings.

3.05 COATING THICKNESSES

- A. All metallic surfaces which are designed to experience temperatures less than 120 degrees F shall receive one coat of epoxy pretreatment primer applied to a minimum dry film thickness of 0.3 mils, one coat of epoxy primer applied to a minimum dry film thickness of 1.0 mils; and two coats of epoxy applied to a minimum dry film thickness of 1.0 mils per coat.
- B. All metallic surfaces which are designed to experience temperatures between 120 and 400 Degrees F shall receive two coats of 400 degrees F heat-resisting epoxy applied to a total minimum thickness of 2.0 mils.
- C. All metallic surfaces which are designed to experience temperatures greater than 400 degrees F shall receive two coats of 1,000 degrees F heat-resisting epoxy paint applied to a total minimum dry film thickness of 2.0 mils.

3.06 INSTALLATION

- A. The Contractor shall install all equipment in accordance with the Manufacturer's requirements. Do not install any equipment until all defects or inadequacies in receiving structures have been corrected to meet the design as noted in the Contract Documents. Erect and lubricate all products/equipment in strict accordance with the Manufacturer's instructions. Installation shall include providing all oils and grease required for proper operation.
- B. All equipment mechanisms shall withstand all stresses that may occur during fabrication, erection, intermittent or continuous operation. The Contractor shall furnish and install all supports as indicated on the Drawings, and as required by the equipment Manufacturer.
- C. Thoroughly clean all equipment and appurtenant piping to remove all dirt, grease, mill scale, tools, dust and other foreign matter. The Contractor shall touch up all factory finishes to the satisfaction of the Engineer.

3.07 INSTRUCTION TO OWNER'S PERSONNEL

- A. Where specified in other sections, the Manufacturer shall furnish the services of competent representatives to give full instruction to the designated Owner's personnel in the adjustment, operation, and maintenance, pertinent safety requirements, etc., of the specified equipment or systems. Instructors/representatives shall be thoroughly familiar with all parts of the installation and shall be trained in operating theory, controls, electrical requirements, practical operation, and maintenance work.

- B. Instruction shall be given during the first regular work week after the equipment or system has been accepted and turned over to the Owner for regular operation. The number of man-days, (8 hours per day), of instruction furnished shall be as specified for each respective piece of equipment or system. When more than 4 man-days of instruction are specified, approximately half of the time shall be used for classroom instruction. The other half of the time shall be used for field instruction/demonstration with the equipment or system.
- C. When significant changes or modifications in the equipment or system are made under the terms of the Contract, the Manufacturer shall provide additional instruction to acquaint the operating personnel with the changes and/or modifications to the equipment or system. Additional instruction shall be at no cost to the Owner.
- D. Only one Startup, Testing or Training session shall be scheduled in a single day. A minimum of 72 hours of prior notice shall be provided prior to testing and training.

END OF SECTION

SECTION 40 05 13

PROCESS PIPE AND FITTINGS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor shall provide all materials, equipment, and incidentals required for process pipe and fittings. All piping systems shall be complete with all accessories in compliance with the Contract Documents. The Contractor shall also provide all related appurtenances, including but not limited to attachments, foundations, anchors, supports, couplings, restraints and all related accessories to provide complete operational piping systems as specified herein and as shown on the Contract Drawings.
- B. Unless otherwise indicated, all fittings and appurtenances shall be of the same type and grade of materials as the connecting pipe. All products provided under this section shall conform to current AWWA and ANSI specifications as appropriate to the type of pipe specified.
- C. Process pipe shall be defined as "Interior", "Above Grade Exterior Piping", and "Below Grade Exterior Piping". Process piping shall include but is not limited to wastewater, sludge, chemicals, utility water, city/town water, non-potable water (plant water), and air piping systems as shown on the Drawings and as specified herein. The following sections reference the process pipe type and specification reference number shown in the piping tag symbols in the Contract Documents.
- D. Piping without tag symbols is specified elsewhere. The piping included in this specification section may or may not all be required for the work outlined in the Contract Documents. Provide all piping that is indicated on the Drawings, is specified, and/or is required to complete the work outlined in the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. ASME INTERNATIONAL (ASME)
 - 1. ASME A13.1 (1996, E1998) Scheme for the Identification of Piping Systems
 - 2. ASME B1.1 (2003; R 2008) Unified Inch Screw Threads (UN and UNR Thread Form)

3. ASME B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250
4. ASME B16.3 (1999) Malleable Iron Threaded Fittings Classes 150 and 300
5. ASME B16.18 (2001; R 2005) Cast Copper Alloy Solder Joint Pressure Fittings
6. ASME B16.26 (2006) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
7. ASME B16.15 (2006) Cast Bronze Threaded Fittings Classes 125 and 250
8. ASME B1.20.1 (1983; R 2006) Pipe Threads, General Purpose (Inch)
9. ASME B16.9 (2001) Factory-Made Wrought Buttwelding Fittings
10. ASME B16.26 (2006) Standard for Cast Copper Alloy Fittings for Flared Copper Tubes
11. ASME B16.2 (2005) Nonmetallic Flat Gaskets for Pipe Flanges
12. ASME B16.22 (2001) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
13. ASME B31.1 (2001) Power Piping

C. ASTM INTERNATIONAL (ASTM)

1. ASTM A 53 (2002) Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
2. ASTM A 153/A 153M (2005) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
3. ASTM A 181 (2001) Standard Specification for Carbon Steel Forgings, for General-Purpose Piping
4. ASTM A 193/A 193M (2008b) Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service
5. ASTM A 197 (2001) Standard Specification for Cupola Malleable Iron
6. ASTM A 234 (2002) Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
7. ASTM A 240 (2001) Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels

8. ASTM A 269 (2008) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
9. ASTM A 307 (2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
10. ASTM A 312/A 312M (2008a) Standard Specification for Seamless, Welded, and Heavily Worked Austenitic Stainless Steel Pipes
11. ASTM A 380 (2006) Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems
12. ASTM A 47/A 47M (1999; R 2004) Standard Specification for Steel Sheet, Aluminum-Coated, by the Hot-Dip Process
13. ASTM A 479/A 479M (2008) Standard Specification for Stainless Steel Bars and Shapes for Use in Boilers and Other Pressure Vessels
14. ASTM A 733 (2003) Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples
15. ASTM A 774/A 774M (2006) Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fittings for General Corrosive Service at Low and Moderate Temperatures
16. ASTM A 778 (2001) Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products
17. ASTM B 117 (2007a) Standard Practice for Operating Salt Spray (Fog) Apparatus
18. ASTM B 61 (2008) Standard Specification for Steam or Valve Bronze Castings
19. ASTM B 62 (2002) Standard Specification for Composition Bronze or Ounce Metal Castings
20. ASTM B 88 (2003) Standard Specification for Seamless Copper Water Tube
21. ASTM C 150 (2007) Standard Specification for Portland Cement
22. ASTM D 1238 (2004c) Melt Flow Rates of Thermoplastics by Extrusion Plastometer
23. ASTM D 1248 (2005) Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable
24. ASTM D 1598 (2002; R 2008) Time-to-Failure of Plastic Pipe Under Constant Internal Pressure

25. ASTM D 1599 (2005) Resistance to Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings
26. ASTM D 1784 (1999) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
27. ASTM D 1785 (1999) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
28. ASTM D 2239 (2003) Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
29. ASTM D 2467 (2006) Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80
30. ASTM D 2564 (2004e1) Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems
31. ASTM E 96/E 96M (2005) Standard Test Methods for Water Vapor Transmission of Materials
32. ASTM F 402 (1993, R1999) Standard Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings
33. ASTM A 530/A 530M (2004a) General Requirements for Specialized Carbon and Alloy Steel Pipe
34. ASTM A 632 (2004) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service
35. ASTM F 493 (2004) Solvent Cements for Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Pipe and Fittings
36. ASTM F 593 (2002; R 2008) Stainless Steel Bolts, Hex Cap Screws, and Studs
37. ASTM F 594 (2008) Standard Specification for Stainless Steel Nuts

D. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C104/A21.4 (2003) Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. ANSI/AWWA C110/A21.10 (1998) Ductile-Iron and Gray-Iron Fittings, 3 in through 48 in (75 mm through 1200 mm), for Water and Other Liquids
3. ANSI/AWWA C111/A21.11 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

4. AWWA C110/A21.10 (2008) Ductile-Iron and Gray-Iron Fittings for Water
 5. ANSI/AWWA C115/A21.15 (1999) Water Treatment – Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
 6. AWWA C115/A21.15 (2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
 7. AWWA C150/A21.50 (2002; Errata 2003) Thickness Design of Ductile-Iron Pipe
- E. INTERNATIONAL ORGANIZATION FOR STANDARDIZATION (ISO)
1. ISO 228-1 (2000) Pipe Threads Where Pressure-Tight Joints Are Not Made on The Threads - Part 1: Dimensions, Tolerances and Designation
- F. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
1. MSS SP-58 (2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
 2. MSS SP-89 (2003) Pipe Hangers and Supports - Fabrication and Installation Practices
 3. MSS SP-69 (2003; R 2004) Standard for Pipe Hangers and Supports - Selection and Application

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-02 SHOP DRAWINGS
1. Shop drawings shall show layout and dimensions of equipment, major components, key alignment locations, and locations of bolt holes. Drawings shall also indicate where access points for Maintenance and operations are located on the equipment. Drawings shall show critical field dimensions. All drawings shall show actual pipe lengths, diameters, fittings, and appurtenances.
 2. Joint couplings and fittings shall be shown on the drawings and product submittals and shall be specifically identified with the applicable style or series designation. The drawings shall show layouts and dimensions of the piping and pipe supports for the pipe systems.
- C. SD-03 PRODUCT DATA

1. Provide Manufacturer's descriptive data, technical literature, catalog cuts, and installation instructions. Provide spare parts data for each different item of material and equipment specified, after approval of the detail drawings and not later than one month prior to the date of beneficial occupancy.
2. Product data shall also include catalog cut sheets and dimensional data for each type of process pipe, tube, and fitting.
3. Prior to shipment of pipe, submit a certified affidavit of compliance from the pipe Manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance with AWWA and ASTM standards as well as the requirements specified herein.

D. SD-06 REPORTS

1. The Contractor shall submit test reports for each section of piping tested for pressure and leakage.

E. SD-10 OPERATION & MAINTENANCE DATA

1. All required cuts, drawings, equipment lists, descriptions, which are required to instruct operation and maintenance personnel unfamiliar with such equipment. The O&M manuals shall include instructions for cleaning and maintenance.

1.04 QUALITY ASSURANCE

- A. Inspection of all piping and fittings shall be conducted by the Contractor after delivery on site. All piping shall be subject to rejection at any time on account of failure to meet that which is outlined in the Contract Documents. Pipe which has been rejected after delivery shall be specifically marked for "non-use" and shall be removed from the job site at no additional cost. The acceptance of Manufacturer's pipe samples prior to shipment shall not be equal to the Engineer's acceptance of all piping delivered to the job site.
- B. All welding shall be conducted under qualified welding procedures. All welders and operators shall be certified in accordance with the latest applicable AWS and ANSI codes for shop and project site welding of piping work. Provide written proof of certifications upon request from the Engineer.
- C. All piping systems, components, and appurtenances in contact with potable water (including potable water during any stage of treatment or conditioning) shall be certified to meet the requirements of ANSI/NSF 61 for water service.

1.05 SPECIAL TOOLS

- A. Furnish one set of all special tools required to completely assemble, disassemble, or maintain the process piping and appurtenances. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items.

PART 2 – PRODUCTS**2.01 DUCTILE IRON PIPE & FITTINGS - TYPE (DI/1)**

- A. All "TYPE (DI/1)" Ductile Iron Piping shall be Class 53 flanged pipe and fittings per AWWA C150/A21.50, AWWA C115/A21.15, and AWWA C110/A21.10 standards. Flanges shall conform to the drilling and facing of ASME B16.1/ANSI Class 125/150 unless otherwise noted or as required to connect to valves, tanks, equipment, and other appurtenances.
- B. The minimum class thickness for flanged pipe shall be Class 53 for sizes up through 54 inches. All flanged pipe joints shall be assembled using gaskets. All pipes shall be provided and installed in standard lengths whenever possible.
- C. All "TYPE (DI/1)" ductile iron pipe of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturer's named or otherwise shall comply completely with the Contract Documents. All Class 53 ductile iron piping shall be a product of the following Manufacturer:
1. U.S. Pipe & Foundry Company Inc.
 2. American Cast Iron Pipe Company
 3. Clow Water System Company
 4. Engineer Approved Equal

2.02 FLANGES & CONNECTORS – TYPE (DI/1)

- A. All ductile iron flanges shall conform to ANSI/AWWA C115/A21.15 and be flat faced type unless otherwise Specified or indicated on the Drawings. All ductile iron fittings shall conform to ANSI/AWWA C110/A21.10 standards and be pressure rated for 250 psi. As a minimum, all fittings shall be rated equally to the connecting piping.
- B. Unless otherwise specified or indicated on the Drawings, all ductile iron piping and fittings shall utilize ANSI standard flanged connections. The use of alternative joining methods, including but not limited to couplings, and flanged adaptors shall be acceptable where specifically indicated and as approved by the Engineer. Grooved connections with "rigid" connectors shall be acceptable where specified or indicated on the Drawings or as approved by the Engineer.

2.03 GASKETS – TYPE (DI/1)

- A. All gaskets shall conform to ANSI/AWWA C111/A21.11 standards. The Gaskets shall be provided by pipe Manufacturer unless otherwise noted or approved by the Engineer. For "Interior" and "Exterior" (Below Grade) wastewater service installations, gaskets shall be full face type Nitrile (NBR/Buna-N). For "Exterior" (Above Grade) wastewater service installations, gaskets shall be full face type EPDM. All gaskets shall provide a positive sealing for all flanged joints. All gaskets shall be a minimum of 1/8 inches thick unless otherwise Specified or shown on the Drawings.

2.04 INTERIOR LININGS – TYPE (DI/1)

- A. Unless otherwise Specified or shown on the Drawings, all "TYPE (DI/1)" ductile iron piping shall be provided with a cement-mortar lining. The cement-mortar lined piping shall conform to AWWA C104/A21.4 standards except that two (2) times the standard thickness shall be provided. The cement used shall be Type II and be in accordance with ASTM C 150.
- B. Ductile iron piping used for high temperature applications such as air piping shall be unlined.

2.05 CERAMIC EPOXY LINING – TYPE (DI/1)

- A. Provide a ceramic epoxy lining where specified or indicated on the Drawings. All Ceramic Epoxy Linings shall be in accordance with the following.
- B. The "Ceramic Epoxy Lining" shall be an amine-cured novalac epoxy containing at least 20% by volume of ceramic quartz pigment. The dry film thickness shall be at least 40 mils (minimum thickness for any one test shall be 35 mils). The Lining shall meet the following requirements (provide certified test reports if requested by Engineer):
1. A permeability rating of 0.00 when tested according to Method A of ASTM E 96/E 96M, Procedure A, with a duration of 30 days.
 2. The following tests shall be run on coupons from factory lined ductile iron pipe:
 - a. ASTM B 117 Salt Spray (scribed panel) - Results to equal 0.0 undercutting after two years.
 - b. ASTM G-95 Cathodic Disbondment 1.5 volts at 77 deg F. Results to equal no more than 0.5 mm undercutting after 30 days.
 - c. Immersion Testing rated using ASTM D-14-87.
 - 1) 20% Sulfuric Acid - No effect after two years.
 - 2) 140 deg F 25% Sodium Hydroxide - No effect after two years.

3. An abrasion resistance of no more than 3 mils loss after one million cycles using European Standard EN 598: 1994 Section 7.8 Abrasion Resistance.

2.06 EXTERIOR COATINGS – TYPE (DI/1)

- A. An exterior coating shall be provided for all ductile iron pipe, fittings, and flanges. Unless otherwise specified or noted on the Drawings, the prime coat shall be factory applied. The top coat (finished coat) shall be field applied as approved by the Engineer. The top coat (finished coat) shall match the color coding for the material to be handled by the pipe. All prime and finish painting shall be in accordance with Section 09 90 00 "PAINTS AND COATINGS. Unless approved in writing by the Engineer the "Finished" coat shall be applied prior to assembly of the pipe in "moist" areas. Stainless steel flange hardware shall not be painted with epoxy paint. Submerged piping shall "NOT" require a urethane finish.
- B. The pipe shall not be coated at pipe and fitting ends to allow for Engineer approved installation of joint connections in the field. The pipe Manufacturer shall provide all necessary coating materials for application at factory supplied uncoated piping locations. All field applied coatings shall be a product of the same manufacturer as the factory prime coating to ensure compatibility. All flange bearing surfaces shall be left uncoated.
- C. Field repair of damaged pipe coatings shall receive prior written approval by the Engineer. If the Engineer deems the coating damage to be beyond repair, all damaged piping shall be replaced at no additional cost to the Owner or the Engineer.

2.07 FLANGE HARDWARE – TYPE (DI/1)

- A. All nuts, bolts, washers and other flange or coupling fastening hardware shall be 304 stainless steel for "Interior" and "Above Grade Exterior" installations. Provide 316 stainless steel flange hardware for submerged and below grade installations. Threads shall be coated with mineral oil or other anti-seize compound. Bolts shall be square headed machine bolts with hexagonal nuts in accordance with ANSI B18.2 standards. All threads shall conform to ANSI B1.1 standards. The bolts shall be of an adequate length such that they protrude through the nut following tightening. The bolt protrusion shall not exceed 1/2 inch.

2.08 PIPE MARKINGS – TYPE (DI/1)

- A. All ductile iron pipe and fittings as specified in this section shall be permanently marked with the Manufacturer, Date of Manufacture, Size, Type, Class/Wall Thickness, and Standard Produced to (ASTM, AWWA, ANSI, etc.).

2.09 NON-STANDARD FITTINGS – TYPE (DI/1)

- A. Fittings with non-standard dimensions shall only be allowed with prior written approval of the Engineer. Unless approved in writing by the Engineer, all non-standard fittings

shall meet the specification requirements for standard fittings and be of the same thickness and diameter. Laterals or reducing elbows not meeting the requirements of ANSI A21.10 standards shall meet the requirements of ANSI B16.1 - Class 125.

2.10 JOINT BRACING – TYPE (DI/1)

- A. Provide joint bracing as shown on the Drawings and as required to prevent piping from being pulled apart when under pressure. If used, all bridles and tie rods shall be a minimum of 3/4 inches in diameter except when they replace flange bolts of a smaller size. If replacing flange bolts of a smaller size, the bridles shall be fitted with a nut on each side of the pair of flanges.
- B. All pipe which requires joint bracing shall be provided with Engineer approved lugs/hooks cast integrally for use with pipe clamps, tie rods, or bridles. All pipe clamps, tie rods, and bridles shall be provided with the same coating as the piping system for interior applications. Buried applications shall be provided with a bituminous coating system. If required the coating system shall be applied prior to assembly.

2.11 DUCTILE IRON PIPE AND FITTINGS - TYPE (DI/2)

- A. All "TYPE (DI/2)" Ductile Iron Piping shall be of Class 350 mechanical joint pipe and fittings for "Buried" applications as per AWWA C151/A21.51 standards. Pipe shall be supplied in standard lengths whenever possible. The pipe thickness design shall be in accordance with AWWA C150/A21.50 standards, except provide a minimum of Class 350 for all piping 12 inches and smaller. Provide a minimum Class 350 for piping from 14 inches to 24 inches and provide a minimum of Class 250 for piping larger than 24 inches.
- B. All "TYPE (DI/2)" ductile iron pipe of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All Class 350 ductile iron process piping shall be a product of the following Manufacturer:
 - 1. U.S. Pipe & Foundry Company Inc.
 - 2. American Cast Iron Pipe Company
 - 3. Engineer Approved Equal

2.12 MECHANICAL JOINT FITTINGS – TYPE (DI/2)

- A. Mechanical joint compact body fittings shall be ductile iron class 350 and shall be produced in strict accordance with AWWA C153/A21.53 and AWWA C111/A21.11 standards. All pipe and fittings shall be provided with a cement and mortar lining in accordance with AWWA C104/A21.4 standards for sizes 3 inches through 12 inches. Pipe and fittings 14 inches through 24 inches shall be a Manufacturer's standard and produced to AWWA C153/A21.53 standards. Mechanical joint fittings shall be UL listed and rated at 350 psi.

- B. All joints shall be rated for pressure service. Joints shall be restrained rubber-gasket mechanical joints and fittings conforming to AWWA C111/A21.11 standards. All gaskets shall be as specified herein. All restrained type joints shall be "Locked Type" and be produced by the pipe and fitting Manufacturer. The joints shall utilize restraint independent of the joint gasket.
- C. All restrained joints of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All restrained joints for mechanical joint ductile iron piping shall be a product of the following Manufacturer:
 - 1. U.S. Pipe & Foundry Company Inc. - TR Flex
 - 2. American Cast Iron Pipe Company - Lok-Ring
 - 3. Engineer Approved Equal

2.13 MECHANICAL JOINT GASKETS – TYPE (DI/2)

- A. Mechanical joint gaskets shall meet or exceed the minimum requirements of AWWA C111/A21.11 specifications latest revision for SBR {Styrene-Butadienne (synthetic) Rubber} gaskets. Standard mechanical joint glands shall be Ductile Iron per ASTM A 536 standards, Grade 65-45-12.

2.14 MECHANICAL JOINT HARDWARE – TYPE (DI/2)

- A. Mechanical joint nuts and tee-head bolts shall be Corten and shall meet or exceed the requirements of AWWA C111/A21.11, 11-7.5 and ANSI A-21.22 for high strength low alloy steel having the following composition: a maximum of 0.20% Carbon, 1.25% Manganese, 0.50% Sulfur, 0.25% Nickel, 0.20% Copper with a minimum combined of 1.25% of Nickel, Copper and Chromium. The mechanical joint nuts and tee-head bolts shall have minimum yield strength of 45,000 psi and an elongation in 2 inch increments of 20%.

2.15 PVC PIPE & FITTINGS - TYPE (PVC/1)

- A. All "Type PVC/1" pipe and fittings shall be flanged or socket welded Schedule 80 PVC pipe. The pipe shall conform to ASTM D 1785 standards, PS 21-70, PVC 1120. Pipe material shall be Type I, Grade I, compound cell classified 12454-B per ASTM D 1784 standards. The PVC compound shall be gray in color. The pipe marking shall indicate the pressure rating in psi for water at 73°F, per ASTM D 1785 standards, as well as the manufacturing date code. Schedule 80 fittings shall comply with ASTM D 2467 standards. Flange dimensions shall conform to ASME B16.1, Class 125 standards unless otherwise indicated or required for connection to pumps, tanks, equipment, and appurtenances. Unions shall utilize Viton O-rings or a material compatible with the process fluid. The pipe shall have a minimum hydrostatic design stress of 2,000 psi at 73 degrees F.

- B. Pipe, fittings, and solvent cement for use with potable water shall be certified by NSF standard No. 14 and the seal shall be included on the pipe.
- C. All "TYPE (PVC/1)" of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply with the Contract Documents. All "Type PVC/1" piping shall be a product of the following Manufacturer:
 - 1. Certain Teed Corporation
 - 2. J-M Manufacturing Company
 - 3. Harvel Plastics Inc.
 - 4. Engineer Approved Equal

2.16 PVC CEMENT FOR SOCKET FITTINGS – TYPE (PVC/1)

- A. All cement for socket welded connections shall be "Low VOC" emission, heavy bodied, medium setting, high strength solvent cement. When bonding sodium hypochlorite piping, sodium hydroxide piping or any other acid piping system the cement shall be specially formulated for the chemical application. The PVC cement shall conform to ASTM F 402,
- B. ASTM D 2564 and ASTM F 493 standards. All Schedule 80 PVC piping solvent cement for "Acid and Chemical Piping Systems" shall be a product of the following Manufacturer:
 - 1. IPS Corporation - Series 724
 - 2. Engineer Approved Equal

2.17 FLANGED JOINTS – TYPE (PVC/1)

- A. Where indicated on the Drawings or as specified, all flanged joints shall be supplied with 1/8 inch thick full-faced gaskets. The gaskets shall be of materials as specified in this section based on the respective process fluid. Flanged bolt spacing shall conform to ANSI B16.5 standards. The flanges shall be rated for a minimum pressure of 150 psi. All flanges shall be single piece and be suitable for solvent cementing to the pipe. Two piece sleeve flanges shall not be acceptable. All gaskets shall be compatible with the process fluid.
- B. All bolts, nuts, washers, and other fastening devices shall be designed for use in corrosive service environments. All fastening devices shall be 316 stainless steel and conform to ASTM F 593 and ASTM F 594 standards. All nuts and bolts shall be installed with an anti-seize compound of molybdenum disulfite base.

2.18 CARBON STEEL PIPE & FITTINGS - TYPE (CS/1)

- A. All "Type CS/1" carbon steel piping shall be Schedule 40, black steel in accordance with ASTM A 53 standards. All carbon steel pipe 12 inches and larger shall have a 0.375 inch thick wall in accordance with ASTM A 53 standards, and be seamless.
- B. All "Type CS/1" piping of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the Contract Documents. All "Type (CS/1)" piping shall be a product of the following Manufacturer:
 - 1. Wheatland Tube Company
 - 2. Federal Steel Supply Inc.
 - 3. Bull Moose Tube Company
 - 4. Engineer Approved Equal

2.19 JOINTS – TYPE (CS/1)

- A. Joints for pipe 2 inches and smaller shall be threaded for standard screwed joints. Joints for pipe 2-1/2 inches and larger shall be butt welded or flanged. Threaded joints shall be made up with appropriate thread compound as recommended by the pipe Manufacturer and applied to the male thread only. All joints shall be air tight. The Contractor shall provide unions to allow for convenient removal of piping, valves, strainers, and other related appurtenances. Unions for piping 2 inches and smaller shall be 250 pound, black malleable iron, ground joint with brass seats.
- B. Joints shall not be backed off after being "set-up" unless the joint is completely broken. If joints are broken, the threads shall be cleaned and new compound shall be applied. All joints for gas piping larger than 2 inches in diameter and all buried joints shall be welded.
- C. All piping 2-1/2 inches and larger shall have flanged or welded joints as specified or shown on the Drawings. All pipe shall have beveled ends for welding. Fittings for pipe 2-1/2 inches and larger shall be Schedule 40 seamless steel, butt weld type in accordance with ASTM A 234 Grade WPB and ASME B16.9 standards.

2.20 FLANGES – TYPE (CS/1)

- A. Flanges for pipe 2-1/2 inches and larger shall be 150 pound, forged steel, weld neck or slip-on in accordance with ASTM A 181 Grade I, and ASME B16.5 standards. Gaskets shall be ring type, minimum 1/8 inches thick. All gaskets shall be of an Engineer approved composition, suitable for the intended service, and compatible with the process liquid/gas.
- B. Companion flanges shall be provided on piping 2 inches and smaller or for connection to valves, equipment, and other related appurtenances. Companion flanges shall be 150 lb ANSI standard, flat face steel flanges of the threaded type. Flanges shall be spot

faced on the back around each bolt hole. For galvanized pipe, flanges shall also be hot-dipped galvanized.

- C. All fastening devices shall be ASTM A 307, Grade B Steel. All bolts and nuts shall be hex head and conform to ASME B16.5 and ANSI B16.2 standards.

2.21 FITTINGS – TYPE (CS/1)

- A. Fittings for pipe 2 inches and smaller shall be 150 pound, black malleable iron, in accordance with ASTM A 197 and ASME B16.3 standards. Joints for fittings shall be threaded for standard screwed joints. Joints for gas piping shall be welded. Fittings for steam piping and hot water piping shall be 300 pound, extra heavy, black malleable iron. All galvanized fittings shall conform to ASTM A 47/A 47M and ASTM A 153/A 153M standards. All fittings used on galvanized pipe shall also be galvanized.

2.22 FINISHING – TYPE (CS/1)

- A. All exposed interior piping and fittings shall be surface prepared and shop painted in accordance with section 09 90 00 "PAINTS & COATINGS".
- B. Each length of pipe shall be continuously stenciled to show the manufacturer, the grade of pipe (ASTM A 53), the kind of pipe the size (Schedule 40), and length. Stencil markings shall indicate UL Listing and FM Approval for sizes 1 inch through 6 inch nominal for use in Fire Sprinkler Pipe Applications.

2.23 STAINLESS STEEL PIPE & FITTINGS - TYPE (SS/1)

- A. All "Type (SS/1)" piping shall be flanged or welded, Grade TP 304L, Schedule 10S with dimensions conforming to ASME B36.19M and ASTM A 778 standards. Where specifically noted, specified, or indicated on the Drawings; pipe shall be austenitic type intended for general corrosive or high pressure service in accordance with the requirements of ASTM A 312/A 312M standards. All stainless steel piping shall be fabricated from stainless steel sheet conforming to ASTM A 778 standards. The carbon content of all 304L stainless steel shall be no greater than 0.03%. All pipe shall be finished to No. 1 or better.
- B. All pipe tolerances for length, inside diameter, outside diameter, and straightness shall conform to ASTM A 530/A 530M standards.
- C. All pipe shall be die-formed or rolled true to dimension and round. Ends of pipe and fittings shall be perpendicular to the longitudinal axis. All interior welds shall be smooth and even. The internal bead shall not exceed 1/16 of an inch in height. Any longitudinal seams on fittings and pipe shall be welded by the tungsten or metallic gas methods.
- D. All "Type (SS/1)" piping of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the

Contract Documents. All stainless steel piping shall be a product of the following Manufacturer:

1. Douglas Brothers
2. Felker Brothers Corporation
3. Tioga Pipe Supply Company, Inc.
4. Engineer Approved Equal

2.24 STAINLESS STEEL JOINTS – TYPE (SS/1)

- A. Stainless steel piping shall be joined by welded fittings, flanges or roll groove joints with "rigid" 316 stainless steel connectors. Dielectric fittings or isolation joints shall be provided between all dissimilar metals. Fittings shall be smooth curve type, same schedule, and same size as the pipe they are connected to. Fittings shall conform to ASTM A 774/A 774M and ANSI B16.9 standards.

2.25 FITTINGS – TYPE (SS/1)

- A. Unless otherwise indicated, all reducers shall be straight tapered, cone type. Eccentric reducers shall be provided as required and as indicated on the Drawings. All tees, crosses, laterals and wyes shall be shop fabricated from stainless steel pipe. Provide eccentric reducers with the flat side up on all pump suction piping.
- B. All long radius elbows up to 24 inches in diameter shall be manufactured so the centerline to end of elbow dimension is equal to 1.5 times the nominal pipe size.
- C. Unless otherwise specified or indicated on the drawings all elbows and associated fittings shall be of smooth curved radial construction. Mitered elbows and fittings shall be acceptable for larger diameter piping. Substitutions of mitered fittings for radial fittings shall only be as approved in writing by the Engineer. A minimum of five (5) miter sections shall be provided for 90 degree bends. A minimum of three (3) mitered sections shall be provided for 45 and 60 degree bends. A minimum of two (2) mitered sections shall be provided for 30 degree and smaller bends.

2.26 WELDING – TYPE (SS/1)

- A. All welding shall be conducted using filler wire of ELC grade. The cross section of all welds shall be equal to or greater than the piping thickness. All butt welds shall have full penetration to the interior surface of the joint/pipe. Provide gas shielding on the interior and exterior of the pipe or fitting joint. All welds shall provide a smooth and even finished surface. All welds shall have a bead height of 1/16 inches or smaller. All angle face rings shall be welded on all sides of the pipe and/or fitting. All welding for angle face rings shall be continuous.
- B. The Contractor shall remove all excess slag, spatter, and weld deposits by grinding. All welds on surfaces to be sealed with gaskets shall be ground to a smooth level surface. The Contractor shall repair all welding defects, including but not limited to, crevices,

pin holes, cracks, undercuts, or concavity at no additional cost to the Owner or Engineer.

- C. All piping with wall thicknesses up to 0.125 inches shall be welded with the TIG process. All piping with heavier walls shall be properly beveled and have a root pass with the TIG process. Additional welding passes shall be provided with the TIG, MIG, or Metallic Arc processes.

2.27 STAINLESS STEEL WELDED FITTINGS – TYPE (SS/1)

- A. All welding fittings shall be butt-welded. Butt welds shall have 100 percent penetration to the interior or backside of the weld joint. All fittings shall be forged austenitic stainless steel in accordance with ASTM A 774/A 774M standards. The grade shall match the connecting pipe and conform to ASME B16.9 and ASME B16.28 standards. Where specifically noted, specified, or indicated on the Drawings; provide fittings to match the connecting piping in accordance with ASTM A 403/A 403M standards.
- B. All shop welding of fabrications shall be done according to the procedures and by welders certified per ASME Section IX. Welds shall be by an inert gas shielding process using only extra low carbon filler metals. Welds shall have a bead height of no more than 1/16 of an inch. Cross-sectional thickness of welds shall be equal or greater than that of the parent metal.

2.28 STAINLESS STEEL FLANGES – TYPE (SS/1)

- A. Flanges shall be used on stainless steel piping where shown on the Drawings, as required, and where approved by the Engineer. Flanges shall be provided at the connection to valves, equipment, couplings, and other appurtenances. The internal diameter bores of flanges and flanged fittings shall be the same as that of the connecting pipe. The flanges shall be slip-on type rolled angle face rings with stainless steel backing flanges. Flanges and flanged fittings shall be same grade as the pipe and be drilled to ASME B16.5 standards.
- B. For tie-in to existing flanges, the Contractor shall field check existing flanges for non-standard bolt hole configurations and shall design as required to assure the new pipe and flange mate properly to the existing pipe. Gaskets shall meet the requirements of ASME B16.5 standards.
- C. Flanges for pipe larger than 4 inches shall have stub ends, angle type stub ends or angle rings of the type of stainless steel as the pipeline welded to the pipe end.
- D. Bolts, washers, nuts and other hardware for flange bolting shall be Type 304 stainless steel. For "continuously submerged" applications, all hardware shall be type 316 stainless steel.

2.29 BACKING FLANGES – TYPE (SS/1)

- A. Unless otherwise specifically noted, specified or indicated on the Drawings, all backing flanges shall be 304 stainless steel. All backing flanges shall be drilled to ASME B16.5 Class 125/150 or as required match to the respective connecting item/appurtenance. The angle face ring thickness shall be equal to or greater than the wall of the pipe or fitting to the sides of the pipe or fitting. The angle leg shall not create interferences with the flange bolt holes.
- B. Only where specifically noted, specified or indicated on the Drawings, provide ductile iron backing flanges in accordance with ASTM A-536-80 standards. All ductile iron back-up flanges shall be shop primed in accordance with section 09 90 00 PAINTS AND COATINGS. Where the pipe stub is to pass through a sleeve during installation, a split-type back up flange shall be used.
- C. Cast austenitic stainless steel backing flanges shall conform to ASTM A 351/A 351M and/or ASTM A 240 standards and shall be drilled to ASME B16.5 Class 125/150 or as required to match to the connecting item/appurtenance.
- D. All backing flanges shall have minimum thicknesses in accordance with the following:

Pipe Size (Inches)	Flange Thickness (Inches)
2 to 8	1/2
10 to 1	5/8
18 to 2	3/4
24 to 3	1
36 to 6	1-1/4

2.30 GASKETS – TYPE (SS/1)

- A. All gaskets shall conform to ASME B16.21 standards. Gaskets for "Interior" and "Below Grade" wastewater service shall be Nitrile (NBR/Buna-N) with a cloth insertion. The gaskets shall have a durometer hardness No.80, 1,500 psi minimum tensile strength, 125 percent minimum elongation. Provide flat ring type gaskets for use with raised face flanges and full face type gaskets for use with flat face flanges.
- B. Gaskets for low pressure air piping and "Above Grade Exterior" wastewater piping shall be EPDM. Gaskets for low pressure air piping shall be suitable for use at temperatures to 250 degrees F.
- C. All gaskets 12 inches in diameter or less shall be a minimum of 1/8 inches thick. All gaskets larger than 12 inches in diameter shall be a minimum of 3/32 inches thick.

2.31 PIPE ENDS & COUPLINGS – TYPE (SS/1)

- A. Unless otherwise specified or indicated on the Drawings, all stainless steel piping and fittings shall utilize welded or ANSI standard flanged connections. Unless otherwise specified or indicated on the Drawings, the use of alternative joining methods, including but not limited to couplings and flanged adaptors, shall not be acceptable without prior written approval from the Engineer.
- B. The use of "rigid" shouldered end connections shall be acceptable where specified or indicated on the Drawings and as approved by the Engineer. All connections to valves, process equipment, appurtenances, etc., shall be flanged. Replacement of flanged joints with shop butt welds or continuous pipe runs shall be acceptable with prior written approval of the Engineer. The manufacturer shall specifically indicate all connection types and locations as part of shop drawing submittals.
- C. All pipe ends shall be prepared for couplings or other type ends where required by transport and handling limitations, where required by the support layout requirements and where noted on the Drawings.
- D. Grooving and built-up ends for stainless steel piping shall be of the coupling Manufacturers standard type. The Contractor shall be responsible for ensuring sufficient rigidity of joints. All normal pipe joints including but not limited to; at valves, pumps, equipment, and other related appurtenances, shall be flanged, drilling per ANSI B 16.1, Class 125/150.

2.32 PIPE MARKINGS – TYPE (SS/1)

- A. All stainless steel piping shall be marked with the gauge and type of stainless steel and with the initials of the inspector marked on the inside of each piece, at each end.

2.33 FINISHING – TYPE (SS/1)

- A. All stainless steel pipe and fittings shall be fully submerged and pickled at the point of manufacture. After removal from the pickling bath, all piping shall be scrubbed and washed until all discoloration is removed in accordance with ASTM A 380 standards.
- B. The pickling bath shall be a minimum 25% solution of nitric and hydrofluoric acids at 125 degrees F. All stainless steel piping, fittings, and related appurtenances shall be fully immersed for a minimum of 20 minutes. All stainless steel shall be clean water rinsed after removal from the acid pickle.
- C. During fabrication and installation care shall be taken to avoid contact of stainless steel pipe with structural steel, chain, wire-ropes, steel tools, and any other "carbon steel" products. The contamination of stainless steel by carbon steel may lead to marks due to rusting of imbedded steel. Provide repair and/or replacement of all contaminated stainless steel pipe, fittings, and appurtenances.

2.34 STAINLESS STEEL PIPE & FITTINGS - TYPE (SS/2)

- A. All "TYPE (SS/2)" stainless steel piping shall be Schedule 40, 304L grade, with NPT threaded connections. All "Type (SS/2)" stainless steel pipe and fittings shall be used for sample piping, instrument piping and gauge connections two (2) inches and smaller in diameter as specified or as shown on the Drawings.
- B. The piping shall meet ASTM A 312/A 312M, ASTM A 733, ASME B1.20.1, and ANSI B1.20.1 standards. All stainless steel piping shall be fabricated from stainless steel sheet conforming to ASTM A 778 standards. All pipe shall be finished to No. 1 or better.
- C. Threaded fittings shall be austenitic stainless steel, Grade 304L, in accordance with ASTM A 182/A 182M ASME B16.11 standards. All fittings shall be threaded in accordance with ASME B1.20.1 standards. Polytetrafluoroethylene (PTFE) pipe-thread tape conforming to ASTM D 3308 standards shall be used for lubricant/sealant.
- D. All "TYPE (SS/2)" piping of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All stainless steel piping shall be a product of the following Manufacturer:
 - 1. Felker Brothers Corporation
 - 2. Tioga Pipe Supply Company, Inc.
 - 3. Engineer Approved Equal

2.35 STAINLESS STEEL TUBING - TYPE (SS/3)

- A. All "TYPE (SS/3)" stainless steel tubing shall meet the requirements of ASTM A 269 and ASTM A 632 standards. All tubing shall be seamless or welded, Grade 316L with nominal size and wall thickness. All tubing shall be of sizes as indicated on the Drawings.
- B. Fittings shall be compression style, constructed of ASTM A 479/A 479M stainless steel, Grade TP 316L. All nuts, ferrules, and bodies shall be rated to a minimum 150 psi pressure. Threads shall be straight conforming to ISO 228-1 and ASME B1.1 standards.
- C. All "TYPE (SS/3)" tubing of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All stainless steel tubing shall be a product of the following Manufacturer:
 - 1. Eagle Stainless Tube & Fabrication Inc.
 - 2. Swagelok Company
 - 3. Plymouth Tube Company
 - 4. Engineer Approved Equal

2.36 STAINLESS STEEL HOSE - TYPE (SS/4)

- A. All "TYPE (SS/4)" flexible metal hose shall be constructed of corrugated inner tubing of type 316L stainless steel and shall have an outer shield of wire-braid of type 321 stainless steel.
- B. The hose shall be rated for a temperature range of - 20 degrees F to +1,200 degrees F. The maximum vacuum shall be 29 inches of Mercury. The hose shall be provided with rigid male and female union fittings with NPT threads or flanged fittings as required or as shown on the Drawings. The flexible hose end connectors shall have a length not less than five (5) times the nominal pipe diameter. The connectors shall be suitable for pressure up to 150 psig and temperatures to 400 degrees F.
- C. The hose shall allow for a minimum of 1/4 inch of intermittent flexing, or per Manufacturer's recommendations for additional motion. For potable water service, connectors shall be UL classified in accordance with ANSI/NSF 61-1977 standards.
- D. All "TYPE (SS/4)" hose of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All stainless steel hose shall be a product of the following Manufacturer:
 - 1. U.S. Hose Corporation - Series 286X
 - 2. Metraflex Company
 - 3. Engineer Approved Equal

2.37 GASKETS

- A. Gaskets shall be used on all flanged piping joints. All gaskets shall be a minimum of 1/8 inches thick unless otherwise specified or indicated on the Drawings. Unless otherwise noted, gaskets shall be low torque, full face to ANSI B16.5 dimensions for 125/150 pound flanges. Gaskets shall have two concentric, convex, molded rings between the center hole and bolt hole circle.
- B. Gaskets for all water and wastewater applications (sludge, septage, etc.) in flanged piping systems shall be Nitrile (NBR/Buna-N) unless otherwise indicated. The NBR shall have a minimum durometer shore A hardness of 60 in accordance with ASTM D 2000 standards. The gasket finish shall be smooth. The gaskets shall be designed for use in plastic piping systems, as well as metal or plastic-lined metal piping systems.
- C. Gaskets for strong acids and bases shall be Hypalon. Gaskets for oil and gasoline shall be Nitrile/Buna-N. Gaskets subject to abrasion, heat, or flame shall be Hypalon or Neoprene. Gaskets for low pressure air service piping shall be EPDM and be suitable for a temperature range of up to 225 degrees F.

- D. If for a specific application a pipe or valve Manufacturer recommends a different type of gasket than that specified, the Contractor shall submit to the Engineer the gasket information for review and approval.
- E. Provide gaskets constructed of the following materials for process fluid/chemical piping systems as required and as shown on the Drawings:
 - 1. Aluminum Sulfate: EPDM
 - 2. Ferric Chloride: EPDM
 - 3. Ferrous Chloride: EPDM
 - 4. Sodium Bisulfite: Viton
 - 5. Sodium Hydroxide: Viton
 - 6. Sodium Hypochlorite: Viton
 - 7. Sulfuric Acid: Viton
 - 8. Wastewater (Interior/Below Grade): Nitrile (NBR/Buna-N)
 - 9. Wastewater (Exterior/Above Grade): EPDM
 - 10. Grit Slurry: Neoprene
- F. All gaskets of the same type and material shall be provided by a single Manufacturer. All Manufacturers' named or otherwise shall comply completely with the Contract Documents. All gaskets shall be a product of the following Manufacturer:
 - 1. Asahi/America Inc.
 - 2. Allstate Gasket Inc.
 - 3. Metro Industries Inc.
 - 4. Engineer Approved Equal

2.38 UNIONS

- A. When joining pipe segments, provide unions where called for on the Drawings and as specified. Provide additional unions to allow for disassembly of piping segments. Provide unions at pumps, equipment, valves, etc. to allow for removal without disassembly of the piping systems.

2.39 PIPE AND FITTINGS COATINGS

- A. An exterior coating shall be provided for all ferrous metallic pipe, fittings, and flanges. The prime coat shall be factory applied. The finish coat shall be field applied. The finish coat may be factory applied for all submerged piping applications. The finish coating color shall match existing color coding (for retrofit or upgrade projects). For new projects and systems, the color coding shall be as directed by the Engineer.
- B. The color coding shall be in accordance with section 4.4.5 "PLANT PAINT & EQUIPMENT IDENTIFICATION" of the TR-16 Guides for Design of Waste Water Treatment Works (latest revision); a unique color shall be selected for each fluid carried. Fluid designations are provided on the Drawings.

- C. All ferrous metallic pipe shall be "Finish" painted (unless covered by insulation). The Contractor shall refer to Section 09 90 00 PAINTS & COATINGS as well as the piping Manufacturer's recommendations for coating types and requirements. The Contractor shall coat pipes, fittings, hangers and supports using the same paint system. Attachment hardware shall not be painted. Stainless steel pipe, stainless steel pipe supports and appurtenances shall not be painted. All ferrous metallic pipe in submerged applications shall "NOT" require a urethane finish. The finished coating shall be a product of the same manufacturer as the prime coat to ensure compatibility.
- D. Confirm the final color coding with the Owner & Engineer prior any application.

2.40 ATTACHMENT HARDWARE

- A. All attachment hardware, including but not limited to nuts, bolts, washers and all related fastening devices shall be 304 stainless steel. Threads shall be coated with mineral oil or another anti-seize compound prior to installation. Hardware for submerged applications shall be 316 stainless steel.

2.41 PIPE LABELS

- A. All piping shall be labeled on two sides at "maximum" 15 foot intervals. A flow direction arrow shall follow the label legend and be of the same color. The labels shall meet or exceed ASME A13.1 and ANSI standards. The legend letters shall be Capitalized and be black or white, depending on the background color. The labels shall be self-adhesive vinyl type. The labels shall be suitable for a pipe temperature range of - 40 degrees F to 175 degrees F.
- B. The pipes shall be labeled according to the fluid carried. The labels shall match the fluid designations as shown on the Drawings. Provide a detailed submittal which shall include each pipe label for each of the respective fluid designations for review by the Engineer. Pipe labels shall be installed on the exterior of all piping insulation/jacket.
- C. The piping labels shall spell out the entire fluid designation, not the abbreviation. Confirm the naming convention with the Engineer and Owner prior to ordering the labels.
- D. All pipe labels of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers' named or otherwise shall comply with the Contract Documents. All pipe labels shall be a product of the following Manufacturer:
 - 1. Marking Services Inc.
 - 2. Brimar Industries Inc.
 - 3. Engineer Approved Equal

PART 3 – EXECUTION**3.01 DELIVERY, STORAGE AND HANDLING**

- A. Materials delivered and placed in storage shall be provided with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of material before, during and after installation shall be provided. Any material found to be damaged shall be replaced.
- B. During installation, piping shall be capped to keep out dirt and other foreign matter. A material safety data sheet in conformance with 29 CFR 1910 Section 1200(g) shall accompany each chemical products delivered for use in pipe installations. At a minimum, this includes all solvents, solvent cements, glues and other materials that may contain hazardous compounds. Handling of chemicals for piping installation shall be in accordance with ASTM F 402 standards.
- C. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation, or other damage. Pipe and fittings shall be handled and stored in accordance with the Manufacturer's recommendations. Plastic pipe shall be packed, packaged and marked in accordance with ASTM D 3892 standards.
- D. Where possible, store pipe and tube inside and protected from weather. Where necessary to store outside, elevate above grade and enclose with durable, waterproof wrapping. Protect flanges and fittings from moisture and dirt by inside storage and enclosure, or by packaging with durable, waterproof wrapping.

3.02 STACKING & UNLOADING

- A. All piping shall be stacked in accordance within the limits recommended by its Manufacturer. The bottom row of the piping stack shall be elevated from the ground surface. The piping shall be supported off the ground through the use on timbers, rails, or concrete as recommended by the piping Manufacturer.
- B. The interior of all piping and fittings shall be kept clean and free from dirt or other foreign material at all times. Utilize suitable caps or wrapping to prevent entry of dirt or foreign material into the piping. Exercise extra care when handling cement lined pipe. Damage to the interior lining of piping shall render it unfit for use.
- C. Unload all piping in strict accordance with the Manufacturer's recommendations. The Contractor shall take care so as not to damage the pipe during unloading. The Contractor shall utilize padding on all hooks, slings, and pipe tongs used for unloading so as to prevent damage to the piping, its exterior coating and interior lining. Dropping of pipe during unloading shall not be acceptable. Care shall be taken so as not to skid piping against stationary piping during unloading or stacking.

3.03 STAINLESS STEEL PIPE

- A. The Contractor shall specifically take care to avoid contacting stainless steel piping with ferrous surfaces or materials. Contact with ferrous surfaces or materials may lead to rusting of particles embedded in the walls of stainless steel piping. If rusting of stainless steel piping occurs after installation, the Contractor shall be responsible for its removal at no additional cost to the Owner or Engineer. The Contractor shall pickle the affected surface area of the piping with a deoxidizer as recommended by the pipe Manufacturer and as approved by the Engineer. The Contractor shall scrub all affected areas of the piping with stainless steel brushes and then thoroughly rinse the affected area.
- B. All stainless steel piping shall be stored on supports constructed of non-ferrous metal materials. All tools, including but not limited to, wire brushes, wrenches, drills, saws, etc. for stainless steel piping installation shall be specifically designated for use on stainless steel piping to ensure no contamination from ferrous metals occurs. All piping storage and fabrication supports shall be constructed from non-ferrous metal, stainless steel, or provided with a rubber lining.

3.04 INSTALLATION - GENERAL

- A. Piping systems shall be fabricated and installed in accordance with ASME B31.1 standards. Install each run of piping with minimum joints and couplings, but with adequate and accessible unions for disassembly and maintenance/replacement of valves and equipment. Reduce sizes (where indicated on the Drawings) by use of reducing fittings. Align piping accurately at connections, within 1/16 inch misalignment tolerances.
- B. Locate piping runs, except as otherwise indicated, vertically and horizontally (pitched to drain) and avoid diagonal runs wherever possible. Orient horizontal runs parallel with walls and column lines. Locate runs as shown or, if not otherwise indicated, run piping in the shortest route which does not obstruct usable space or block access for servicing the building and its equipment. Hold piping close to walls, overhead construction, columns and other structural and permanent-enclosure elements of buildings.
- C. Horizontal piping shall pitch uniformly 1 inch in 40 feet and drain to a minimum number of low points. All low points shall be provided with a minimum one (1) inch tapped "TYPE (SS/2)" drain pipe, 316 stainless steel isolation ball valve (Type V26), and 316 stainless steel hose connection. Provide "TYPE (PVC/1)" drain piping and a (Type V20) PVC ball valve for drain connections off of PVC piping. Drain connections may or may not be shown on the Drawings. Confirm the final location of all drain connections with the Engineer and Owner prior to installation. Provide larger drain connections as required and as directed by the Engineer and Owner.

- D. The Contractor shall provide unions in piping as shown on the Drawings and as specified herein. Unions shall be provided in locations including but not limited to the following: equipment, pumps, tanks, valves, long piping runs, piping bypasses around equipment, or any other location as directed by the Engineer or Owner. Unions shall be located to as to allow for piping disassembly, alterations, and repairs.
- E. The Contractor shall be responsible for "All" field routing and coordination of process piping routing as required to accommodate all necessary coordination with other work of the Contract, including but not limited to HVAC, Electrical, Structural, Architectural, Plumbing and Civil work.
- F. Provide concrete thrust blocks at all pipe fittings and changes in direction or alignment. For clarity, thrust blocks may or may not be shown at every bend, fitting or directional change. Thrust blocks which have not been shown shall not relieve the Contractor of the responsibility for providing and installing them.

3.05 DUCTILE IRON PIPE INSTALLATION - TYPE (DI/1)

- A. The Contractor shall install "Type (DI/1)" ductile iron piping and fittings true to alignment. Provide rigid pipe supports and anchorage. The support spacing shall be in strict accordance with the recommendations of the piping Manufacturer.
- B. The installation and piping support system shall not allow deflection of piping greater than 50% of the maximum deflection as recommended by the piping Manufacturer. Each section of piping and fittings shall be cleaned free of dirt, debris and other foreign material prior to installation. All cleaning shall be in accordance with the recommendations of the piping Manufacturer.
- C. All ductile iron piping and fittings shall be installed in accordance with requirements of AWWA C600 standards. Provide all fittings for field routing of piping in addition to those shown on the Drawings to provide for a complete and operational piping system. Provide additional flanges as directed by the Engineer where piping interferes with existing facilities.

3.06 PIPE CUTTING – TYPE (DI/1)

- A. Pipe cutting shall be as approved by the Engineer. Any damage to the interior pipe linings shall be repaired to the satisfaction of the Engineer before installation. If approved by the Engineer, cutting shall be conducted using a saw with blades specifically designed for cutting iron pipe. All cuts shall be at right angles to the axis of the piping. The cuts shall leave smooth edges. Damages to interior pipe linings caused by cutting of pipe shall be repaired to the satisfaction of the Engineer and Owner.
- B. The Contractor shall seal the ends of all cut pipe in accordance with the recommendations of the pipe Manufacturer.

- C. Field cutting and threading of ductile iron pipe shall not be acceptable under any circumstances, all pipe shall be pre-cut and threaded for flanges at the factory of origin.

3.07 JOINTS & CONNECTIONS – TYPE (DI/1)

- A. Connect piping to equipment in accordance with the instructions of the equipment Manufacturer. When Manufacturer's indicate that equipment shall not support dead loads from piping, the Contractor shall submit, in writing, that the piping installation does not transfer loading from the piping to the equipment, and that all the Manufacturer's requirements have been met. Install piping so as not to impart any strain or loading on the connected equipment
- B. All bolts for flanged joints shall be tightened evenly. All bolts shall conform to the size of the flange and well as all ANSI standards. Flanged joints shall be made using gaskets, bolts, and bolt studs with a nut on each end. The Contractor shall utilize studs with nuts where the flange is tapped.
- C. The Contractor shall provide tapped pipe connections as shown on the Drawings and as directed by the Engineer. All piping shall be drilled and tapped perpendicular to the longitudinal axis of the pipe. All taps shall be designed to seal water tight. The pipe taps shall be of sufficient strength so as to prevent blowouts in pressurized applications. Follow the Manufacturer's instructions when tapping into fittings. All pipe taps shall be in accordance with ANSI A21.51 standards.

3.08 DUCTILE IRON PIPE INSTALLATION - (TYPE DI/2)

- A. Install "Type (DI/2)" ductile iron piping and fittings true to alignment. All pipe shall be thoroughly cleaned prior to laying and shall be kept clean throughout the duration of the Work. Piping shall conform to the lines and grades indicated in the Contract Documents. All ductile iron piping and fittings shall be installed in accordance with the requirements of AWWA C600, unless otherwise specified or indicated on the Drawings.
- B. A firm, even bearing shall be constructed by digging bell holes at each joint and by tamping screened gravel at the sides of the pipe up to mid-diameter. Provide fill at least one (1) foot over the top of the pipe in accordance with the details shown on the Drawings. Blocking shall not be permitted. Any and all defective pipe shall be removed even after it has been laid. The pipe shall be replaced with a sound, non-defective pipe in a satisfactory manner by the Contractor at no additional cost to the Owner or Engineer.
- C. All pipe shall be sound and clean prior to laying. When laying is not in progress, including lunch breaks, the open ends of piping shall be closed by watertight plugs or other Engineer approved means. Proper alignment shall be preserved in laying. Deflection of joints shall not exceed that recommended by the pipe Manufacturer. All fittings shall be provided, for crossing utilities which may be encountered upon opening

the trench. Solid sleeve couplings shall only be utilized where indicated on the Drawings or with written approval of the Engineer.

3.09 PIPE LAYING – TYPE (DI/2)

- A. All "TYPE (DI/2)" ductile iron pipe shall be installed in accordance with the trench detail as shown on the Contract Drawings.

3.10 PIPE CUTTING – TYPE (DI/2)

- A. When cutting of pipe is required, the cutting shall be done by a machine, leaving a smooth cut at right angles with the axis of the pipe. Cut ends of pipe shall be joined with a bell and shall be beveled to conform to the manufactured spigot end. Cement lining shall be undamaged. Field cut ends shall be sealed with an Engineer Approved epoxy, in accordance with the pipe Manufacturer's instructions. Cutting of restrained joint pipe shall not be acceptable unless approved in writing by the Engineer. If approved, cutting shall be at specific locations and the Contractor shall provide all restrainer glands or field adaptable restrained joints.

3.11 PUSH-ON JOINTS – TYPE (DI/2)

- A. All push on joints shall be installed in accordance with the recommendations of the pipe Manufacturer as well as all AWWA C600 standards. All pipe shall be laid with bell ends facing ahead. A rubber gasket shall be inserted in the groove end of the pipe, and the joint surfaces shall be cleaned and lubricated. The plain end of the pipe shall be aligned and inserted in the bell end of the pipe to which it is to be joined and pushed home with a jack or other means. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

3.12 MECHANICAL JOINTS – TYPE (DI/2)

- A. Mechanical joints shall be assembled in accordance with Appendix A of AWWA C111/A21.11 and the pipe Manufacturer's instructions. Thoroughly clean and lubricate the joint surfaces and rubber gaskets with soapy water before assembly. Bolts shall be tightened to the specified torques. Under no conditions shall extension wrenches or pipe over handle of ordinary ratchet wrenches be used to secure greater leverage. Bolts in mechanical or restrained joints shall be tightened evenly and alternately.

3.13 PVC PIPE INSTALLATION - TYPE (PVC/1) AND TYPE (PVC/4)

- A. Install "TYPE (PVC/1) and "TYPE (PVC/4)" pressure piping in strict accordance with the Manufacturer's instructions as well as that specified herein. When cutting of piping is required, all burrs, chips, filings, and other associated defects shall be removed from both the pipe inside diameter and outside diameter before joining. Cutting of piping shall be with a hand saw or pipe cutter with blades. The use of pipe cutters with rollers shall not be acceptable. All cut pipe ends shall be beveled approximately 1/16 inch back from the edge of the pipe at an angle of 10 to 15 degrees. All cutting of PVC

piping shall be in strict accordance with the recommendations of the piping Manufacturer.

3.14 SOLVENT WELDING – TYPE (PVC/1) & (PVC/4)

- A. All joints for plastic pipe shall be solvent welded except where flanged joints are required. All pipe and fittings to be socket welded shall be clean of all loose dirt and moisture from the inside and outside diameter of the pipe end and the inside diameter of the fitting. The Contractor shall not socket weld wet piping surfaces.
- B. The solvent cement shall be a grade specifically recommended by the piping Manufacturer for the size and schedule of the pipe as well as the process fluid carried. Solvent cements for acidic chemicals shall be in accordance with that previously specified. Prior to solvent welding, all fittings and couplings shall be exposed to the installation atmosphere for at least one (1) hour to the same temperature conditions as the pipe in order to assure proper thermal balance between the piping and associated fitting.
- C. The Contractor shall apply "Low VOC" solvent cement to the pipe in accordance with the Manufacturer's recommendations. A minimum of two (2) coats shall be applied when recommended by the pipe, fitting, or solvent cement Manufacturer. All piping system joints four (4) inches and larger shall use a primer and finished solvent cement coating prior to assembly. The Contractor shall apply the solvent cement to the socket while keeping both the surface and applicator wet and in motion for approximately 5 to 15 seconds. The Contractor shall take care so as not to add excess solvent cement. Joints shall not be cramped.
- D. The atmospheric and weather conditions affect the solvent welding procedure. In cold weather sufficient time shall be allowed for proper penetration of the solvent cement. Joining of PVC pipe and fittings shall not be conducted in atmospheric conditions below 40 degrees F, above 90 degrees F, or when exposed to direct sunlight. The Contractor shall allow for a minimum of 48 hours of drying time before moving the socket welded joint or subjecting any internal or external pressure/force.
- E. When solvent welding piping to valves or other appurtenances the Contractor shall take specific care so as not to allow solvent cement to enter the valve. Solvent cement shall not be allowed to run free from joints. All valves shall be solvent welded in strict accordance with the recommendations of the valve Manufacturer.
- F. All solvent welded joints shall remain undisturbed for a minimum of 48 hours so as to allow for the development of complete strength.

3.15 FLANGED JOINTS – TYPE (PVC/1) & (PVC/4)

- A. When connecting "TYPE (PVC/1)" piping to metallic piping, the Contractor shall assemble the metallic piping first. Flanged connections shall be used to connect all PVC piping to metallic piping unless otherwise specified or shown on the Drawings.

Tighten all bolts evenly to prevent warping/dishing of the PVC flange. A wrench may be used to provide a tight seal between the flanges and gaskets. All joints shall conform to the piping Manufacturer's recommendations.

3.16 STAINLESS STEEL PIPE INSTALLATION - TYPE (SS/1) (SS/2) (SS/3) & (SS/4)

- A. The Contractor shall install all "TYPE (SS/1) & TYPE (SS/2)" pipe and fittings in strict accordance with the recommendations of the pipe Manufacturer. The installation shall be true to alignment. All piping shall be pitched to low points and shall be provided with condensate drains as required and as shown on the Drawings. All pipe supports and restraints shall be provided as recommended by the pipe Manufacturer.
- B. If pipe cutting is required for installation, a machine shall be used. All cuts shall be neat, true, and smooth at 90 degree angles to the pipe longitudinal axis/center line.
- C. Prior to assembly in the field, the Contractor shall clean all flanges, gaskets or threads (if any) with a soap and warm water solution. All flanged bolts shall be tightened alternately and evenly to the Manufacturer's required torque. The Contractor shall take care so as not to over-tighten any flange bolts. The Contractor shall not utilize extension or pipe ratchet wrenches; which may cause over-torque of flange bolts. All flange joints shall be assembled with; gaskets, bolts and nuts; bolt studs with a nut on each end; or studs and nuts when the pipe is tapped. The Contractor shall ensure all flange holes are provided with connectors.
- D. The Contractor shall cut threads full and clean using sharp dies as required. The Contractor shall ream all threaded ends to remove burrs and restore the full inside pipe diameter. The Contractor shall apply pipe joint compound, or pipe joint tape (Teflon) as recommended by the pipe/fitting Manufacturer, on male threads at each joint and tighten the joint to leave not more than three (3) threads exposed.
- E. All pipe and fittings shall be cleaned of all dust, oil, grease, water, dirt or any other foreign matter prior to installation. The Contractor shall ensure no foreign matter, tools, or other construction materials are left in the piping. All stainless steel piping shall be washed clean with steam or warm water to remove any other remaining foreign matter or debris.
- F. Stainless steel piping used in low pressure air or other associated "hot" applications shall be designed to account for thermal expansion/contraction over a temperature range of 0 degrees F to 200 degrees F.
- G. Welding in the field shall only be conducted with prior written approved by the Engineer. All welds shall be made by welders certified under ASME Section IX and be equal or exceed shop welds in all respects. Field welding shall only be conducted after a demonstration weld is successfully completed by each welder at no additional cost to the Owner or Engineer. All field welded joints shall be thoroughly cleaned and buffed using deburring and finishing wheels.

- H. The Contractor shall provide certifications that all welders on site are qualified, in accordance with ANSI B31.1, Paragraph 127.5 for shop and project site welding of pipe work. The Contractor shall provide certified copies of current welding certificates for all welders on site to the Engineer and Owner.

3.17 CARBON STEEL PIPE INSTALLATION - TYPE (CS/1)

- A. All "TYPE (CS/1)" Carbon Steel Pipe shall be installed in accordance with the recommendations of the pipe Manufacturer. The Contractor shall install all carbon steel pipe true to alignment. Provide rigid supports and anchors where required or as shown on the Drawings. Each end of pipe shall be capped until it is installed. Each length of pipe as erected shall be up-ended and rapped to dislodge any dirt, scale or foreign debris.
- B. All welding of carbon steel piping shall conform to ANSI B31.1 and all AWS standards. A final inspection of all welds shall be conducted for quality control purposes prior to final assembly. The Contractor shall repair and/or replace all unsatisfactory welds at no additional cost to the Owner or Engineer. The strength of the field weld shall develop the strength of the pipe.
- C. The Contractor shall install all flanged joints such that gaskets are uniformly compressed. All flanged joints shall provide a water tight seal. The Contractor shall take care so as not to over-tighten flanges and cause distortion or over-compression of gaskets.
- D. The Contractor shall install all threaded joints with an approved pipe joint compound or tape applied to the male threads only. Prior to joining threaded pipe sections, the Contractor shall remove all dirt, debris, and foreign material from the inside of pipe, fittings and threads. All threads shall be reamed free of burrs and other associated defects. All threads shall be cut clean with long tapers. If the Contractor needs to "back-off" any threaded connections, the joint shall be completely disconnected and all male and female threads shall be cleaned. To re-assemble the connection, apply new thread compound to the male thread and reassemble the connection. All threaded connections shall be air tight and water tight.
- E. The Contractor shall cut all pipe as required for installation as shown on the Drawings. All cutting shall be conducted with a machine without causing damage to the pipe or interior lining (if any). All cuts shall be at a right angle, perpendicular to the center line of the pipe. All cut ends shall be smooth, free from burrs, chips, or other related defects.
- F. All marred or damaged coatings shall be repaired at no additional cost to the Owner or Engineer. All coatings shall be repaired in strict accordance with the recommendations of the piping Manufacturer.

3.18 INSTALLATION OF SLEEVES AND SEALS

- A. Install pipe sleeves of types as indicated on the Drawings where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on the Drawings, or as approved by the Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in the sleeve, including allowance for thermal expansion; but not less than two (2) pipe sizes larger than the piping run. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves four (4) inches above the level floor finish, and four (4) inches above floor finishes sloped to drain. Provide temporary support of sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves.
- B. Sleeve Seals shall be installed in accordance with the following:
1. Mechanical Sleeve Seals: Loosely assemble rubber links, around the pipe with bolts and pressure plates located under each bolt head and nut. Push into sleeve and center. Tighten bolts until links have expanded to form a watertight seal.
 2. Wall Pipe: Install wall pipe where indicated on Drawings. Joints shall be as required and indicated for connection to adjacent piping.

3.19 CLEANING

- A. The Contractor shall thoroughly clean the interior and exterior of all piping prior to testing. The Contractor shall be responsible for removal of all dirt, dust, oil, grease and other foreign materials from the piping. Exercise care while cleaning piping to avoid damage to linings and coatings. The Contractor shall clean all piping in strict accordance with the recommendation of the piping Manufacturer.
- B. The contractor shall flush out piping systems, except odor control piping, with clean water prior to proceeding with the required tests. The Contractor shall inspect each run of piping for completion of joints, supports, accessory items and appurtenances prior to testing.

3.20 PIPE TESTING - GENERAL

- A. The Contractor shall test all piping in the presence of the Engineer and the plumbing or building inspector if required by the State of the project location or by the Owner. All testing shall be in accordance with the requirements of the local and state plumbing codes and the appropriate Sections of these Specifications. All testing shall be conducted at no additional cost to the Owner or Engineer. The Contractor shall be responsible for supplying all labor, equipment, materials, taps, water, gauges, pumps, and appurtenances required to conduct all piping tests.

- B. When requested by the Engineer or local plumbing inspector, building gravity drains shall be tested prior to backfilling or concealing. All other piping may be tested after backfilling. Any deficiencies found during testing, including but not limited to leakage, damage to piping, loss of pressure, etc., shall be repaired and retested as required by the Engineer at no additional cost to the Engineer or Owner. The Contractor shall be responsible for lawful disposal of all waste after the testing including but not limited to water or other test fluids.
- C. Test all piping systems before insulation is installed wherever feasible. Remove all control devices before testing. Test each natural section of each piping system independently but do not use piping system valves to isolate sections where the test pressure exceeds the valve pressure rating. Test each section with water or other fluids as directed by the Engineer and Owner. Pressurize the pipe to the specified level for the required time period.

3.21 HYDROSTATIC PRESSURE TESTING

- A. All liquid service pipe and fittings shall be pressure tested using water to the test pressures specified or as directed by the Engineer. All pipe and fittings shall be pressure tested with water at the maximum service temperature specified or as directed by the Engineer. Test pressures for designations and/or systems not listed shall be as approved by the Engineer prior to testing. All testing shall be in accordance with the procedures of ASME B31.1 standards.
- B. The Contractor shall provide water or other test fluid as directed by the Engineer, of sufficient capacity to deliver the required test pressure specified. The Contractor shall provide all valves on the suction and discharge side of the pump as well as a strainer on the inlet side of the pump to prevent foreign matter from entering the system. Provide pressure gauge(s) capable of reading 50 percent higher the specified test pressure. The pressure gauges shall be located at the pump discharge and any other place as directed by the Engineer. Provide a pressure relief valve set at a pressure 20 to 25 percent above the specified test pressure. Provide heaters (if required) to heat the test water to the specified test temperature.

3.22 PREPARATION FOR TESTING

- A. The Contractor shall coordinate the testing fluid to be used with the Engineer and Owner. When the fluid test temperature is not ambient, the Contractor shall consult the Engineer for the appropriate test temperature. All testing equipment shall be compatible with the piping and test fluid. Provide vents at all high points of the system if not already installed. Provide drains in locations as required where venting or draining devices do not exist.
- B. Remove all discs, pistons, balls etc., from check valves if they prohibit testing of the piping system. Ensure all valves and appurtenances are fully open within the section of piping to be tested. Remove all control instruments and alarms prior to testing. Block

- off or remove all pressure relief valves prior to testing and temporarily close all external openings of the piping section to be tested. All closures shall be specifically designed for the test pressure. All joints in the piping section to be tested shall be left exposed for examination and inspection during the test period. Pipe insulation shall not be installed prior to conducting pipe testing.
- C. Provide temporary supports for vapor or gas piping to support the weight of the test fluid; if the vapor or gas piping is directed to be hydrostatically tested.
- D. Provide temporary support/restraint or isolation for all expansion joints.
- E. Hydrostatic Test
1. Slowly fill the piping system, expelling entrapped air from all high points. The fill rate shall be controlled so that the fluid velocity within the pipe system is less than 2 feet per second. Once the filling process has been completed the piping system shall be brought up to the specified test temperature, if required or directed by the Engineer. The pressure shall be held at 20% less than the test pressure until the temperature has been stabilized. Once the temperature has stabilized, raise the pressure to the test level as specified or as directed by the Engineer.
 2. The pipe system shall be slowly brought up to the test pressure. Take care so as not to create shock, surge or water hammer in the pipe system.
 3. For "Pressure Piping", test each piping system at 150% of the design operating pressure, but not less than 25 psi test pressure, whichever is greater. "Pressure Piping" shall be defined as piping systems in which the process fluid does not flow (move) via gravity. The minimum test pressure for all "Gravity Piping" shall be 10 psig. Provide the Engineer and Owner with a minimum of 24 hour notice prior to the testing. Tests which are not witnessed by Engineer shall not be acceptable. In the absence of specified test pressures the Contractor shall consult the Engineer for determining the test pressure for each system. The required test period shall be a minimum of two (2) hours.
 4. The test duration time limit shall not begin until the full pressure specified or indicated by the Engineer has been reached and the system has been stabilized to within (+/-) 5 percent of the test temperature. The system temperature shall be maintained to within (+/-) 5 percent of the specified or Engineer indicated value for the entire duration of the test. The test pressure shall be maintained at (+/-) 5 psi of the specified or Engineer indicated test pressure for the entire duration of the test.
 5. The pressure test shall be monitored by a recording type pressure gauge. When temperature and pressure control is required, the Contractor shall use a combination temperature/pressure recording gauge. Record the entire test process. The records shall include but are not limited to the Date of Testing, Piping Section

Tested, Test Pressure, Testing Equipment, Testing Results, Test Fluid, Test Temperature (If Required), and Signatures of the Engineer, Contractor & Owner.

3.23 INSPECTION

- A. Observe each test section for leakage during the test period. The hydrostatic test shall be deemed acceptable if no visible leaks are detected and the pipe system pressure can be maintained within (+/-) 1/2 percent but no more than 5 psi of the specified value.
- B. Upon completion of the test, the pressure shall be slowly removed by opening a valve or other pressure relieving device at a location remote to the location of the pressure/temperature monitoring equipment. The pressure shall be reduced to approximately 20 percent of the specified or Engineer indicated test pressure. Stabilize the system pressure at that point while the entire system is inspected for leaks, cracks, or other piping system defects. If any defects are found, the Contractor shall alleviate all pressure in the piping system, drain the test fluid, correct all defects, and retest the piping system.
- C. Repair all piping system sections which fail the hydrostatic pressure piping test, by disassembly and re-installation, using new materials to the extent required to overcome leakage and/or pressure drop. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods. The Contractor shall be responsible for repairing and retesting all defective piping sections at no additional cost to the Owner or Engineer. The Contractor shall drain and dispose of all fluids from the piping systems after testing and repair work (if required) has been completed.

3.24 PNEUMATIC PRESSURE TESTING

- A. All low pressure air service pipe and fittings shall be pneumatically pressure tested using air to the test pressures specified or as directed by the Engineer. All pipe and fittings shall be pressure tested with air at the maximum service temperature specified or as directed by the Engineer. Test pressures for designations and/or systems not listed shall be as approved by the Engineer prior to testing. All testing shall be in accordance with the procedures of ASME B31.1 standards.

3.25 PREPARATION FOR TESTING

- A. The Contractor shall coordinate the testing pressure with the Engineer. When the air test temperature is not ambient, the Contractor shall consult the Engineer for the appropriate test temperature. All testing equipment shall be compatible with the piping. Provide vents at all high points of the system if not already installed.
- B. Remove all discs, pistons, balls etc., from check valves if they prohibit testing of the piping system. Ensure all valves and appurtenances are fully open within the section of piping to be tested. Remove all control instruments and alarms prior to testing. Block off or remove all pressure relief valves prior to testing and temporarily close all external openings of the piping section to be tested. All closures shall be specifically designed

for the test pressure. All joints in the piping section to be tested shall be left exposed for examination and inspection during the test period. Insulation shall not be installed prior to conducting tests. Provide a soapy water solution and test all fittings, joints, couplings, valves, etc., for air leakage.

- C. Personnel not directly involved in pneumatic pressure testing of piping shall be evacuated from the area. The maximum length of piping to be tested at one (1) time shall be 400 feet. Examine all connections prior to testing to ensure proper fit and tightness. Determine the pressure rating for all connected devices and appurtenances to ensure they are rated for the required test pressure. Isolate all equipment and appurtenances which may be damaged by testing. Plug all test, drain, and vent ports which are not required for the test. If the section of pipe being tested is isolated from other sections by in-line valves, ensure that the portion not being tested is open to the atmosphere. Protect expansion joints against system pressures by suitable movement-limiting devices.

3.26 PNEUMATIC PRESSURE TEST

- A. Slowly fill the piping system. Each piping system shall be brought up to the specified test temperature, if required. The pressure shall be held at 20% less than the required test pressure until the temperature has been stabilized. Once the temperature has stabilized the Contractor shall raise the pressure to the test level as specified or as directed by the Engineer.
- B. Test each piping system at 150% of the design operating pressure, but not less than 25 psi test pressure, whichever is greater. Provide the Engineer and Owner with a minimum of 24 hour notice prior to the testing. Tests which are not witnessed by Engineer shall not be acceptable. In the absence of specified test pressures the Contractor shall consult the Engineer for determining the test pressure for each system. The required test period shall be two (2) hours.
- C. The test duration time limit shall not begin until the full pressure specified or indicated by the Engineer has been reached and the system has been stabilized to within (+/-) 5 percent of the test temperature. The system temperature shall be maintained to within (+/-) 5 percent of the specified or Engineer indicated value for the entire duration of the test. The test pressure shall be maintained at (+/-) 0.5 psi of the specified or Engineer indicated test pressure for the entire duration of the test.
- D. The pressure test shall be monitored by a recording type pressure gauge. When temperature and pressure control is required, the Contractor shall use a combination temperature/pressure recording gauge. Record the entire test process. The records shall include but are not limited to the Date of Testing, Piping Section Tested, Test Pressure, Testing Equipment, Testing Results, Test Temperature (If Required), and Signatures of the Engineer, Contractor and Owner.

3.27 INSPECTION

- A. Observe each test section for leakage during the test period. Once the test segment has been pressurized to the specified levels, the source of pressurization shall be isolated and all piping, connections, etc., shall be tested for leaks by swabbing with standard high film soap solution conforming to MIL-L-25567 standards, while also observing for the formation of air bubbles. Each pneumatic pressure test shall be deemed acceptable if no visible leaks (air bubbles) are detected and the pipe system pressure can be maintained to within (+/-) 1/2 percent but no more than 0.5 psi of the specified value.
- B. Upon completion of the test, the pressure shall be slowly removed by opening a valve or other pressure relieving device at a location remote to the location of the pressure/temperature monitoring equipment. If any defects are found, the Contractor shall alleviate all pressure in the piping system, correct all defects, and retest the piping system.
- C. Repair all piping system sections which fail the pneumatic pressure piping test, by disassembly and re-installation, using new materials to the extent required to overcome leakage and/or pressure drop. Do not use chemicals, stop-leak compounds, mastics, or other temporary repair methods. The Contractor shall be responsible for repairing and retesting all defective piping sections at no additional cost to the Owner or Engineer.

3.28 POTABLE WATER SYSTEM FLUSHING

- A. Before operational tests or disinfection all potable water piping systems shall be flushed with potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system. In the event that this is impossible due to size of system, the Engineer (or the designated representative) shall specify the number of fixtures to be operated during flushing.
- B. Provide adequate personnel to monitor the flushing operations and to ensure that drain lines are unobstructed in order to prevent flooding of the facility. The Contractor shall be responsible for any flood damage resulting from flushing of the system. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration. All end points or devices as outlined in NSF/ANSI 61, Section 9 standards shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.
- C. After flushing, the system shall be drained at low points. Strainer screens shall be removed, cleaned, and replaced. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the

building due to the Contractor's failure to properly clean the piping system shall be repaired by the Contractor. When the system flushing is complete, the water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions. Comply with ASHRAE 90.1 - IP for minimum efficiency requirements. The water supply to the building or facility shall be tested separately to ensure that any lead contamination found during potable water system testing is due to work being performed inside the facility.

3.29 WATER SYSTEM OPERATIONAL TESTING

- A. Upon completion of flushing and prior to disinfection procedures, the Contractor shall subject the plumbing/water systems to operating tests to demonstrate satisfactory installation, connections, adjustments, functional and operational efficiency. Such operating tests shall cover a period of not less than two (2) hours for each system and shall include the following information in a report with conclusion as to the operation of the system.
1. Time, date, and duration of test.
 2. Water pressures at the most remote and the highest fixtures.
 3. Operation of each valve, hydrant, or faucet.
 4. Pump suction and discharge pressures.
 5. Operation of each floor drain by flooding with water.
 6. Operation of each vacuum breaker and backflow preventer.
 7. Complete operation of each water pressure booster system, including pump start pressure and stop pressure.
- B. The report of the test shall be submitted in quadruplicate. The Contractor shall furnish instruments, equipment, and personnel required for the tests. The Contractor shall also provide all the necessary water, electricity, fuel and related appurtenances for testing.

3.30 DISINFECTION OF POTABLE WATER SYSTEMS

- A. After all system components are provided and operational tests are complete, the entire water distribution system shall be disinfected. Before introducing disinfecting chlorination material, entire system shall be flushed with potable water until any entrained dirt and other foreign materials have been removed.
- B. Water chlorination procedure shall be in accordance with AWWA C651 and AWWA C652 as modified and supplemented by this specification. The chlorinating chemical shall be hypochlorites or liquid chlorine. The chlorinating chemical shall be fed into the water piping system at a constant rate at a concentration of at least 50 parts per million (ppm). Feed a properly adjusted hypochlorite solution injected into the system with a hypochlorinator, or inject liquid chlorine into the system through a solution-feed chlorinator and booster pump until the entire system is completely filled.

- C. Test the chlorine residual level in the water at 6 hour intervals for a continuous period of 24 hours. If at the end of a 6 hour interval, the chlorine residual has dropped to less than 25 ppm, flush the piping including tanks with potable water, and repeat the above chlorination procedures. During the chlorination period, each connection and fixture shall be opened and closed several times.
- D. After the second 24 hour period, verify that no less than 25 ppm chlorine residual remains in the treated system. The 24 hour chlorination procedure must be repeated until no less than 25 ppm chlorine residual remains in the treated system.
- E. Upon the specified verification, the system including tanks shall then be flushed with potable water until the residual chlorine level is reduced to less than one part per million. During the flushing period, each connection and fixture shall be opened and closed several times.
- F. Take addition samples of water in disinfected containers, for bacterial examination, at locations specified by the Engineer. Test these samples for total coliform organisms (coliform bacteria, fecal coliform, streptococcal, and other bacteria) in accordance with AWWA 10084. The testing method used shall be EPA approved for drinking water systems and shall comply with applicable local and state requirements.
- G. Disinfection shall be repeated until bacterial tests indicate the absence of coliform organisms (zero mean coliform density per 100 milliliters) in the samples for at least 2 full days. The system will not be accepted or considered complete until satisfactory bacteriological results have been obtained.

END OF SECTION

SECTION 40 05 14

PROCESS PIPE COUPLINGS AND CONNECTORS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. The Contractor shall provide, install, test, and make ready for operation all process pipe couplings and connectors of the type(s) and size(s) as required and as shown on the Drawings. All couplings and connectors shall conform to the requirements of the Contract Documents. The items include but may not be limited to sleeve type couplings, split type couplings, flanged adaptors, expansion joints, harnessing and restraints, quick connect couplings, unions, dielectric connectors, and restrained mechanical joint couplings. The aforementioned items may or may not all be required for the work of the Contract. All items shall be provided for complete and operational systems, as shown on the Drawings, and as specified herein.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN WATER WORKS ASSOCIATION (AWWA)
1. AWWA C110/A21.10 (2008) Ductile-Iron and Gray-Iron Fittings for Water
 2. AWWA C111/A21.11 (2000) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 3. AWWA C153/A21.53 (2006) Ductile-Iron Compact Fittings for Water Service
 4. AWWA C207 (2007) Standard for Steel Pipe Flanges for Waterworks Service-Sizes 100 mm through 3600 mm 4 in. through 144 in.
 5. AWWA C600 (2005) Installation of Ductile-Iron Water Mains and Their Appurtenances
 6. AWWA C606 (2006) Grooved and Shouldered Joints
 7. AWWA M11 (2004) Manual: Steel Pipe: A Guide for Design and Installation
- C. ASTM INTERNATIONAL (ASTM)

1. ASTM A 108 (2007) Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
2. ASTM A 126 (2004) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
3. ASTM A 183 (2003) Standard Specification for Carbon Steel Track Bolts and Nuts
4. ASTM A 197/A 197M (2000; R 2006) Standard Specification for Cupola Malleable Iron
5. ASTM A 307 (2007b) Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength
6. ASTM A 325M (2009) Standard Specification for Structural Bolts, Steel, Heat Treated, 830 Mpa Minimum Tensile Strength (Metric)
7. ASTM A 36/A 36M (2008) Standard Specification for Carbon Structural Steel
8. ASTM A 48/A 48M (2003; R 2008) Standard Specification for Gray Iron Castings
9. ASTM A 512 (2006) Standard Specification for Cold-Drawn Buttweld Carbon Steel Mechanical Tubing
10. ASTM A 513 (2008a) Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
11. ASTM A 536 (1984; R 2009) Standard Specification for Ductile Iron Castings
12. ASTM A 564/A 564M (2004; R 2009) Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes
13. ASTM A 575 (1996; R 2007) Standard Specification for Steel Bars, Carbon, Merchant Quality, M-Grades
14. ASTM A 632 (2004) Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing (Small-Diameter) for General Service
15. ASTM B 584 (2008a) Standard Specification for Copper Alloy Sand Castings for General Applications
16. ASTM B 62 (2002) Standard Specification for Composition Bronze or Ounce Metal Castings
17. ASTM B 633 (2007) Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
18. ASTM B 88 (2003) Standard Specification for Seamless Copper Water Tube

19. ASTM D 2774(2008) Underground Installation of Thermoplastic Pressure Piping

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-02 Shop Drawings
 - 1. Provide drawings of all couplings, connectors, and fittings in the product submittals. The drawings shall be specifically identified with the applicable style or series designation. The submittal drawings shall show layouts and dimensions of the couplings and connectors. Drawings shall also show layout and dimensions of all couplings and connectors, major components, key alignment locations and locations of bolt holes.
- C. SD-03 Product Data
 - 1. All "bellows type" expansion joint Manufacturers shall provide materials of construction, including gauge of corrugated element, maximum test pressure force to compress joint, bellows spring rate, shear force and end moment due to calculated traverse only. The Manufacturer shall also furnish evidence of completing cycle life testing for the maximum diameter coupling to be installed. The Manufacturer shall indicate such assured cycle life test results on the materials and information submitted for approval.
 - 2. Provide catalog cut sheets of joints, couplings, harnesses, expansion joints, gaskets, fasteners and all other process pipe couplings and connectors specified in this section.
 - 3. Provide sufficient product data to verify compliance with the specifications and to illustrate the construction and assembly of the products. Include compliance of materials and components with applicable CEAM, ASTM, AGMA, and other standards. List the manufacture, model and weights of major components. Include catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment.
- D. SD-10 Operation and Maintenance Data
 - 1. All required cuts, drawings, equipment lists, descriptions, etc., which are required to instruct operation and maintenance personnel unfamiliar with such equipment. The O&M manuals shall include instructions for cleaning and maintenance.

1.04 QUALITY ASSURANCE

- A. All welding shall be conducted under qualified welding procedures. All welders and operators shall be certified in accordance with the latest applicable AWS and ANSI

codes for shop and project site welding of piping work. The Contractor shall furnish written proof of certifications upon request from the Engineer.

- B. All piping systems, components, and appurtenances in contact with potable water (including potable water during any stage of treatment or conditioning) shall be certified to meet the requirements of ANSI/NSF 61 for water service.
- C. All process piping couplings and connectors shall be new and unused.
- D. Provide Manufacturer's certification that the submitted materials meet or exceed the minimum requirements as specified. Coordinate dimensions and drilling of flanges with flanges for valves, pumps and other equipment to be installed in the piping systems. Bolt holes in flanges shall straddle the vertical centerline.

1.05 QUALIFICATIONS OF MANUFACTURER

- A. Materials and equipment shall be the standard products of a Manufacturer regularly engaged in the production of such products and shall essentially duplicate items that have been in satisfactory use in identical applications in other wastewater treatment facilities. The Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of couplings and connectors of all types, and not less than five (5) years of experience in the production of equal or larger sized models of the exact equipment as specified herein.
- B. The equipment supplier shall provide a list of at least ten (10) similar installations, including contact names and phone numbers. All equipment shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.

1.06 WARRANTY

- A. The Manufacturer shall provide a full and comprehensive warranty for the equipment specified in this section. The equipment shall be warrantied to be free from defects in workmanship, design, and materials for a period of not less than one (1) year. If any parts of the equipment supplied under this section should fail during the Manufacturer's warranty period, replacement of parts or the unit itself shall be provided. The units shall be restored to active working service at no expense to the Owner of the equipment. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling as required for restoration of equipment to active service as required under the Manufacturer's warranty.
- B. The Manufacturer's warranty shall commence at the date of substantial completion or partial utilization.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or

other contaminants. Proper protection and care of materials before, during and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, ultraviolet (UV) radiation, or other damage.

- B. Surfaces such as female threads, internal mechanical joint ends or flange faces shall be protected from damage during shipment. Inspect the materials delivered to the site for damage. Store rubber products under cover out of direct sunlight. Do not store materials directly on the ground. Keep the inside of couplings, connectors, and fittings free of dirt and debris.

1.08 SPECIAL TOOLS

- A. Furnish one set of all special tools required to completely assemble, disassemble, or maintain the equipment. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items.

PART 2 – PRODUCTS

2.01 GENERAL

- A. All couplings and connectors shall be of sizes shown on the Drawings or as specified. Provide couplings which are sized to match the connecting piping outside diameters. Where piping outside diameters differ, provide transition type couplings. All couplings and connectors shall have the Manufacturer, size, flow directional arrows (if applicable), working pressure for which they were designed and all standard referenced specifications cast in raised letters or permanently marked upon some appropriate part of the equipment. Unless otherwise specified or indicated on the Drawings, all couplings and connectors shall have a minimum pressure rating of 150 psi or be of the same working pressure as the pipes they connect, whichever is greater.
- B. All couplings and connectors shall be designed for the pressures of the application where they are to be installed. The reference of a Manufacturer's name and/or model number in this specification has been provided for the purpose of establishing the standard of quality or general configuration desired and shall not be considered as proprietary.
- C. Unless otherwise specified or indicated on the Drawings all piping shall be connected using standard flanged, mechanical joint, push-on joint, threaded, welded, or solvent cement welded connections. Couplings and connectors shall be used where specified or indicated on the Drawings. The use of couplings in place of standard piping connections shall not be acceptable unless approved by the Engineer in writing.

2.02 SOLID SLEEVE TYPE COUPLINGS - TYPE C01

- A. Provide solid sleeve type couplings to join all plain end pipes and/or exterior below grade transitions in piping materials as shown on the Drawings, as specified and as

outlined in AWWA C 201 standards. In cases where the outside diameters of the piping segments to be connected differ, provide "reduction/expansion" sleeve type couplings.

- B. Sleeve type couplings shall also be provided for all exterior below grade piping runs prior to entering and exiting buildings or structures. The couplings shall be installed prior to the building or structure wall penetration to allow for differential settlement of the piping and structure. All sleeve type couplings shall conform to the provisions of AWWA C 219 standards. All sleeve type couplings shall be rated for use with the same operational pressure as the connecting pipes.
- C. All sleeve type couplings for low pressure air service shall be 304L stainless steel with 316L stainless steel followers. Sleeve type couplings in Type SS/1 piping systems shall be 304L stainless steel with 316 stainless steel followers.
- D. All coupling lugs shall be in accordance with ASTM A 36/A 36M standards. All washers shall be in accordance with ASTM A 325M standards. All couplings shall be fitted with plastic plugs to protect the bolt holes.
- E. Provide sleeve couplings on all piping buried directly under a structure at the structure's expansion joints. In applications where the piping is encased in concrete, provide a minimum of 3-inch-thick styrofoam placed perpendicular to the horizontal centerline of the coupling.

2.03 FASTENERS – TYPE C01

- A. All bolts shall be installed such that a minimum of 1/4 inch of the bolt projects beyond the surface of the nut. All hexagonal nuts shall be in accordance with ANSI B18.2 standards. Hexagonal nuts shall have threads in accordance with ANSI B1.1 standards. All bolts shall be in accordance with ASTM A 307 and ANSI B1.1 standards. All bolts shall be square or hexagonal head type. Bolts shall be threaded over the full length. All bolt ends shall be rounded or chamfered. Bolts shall be coarse thread fit type. Provide 316 stainless steel hardware for all sleeve type couplings.

2.04 GASKETS – TYPE C01

- A. Provide gaskets to match the particular service application. Unless otherwise specified or recommended by the coupling Manufacturer, all gaskets for low pressure air service shall be EPDM and all gaskets for wastewater service shall be Nitrile (Buna-N/NBR). The coupling gasket shall match the gasket material used for the piping system.

2.05 MIDDLE RING – TYPE C01

- A. The pipe stop within the inner surface of the middle ring of couplings shall be omitted as required to permit removal of valves, flow meters, equipment, and appurtenances. All other couplings shall be provided with pipe stops.
- B. The middle ring of each sleeve type coupling shall have a thickness at least equal to that of the connecting piping on which the coupling is to be used. All sleeve type couplings

shall be a minimum of 10 inches long for pipe 30 inches and larger. All sleeve type couplings shall be a minimum of 7 inches long for pipe under 30 inches in diameter.

- C. Couplings which are designed to be self-restrained shall not be required to meet the minimum middle ring length requirements specified.

2.06 JOINT HARNESSES – TYPE C01

- A. When specified or when shown on the Drawings, anchor sleeve-coupled joints with harness bolts. Weld all harness lugs to steel pipe. All harnesses shall be in accordance with AWWA M11 standards. All harnesses shall be provided with a minimum of two (2) 5/8 inch diameter bolts.
- B. All joint harness bolts shall be of sufficient length. Provide harness lugs and install them such that the coupling can be slipped in one direction to clear the joint. Provide harnesses of sufficient number and strength to withstand the test pressure of the piping being connected. Test pressures shall be as indicated by the Engineer or as specified in section 40 05 13 "PROCESS PIPE AND FITTINGS". Provide 304L stainless steel harnesses for stainless steel piping systems.

2.07 FINISHING – TYPE C01

- A. All ferrous metallic surfaces of couplings shall be provided with a standard fusion-bonded epoxy coating. All stainless steel, plastic, brass or bronze parts shall not be painted.

2.08 MANUFACTURER – TYPE C01

- A. All sleeve type couplings of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the Contract Documents. All sleeve type couplings shall be a product of the following Manufacturer:
 - 1. Dresser Piping Specialties
 - 2. Smith-Blair Inc.
 - 3. Engineer Approved Equal

2.09 FLEXIBLE SLEEVE TYPE COUPLINGS - TYPE C02

- A. Provide flexible sleeve type couplings to join all plain end pipes and/or transitions in piping materials as shown on the Drawings and as specified herein. In cases where the outside diameters of the piping segments to be connected differ, provide concentric or eccentric "reduction/expansion" flexible sleeve type couplings.
- B. Flexible sleeve type couplings shall also be provided for all exterior below grade piping runs prior to entering and exiting buildings or structures. The couplings shall be installed prior to the building or structure wall penetration to allow for differential settlement of the piping and structure. All sleeve type couplings shall be rated for use with the same

operational pressure as the connecting pipes. The couplings shall also conform to applicable portions of ASTM A 564/A 564M, ASTM C 443, ASTM C 425 and ASTM D 1869 standards. Provide couplings with a 300 series stainless steel shear ring for all below grade installation applications.

- C. The couplings shall be designed for a maximum operating temperature of 140 degrees F (non-consistent) and a minimum operating temperature: -30 degrees F. Each coupling shall include two (2) 316 stainless steel band clamps. Each clamp shall be an interlocked housing and band design which strengthens under tension to ensure a positive seal. The bands shall include additional slots to accommodate a greater dimensional range.
- D. All flexible sleeve type couplings of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the Contract Documents. All flexible sleeve type couplings shall be a product of the following Manufacturer:
 - 1. Fernco, Inc.
 - 2. Mission Rubber Company, LLC
 - 3. Engineer Approved Equal

2.10 COUPLING SLEEVE (GASKET) – TYPE C02

- A. The coupling sleeve shall be constructed of PVC to allow for flexibility and chemical resistance. The PVC sleeve shall also be resistant to ultraviolet rays, fungus growth and sewer gases. All flexible sleeve type couplings shall also be designed in accordance with ASTM D 5926, ASTM C 1173 and CSA B602 standards. All coupling sleeves shall be designed and constructed in accordance with the following criteria:
 - 1. Hardness (Shore A): 65 (+/-) 5
 - 2. Tensile Strength: 1,000 psi (minimum)
 - 3. Elongation at Rupture: 250% (minimum)
 - 4. Tear Strength: 150 lb/in (minimum)
 - 5. Brittleness Temperature: -40°F

2.11 COUPLING SHEAR RINGS – TYPE C02

- A. For "buried" applications provide couplings with shear rings which are designed for resistance to heavy earth loads and shear forces to provide improved pipe alignment. The shear ring shall be a minimum of 0.12 inches thick 300 series stainless steel. The width of the shear ring shall be manufactured according to coupling width and the length shall be manufactured according to coupling diameter. Each shear ring shall have clamps spot welded in place at the factory.

2.12 SPLIT TYPE COUPLINGS

- A. Provide "rigid" split type couplings for connection of grooved or shouldered end pipe. All split type couplings shall be cast in two (2) segments for sizes 3/4 inch through 14

inch, four (4) segments for sizes 15 inch through 24 inch pipe, and six (6) segments for pipe sizes over 24 inches, to facilitate ease of handling and installation.

- B. The couplings shall be designed to engage grooved or shouldered pipe ends while encasing an elastomeric gasket to create a seal between the connected pipe segments. Split type couplings shall be utilized as directed by the Engineer for piping with thin wall thicknesses. The use of split type couplings shall prevent weakening of the piping due to compression.

2.13 SPLIT COUPLING GASKETS

- A. The Manufacturer shall provide gaskets to match the particular service application. Unless otherwise specified or recommended by the coupling Manufacturer, all gaskets for low pressure air service shall be EPDM and all gaskets for waste water service shall be Nitrile (Buna-N/NBR). All EPDM gaskets shall be rated for a temperature range of -30 degrees F to +230 degrees F. All coupling gaskets shall be equal to the gasket used and recommended by the process piping Manufacturer of the pipe segments to be connected.

2.14 SPLIT COUPLING HOUSING

- A. The coupling housing shall be constructed of ductile iron conforming to ASTM A 536 standards, grade 65-45-12. The housing shall be provided with two part fusion bonded epoxy coating for corrosion resistance. The finished coatings shall be in accordance with the Manufacturer's recommendations as well as that specified in Section 09 90 00 "PAINTS & COATINGS". Provide 316 stainless steel split coupling housings for use with stainless steel pipe.

2.15 SPLIT COUPLING HARDWARE

- A. Only when specified or specifically indicated on the Drawings; provide all couplings with carbon steel bolts and nuts, conforming to ASTM A 183 standards. Unless otherwise specified or indicated on the Drawings, all couplings shall be provided with type 316 stainless steel, Grade B-8M, Class 2, bolts, nuts, and washers.

2.16 PIPING WALL THICKNESS & SPLIT COUPLINGS

- A. The standards of AWWA C606 as well as the respective coupling Manufacturers require a minimum thickness of pipe walls for use of various split type couplings. Provide piping with the minimum wall thicknesses required (unless a greater thickness is specified or required in the individual pipe specifications) for use with split type couplings.
- B. In the event that the minimum pipe wall thicknesses do not meet the coupling manufacturer or AWWA C606 standards for the minimum requirements for grooving, then a shouldered end treatment with couplings as specified or as shown on the Drawings shall be utilized.

2.17 SPLIT COUPLINGS - DUCTILE IRON PIPING

- A. All ductile iron pipe for use with split-type coupling joints shall be designed with radius grooved ends and conform to AWWA C606 standards. All ductile iron pipe shall have grooved ends to provide either a rigid joint or flexible joint as shown on the Drawings or as specified.
- B. When not specified or shown on the Drawings, provide "rigid" grooved couplings unless otherwise approved by the Engineer. Flexible joint grooving and couplings shall permit expansion, contraction, and angular deflection of the piping. All rigid joint grooving and couplings shall allow no angular or linear movement/deflection. The minimum pipe wall thickness for grooved pipe shall be as specified by the coupling Manufacturer.

2.18 SPLIT COUPLINGS – STEEL & STAINLESS STEEL PIPING

- A. Grooved couplings for steel and stainless steel piping shall have roll grooving, machine-grooving, or ring collars fully welded to the pipe or fitting.

2.19 FLEXIBLE SPLIT RING GROOVED END COUPLINGS - TYPE C03

- A. Unless otherwise specified or shown on the Drawings, all flexible split ring grooved end type couplings of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All flexible split ring grooved end type couplings shall be a product of the following Manufacturer:
 - 1. Victaulic Company of America - Style 77
 - 2. Gustin-Bacon Company
 - 3. Engineer Approved Equal

2.20 FLEXIBLE SPLIT RING SHOULDERED END COUPLINGS - TYPE C04

- A. Unless otherwise specified or shown on the Drawings, all flexible split ring shouldered end type couplings of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All flexible split ring shouldered end type couplings shall be a product of the following Manufacturer:
 - 1. Victaulic Company of America - Style 44
 - 2. Gustin-Bacon Company
 - 3. Engineer Approved Equal

2.21 RIGID SPLIT RING GROOVED END COUPLINGS - TYPE C05

- A. Unless otherwise specified or indicated on the Drawings. Provide rigid split ring grooved end couplings on ductile iron pipe less than 36 inches. Provide flexible split ring grooved end couplings as previously specified and where indicated on the Drawings. Pipe wall thickness shall meet all requirements of AWWA C606. If not specifically specified or

indicated on the Drawings, the use of rigid split ring grooved end couplings shall only be used with written permission from the Engineer. If approved, all couplings used in place of flanges shall utilize "rigid" grooved pipe connections.

- B. Unless otherwise specified or shown on the Drawings, all rigid split ring grooved end type couplings for ductile iron piping, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All rigid split ring grooved end type couplings shall be a product of the following Manufacturer:

1. Victaulic Company of America - Style 31
2. Gustin-Bacon Company
3. Engineer Approved Equal

- C. Unless otherwise specified or shown on the Drawings, all rigid split ring grooved end type couplings for manufactured steel and other associated standard groove piping, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All rigid split ring grooved end type couplings shall be a product of the following Manufacturer:

1. Victaulic Company of America - Style 07
2. Gustin-Bacon Company
3. Engineer Approved Equal

2.22 RIGID SPLIT RING SHOULDERED END COUPLINGS - TYPE C06

- A. Provide rigid split ring shouldered end couplings as specified and as shown on the Drawings. Utilize rigid split ring shouldered end couplings on all ductile iron pipe over 16 inches or ductile iron pipe without sufficient wall thickness as outlined in AWWA C606 standards. Also utilize rigid split ring shouldered end couplings on all manufactured steel pipe or thin walled stainless steel pipe. Unless otherwise specified or shown on the Drawings the coupling shall be of the same materials of construction as the piping being connected. Provide stainless steel couplings for use with stainless steel piping.

- B. Unless otherwise specified or shown on the Drawings, all rigid split ring shouldered end type couplings for manufactured steel, ductile iron, stainless steel and other associated thin walled piping, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All rigid split ring shouldered end type couplings shall be a product of the following Manufacturer:

1. Victaulic Company of America - Style 44
2. Gustin-Bacon Company
3. Engineer Approved Equal

2.23 EXPOSED SLEEVE TYPE FLANGED ADAPTORS - TYPE C07

- A. Provide exposed sleeve type flanged adaptors for joining "Plain end cast iron, ductile iron, and steel piping at fittings, valves, equipment, flow meters, and other appurtenances as required, specified, as shown on the Drawings or as directed by the Engineer. All flanged adaptors shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125/150 pound standard unless otherwise required for connections. Flanged adaptors shall be rated for a minimum pressure of 150 psi.
- B. The follower shall be in accordance with AISI C1012 or ASME SA36 standards. The body and flange shall be of the same material as the connecting piping and designed in accordance with ASTM A 513, ASTM A 635, or ASME SA675 GR60 standards. All ductile iron bodies shall be in accordance with ASTM A 536 standards. All bolts, nuts and washers shall be 316 stainless steel in accordance with AWWA C111/A21.11 standards. Gaskets for wastewater service shall be Nitrile (Buna-N/NBR). All flanged adaptors for use in potable water service shall be ANSI/NSF 61 listed. The gasket shall have a nominal temperature range of -20 degrees F to 180 degrees F. All ferrous metal surfaces of flanged adaptors shall be provided with a corrosion resistant epoxy finish. Stainless steel components shall not be painted.
- C. Unless otherwise specified or shown on the Drawings, all exposed sleeve type flanged adaptors, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All exposed sleeve type flanged adaptors shall be a product of the following Manufacturer:
 - 1. Dresser Inc. - Style 128
 - 2. Smith-Blair Inc. - Style 912
 - 3. Engineer Approved Equal

2.24 STAINLESS STEEL SLEEVE TYPE FLANGE ADAPTORS - TYPE C08

- A. Provide exposed sleeve type flanged adaptors for joining plain end stainless steel piping at fittings, valves, equipment, flow meters, and other appurtenances as required, specified, and as shown on the Drawings. All flanged adaptors shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125/150 pound standard unless otherwise required for connections. The flanged adaptors shall be rated for a minimum pressure of 150 psi.
- B. All flange adaptors for stainless steel piping shall be type 316L stainless steel and conform to AWWA C207 standards. Gaskets for low pressure air service piping shall be EPDM with a maximum temperature rating of at least 230 degrees F.
- C. Unless otherwise specified or shown on the Drawings, all exposed stainless steel sleeve type flanged adaptors, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All exposed stainless steel sleeve type flanged adaptors shall be a product of the following Manufacturer:

1. Dresser Inc.
2. Smith-Blair Inc.
3. Engineer Approved Equal

2.25 SHORT BODY FLANGED ADAPTORS - TYPE C09

- A. Provide exposed "short body" flanged adaptors for joining plain end piping at fittings, valves, equipment, flow meters, and other appurtenances as required, specified, as shown on the Drawings or as directed by the Engineer. All flanged adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125/150 pound standard unless otherwise required for connections. The flanged adaptors shall be rated for a minimum pressure of 150 psi.
- B. The restraints shall be manufactured of ductile iron conforming to ASTM A 536 standards. The bolt circles and bolt holes shall conform to AWWA C110/A21.10 standards. The screws shall have a Rockwell hardness of C40-45 converted from Brinnell. The flanged adaptor shall be designed with a minimum safety factor of 2.
- C. Flange adaptors shall be UL listed. All flanged adaptors shall be designed for use on water or wastewater pipelines subject to hydrostatic pressure in accordance with AWWA C600 or ASTM D 2774 standards.
- D. All flanged adaptor assemblies and related parts shall be processed through a phosphate wash, rinse, and drying operation prior to coating application. The coating shall consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat. All casting bodies shall be surface pretreated with a phosphate wash, rinse, and sealer before drying. The coating shall be electrostatically applied and heat cured. The coating shall be a polyester based powder to provide corrosion, impact, and UV resistance.
- E. All short body flanged adaptors of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply completely with the Contract Documents. All short body flanged adaptors shall be a product of the following Manufacturer:
 1. EBAA Iron, Inc. - Series 1000
 2. Engineer Approved Equal

2.26 SPLIT TYPE FLANGED ADAPTORS - TYPE C10

- A. Provide exposed split type flanged adaptors for joining "Grooved or Shoulder End" piping at fittings, valves, equipment, flow meters, and other appurtenances as required, as specified, and as shown on the Drawings. All flanged adapters shall conform in size and bolt hole placement to ANSI standards for steel and/or cast iron flanges 125/150 pound standard unless otherwise required for connections. The flanged adaptors shall be rated for a minimum pressure of 150 psi. All flanged adaptors shall meet or exceed all applicable AWWA C 219 standards.

- B. The flange housing/body shall be ductile iron conforming to ASTM A 536 standards, Grade 65-45-12 or carbon steel conforming to ASTM A 512 and ASTM A 52 standards. The follower flanges shall be ductile iron conforming to ASTM A 536 standards. All ferrous metal surfaces of flanged adaptors shall be provided with a corrosion resistant two part epoxy paint finish. The prime and finish coatings shall be in accordance with section 09 90 00 "PAINTS & COATINGS".
- C. Gaskets for waste water service shall be Nitrile (Buna-N/NBR), Grade S, with an NSF 61 listing. The gasket shall have a nominal temperature range of -20 degrees F to 180 degrees F. Gaskets for low pressure air service piping shall be EPDM with a maximum temperature rating of at least 230 degrees F.
- D. Only when specified or indicated on the Drawings; provide all flanged adaptors with carbon steel bolts and nuts, conforming to ASTM A 183 standards. Unless otherwise specified or indicated on the Drawings, all flanged adaptors shall be provided with type 316 stainless steel, Grade B-8M, Class 2, bolts, nuts, and washers.
- E. Unless otherwise specified or shown on the Drawings, all exposed split type flanged adaptors, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All exposed split type flanged adaptors shall be a product of the following Manufacturer:
 - 1. Victaulic Company of America - Style 341
 - 2. Smith-Blair Inc. - Style 913 or 914
 - 3. Engineer Approved Equal

2.27 EXPANSION JOINTS (LIQUID SERVICE) - TYPE C11

- A. Provide single arch flexible connectors of the expansion/vibration type for connection to pumps and equipment as specified and as shown on the Drawings. Expansion joints for liquid waste water service shall be "filled arch" type to prevent sediment build up. Utilize filled arch expansion joints for all sludge, septage, raw waste water, chemicals and other piping of similar fluid service. Guides shall be provided for each expansion joint.
- B. All expansion joints shall be designed for the axial movements required for the specified application along with the maximum axial force required to compress the joint. The joints shall prevent axial, lateral and rotational movement and vibration from being transmitted to the piping and equipment. All expansion joints shall be designed for the test pressure of the connecting piping where installed as outlined in section 40 05 13 "PROCESS PIPE AND FITTINGS" or as directed by the Engineer.
- C. Unless otherwise specified or shown on the Drawings, all expansion joints for liquid service, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. The manufacturer of the expansion joints shall be a member of the Rubber Expansion Joint Division of the Fluid Sealing Association. All liquid service expansion joints shall be a product of the following Manufacturer:

1. General Rubber Corporation - Style 1025
2. Mercer Rubber Company - Series 450
3. Red Valve Company Inc. - Type J-1
4. Engineer Approved Equal

2.28 MATERIALS OF CONSTRUCTION – TYPE C11

- A. Expansion joints shall be manufactured of butyl rubber surrounded by high grade woven cotton or suitable synthetic fiber and individual solid steel ring reinforcement. All soft rubber fillers shall be integrally cured into the arches to provide a smooth flow path to prevent settling of material, grit, sludge etc., into the arch. The rubber used shall be specifically designed for service with wastewater and/or sludge. The expansion joints shall include a three-ply abrasion resistant liner.
- B. All expansion joints for chemical service shall be constructed of Viton. Provide alternative materials of construction which are compatible with the process fluid if Viton is not compatible.

2.29 JOINTS – TYPE C11

- A. Unless otherwise specified or shown on the Drawings, all joints shall match the connecting piping size. The expansion joints shall be designed for the working pressure and fluid service of the connecting piping. All joints shall have full faced fabric reinforced butyl flanges integral with the flexible connector body.

2.30 BACK-UP RINGS – TYPE C11

- A. Provide stainless steel back-up rings for each joint. Provide Split steel or ductile iron back-up rings only where specifically indicated on the Drawings to ensure a proper joint fit. Unless otherwise specified or shown on the Drawings, all rings shall be designed for mating with ANSI Standard 125/150 pound flanges. All joints shall be provided with a two part epoxy coating finish. Stainless steel back-up rings shall not be painted.

2.31 CONTROL HARNESESSES – TYPE C11

- A. All expansion joints used for vibration isolation/expansion service shall be provided with control harness assemblies. All control harness assemblies shall consist of a minimum of two drilled plates, stretcher bolts, and rubber washers backed by metal washers. The stretcher bolts/control rods shall prevent over-elongation of the joint. Extra nuts shall be provided on the stretcher bolts/control rods on the inside of the plate to prevent over compression. All nuts, bolts, fasteners and plates shall be 316 stainless steel.

2.32 SEAL WATER SYSTEMS – TYPE C11

- A. Provide flexible connectors for the seal water connection to each pump stuffing box. The flexible connectors shall be designed to isolate vibration from being transmitted from the pump(s) and the seal water piping assemblies. The flexible connectors shall be hose type

constructed of Nitrile (Buna-N/NBR) with fiber type reinforcement. All hose type flexible connectors shall be rated for a pressure of 150 psi. The hose type flexible connectors shall be a minimum of 12 inches long. Provide type 304L stainless steel or bronze NPT end fittings for connection to the pump stuffing box.

2.33 EXPANSION JOINTS (AIR SERVICE) - TYPE C12

- A. Provide "bellows style" flexible connectors of the expansion/vibration type for all low pressure air service piping, equipment, and appurtenances as specified and as shown on the Drawings. The flexible connector shall be "non-filled arch" type. All expansion joints shall be designed for a maximum pressure of 20 psig at a temperature of 250 degrees F. The expansion joints shall be designed to prevent rotational movement and vibration from being transmitted to the piping, equipment, or associated appurtenances. All flexible connectors shall be constructed in accordance with the latest revision of Section C of The Standards of the Expansion Joint Manufacturers, Fifth Edition, 1980, including all current addenda.
- B. Flange drilling shall match or be suitable for use with the connected equipment or companion flanges. Furnish guides with all bellows style expansion joints. "Hinged" or "Gimbal" expansion joints shall be provided at horizontal and vertical bends in strict accordance with the standards of the Expansion Joint Manufacturer's Association (EJMA). If reinforcement of the expansion joint is necessary for pressure, reinforcing rings shall be formed integrally with bolted-on control devices such as equalizing rings.
- C. All bellows style expansion joints shall be hydraulically formed (with dies on the outside only). All seam welding shall be longitudinal only. All seams shall have equal strength, physical properties and thickness as the parent metal. The entire expansion joint, including but not limited to the bellow and internal sleeve shall be constructed entirely of Type 316 stainless steel (minimum). The end flanges shall be constructed of 316 stainless steel. The entire inside length of the expansion joint shall be straight.
- D. The expansion joint Manufacturer shall warrant their product to be suitable for the proposed service conditions as specified and as shown on the Drawings. The Manufacturer shall provide lifting lugs at each flange for ease in handling and removal of sheet metal coverage for any expansion joint for maintenance or installation.
- E. Unless otherwise specified or shown on the Drawings, all expansion joints for low pressure air service, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. The manufacturer of the expansion joints shall be a member of the Expansion Joint Manufacturer's Association (EJMA). All air service expansion joints shall be a product of the following Manufacturer:
 - 1. U.S. Bellows, Inc.
 - 2. Unaflex Inc.
 - 3. Engineer Approved Equal

2.34 HARNESSING AND RESTRAINTS

- A. Provide all harnessing as specified, as shown on the Drawings, and as required for couplings and adaptors. Unless otherwise specified or noted, the size and material for tie rods, clamps, plates and hex nuts shall be as shown on the Drawings. When not specifically specified or shown on the Drawings all harnessing and restraints shall be sized per AWWA M11 standards.
- B. All restrained joints, such as welded, or locking mechanical joints shall be of the type specified with the individual type of pipe. If not specified, restrained (locking) mechanical joint pipe shall be of the Manufacturer's standard design utilizing a locking device (ring or ears) integrally cast with the pipe. The Contractor shall be responsible for all anchorage and restraint for piping installations.
- C. Unless otherwise specified or shown on the Drawings, all harnessing and restraint systems, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All harnessing and restraint systems shall be a product of the following Manufacturer:
 - 1. Dresser Inc. - Style 440
 - 2. Engineer Approved Equal

2.35 QUICK CONNECT COUPLINGS - TYPE C13

- A. Provide quick connect couplings as specified and as shown on the Drawings. Quick connect couplings shall be provided at all exterior chemical delivery stations as well as septage delivery stations.
- B. Couplings shall match the connecting pipe size shown on the Drawings. The quick connect couplings shall be cam and groove type with a male/female adapter as required. All quick connect couplings shall conform to A-A-59326 and (MIL-C-27487) standards. All couplings for wastewater and septage service which are connected to metallic piping shall have a body constructed of 316 stainless steel with 316 stainless steel handles and pull rings. All seals for wastewater and/or septage service shall be EPDM for maximum UV resistance in outdoor installations. The male adapter shall connect to the pipe via a 125/150 pound flange connection.
- C. All couplings connected to PVC (non-metallic piping) as well as all couplings for chemical delivery or chemical service applications shall have a body constructed of polypropylene. The polypropylene shall be acid-resistant and glass-reinforced. Handles and pull rings for polypropylene couplings shall be brass. Gaskets shall be of a material which is compatible with the process fluid to match the gasket of the piping system, or of a material as specified or as directed by the Engineer. Gaskets for chemical delivery quick connect couplings shall be Viton.
- D. The quick connect coupling shall be designed to receive a female/male coupler without requiring threading, bolting, or special tools. The connection shall remain tight and leak-

proof under pressures up to 100 psi. Each quick connect coupling shall be furnished with a dust cap complete with a stainless steel security chain. Provide all adaptors and appurtenances as required to provide a complete and working system.

- E. Unless otherwise specified or shown on the Drawings, all quick connect couplings, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All quick connect coupling systems shall be a product of the following Manufacturer:

1. OPW Engineered Systems - Kamlock Series
2. Flow Lock Inc. - Snaplock Series
3. Banjo Corporation
4. Engineer Approved Equal

2.36 UNIONS

- A. Provide unions as specified and as shown on the Drawings. In addition to that shown on the drawings, provide unions at all locations including but not limited to the following: equipment, pumps, tanks, valves, long piping runs, piping bypasses around equipment, or any other location as directed by the Engineer or Owner. Unions shall be located to allow for ease of piping disassembly, alterations, or repairs.
- B. All unions shall be brass or bronze for joining nonferrous metallic pipe. Provide malleable brass, bronze-seated iron, or steel unions for joining ferrous metallic pipe. Provide PVC unions for joining plastic and non-metallic pipe.

2.37 DIELECTRIC CONNECTORS

- A. Provide dielectric piping connectors, fittings, and insulators as specified, as shown on the Drawings or as directed by the Engineer. Dielectric pipe connectors and unions shall be used to prevent galvanic action wherever valves or piping of dissimilar metals connect. In addition, Provide dielectric connectors whenever copper, brass, or bronze piping is required to be connected to cast iron or steel piping.
- B. Provide dielectric flange unions for all connections 2-1/2 inches and larger. All cast iron flanges shall meet ASTM A 126 standards. The copper solder end shall meet ASTM B 62 standards and the pipe thread shall meet ASME B2.1 standards. Dielectric flange unions shall be rated for at least 175 psi at 210 degrees F.
- C. Dielectric unions used for piping connections two (2) inches and smaller shall be designed to accommodate the end connections of the two connecting pipe segments. Steel union nuts shall be in accordance with ASTM A 575 standards. Steel or ductile iron connection ends shall have accurately machined taper tapped pipe threads in accordance with ASME B2.1 standards. Copper connection ends shall be solder joint which meets the requirements of ASTM B 88 standards. All dielectric unions for piping connections two (2) inches and smaller shall be rated for at least 250 psi at 210 degrees F.

- D. Dielectric fittings and unions shall be manufactured of one or more of the following materials. The materials shall be in accordance with the associated reference standards and criteria:
1. Gray iron - ASTM A 48/A 48M
 2. Malleable iron parts - ASTM A 197/A 197M
 3. Steel parts - ASTM A 108
 4. Brass parts - ASTM B 16
 5. Bronze parts - ASTM B 584
 6. Zinc parts - ASTM B 633
 7. Stainless steel - ASTM A 632
- E. All gaskets for water or waste water service shall be Nitrile (Buna-N/NBR) or EPDM. Gaskets for low pressure air service or other high temperature applications shall be EPDM. The Contractor shall ensure that all gaskets are of a material which is compatible with the process fluid. The use of gasket materials shall be as approved by the Engineer and Manufacturer.
- F. Unless otherwise specified or shown on the Drawings, all dielectric unions, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All dielectric union systems shall be a product of the following Manufacturer:
1. Watts Inc. - Series 3000
 2. Wilkins, a Zurn Company
 3. G&L Fittings Inc.
 4. Engineer Approved Equal
- G. Provide all flange insulating kits for dielectric connections. One insulator shall be provided for each bolt of the flange connection. Insulated sleeve couplings and flange adaptors shall be similar to those units as previously specified.
- H. Unless otherwise specified or shown on the Drawings, all flange insulating kits, of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturers named or otherwise shall comply with the Contract Documents. All flange insulating systems shall be a product of the following Manufacturer:
1. Watts Inc.
 2. Wilkins a Zurn Company
 3. Engineer Approved Equal

2.38 RESTRAINED MECHANICAL JOINT COUPLINGS - TYPE C14

- A. Provide restrained mechanical joint couplings where indicated on the Drawings or as specified. Restrained mechanical joint couplings shall only be utilized with written permission of the Engineer when not specified or indicated on the Drawings. Restrained

mechanical joint couplings shall not be considered as equivalent to concrete thrust blocks.

- B. All restrained mechanical joint couplings shall be listed by Underwriters Laboratories, Inc., as meeting their standard (UL 6M46), latest revision. Restrained mechanical joint couplings shall also comply with Factory Mutual Research Corporation's approvals.

2.39 RETAINER AND FOLLOWER GLANDS – TYPE C14

- A. Mechanical joint retainer glands shall be incorporated in the design of the follower gland and shall include a restraining ring that, when actuated by a wedging action of the gland, imparts a restraining force against the pipe that increases as the pressure increases. The restraining ring shall grip the full pipe circumference.
- B. Coupling devices that restrain by a method of "Point-Loading" on the pipe shall not be acceptable.

2.40 MATERIALS OF CONSTRUCTION – TYPE C14

- A. Glands and restraining rings shall be manufactured of Ductile Iron meeting ASTM A 536 standards, Grade 65-45-12. Restraining rings shall also be heat treated to a minimum hardness of Rockwell 40. The restrained mechanical joint couplings shall meet the latest revisions of ANSI A21.10, AWWA C111/A21.11, and AWWA C153/A21.53 standards. The restraint ring shall be actuated solely by the tee-head bolts. Provide a two part epoxy coating on all ferrous metallic surfaces of couplings.
- B. The restrained mechanical joint couplings shall have a working pressure of at least 350 psi with a minimum safety factor of 2:1.

2.41 DUCTILE IRON EXPANSION JOINTS – TYPE C15

- A. Expansion joints shall be installed in the locations indicated on the drawings and shall be manufactured of ductile iron conforming to the material properties of ANSI/AWWA C153/A21.53. All expansion joints shall be capable of expanding or contracting to the amounts shown on the drawings or as indicated in the specifications. At a minimum, each expansion joint shall allow for a minimum of four (4) inches of total axial movement.
- B. Separation beyond the maximum extension of the expansion joint shall be prevented without the use of external tie rods. Each expansion joint shall be pressure tested against its own restraint to a minimum of 350 psi for joint which are less than 24 inch and 250 psi for joints which are larger than 24 inches. Joint restraint shall be provided with each mechanical joint connection to the expansion joint.
- C. All internal surfaces (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Exterior surfaces shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16. Sealing

gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61. Each ductile iron expansion joint shall be designed in accordance with the following criteria:

1. Size: 3 inch through 36 inch – Match to piping size shown on Drawings
 2. Body: Ductile Iron, per ASTM A 536
 3. End Connections: Flanged, Mechanical Joint or combination Flanged/Mechanical Joint as required for piping connections or as indicated on the Drawings.
 4. Linear Expansion: 4 inches (Minimum)
- D. All coupling seals shall conform to the applicable requirements of ANSI/AWWA C111/A21.11. Flange outlets shall conform to the dimensional requirements of ANSI/AWWA C110/A21.10 (class 150) with the addition of an O-ring gasket to ensure a watertight seal. Mechanical Joint end connections conform to the dimensional requirements of either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 depending on size.

PART 3 – EXECUTION

3.01 INSTALLATION OF SLEEVE TYPE COUPLINGS

- A. All sleeve type couplings shall be installed in strict accordance with the recommendations of the coupling Manufacturer. The Contractor shall thoroughly clean all pipe connecting ends prior to installation of sleeve couplings. The pipe ends shall be cleaned a minimum of 8 to 12 inches from the ends of the piping prior to installation. Provide clean soapy water for use as a gasket lubricant.
- B. Install the follower ring then the gasket over each pipe end to a distance of approximately 6 inches from the end of the pipe. Place the middle ring over the center of the joint. Insert the pipe length into the middle ring the full and proper distance. The gaskets and followers shall then be pressed evenly into the middle ring flares.
- C. Insert all bolts. All bolts shall be finger tightened prior to the use of tools. Progressively tighten diametrically opposite nuts uniformly around the adapter. Once the nuts can no longer be finger tightened use a torque wrench of the appropriate size and torque for the bolts. Utilize the wrench to progressively and uniformly tighten all bolts.
- D. The torque applied shall be in accordance with the recommendations of the coupling Manufacturer. The correct torque as indicated by a torque wrench shall not exceed 75 foot-pounds for 5/8 inch bolts and 90 foot-pounds for 3/4 inch bolts.
- E. Insert and tighten all tapered threaded lock pins. All bolts shall be finger tightened prior to use of tools. Progressively tighten diametrically opposite nuts uniformly around the adapter. Once the nuts can no longer be finger tightened use a torque wrench of the appropriate size and torque for the bolts. Utilize the wrench to progressively and uniformly tighten all bolts.

- F. Provide and install harnessing or flange clamp assemblies where shown on the Drawings, as specified or as directed by the Engineer. Harnessing or flange clamp assemblies shall be provided to prevent sleeve couplings from being pulled apart under pressure. It shall be the Contractor's responsibility for locating, providing and installing all restraints. Harnessing, flange clamp assemblies, or tie rods shall be provided on all pressurized lines.

3.02 INSTALLATION OF SPLIT TYPE COUPLINGS

- A. Install all split type couplings in strict accordance with the recommendations of the coupling Manufacturer. Where applicable the Contractor shall refer to specified procedures for the installation of sleeve type couplings. The shoulders of the connecting pipes as well as all other associated portions of the assembly shall be thoroughly cleaned prior to assembly. Slip the gasket over the pipe end. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap, or graphite paste to provide lubrication for installation. Once the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. Then install the housing sections of the coupling.
- B. Ensure that the joints are fully extended after the rings are in place. Do not tighten the bolts prior to assuring that the joints are fully extended. Insert all bolts and tighten nuts progressively and uniformly until the housing sections are in tight contact. Do not overtighten such that excessive bolt tension or strain is applied on the connecting piping. Tighten all fasteners to the torque rating as recommended by the coupling Manufacturer.

3.03 INSTALLATION OF EXPANSION JOINTS

- A. Align all piping systems prior to installation of expansion fittings. The alignment shall be provided by fitting a rigid pipe spool in place of the expansion joint. Prior to testing of the piping system, the pipe spool shall be replaced with the specified expansion or flexible fitting.
- B. In addition to the locations noted on the Drawings, expansion fittings and anchors shall be located and spaced as specified by the Expansion Joint Manufacturer's Association (EJMA). The Contractor shall not install any expansion joints or flexible connectors during times of temperature extremes or in a fully compressed or fully expanded condition. Install all expansion joints in strict accordance with the Manufacturer's recommendations.

3.04 TESTING

- A. All couplings and connectors specified in this section shall be hydrostatically pressure tested with the associated piping as specified in section 40 05 13 "PROCESS PIPE AND FITTINGS" or as directed by the Engineer.

END OF SECTION

SECTION 40 05 15

PROCESS PIPE SUPPORTS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, incidentals, hardware and appurtenances to install a complete system of pipe hangers, pipe supports, concrete inserts, anchor bolts and related appurtenances for supporting non-buried piping as shown on the Drawings and as specified herein. All pipe hanger and support systems shall be designed and constructed to resist the seismic forces as specified herein or as indicated on the Contract Drawings.
- B. Pipe supports and details are not always specifically shown on the Drawings. The absence of pipe supports and details on the Drawings shall not relieve the responsibility for providing them. Pipe supports indicated on the Drawings are shown only to convey the intent of the design for a particular location and are not intended to represent a complete system.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGS INDUSTRY (MSS)
 - 1. MSS SP-58 (2002) Standard for Pipe Hangers and Supports - Materials, Design and Manufacture
 - 2. MSS SP-69 (2003; R 2004) Standard for Pipe Hangers and Supports – Selection and Application
 - 3. MSS SP-90 (2000) Guidelines on Terminology for Pipe Hangers and Supports

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-02 Shop Drawings

1. Submittals shall include complete piping layout drawings for each piping system. The piping layouts shall indicate the type of hanger and/or support, location, pipe support reactions transmitted to the structure, type of anchor, guides, and other pipe supporting appurtenances including the structural attachment hardware. Provide a description of the surface preparation and shop painting of all piping hangers and supports. The information shall include the manufacturing process and final dry film thicknesses.

C. SD-03 Product Data

1. Submit catalog cuts, specifications and dimensioned drawings for each type of pipe hanger and/or support.
2. The product data shall include a representative catalog cut for each different type of pipe hanger or support indicating the materials of construction, important dimensions and range of pipe sizes for which that hanger is suitable. Where standard hangers and/or supports are not suitable, submit detailed drawings showing materials and methods of construction for each type of special hanger and/or support. Provide detailed information on anti-seize compounds.

1.04 QUALITY ASSURANCE

- A. Provide pipe hangers and supports of which materials, design, and manufacture comply with MSS SP-58 standards. Select and apply pipe hangers and supports, complying with MSS SP-69 standards. Terminology in this specification is defined in MSS SP-90 standards.
- B. Provide the Engineer with detailed drawings and product data for any construction-related deviations in piping layouts, materials or routing. The review of construction-related deviation submittals shall only be for conformance to the specifications and Contract Drawings. All piping hangers, supports and appurtenances shall conform to the latest applicable requirements of the State Building Code of the project location and ANSI B31.1, except as supplemented or modified by the requirements of this specification.
- C. All piping hangers, supports and appurtenances shall be of approved standard design where possible. All piping hangers, supports and appurtenances shall be adequate to maintain the supported load in proper position under all operating conditions. The minimum working factor of safety for all supporting equipment, with the exception of springs, shall be one fifth the ultimate tensile strength of the material, assuming a minimum 10 feet of water filled pipe being supported.
- D. Coordinate process piping hangers, supports, and appurtenances to eliminate interference with similar support systems to be installed for Plumbing, HVAC, Electrical and other disciplines of work. The piping support systems shall account for structural expansion joints and co-located piping expansion joints. The piping hanger and support system shall provide and maintain unhindered access to all equipment for

both operation and removal. No material handling equipment supports shall be used for piping supports under any circumstances. Do not attach piping hangers, supports and appurtenances from structural struts, or braces unless approved in writing by the Engineer.

- E. All process piping and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain or force from being imposed on the equipment. When the equipment Manufacturers have indicated that piping loads shall not be transmitted to their equipment, the Contractor shall submit a written certification stating that such requirements have been complied with.

1.05 QUALIFICATIONS OF MANUFACTURER

- A. The fabricator of pipe hangers, supports and related appurtenances shall have not less than five (5) years of current experience in the design and fabrication of the pipe hangers and supports as specified in this section.

1.06 SEISMIC CONDITIONS

- A. Provide seismic restraints for all piping systems including but not limited to free standing, suspended or wall mounted piping. Use the restraints defined in the manual when the seismic criteria, and size of piping, are within the limits of the latest edition of the SMACNA Seismic Restraints Manual at the time of bid opening. Select restraints from the tables that represent the highest seismic hazard class or level possible within the State in which the project resides. Provide members of material of equal strength to those in the standards where materials other than carbon steel are specified. All process piping supports shall be designed in accordance with the seismic criteria indicated in the Contract Documents.

PART 2 – PRODUCTS

2.01 PROCESS PIPING SUPPORTS - GENERAL

- A. The products specified herein are intended to support the various types of process piping systems shown on the Drawings. The Contractor shall be responsible for developing the final details associated with the specific installation conditions. The details include but are not limited to piping system temperatures and pressures associated with each application.
- B. The Contractor may propose minor adjustments to the piping arrangements in order to simplify the supports and/or to resolve conflicts in the layout of process piping systems. An example of an adjustment shall be a minor change to a pipe centerline elevation so that a single trapeze support may be used for a process piping system.
- C. Unless otherwise specified or shown on the Contract Drawings, process piping hangers and supports shall be a Manufacturer's standard product. All products specified or otherwise shall conform to the requirements of MSS SP-58 and MSS SP-69 standards.

Any reference to specific catalog or figure numbers from a specific Manufacturer shall be for the purpose of establishing the type, design, and quality of a piping support product. Any references contained in this specification section shall not be considered as proprietary.

- D. All piping supports and hangers of the same type, style, and duty shall be supplied by a single Manufacturer. All Manufacturer's named or otherwise shall comply with the Contract Documents. All process piping supports and hangers shall be a product of the following Manufacturer:
1. Anvil International Inc. (Formerly Grinnell)
 2. Carpenter & Patterson Inc.
 3. Cooper B-Line Inc.
 4. PHD Manufacturing Inc.
 5. Engineer Approved Equal

2.02 PIPING FORCES

- A. Provide supports for all pipe and tubing to prevent significant stresses in the material, valves, fittings and other connected pipe appurtenances. All supports and anchors shall be designed to secure the pipe in the intended position and alignment. All supports and anchors shall be designed to secure all pipe and tubing against excessive dislocation due to thermal expansion and contraction.
- B. The pipe supports and anchor design shall specifically account for internal flow forces, all probable external forces from equipment connection, human contact, and all seismic forces. Provide and install all structural steel members as required to brace any piping system from excessive dislocation. All pipe fittings and appurtenances connected to equipment shall be supported in a manner to prevent any strain from being imposed on the equipment or piping systems. All pipe supports shall be installed such that they do not induce point loadings on the piping. All supports shall distribute pipe loads evenly along the pipe circumference.
- C. All valves shall be provided with a dedicated independent supporting system. Supporting of valves by the connected piping shall not be acceptable. All electric and hydraulic valve actuators shall be independently supported.

2.03 COUPLING SUPPORT

- A. All couplings shown on the Drawings and as specified for connection to tanks, pumps, equipment, and appurtenances shall be provided with supports. The supports shall be located at the end opposite the tank, pump, equipment, and appurtenance.
- B. All such couplings shall be rigidly supported, to prevent transfer of force to the equipment. Fixed or restraining supports shall not be installed between a flexible coupling and the connected piece of equipment/appurtenance.

2.04 SUPPORT SPACING

- A. All supports shall be provided with appropriate spacing such that the sag of the pipe (if any) is within the limits of the piping Manufacturer. The support design and layout shall be such that it permits drainage of the pipe line. The support design and layout shall minimize bending stresses on the supported piping from concentrated loads between supports.
- B. For elevated bridge crossings, provide pipe supports with spacing as indicated on the Drawings.

2.05 DISSIMILAR METALS

- A. All stainless steel piping shall be isolated from all ferrous metals including galvanized steel. Provide a neoprene sheet and/or stainless steel protection shields to prevent direct contact when installed.
- B. All copper piping shall be protected from galvanic corrosion from contact with ferrous metals. Provide corrosion protection by wrapping the copper pipe with 1/16 inch thick neoprene, sheet metal and a galvanized protection shield with isolators. Copper plated or PVC-coated hangers and supports may also be used to provide dielectric isolation.

2.06 NON-METALLIC PIPING

- A. All uninsulated non-metallic piping including but not limited to "TYPE (PVC/1)", "TYPE (PVC/3)", "TYPE (PVC/4)" and "TYPE (PE/1)", shall be protected from local stress concentrations at each support point. Protection from local stresses shall be provided by PVC coated steel or 304 stainless steel protection shields.
- B. All pipes which are bottom supported for 180 degrees shall be provided with arc shields. All pipes which are supported for 360 degrees shall be provided with protection shields for the entire exterior pipe circumference. All protection shields shall have an 18 gauge minimum thickness. All protection shields shall be a minimum of 12 inches in length. Securely fasten each protection shield to the pipe with 304 stainless steel straps not less than 1/2 inches in width.

2.07 INSULATED PIPE

- A. All insulated piping shall be provided with a rigid insulating saddle at each pipe support location. Provide protection shields at each support location.

2.08 GENERAL PIPE SUPPORT SPACING

- A. All solid metallic process piping, including but not limited to, cast iron, ductile iron, steel and stainless steel shall be provided with supports spaced in strict accordance with the pipe Manufacturer's recommendations. Provide a minimum of one (1) support per pipe section at joints, changes in direction, and valves. At a minimum provide supports

for steel, stainless steel, cast iron, and ductile iron pipe in accordance with the following:

Pipe Size (Inches)	Maximum Span (feet)
1½ inches & smaller	5 feet
2 inches to 4 inches	10 feet
5 inches to 8 inches	15 feet
10 inches & larger	20 feet

- B. Small diameter metallic piping, including but not limited to steel, copper piping, copper tubing, and stainless steel shall be provided with supports spaced at a maximum of five (5) feet.
- C. For elevated bridge crossings, provide support spacing as indicated on the Drawings.
- D. All solid PVC and HDPE process piping shall be provided with supports spaced in strict accordance with the pipe Manufacturer's recommendation. At a minimum provide supports for PVC and HDPE piping in accordance with the following:

Pipe Size (Inches)	Maximum Span (feet)
1½ inches & smaller	4.5 feet
2 inches to 4 inches	6 feet
5 inches to 8 inches	9 feet
10 inches & larger	10 feet

- E. All stainless steel piping shall be provided with neoprene isolators between the pipe and supports to prevent dielectric corrosion. Where stainless steel supports are used neoprene isolators shall not be required.

2.09 VERTICAL PIPING

- A. Supports for all vertical pipes shall be provided when piping is in close proximity to the floor. All vertical piping shall be provided with Engineer approved supports spaced at intervals of not more than ten (10) feet by approved pipe collars, clamps, brackets, or wall rests.
- B. All floor and wall supports for vertical piping runs shall provide rigid and solid support. All vertical pipes passing through pipe sleeves shall be secured using a pipe collar. Whenever possible, floor supports shall be used rather than wall supports. Concrete supports, base elbows, and base tees shall be used where possible and as shown on the Drawings.

2.10 SUPPORT LOCATIONS

- A. Provide supports at all changes in directions of piping runs as well as at locations as shown on the Contract Drawings or as specified herein. Do not support piping from other piping or appurtenances including but not limited to metal stairs, ladders, walkways, or process equipment unless specifically directed or authorized in writing by the Engineer.
- B. Pipe supports shall be provided to minimize lateral forces through valves as well as both sides of split type couplings and sleeve type couplings. All supports shall be designed and installed in a manner to minimize all forces on pump housings. Pump housings shall not be utilized to support connecting piping. Piping shall not be used to support process equipment and appurtenances.

2.11 PLASTIC PIPING SUPPORTS

- A. Provide continuous supports for multiple and single "TYPE - (PVC/1)" plastic piping runs whenever possible. Provide supports for single "TYPE - (PVC/1)" piping with support spacing as recommended by the pipe Manufacturer. The support spacing shall not exceed three (3) feet under any circumstances. Whenever possible, multiple, suspended, horizontal "TYPE - (PVC/1)" pipe runs, shall be supported by v-troughs or ladder type cable trays. Refer to the Contract Drawings for typical v-trough multiple pipe support details and requirements.
- B. All ladder type cable trays for "TYPE - (PVC/1)" piping support shall be shall be constructed of PVC coated aluminum, aluminum or stainless steel. The ladder rung spacing shall be a maximum of 12 inches. The tray width shall be a minimum of six (6) inches for single piping runs and 12 inches for double piping runs. Provide all appurtenances including but not limited to all hanger rods, rod couplings, concrete inserts, hanger clips, etc., required for a complete support system.
- C. Individual plastic pipes shall be secured to the rungs of the cable tray by strap clamps or fasteners. The spacing between clamps and fasteners shall not be greater than ten (10) feet. The ladder type cable trays shall provide continuous support along the length of the pipe. Individual clamps, hangers and supports in contact with plastic pipe shall provide rigid support. The support shall be designed and installed so as to allow for longitudinal movement due to thermal expansion and contraction of the piping runs.
- D. All ladder cable trays of the same type, style, and duty shall be supplied by a single Manufacturer. All ladder type cable trays for "TYPE - (PVC/1)" piping supports shall be a product of the following Manufacturer:
 - 1. MP Husky - Ladder Cable Tray
 - 2. Cooper B-Line Inc. - Ladder Cable Tray
 - 3. Engineer Approved Equal

2.12 MATERIALS OF CONSTRUCTION

- A. Unless otherwise specified or shown on the Drawings, all rods, clamps, hangers, inserts, anchor bolts, brackets, components, and appurtenances for "Interior" pipe supports shall be constructed of 304 stainless steel. All interior pipe clamps on plastic pipe shall be provided with a plastic coating or neoprene isolator. All supports for copper pipe shall be copper plated or shall have a minimum 1/16 in plastic coating.
- B. All rods, clamps, hangers, inserts, anchor bolts, brackets, components, and appurtenances for exterior pipe, submerged pipe, polymer piping, interior piping within chemical containment areas, pipe within unheated structures, pipe within tanks, interior pipe within manholes, interior pipe within channels, and exterior pipe within channels shall be constructed of stainless steel. The grade of stainless steel shall be in accordance with the following criteria.
- C. All process piping support systems shall be constructed of the following materials based on location unless otherwise specified or indicated on the Drawings:
 - 1. All Submerged Piping: 316 Stainless Steel
 - 2. All Outdoor Piping: 304 Stainless Steel
 - 3. All Interior In-Basin, In-Channel, as well as Piping in Access Vaults (Located Above the Maximum Water Level): 304 Stainless Steel
 - 4. All Interior Building Piping: 304 Stainless Steel
- D. All fasteners and related hardware for supports including but not limited to nuts, bolts, and washers shall be 316 stainless steel regardless of location. Fasteners for submerged support locations shall be 316 stainless steel.

2.13 HORIZONTAL PIPING HANGERS AND SUPPORTS

- A. Unless otherwise specified or indicated on the Contract Drawings, provide factory fabricated horizontal piping hangers and supports conforming to MSS SP-58 standards. Horizontal piping supports and hangers shall be one of the following Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) types listed below.
- B. The specific type of support shall be selected by the Contractor to suit the horizontal piping system layout in accordance with MSS SP-69 standards as well as the piping Manufacturer's published support requirements. Whenever possible, use only one (1) type of support system by one (1) Manufacturer for each piping service. Select the size of hangers and supports to exactly fit the nominal pipe outside diameter for bare piping, and to exactly fit around piping insulation with a saddle or shield for all insulated piping.

- C. Type 5 - Pipe Hangers, Type 12 - Pipe Clamps, and Type 26 - Pipe Clips shall not be used. Type 3 - Three Bolt Pipe Clamps shall not be used on insulated piping systems. Type 24 - U-Bolts shall only be used on trapeze type hanger systems or fabricated frames.

2.14 SINGLE PIPE CLEVIS HANGERS

- A. Whenever possible, single process piping runs shall be supported by single pipe adjustable clevis type hangers, (MSS Type 1), suspended by hanger rods from structural steel members, concrete ceilings, or the bottom of trapeze hangers. The clevis type hanger shall be specifically designed for the process piping type being supported as follows:

1. Adjustable Clevis Hangers:
 - a. Anvil International Inc. - Figure No. 260
 - b. Carpenter & Patterson Inc. - Figure No. 100
 - c. PHD Manufacturing Inc. - Figure No. 425
 - d. Engineer Approved Equal
2. Adjustable Clevis Hangers (Insulated Pipe):
 - a. Anvil International Inc. - Figure No. 300
 - b. Carpenter & Patterson Inc. - Figure No. 100EL
 - c. PHD Manufacturing Inc. - Figure No. 430
 - d. Engineer Approved Equal
3. Adjustable Clevis Hangers (Cast Iron or Ductile Iron Pipe):
 - a. Anvil International Inc. - Figure No. 590
 - b. Carpenter & Patterson Inc. - Figure No. 100DI
 - c. PHD Manufacturing Inc. - Figure No. 420
 - d. Engineer Approved Equal

2.15 PIPE CLAMPS

- A. Single process piping runs supported by Pipe Clamps, (MSS Type 4), shall be in accordance with the following:
1. Anvil International Inc. - Figure No. 212
 2. Carpenter & Patterson Inc. - Figure No. 175
 3. PHD Manufacturing Inc. - Figure No. 520/521
 4. Engineer Approved Equal

2.16 ADJUSTABLE BAND HANGERS

- A. Single process piping runs supported by Adjustable Band Hangers, (MSS Type 7), shall be in accordance with the following:
1. Carpenter & Patterson Inc. - Figure No. 1A
 2. PHD Manufacturing Inc. - Figure No. 180, 181, & 183
 3. Engineer Approved Equal

2.17 PIPE SADDLE SUPPORTS

- A. Single process piping runs supported by Pipe Saddle Supports, (MSS Type 36), shall be in accordance with the following:
1. Anvil International Inc. - Figure No. 258
 2. PHD Manufacturing Inc. - Figure No. 880
 3. Engineer Approved Equal
- B. Provide pipe base supports and cast floor flanges for all pipe saddle supports. Refer to the details on the Drawings for additional requirements.

2.18 PIPE STANCHION SADDLES

- A. Single process piping runs supported by Pipe Stanchion Saddles, (MSS Type 37), shall be in accordance with the following:
1. Anvil International Inc. - Figure No. 259
 2. Carpenter & Patterson Inc. - Figure No. 125
 3. PHD Manufacturing Inc. - Figure No. 882
 4. Engineer Approved Equal
- B. Provide pipe base supports and floor flanges for all pipe stanchion saddles. Refer to the details on the Drawings for additional requirements.

2.19 SINGLE PIPE ROLLS

- A. Single process piping runs supported by Single Pipe Rolls (MSS Type 41) shall be in accordance with the following:
1. Gulf State Hangers & Supports Manufacturers, Inc. – Figure 77SS
 2. Anvil International, Inc. – Figure No. 171
 3. Engineer Approved Equal

2.20 ADJUSTABLE ROLLER HANGERS

- A. Single process piping runs supported by Adjustable Roller Hangers, (MSS Type 43), shall be in accordance with the following:

1. Anvil International Inc. - Figure No. 181
2. Carpenter & Patterson Inc. - Figure No. 140
3. PHD Manufacturing Inc. - Figure No. 470 & 475
4. Engineer Approved Equal

2.21 PIPE ROLL STANDS

- A. Single process piping runs supported by Pipe Roll Stands, (MSS Type 44), shall be in accordance with the following:

1. Anvil International Inc. - Figure No. 271
2. Carpenter & Patterson Inc. - Figure No. 54
3. PHD Manufacturing Inc. - Figure No. 486
4. Engineer Approved Equal

2.22 PIPE ROLLS & PLATES

- A. Single process piping runs supported by Pipe Rolls and Plates, (MSS Type 45), shall be in accordance with the following:

1. Anvil International Inc. - Figure No. 277
2. Carpenter & Patterson Inc. - Figure No. 63
3. Engineer Approved Equal

2.23 PIPE GUIDES & SLIDE PLATES

- A. Provide structural slide assemblies and guides (MSS Type 35) using reinforced polytetrafluoroethylene (PTFE) or graphite slides to allow for longitudinal pipe movement. Slide materials shall be suitable for the system operating temperatures, atmospheric conditions, and bearing loads encountered. Lateral restraints shall be provided as needed. Where slides do not require provisions for lateral restraint the following methods may be used:

1. For piping systems four (4) inches and larger when the temperature of the medium is 60 Degrees F or higher, a Pipe Covering Protective Saddle (MSS Type 39) which is welded to the pipe may freely rest on the support.
2. For piping systems less than four (4) inches a Pipe Protection Shield (MSS Type 40) attached to the pipe or insulation, may freely rest on a the support.
3. For piping systems four (4) inches and larger carrying medium less that 60 Degrees F a Pipe Protection Shield (MSS Type 40), attached to the pipe or insulation, may freely rest on the support.

- B. In cases where there are high system temperatures and welding to piping is not desirable, pipe slide assemblies and guides shall include a pipe cradle, welded to the guide structure and strapped securely to the pipe. The pipe shall be separated from the

slide material by at least four (4) inches or by an amount adequate for the insulation, whichever is greater.

- C. Except as otherwise indicated, provide factory fabricated pipe guides and slide plate systems. Provide pipe guides and slide plates (MSS Type 35) in accordance with the following:
1. Anvil International Inc. - Figure No. 439
 2. PHD Manufacturing Inc. - Figure No. 690
 3. Carpenter & Patterson Inc. - Figure No. 1010
 4. Engineer Approved Equal

2.24 EXTENDED VERTICAL PIPING CLAMPS

- A. Except as otherwise indicated, provide factory fabricated extended vertical piping clamps. Use only one type by one Manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping. Provide larger diameter clamps to accommodate insulated piping and shields. Provide vertical piping two bolt extended riser clamps in accordance with the following:
1. Anvil International Inc. - Figure No. 100
 2. Carpenter & Patterson Inc. - Figure No. 267
 3. PHD Manufacturing Inc. - Figure No. 545
 4. Engineer Approved Equal

2.25 OFFSET PIPE CLAMPS

- A. Except as otherwise indicated, provide factory fabricated offset vertical piping clamps. Use only one type by one Manufacturer for each piping service. Select the size of clamps and supports to exactly fit the pipe size for bare piping. Copper clad or PVC coated clamps shall be used on all copper piping. Provide vertical piping two bolt offset riser clamps in accordance with the following:
1. Anvil International Inc. - Figure No. 103
 2. Carpenter & Patterson Inc. - Figure No. 179
 3. PHD Manufacturing Inc. - Figure No. 535
 4. Engineer Approved Equal

2.26 PIPE RISER CLAMPS

- A. Pipe riser clamps (MSS Type 8) shall be used to support vertical piping runs extending through floor slabs. Copper clad or PVC coated clamps shall be used on copper pipes. Insulation shall be provided for the entire diameter of insulated pipes prior to installing riser clamps. Insulation shall not be damaged by clamp installation. Provide pipe riser clamps in accordance with the following:
1. Anvil International Inc. - Figure No. 261

2. Carpenter & Patterson Inc. - Figure No. 126
3. PHD Manufacturing Inc. - Figure No. 550, 551, or 553
4. Engineer Approved Equal

2.27 WALL PIPE SUPPORTS

- A. Where pipe runs are in close proximity to supports including but not limited to walls, beams, and columns; and are also located an excessive distance from ceilings or the underside of beams, welded stainless steel wall pipe supports shall be used for hanging pipe. In cases where single pipes rest on top of bracket pipe supports, all attachments shall meet requirements as specified under multiple pipe hangers. Provide Structural Wall Pipe Supports in accordance with the following:
 1. PHD Manufacturing Inc. - Figure No. 850
 2. Carpenter & Patterson Inc. - Figure No. 69
 3. Engineer Approved Equal
- B. For Light Duty Applications (MSS Type 31). Light duty applications shall be defined as small diameter piping less than two (2) inches nominal pipe size.
 1. PHD Manufacturing Inc. - Figure No. 850
 2. Carpenter & Patterson Inc. - Figure No. 69
 3. Engineer Approved Equal
- C. For Medium Duty Applications (MSS Type 32). Medium duty applications shall be defined as three (3) inch through six (6) inch PVC or Stainless Steel piping.
 1. PHD Manufacturing Inc. - Figure No. 855
 2. Carpenter & Patterson Inc. - Figure No. 84
 3. Engineer Approved Equal
- D. For Heavy Duty Applications (MSS Type 33). Heavy duty supports shall be used for all "Type DI/1" piping and all piping larger than six (6) inch nominal pipe size.
 1. PHD Manufacturing Inc. - Figure No. 860
 2. Carpenter & Patterson Inc. - Figure No. 139
 3. Engineer Approved Equal
- E. Where applicable and approved by the Engineer the use of "C" channels with stainless steel brackets and pipe clamps shall be provided. All members shall be securely fastened to walls, columns, or other Engineer approved structural members. Attachment shall utilize double expansion shields or other methods as approved by the Engineer. Additional wall bearing plates shall be provided where required.

2.28 MULTIPLE PIPE HANGERS

- A. Suspended multiple pipes, running parallel in the same horizontal plane, which are adjacent to each other shall be suspended by trapeze type hangers or wall brackets. Trapeze hangers shall consist of stainless steel or aluminum structural channels supported from stainless steel threaded rods. Whenever possible attach multiple pipe

supports to concrete walls, columns, structural steel, and other Engineer approved support members.

- B. Provide all other necessary accessories including but not limited to rods, concrete inserts, "C" clamps, beam clamps, welded beam attachments, and expansion shields, as required and as specified for a complete piping support system.
- C. Unless otherwise specified or indicated on the Drawings pipe anchors used for attaching pipe to trapeze or multiple pipe wall brackets shall be anchor or pipe chairs as required.
- D. The anchors shall be constructed of stainless steel. All chair "U" bolts shall be tightened to allow freedom of movement for normal expansion and contraction of piping runs except where pipe shall be anchored to control direction of movement or act as a thrust anchor.

2.29 HANGER ROD ATTACHMENTS & BEAM CLAMPS

- A. All hanger rod attachments shall be stainless steel, machine threaded, and passivated after fabrication. The strength of the rod shall be based on its root diameter. Hanger rods shall be attached to concrete structures using concrete inserts. Threaded rods shall not be formed or bent in the field.
- B. All inserts shall be malleable iron, or steel with a galvanized finish. Beam clamps, "C" clamps, or welded beam attachments shall be used for attaching hanger rods to structural steel members.
- C. Where required and as approved by the Engineer, expansion anchors shall be used for attaching to concrete structures. Provide a bituminous coating for all iron or steel in direct contact with concrete.
- D. All Top Beam C-Clamps (MSS Type 19) and C-Clamps (MSS Type 23) shall be torqued in accordance with MSS SP-69 standards. Both locknuts and retaining devices shall be furnished by the piping support Manufacturer.
- E. Field fabricated clamp bodies and retaining devices shall not be acceptable. Side Beam or Channel Clamps (MSS Type 20) shall be provided with an added iron heel plate or adaptor. U-bolts (MSS Type 24) shall only be used in conjunction with trapeze hanger systems or on fabricated frames. Whenever possible utilize Center Beam Clamps (MSS Type 21).

2.30 ANCHORS

- A. The Contractor shall anchor piping at locations indicated on the Drawings or required per the specifications. The anchor design and materials shall be in accordance with ANSI/ASME B.31 standards. Additional anchoring shall be provided as approved by the Engineer. All anchors shall be 316 stainless steel regardless of installation location.

- B. The length of expansion bolts shall be sufficient to place the wedge portion of the bolt a minimum of one (1) inch behind the steel reinforcement. Concrete anchors for ceiling mounted pipe supports and appurtenances shall be adhesive or expansion type.
- C. Anchors for wall supports, floor supports and all related appurtenances shall be in accordance with the following. Size all supports as required for proper support as well as to provide compatibility with the associated pipe support.
 - 1. Hilti - Kwok-Bolt
 - 2. Simpson Strong-Tie - Wedge All
 - 3. Powers Power-Stud
 - 4. Engineer Approved Equal

2.31 INSULATION SHIELDS & SADDLES

- A. Provide Pipe Covering Protective Saddles (MSS Type 39) on insulated pipe four (4) inches and larger when the temperature of the medium is 60 degrees F or higher. All Pipe Covering Protective Saddles shall be welded to the pipe. The saddle materials of construction shall match the connecting pipe.
- B. Provide Pipe Protection Shields (MSS Type 40) for use on insulated piping systems less than four (4) inches. Shields may be used on piping systems larger than four (4) inches when the temperature of the medium is 60 Degrees F or less. All shields shall be 304 stainless steel. Shield length and gauge stock shall be sized for the respective piping system.
- C. Single process piping protective sleeves (MSS Type 40), shall be stainless steel sheet metal. All protective shields shall be in accordance with the following:
 - 1. Gulf State Hangers & Supports Manufacturers, Inc. – Figure No. 100
 - 2. Anvil International Inc. - Figure No. 167
 - 3. Carpenter & Patterson Inc. - Figure No. 265
 - 4. PHD Manufacturing Inc. - Figure No. 170
 - 5. Engineer Approved Equal

2.32 HORIZONTAL SMALL DIAMETER PIPE SUPPORTS

- A. Horizontal piping runs less than three (3) inches in diameter shall be held in position by supports fabricated from 304 stainless steel or aluminum "C" channels, welded post bases and pipe clamps.
- B. Where required to assure adequate support, fabricate supports using two vertical members and post bases connected together by a horizontal member of sufficient load capacity to support the piping run. Wherever possible supports shall be anchored to nearby walls or other structural members to provide horizontal rigidity. More than one pipe may be supported from a common fabricated support as approved by the Engineer.

2.33 SMALL DIAMETER PLASTIC PIPE SUPPORT

- A. Provide all pipe supports for closely spaced vertical "Plastic Piping Systems" three (3) inches and smaller as required to provide a rigid support system. The interval of vertical support spacing shall be as specified, but in no case shall the vertical spacing interval exceed 6 feet between supports. The support system shall consist of a framework suitably anchored to floors, ceilings, roofs or other Engineer approved structural members.
- B. Vertical and horizontal supporting members shall be 304 stainless steel or aluminum "U" shaped channels. The assemblies shall be furnished complete with all nuts, bolts and fittings required for a complete assembly including end caps for all support members.
- C. Vertical piping shall be secured to the horizontal members by pipe clamps or pipe straps. For support of exterior pipe, submerged pipe, pipe within outdoor structures and interior pipe within channels all components shall be Type 316 stainless steel. Piping supports in chemical containment and storage areas shall be PVC coated. In all other areas, all components shall be 304 stainless steel or aluminum.
- D. The design of each individual framing system for small diameter plastic pipe support systems shall be the responsibility of the Contractor. Shop drawings, as specified above shall be submitted and shall show all details of the installation, including dimensions and types of supports. In all instances the completed frame shall be adequately braced to provide a complete rigid structure when all the piping has been attached.
- E. The framework for small diameter plastic piping supports shall be in accordance with the following. Size all supports as required for proper support as well as to provide compatibility with the associated piping material. Use only one type by one Manufacturer for each piping service. All framework for small diameter plastic piping shall be a product of the following Manufacturer:
 - 1. Unistrut Corporation
 - 2. Globe-Strut
 - 3. Power Strut
 - 4. Cooper B-Line Inc.
 - 5. Engineer Approved Equal

2.34 CUSTOM FABRICATED PIPE SUPPORTS

- A. Whenever possible the Contractor shall utilize standard piping supports and appurtenances. If standard supports are not suitable for an application, the Contractor shall furnish custom fabricated structural steel shapes, concrete, and anchor hardware for support of process piping systems. All custom fabricated supports shall be of approved materials of construction identical to items previously specified herein. All anchor hardware shall be similar to items previously specified herein and shall meet the

minimum requirements for support as approved by the Engineer. All custom fabricated piping supports shall be subject to the approval of the Engineer.

- B. All pipe support systems shall meet all requirements of this Section and all related Sections as well as the Drawings. Complete design details of the pipe support system and system components shall be submitted for review and approval as specified. No hanger or support shall be installed without the written approval of the Engineer. The pipe support system shall not impose loads on the supporting structures in excess of the loads for which the supporting structure was designed.

2.35 THIN-WALLED PIPE SUPPORTS

- A. Supports for thin walled pipe shall be provided per the requirements of this specification, and shall include all required saddle bracing to avoid damaging the pipe at the point of contact with the associated support.

2.36 CONCRETE INSERTS

- A. Provide inserts (MSS Type 18) to allow a connection point for hanger rods in concrete. Inserts shall be secured to concrete forms before concrete is placed. Continuous inserts which allow more adjustment may be used if they otherwise meet the requirements for (MSS Type 18) inserts. Provide a bituminous coating for all metallic inserts in direct contact with concrete. All concrete inserts shall be in accordance with the following:
 - 1. Anvil International Inc. - Figure No. 282
 - 2. Carpenter & Patterson Inc. - Figure No. 650
 - 3. PHD Manufacturing Inc. - Figure No. 951
 - 4. Engineer Approved Equal

PART 3 – EXECUTION

3.01 GENERAL

- A. Hangers, supports, and guides shown on the Drawings are for estimating purposes only and represent recommendations based on assumed pipe routing. The Contractor shall be responsible for actual routing and installation of all hangers, supports and guides for complete piping systems.
- B. For elevated bridge crossings, provide pipe hanger and support systems with a spacing and configuration as shown on the Drawings.
- C. The Contractor shall proceed with the installation of piping and supports only after any building structural work has been completed and all new concrete has reached its specified design strength. The installation of pipe support systems shall in no way interfere with the operation of monorails, access hatches, building system, overhead

doors, etc. The installed systems shall not interfere with maintenance and operational access to any equipment installed under this Section, or any other related Section.

- D. All pipe supports shall be designed with liberal strength and stiffness to support the respective pipes under the maximum combination of peak loading conditions to include pipe weight, liquid weight, liquid movement and pressure forces, thermal expansion and contraction, vibrations and all probable externally applied forces including seismic forces. Prior to installation, all pipe support systems shall be approved by the Engineer.

3.02 INSTALLATION OF BUILDING ATTACHMENTS

- A. Install building attachments at required locations within concrete. Space attachments where support is required for additional concentrated loads, including flanges, valves, guides, strainers, expansion joints, and at changes in direction of piping.
- B. Apply anti-seize compound to all nuts, bolts, and other associated fasteners. Supports installed without the approved anti-seize compound shall be dismantled and correctly installed, at no additional cost to the Owner or Engineer.

3.03 INSTALLATION OF HANGERS AND SUPPORTS

- A. Install hangers, supports, clamps, and attachments to support piping properly from building structures in accordance with MSS SP-69. Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Install supports with maximum spacing complying with MSS SP-69. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe. Do not use wire or perforated metal to support piping, and do not support piping from other piping. No piping shall be supported from existing precast concrete tees, metal stairs, ladders and/or walkways unless specifically directed or authorized by the Engineer.
- B. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.
- C. Install hangers and supports such that piping live and dead loading, and stresses from movement, will not be transmitted to connected equipment. Equipment shall not be used to support piping.
- D. Except as otherwise permitted, make provisions for vertical adjustment of all hangers after installation. Locate one hanger immediately adjacent to each change of direction and offset, additional hangers where installation of inline equipment produces concentrated loads. Provide additional guides or supports at offsets in piping as necessary to prevent deflection of the pipe axis due to expansion or pressure forces except where right angle bends are utilized to compensate for expansion.

- E. Provide hangers and/or supports immediately adjacent to either side of all in-line instruments, including but not limited to valves and flow meters.

3.04 SUPPORT SPACING

- A. Provide hangers and support spacing for carbon steel pipe not exceeding 17 feet on center for 6 inch pipe and 14 feet on center for 4 inch pipe. For all pipe support vertical runs provide clamps at a maximum spacing of 6 feet on center. Provide hangers to give broad support to piping and permit free axial movement. Where temporary supports are used, provide sufficiently rigid support to prevent shifting or distortion of pipe. Provide support spacing in accordance with the recommendation of the pipe manufacturer.

3.05 COUPLING SUPPORT

- A. Pipe supports shall be provided to minimize lateral forces through valves, both sides of split type couplings and sleeve type couplings (within four pipe diameters) and to minimize all pipe forces on pump housings and other equipment. Pump housings and other equipment shall not be utilized to support connecting pipes.

3.06 CONCRETE INSERTS

- A. Concrete inserts for pipe hangers and supports shall be installed on forms before concrete is placed. Before setting these items, all Drawings and figures shall be checked which have a direct bearing on the pipe location. Responsibility for the proper location of pipe supports shall be the responsibility of the installing Contractor. Continuous metal inserts shall be embedded flush with the concrete surface. Provide a bituminous coating for all metallic concrete inserts in contact with concrete.

3.07 FINISHING

- A. All sharp edges and comers within 7 feet of the floor or walking surfaces shall be ground down and/or protected with plastic protective covers. All ferrous metal surfaces shall be finished in accordance with section 09 90 00 "PAINTS AND COATINGS". Stainless steel, galvanized steel, plastic, brass, bronze, copper and FRP components shall not be painted unless otherwise indicated in the Contract Documents.

3.08 TESTING

- A. All pipe support systems shall be tested for compliance with this Section. After installation, each pipe support system shall be tested in conjunction with the respective piping pressure tests as specified in section 40 05 13 "PROCESS PIPE AND FITTINGS". If any part of the pipe support system proves to be defective or inadequate, it shall be repaired or augmented under this Section to the satisfaction of the Engineer at no additional cost to the Owner or Engineer.

END OF SECTION

SECTION 40 05 17

PROCESS PIPE SLEEVES AND SEALS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all labor, materials, equipment, incidentals and appurtenances required to install pipe penetration assemblies as indicated on the Drawings and as specified herein. The following specification section outlines the materials and designs for the various pipe penetration configurations as shown on the Drawings. Refer to the Drawings for additional details and requirements for each configuration.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN WATER WORKS ASSOCIATION (AWWA)
1. AWWA C110/A21.10 (2008) Ductile-Iron and Gray-Iron Fittings for Water
 2. AWWA C111/A21.11 (2007) Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
 3. AWWA C115/A21.15 (2005) Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges
 4. AWWA C151/A21.51 (2002; Errata 2002) Ductile-Iron Pipe, Centrifugally Cast, for Water
 5. AWWA C153/A21.53 (2006) Ductile-Iron Compact Fittings for Water Service
- C. ASTM INTERNATIONAL (ASTM)
1. ASTM D 2000 (2008) Standard Classification System for Rubber Products in Automotive Applications
 2. ASTM D 297 (1993; R 2006) Rubber Products - Chemical Analysis
 3. ASTM D 395 (2003; R 2008) Standard Test Methods for Rubber Property - Compression Set

4. ASTM D 412 (2006ae2) Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension
5. ASTM F 593 (2002; R 2008) Stainless Steel Bolts, Hex Cap Screws, and Studs
6. ASTM F 594 (2008) Standard Specification for Stainless Steel Nuts

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall also include but are not limited to the following.
- B. SD-03 Product Data
 1. Product data shall include Manufacturer's descriptive data, technical literature, performance charts, catalog cuts, and installation instructions. Include all spare parts data for each different item of material and equipment specified. Provide literature, installation instructions, and where applicable, fire ratings and certified test results of the various components on all sleeves and seals to be furnished.

1.04 QUALIFICATIONS OF MANUFACTURER

- A. Materials and equipment shall be the standard products of a Manufacturer regularly engaged in the production of such products and shall essentially duplicate items that have been in satisfactory use in identical applications in other wastewater treatment facilities. The Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of pipe sleeves and seals of "all types", and not less than five (5) years of experience in the production of equal or larger sized models or designs of the exact products as specified herein.
- B. The Manufacturer shall provide an installation list of at least ten (10) similar installations, including contact names and phone numbers. Products shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.

1.05 WARRANTY

- A. Provide a full and comprehensive warranty for all related equipment/appurtenances specified in this section. All equipment and appurtenances shall be warrantied to be free from defects in workmanship, design, and materials for a period of not less than one (1) year. If any parts of the equipment supplied under this section should fail during the Manufacturer's warranty period, replacement of parts or the units themselves shall be provided. The units shall be restored to active working service at no expense to the Owner. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling required for restoration of equipment to active service as required under the Manufacturer's warranty.

- B. The Manufacturer's warranty shall commence at the date of substantial completion or partial utilization.

1.06 SPECIAL TOOLS

- A. Furnish one set of all special tools required to completely assemble, disassemble, or maintain the equipment and appurtenances. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items.

PART 2 – PRODUCTS

2.01 PIPE SLEEVES

- A. Provide pipe wall sleeves and seal penetrations as indicated on the Drawings. Unless otherwise specified or indicated on the Drawings, all pipe sleeves 24 inches and smaller be constructed of High Density Polyethylene (HDPE). The use of ferrous metallic sleeves shall not be acceptable. All pipe sleeves larger than 24 inches shall be constructed of 304L stainless steel. Pipe sleeves of all sizes and materials shall include a two (2) inch (minimum) circumferential water stop welded or integrally molded to the exterior of the sleeve at its midpoint. The sleeve length shall be specifically coordinated with the respective thickness of the penetrated structural wall, floor or ceiling. Unless otherwise indicated, ends of sleeves shall be flush with the wall or ceiling and extend a minimum of four (4) inches above finished floors. Refer to the piping penetration details on the Drawings for additional information and requirements. Pipe sleeves which penetrate masonry block walls shall not require an integral water stop.
- B. Pipe sleeves which are to be sealed with mechanical seals shall be sized in accordance with the recommendations of the seal manufacturer.
- C. Sleeves to be sealed by caulking or sleeves for insulated piping shall be sized, constructed and installed as specified or as indicated on the Drawings. All pipe sleeves which penetrate fire rated walls, floors or ceilings shall be 304L stainless steel regardless of size.
- D. All pipe sleeves shall be supplied by a single Manufacturer. All wall pipe sleeves shall be a product of the following Manufacturer:
1. Pipeline Seal & Insulator, Inc.
 2. Advance Products & Systems, Inc. - "Infinity Series"
 3. Engineer Approved Equal

2.02 WALL CASTINGS (WALL PIPE)

- A. Provide wall castings (wall pipe) as specified or indicated on the Drawings. All wall castings shall be constructed of ductile iron conforming to AWWA C151/A21.51 standards, Class 53, with a diameter to match the connecting piping system. Ductile

iron, wall castings shall be grade 60-42-10. All wall castings shall have minimum physical properties in accordance with the following:

1. Minimum Tensile Strength: 60,000 psi
 2. Minimum Yield Strength: 42,000 psi
 3. Minimum Elongation: 10%
- B. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall. Castings shall be provided with a two (2) inch minimum circumferential flange/waterstop integrally cast with or welded to the pipe. All welded flanges/waterstops shall include a continuous 360 degree fillet weld on both sides of the collar over the entire circumference of the wall pipe. The pipe collar shall be designed for use as both a thrust collar and a water stop mechanism.
- C. Unless otherwise noted, all cast flanges shall be in accordance with AWWA C110/A21.10, AWWA C153/A21.53 and AWWA C115/A21.15 standards. All mechanical joints shall be in accordance with AWWA C111/A21.11 standards. Fabricated mechanical joint bells shall be in accordance with applicable portions of AWWA C153/A21.53 standards. Flanges shall be designed for a 125 lb drilling pattern.
- D. For castings set flush with walls, locate the flange/waterstop at the center of the overall length of the casting. For castings which extend through the wall locate the flange/waterstop within the middle third of the wall. All ductile iron wall castings shall be provided with a two part epoxy prime and finished coating system in accordance with Specification 09 90 00 "PAINTS AND COATINGS". In addition, provide a bituminous coating on all surfaces of wall castings which are in contact with concrete.
- E. Stainless steel wall pipes shall be provided for all stainless steel piping systems to match the connecting piping. All stainless steel wall pipes shall be Schedule 10S, Type 304L stainless steel with a two (2) inch minimum circumferential flange/waterstop integrally cast with or welded to the pipe. All stainless steel wall pipes shall be in accordance with the requirements of "Types SS/1" piping as noted in specification 40 05 13 "PROCESS PIPE AND FITTINGS".
- F. All ductile iron wall castings shall be supplied by a single Manufacturer. All wall castings (wall pipes) shall be a product of the following Manufacturer:
1. American Cast Iron Pipe Company
 2. Clow Water Systems Company
 3. Engineer Approved Equal

2.03 MECHANICAL PIPE SEALS

- A. Unless otherwise specified or indicated on the Drawings; all core drilled or sleeved wall, floor and ceiling penetrations shall be provided with a modular, mechanical type, sealing system. The sealing system shall consist of inter-locking synthetic rubber links shaped to continuously fill the annular space between the pipe and the cored opening or

pipe sleeve. The elastomeric element shall be sized and selected in accordance with the Manufacturer's recommendations and sizing guidelines. Coloration shall be throughout the elastomer as indicated below for the respective seal materials to allow for positive field identification. Each link shall have a permanent identification of the size and Manufacturer's name molded into it. Each seal shall be rated by the manufacturer for positive sealing at a minimum pressure of 40 feet of water or 20 psig. All mechanical pipe seals shall have the following properties. Provide mechanical pipe seals for each respective application as indicated in the following paragraphs:

1. For "General Service Applications" utilize EPDM seals per ASTM D 2000 standards. Color shall be black. Pressure plates shall be constructed of reinforced nylon polymer or composite material. Seals shall be rated for a temperature range of -40 to 250 degrees F. The minimum EPDM durometer hardness (Shore A) shall be 50 (+/-) 5. Areas where this type of seal shall be used include but are not limited to the following:
 - a. Dry Process Areas
 - b. Below Grade Vaults
2. For "Thin Wall Pipe Applications" utilize EPDM seals per ASTM D 2000 standards. Color shall be blue. Pressure plates shall be constructed of reinforced nylon polymer or composite material. Seals shall be rated for a temperature range of -40 to 250 degrees F. The minimum EPDM durometer hardness (Shore A) shall be 40 (+/-) 5. Examples of thin walled pipe applications include but are not limited to the following:
 - a. Copper Tubing (Type CU/1)
3. For "Wastewater or Corrosive Chemical Service Applications" where sewage gas or solvents may present (see partial list below), utilize EPDM seal elements per ASTM D 2000 standards. Color shall be black. Pressure plates shall be constructed of reinforced nylon polymer or composite material. Temperature rating shall be -40 degrees F to 250 degrees F. The minimum EPDM durometer hardness (Shore A) shall be 50 (+/-) 5. Areas where this type of seal shall be used include but are not limited to the following:
 - a. Pumping Station Wet Well
 - b. Sewer Manholes
 - c. Tanks
 - d. Channels
 - e. Exterior Areas Exposed to Direct Sunlight
4. For "Fire Rated or High Temperature Penetration Applications" utilize Silicone or rubber seal elements. All seals shall meet or exceed the fire rating requirements of the wall, floor or ceiling which is penetrated. Provide a double seal for all fire rated penetrations. Color shall be gray or red. All seals shall be rated for a temperature range of at least -67 to 400 degrees F. Pressure plates shall be constructed of

corrosion resistant zinc plated steel. All Fire Rated seals shall be Factory Mutual (FM) approved for the rating of the constructed element being penetrated. Refer to the Drawings for the fire ratings of each respective area.

5. For "Oil Resistant Applications" utilize Nitrile (NBR/Buna-N) seal elements. Typical oil resistant applications include but are not limited to areas with exposure to solvents, oil, and hydraulic fluid. Color shall be green. Pressure plates shall be constructed of reinforced nylon polymer or composite material. Temperature rating shall be -40 degrees F to 210 degrees F. The minimum EPDM durometer hardness (Shore A) shall be 50 (+/-5).
- B. Provide mechanical seals with wall sleeves for new construction where specified or as indicated on the Drawings. Provide seals for cored openings for existing construction where pipe penetrations pass through a sound concrete wall. When a pipe penetration into a tank or other vessel is below the high water level, provide two (2) mechanical seals, one flush with the inside wall and one flush with the outside wall. Mechanical seal hardware shall be oriented towards the wall side which allows for future access. Refer to the Drawings for additional details and requirements.
- C. All mechanical pipe seals shall be supplied by a single Manufacturer. All pipe seals shall be a product of the following Manufacturer:
 1. Pipeline Seal & Insulator, Inc. - "Link-Seal"
 2. Advance Products & Systems, Inc. - "Innerlynx"
 3. Engineer Approved Equal

2.04 MECHANICAL PIPE SEAL PROPERTIES

- A. All EPDM mechanical pipe seals shall be designed and constructed in accordance with the following minimum physical and chemical properties:
 1. Tensile Strength: 1,450 psi per ASTM D 412
 2. Elongation At Break: 400% per ASTM D 412
 3. Compression Set: 15% 22 hrs. at 150 degrees F per ASTM D 395
 4. Specific Gravity: 1.10 per ASTM D 297
- B. All Silicone mechanical pipe seals shall be designed and constructed in accordance with the following minimum physical and chemical properties:
 1. Tensile Strength: 860 psi per ASTM D 412
 2. Elongation At Break: 250% per ASTM D 412
 3. Compression Set: 38% 22 hrs. at 150 degrees F per ASTM D 395
 4. Specific Gravity: 1.30 per ASTM D 297
- C. All Nitrile (NBR/Buna-N) mechanical pipe seals shall be designed and constructed in accordance with the following minimum physical and chemical properties:

1. Tensile Strength: 1,200 psi per ASTM D 412
2. Elongation At Break: 300% per ASTM D 412
3. Compression Set: 45% 22 hrs. at 150 degrees F per ASTM D 395
4. Specific Gravity: 1.15 per ASTM D 297

2.05 SEALING OF FLAMMABLE PIPE

- A. All pipe sleeves which penetrate fire rated walls, floors or ceilings shall be 304L stainless steel regardless of size. In cases where small diameter flammable plastic pipes penetrate fire rated construction, provide an intumescent pipe wrap with a rating which meets or exceeds the fire resistance requirements of the area. Examples of flammable plastic pipes include but are not limited to PVC, UPVC, ABS, polypropylene, and polyethylene. All intumescent pipe wrap shall be water resistant as well as halogen and plasticizer free. Provide a minimum fire expansion rate of 40:1.
- B. In cases where larger diameter flammable plastic pipes penetrate fire rated construction, provide an intumescent pipe collar with a rating which meets or exceeds the fire resistance requirements of the area. The collar shall be surface mounted for existing construction. Provide centrally cast flush fitted collars for new construction.
- C. Pipe collars shall be galvanized or epoxy coated steel and contain high-performance intumescent material. On exposure to heat from a fire the pipe collars shall rapidly expand inwards to squeeze the collapsing flammable pipe until the aperture is completely sealed. For horizontal installations the collar may be surface mounted or recessed depending upon the construction installation requirements. Install a collar on one or both sides of walls, floors, or ceilings according to the direction of risk. Provide fire rated insulation, caulk, putty, mortar, pillows and hardware to provide a complete installation.
- D. All fire rated sealing systems shall be supplied by a single Manufacturer. All fire rated pipe collars, wraps and related appurtenances shall be a product of the following Manufacturer:
 1. 3M Fire Protection Products
 2. Hilti Corporation
 3. Biofireshield Company
 4. Engineer Approved Equal

2.06 PIPE CASING SPACERS

- A. Casing spacers shall be constructed of circular stainless steel bands, which bolt together forming a shell around the carrier pipe. The spacers shall be designed with runners to support the carrier within the casing and maintain a minimum clearance of 1 inch between the casing inside diameter and the spacer outside diameter. Each spacer shall contain four modular runners, two on each half. Bolts, nuts and washers shall be manufactured of 304 stainless steel. All risers shall be welded to the band via MIG welding. Stainless steel welds shall be fully passivated.

- B. The spacer band shall be manufactured of 304 stainless steel. Provide abrasion resistant runners, having a minimum width of 2 inches and a length of 7 inches. Runners shall be attached to each band to minimize friction between the casing pipe and the carrier pipe as it is installed. Runner material shall be glass filled polymer with a compression strength of 33,000 psi, flexural strength of 40,000 psi and tensile strength of 27,000 psi. The ends of all runners shall be beveled to facilitate installation over rough weld beads or the welded ends of misaligned or deformed casing pipe.
- C. Interior surfaces of the circular stainless steel band shall be lined with a material as specified. Minimum thickness shall be 0.090 inches with a Durometer "A" hardness of 85-90. All casing spacers shall be designed and constructed in accordance with the following criteria:
1. Band: 14 gauge, 304 stainless steel
 2. Riser: 10 gauge, 304 stainless steel
 3. Liner: PVC
 4. Liner Thickness: 0.090 inches (Minimum)
 5. Liner Hardness: Durometer "A" 85-90
 6. Dielectric Strength: 60,000 VPM
 7. Water Absorption: 1% (Maximum), Overlaps Edges
 8. Hardware: 304 Stainless Steel
 9. Spacer Type: Centered & Restrained. Provide cluster systems as shown on the Drawings.
- D. All runners shall be designed and constructed in accordance with the following criteria:
1. Runners: 2 inch wide, glass filled polymer
 2. Runner Length: 7 inches
 3. Rockwell Hardness (M): 100, per ASTM D 785
 4. Tensile Strength: 27,000 psi, per ASTM D 638
 5. Flexural Strength: 40,000 psi, per ASTM D 790
 6. Compression Strength: 33,000 psi, per ASTM D 695
 7. Deflection Temperature at 264 psi: 487 °F, per ASTM D 648
 8. Deformation Under Load at 122 °F, 4,000 lb Load: 1.2 %, per ASTM D 648
 9. Coefficient of Friction: 0.1

2.07 PIPE CASING END SEALS

- A. Casing end seals shall be manufactured of 3/8 inch thick SBR rubber, assuring excellent chemical resistance and resiliency. Provide ½ inch wide 304 stainless steel bands with a 100% non-magnetic worm gear mechanism. End seal shall be designed to permit movement of the carrier pipe without damage to the seal. Seal shall prevent damage from backfill entering the pipe casing. Each end seal shall be made of 60 Durometer synthetic rubber. End seals shall be concentric molded type. Provide multiple molded penetrations in end seals to accommodate pipe clusters within the pipe casing as shown on the Drawings. Molded end seals shall be designed and constructed in accordance with the following criteria:

1. Temperature: -20 °F to 212 °F
2. Color: Black
3. Finish: Smooth
4. Durometer: 60 (+/-) 5
5. Average Tensile Strength: 1,000 psi
6. Average Elongation: 350%
7. Specific Gravity: 1.5
8. Polymer Content: 20%

2.08 HARDWARE

- A. All process pipe sleeve and seal hardware, including mechanical seal hardware shall be 316 stainless steel in accordance with ASTM F 593 and ASTM F 594 standards. The minimum hardware tensile strength shall be 60,000 psi. Provide dielectric insulation and/or isolation between ferrous metal surfaces and stainless steel hardware.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

- A. Install pipe sleeves, seals and wall castings of the types and configurations as indicated on the Drawings. Provide sleeves, seals and wall castings where piping passes through walls, floors, ceilings, and roofs. Do not install sleeves through structural members of work, except as detailed on the Drawings, or as approved by the Engineer. Install all sleeves and castings accurately centered on pipe runs. Size wall sleeves so that piping and insulation (if any) will have free movement in the sleeve, including allowance for thermal expansion; but not less than two (2) pipe sizes larger than the piping run.
- B. Provide and install sleeves and wall castings with a length equal to thickness of the construction being penetrated. Unless otherwise specified or indicated on the Drawings all wall sleeves and castings shall be finished flush to the wall construction being penetrated. Unless otherwise indicated, floor sleeves shall be extended a minimum of four (4) inches above the finished floor in Process Areas. Provide temporary supports of sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves during construction.

3.02 MECHANICAL PIPE SEAL INSTALLATION

- A. Center the pipe in the cored or sleeved opening. Provide temporary support for the pipe on both ends. Loosen the rear pressure plate with nut just enough so mechanical links move freely. Connect both ends of belt around the pipe. Check to be sure all bolt heads are facing the installer. Extra slack or sag is normal. Do not remove links if extra slack exists. On smaller diameter pipe, links may require stretching. Slide belt assembly into annular space. For larger size belts, start inserting the mechanical seal assembly at the 6 O'clock position and work both sides up toward the 12 O'clock position in the annular space.

- B. Using a hand socket or offset wrench only, start at 12 O' Clock. Do not tighten any bolt more than 4 turns at a time. Continue in a clockwise manner until links have been uniformly compressed. Approximately 2 or 3 rotations are typical. Make 2 or 3 more passes at 4 turns per bolt maximum, tightening all bolts clockwise until all sealing elements "bulge" around all pressure plates. If the mechanical seals include type 316 stainless steel bolts, hand wrench tighten only without use of power tools to prevent galling.

END OF SECTION

SECTION 40 05 23

PROCESS VALVES AND STRAINERS

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide and test process valves, strainers, and appurtenances as shown on the Drawings and as specified herein. The valves, strainers, and appurtenances shall be of sizes and connection types as shown on the Drawings as well as that specified herein. The following sections reference the process valve type and specification reference numbers shown in the valve tag symbols on the Contract Drawings. Valves without valve tag symbols are specified elsewhere. Provide all valves that are specified, indicated on the Drawings and/or are required to complete the work outlined in the Contract Documents.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)
1. ANSI B16.1 (1998) Cast Iron Pipe Flanges and Flanged Fittings Classes 25, 125, and 250 Ref Title
- C. ASTM INTERNATIONAL (ASTM)
1. ASTM A 126 (2004) Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
 2. ASTM A 216/A 216M (2008) Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
 3. ASTM A 240/A 240M (2009) Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications
 4. ASTM A 276 (2008a) Standard Specification for Stainless Steel Bars and Shapes
 5. ASTM A 351/A 351M (2006) Standard Specification for Castings, Austenitic, Austenitic-Ferritic (Duplex), for Pressure-Containing Parts

6. ASTM A 436 (1984; R 2006) Standard Specification for Austenitic Gray Iron Castings
7. ASTM A 48/A 48M (2003; R 2008) Standard Specification for Gray Iron Castings
8. ASTM A 536 (1984e1; R 2004) Standard Specification for Ductile Iron Castings
9. ASTM B 584 (2008a) Standard Specification for Copper Alloy Sand Castings for General Applications
10. ASTM B 124/B 124M (2009) Standard Specification for Copper and Copper Alloy Forging Rod, Bar, and Shapes
11. ASTM B 150/B 150M (2008) Standard Specification for Aluminum Bronze Rod, Bar, and Shapes
12. ASTM B 505/B 505M (2008a) Standard Specification for Copper-Base Alloy Continuous Castings
13. ASTM D 2000 (2008) Standard Classification System for Rubber Products in Automotive Applications
14. ASTM D 3222 (2005) Unmodified Poly(Vinylidene Fluoride) (PVDF) Molding Extrusion and Coating Materials
15. ASTM D 4024 (2005) Machine Made "Fiberglass" (Glass-Fiber-Reinforced Thermosetting Resin) Flanges
16. ASTM D 429 (2002) Standard Test Methods for Rubber Property-Adhesion to Rigid Substrates
17. ASTM B 61 (2008) Standard Specification for Steam or Valve Bronze Castings
18. ASTM B 62 (2002) Standard Specification for Composition Bronze or Ounce Metal Castings
19. ASTM D 1784 (1999a) Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

D. ASME INTERNATIONAL (ASME)

1. ASME B16.5 (1996 A1998) Pipe Flanges and Flanged Fittings NPS 1/2 Through NPS 24 Addenda A - 10/26/1998

E. AMERICAN WATER WORKS ASSOCIATION (AWWA)

1. AWWA C550 (2005; Errata 2005) Protective Epoxy Interior Coatings for Valves and Hydrants
2. AWWA D102 (2006) Coating Steel Water-Storage Tanks
3. AWWA C504 (2006) Standard for Rubber-Seated Butterfly Valves
4. AWWA C508 (2001) Swing-Check Valves for Waterworks Service, 2 In. (50 mm) Through 24 In. (600 mm) NPS
5. AWWA C509 (2001) Resilient-Seated Gate Valves for Water Supply Service

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units. The submittals shall also include but are not limited to the following:
- B. SD-02 Shop Drawings
 1. Shop drawings shall include descriptive literature, bulletins and/or catalog cuts of the valves and strainers as well as a complete bill of materials. Include the weights of all components. The Drawings shall specifically outline all required clearances for maintenance and manual operation. Shop drawings shall show layout and dimensions of equipment, major components, key alignment locations and locations of bolt holes. Drawings shall also indicate where access points for maintenance and operations are located on the equipment. Drawings shall show all critical field dimensions identified by the Manufacturer and obtained by the Contractor.
- C. SD-03 Product Data
 1. Submit data including details of construction, extent of shop assembly of the valves/strainers and a detailed description of installation procedures. The Manufacturer shall submit standard drawings or catalog cuts. The type, thickness, application procedure, and test for coatings, and non-metallic and metallic linings shall also be included.
- D. SD-06 Reports
 1. The Manufacturer shall submit performance test reports in booklet form showing all field tests performed to adjust each component and all field tests performed to prove compliance with the specified performance criteria, upon completion and testing of the installed system.
- E. SD-10 Operation and Maintenance Data Submittals

1. Complete information on operation, installation, lubrication, adjustment, safety precautions, routine and special maintenance disassembly, repair, reassembly, and trouble diagnostics of each valve or strainer. The manuals shall contain attached copies of the factory and field test reports as well as a description of the unit and its component parts.
2. Operation and Maintenance Data shall include all required cuts, drawings, equipment lists, descriptions, etc., which are required to instruct operation and maintenance personnel unfamiliar with such equipment.

1.04 QUALIFICATIONS OF MANUFACTURER

- A. Materials and equipment shall be the standard products of a Manufacturer regularly engaged in the production of such products and shall essentially duplicate items that have been in satisfactory use in identical applications in other wastewater treatment facilities. The Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of process valves or strainers of "all types", and not less than five (5) years of experience in the production of equal or larger sized units of the exact equipment models/designs as specified herein.
- B. The Manufacturer shall provide a list of at least ten (10) similar installations, including contact names and phone numbers. Equipment shall be supported by a service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.

1.05 QUALITY ASSURANCE

- A. All valves and strainers of the same type shall be from one (1) Manufacturer. If required or shown on the Drawings; floor stands, associated adapters, extension stems, extension stem brackets, and all associated appurtenances shall be provided by the Manufacturer of the valve being served whenever possible.
- B. The pressure ratings and materials specified represent minimum acceptable standards for valves and strainers. All valves and strainers shall be suitable for the services specified and intended. All valves and strainers shall have a pressure rating no less than that required for the system in which they are installed.

1.06 DELIVERY, STORAGE & HANDLING

- A. Surfaces such as female threads, internal mechanical joint ends or flange faces shall be protected from damage during shipment. The Contractor shall inspect all products and materials delivered to the site for damage. All valves and strainers shall be stored with a minimum of handling. Store all materials on site in enclosures or under protective coverings. Store rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep the inside of valves, strainers, and fittings free of dirt and debris.

- B. Materials delivered and placed in storage shall be stored with protection from the weather, excessive humidity variation, excessive temperature variation, dirt, dust and/or other contaminants. Proper protection and care of materials before, during and after installation shall be the Contractor's responsibility. Any materials found to be damaged shall be replaced at the Contractor's expense. Materials shall be stored with protection from puncture, dirt, grease, moisture, mechanical abrasions, excessive heat, and ultraviolet (UV) radiation. All valves and strainers shall be handled and stored in accordance with the Manufacturer's recommendations. Plastic valves shall be packed, packaged and marked in accordance with ASTM D 3892 standards.

1.07 WARRANTY

- A. The Manufacturer shall provide a full and comprehensive warranty for all valves and strainers as well as all related equipment/appurtenances specified in this section. All valves, strainers, and appurtenances shall be warrantied to be free from defects in workmanship, design, and materials for a period of not less than one (1) year. If any parts of the equipment supplied under this section should fail during the Manufacturer's warranty period, replacement of parts or the valve/strainer itself shall be provided. The valves/strainers shall be restored to active working service at no expense to the Owner. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling required for restoration of equipment to active service as required under the Manufacturer's warranty.
- B. The Manufacturer's warranty shall commence at the date of substantial completion or partial utilization.

1.08 FIELD MEASUREMENTS

- A. The Contractor shall become familiar with all details of the work, verify all dimensions in the field, and shall advise the Engineer of any discrepancy before performing the work. The Contractor shall coordinate with the equipment supplier to determine and collect required field dimensions to ensure equipment; valves, strainers, hand wheels, chain wheels, extension stems, and all related appurtenances are properly manufactured and located in field.

1.09 SPECIAL TOOLS

- A. Furnish one set of all special tools required to completely assemble, disassemble, or maintain the valves and/or strainers. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items.

PART 2 – PRODUCTS

2.01 PROCESS VALVES - GENERAL

- A. The following sections reference the process valve type and specification reference number shown in the valve tag symbols on the Drawings. Valves without valve tag

symbols are specified elsewhere. The Contractor shall be responsible for providing all valves that are indicated on the Drawings or referred to in the Specifications. The use of a Manufacturer's and/or identification catalog number shall be for the purpose of establishing a standard of quality and/or the valve configuration/assembly desired for the application specified or shown on the Drawings. The reference to specific product catalog, model, or figure numbers shall not be considered as "Proprietary".

- B. Valve sizes shall be equal to line sizes as shown on the Drawings, unless otherwise indicated. The Contractor shall provide all necessary reducers and/or expansion fittings for connection of valves to pipelines that are not of equal size. All flanged valves shall conform to ANSI B16.1 standards unless otherwise noted.
- C. Valves and strainers shall include all required operator(s), actuator(s), handwheel(s), chain wheel(s), extension stem(s), floor stand(s), floor box(es) worm and gear operator(s), operating nut(s), chain(s), wrenches, and all other appurtenances required for a properly installed and operational valve assembly as shown on the Drawings and as specified herein. The installation shall form a complete workable system as shown on the Drawings.
- D. Cast marking(s) shall be provided on all valves and strainers. The marking(s) shall include size, working pressure, a cast arrow to indicate direction of flow, name of Manufacturer, and year of Manufacture. The marking shall be located on an appropriate part of the valve in a clearly visible location. All valves and strainers shall be suitable for the intended service shown on the Drawings and specified herein. Renewable parts shall not be of a lower quality than those specified and provided with the initially specified and installed valve or strainer assembly.
- E. **All valves shall open by turning/rotating the valve actuator Counterclockwise ("Left"), unless otherwise specified or shown on the Drawings.** The Contractor shall provide all special adaptors to ensure compatibility between valves, appurtenances, and adjacent piping.

2.02 KNIFE GATE VALVE (RESILIENT SEATED) - TYPE V10

- A. Provide manually operated knife gate valves as shown on the drawings. All interior exposed knife gate valves shall be Non-Rising Stem (NRS) type except for where outside screw and yoke (OS&Y) service is specified or shown on the Drawings. All valves shall be manufactured in accordance with AWWA C500 and AWWA C509 standards. All valves shall have a body with drilled and tapped lugs, faced and drilled per ASME B16.5, ANSI 150 standards.
- B. The valve body shall be cast in a single piece. The valves shall allow replacement of the packing without draining the pipeline. All body bolts, yoke bolts, set screws, Pins, Nuts, and washers shall be Type 316 Stainless Steel per ASTM F 593 standards. The knife gate valves shall be provided with gate guides to provide support for the moving gate. Gate jams at the bottom of the body shall hold the gate securely against the seat to assure positive shutoff. All knife gate valves shall be full, round port design to allow

high flow capacity and minimum pressure drop. All knife gate valves shall also be designed constructed in accordance with the following criteria:

1. Size: 2 inch through 48 inch - Match to Piping Size as Shown on Drawings
 2. End Connections: Lugged - Drilled & Tapped per ASME B16.5 ANSI Class 150
 3. Body & Gate: Type 304 Stainless Steel per ASTM A 351/A 351M
 4. Yoke & Stem: Type 304 Stainless Steel per ASTM A 276 ASTM A 351/A 351M
 5. Gland: Ductile Iron ASTM A 536 Grade 65-45-12, Epoxy Coated
 6. Packing: PTFE Impregnated Syntex Fiber - Maximum Temperature 450 Degrees F
 7. Actuator: Handwheel - Cast Iron ASTM A 126 Class B, Epoxy Coated
 8. Resilient Seat (Wastewater or Sludge Service): Nitrile (NBR/Buna-N)
 9. Resilient Seat (Plant Water Service - "NPW"): Viton
- F. Knife gate valves up to 24 inches shall be rated at 150 psi water working pressure. Knife gate valves larger than 24 inches shall be rated at 100 psi water working pressure. Seat tightness at rated pressure shall be in accordance with values shown in AWWA C500 and AWWA C509 standards for gate valves.
- G. All resilient seated knife gate valves shall provide drip tight closure. The resilient seat material shall be bonded into a stainless steel seat ring. When the valve is closed, the gate shall be pushed against the seat and held in place by the gate jams. When the valve is open, the gate shall move away from the seat allowing operating clearance which shall prevent seat damage and make operation easy.
- H. All knife gate valves of the same type, style, and duty shall be supplied by a single Manufacturer. All resilient seated knife gate valves shall be a product of the following Manufacturer:
1. Dezurik Water Controls - Model GKU
 2. ITT Fabri-Valve - Models C37 & F37
 3. Hilton Valve Inc.
 4. Engineer Approved Equal

2.03 STAINLESS STEEL BALL VALVE - TYPE V26

- A. All stainless steel ball valves shall be non-lubricated with a blow-out proof stem design. All valves shall have a full floating ball. The valve seats and seals shall be easily accessible and replaceable. All Stainless Steel Ball Valves shall be designed and constructed in accordance with the following criteria:
1. Size: 1/4 Inch to 3 Inch - Match to Piping Size as Shown on Drawings
 2. End Connections: Threaded NPT, Provide ANSI 150# Flanged Connections as indicated on the Drawings and as required for connection to piping and appurtenances.
 3. Body & Trim: 316 Stainless Steel per ASTM B 276
 4. Ball & Stem/Shaft: 316 Stainless Steel per ASTM B 276

5. Seats & Seals: PTFE
 6. Maximum Operating Pressure: 150 psi
 7. Valve Type: Full Port
 8. Valve Body Type: Two Piece
 9. Valve Operator: Lever - 304 Stainless Steel Lever Hand Grip: Vinyl
- B. An easily visible, permanent indicator located conspicuously on the top of the valve shall be provided to determine the position of the ball within the valve in the "Open" or "Closed" position.
- C. All stainless steel ball valves of the same type, style, and duty shall be supplied by a single Manufacturer. All stainless steel ball valves shall be a product of the following Manufacturer:
1. Apollo by Conbraco Industries Inc.
 2. Neles Jamesbury Company
 3. Watts Regulator Company
 4. Hammond Valve Company
 5. Engineer Approved Equal

2.04 PLUG VALVE - TYPE V40

- A. All plug valves shall be manufactured in accordance with AWWA C517 standards. All valves shall have a body with integral flanges, faced and drilled per ASME B16.5 Class 125. All plug valves shall be non-lubricated, eccentric, quarter turn, with resilient faced plugs. Valves shall be furnished with a 1/8 inch welded seat overlay of not less than 90% pure nickel. Seat area shall be raised and the raised surface shall be completely covered with a weld to insure that the plug face only contacts nickel. Screwed-in seats shall not be acceptable. The valve shall be provided with adjustable limit stops for both opening and closing. A clearly marked position indicator shall also be provided.
- B. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. The valve plug shall be resilient faced with Nitrile (Buna-N/NBR) and be suitable for use with wastewater. Valves shall have sleeve type metal bearings and shall be sintered, oil impregnated, and permanently lubricated. Valve shaft seals shall be multiple V-ring type and shall be externally adjustable and re-packable without removing the bonnet or actuator from the valve under pressure. All metallic plug valves for water/wastewater service shall be designed and constructed in accordance with the following criteria:
1. Size: 3 Inch to 72 Inch - Match to Piping Size as Shown on Drawings
 2. End Connections: Flanged, ANSI Class 125/150
 3. Body Type: Minimum 100% Nominal Full Port Area

4. Body & Cover: Cast Iron per ASTM A 126, Class B or Ductile Iron per ASTM A 536, (Epoxy Coated)
 5. Seat: Welded Nickel
 6. Plug: Cast Iron per ASTM A 126 Class B or Ductile Iron per ASTM A 536
 7. Plug Facing: Nitrile (Buna-N/NBR)
 8. Valve Operator (Valves 6 Inches & Smaller): Lever, for 2 Inch Square Operating Nut
 9. Valve Operator (Valves Larger than 6 Inches): Gear Operated Hand wheel
 10. Bolts, Nuts, Washers: 316 Stainless Steel
- C. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable. Valves shall provide drip-tight bidirectional shutoff at the rated pressures. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interface between the plug face and body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. For "Sludge Service", plug valves shall permit pigging of the piping with line-size pigs.
- D. The valve plug shall be removable without the need to take the valve out of the line. The valve plug shall be one piece for valves up to 14 inches and a maximum of two (2) pieces for larger valves.
- E. Valves in horizontal liquid lines shall have plugs that travel from open above the flow to closed on the upstream end of the valve. Valves in vertical liquid lines shall have plugs that close up. Valves shall be tagged or marked by the Manufacturer to indicate the proper mounting position. All gearing shall be enclosed in semi-steel housing and be suitable for running in a lubricant with seals provided on shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. The actuator shall be capable of holding the valve in a single position without slip or vibration.
- F. Plug valves up to 12 inches shall be rated at 200 psi water working pressure. Plug valves larger than 12 inches shall be rated at 150 psi water working pressure. Seat tightness at rated pressure shall be in accordance with AWWA C504 standards. The valves shall be certified by the Manufacturer as allowing zero (0) leakage for a period of at least 1/2 hour with the specified pressure applied in either direction. If requested, a valve seat leakage test shall be conducted & witnessed by the Engineer to prove compliance of the valve with this section.
- G. All three way plug valves shall be designed in accordance with the previously specified criteria and performance requirements for "two way" plug valves. All three way plug valves shall be designed for installation in either horizontal or vertical piping. Each valve shall be designed for flow in any direction. Each valve shall be designed for

positive shut-off of the "feed port" as well as the two "discharge ports". Provide tight shut-off of bi-directional flow in either direction.

- H. All plug valves of the same type, style, and duty shall be supplied by a single Manufacturer. All metallic plug valves shall be a product of the following Manufacturer:
1. DeZurik Water Controls
 2. Henry Pratt Company
 3. Clow Valve Company
 4. Engineer Approved Equal

2.05 SPARE PARTS

- A. Concurrent with delivery and installation of the specified valves, spare parts for each different item of material and equipment specified that is recommended by the Manufacturer to be replaced any time up to three (3) years of service shall be provided. For each type and size of valve, the following extra materials shall be provided: lubricator, lubricant (with appropriate temperature rating), lubricator/isolating valve; galvanized operating wrench, 4 feet long, for T-handled operators; galvanized operating key for cross handled valves.
- B. Extra materials shall include two (2) of the following spare parts for each type and size of valve: gaskets; O-ring seals; diaphragms (molded); all elastomer parts; stem packing; seat rings and seat ring pulling tool.

2.06 VALVE ACTUATORS & OPERATORS

- A. Unless otherwise specified or shown on the Drawings, all valves shall be manually actuated. All valves shall have an operating hand wheel or a handle/lever mounted on the operator. Valves with operating nuts shall be non-rising stem design with an AWWA 2 inch square operating nut. Provide one (1) two (2) foot long steel operating bar for all operating nuts. All valves shall be provided with hand wheel actuators on all manually actuated valves larger than six (6) inches in size unless otherwise specified or shown on the Drawings.
- B. The valve Manufacturer shall supply and factory mount all actuators; including any type of manual or powered actuators. The valves and actuators shall be shipped as a single unit. All valve actuators shall be sized to operate the associated valve for the full range of pressures and velocities. Position indicators shall be provided for interior NRS valves.
- C. The force in a manual operator shall not exceed 40 pounds of rim-pull under any operating condition, including initial breakaway. The operator shall be equipped with gear reduction when force exceeds 40 pounds of rim-pull. All manual operators shall be self-locking type or shall be equipped with a self-locking device. The actuators shall be capable of moving the valves from a fully open to a fully closed position and a fully

closed position to a fully open position. The actuator shall be capable of holding the valve at any position in between the fully open and fully closed positions. A position indicator shall be supplied on quarter-turn valves. Each operating device shall have the word "OPEN" permanently cast as well as an arrow indicating the direction of operation.

2.07 GEAR OPERATORS

- A. Unless otherwise specified or shown on the Drawings, all valves larger than eight (8) inches shall be provided with gear operators. All manually operated valves with a rim pull greater than 40 ft-lbs shall also be provided with gear operators. Worm and gear operators shall be a one-piece design with worm-gears of bronze or machine cut steel material. Worm shall be hardened alloy steel with the thread ground and polished. Traveling nut type operators shall have threaded steel reach rods with an internally threaded bronze or ductile iron nut.
- B. The output shaft shall be perpendicular to the valve shaft and be provided with a removable hand wheel. Unless otherwise noted or specified all gear actuators shall conform to AWWA C504 standards. All butterfly valve actuators shall provide proof of certification. All gear actuators shall be removable from the valve without removing the valve from the line or dismantling the valve.
- C. All gear operators shall indicate the valve position and have adjustable stops. The maximum hand wheel size shall be 24 inches in diameter. All position indicators shall be of the embossed, stamped, engraved, etched, or raised types.
- D. Unless otherwise specified or shown on the Drawings, all gear operated valves three (3) inches & larger shall be provided with position indication at the point of operation. Valves smaller than three (3) inches shall have position indication on the respective hand wheel's or lever actuators.

2.08 FINISHING'S & COATINGS

- A. All coatings and lubricants in contact with "Potable Water" shall be certified as acceptable for use with that fluid. If the valve Manufacturer does not require finished coating on any interior surfaces, then the Manufacturer shall state so in writing and no finish coating shall be required, if approved by the Engineer.
- B. Unless otherwise specified, all iron body valves shall be exterior primed with a shop coat of an Engineer approved rust-inhibitive primer. The primer shall be applied in accordance with the instructions of the paint Manufacturer. The primer shall be compatible with the finish coat provided. Unless otherwise specified, the finish coat shall match the coating of connecting pipe in type and color. All field painting shall be in accordance with section 09 90 00 "PAINTS & COATINGS". Stainless steel, brass, bronze, and plastic body valves shall not require coating.

- C. Unless otherwise specified or noted, all interior ferrous surfaces shall be given a shop finish of an asphalt varnish or epoxy coating in accordance with AWWA C550 and AWWA C509 standards.
- D. The epoxy paint shall be either a two-part liquid material or a heat-activated (fusion) material except that only a heat-activated material shall apply if a valve coating is specified as "fusion" or "fusion bonded" epoxy. The epoxy lining and coating shall have a minimum 4.0 mils dry film thickness except where it is limited by valve operating tolerances. Safety isolation valves and lockout valves with handles, hand wheel's, or chain wheels shall be painted "Safety Yellow."
- E. Ferrous surfaces obviously not intended to be painted shall be given a shop coat of grease or other acceptable rust-inhibitive coating.

2.09 VALVE IDENTIFICATION TAGS

- A. All valves in piping including individual valves provided with equipment shall be tagged in accordance with the Drawings. The valve tags shall be provided with identifying numbers and letters to match the designations shown on the Drawings. All valve tags shall be provided with sufficient lengths of chain for attachment to the respective valve. All valve tags shall be designed and constructed in accordance with the following:
 - 1. Tag Size: 2 Inch Square or Circular
 - 2. Tag Material: PVC – Black Background, White Lettering
 - 3. Chain: #16 Stainless Steel Jack Chain
 - 4. Lettering: Engraved
- B. All buried valves shall be provided with tags embedded in a concrete pad surrounding the valve box.
- C. The Contractor shall confirm the final numbering sequence with the Engineer prior to ordering any tags.
- D. All valve tags of the same type, style, and duty shall be supplied by a single Manufacturer. All valve tags shall be a product of the following Manufacturer:
 - 1. Seton Identification Products Inc.
 - 2. Emedco Inc.
 - 3. Engineer Approved Equal

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Install valves as shown on the Drawings and in strict accordance with the Manufacturer's recommendations. Install valves with stems pointed up, in vertical

position where possible, but in no case with stems pointed downward of the horizontal plane. Allow sufficient room for maintenance, removal and proper operation. All valves shall be located and oriented to permit easy access to the valve operator, and to avoid interferences.

- B. All valves shall be independently supported. Valves shall not be supported by the connecting piping.
- C. Flanged valve bolt holes shall be installed to straddle the vertical centerline of the pipe. Flanged faces shall be cleaned prior to inserting the gasket and bolts. All nuts shall be tightened progressively and uniformly. Threaded ends shall have the threads cleaned by wire brushing or swabbing prior to installation.
- D. Where any valve or appurtenance installation is covered by a standard, the Contractor shall install such equipment in accordance with the standard unless otherwise specified or indicated on the Drawings. The Contractor shall certify any such installations are in accordance with all applicable standards.
- E. Unless otherwise specified or shown on the Drawings, all valve connections/joints shall be installed in accordance with the specified and applicable standards. The Contractor shall be responsible for all verification of Manufacturer's torque requirements.

3.02 VALVE ORIENTATION

- A. The operating stem of a manual valve shall be installed in a vertical position when the valve is installed in horizontal runs of pipe having centerline elevations of **4.5 feet** or less above the finished floor, unless otherwise specified or indicated on the Drawings. The operating stem of a manual valve shall be installed in a horizontal position in horizontal runs of pipe having centerline elevations greater than 4.5 feet above the finish floor, unless otherwise specified or indicated on the Drawings.
- B. All manually actuated valves three (3) inches and smaller shall have the valve indicators and operators located to display toward the normal operational locations.

3.03 PLUG VALVES

- A. If a plug valve seat position is not shown on the Drawings, locate the seat position as follows: for horizontal flow, the flow shall produce an "unseating" pressure, and the plug shall open into the top half of valve; and for vertical flow, the seat shall be installed in the highest portion of the valve.

3.04 VALVE TESTING

- A. Test all valves visually for leaks and proper operation under pressure. Test valves to ensure proper valve function and actuation. All valves shall be tested as part of the respective piping system or segment in accordance with Section 40 05 13 "PROCESS PIPE AND FITTINGS".

- B. Valves may either be tested while testing pipelines, or as a separate test. It shall be demonstrated that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other, and in both directions for two-way valve applications. Count and record the number of turns required to open and close each valve, and account for any discrepancies with the Manufacturer's data.
- C. Air and vacuum relief valves shall be examined as the associated pipe is being filled to verify venting and seating is fully functional. Set, verify, and record set pressures for all relief and regulating valves. Self-contained automatic valves shall be tested at both maximum and minimum operating ranges, and reset upon completion of test to the design value.
- D. Take care not to overpressure any valve and appurtenances during testing.

3.05 RETESTING

- A. If the equipment does not successfully pass the tests listed above, the Manufacturer/Contractor shall repair the equipment and perform the tests again until passing the tests successfully. If any deficiencies are revealed during any test, such deficiencies shall be corrected and the tests shall be reconducted at no additional cost to the Owner or Engineer.

3.06 CLEANING

- A. All items, including but not limited to all valves & valve interiors, shall be thoroughly cleaned prior to installation, testing, and final acceptance. All dirt, debris, and other foreign materials shall be removed.

END OF SECTION

SECTION 40 41 13

PROCESS PIPE HEAT TRACING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide all materials, equipment and incidentals for "self-limiting" process pipe heat tracing, appurtenances and coordinated systems as hereinafter specified. Provide all related appurtenances, including but not limited to, thermostats, valves, piping, wiring, conduit, attachments, controllers, control relays, foundations, anchors, supports, and all related accessories to provide complete operational heat tracing systems as specified herein and as shown on the Drawings.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise noted, the most recent version of the listed publications, including revisions, at time of bid opening shall apply.
- B. ASTM INTERNATIONAL (ASTM)
 - 1. ASTM F 593 (2002; R 2008) Stainless Steel Bolts, Hex Cap Screws, and Studs
 - 2. ASTM F 594 (2008) Standard Specification for Stainless Steel Nuts
- C. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE)
 - 1. IEEE Std 515 (2004) Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications
- D. NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)
 - 1. NEMA ICS 1 (2000; R 2005) Industrial Control and Systems: General Requirements

1.03 SUBMITTALS

- A. All submittals shall have pertinent numerical data and information specified in the "English" language using "English" units. The submittals shall include but are not limited to the following.

B. SD-02 SHOP DRAWINGS

1. Shop drawings shall show layout and dimensions of equipment, major components, key alignment locations and locations of attachments. Drawings shall also indicate where access points for maintenance and operations are located on the equipment. Drawings shall show critical field dimensions identified by the Manufacturer and obtained by the Contractor. Shop drawings shall include electrical wiring, control wiring, and grounding requirements.
2. Provide sufficient product data to verify compliance with the specifications and to illustrate the construction and assembly of the products. Include compliance of materials and components with applicable CEAM, ASTM, AGMA and other standards. List the manufacture, model and weights of major components. Include catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures. Documentation shall illustrate size, physical appearance and other characteristics of materials, systems or equipment.
3. Electrical splices, couplings, terminations and fittings shall be shown on the drawings and product submittals and shall be specifically identified with the applicable style or series designation. The drawings shall show layouts and dimensions of the piping and wiring of the heat tracing systems.

C. SD-03 PRODUCT DATA

1. Product data shall include a complete list of equipment and materials; including Manufacturer's descriptive data and technical literature, performance charts, performance curves, catalog cuts, and installation instructions. Include warrantee language for the equipment and all related appurtenances.
2. Submit copies of Manufacturers' complete parts list showing all parts, spare parts, and bulletins for the equipment. Clearly show all details, parts, and adequately describe parts or have proper identification marks. Photographs and/or catalog cuts of components shall be included for identification.

1.04 QUALIFICATIONS OF MANUFACTURER

- A. Materials and equipment shall be the standard products of a Manufacturer regularly engaged in the production of such equipment and shall essentially duplicate items that have been in satisfactory use in identical applications in other wastewater applications. The Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of piping heat tracing systems of "all types", and not less than five (5) years of experience in the production of equal or larger sized models of the exact equipment as specified herein.
- B. The Manufacturer shall provide a list of at least twenty (20) similar installations, including contact names and phone numbers. Equipment shall be supported by a

service organization that is, in the opinion of the Engineer, reasonably convenient to the site to ensure parts and service can be acquired in a timely fashion.

1.05 DELIVERY, STORAGE AND HANDLING

- A. All spare parts shall be packed in containers bearing labels clearly designating the contents and respective pieces of equipment for which they are intended. All spare parts shall be delivered at the same time as the pertaining equipment.
- B. All equipment delivered and placed in storage shall be stored with protection from the weather, humidity, temperature variations, dirt, dust, or other contaminants in accordance with the Manufacturer's written instructions.
- C. Inspect all equipment and appurtenances for shipping damage or missing parts. Any damage or discrepancy shall be noted in a written claim with the shipper prior to accepting delivery. Validate all equipment serial numbers and parts lists with the shipping documentation. The Contractor shall notify the Manufacturer of any unacceptable conditions noted with the shipper if required.

1.06 WARRANTY

- A. The Manufacturer shall provide a full and comprehensive warranty for all equipment specified in this section. The equipment shall be warrantied to be free from defects in workmanship, design, and materials for a period of ten (10) years. If any parts of the equipment supplied under this section should fail during the Manufacturer's warranty period, replacement of parts or the entire unit itself shall be provided. The units shall be restored to active working service at no expense to the Owner of the equipment. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling required for restoration of equipment to active service as required under the Manufacturer's warranty.
- B. The Manufacturer's warranty shall commence at the date of substantial completion or partial utilization.

1.07 SPECIAL TOOLS

- A. Furnish one (1) set of all special tools required to completely assemble, disassemble, or maintain the equipment. Special tools shall refer to oversized or specially dimensioned tools, special attachments or fixtures, or any similar items. One (1) set of special tools shall be provided for each size of equipment or related system.

PART 2 – PRODUCTS

2.01 GENERAL

- A. Provide "self-limiting" (self-regulating) heat tracing systems, all accessories, and related appurtenances for process piping systems as shown on the Drawings and as specified herein. All heat tracing systems shall conform to IEEE Std. 515 standards. The heat tracing systems shall be
- B. designed and applied to protect all piping, fittings, valves, flow meters, gauges, drains and related appurtenances of each system as shown on the Drawings. Each system shall include over-heat protection.
- C. All heating cable shall be parallel conductor type. All heating cable shall be designed for field cutting and splicing as required for installation. Heating elements shall be manufactured of polymers mixed with conductive carbon black. Heating elements shall be specifically designed for creating electrical paths for conducting current between the parallel bus wires along the entire cable length.
- D. In each heating cable the number of electrical paths between the bus wires shall change in response to temperature fluctuations. As the ambient temperature surrounding the heating cable decreases, the conductive core or fiber shall automatically contract microscopically. This contraction shall decrease the electrical resistance and create numerous electrical paths between the bus wires. Current shall flow across these paths to warm the core or fiber of the heat tracing. As the temperature rises, the core or fiber shall automatically expand microscopically. The expansion shall increase electrical resistance and the corresponding number of electrical paths shall decrease. As a result, the heating cable shall automatically begin to reduce its power output.

2.02 UNIT DESCRIPTIONS

- A. Provide the following process pipe heat tracing systems as specified and indicated on the Drawings:

Tag #	Description
HT-2308	Force Main Bridge Crossing – Heat Trace System #1
HT-2309	Force Main Bridge Crossing – Heat Trace System #2

2.03 PROCESS DESIGN CONDITIONS

- A. All electrical heat tracing shall be sized to accommodate the respective process design requirements. Each electrical heat trace system shall be designed and constructed in accordance with the following design criteria and service conditions:

AREA F - COLLECTION SYSTEM COVERED BRIDGE CROSSING HEAT TRACE DESIGN CRITERIA	
Number of Systems	Two (2)

Approximate Length (Each)	450 Linear Feet (Field Verify Each Run)
Maintain Temperature	40 °F (Minimum)
Ambient Air Temperature	-20 °F (Minimum)
Startup Temperature	0 °F (Minimum)
Shutoff Temperature	60 °F
Pipe Size	4 Inch – See Drawings
Pipe Material	Type DI/2 and DI/1
Insulation Type	Polyisocyanurate
Insulation Thickness	2 Inch
Insulation Jacket (Above Grade)	0.020 Inch Thick Aluminum
Insulation Jacket (Below Grade)	50 Mil Sheet Membrane
Power Supply (Future)	208 Volt, 1 Phase, 60 Hertz
Thermal Rating	2.44 W/ft
Electrical Hazard Area	C1/D2 – Inside Valve Manholes
Electrical Hazard Area	Unclassified – Outside Valve Manholes
Enclosures (Unclassified Areas)	NEMA 4 or NEMA 4X
Enclosures (Valve Manholes)	Rated for Use In C1/D2 Environment
Self-Regulation Factor	90% (Minimum)
Thermostat	No – <i>(Separate Future Project)</i>
Local Controller	No – <i>(Separate Future Project)</i>
Remote Control Capabilities	No – <i>(Separate Future Project)</i>
Remote Monitoring Capability	No – <i>(Separate Future Project)</i>
Power Connection Kit	Yes – Above Insulation W/Indicating Light
End Termination Kit	Yes – Above Insulation W/Indicating Light
Spiral Wrapping	No – Not Required
Labeling	Yes – At All Exposed Piping Segments
Temperature Identification	T6, T4 or T3
Heating Cable Jacket	Fluoropolymer

- B. Provide one (1) Power Connection Kit and One (1) End Termination Kit for each heat tracing system.
- C. Each system shall operate using self-regulating control with a local thermostat and controller. The local controller shall include a thermostat for monitoring of the startup temperature for the system. All heat tracing shall be wrapped around all valves, fittings, and related appurtenances. The system shall be controlled by an ambient thermostat which is set to energize the heat tracing if the air temperature reaches the previously specified startup temperature. The heat tracing shall automatically turn off when the pipe temperature reaches the previously specified shut off temperature.

2.04 HEATING CABLE

- A. All heating cable shall be "self-regulating" designed for a maximum continuous exposure (maintain) temperature of 150 Degrees F to 250 Degrees F or an intermittent exposure temperature from 185 °F to 420 °F. All "self-regulating" heating cable shall

vary its power output relative to the temperature of the surface of the heated item. The cable shall be designed such that it can be crossed over itself and cut to length in the field if required.

- B. All "self-regulating" heating cable shall be designed for a minimum useful life of 20 years or more with "power on" continuously. Useful life shall be based on the following design criteria:
1. Retention of at least 75% of rated power after 20 years of operation at the maximum published continuous exposure (maintain) temperature.
 2. Retention of at least 90% of rated power after 1,000 hours of operation at the maximum published intermittent exposure temperature. The testing shall conform to UL 7468, IEC 216-1 Part 1 standards.
- C. All cables shall be capable of passing a 2.5 kV dielectric test for one (1) minute in accordance with ASTM D 2633 standards after undergoing a 0.5 kg-m impact (BS 6351, Part 1, 8.1.10).
- D. The heating cable shall consist of two 16 AWG or larger nickel-plated copper bus wires, embedded in a self-regulating polymeric core that controls power output so that the cable can be used directly on plastic or metallic pipes. Cables shall have a temperature identification number as previously specified. A ground-fault protection device shall be used to protect each circuit.
- E. The heating cable shall have a tinned copper braid with a resistance less than the heating cable bus wire resistance as determined in type test ASTM B 193, Sec. 5. The braid shall be protected from chemical attack and mechanical abuse by an outer jacket as previously specified.
- F. In order to provide rapid heat-up, to conserve energy, and to prevent overheating of fluids and plastic pipe, the heating cable shall have the following minimum self-regulating indices:

MINIMUM SELF-REGULATING INDICIES		
Heating Cable (W/ft)	S.R. Index (W/°F)	S.R. Index (W/°C)
3	0.038	0.068
5	0.060	0.108
8	0.074	0.133
10	0.100	0.180

- G. The self-regulating index shall be the rate of change of power output in watts per degree Fahrenheit or watts per degree Celsius, as measured between the temperatures of 50 Degrees F and 100 Degrees F and confirmed by the type test and published data sheets.

- H. All heat tracing shall be compatible with the piping material. The heating cable shall cut to length at the job site and attached to the pipe with glass tape. Provide glass tape attachment to the pipe at one (1) foot intervals on center. A power connection kit shall connect each heating cable
- I. Bus wires to power in a junction box. Tees and splices shall accommodate pipe branches to connect two or three heating cables together as required. An end seal kit shall be used to terminate the end of the heating cable in each system.

2.05 END TERMINATIONS

- A. All connection components used to terminate heating cables, including power connectors, splices, tees, and connectors shall be approved for the respective "Electrical Hazard Area Classification" as previously specified. All connection components shall also be compatible as a system with the particular type of heating cable in use. Under no circumstances shall terminations be used which are not a product of the heating cable Manufacturer.
- B. In order to keep connections dry and corrosion resistant, components shall be constructed of a nonmetallic, electrostatic, charge-resistant, glass-filled, engineered polymer enclosure rated NEMA 4. The component stand shall allow for up to four (4) inches (100 mm) of thermal insulation. Heating cable terminations shall use cold-applied materials and shall not require the use of a heat gun, torch, or hot work permit for installation.
- C. Components shall be rated to a minimum installation temperature of -40 Degrees F, minimum usage temperature of -60 Degrees F, and a maximum pipe temperature of 482 Degrees F.

2.06 GROUND FAULT PROTECTION

- A. All heat tracing shall be provided with ground-fault equipment protection as required by NEC Article 427-22. The protection shall be an "integral" device supplied as part of the heat tracing equipment.

2.07 POWER CONNECTOR

- A. Provide power connection boxes for each heat tracing system. Each power connection box shall be designed for the "Electrical Hazard Area Classification" previously indicated. Each connection box shall include a cold-applied heating cable core seal. Provide all pipe straps, attachment hardware and appurtenances required for installation. Each power connector shall include an indicator light to provide local visual indication of heat tracing system operation. All lights shall become illuminated when the heat tracing system becomes activated.

2.08 GLAND KIT

- A. Provide all gland kits for transitions of heating cables into junction boxes. Each gland kit shall be provided with 3/4 inch NPT connections. Each gland kit shall be designed for the "Electrical Hazard Area Classification" previously specified. Each gland kit shall include a cold-applied heating cable core seal. A 3x12 AWG terminal block shall be included.

2.09 TEE CONNECTIONS

- A. Provide tee and splice connections for each heating cable system. Tee and splice connections shall be designed for up to three (3) heating cables. Each tee or splice connection shall be designed for the "Electrical Hazard Area Classification" previously specified. Each tee and splice connection kit shall include a cold-applied heating cable core seal. Provide two (2) pipe straps for installation of each tee or splice connection.

2.10 TAPE

- A. Provide glass installation tape for attachment of heat tracing to metallic piping systems. The glass tape shall be specifically rated for use with the respective process pipe material. All tape shall be rated for the process design conditions and temperatures previously specified. Strap all heat tracing to metallic piping with glass tape at a maximum of one (1) foot intervals. Minimum application temperature shall be in accordance with the recommendations of the Manufacturer.
- B. Provide aluminum tape for installation of heat tracing on plastic piping systems. Aluminum tape shall have a minimum temperature class rating of 300 Degrees F. Minimum application temperature shall be in accordance with the recommendations of the Manufacturer.

2.11 LABELING

- A. Provide labeling for all piping systems which include heat tracing. Attach each label to the outside of the insulation jacketing to indicate the presence of electrical heat tracing. Provide one (1) label at a maximum spacing of every ten (10) feet. Labels shall be attached to piping systems in clear visible locations.

2.12 PIPE STRAPS

- A. Provide 304L stainless steel pipe straps to attach heat tracing components to piping systems. Straps shall be sized based on the respective piping system as specified or as shown on the Drawings.

2.13 LOCAL CONTROLS

- A. For multiple freeze protection or process temperature maintenance systems; all control panels shall consist of an enclosure, including a panel board with ground-fault

protection devices (30 mA trip level). The panels shall provide ground-fault indication capabilities. If more than one circuit is required, a main contactor shall be used. The panels shall operate with ambient temperature sensing or proportional ambient temperature sensing controllers.

- B. For single control process temperature maintenance systems, distribution panels shall consist of an enclosure, including a pane board with ground-fault protection devices (30 mA trip level). The panels shall provide ground-fault indication capabilities. Circuits shall be switched by individual contactors operated by line sensing controllers. All panels shall be rated for use in the "Electrical Hazard Area Classification" previously specified.

2.14 CONTROLS WITH REMOTE MONITORING

- A. If previously specified or indicated on the Drawings, all control and monitoring systems, shall be capable of communicating with a remote PLC for central programming, status review, and alarm/fault communication. All systems shall include, but not be limited to, the following:
 - 1. Alarm limits and set-point temperatures shall be programmable from a central monitoring and control panel in Degrees F. The system shall include an alphanumeric display with multi-language support and password protection or a lockable cabinet to prevent unauthorized access to the system.
 - 2. The system shall be switched by an external solid state or mechanical relay with a minimum rating of 30 amps. The system shall be capable of assigning one or more RTDs (thermostats) to a circuit to monitor temperature.
 - 3. The controller shall be capable of one RTD to control the heater circuit and a second RTD for another control point or to measure sheath temperature of a heater for high temperature cutout.
 - 4. The control system shall monitor temperature, voltage, and line current to all systems. The system shall monitor ground-fault current and offer the option of alarm or trip if the ground fault exceeds the selectable level.

2.15 SINGLE CIRCUIT CONTROL & MONITORING

- A. If previously specified or indicated on the Drawings, provide single circuit control and monitoring for the pipe heat tracing systems. The system shall be field-mounted and shall be have FM or CSA approval for use in the "Electrical Hazard Area Classification" previously specified when using a solid-state switching device.
- B. The system shall provide the user with the option of line-sensing control with a user-selectable dead band, ambient sensing, proportional ambient sensing (PASC), and power limiting control modes. The system shall provide an isolated triac alarm relay or a dry contact relay for alarm annunciation back to a Distributed Control System (DCS).

- C. NEC approved ground-fault detection equipment shall be integral to the controller to simplify the installation and reduce total cost. Enclosure type shall be NEMA 4 fiberglass reinforced plastic (FRP) for corrosion resistance and protection from moisture. All units shall be network-ready to provide communication to a host PLC for central programming, status review, and alarm communication. Communication shall be via Ethernet IP protocol.

2.16 HARDWARE

- A. All Bolts, nuts, anchors, washers, appurtenances and related fastening hardware shall be type 316 stainless steel. All stainless steel components shall be electro-polished or pacified to obtain maximum corrosion resistance. All necessary hardware, attachments, and related appurtenances for installation of all equipment shall be provided. All stainless steel bolts shall comply with ASTM F 593 standards. Stainless steel nuts shall comply with ASTM F 594 standards.

2.17 NAMEPLATES

- A. Each major item of equipment shall have the Manufacturer's name, address, type or style, model or serial number, catalog number, rated capacity, voltage, and all other pertinent data on a plate secured to the item of equipment per section 40 00 00 "BASIC PROCESS MATERIALS AND METHODS".

2.18 ELECTRICAL WORK

- A. All electrical work and controls (if previously specified) shall conform to NEMA ICS 1 standards. Provide all controls, as well as wiring for the fully automatic operation of all equipment as shown on the Drawings. The equipment Manufacturer shall provide all control wiring diagrams. Submit Manufacturers wiring diagrams for review and approval by the Engineer. Electrical equipment and wiring shall be in accordance with the Contract Documents. Electrical characteristics shall be as specified or indicated in the Contract Documents. All electrical work shall be in accordance with the Contract Documents and NEC standards.

2.19 DESIGN BASIS MANUFACTURER

- A. All self-regulating electrical heat tracing equipment of the same type, style, and duty shall be supplied by a single Manufacturer. All heat tracing systems shall be a product of the following Manufacturer:
 - 1. Tyco Thermal Controls, Inc.
 - 2. Thermon Manufacturing Company
 - 3. Chromalox, Inc.
 - 4. Engineer Approved Equal

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All heat tracing shall be installed in accordance with the written instructions of the Manufacturer. Correct installation and assembly of the heat tracing systems and ancillary equipment shall be the Contractor's responsibility. Install all electrical heat tracing in accordance with the Drawings and the Manufacturers' installation instruction manual.
- B. All appurtenances required for a complete and operating heat tracing system shall be provided, including but not limited to such items as piping, conduit, wall sleeves, wall pipes, anchors, grouting, drivers, power supply, splices, tees, end seals, attachment tape, labels, pipe straps, thermostats, and junction boxes. Provide wiring of all heat tracing to junction boxes and power supplies.

3.02 FACTORY TESTING

- A. Factory inspections and tests shall be conducted for all self-regulating, power limiting, series constant wattage and constant wattage heat tracing cables. Testing shall be conducted per the latest IEEE Std 515 standards as well as all applicable Manufacturer's standards.

3.03 FIELD TESTING

- A. The heat tracing system startup and demonstration period shall include but is not limited to that which is specified herein.
- B. In the field, all heat tracing system shall be meggered. The following separate field megger readings shall be taken on each heat tracing cable:
 - 1. Each heat tracing cable shall be meggered when received at the jobsite before installation.
 - 2. Each heat tracing cable shall be meggered after installation, but before insulation is applied.
 - 3. All heat tracing cable shall be meggered after insulation has been installed.
- C. All three of the above field megger readings shall be greater than 20 megohms. Otherwise the heat tracing shall not be acceptable and shall be replaced at no additional cost to the Owner or Engineer. Field megger tests shall be recorded for each heat tracing system, and certified reports shall be submitted to the Owner and Engineer by the Contractor.
- D. The Contractor shall provide a field demonstration test of all heat tracing systems. Testing shall occur prior to installation of all insulation and jacketing. The Contractor

shall simulate an air temperature below the previously specified minimum criteria. Once the air temperature reaches a level below the previously specified minimum value; the amperage draw shall be measured from each heat tracing system to confirm proper operation.

- E. Amperage draw values shall be compared to the Manufacturer supplied ratings for each system. All heat tracing shall also be tested using a 1,000 VDC megger. Minimum heat tracing resistance shall be between 20 to 1,000 megohms regardless of the length. Certified field performance test results shall be submitted to the Owner and Engineer.

END OF SECTION

SECTION 40 42 13

PROCESS PIPE INSULATION

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Provide process piping insulation as specified herein and as indicated on the Drawings. Provide all required insulation and accessories including but not limited to jackets, covers, coatings, adhesives, fasteners, lagging, mastics, saddle supporting devices, and appurtenances required for complete and operational pipe insulating systems. Where applicable, replace all insulation removed or damaged during construction activities with new insulation of the same thickness and jacket to match the existing conditions of the insulation as was used previously.

1.02 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. Unless otherwise noted, the latest version of the listed publications, including revisions, at the time of bid opening shall be used.
- B. ASTM INTERNATIONAL
1. ASTM A 666 (ASTM) (2003) Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar
 2. ASTM B 209 (2007) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 3. ASTM C 272 (2001; R 2007) Water Absorption of Core Materials for Structural Sandwich Constructions
 4. ASTM C 273/ C273M (2007a) Shear Properties of Sandwich Core Materials
 5. ASTM C 518 (2004) Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
 6. ASTM C 534 Standard Specification for Preformed Flexible Elastomeric Thermal Insulation in Sheet and Tubular Form
 7. ASTM C 547 (2008e1) Standard Specification for Mineral Fiber Pipe Insulation
 8. ASTM E 96/E 96 M (2005) Standard Test Methods for Water Vapor Transmission of Materials

9. ASTM C 203 (2005a) Breaking Load and Flexural Properties of Block-Type Thermal Insulation
10. ASTM D 792 (2008) Density and Specific Gravity (Relative Density) of Plastics by Displacement
11. ASTM C 591 (2009) Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation
12. ASTM C 795 (2008) Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel
13. ASTM D 1621 (2004a) Compressive Properties of Rigid Cellular Plastics
14. ASTM D 1623 (2009) Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
15. ASTM D 2126 (2009) Response of Rigid Cellular Plastics to Thermal and Humid Aging
16. ASTM D 2856 (1994; R 1998) Open-Cell Content of Rigid Cellular Plastics by the Air Pycnometer
17. ASTM D 638 (2008) Standard Test Method for Tensile Properties of Plastics
18. ASTM C 1136 (2008) Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation
19. ASTM C 552 (2007) Standard Specification for Cellular Glass Thermal Insulation
20. ASTM D 1622 (2008) Apparent Density of Rigid Cellular Plastics
21. ASTM D 257 (2007) Standard Test Methods for D-C Resistance or Conductance of Insulating Materials
22. ASTM D 790 (2007e1) Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
23. ASTM E 136 (2009) Behavior of Materials in a Vertical Tube Furnace at 750 Degrees C
24. ASTM E 84 (2009c) Standard Test Method for Surface Burning Characteristics of Building Materials
25. ASTM G 21 (1996; R 2002) Determining Resistance of Synthetic Polymeric Materials to Fungi

1.03 SUBMITTALS

- A. All submittals shall be in the "English" language with "English" dimensions and units as required. The submittals shall also include but are not limited to the following:
- B. SD-03 Product Data
 - 1. Provide catalog cut sheets and dimensional data for pipe insulation, jacketing, covers, coatings, adhesives, fasteners, saddle supporting devices, and appurtenances. Include Manufacturer's descriptive data and technical literature for insulation systems. For insulation that will be shipped exposed, provide a description of the protective packaging that will be used during transit.

1.04 QUALITY ASSURANCE

- A. Provide final design and installation of all process pipe insulation systems. Conform and correlate all quantities and dimensions of process pipe insulation which is required. Select the appropriate fabrication and techniques of installation for the piping insulation systems. All installations shall be in accordance with the Manufacturer's recommendations. Coordinate the work of all related trades when installing process pipe, appurtenances and related systems.
- B. Multiple Manufacturers are indicated as acceptable for each type of insulation in this specification. The Contractor shall also insure that all materials used are compatible and in compliance with all applicable codes and standards.
- C. The Owner and Engineer shall reserve the right to sample and test any materials after delivery and to reject all components represented by a sample that fails to comply with the requirements of this specification.

1.05 WARRANTY

- A. The Manufacturer shall provide a full & comprehensive warranty for all insulation, jacketing, and appurtenances specified in this section. The insulation shall be warrantied to be free from defects in workmanship, design, and materials for one (1) year. If any parts of the materials supplied under this section should fail during the Manufacturer's warranty period, replacement of parts or the materials themselves shall be provided. The materials shall be restored to active working service at no expense to the Owner or Engineer. The Manufacturer shall incur all costs including but not limited to parts, labor, service, technicians, shipping, and handling required for restoration of the insulation and jacket systems to active service as required under the Manufacturer's warranty.
- B. The Manufacturer's warranty shall commence at the date of substantial completion or partial utilization.

1.06 QUALIFICATIONS OF MANUFACTURER

- A. Materials shall be the standard products of a Manufacturer regularly engaged in the production of pipe insulation. The insulation supplied shall essentially duplicate materials that have been in satisfactory use for at least five (5) years prior to bid opening in identical applications in other waste water treatment facilities.
- B. The insulation Manufacturer shall have a minimum of five (5) years of documented experience in the design and production of the pipe insulation types specified herein.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. All insulation materials shall be inspected for size, quality and quantity against approved submittals upon delivery. Delivery schedule of all insulation shall be coordinated with the Contractor. All insulation shall be protected from moisture, dirt, stones, and contaminants.
- B. All insulation materials shall be suitably packed for shipment and long term storage. Each package shall be labeled to indicate the project and the contents. All insulation materials shall be stored in a covered dry location off of the ground.

PART 2 – PRODUCTS

2.01 PIPE INSULATION - GENERAL

- A. Unless otherwise specified or indicated on the Drawings, all insulation materials, integrated insulation assemblies, adhesives, coatings, and other accessories which are provided shall have flame spread ratings not exceeding 25 (fire resistive). The smoke developed rating shall not exceed 50. The fuel contributed rating shall not exceed 50. The aforementioned ratings are as established by tests conducted in accordance with Interior Federal Standard No. 00136B, entitled "Interior Federal Standard Flame-Spread Properties for Materials" and the National Fire Code of the NFPA.
- B. The insulation Manufacturer shall provide permanent treatment of jackets and/or facings to impart flame and smoke. The use of water soluble treatments of jackets and/or facings shall not be acceptable.
- C. Exceptions shall be allowed for closed cell foam insulation, one-piece pre-molded PVC fittings, PVC valve covers, PVC pipe jacketing, and asphaltic mastic.
- D. Piping insulation products containing asbestos shall not be permitted under any circumstances.
- E. The toxicity of any solvents used for the piping insulation systems shall not exceed a maximum allowable concentration of 200 ppm or the latest value published by the American Conference of Governmental Industrial Hygienists and OSHA. Use low VOC solvents whenever possible.

2.02 FIBROUS GLASS PIPE INSULATION – TYPE (I/1)

- A. Provide fibrous glass insulation for "Dry Interior" piping systems as specified herein and as indicated on the Drawings.
- B. All fibrous glass pipe insulation shall be in accordance with ASTM C 547 standards. The insulation shall be molded rigid fibrous glass sectional pipe insulation rated to a maximum temperature of 500 degrees F. The insulation shall have a minimum density of 3.5 lbs/cubic foot and a minimum "K" factor of 0.24 at 75 degrees F mean temperature. All insulation shall be sized in accordance with ASTM C 585 standards. The Water vapor sorption shall be in accordance with ASTM C 1104 standards, and be Less than 1% by weight at 120 degrees F and 95% relative humidity.
- C. Unless otherwise specified or indicated on the Drawings; the jacket for interior piping shall be kraft paper bonded to aluminum foil reinforced with fiberglass yarn and self-sealing lap with a maximum permeability of 0.02 perms. The jacket, for interior piping to seven (7) feet above the finished floor shall be provided with the addition of a field applied 0.016 inch thick Aluminum or PVC jacket on the exterior for additional protection. All fitting covers shall be pre-molded PVC or Aluminum. All vapor barrier jackets shall be applied with a continuous vapor seal in accordance with ASTM C 1136 standards.
- D. All fiberglass pipe insulation of the same type, style, and duty shall be supplied by a single Manufacturer. All fiberglass pipe insulation shall be a product of the following Manufacturer:
 - 1. Johns Manville Corporation
 - 2. Owens-Corning
 - 3. Certain Teed Corporation
 - 4. Knauf
 - 5. Engineer Approved Equal

2.03 ELASTOMERIC FOAM PIPE INSULATION – TYPE (I/2)

- A. Provide "Closed Cell" flexible elastomeric pipe insulation as specified and as indicated on the Drawings. Flexible elastomeric pipe insulation shall be provided for all "Cold Piping" or "Moist Piping" applications; pipes or surfaces where the normal operating temperature is 55°F or lower and/or for the prevention of condensation formation on process piping systems. Flexible elastomeric insulation shall be utilized on process piping systems including but not limited to plant water, city water, utility water, town water, non-potable water, etc.
- B. The insulation material shall have a closed-cell structure to prevent moisture from wicking and thereby improving efficiency. The insulation material shall be manufactured without the use of CFC's, HFC's or HCFC's. The insulation shall also be formaldehyde free, fiber free, dust free and be resistant to mold and mildew. The insulation shall conform to ASTM C 534 and/or ASTM C 552 standards.

- C. The insulation materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84 standards, latest revision. In addition, the product, when tested, shall not melt or drip flaming particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests.
- D. The insulation shall be a minimum of one (1) inches thick. Provide increased thicknesses where specified or indicated on the Drawings. Size the insulation for each respective nominal pipe size as shown on the Drawings. The insulation shall be designed with an antimicrobial product protection for added defense against mold formation on the insulation.

2.04 ELASTOMERIC FOAM INSULATION PHYSICAL PROPERTIES

- A. All flexible elastomeric insulation shall conform to or exceed the following physical properties and design criteria:
 - 1. Thermal Conductivity: 0.27 (Btu-in)/(H-ft²-°F) at 75 Degrees F, per ASTM C 177 and ASTM C 518 standards.
 - 2. Water vapor permeability: 0.08 perm-in per ASTM E 96/E 96M standards, Procedure A.
 - 3. Mold Growth: Meet or exceed the requirements of UL 181.
 - 4. Fungi Resistance: Meet or exceed the requirements of ASTM G 21 and ASTM C 1338 standards.
 - 5. Bacterial Resistance: Meet or exceed the requirements of ASTM G 22 standards.
 - 6. Water Absorption: 0.2% by volume per ASTM C 209 standards.
 - 7. Upper Use Limit: 180 Degrees F.
 - 8. Lower Use Limit: -90 Degrees F.
 - 9. Typical Density: 1.5 - 6.0 lbs/ft³ per ASTM D 1622 and ASTM D 1667 standards.
 - 10. Insulation Color: Black, or Color Directed by Engineer and Owner
- B. Whenever possible, provide flexible elastomeric pipe insulation in un-slit tubular form such that it can be slipped onto piping before it is connected. In cases where this is not possible slit the insulation lengthwise and attach it over piping already connected. All fitting covers shall be fabricated in miter-cut tubular form. In all cases, butt joints and seams shall be sealed with a low VOC "Contact" adhesive. In all cases, both surfaces to be joined shall be coated with adhesive. For pipes larger than 6 inches use "Sheet or Roll Type" insulation.
- C. For insulation thicknesses greater than one (1) inch sleeve the insulation utilize the insulation Manufacturer's recommended contact adhesive. Accessories including but not limited to adhesives, mastics, lagging and cements shall have the same properties as listed above and shall not detract from any of the system ratings as specified above.

2.05 MINERAL WOOL PIPE INSULATION – TYPE (I/3)

- A. Provide mineral wool type piping insulation for low pressure stainless steel air piping, other process piping systems, generator exhaust piping and other applications as specified and as shown on the Drawings. Install the insulation within the specific limits as specified, as shown on the Drawings, and as directed by the Engineer and Owner.
- B. Mineral wool type pipe insulation shall be rated for a continuous service temperature of at least 1,000 degrees F. The insulation shall have a minimum density of 7 lbs/ft³. The insulation shall be a minimum thickness as indicated on the Drawings. Provide insulation with v-shaped grooves on the inner surface to allow forming around the pipe to be insulated. Mineral wool pipe insulation shall conform to ASTM C 547, ASTM C 585, and U.S. Federal Specification HH-I-558B standards. The insulation shall be specifically designed for use on austenitic stainless steel piping in accordance with ASTM C 795 standards.
- C. The insulation shall have a minimum thermal conductivity of 0.23 Btu-inch/h-ft² per ASTM C 335-89 standards. The insulation moisture adsorption shall be less than 1%. The insulation shall be water wicking resistant and non-hygroscopic. The insulation shall not promote growth of fungi or bacteria.
- D. The mineral wool insulation shall be "Incombustible" per ASTM E 136 standards. The insulation surface burning characteristics shall produce a flame spread of 25 or less and a smoke developed of 50 or less per ASTM E 84 test methods and standards.

2.06 MINERAL WOOL INSULATION JACKET

- A. Unless otherwise specified or indicated on the drawings. The exterior surface of all insulation shall be an "All Service Type Jacket" (ASJ) consisting of a laminate of aluminum and kraft paper bonded to the mineral wool insulation. Provide other jacketing as specified or indicated on the Drawings. All sections of the jacket shall be held in place with tape made of the same material as the all service jacket. The insulation all service jacketing shall conform to ASTM C 1136, U.S. Federal Specification HH-B-100B, and Underwriters Laboratories UL-723 standards.
- B. Fittings shall be insulated with mitered units of insulation and all service jacket tape. Flanges and other piping specialties shall be insulated with sections of the insulation material cut and shaped to fit with all service jacket tape and mineral wool laminate.
- C. Outdoor pipe insulation shall be jacketed and sealed completely weather tight. The jacket material shall be stucco embossed flat aluminum with a minimum thickness of 0.020 inches. The jacket shall be supplied with a factory applied vapor barrier liner. The jacket shall be banded with Type 316 stainless steel bands and fasteners. Each band shall be a minimum of 0.020 inches thick with a minimum 3/4 inch width. All jacket laps shall be sealed with tape sealant or beads of mastic. All fitting segments shall be set in mastic. Mastic sealant shall be Foster No. 95-44 Trowel Grade Mastic or

Engineer Approved Equal. Tape sealant shall be Foster 96-01 Extruded Tape Sealant or Engineer Approved Equal.

- D. All mineral wool type pipe insulation of the same type, style, and duty shall be supplied by a single Manufacturer. All flexible mineral wool type pipe insulation shall be a product of the following Manufacturer:
1. Rock Wool Manufacturing Company - Delta Pipe Insulation
 2. Owens Corning Inc. - Series 1200 Pipe Insulation
 3. Engineer Approved Equal

2.07 POLYISOCYANURATE PIPE INSULATION – TYPE (I/4)

- A. Provide polyurethane modified rigid polyisocyanurate cellular insulation for process piping as specified and indicated on the Drawings. The insulation shall meet ASTM C 591 standards, Grade II, Type V. The rigid insulation shall be supplied in pre-fabricated pipe shells for thermal insulation of process piping. The insulation shall not be a nutrient source for mold and mildew. Insulation thickness shall be as indicated on the Drawings. All formed polyisocyanurate insulation shall meet or exceed the following physical properties and design criteria:
1. Service Temperature Range: -297 to +300 Degrees F
 2. Density: 4 lbs/ft³, per ASTM D 1622
 3. Compressive Strength: 95 psi, per ASTM D 1621 (parallel to rise thickness)
 4. Compressive Strength: 80 psi, per ASTM D 1621 (perpendicular to rise width)
 5. Compressive Strength: 100 psi, per ASTM D 1621 (perpendicular to rise length)
 6. Shear Strength: 42 psi, per ASTM C 273/C 273M, parallel & perpendicular
 7. Shear Modulus: 650 psi, per ASTM C 273/C 273M, parallel & perpendicular
 8. Tensile Strength: 60 psi, per ASTM D 1623, parallel to rise - thickness
 9. Flexural Strength: 150 psi, per ASTM C 203, parallel to rise
 10. Flexural Modulus: 3,850 psi, per ASTM C 203, parallel to rise
 11. K-Factor: 0.19 Btu-in/hr-ft²-F, per ASTM C 518, aged 180 days at 75 Degrees F.
 12. Closed Cell Content: 95% (minimum), per ASTM D 2856
 13. Water Absorption: <0.7% by volume, per ASTM C 272
 14. Water Vapor Permeability: 2.9 perm-inch, per ASTM E 96/E 96M
 15. Dimensional Stability: 1.0 % change in length and 2.0% change in volume per ASTM D 2126, 7 days at 158 degrees F
 16. Surface Burning Flame Spread: 25, per ASTM E 84 up to 6 inch thick
 17. Surface Burning Smoke Developed: 450, per ASTM E 84 up to 6 inch thick
- B. Unless otherwise specified or indicated on the Drawings, provide aluminum or stainless steel jacketing for exposed application locations. For buried piping systems provide a heavy duty 50 mil flexible vapor retarder sheet membrane jacket. The jacket shall be comprised of a synthetic rubber modified asphalt with cross laminated polyethylene.

- C. Provide adhesives, joint sealers and mastics for a complete vapor barrier system. Mastics shall remain flexible at the lowest expected ambient temperature. Joint sealers for sealing joints of insulation or PVC jacketing slip joints, shall be vapor retarder type, moisture and water resistant, non-hardening, and flexible with a service temperature range from -50°F to +200°F. Provide a complete vapor barrier system.
- D. For buried piping provide "high density" and high compressive strength insulation around the entire exterior of the pipe. High density and compressive strength insulation shall meet or exceed the physical properties previously specified. Lower density and compressive strength insulation may be used on piping segments not subjected to external loading from soil, pipe supports or related appurtenances in the piping system. Provide high density insulation segments at all pipe supports and insulation protection saddles.
- E. All polyisocyanurate pipe insulation of the same type, style, and duty shall be supplied by a single Manufacturer. All rigid polyisocyanurate pipe insulation shall be a product of the following Manufacturer:
 - 1. ITW Insulation Systems - Trymer PIR Insulation
 - 2. Engineer Approved Equal

2.08 PVC INSULATION JACKET – TYPE (J/1)

- A. Unless otherwise specified or indicated on the Drawings, provide PVC jacketing for all "Fibrous Glass" pipe insulation below seven (7) feet above the finished floor elevation. Unless otherwise specified or indicated on the Drawings, all "Flexible Elastomeric Foam Insulation" shall be provided with PVC jacketing regardless of location.
- B. The PVC jacketing shall be provided for all insulated piping runs, fittings, valves, and flanges. The jacketing shall be attached using adhesives and mastics. Provide 316 stainless steel bands and fasteners for attachment of insulation jacket in cases where adhesives cannot be used. All PVC jacketing for piping, fittings, valves, and flanges shall be designed and constructed in accordance with the following physical properties/criteria:
 - 1. Specific gravity: 1.48 per ASTM D 792 standards.
 - 2. Tensile Strength at Yield: 6,000 psi per ASTM D 638 standards.
 - 3. Elongation at Yield: 3.0 per ASTM D 638 standards.
 - 4. Tensile Modulus: 470,000 psi per ASTM D 638 standards.
 - 5. Flexural Modulus: 460,000 psi per ASTM D 790 standards.
 - 6. Electrical Conductance: Non-Conductor per ASTM D 257 standards.
 - 7. Temperature Rating: 150 Degrees F
- C. The PVC jacket materials shall have a flame spread index of less than 25 and a smoke-developed index of less than 50 when tested in accordance with ASTM E 84 standards, latest revision. In addition, the jacketing, when tested, shall not melt or drip flaming

- particles, the flame shall not be progressive and all materials shall pass simulated end-use fire tests. PVC jacketing which is "Colored", (Not Standard White) shall not be required to conform to the aforementioned standards for fire resistance.
- D. Unless otherwise specified or indicated on the Drawings all PVC jacketing shall be a minimum of 30 mils thick. The PVC jacketing shall be produced from a glossy, high impact, polyvinyl chloride compound. The PVC jacketing shall be designed to be immune to galvanic or electrolytic corrosion. The jacketing and fitting covers shall be designed for wash down with soap and water.
- E. For indoor applications which are not in direct exposure to ultraviolet radiation the jacketing shall be colored to match the plant color code designation for the respective fluid carried in the pipe system which is insulated. **The Contractor shall coordinate the final color code with the Owner and Engineer prior to ordering the jacketing.**
- F. PVC jacketing for exterior pipe applications shall meet all the previously specified requirements for indoor PVC jacketing. However, the jacketing shall be standard white in color, 30 mils thick, with a UV resistant coating. Exterior jacketing shall not be required to be matched to the "color coding" for the plant piping system being insulated.
- G. All PVC jacketing for pipe insulation of the same type, style, and duty shall be supplied by a single Manufacturer. All PVC jacketing for shall be a product of the following Manufacturer:
1. Johns Manville - Zeston 300 Series
 2. Ceel-Co - Series 300
 3. Speedline Corporation
 4. Engineer Approved Equal

2.09 ALUMINUM JACKET – TYPE (J/2)

- A. Provide aluminum insulation jacketing as specified and as indicated on the Drawings. Jacket shall be assembled from aluminum roll stock, ready for shop or field cutting and forming to the indicated sizes. The aluminum jacketing shall comply with ASTM B 209 standards, 3003, 1100 or 3105 alloy, H-14 temper. Provide the aluminum jacket with a corrugated finish with a thickness as specified or indicated on the Drawings. Unless otherwise specified or indicated on the Drawings the minimum thickness of jacketing shall be 0.020 inches.
- B. Provide moisture barriers as specified and as indicated on the Drawings. Moisture barriers shall be a minimum of 2-1/2 mils thick and be constructed of heat-bonded polyethylene and kraft paper. All elbow fittings shall be of preformed Construction. Provide 30, 45, 90 degree etc., short and long-radius elbows, and fittings of the same material, finish, and thickness as the insulating jacket. Aluminum jacketing shall not be considered equal to a vapor barrier system. Neither rivets, screws, staples nor any other

fastener capable of penetrating the underlying vapor retarder shall be used to secure the aluminum jacketing.

2.10 STAINLESS STEEL JACKET – TYPE (J/3)

- A. Provide stainless steel insulation jacketing as specified and as indicated on the Drawings. Jacket shall be assembled from stainless steel roll stock ready for shop or field cutting and forming to the indicated sizes. All stainless steel jacketing shall comply with ASTM A 666 standards. Stainless steel shall be a minimum Type 304. Provide type 304 or type 316 as specified and as indicated on the Drawings. Provide the stainless steel jacketing with a thickness as specified or indicated on the Drawings. Unless otherwise specified or indicated on the Drawings the minimum thickness of jacketing shall be 0.10 inches.
- B. Provide moisture barriers as specified and as indicated on the Drawings. Moisture barriers shall be a minimum of 3-mils thick and be constructed of heat-bonded polyethylene and kraft paper. All elbow fittings shall be pre-formed type. Provide 30, 45, 90 degree etc. short and long-radius elbows and fittings of the same material, finish, and thickness as the insulating jacket as required. Provide type 304 stainless steel bands with a minimum width of 3/4 inches.

2.11 SHEET MEMBRANE JACKET – TYPE (J/4)

- A. Provide heavy duty 50 mil flexible vapor retarder sheet membrane jacket as specified or as indicated on the Drawings. The sheet membrane shall be comprised of synthetic, rubber modified asphalt laminated to a tough polymer film and a treated peel and stick release liner. Jacket shall be designed for use over thermal insulation including cellular glass, polyurethane, polyisocyanurate, polystyrene, and rigid fiberglass. The sheet membrane jacket shall be specifically designed for direct burial underground as well as jacketed above ground applications. All sheet membrane jacket shall be designed in accordance with the following criteria
 - 1. Color: Black
 - 2. Composition: Rubber modified asphalt with cross-laminated polyethylene
 - 3. Service Temperature: -250F to 160 0F
 - 4. Film Thickness: 50 mils
 - 5. Tensile Strength: >400 psi, per ASTM D 412
 - 6. Elongation: >300%, per ASTM D 412
 - 7. Permeance: <0.015 perms at 1000F and 90% RH, per ASTM F 1249
 - 8. Puncture Resistance: 50 lbf (minimum), per ASTM E 154
 - 9. Overlap Adhesion: >7.0 lb/in-width, per ASTM D 903
 - 10. Flame Spread: 0, per ASTM E 84
 - 11. Soil Deterioration: Pass, no loss of performance, per ASTM E 154
 - 12. Pliability: No cracking at -250F, per ASTM D 146

- B. The membrane shall be elastomeric and allow for expansion and contraction of the insulation system. The jacket shall be self-healing and form a strong bond to the substrate and the sheet overlaps.

2.12 FASTENING BANDS

- A. Provide all fastening bands for insulation jacket and installation of materials as specified and indicated on the Drawings. All fastening bands shall be a minimum 3/4 inches wide. Fastening bands shall be constructed of one of the following materials which shall be compatible with jacket:
 - 1. Stainless Steel: ASTM A 666, Type 304/316; 0.10 inches thick
 - 2. Galvanized Steel: 0.005 inches thick
 - 3. Aluminum: 0.007 inches thick
 - 4. Brass: 0.010 inches thick
 - 5. Nickel-Copper Alloy: 0.005 inches thick

2.13 FASTENING WIRE

- A. Provide all fastening wire for attaching insulation and jacketing of materials as specified and as indicated on the Drawings. All wire shall be constructed of the one of the following materials which shall be compatible with the insulation and jacket:
 - 1. 0.080-inch nickel-copper alloy
 - 2. 0.062-inch soft-annealed stainless steel
 - 3. 0.062-inch soft-annealed galvanized steel

2.14 ADHESIVES AND COATINGS

- A. All lagging adhesives, vapor barrier coatings, vapor seal adhesives, sealing compound adhesives, weatherproof mastics, and vapor barrier materials shall be compatible with the insulation as recommended by the insulation Manufacturer. Submit a certified statement attesting to the approval of the adhesive, coating, sealing compound, mastic and vapor barrier materials by the insulation Manufacturer.
- B. All adhesives and coatings for pipe insulation of the same type, style, and duty shall be supplied by a single Manufacturer. All adhesives, coatings, sealing compounds, mastics, and vapor barriers for process pipe insulation shall be a product of the following Manufacturer:
 - 1. Foster Products Company
 - 2. H.B. Fuller Company
 - 3. Childers Products Company
 - 4. Engineer Approved Equal

2.15 GLASS CLOTH AND TAPE

- A. Provide all glass cloth and tape for installation of process pipe insulation systems. All glass cloth and tape shall comply with MIL-C-20079H standards, Type I for glass cloth and Type II for tape. All glass cloth shall be constructed of woven glass-fiber fabrics, plain weave, pre-sized to a minimum of 8 ounces per square yard. All tape shall be a minimum width of four (4) inches.

PART 3 – EXECUTION

3.01 GENERAL INSTALLATION

- A. Obtain the Engineer's written approval of piping systems prior to the application of insulation. Piping shall not be insulated until testing has been performed on the piping systems as outlined in section 40 05 13 "PROCESS PIPE AND FITTINGS". Piping shall be clean, dry, and painted (if required) prior to insulation application. Insulation shall be clean, dry, and installed, prior to the application of insulation jacket. Short pieces of insulation and jacket materials shall not be used where a full length section will fit.
- B. Provide insulation materials and jackets with smooth and even surfaces, with jackets drawn tight, and secured on longitudinal and end laps. Insulate fittings and piping accessories with pre-molded, precut, or field-fabricated pipe insulation of the same pipe insulation material and thickness as the adjoining pipe insulation. Provide unions, flanges, valves, and piping accessories with removable (snap-on) sections of insulation. Provide continuous sections of insulation through pipe hangers and pipe supports. Do not step on or walk on insulation or jacket.
- C. All insulated piping shall be protected against vapor seal damage at all pipe hangers by use of insulation protection saddles as specified in section 40 05 15 "PROCESS PIPE SUPPORTS" and as shown on the Drawings.
- D. Install a continuous insulation protection shield on all insulated piping that passes over electrical enclosures. The shield shall cover a minimum 1/3 of the lower circumference of pipe insulation and be permanently secured to the pipe insulation. The shield length shall extend a minimum of four (4) feet beyond the electrical enclosure.
- E. Where piping is provided with heat tracing, the insulation shall not be installed until the heat tracing has been tested by the Contractor and accepted to the satisfaction of the Engineer and Owner. Size the insulation to allow for the heat tracing line and all appurtenances without deforming the insulation.
- F. Unless otherwise specified or indicated on the Drawings, insulate all valves, fittings, pipe specialties and all other components that are part of the piping system. Insulate valve bonnets to a point just below the stuffing box.

- G. Bridge flanges, unions, and pipeline strainers with block or sectional insulation wired in place. The wire shall be 316 stainless steel or other material as directed/approved by the Engineer. Stop all pipe insulation a sufficient distance from pipe flange unions, or strainers to allow removal of flange bolts without disturbing the pipe insulation. Extend the block, at least two (2) inches over the adjacent pipe insulation. Flange covers shall be designed for removal without damaging the pipe insulation. Fill all voids with blanket insulation.
- H. Where possible, all insulation shall be continuous through wall/floor openings and sleeves.

3.02 PIPING INSULATION

- A. Utilize preformed sectional insulation and jacketing whenever possible. The use of blanket insulation shall only be allowed for fittings that cannot be insulated with sectional insulation. All joints on preformed and fabricated insulation shall be accurately fitted to eliminate voids. Voids shall be eliminated by refitting or replacing the insulation. End joints of all insulation shall be firmly butted to adjoining sections of insulation.
- B. Outdoor piping insulation shall be installed to keep the insulation dry at all times. All joints shall be located to prevent the entrance of water. Breaks in jacketing caused by vertical connections or instruments shall be protected by hoods or cones. Where there are breaks in the jacket, plastic moisture barriers shall be provided under the jacketing to protect the insulation. Insulation and jacketing of valves shall be waterproofed. Insulation and jacketing of valves shall be removable to allow servicing of the respective valve.
- C. Vapor seal adhesives shall be used to seal seams and butt sections on all cold piping applications if self-sealing laps are not provided. The use of staples or any other fastening methods that could potentially penetrate the vapor barrier shall not be permitted on cold piping systems under any circumstances. Staples may be used on hot piping systems where there is no potential for condensation. All staples shall be 316 stainless steel.
- D. Where supports, anchors or guides are in direct contact with cold piping systems, insulate the item in contact a distance of four times the insulation thickness. Clamps and non-welded support devices shall be contained within the insulation. The space within insulating saddles at pipe hangers shall be filled with insulation.
- E. On vertical pipe risers exceeding 15 feet in height, provide intermediate support for the insulation. For carbon steel pipe, the supporting shall consist of angle clips or other suitable devices welded to the pipe at approximately 15 feet on center and concealed by the pipe covering. On non-carbon steel piping, clamps or other non-welded devices as approved by the Engineer shall be utilized.

- F. In the case of insulated piping runs between two different piping systems, the interconnecting line shall be insulated the same as the system having the most rigid insulating requirements. If one of the connecting piping lines is not insulated the interconnecting line shall be insulated the same as the insulated line.

3.03 ROOF PENETRATIONS

- A. Apply insulation for interior applications to a point even with the top of the roof flashing. Seal penetrations with vapor-retarder mastic. Apply insulation for exterior applications tightly joined to the interior insulation ends. Extend jacketing of exterior insulation outside roof flashing at least 2 inches below the top of the flashing. Seal the insulation jacket to the roof flashing with vapor-retarder mastic.

3.04 EXTERIOR WALL PENETRATIONS

- A. Unless otherwise specified or indicated on the Drawings, for insulated process piping penetrations through "below-grade" exterior walls, terminate the insulation flush with the mechanical sleeve seal. Seal all insulation terminations with vapor-retarder mastic.

3.05 INTERIOR WALL & PARTITION PENETRATIONS

- A. For insulated process piping penetrations through interior walls and partitions, apply the piping insulation continuously through walls and floors.

3.06 FIRE RATED WALL & PARTITION PENETRATIONS

- A. For insulated process piping penetrations through fire-rated walls and partitions, apply all insulation continuously through the penetrations. Provide fire-stopping and fire-resistive joint sealers as specified and as indicated on the Drawings.

3.07 FLOOR PENETRATIONS

- A. For insulated process piping penetrations through floors, apply insulation continuously through all floor assemblies. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.08 VAPOR BARRIERS

- A. All penetrations through a vapor barrier for hangers, instruments, etc., shall be sealed to provide a complete vapor barrier. The use of staples or other fasteners that penetrate the vapor barrier shall not be permitted.
- B. Insulation systems that require a vapor barrier shall be installed with an intact vapor barrier that covers the entire piping system to be insulated. All edges of insulation that do not abut another piece of insulation shall have the vapor barrier extended, and sealed to the piping system being insulated.

- C. All penetrations through the insulation including but not limited to, test ports, dampers, nameplates, or other items shall have the vapor barrier extend over the edges of the insulation and then sealed to the piping system being insulated. For insulated piping exceeding 20 feet in length, extend the vapor barrier to the item being insulated to reduce the area or length within a single enclosed area.

3.09 FLEXIBLE ELASTOMERIC PIPE INSULATION

- A. Install flexible elastomeric pipe insulation by slitting tubular sections and then applying them onto the piping. Alternately, whenever possible, slide un-slit sections over the open ends of piping or tubing. All seams and butt joints shall be adhered and sealed using a "low VOC" sealing agent as recommended by the insulation Manufacturer.
- B. Insulation shall be pushed onto piping, never pulled. Stretching of insulation may result in open seams and joints. Tape the ends of the piping segments before slipping the insulation over the pipes to prevent dust from entering the pipe segments. All edges of the insulation shall be clean cut. Rough or jagged edges of insulation shall not be permitted. Proper tools such as sharp non-serrated knives shall be used for cutting of insulation as required.
- C. On "Cold Piping" or "Moist Piping" which is subject to condensation formation, the insulation shall be adhered directly to the piping at the high end of the run using a two (2) inch strip of adhesive on the inside diameter of the insulation and on the respective pipe segment. All exposed end cuts of the insulation shall be coated with adhesive. All penetrations through insulation and termination points shall be adhered to the substrate to prevent condensation migration.
- D. Sheet insulation shall be used on all pipes larger than six (6) inches. Insulation shall not be stretched around the pipe. On pipes larger than 12 inches, adhere insulation directly to the pipe on the lower 1/3 of the pipe. On pipes greater than 24 inches, provide complete adhesion to the pipe. All seams shall be staggered when applying multiple layers of insulation.

3.10 FIBROUS GLASS PIPE INSULATION

- A. Install all fibrous glass pipe insulation in strict accordance with the Manufacturer's recommendations. Secure each layer of preformed insulation to piping with wire, tape, or bands without deforming the insulation materials. Where vapor retarders are indicated, seal all longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments. For insulation with factory-applied jackets, secure laps with outward clinched staples at six (6) inches on center. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs. Secure tabs with additional adhesive as recommended by the insulation material Manufacturer and seal with vapor-retarder mastic.

- B. Apply preformed fibrous glass pipe insulation to the outer diameter of pipe flanges. Make the width of the insulation segment the same as the overall width of the flange and bolts, plus twice the thickness of the pipe insulation. Fill all voids between the inner circumference of the flange insulation and the outer circumference of the adjacent straight pipe segments with blanket insulation. Apply any jacket material as specified or indicated on the Drawings with the Manufacturer's recommended adhesive. Overlap all seams at least one (1) inch, and seal joints with vapor-retarder mastic.
- C. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available for insulating pipe fittings and elbows. Secure all pre-molded insulation sections according to the Manufacturer's written instructions. When pre-molded insulation elbows and fittings are not available, apply mitered sections of pipe insulation to a thickness equal to the adjoining pipe insulation. Secure all insulation materials with wire, tape, or bands.
- D. Apply pre-molded insulation sections of the same material as straight segments of pipe insulation when available for insulating valves and strainers. Secure insulation according to the Manufacturer's written instructions. When pre-molded insulation sections are not available, apply blanket insulation to the valve body. Arrange the insulation to permit free and unobstructed access to the valve packing. Install all insulation to allow for free and unobstructed valve operation. For strainers, arrange the insulation for free and unobstructed access and removal of the strainer basket.

3.11 POLYISOCYANURATE PIPE INSULATION

- A. Stagger insulation half sections so that butt joints are staggered between top and bottom half sections by 6 to 18 inches on insulation layers that do not have a vapor retarder factory applied to them. On a single layer system, orient longitudinal joints between half sections in the 3 and 9 o'clock position on the pipe. Where insulation thickness required is greater than 2 1/2 inches, employ a double layer system. Stagger all longitudinal joints between the inner and outer layers. Install the inner and outer layer longitudinal joints 90° to each other with the inner layer joints in the 12 and 6 o'clock positions and the outer layer joints in the 3 and 9 o'clock positions. All butt joints between the inner and outer layers shall be staggered between 6 and 18 inches. Install pre-fabricated insulation fittings on elbows, tees, and valves. Insulation shall be the same thickness at fittings as the corresponding straight pipe segments.
- B. If a double layer system is required, all fittings shall be double layered. Fittings may be cut to full thickness in lieu of double layered if they are fabricated with shiplap butt ends. Depth of the shiplap shall be cut to the thickness of the inner layer to allow the outer layer to overlap creating a staggered joint. Install half-length pipe section half round on the bottom of all pipe hanger saddles with a full pipe section half round on the top so as to maintain a staggered joint through the pipe hanger saddle. In double layer systems install nested half and full pipe half round sections in bottom of saddle or use a full thickness single layer pipe section with shiplap ends cut to the depth of the inner layer thickness so the outer layer will overlap.

- C. Bottom insulation sections in hanger saddles shall be high density and high compressive strength type. Saddles shall wrap the insulation in an arc between 120° and 180° depending upon the load. Single layer insulation shall be applied to piping with all joints sealed full depth with joint sealant and spread to uniform thickness so that joints appear tight and uniform. In double layer insulation system, inner layer shall not be installed with sealants. In double layer systems inner and outer layer shall remain independent of each other so as to allow movement between the layers. Insulation shall be secured to the pipe with 3/4" wide fiber reinforced tape. Insulation shall be secured with fiber reinforced tape on both inner and outer layers of a double layered system except as otherwise noted or recommended by the Manufacturer.
- D. Insulation shall be secured with fiber reinforced tape prior to installation of the vapor retarder material when vapor retarder is field applied. Outer layer or single layer insulation and vapor retarder shall be secured with fiber reinforced tape. Use a 25% circumferential overlap on 12 inch centers when vapor retarder is factory applied to insulation. Fiber tape shall be applied to the exterior of the insulation/ vapor retarder system. Provide contraction/expansion joints in double layer systems to accommodate system piping expansion and contraction.
- E. All insulation shall be tightly butted and free of voids and gaps at all joints. The vapor barrier shall be continuous. All fasteners and bands shall be neatly aligned. Vapor stops shall be used on either side of valves frequently removed for servicing, valve stations left exposed, or odd fittings, elbows, tees, or insulation end terminations where the chance of moisture infiltration is high.
- F. Vapor barriers shall be cut to length longitudinally and wrapped around the circumference of the pipe with lap joint facing downward avoiding the placement of the joint at the top or bottom of the pipe. Lap joints shall be sealed using SSL tape or a liquid adhesive. Butt joints shall be covered with vapor retarder tape. A spiral wrap configuration may be used in lieu of the above installation. Spiral wrapping shall require adhesive placed on one edge of the film as it is wrapped over the previous layer.
- G. Elbows and fittings shall be wrapped with vapor retarder tape or covered with a mastic type vapor retarder product. Tape shall be wrapped in a spiral configuration. Where permeance less than 0.02 perms is required, tape shall be spiral wrapped with a minimum 50% overlap. If using mastic type vapor retarder at fittings and elbows, form mastic so that fitting covers can be applied true and tight. The Contractor shall not install PVC jacket with polyurethane foam fill in lieu of a vapor retarder at fittings and elbows without approval by the Engineer.
- H. On factory-applied vapor barriers, lap joints to be sealed with tape. All vapor retarder surfaces shall be cleaned and free of dust/ grease/ oil/etc. before application of the tape to ensure good adhesion between the tape and vapor retarder. Apply tape around the butt joint with a 25% circumference overlap. For other types of factory applied vapor retarders, consult manufacturer's recommendations on installation. Before jacketing can

be installed on a portion of the piping, the vapor retarder system on that portion shall be complete and continuous.

- I. All insulation shall be protected from prolonged exposure to UV light and weather upon installation. In applications with UV exposure all insulation shall be covered with a jacketing material within two weeks of installation to eliminate long term exposure to UV light. Outdoor jacketing overlap shall be a minimum of 2" at butt joints and a minimum of 2" at longitudinal joints. Jacketing shall be caulked before closing and banding and positioned in an orientation to avoid water infiltration. Straight sections of jacketing shall be neatly secured with bands and seals with a maximum spacing of 12 inches on center. End joints shall be secured with bands and seals centered directly over joint. Do not use screws, staples or other fasteners on lines containing a vapor retarder system.

3.12 METALLIC AND PVC INSULATION JACKETING

- A. Install all metal or plastic jacketing with joints staggered from those of the piping system insulation. All metallic or plastic jacketing shall have a minimum three (3) inch overlap on longitudinal joints and end joints. Longitudinal joints in horizontal piping shall have the outer lap of the joint pointed down to shed water. The end of the outer lap shall be located at the 5 or 7 o'clock positions.
- B. Where called for on the Drawings or as specified, provide new piping insulation and existing piping insulation affected by Contractor's operations with an aluminum or PVC jacket. Machine cut the jacket to produce a straight, smooth edge. Lap longitudinal and circumferential seams not less than three (3) inches.
- C. Install jackets on horizontal piping with the longitudinal seam approximately midway between horizontal centerline and the bottom side of pipe. Install with the top edge of the jacket overlapping the bottom edge of the jacket and with the seam of each jacket offset from the seam of the adjacent jacket. Install jackets on vertical piping and on piping pitched from the horizontal from low point to high point so that the lower circumferential edge of each jacket overlaps the jacket below it. Provide factory prefabricated covers for insulation on fittings, valves, flanges and other piping appurtenances as required.
- D. Finish jackets neatly at pipe hangers and pipe supports. Terminate jackets neatly at the ends of unions, valves, traps, strainers and other process piping appurtenances. Secure all jacketing with 316 stainless steel bands and hardware spaced not more than twelve (12) inches on center.

3.13 GLASS CLOTH JACKETING

- A. Install glass cloth jacketing, where indicated, directly over bare insulation or insulation with factory-applied jackets. Apply all jacketing smooth and tight to the surface with a minimum two (2) inch overlap at all seams and joints. Embed glass cloth between two (2) 0.062 inch thick coats of the jacket Manufacturer's recommended adhesive.

Completely encapsulate all insulation with jacketing, leaving no exposed raw insulation surfaces.

3.14 FOIL AND PAPER JACKETING

- A. Install foil and paper jackets where Specified or indicated on the Drawings. Apply all jacketing smooth and tight to the surface. Secure jacket to insulation with the Manufacturer's recommended adhesive. Apply jackets with 1-1/2 inch laps at longitudinal seams and three (3) inch wide joint strips at end joints. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.

3.15 SHEET MEMBRANE JACKET

- A. Prior to application, ensure insulation is dry and free of frost or condensation. Apply jacket by cigarette wrapping. Cut membrane to desired length. Ensure length includes a minimum 2 inch overlap. Start by positioning the membrane such that the finished overlap will allow for water to drain over and not into the lap.
- B. All longitudinal and circumferential seams on exposed piping systems shall be overlapped a minimum of 2 inches. Ensure complete contact at the laps and to the substrate using a roller or firm pressure throughout. Stagger laps of subsequent pieces. All penetrations, insulation supports, valves, expansion and contraction joints and other protrusions shall be properly flashed to ensure a complete seal between the protrusion and the membrane's polymer film.
- C. On exterior applications, the wrap shall be protected from the sun within a maximum of 14 days exposure. Jacketing shall be applied as soon as possible to protect the membrane from damage. Consult the manufacturer's recommendations for installation during low temperatures.
- D. On below grade applications longitudinal overlaps shall be increased to a minimum of three (3) inches. Backfill shall be sand and free of rocks or other objects that may puncture the membrane. Fill containing clay or other materials that may result in sticking to the membrane or shrinking and pulling at seams shall not be used. Where soil stress conditions are possible, on large pipes, an un-adhered layer of polyethylene or other fabric should be placed over the wrap and taped in place prior to backfilling thus allowing for expansion and contraction of the insulation and wrap without pulling at the seams.
- E. Use a four (4) inch wide wrap to spiral wrap elbows or cut gores using appropriate templates. Overlap all seams by 50%. If mastic is preferred to cover elbows or fittings adjacent to the membrane wrap, do so by extending the mastic and reinforcing mesh a minimum of two (2) inches over the wrap facing. Where white, solvent based mastics are desired, tape terminations of sheet membrane with an acrylic PSA tape to cover the exposed asphalt cut ends. This will prevent bleed through. Mastic and reinforcing mesh

should be extended at least two (2) inches past edge of PSA tape onto membrane facing.

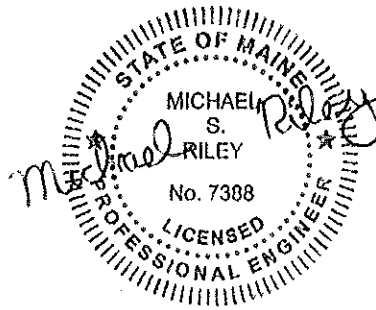
END OF SECTION



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King Street Water Main Replacement Specifications

Prepared for:
Oxford Water District



11 March 2014

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LIST OF DIVISION SPECS

DOCUMENT

DIVISION 0 - NOT USED

DIVISION 1 - GENERAL REQUIREMENTS

01010	Summary of Work
01040	Project Coordination
01055	Subsurface Information-Utility Conflicts
01070	Abbreviations and Symbols
01150	Measurement and Payment
656.75	Temporary Erosion Control
01720	Project Record Documents

DIVISION 2 - SITE WORK

827.301	Rock Excavation
802.164, 822.36, 822.34	Water Main Fittings
825.62, 825.60	8" and 12" HDPE Water Main
825.42	Copper Tube and Fittings
823.311	Resilient Seated Gate Valves
825.32	Curb Stops and Corporation Cocks
823.334	Valve and Service Boxes
832.00	Water Distribution Testing & Disinfection
652.35	Construction Signs

DIVISION 3 - 16 - NOT USED

END OF SECTION

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SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.1 DESCRIPTION

Work Included in King Street Water Main Replacement:

- A. Replacement of approximately 660 linear feet of existing 8" water main.
- B. Contractor shall coordinate work on this contract with a separate contract to replace the bridge over the Little Androscoggin. The work includes a 120 foot river crossing with new 12" water main and all related work and appurtenances.

END OF SECTION

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SECTION 01040

PROJECT COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Divisions and Sections: For convenience of reference, the specifications are separated into titled Divisions and Sections. Such separations shall not, however, operate to make the Owner or the Engineer an arbiter or establish limits to the contracts between the Contractors and subcontractors.

END OF SECTION

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SECTION 01055

SUBSURFACE INFORMATION/UTILITY CONFLICTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Subsurface Information Not Guaranteed: Subsurface information shown in the Contract Documents is for general information of the bidders and is not guaranteed.
- B. Underground Utility Conflicts:

Condition 1 - Utilities Shown on the Plans

- 1. A utility is assumed to be "shown" on the plans if 1) the approximate location is shown or indicated on the plans or addendum, or 2) the information could reasonably have been discovered by the Contractor's direct contact with utilities during the bidding process.
- 2. The Contractor must protect the utility from damage and repair the utility if damage does occur at no additional cost to the Owner.
- 3. If the utility cannot be protected or repaired in its original location because of a direct on-grade conflict, the Contractor must permanently relocate the utility, if the new pipeline cannot be field adjusted. The Contractor will be allowed an increase in price, time, or both, to accomplish the relocation only if the following actions are taken:
 - a. The Engineer has been notified prior to the relocation.
 - b. Adequate measures to verify the additional costs have been established prior to the work being done.

Condition 2 - Utilities NOT Shown on the Plans

- 4. Any utility, which does not meet the definition of Condition 1, Paragraph '1' above, is assumed to be "not shown".
- 5. When the Contractor encounters a "not shown" utility, the Engineer shall be notified immediately and a determination made as to whether the "not shown" utility will significantly delay the Contractor's progress as defined in the Contract Documents.

6. The Contractor must protect, repair, or permanently relocate the utility. If a delay is caused, the Contractor will be allowed an increase in the contract price, time, or both, only if the following actions are taken:
- a. The Engineer has been notified prior to the relocation.
 - b. Adequate measures to verify the additional costs have been established prior to the work being done.

C. Utility Contacts: Utilities known to be in the area are as follows:

<u>Utility</u>	<u>Owner</u>	<u>Contact</u>	<u>Telephone</u>
Water	Oxford Water District	Ryan Lippincott	890-2624

END OF SECTION

SECTION 01070
ABBREVIATIONS & SYMBOLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Where any of the following abbreviations are used in these Specifications, they shall have the meaning set forth opposite each.

AASHTO	American Association of State Highway and Transportation Officials
AC	Alternating Current
ACI	American Concrete Institute
ACP	Asbestos Cement Pipe
AGA	American Gas Association
AIC	Ampere Interrupting Capacity
AGMA	American Gear Manufacturers Association
AIEE (IEEE)	American Institute of Electrical Engineers (Institute of Electrical & Electronics Engineers, Inc.)
AISC	American Institute of Steel Construction
amp	Ampere
125-16 Amer. Std.	American Standard for Cast Iron Pipe Flanges and Flanged Fittings, Class 125 (ASA B16 11960)
ANSI	American National Standards Institute
API	American Petroleum Institute
ASA	American Standards Association
ASCE	American Society of Civil Engineers
ASH & AE	American Society of Heating & Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWG	American or Brown and Sharp Wire Gauge
AWWA	American Water Works Association
BOD	Biochemical Oxygen Demand
CF	Cubic Foot
cfm	Cubic Foot per Minute
cfs	Cubic Foot per Second
CI	Cast Iron
CIPRA	Cast Iron Pipe Research Association
CSI	Construction Specifications Institute
CY	Cubic Yards
DC	Direct Current
DEP	Department of Environmental Protection
DI	Ductile Iron
DOT	Department of Transportation
EDR	Equivalent Directional Radiation
EPA	US Environmental Protection Agency

FmHA	Farmers Home Administration
fps	Feet Per Second
ft	Feet
gal	Gallons
gpd	Gallons Per Day
gpm	Gallons Per Minute
HDPE	High Density Polyethylene
HP	Horsepower
IBR	Institute of Boiler & Radiator Manufacturers
in	Inches
inter.	Interlock
ISA	Instrument Society of America
kva	Kilovolt-ampere
kw	Kilowatt
lb	Pound
max.	Maximum
MCB	Master Car Builders
MDOTSSHB	Maine Department of Transportation Standard Specifications for Highways and Bridges
MGD	Million gallons per Day
Min.	Minimum
NBS	National Bureau of Standards
NEC	National Electrical Code, Latest Edition
NEMA	National Electrical Manufacturers Association
NEWWA	New England Water Works Association
NPT	National Pipe Thread
OS&Y	Outside Screw and Yoke
PCA	Portland Cement Association
ppm	Parts Per Million
%	Percent
psi	Pounds per Square Inch
psig	Pounds per Square Inch Gauge
PVC	Polyvinyl Chloride
rpm	Revolutions Per Minute
SF	Square Foot
STL. W.G.	US Steel Wire, Washburn & Moen, American Steel and Wire Cos., or Roebling Gauge
SY	Square Yard
TDH	Total Dynamic Head
USAS	Standards of the US of America Standards Institute (formerly American Standards Association)
USS GAUGE	US Standard Gauge
VC	Vitrified Clay
WSP	Working Steam Pressure
Fed. Spec.	Federal Specifications issued by the Federal Supply Service of the General Service Administration, Washington, D.C.

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.1 DESCRIPTION

- A. For all items other than those to be paid for by lump sum amounts, after the work is completed and before final payment is made therefore, the Engineer will make final measurements to determine the quantities of various items of work accepted as the basis for final settlement. Payment for quantities on a lump sum project will be made to the Contractor only with the authorization of Change Order approved by the Owner and the Contractor. MaineDOT requires daily agreement on quantities.
- B. The Contractor, in case of unit-price items, shall be paid for the actual amount of work accepted and the actual amount of materials in place, as shown by final measurement except as provided for in Section 01150.1.2.A.
- C. All units of measurement shall be standard U.S. convention as applied to the specific items of work by tradition and as interpreted by the Engineer.
- D. These complete forms will provide the basis of the Engineer's monthly quantity estimate upon which payment will be made.

1.2 SCOPE OF PAYMENT

- A. Payments to the Contractor will be made for the actual quantities of the Contract items performed and accepted in accordance with the Contract Documents
- B. The Contractor shall accept in compensation, as herein provided, in full payment for furnishing all materials, labor, tool, equipment, and incidentals necessary to the completed work and for performing all work contemplated and embraced by the Contract; also for all loss or damage arising from the nature of the work, or from the action of the elements, or from any unforeseen difficulties which may be encountered during the execution of the work and until its final acceptance by the Owner, and for all risks of every description connected with the execution of the work, except as provided herein, also for expenses incurred in consequence of the suspension of the work as herein authorized.
- C. The payment of any partial estimate or of any retained percentage except by and under the approved final invoice, in no way shall diminish the obligation of the Contractor to repair or renew any defective parts of the construction or to be responsible for all damage due to such defects.

1.3 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

- A. When alterations in the quantities of work not requiring supplemental agreements, as hereinbefore provided for, are ordered and performed, the Contractor shall accept payment in full at the Contract price for the actual quantities of work done. No allowance will be made for anticipated profits. Increased or decreased work involving supplemental agreements will be paid for as stipulated in such agreements.

1.4 OMITTED ITEMS

- A. Should any items contained in the proposal form be found unnecessary for the proper completion of the work contracted, the Engineer may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.5 PARTIAL PAYMENTS

- A. See General Conditions, Document 00700, Article 14, for payments to the Contractor, except as modified below.
- B. Partial payments shall be made monthly as the work progresses according to and in compliance with MaineDOT Standard Specification 108.2.
- C. No monthly payments shall be required to be made when, in the judgment of the Engineer the work is not proceeding in accordance with the provisions of the Contract Documents, or when in this judgment the total value of the work performed since the last payment amounts to less than \$5,000.
- D. Estimates of lump sum items shall be based on a schedule dividing each item into its appropriate component parts together with a quantity and a unit price for each part so that the sum of the products of prices and quantities will equal the contract price for the item. This schedule shall be submitted by the Contractor for, and must have the approval of, the Engineer before the first estimate becomes due.

1.6 PAYMENT FOR MATERIAL DELIVERED

- A. Payment shall be made for all or part of the value of acceptable, non-perishable materials and equipment which are to be incorporated into bid items, have not been used and have been delivered to the construction site, or placed in storage places acceptable to the Owner. Prior to payment being made, submit to the Engineer, original invoices accompanied by receipted bills as proof of payment of all the value of the materials and/or equipment under consideration. Materials and equipment when so paid for by the Owner, shall become the property of the

Owner, and in the event of default on the part of the Contractor, the Owner may use, or cause to be used, these materials and equipment in the construction of the work. The Contractor shall be responsible for any damage to, or loss of, these materials and equipment. The amounts thus paid by the Owner shall reduce the estimated amounts due the Contractor as the material is used in the work.

- B. No partial payment shall be made upon fuels, supplies, lumber, false work, or other materials, or on temporary structures of any kind which are not a permanent part of the contract.

1.7 INCIDENTAL WORK

- A. Incidental work items for which separate payment is not measured include, but are not limited to, the following items:
 - 1. Restoration of property.
 - 2. Cooperation with other Contractors, Utilities, and others.
 - 3. Uncovering existing culvert ends for Owner inspection
 - 4. Utility crossings, unless otherwise paid for.
 - 5. Minor Items -- such as pole restraint, replacement of fences, rock wall, etc.
 - 6. Steel and/or wood sheeting as required.
 - 7. Construction Layout.
 - 8. Cutting, removal and disposal of existing pavement, piping, culverts, stones, etc.
 - 9. Common Excavation required to attain subgrade levels in pathway cut areas, "wet areas" and other miscellaneous common excavation required.
 - 10. Repair of existing utilities damaged during the course of construction.
 - 11. Dewatering
 - 12. Traffic control
 - 13. Loam and seed

1.8 DESCRIPTION OF PAY ITEMS

- A. The following sections describe the measurement of and payment for the work to be done under the respective items listed in the proposal.
- B. Each unit or lump sum price stated in the Proposal shall constitute full compensation, as herein specified, for each item of the work completed.

Item 825.60 & 825.62 – Provide 12" & 8" Water Main (River Crossing)

The quantity of Water Main Construction to be measured for payment will be the number of linear feet measured in place along the centerline of the restrained joint pipe

acceptably installed and tested. Water main constructed will be paid for at the Contract unit price per linear foot in the following manner:

85% of pipe quantity will be paid upon proper installation
10% of pipe quantity will be paid upon proper cleaning and testing
5% of pipe quantity will be paid upon receipt of record drawings

No separate payment will be made for demolition, clearing, excavation, trench shaping, dewatering, bedding, pipe placement, anti-floatation anchors, fittings, trench dams, backfilling, gravel base & subbase (including water added to aid compaction), mulching, loaming and seeding, testing, and disposal of excess material, the cost of which shall be considered included in the Contract unit price for Water Main Construction.

Item 823.311 – Provide 12" Resilient Wedge Gate Valves

Measurement for gate valves shall be by the unit. Payment for gate valves will be at the contract price per unit complete, in place, and accepted, with gate box and cover, mechanical joint bolts and accessories, excavation, backfill and loam and seed as necessary for a complete and operating installation.

Item 910.30 – Special Work - Provide Hydrant Lateral and RW Valve

Measurement will be made for each hydrant lateral with shutoff valve provided. Payment of this item shall be full compensation for providing a complete and fully functioning hydrant lateral and shut off valve, and installing two hydrants supplied by Owner.

Item 910.301 – Special Work – Water Main Connection A & B

Work done under these two items will be paid for upon a successful and fully functioning connection between the new main and the existing water mains on either side of the river. Water main connections will be paid at the lump sum prices contained in the bid.

Item 910.301 Special Work – Water Main Service Lateral

Payment of the lump sum price for this item shall be full compensation for all work required to remove an existing copper service line by disconnecting it at the main.

Item 827.31 – Unsuitable Material Excavation

Measurement will made for cubic yards of unsuitable material removed and disposed of including muck, organics, and all other material not suitable for proper construction as determined and approved by Engineer. Payment of this item shall be full compensation for the excavation and disposal of the unsuitable material. In-place replacement of the unsuitable material with suitable material is incidental to this pay item.

Item 827.301 – Rock Excavation Water Main

Ledge Excavation: The method of measurement for Rock Excavation will be the number of cubic yards acceptably excavated and disposed of, computed by multiplying the authorized trench width times the average depth times the distance along the trench.

The method of measurement for boulders will be as spheres ($V \text{ (CY)} = 0.16R^3$) where R is the average radius in feet computed on the basis of at least three representative measurements of circumference. Ledge Excavation will be paid for at the Contract unit price per cubic yard. Authorized trench width for utilities shall be as indicated on drawings.

"Ledge" and "rock" include any natural compound, natural mixture and chemical element required to be excavated that, in the opinion of the Engineer, can be removed from its existing position and state only by blasting, drilling and blasting, wedging, drilling and wedging, wedging and breaking with power hand tools, or by extending the use of an approved excavating machine beyond normal and design wear and tear. No boulder, ledge, slab or other single piece of excavated material less than 3.0 cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer, it must be removed from its existing position by one of the methods mentioned above.

Item 827.331 - Trench Insulation

The method of measurement and payment will be the number of square yards of 2-inch thick, rigid polystyrene insulation, suitable for direct burial, properly installed per contract documents and as directed and approved by Engineer. Payment of this item shall be full compensation for all labor and incidentals necessary for proper installation.

Item 656.75 - Temporary Soil Erosion and Water Pollution Control

Payment of the lump sum price for this item shall be full compensation for all work required to prevent soil erosion and subsequent water pollution, including silt fence, hay bales, stone check dams, mulch etc.

Item 659.10 - Mobilization

Payment of the lump sum price for this item shall be full compensation for all work required to fully mobilize workforce, equipment and materials.

Item 652.35 - Construction Sign

Work done under this item is for providing a construction sign. Measurement and payment will be based on the square footage of sign.

END OF SECTION

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SECTION 656.75

TEMPORARY EROSION CONTROL

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Provide all labor, equipment, materials and maintain temporary erosion control devices as specified herein and as shown on the Drawings.
2. Provide such erosion control measures as may be necessary to correct conditions that develop prior to the completion of permanent erosion control devices or as required to control erosion that occurs during normal construction operations.
3. Construction operations shall comply with all federal, state and local regulations pertaining to erosion control.
4. After awarded the Contract, prior to commencement of construction activities, meet with the Engineer to discuss erosion control requirements and develop a mutual understanding relative to details of erosion control.
5. Erosion control devices include, but are not limited to, silt fences, filter barriers, rock check dams, hay bales, sand bags, landscaping, and similar items. The extent of erosion control is only partially shown on the Drawings. The Contractor shall also furnish and install all erosion control measures, which are required by other related authorities, such as DEP, local boards, and all other similar entities.

B. Related Work Specified Elsewhere:

1. Site work is specified in appropriate sections of Division 2.

C. Design Criteria:

1. Conduct all construction in a manner and sequence that causes the least practical disturbance of the physical environment.
2. Stabilize disturbed earth surfaces in the shortest time and employ such temporary erosion control devices as may be necessary until such time as adequate soil stabilization has been achieved.

1.2 SUBMITTALS

- A. Contractor shall furnish to the Engineer, in writing, his work plan giving proposed locations for storage of topsoil and excavated material before

beginning construction. A schedule of work shall accompany the work plan. Acceptance of this plan will not relieve the Contractor of the responsibility of completion of the work as specified.

1.3 QUALITY ASSURANCE

A. Standards:

1. Maine Department of Transportation Standard Specifications for Highways and Bridges, Section 656, Temporary Erosion Control.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Baled Hay: At least 14"x18"x30" securely tied and staked twice per bale in accordance with MDOT Standard Specification details.
- B. Sand Bags: Heavy cloth bags of approximately one cubic foot capacity filled with sand or gravel.
- C. Mulches:
 1. Asphalt emulsion, compost, corn stalks, gravel, crushed stone, loose hay, straw, peat moss, pine straw or needles, sawdust, wood chips, wood excelsior, or wood fiber cellulose.
 2. Type and use shall be as specified by the MDOT Standard Specifications, Subsection 717.04, Mulch; Subsection 717.05, Mulch Binder and applicable subsections of Section 619, Mulch, or as outlined in MDEP Maine Best Management Practices Manual.
- D. Erosion Control Blankets:
 1. Type and use shall be as specified by the MDOT Standard Specifications, Section 613 – Erosion Control Blankets, Subsection 717.061.
 2. Reference: North American Green Series.
- E. Seed:
 1. Temporary seeding shall conform to the requirements of MDOT Standard Specifications, Subsection 618.02 Seeding Material and Subsection 717.03 Seed.
 2. Equivalent seed mixture may be used as approved by the Engineer based on its suitability for use in controlling erosion of the various soil types and slopes.

- F. Sod:
 - 1. Sodding shall conform to the requirements of MDOT Standard Specifications, Section 616 Sodding.
- G. Silt Fence:
 - 1. Type and use shall be in accordance with the Temporary Soil Erosion and Water Pollution Control measures required under Section 656 of MDOT Standard Specifications, 2002 and as shown on details.
- H. Drains:
 - 1. Flexible drains consisting of collapsible neoprene pipe, minimum of 8" in diameter, or an approved equal.
 - 2. Corrugated metal of a gauge consistent with the loading conditions. A minimum size of 12" in diameter or approved equal.
- I. Stakes:
 - 1. Stakes shall be 2"x2"x36" pine.
- J. Water:
 - 1. Contractor shall provide water and equipment to control dust, as required by job conditions.

2.2 CONSTRUCTION REQUIREMENTS

- A. Temporary Erosion Checks:
 - 1. Construct temporary erosion checks in ditches and other locations designated by the Engineer.
 - 2. Baled hay and/or sand bags may be used in an arrangement to fit local conditions designated by the Engineer.
 - 3. Type and use shall be as specified by the Temporary Soil Erosion and Water Pollution Control measures required under Section 656 of MDOT Standard Specifications, 2002.
- B. Temporary Berms:
 - 1. Construct temporary barriers along the toe of embankments when designated by the Engineer.
 - 2. Construct temporary side drains in intervals designated by the Engineer.

C. Temporary Slope Drains:

1. Shall be collapsible pipe with corrugated metal pipe inlet with a crescent shaped barrier placed at each slope drain.

D. Debris Basin:

1. A barrier or dam constructed across a water way or other suitable location to form a silt or sediment basin, as directed by the Engineer.
2. Capacity shall be equal to the volume of sediment expected to be trapped at the site during the planned use for life of the structure or if the periodic removal of debris would be practical, the capacity should be proportionately reduced.
3. Design shall be in accordance with the Standards for Ponds, Grade Stabilization Structures, MDEP Maine Stormwater Management: Best Management Practices and/or as shown on the Drawings.

E. Hay bale barriers shall be checked on a regular basis and after each rainfall.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. Install erosion control devices as shown on the Drawings and as specified herein and in compliance with applicable sections of the MDOT Standard Specifications.

1. Apply seed for temporary cover as specified in MDOT Standard Specifications, Section 618 and Section 717.03.
2. Apply hay or straw as specified in MDOT Standard Specifications, Section 619 and Section 717.05.
3. Install silt fence in accordance with the Temporary Soil Erosion and Water Pollution Control measures required under Section 656 of MDOT Standard Specifications, 2002.

B. Protection:

1. Protect all areas outside and inside the contract limit line from fuel, lubricants, sediment and other pollutants.
2. All topsoil to be stored for more than six months shall be immediately seeded as specified in MDOT Standard Specifications, Subsection 618 and Subsection 717.03.
3. All catch basin inlets to be protected by hay bales.

C. Tracking and spilling of earth and debris on public streets is not permitted.

3.2 REMOVAL AND DISPOSAL

- A. General: When permanent soil stabilization has been achieved, such temporary materials and devices that are unsightly in appearance or not readily degradable shall be removed.
- B. Reuse: Materials and devices of suitable type and condition may be reused at other on-site locations when approved by the Engineer. Materials and devices, determined by the Engineer to be unsuitable for reuse, shall become the Contractor's property and shall be disposed of in a manner and location approved by the Engineer.

END OF SECTION

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SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Keep accurate record documents for all additions, substitutions of material, variations in work, and any other additions or revisions to the Contract.
- B. Related Work Specified Elsewhere: Shop Drawings, Project Data, and Samples are specified in "General Conditions".

1.2 MAINTENANCE OF DOCUMENTS

- A. Maintain at job site, one copy of:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Reviewed Shop Drawings
 - 5. Change Orders
 - 6. Any other modifications to the Contract
 - 7. Field test reports
- B. Maintain documents in clean, dry, legible condition.
- C. Do not use record documents for construction purposes.
- D. Make documents available at all times for inspection by the Engineer and Owner.

1.3 RECORDING

- A. Label each document "Project Record" in large high printed letters.
- B. Keep record documents current and do not permanently conceal any work until required information has been recorded.
- B. Contract Drawings: Legibly mark to record actual construction:
 - 1. Horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements.

- a. Include all water, sewer, and fuel piping systems and all electrical and communications circuits including all direct burial cables.
 - b. Whenever any existing utility line is uncovered in the course of excavation for new utility installation, record location dimensions for such lines.
 - c. Method of location and recording shall have prior approval of the Engineer.
- 2. Field changes of dimension and detail and changes made by Change Order or Field Order.
- 3. Details not on original Contract Drawings.
- D. Specifications and Addenda: Legibly mark up each Section to record:
 - 1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.
 - 2. Changes made by Change Order or Field Order.

1.4 SUBMITTALS

- A. At the completion of the project, deliver Record Documents to the Engineer.
- C. Accompany submittal with transmittal letter, in duplicate, containing:
 - 1. Date, project title and number.
 - 2. Contractor's name and address.
 - 3. Title and number of each Record Document with certification that each document is complete and accurate.
 - 4. Signature of Contractor, or his authorized representative.

END OF SECTION

SECTION 827.301

ROCK EXCAVATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Included:

1. Trench excavation work in ledge includes the removal of ledge and rock required for the installation of pipes and structures.
2. "Ledge" and "rock" include any natural compound, natural mixture, and chemical element required to be excavated that, in the opinion of the Engineer, can be removed from its existing position and state only by blasting, drilling and blasting, wedging, drilling and wedging, wedging and breaking with power hand tools, or by extending the use of an approved excavating machine beyond normal and design wear and tear. No boulder, ledge, slab, or other single piece of excavated material less than two cubic yards in total volume shall be considered to be rock unless, in the opinion of the Engineer, it must be removed from its existing position by one of the methods mentioned above.
3. All trench excavation shall be classed as earth or ledge.

B. Related Work Specified Elsewhere (When Applicable):

1. The use of explosives will conform to MDOT SSHB 107.12.
2. When applicable, clearing, removal and replacement of paving, trench excavation - earth, backfilling, dewatering, borrow and bedding material, manholes and catch basins are specified in the appropriate Sections in this Division.
3. Pipe and pipe fittings are specified in Divisions 2.

1.2 JOB CONDITIONS

A. Utilities:

1. The locations of known buried water lines, sewer lines, telephone cables, storm drains, culverts, gas mains, electric conduits and other utilities are shown. No guarantee is made as to the correctness of the locations shown and to the completeness of the information given. Refer also to Division 1 for utility information.
2. Use manual excavation methods to locate existing utilities.

B. Existing Structures:

1. Perform excavation in such a manner that will prevent any possibility of undermining and disturbing the foundations of any existing structures and any work previously completed under this Contract.
2. Where existing buildings and other structures are in close proximity to the proposed construction, exercise extreme caution and utilize whatever precautionary measure may be required.

C. Repairing Damage: Repair, or have repaired, all damage to existing utilities, structures, lawns, and other public and private property which results from construction operations, at no additional expense to the Owner, to the complete satisfaction of the Engineer, the utility company, property owner and the Owner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. The Contractor shall not have right of property to any suitable materials taken from any excavation. Do not remove any such materials from the construction site without the approval of the Engineer. This provision shall in no way relieve the Contractor of his obligations to remove and dispose of any material determined by the Engineer to be unsuitable for backfilling.

PART 3 - EXECUTION

3.1 PERFORMANCE

A. General:

1. Unless otherwise specifically directed or permitted by the Engineer, begin excavation at the low end of sewer lines and proceed upgrade.

B. Amount of Excavation:

1. Trench width: As shown.
2. Trench depth: As shown.
3. Open Excavation:
 - a. The extent of open excavation shall be controlled by prevailing conditions.
 - b. Open excavation shall, at all times, be confined to the limits as directed by the Engineer.

4. Unauthorized Excavation:
 - a. Backfill to the specified grade, any excavation beyond the limits stated above and as shown on the Drawings (unless specifically ordered by the Engineer) with thoroughly compacted crushed stone or screened gravel.
 - b. Backfilling unauthorized excavation shall be at no additional cost to the Owner.

C. Shoring and Bracing:

1. As the excavation progresses, install such shoring and bracing necessary to prevent caving and sliding and to meet the requirements of the State and OSHA safety standards.

D. Blast Monitoring:

1. A pre-blast survey shall be performed for all blasting unless such survey is specifically specified by the Engineer, in writing, not to be necessary.
2. The following information will be printed out for each blast and a copy given to the Engineer:

Instrument type
Instrument calibration date
Date and time of blast
Instrument location
Distance to blast
Resultant peak particle velocity (in/sec)
Seismograph operator
Airblast (dB)

END OF SECTION

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SECTION 825.62, 910.30, 910.301

WATER MAIN FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install ductile iron fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: Pipe is specified in this division.

1.2 QUALITY ASSURANCE

- A. Standards:
 - 1. Cement-mortar lining for water: ANSI A21.4, AWWA C104 & C110
 - 2. Fittings, 2" through 48": ANSI A21.10 or ANSI A21.53, AWWA C153
 - 3. Rubber gasket joints: ANSI A21.11.
 - 4. Flanged fittings: ANSI B16.1.
 - 5. Threaded flanges: ANSI A21.15.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Standard Fittings:
 - 1. Minimum 250-psi working pressure, except as shown on the Drawings or as specified.
 - 2. Joints the same as the pipe with which they are used, or as shown on the Drawings.
 - 3. Provide fittings with standard bases where shown on the Drawings.
 - 4. Fittings shall have double the lining thickness specified in ANSI A 21.4.
 - 5. Mechanical joint follower glands to be ductile iron retainer type with ductile iron set screws. Glands 4" to 12" shall have a working pressure of 200 psi with a 2:1 safety factor; larger glands shall have at least 175 psi working pressure with a 2:1 safety factor. Retainer glands used on PVC pipe shall be designed especially for that material. The Grip Ring system manufactured by Romac Industries may be substituted for retainer glands.

B. Non-Standard Fittings:

1. Fittings having non-standard dimensions shall be subject to the Engineer's approval.
2. Non-standard fittings shall have the same diameter and thickness as standard fittings and shall meet the specification requirements for standard fittings.
3. The laying lengths and types of joints shall be determined by the particular piping to which they connect.
4. Flanged fittings not meeting the requirements of ANSI A21.10 (i.e., laterals or reducing elbows) shall meet the dimensional requirements of ANSI B16.1 in Class 125.

C. Mechanical Joint Tapping Sleeves:

1. Ductile Iron meeting ASTM A536
2. Side flange seals shall be of the O-ring type of either round, oval or rectangular cross-sectional shape.
3. Tapping sleeve to be used in conjunction with a mating tapping valve from same manufacture. Outlet flange of 12" and smaller sleeves to be counterbored per MSS SP-60 for true alignment of tapping valve and tapping machine. Sizes of outlet to be available through equal opening of sleeve diameters up to 24". Sizes 12" and smaller sleeves must be capable of working on Class ABCD Pipe diameters without changing either half of sleeves. Sizes 14" and larger must be specified as to which class size is needed. All sleeves are to include the end joint accessories and split glands necessary to assemble sleeve to pipe. MJ bolts and nuts are to conform to ANSI/AWWA C111/A21.11. No special tools other than standard socket wrench to be required for assembly of sleeve to main.
4. Ductile Iron Sleeve shall be coated with asphaltic varnish per Federal Specification TT-V-51, Military Specification MIL C-450, or equal.

D. Stainless Steel Tapping Sleeve:

1. All stainless steel tapping sleeves shall have the following features:
 - a. 304 Stainless steel flange welded to a 304 stainless steel neck. Outlet flange shall conform to AWWA C-207 Class D with drilling recessed for tapping valve
 - b. Mig welded to form strong permanent fusion with the shell and fully passivated
 - c. Shell is 304 stainless steel per ASTM A -240.
 - d. The test plug is type 304 stainless steel 3/4 NPT, with standard square head for pressure testing before tapping pipe
 - e. The lifting bar shall be 304 stainless steel

- f. Nuts, bolts and washers shall be 304 stainless steel (Type 18-8). Bolt threads shall be Teflon coated to prevent galling. Plastic lubricating washer to reduce friction between nut and lifting bar
- g. All stainless steel tapping sleeves shall be Romac Model "SST" Stainless Steel, or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General:

1. Coordinate with utility when tapping live lines or when cutting tees or other fittings into existing lines.
2. Operate no valves without permission of the utility.
3. Ensure that all exposed fittings, new and existing, are thrust blocked or otherwise restrained prior to backfilling excavation.

B. Connections to Existing Lines:

1. Excavate and ascertain size and materials of existing piping prior to ordering materials.
2. Coordinate with utility when cutting in tees or other fittings.
3. Operate no valves without permission of the utility.

C. Cutting:

1. Perform all cutting with machines designed to cut cast or ductile iron. Do not use a hammer and chisel to cut pipe.
2. After cutting, examine all cut ends for possible cracks.
3. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

D. Joints:

1. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.
2. Lubricate the gasket, bell and spigot by washing with soapy water.
3. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly seated.
4. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.
5. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joint to the proper tension with a torque wrench.
6. The correct range of torque (as indicated by a torque wrench) and the length of wrench (if not a torque wrench) shall not exceed:
 - (1) Range of Torque: 60-90 ft. - lbs.
 - (2) Length of Wrench: 10".

7. If effective joint sealing is not attained at the maximum torque specified above, disassemble, thoroughly clean and reassemble the joint. Do not overstress the bolts to tighten a leaking joint.

E. Tapped Connections:

1. Make all tapped connections as shown on the Drawings and/or as directed by the Owner.
2. Make all connections watertight and of adequate strength to prevent pullout.
3. Drill and tap normal to the longitudinal axis of the pipe.
4. The maximum sizes of taps in pipes and fittings without bosses shall not exceed the sizes listed in the appendix of ANSI A21.51, based on three full threads for cast iron and two full threads for ductile iron.

END OF SECTION

SECTION 825.60, 825.62
8" AND 12" HDPE WATER MAIN

PART 1 - GENERAL

1.1 DESCRIPTION

This specification covers high-density polyethylene (PE 3408) pressure pipe primarily intended for the transportation of potable water either buried or above grade. Work includes furnishing and installing high-density polyethylene pipe and fittings of the type(s) and size(s) and in the location(s) shown on the drawings and as specified herein.

1.2 QUALITY ASSURANCE

- A. Materials used for the manufacturing of polyethylene pipe and fittings shall be PE 3408 High Density Polyethylene (HDPE) meeting the ASTM D3350 cell classification of 345434C.
- B. The material shall have a minimum Hydrostatic Design Basis (HOB) of 1600 psi at 73SF when tested in accordance with PPI TR-3 and shall be listed in the name of the pipe and fitting manufacturer in PPI TR-4.
- C. The material used in the production of potable water pipe shall be approved by the National Sanitation Foundation (NSF-61).
- D. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet the requirements of this specification.

1.3 SUBMITTALS TO THE ENGINEER

- A. Submit shop drawings in accordance with the general conditions of the construction contract.
- B. If requested by the Engineer, submit manufacturer's "Certification of Conformance" that pipe and fittings meet or exceed the requirements of these specifications.
- C. Submit other documents as specified in the appropriate sections of this division.

PART 2 - PRODUCTS

2.1 PIPE

- A. Polyethylene pipe shall be manufactured in accordance with AWWA C906 for sizes 4' through 54'. Pipe shall be 12" DIPS SDR 11.
- B. Permanent identification of potable piping service shall be provided by co-extruding longitudinal blue stripes into the pipe's outside surface. The striping material shall be the same material as the pipe material except for

color. Stripes printed or painted on the pipe outside surface shall not be acceptable

2.2 FITTINGS

- A. Mechanical joint ductile iron with accessories and MJ Adaptor with stiffener rings.

PART 3 - EXECUTION

3.1 INSTALLATION AND TESTING

- A. Joints between plain ends of polyethylene pipe shall be made by butt fusion when possible. The Pipe Manufacturer's fusion procedures shall be followed at all times as well as the recommendations of the Fusion Machine Manufacturer. The wall thickness of the adjoining pipes shall have the same DR at the point of fusion. Electrofusion couplings of proper pressure rating installed according to manufacturers written instructions may be used where outside diameter is not a limitation.
- B. When saddle connections are fusion welded the Manufacturers recommended saddle fusion procedures shall be used.
- C. If mechanical fittings (which are designed for, or tested and found acceptable for use with polyethylene pipe) are utilized for transitions between pipe materials, repairs, joining pipe sections, saddle connections, or at other locations, the recommendation of the Mechanical Fitting Manufacturer must be followed. These procedures may differ from other pipe materials. A stainless steel insert shall be used with adapters to mechanical joint pipe and fittings.
- D. On each day butt fusions are to be made, the first fusion of the day shall be a trial fusion. The trial fusion shall be allowed to cool completely, then fusion test straps shall be cut out. The test strap shall be 12" or 30 times the wall thickness in length (minimum) and 1" or 1.5 times the wall thickness in width (minimum). Bend the test strap until the ends of the strap touch. If the fusion fails at the joint, a new trial fusion shall be made, cooled completely and tested. Butt fusion of pipe to be installed shall not commence until a trial fusion has passed the bent strap test.
- E. Socket and Saddle fusions shall be tested by a bent strap test as described by the Pipe Manufacturer. The Pipe Manufacturer shall provide visual guidelines for inspecting the butt, saddle, and socket fusion joints.
- F. Pressure testing shall be conducted in accordance with the Manufacturer's recommended procedure. Pressure testing shall use water as the test media. Pneumatic (air) testing is prohibited.

END OF SECTION

SECTION 825.42

COPPER TUBE & FITTINGS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install copper tube and fittings of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

- A. Pipe: Seamless copper water tube, ASTM B88 (pressure) and ASTM B306 (atmospheric).

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Tube Use (when applicable):
 - 1. Buried water services, fuel oil piping (where indicated):
 - a. Type K, soft temper.
- B. Fittings:
 - 1. Cast bronze fittings for flared copper tube: AWWA C-800 (latest revision).
 - 2. Packed Compression Fittings – Buna-N beveled gasket - AWWA C-800 (latest revision).

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Flared Joints:
 - a. Ream or file pipe to remove burrs.
 - b. Slip the fittings over the tube ends to be flared.
 - c. Expand the ends of the tube using flaring tools.
 - d. Inspect the flared ends for cracks, splits and other damage.
 - e. If inspection reveals damage, cut the flare off and make a new flare.
 - f. Squarely seat the flared ends on the fittings and tighten the nuts.
- B. Bending Tube:

1. Bend tube by the method and to the radius to comply with the manufacturer's recommendation. No flattened or crimped tube shall be installed.
2. Bends shall be free of any cracks or buckles.

END OF SECTION

SECTION 823.311

RESILIENT SEATED GATE VALVES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included - Furnish and install gate valves of the size(s) and in the location(s) shown on the drawings and as specified.
- B. Related Work Specified Elsewhere:
 - 1. Requirements for buried water distribution main are specified in this division.

1.2 QUALITY ASSURANCE

- A. Acceptable Manufacturers:
 - 1. Waterous (American Flow Control) Series 500.
 - 2. Clow
 - 3. Or approved equal.
- B. All gate valves of same type and style shall be by one manufacturer.
- C. All gate valves to open right.

PART 2 - PRODUCTS

2.1 VALVE LOCATION AND USE

- A. As shown on the drawings.
- B. All 3" to 12" Water Piping:
 - 1. Buried: AWWA Type.
 - 2. Exposed: AWWA OS&Y.
 - 2. Exposed with floor box or floor stand: AWWA NRS.
- C. Accessories: As shown on the drawings and required for proper operation.

2.2 MATERIALS

- A. Waterworks type NRS valves, Resilient-Seated (in accordance with AWWA C509):
 - 1. Ductile Iron Body.
 - 2. Non-rising stem (NRS).
 - 3. Stainless Steel Body Bolts.
 - 4. Meet or exceed AWWA C-509.
 - 5. Ductile Iron Wedge Encapsulated in Synthetic Rubber meeting AWWA

- C153.
6. Full Diameter Waterway.
 7. End Connections: Mechanical Joint for buried, or as shown on the drawings and as required for pipe.
 8. Solid high strength bronze stem and cast bronze stem thrust collar.
 9. Corrosion resistant factory-applied fusion-bonded epoxy coated waterway, non-toxic and approved for potable water.
 10. Synthetic polymer thrust washers - one above and one below.
 11. Working pressure:
 - a. 12" and smaller: 250-psi water.
 - b. 14" and larger: 150-psi water.
 - c. Unless otherwise shown on the drawings.
 12. Stuffing Box:
 - a. 316 stainless steel or bronze bolting.
 - b. "O" ring or similar design.
 - c. Capable of replacing under pressure with valve open.
 13. Buried Valves in accordance with AWWA C111:
 - a. Corrosion resistant fusion-bonded epoxy protective coating inside and out meeting AWWA C550.
 - b. Cast iron valve box and cover required. Slide type, 2 piece with necessary extensions, minimum I. D. 5 1/4", top flange on top section. Cover 2" CI drop type with pick holes and word "Water" cast in.
 - c. 2" square operating nut, securely fastened to shaft with 316 stainless steel or bronze hold-down nut.
 14. Exposed valves:
 - a. Hand wheel with direction arrow for opening.
 - b. 2" square operating nut for floor-box operated valves.
 - c. Enamel or varnish finish.
 15. Valve operation: Open by turning counter-clockwise (left), unless otherwise shown on the drawings or when approved by the Engineer.

B. Waterworks type OS&Y valves (AWWA):

1. Ductile Iron Body.
2. Open screw and yoke (OS&Y).
3. Meet or exceed AWWA C-509.
4. Equal in all respects to non-rising stem valve specified above, except as required for OS&Y operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install exposed valves with stem position horizontal to vertical, buried valves with stem vertical.

END OF SECTION

SECTION 825.32

CURB STOPS AND CORPORATION COCKS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install curb stops and corporation cocks of the type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.
- B. Related Work Specified Elsewhere: Service boxes are specified in this division.

1.2 QUALITY ASSURANCE

- A. All curb stops and corporation cocks shall be manufactured by a single manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.
- C. Acceptable Manufacturers:
 - 1. Curb Stops:
 - a. Utility standard (if any).
 - b. McDonald ¼ turn ball type.
 - c. Or approved equal.
 - 2. Corporation Cocks:
 - a. Utility standard (if any).
 - b. McDonald ¼ turn ball type.
 - c. Or approved equal.

PART 2 - PRODUCTS

2.1 FABRICATION

- A. Constructed of ASTM B62 brass.
- B. Corporation outlet shall have packed compression or copper flare connection.
- C. Corporation inlet shall have AWWA taper.

- D. Curb stops shall have packed compression or copper flare connections.
- E. Working pressure shall be as required.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install at locations shown on the Drawings and as directed by the Engineer and in accordance with the manufacturer's instructions.
- B. Cap outlets of all curb stops which are not immediately connected to customer services to exclude dirt and groundwater.
- C. The maximum sizes of taps in pipes and fittings without bosses shall not exceed the sizes listed in the appendix of ANSI A21.51, based on three full threads for cast iron and two full threads for ductile iron. Use service saddles for service connections to all other pipe material.
- D. Service saddles, when required, shall conform to utility standard. If no utility standard exists, use two strap nylon coated DI with SS straps and bolts.

3.2 ADJUSTMENTS

- A. Check and adjust all curb stops and corporation cocks for smooth operation.

END OF SECTION

SECTION 823.334

VALVE AND SERVICE BOXES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included: Furnish and install valve and service boxes of type(s) and size(s) and in the location(s) shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

- A. All service boxes and all valve boxes shall be manufactured by one manufacturer.
- B. Qualifications of Manufacturer: Products have proven reliable in similar installations over a reasonable number of years.
- C. Acceptable Manufacturers:
 - 1. E.J. Prescott.
 - 2. Mueller Co.
 - 3. Red Head Manufacturing Company.
 - 4. Or approved equal.

PART 2 - PRODUCTS

2.1 MATERIALS AND FABRICATION

- A. Conform to utility standard, if any, or:
- B. Service boxes shall be Erie style extension type, arch pattern base, SS rod, brass pin, plug-type cover.
- C. Valve box and cover shall be cast iron slide type, two piece with necessary extensions, minimum I.D. 5¼", top flange on top section.
- D. **Water** shall be stamped into cover

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install as shown on the Drawings and/or as directed by the Owner's field representative.
 - 1. When installation is complete, the valve or curb box shall exert no pressure on the piping system.

END OF SECTION

SECTION 832.00

TESTING AND DISINFECTING WATER MAIN

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Install pipe and fittings of the size(s) and type(s) and in the location(s) shown on the drawings and as specified herein.
- B. Related Work Specified Elsewhere:
 - 1. Materials, excavation and backfill, dewatering, pavement, borrow and bedding material, and cleaning and testing requirements are specified in the appropriate sections of this Division.

1.2 DELIVERY, STORAGE AND HANDLING

- A. Provide all labor necessary to assist the Engineer to inspect pipe, fittings, gaskets and other materials.
- B. Carefully inspect all materials at the time of delivery and just prior to installation.
- C. Carefully inspect all pipe and fittings for:
 - 1. Defects and damage.
 - 2. Deviations beyond allowable tolerances for joint dimensions.
 - 3. Removal of debris and foreign matter.
- D. Examine area and structures to receive piping for:
 - 1. Defects, such as weak structural components that adversely affect the execution and quality of work.
 - 2. Deviations beyond allowable tolerance for pipe clearances.
- E. All materials and methods not meeting the requirements of the Contract Documents will be rejected.
- F. Immediately remove all rejected materials from the project site.

PART 2 - PRODUCTS

2.1 WATER DISTRIBUTION MAIN:

D.I. or HDPE as shown on the drawings.

2.2 FITTINGS

A. Mechanical joint ductile iron with accessories or buttfusion of HDPE fittings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Inspection

1. Each pipe unit shall be inspected before being installed. No single piece of pipe shall be laid unless it is generally straight.
2. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16" per foot of length.
3. If a piece of pipe fails to meet this requirement for straightness it shall be rejected and removed from the site.
4. Any pipe unit or fittings discovered to be defective either before or after installation shall be removed and replaced with a sound unit.

B. Jointing

1. All pipe and fittings shall be cleared of all debris, dirt, etc., before being installed and shall be kept clean until accepted in the completed work.
2. Pipe and fittings shall be installed to the lines and grades indicated on the drawings as required by the Engineer. Care shall be taken to ensure true alignments and gradients.
3. All joint surfaces shall be cleaned. Immediately before jointing the pipe, the bell or groove shall be lubricated in accordance with the manufacturer's recommendations.
4. Each pipe unit shall then be carefully pushed into place without damage to the pipe or gasket. Suitable devices shall be used to force the pipe units together so that they will fit with a minimum open recess inside and outside and have tightly sealed joints. Care shall be taken not to use such force as to wedge apart and split the bell or grove ends.
5. Joints shall not be *pulled* or *cramped* unless permitted by the Engineer.

C. Fabrication

1. Cut the pipe with a hand saw, metal-inserted abrasive wheel, or pipe cutter with blades (not rollers).
2. Examine all cut ends for possible cracks caused by cutting.

D. Installation in Trenches

1. Firmly support the pipe and fittings on bedding material as shown on the Drawings and as specified in the appropriate Sections of these Specifications.
2. Do not permanently support the pipe or fittings on saddles, blocking stones, or any material which does not provide firm and uniform bearing along the outside length of the pipe.
3. Thoroughly compact the material under the pipe to obtain a substantial unyielding bed shaped to fully support the pipe.
4. Excavate suitable holes for the joints so that only the barrel of the pipe receives bearing pressure from the supporting material after placement.
5. Lay each pipe length so it forms a close joint with the adjoining length and bring the inverts to the required grade.
6. Set the pipe true to line and grade.
7. Do not drive the pipe down to grade by striking it with a shovel handle, timber, rammer, or any other unyielding object.
8. Make all pipe joints as watertight as possible with no visible leakage and no sand, silt, clay, or soil of any description entering the pipeline at the joints.
9. Immediately after making a joint, fill the holes for the joints with bedding material, and compact.
10. When each pipe length has been properly set, place and compact enough of the bedding material between the pipe and the sides of the trench to hold the pipe in correct alignment.
11. After filling the sides of the trench, place and lightly tamp bedding material to complete the bedding as shown on the Drawings.
12. Take all necessary precautions to prevent floatation of the pipe in the trench.
13. Where there is evidence of water or soil entering the pipeline, repair the defects to the satisfaction of the Engineer.
14. Bury to be 5.5' or as shown on the drawings.

D. Trench Insulation:

Where indicated on the Drawings or where cover over proposed water or wastewater piping is 4' or less, install 2" rigid extruded polystyrene foam plank insulation 1" above the top of pipe and at least 1' wider than pipe diameter. Planks to be furnished in widths of 2' and lengths of 8' or greater, ends tightly butted. Foam to be closed cell, K not more than .20 at 75°F, chemically inert. Hand backfill 6" over trench insulation.

E. Temporary Plugs

1. When pipe installation work in trenches is not in progress, close the open ends of the pipe with temporary watertight plugs.
2. If water is in the trench when work is resumed, do not remove plugs until all danger of water entering the pipe is eliminated.
3. Do not use the pipelines as conductors for trench drainage during construction.

F. Trench Dams

1. Trench dams to hinder the flow of groundwater through the bedding material shall be constructed along the trench. Trench dams shall be constructed of material excavated from the trench and shall extend 1' above the pipe embedment zone with a 2' minimum top width. Trench dams shall be at the locations shown.

G. Thrust Backing and Anchorage at Fittings

1. Provide thrust anchors at:
 - a. Changes in directions as at tees, bends and crosses
 - b. Changes in size, as at reducers
 - c. Stops, as at dead ends
 - d. Valves, at which thrust develops when closed
2. Concrete shall be used for thrust blocks. The thrust blocks shall be constructed by pouring concrete between the fitting and the undisturbed wall of the trench. A stiff mixture shall be used so that the concrete may be easily shaped into the desired form, a wedge with the wide end against the solid wall.
3. For vertical bends, downward thrust shall be resisted by concrete thrust blocks against undisturbed earth as specified above. Upward thrust shall be resisted by concrete thrust anchors.

3.3 POLE RESTRAINT

- A. Completion of the work may require temporary restraint of power poles. The Contractor shall obtain all necessary permits, pay all fees, and fully coordinate his activities as required by the local power utility.

3.4 CLEANING AND TESTING

- A. The completed installation shall receive a hydrostatic leakage and pressure test as described in AWWA C600 by this section using a pump capable of maintaining a constant pressure throughout the test period. The maximum allowable leakage shall be as indicated in AWWA C600.

The following precautions pertain to this test:

1. High points in the system which may trap air shall be vented to completely fill the pipe with water. This may be accomplished with air relief valves.
2. The run of pipe must be backfilled sufficiently to prevent movement while under test pressure.
3. Thrust blocks at fittings shall be permanent and constructed to withstand test pressure. Concrete thrust blocks shall be cured prior to testing.

4. Test ends shall be capped and braced to withstand the thrusts developed under test pressure.
 5. Hydrant branch gate valves shall remain open during this test.
- B. Chlorination of Pipelines (When Applicable):
1. All new potable water lines shall be chlorinated in accordance with the procedure outlined in AWWA C651 (continuous feed method).
 2. Locate chlorination and sampling points as approved by the Owner.
 3. Use a dosage which will produce not less than 25 ppm chlorine residual after a contact period of not less than 24 hours.
 4. During the chlorination period, exercise care to prevent the contamination of water in the existing water main.
 5. After chlorination, flush the piping with clean water until the chlorine residual is that prevailing in the existing system.
- C. Bacteriological Testing:
1. Test all new potable water lines for total coliform bacteria, at no additional cost to the Owner.
 2. The length of pipe to be tested and the time of the test itself shall be as approved in advanced by the Engineer.
 3. The Owner will observe the taking of samples.
 4. Have all samples tested by a laboratory approved by the State and submit test results to the Owner.
 5. Any segment of a potable water line shall be considered unsuitable for service if a coliform bacteria count is obtained from that sample.
 6. Re-disinfect all segments of piping considered unsuitable and retest. Continue to disinfect and test until no coliform bacteria are present.
 7. Place piping into service when it has been successfully tested for pressure, leakage and total coliform bacteria at 24 hours and 48 hours and has been approved by the Owner.

END OF SECTION

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SECTION 652.35

CONSTRUCTION SIGNS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Included:
 - 1. Provide, erect and remove a sign at the project site to identify the project and to indicate that the U.S. Department of Agriculture, Rural Utilities Service, is participating in this Project.
- B. Do not place, or allow the placement of, other advertising sign boards at the project site or along rights-of-way furnished for the project work.

PART 2 - PRODUCTS

2.1 MATERIAL AND DESIGN

- A. Construct a sign of ¾" exterior grade, high-density overlaid plywood or other material, approved by the Engineer, suitable for signs.
- B. Sample of Project sign is attached to this section.

PART 3 - EXECUTION

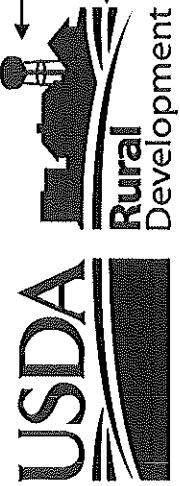
3.1 INSTALLATION

- A. Erect the sign in a prominent location as approved by the Engineer.
- B. The sign is to be removed upon written notification from the Owner following completion of the work. Notification to remove the sign will be issued when the certificate of Substantial Completion is accepted by the Owner. The sign is to be removed and the site restored to match existing usage conditions, within 10 business days of the Date of Notification.

END OF SECTION

TEMPORARY CONSTRUCTION SIGN FOR RURAL DEVELOPMENT PROJECTS

WHITE BACKGROUND

Project Title		 <p>Committed to the future of rural communities.</p>	TOWNSCAPE AND LETTER FORMS (BLUE, PMS 288)
Sponsor / Developer	ROLLING FIELDS (GREEN, PMS 343)		
Official(s) or Sponsor Address	LETTERING (GREEN, PMS 343)		
Architect or Engineer (second line)			
Contractor (second line)			
Financed by United States Department of Agriculture (USDA) Rural Development This institution is an equal opportunity provider.		Barack Obama, President of the United States Tom Vilsack, Secretary of Agriculture	

BLACK
LETTERING

BLACK LETTERING

SIGN DIMENSIONS: 1200 mm x 2400 mm x 19 mm (approx. 4' x 8' x 3/4")
PLYWOOD PANEL (APA RATED A-B GRADE-EXTERIOR)

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	03/18/14
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	Up to and	Amount of Liquidated
------	-----------	----------------------

<u>More Than</u>	<u>Including</u>	<u>Damages per Calendar Day</u>
\$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.

110 - Indemnification, Bonding and Insurance

Add the following to the end of Section 110, Indemnification, Bonding and Insurance:

Nothing in these Standard Specifications constitutes a waiver of any defense, immunity or limitation of liability that may be available to the Department, or its officers, agents or employees under the Maine Tort Claims Act (Title 14 M.R.S.A. 8101 et seq.), and shall not constitute a waiver of other privileges or immunities that may be available to the Department.

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:

<u>Organic Content</u>	<u>Percent by Volume</u>
Humus	“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 Transportation's 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>Up to and</u>	<u>Amount of Penalty Damages per Violation</u>		
<u>More Than</u>	<u>Including</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.”

703.18 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 [½ 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 [$\frac{1}{2}$ 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 [$\frac{3}{4}$ 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 “ $\geq 50\%$ ” 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 “ $\geq 50\%$ ” 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 “ $\geq 50\%$ ” 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	0.5%
(Androscoggin)	
6403 Portland, ME	0.6%
(Cumberland, Sagadahoc)	
Non-SMSA Counties:	0.5%
(Franklin, Kennebec, Knox, Lincoln, Oxford, Somerset, York)	

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



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

MAINE GENERAL PERMIT (GP)
AUTHORIZATION LETTER AND SCREENING SUMMARY

OFFICE OF ENVIRONMENTAL SERVICES
MAINE DEPT. OF TRANSPORTATION
16 STATE HOUSE STATION
AUGUSTA, MAINE 04333

CORPS PERMIT # NAE-2014-00229
CORPS PGP ID# 14-049
STATE ID# PBR

DESCRIPTION OF WORK:

Place temporary and permanent fill below the ordinary high water line of the Little Androscoggin River at Oxford, Maine in order to replace the existing deteriorated Route 121 bridge. The project will result in approximately 2,500 s.f. of temporary stream bed impact and 2,326 s.f. of permanent stream bed impact. This work is shown on the attached plans entitled "COVERED BRIDGE OVER LITTLE ANDROSCOGGIN RIVER, OXFORD, OXFORD COUNTY" in five sheets dated "11-15-13".
DOT WIN: 19268.00

LAT/LONG COORDINATES : 44.1368327° N -70.4903924° W USGS QUAD: OXFORD, ME

I. CORPS DETERMINATION:

Based on our review of the information you provided, we have determined that your project will have only minimal individual and cumulative impacts on waters and wetlands of the United States. Your work is therefore authorized by the U.S. Army Corps of Engineers under the enclosed Federal Permit, the Maine General Permit (GP). Accordingly, we do not plan to take any further action on this project.

* You must perform the activity authorized herein in compliance with all the terms and conditions of the GP [including any attached Additional Conditions and any conditions placed on the State 401 Water Quality Certification including any required mitigation]. Please review the enclosed GP carefully, including the GP conditions beginning on page 5, to familiarize yourself with its contents. You are responsible for complying with all of the GP requirements; therefore you should be certain that whoever does the work fully understands all of the conditions. You may wish to discuss the conditions of this authorization with your contractor to ensure the contractor can accomplish the work in a manner that conforms to all requirements.

If you change the plans or construction methods for work within our jurisdiction, please contact us immediately to discuss modification of this authorization. This office must approve any changes before you undertake them.

Condition 41 of the GP (page 18) provides one year for completion of work that has commenced or is under contract to commence prior to the expiration of the GP on October 12, 2015. You will need to apply for reauthorization for any work within Corps jurisdiction that is not completed by October 12, 2016.

This authorization presumes the work shown on your plans noted above is in waters of the U.S. Should you desire to appeal our jurisdiction, please submit a request for an approved jurisdictional determination in writing to the undersigned.

No work may be started unless and until all other required local, State and Federal licenses and permits have been obtained. This includes but is not limited to a Flood Hazard Development Permit issued by the town if necessary.

II. STATE ACTIONS: PENDING [☒], ISSUED [☐], DENIED [☐] DATE: _____

APPLICATION TYPE: PBR: ☒ TIER 1: ☐ TIER 2: ☐ TIER 3: ☐ LURC: ☐ DMR LEASE: ☐ NA: ☐

III. FEDERAL ACTIONS:

JOINT PROCESSING MEETING: 2/6/14 LEVEL OF REVIEW: CATEGORY 1: ☐ CATEGORY 2: ☒

AUTHORITY (Based on a review of plans and/or State/Federal applications): SEC 10 ☐ 404 ☒ 10/404 ☐ 103 ☐

EXCLUSIONS: The exclusionary criteria identified in the general permit do not apply to this project.

FEDERAL RESOURCE AGENCY OBJECTIONS: EPA NO USF&WS NO NMFS NO

If you have any questions on this matter, please contact my staff at 207-623-8367 at our Manchester, Maine Project Office. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at <http://per2.nwp.usace.army.mil/survey.html>

Jay L. Clement
JAY L. CLEMENT
SENIOR PROJECT MANAGER
MAINE PROJECT OFFICE

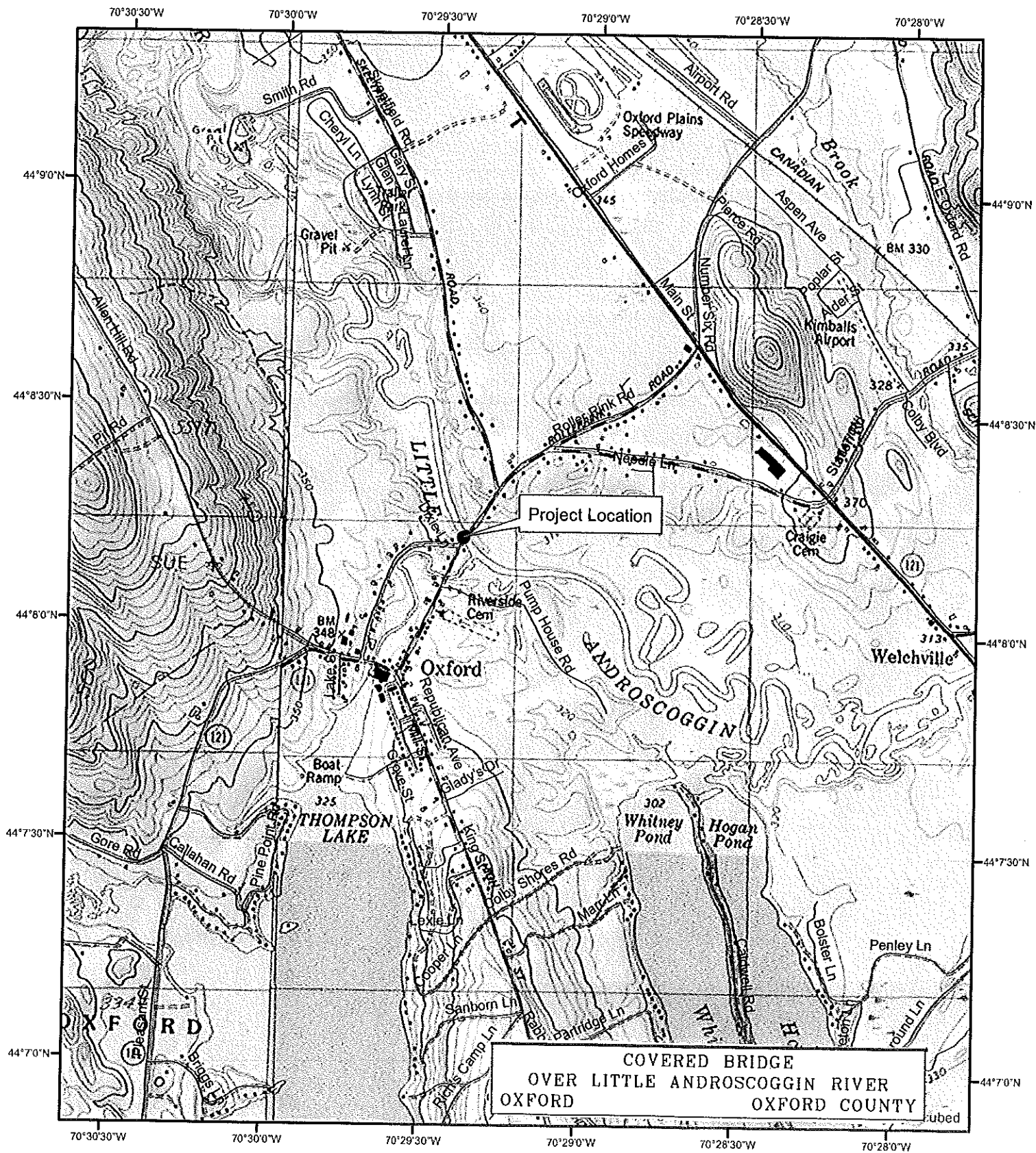
Jay L. Clement 3/28/14
FOR FRANK J. DEL GIUDICE DATE
CHIEF, PERMITS & ENFORCEMENT BRANCH
REGULATORY DIVISION



**US Army Corps
of Engineers**
New England District

**PLEASE NOTE THE FOLLOWING GENERAL CONDITIONS FOR
DEPARTMENT OF THE ARMY
GENERAL PERMIT
NO. NAE-2014-00229**

1. This authorization requires you to 1) notify us before beginning work so we may inspect the project, and 2) submit a Compliance Certification Form. You must complete and return the enclosed Work Start Notification Form(s) to this office at least two weeks before the anticipated starting date. You must complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work and any required mitigation (but not mitigation monitoring, which requires separate submittals).
2. The permittee shall assure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers' jurisdiction at the site of the work authorized by this permit. This shall be done by including the entire permit in the specifications for the work. If the permit is issued after construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. The term "entire permit" includes permit amendments. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps of Engineers jurisdiction.
Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.
3. Adequate sedimentation and erosion control devices, such as geotextile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.
4. All exposed soils resulting from the construction will be promptly seeded and mulched in order to achieve vegetative stabilization.
5. The permittee must still obtain any other Federal, State, or local permits as required by law before beginning work. This includes but is not limited to a Flood Hazard Development Permit issued by the town if necessary.
6. In water work shall be conducted between July 15 and October 1 in order to minimize potential impacts to fisheries, freshwater mussels, and local water quality.

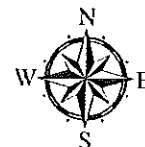


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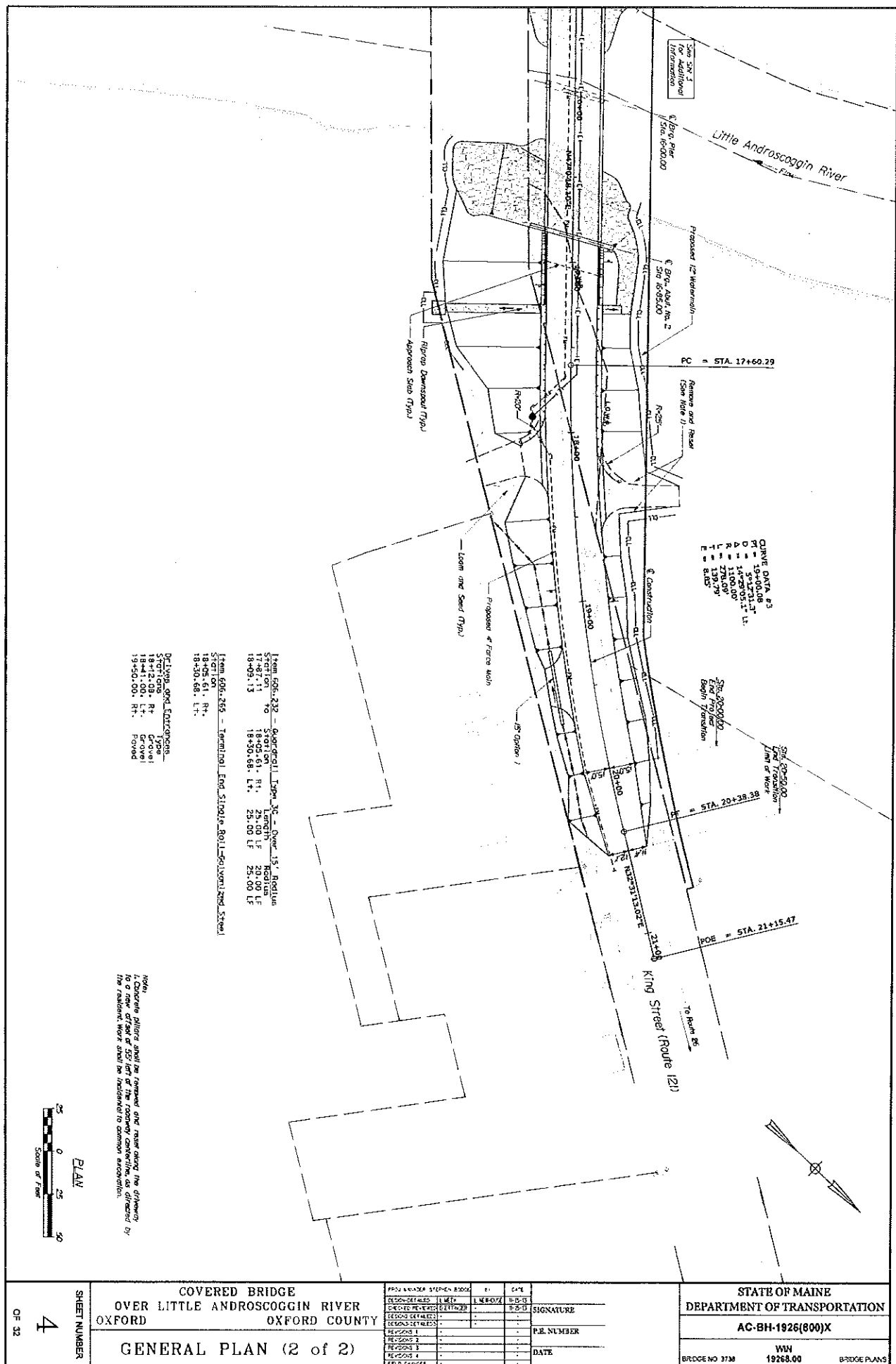
0 290 580 1,160 1,740 2,320 Feet

MDOT WIN 19268.00

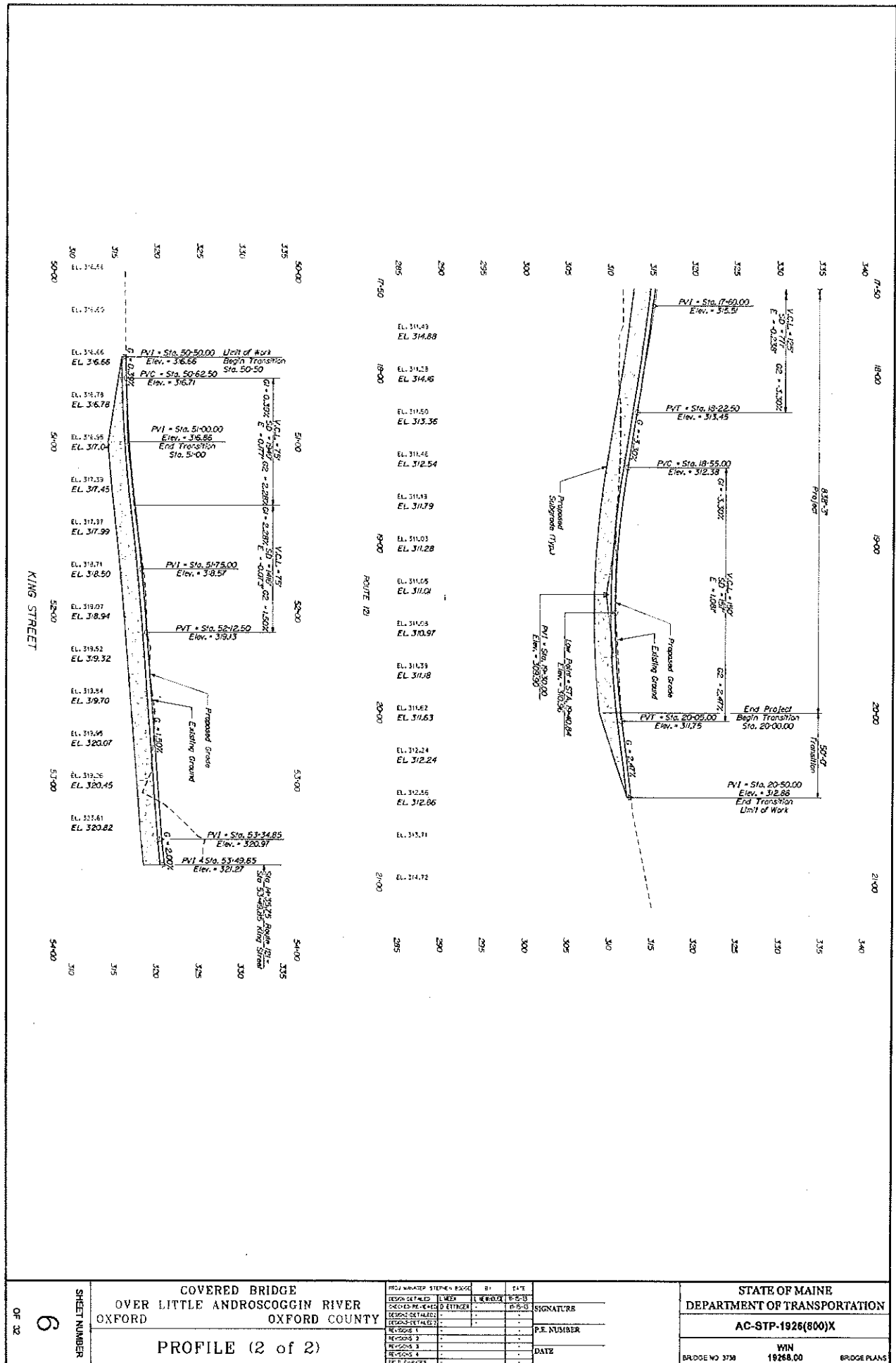
Oxford - Route 121 over Little Androscoggin River
Bridge Replacement

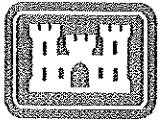












**US Army Corps
of Engineers®**
New England District

**GENERAL PERMIT
WORK-START NOTIFICATION FORM**
(Minimum Notice: Two weeks before work begins)

* MAIL TO: U.S. Army Corps of Engineers, New England District *
* Permits and Enforcement Branch *
* Regulatory Division *
* 696 Virginia Road *
* Concord, Massachusetts 01742-2751 *

Corps of Engineers Permit No. NAE-2014-00229 was issued to the Maine Dept. of Transportation on 3/28/14 . This work is located in the Little Androscoggin River at Oxford, Maine. The permit authorized the permittee to place temporary and permanent fill below the ordinary high water line in order to replace the existing deteriorated Route 121 covered bridge. The project will result in approximately 2,500 s.f. of temporary stream bed impact and 2,326 s.f. of permanent stream bed impact. MaineDOT WIN 19268.00

The people (e.g., contractor) listed below will do the work, and they understand the permit's conditions and limitations.

PLEASE PRINT OR TYPE

Name of Person/Firm: _____

Business Address: _____

Telephone Numbers: () _____ () _____

Proposed Work Dates: **Start:** _____ **Finish:** _____

Permittee/Agent Signature: _____ **Date:** _____

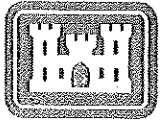
Printed Name: _____ **Title:** _____

Date Permit Issued: 3/28/14 **Date Permit Expires:** 10/12/2016

FOR USE BY THE CORPS OF ENGINEERS

PM: Clement **Submittals Required:** No

Inspection Recommendation: Inspect as convenient



**US Army Corps
of Engineers®**
New England District

(Minimum Notice: Permittee must sign and return notification
within one month of the completion of work.)

COMPLIANCE CERTIFICATION FORM

Permit Number: NAE-2014-00229

MaineDOT WIN 19268.00

Project Manager Clement

Name of Permittee: Maine Dept. of Transportation

Permit Issuance Date: 3/28/14

Please sign this certification and return it to the following address upon completion of the activity and any mitigation required by the permit. You must submit this after the mitigation is complete, but not the mitigation monitoring, which requires separate submittals.

* MAIL TO: U.S. Army Corps of Engineers, New England District *
* Permits and Enforcement Branch C *
* Regulatory Division *
* 696 Virginia Road *
* Concord, Massachusetts 01742-2751 *

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit was completed in accordance with the terms and conditions of the above referenced permit, and any required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

Printed Name

Date of Work Completion

() _____
Telephone Number

() _____
Telephone Number

**DEPARTMENT OF THE ARMY
GENERAL PERMIT
STATE OF MAINE**

The New England District of the U.S. Army Corps of Engineers (Corps) hereby issues this General Permit (GP) for activities in waters of the United States (U.S.) that have no more than minimal individual, secondary, and cumulative adverse effects on the aquatic environment in waters of the U.S. within the boundaries of and off the coast of the State of Maine.

I. GENERAL CRITERIA

In order for activities to qualify for this GP, they must meet the GP's terms and eligibility criteria (Pages 1 – 4), general conditions (GC) (Pages 5 – 18), and Appendix A - Definition of Categories.

Under this GP, projects may qualify for the following:

- Category 1: Category 1 Notification Form required.
(Submittal of the Category 1 Notification Form at Appendix B to the Corps is required).
- Category 2: Application required.
(Submittal of an application to the Corps is required and written approval from the Corps must be received).

If your project is ineligible for Category 1, it may qualify for Category 2 or an Individual Permit and you must submit an application (see Page 3). The thresholds for Categories 1 and 2 are defined in Appendix A. This GP does not affect the Corps Individual Permit review process or activities exempt from Corps regulation.

II. ACTIVITIES COVERED:

- Work and structures that are located in, under or over any navigable water of the U.S.¹ that affect the course, location, condition, or capacity of such waters; or the excavating from or depositing of material in such waters. The Corps regulates this under Section 10 of the Rivers and Harbors Act of 1899);
- The discharge of dredged or fill material into waters of the U.S.². The Corps regulates this under Section 404 of the Clean Water Act (CWA).³
- The transportation of dredged material for the purpose of disposal in the ocean. The Corps regulates this under Section 103 of the Marine Protection, Research and Sanctuaries Act.

¹ Defined at 33 CFR 329 and Appendix A, Page 4.

² Defined at 33 CFR 328

³ When there is a regulated discharge of dredged or fill material into waters of the U.S., the Corps will also consider secondary impacts, which are defined at Appendix A, Endnote/Definition 2.

III. PROCEDURES:

1. State Approvals

Applicants are responsible for applying for and obtaining any of the required state or local approvals (see GC 1, Page 5). Federal and state jurisdictions may differ in some instances. State permits may be required for specific projects regardless of the general permit category.

In order for authorizations under this GP to be valid, when any of the following state approvals or statutorily-required reviews is also required, the approvals must be obtained prior to the commencement of work in Corps jurisdiction.

- Maine Department of Environmental Protection (DEP): Natural Resources Protection Act (NRPA) permit, including permit-by-rule and general permit authorizations; Site Location of Development Act permit; and Maine Waterway Development and Conservation Act permit.
- Maine Department of Conservation: Land Use Regulation Commission (LURC) permit.
- Maine Department of Marine Resources: Aquaculture Leases.
- Maine Department of Conservation, Bureau of Parks and Lands, Submerged Lands: Lease

NOTE: This GP may authorize projects that are not regulated by the State of Maine (e.g., seasonal floats or moorings).

2. Corps Authorizations

a. Category 1 (Submission of Category 1 Notification Form required)

Eligibility Criteria

Activities in Maine that:

- Are subject to Corps jurisdiction (see GC 2, Page 5),
- Meet the terms and eligibility criteria of this GP (Pages 1 - 4),
- Meet all GCs of this GP (Pages 5 – 18), and
- Meet the definition of Category 1 in Appendix A - Definition of Categories,

may proceed without application to the Corps provided:

- The Category 1 Notification Form (Appendix B) is submitted to the Corps before starting the work authorized by this GP.

Consultation with the Corps and/or outside experts may be necessary to ensure compliance with this GP's general conditions (starting on Page 5) and related federal laws such as the National Historic Preservation Act, the Endangered Species Act (ESA), and the Wild and Scenic Rivers Act. For example, experts on historic resources may include the agencies and tribes referenced in GC 8, while experts on endangered species include the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Project proponents are encouraged to contact the Corps with Category 1 eligibility questions.

Work that is not regulated by the State of Maine, but is subject to Corps jurisdiction, is eligible for Category 1 authorization under this GP. The Maine DEP and LURC have waived WQC for projects authorized under Categories 1 and 2 of this GP. The state has concurred with the determination that projects authorized under Categories 1 and 2 of this GP are consistent with the enforceable policies of the Maine CZM Program.

b. Category 2 (Application to and written approval from the Corps required)

Eligibility Criteria

Activities in Maine that:

- Are subject to Corps jurisdiction (see GC 2, Page 5),
- Meet the terms of this GP (Pages 1 - 4),
- Meet all GCs of this GP (Pages 5 - 18),
- Meet the definition of Category 2 in Appendix A - Definition of Categories,

require an application to and written approval from the Corps. The Corps will coordinate review of Category 2 activities with federal and state agencies, as appropriate. To be eligible and subsequently authorized, an activity must result in no more than minimal impacts to the aquatic environment as determined by the Corps based on comments from the review team and the criteria listed above. This may require project modifications involving avoidance, minimization or compensatory mitigation for unavoidable impacts to ensure the net effects of a project are minimal. Compensatory mitigation for waterway/wetland impacts may take the form of wetland preservation, restoration, enhancement, creation, and/or “in-lieu fee” for inclusion into the Natural Resources Mitigation Fund. See www.nae.usace.army.mil/reg, “Mitigation” and then “Maine” for more information.

Work that is not regulated by the State of Maine, but is subject to Corps jurisdiction, is eligible for Category 2 authorization under this GP. The Maine DEP and LURC have waived WQC for projects authorized under Categories 1 and 2 of this GP. The state has concurred with the determination that projects authorized under Categories 1 and 2 of this GP are consistent with the enforceable policies of the Maine CZM Program.

3. Applying for a Permit

All applicants for Category 2 projects must:

- a.** Apply directly to the Corps using the state application form or the Corps application form (ENG Form 4345¹), and apply directly to the state (DEP, LURC, BPL or DMR) as applicable using the appropriate state form, if the work is regulated by the Corps and the state.
- b.** Apply directly to the Corps using the Corps application form (ENG Form 4345¹) if the work is regulated by the Corps but not the state (DEP, LURC, BPL or DMR).
- c.** Provide application information (see “Information Typically Required” in Appendix C) to help ensure the application is complete and to speed project review.
- d.** Submit a copy of their application materials to the Maine Historic Preservation Commission (MHPC) and the five Indian tribes listed at Appendix D, at the same time, or before, they apply to the state (DEP or LURC) or the Corps, to be reviewed for the presence of historic, archaeological or tribal resources in the permit area that the proposed work may affect. Submittals to the DEP or Corps shall include information to indicate that this has been done (a copy of the applicant’s cover letter to MHPC and tribes or a copy of the MHPC and tribal response letters is acceptable).

¹ Located at www.nae.usace.army.mil/reg under “Forms.”

4. Review Procedures

The Corps will coordinate review of all Category 2 activities with federal and state agencies, as appropriate, to ensure that the work will result in no more than a minimal impact to the aquatic environment. Applicants are responsible for applying for the appropriate state and local approvals listed on Page 2.

Emergency Procedures: 33 CFR 325.2(e)4 states that an “emergency” is a situation which would result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship if corrective action requiring a permit is not undertaken within a time period less than the normal time needed to process the application under standard procedures.” The Corps will work with all applicable agencies to expedite authorization according to established procedures in emergency situations.

Individual Permit Procedures: Proponents of work that does not meet the terms and general conditions of this GP must submit the Corps application form and the appropriate application materials to the Corps at the earliest possible date in order to expedite the Individual Permit review process. General information and application forms can be obtained at our website or by calling us (see Appendix D). Individual WQC and CZM consistency concurrence are required when applicable from the State of Maine before Corps permit issuance. The Corps encourages applicants to concurrently apply for a Corps Individual Permit and state permits.

5. Approval Process

Applicants for Category 2 activities may not proceed with work in Corps jurisdiction until written authorization is received from the Corps. If the Corps determines that the Category 2 activity is eligible for the GP, the Corps will send an authorization letter directly to the applicant. The Corps will attempt to issue a written eligibility determination within the state’s review period. If the Corps determines that the activity is not eligible under the GP or that additional information is required, the Corps will notify the applicant in writing and send a copy to the DEP or LURC. Applicants are responsible for obtaining all applicable approvals listed on Page 2 from the appropriate state and local agencies before commencing work in Corps jurisdiction.

V. GENERAL PERMIT CONDITIONS:

The following conditions apply to activities authorized under this Maine GP, unless otherwise specified, including all Category 1 (notification required) and Category 2 (application required) activities:

1. Other Permits. Authorization under this GP does not obviate the need to obtain other federal, state, or local authorizations required by law. This includes, but is not limited to, the project proponent obtaining a Flood Hazard Development Permit issued by the town, if necessary. Inquiries may be directed to the municipality or to the Maine Floodplain Management Coordinator at (207) 287-8063. See www.maine.gov/spo/flood.

2. Federal Jurisdictional Boundaries.

(a) Applicability of this GP shall be evaluated with reference to federal jurisdictional boundaries. Applicants are responsible for ensuring that the boundaries used satisfy the federal criteria defined at 33 CFR 328 “Waters of the U.S.” and 33 CFR 329 “Navigable Waters of the U.S.”

Note: Waters of the U.S. include the subcategories “navigable waters of the U.S.” and “wetlands.”

(b) For Category 1 projects, proponents are not required to delineate the waters of the U.S. that they plan to impact, but must approximate the square footage of impacts in order to determine the review category (1 or 2 or Individual Permit). For projects filling <15,000 SF of waters of the U.S. that do not qualify for Category 1 (e.g., vernal pool, secondary or endangered species impacts, etc.) and therefore require an application to the Corps, and for those filling ≥15,000 SF, applicants shall delineate all waters of the U.S. that will be filled (direct impacts) in accordance with the Corps of Engineers Wetlands Delineation Manual and the most recent regional supplements (see Appendix E). In addition, applicants shall approximately identify all waters of the U.S. on the property and known waters adjacent to the property in order for the Corps to evaluate secondary impacts. The waters of the U.S. shall be clearly shown on the project plans submitted with the application. This includes all waters of the U.S. in areas under DEP or LURC jurisdiction regardless of whether they’re shown on LURC zoning maps.

(c) On a case-by-case basis, the Corps may modify/refine the above delineation and identification requirements for waters of the U.S.

3. Minimal Direct, Secondary and Cumulative Impacts.

(a) Projects authorized by this GP shall have no more than minimal direct, secondary and cumulative adverse environmental impacts. Category 2 applicants should provide information on secondary and cumulative impacts as stated in Appendix C. Compensatory mitigation may be required to offset unavoidable impacts (see GC 16) and to ensure that they are no more than minimal. Compensatory mitigation requirements will be determined on a case-by-case basis.

(b) Secondary impacts to waterway and/or wetland areas, (e.g., areas drained, flooded, cleared, excavated or fragmented) shall be added to the total fill area when determining whether the project qualifies for Category 1 or 2. Direct, secondary and cumulative impacts are defined at Appendix A, Endnote 2.

(c) Site clearing, grading and construction activities in the upland habitat surrounding vernal pools (“Vernal Pool Management Areas”) are secondary impacts. See GC 28 for avoidance and minimization requirements and recommendations.

4. Discretionary Authority. Notwithstanding compliance with the terms and conditions of this permit, the Corps retains discretionary authority to require Category 2 or Individual Permit review based on concerns for the aquatic environment or for any other factor of the public interest [33 CFR

320.4(a)]. This authority is invoked on a case-by-case basis whenever the Corps determines that the potential consequences of the proposal warrant a higher level of review based on the concerns stated above. This authority may be invoked for projects that may contribute to cumulative environmental impacts that are more than minimal or if there is a special resource or concern associated with a particular project that is not already covered by the remaining conditions of the GP and that warrants greater review. Whenever the Corps notifies an applicant that an Individual Permit may be required, the project is not authorized under this GP and no work may be conducted until an Individual Permit is obtained or until the Corps notifies the applicant that further review has demonstrated that the work may proceed under this GP.

5. Single and Complete Projects.

(a) This GP shall not be used to piecemeal work and shall be applied to single and complete projects¹. When determining the review category in Appendix A (Category 1 or 2) for a single and complete project, proponents must include any permanent historic fill placed since October 1995 that is associated with that project and all currently proposed temporary and permanent impact areas.

(b) A single and complete project must have independent utility¹.

(c) Unless the Corps determines the activity has independent utility¹:

i. This GP shall not be used for any activity that is part of an overall project for which an Individual Permit is required,

ii. All components of a single project and/or all planned phases of a multi-phased project (e.g., subdivisions should include all work such as roads, utilities, and lot development) shall be treated together as constituting one single and complete project¹.

(d) For linear projects, such as power lines or pipelines with multiple crossings, the single and complete project¹ is all crossings of a single water of the U.S. (i.e., single waterbody) at a specific location. For linear projects crossing a single waterbody several times at separate and distant locations, each crossing is considered a single and complete project. However, individual channels in a braided stream or river, or individual arms of a large, irregularly-shaped wetland or lake, etc., are not separate waterbodies and crossings of such features cannot be considered separately. If any crossing requires a Category 2 activity, then the entire linear project shall be reviewed as one project under Category 2.

6. Permit On-Site. For Category 2 projects, the permittee shall ensure that a copy of this GP and the accompanying authorization letter are at the work site (and the project office) authorized by this GP whenever work is being performed, and that all personnel with operation control of the site ensure that all appropriate personnel performing work are fully aware of its terms and conditions. The entire permit authorization shall be made a part of any and all contracts and sub-contracts for work that affects areas of Corps jurisdiction at the site of the work authorized by this GP. This shall be achieved by including the entire permit authorization in the specifications for work. The term “entire permit authorization” means this GP and the authorization letter (including its drawings, plans, appendices and other attachments) and also includes permit modifications. If the authorization letter is issued after the construction specifications, but before receipt of bids or quotes, the entire permit authorization shall be included as an addendum to the specifications. If the authorization letter is issued after receipt of bids or quotes, the entire permit authorization shall be included in the contract or sub-contract. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions contained within the entire GP authorization, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.

¹ Single and Complete Project and Independent Utility are defined at Appendix E.

7. St. John/St. Croix Rivers. Work within the Saint John and Saint Croix River basins that requires approval of the International Joint Commission is not eligible for Category 1 and an application to the Corps is required if any temporary or permanent use, obstruction or diversion of international boundary waters could affect the natural flow or levels of waters on the Canadian side of the line; or if any construction or maintenance of remedial works, protective works, dams, or other obstructions in waters downstream from boundary waters could raise the natural level of water on the Canadian side of the boundary.

8. Historic Properties. No activity otherwise authorized by this GP shall result in effects (as that term is defined at 36 C.F.R. § 800.16(i)) on properties listed on, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties, unless and until the Corps or another federal agency has satisfied the consultation requirements of Section 106 of the National Historic Preservation Act. Work is not eligible for Category 1 and an application to the Corps is required if the activity may have the potential to cause effects to any historic properties listed, determined to be eligible for listing on, or potentially eligible for listing on the National Register of Historic Places, including previously unidentified properties. Work is eligible for Category 1 if a no effect or no adverse effect determination has been made for that work by another federal action agency in its Section 106 consultation with the Maine Historic Preservation Commission (MHPC) and the five federally recognized Indian tribes listed at Appendix D. Information on the location and existence of known historic resources can be obtained from the MHPC, the National Register of Historic Places, and the five tribes listed in Appendix D. Historic properties include those that are eligible for inclusion, but not necessarily listed on the National Register. If the permittee, either prior to construction or during construction of the work authorized herein, encounters a previously unidentified archaeological or other cultural resource within the area subject to Corps jurisdiction that might be eligible for listing in the National Register of Historic Places, he/she shall stop work and immediately notify the Corps and the MHPC and/or applicable tribe(s).

9. National Lands. None of the following work is eligible as a Category 1 project:

(a) Activities that impinge upon the value of any National Wildlife Refuge, National Forest, National Marine Sanctuary, National Park or any other area administered by the National Park Service, U.S. Fish and Wildlife Service (USFWS) or U.S. Forest Service.

(b) Work on Corps properties and Corps-controlled easements. Contact the Corps, Real Estate Division (978) 318-8585 to initiate reviews about both Corps holdings and permit requirements.

(c) Any proposed temporary or permanent modification or use of a federal project (including but not limited to a levee, dike, floodwall, channel, sea wall, bulkhead, jetty, wharf, pier, or other work built but not necessarily owned by the United States), which would obstruct or impair the usefulness of the federal project in any manner, and/or would involve changes to the authorized federal project's scope, purpose, and/or functioning that go beyond minor modifications required for normal operation and maintenance (requires review and approval by the Corps pursuant to 33 USC 408). Federal projects in Maine as of October 2010 are shown at Appendix F. This map may not be inclusive of all projects.

10. Endangered Species.

(a) No activity may be authorized under Category 1 of this GP which:

i. "May affect" a threatened or endangered species, a species proposed for listing as threatened or endangered, or designated or proposed critical habitat (all herein referred to as "listed species or habitat") as identified under the federal Endangered Species Act (ESA) (unless specified in a programmatic agreement with NMFS or USFWS),

ii. Results in a “take” of any federally-listed threatened or endangered species of fish or wildlife, or
iii. Results in any other violation of Section 9 of the ESA protecting threatened or endangered species of plants.

(b) Work in Inland Waters and Wetlands¹ and the non-tidal portions of Navigable Waters² (e.g., the Penobscot River, Kennebec River) is not eligible for Category 1 if:

i. The project action area occurs within a watershed occupied by listed Atlantic salmon or shortnose sturgeon. Project proponents must check the site in Footnote 3 below.

ii. In areas outside these watersheds contact the USFWS (see Appendix D, Page 1 for contact information) to check for the presence of other listed species.

(c) Work in the tidal portions of Navigable Waters may be eligible for Category 1. Reference Appendix A, II. Navigable Waters, Pages 4 – 9, and the other terms and general conditions (GC 11 is particularly relevant) of this GP to determine Category 1 eligibility. Project proponents must contact the USFWS (see Appendix D, Page 1 for contact information) to ensure that work in all tidal portions of Navigable Waters² is not in critical habitat or areas occupied by listed species other than Atlantic salmon or shortnose sturgeon.

(d) Although some work is excluded from Category 1 as stated in (b) and (c) above, work may qualify for Category 1 if a no effect determination has been made for that work by a federal action agency such as the Corps.

(e) Proponents must submit an application to the Corps if any of the activities in 10(a)-10(c) that do not qualify for Category 1 may occur and provide information on federally-listed species or habitat to allow the Corps to conduct any required consultation under Section 7 of the ESA.

(f) The Corps review may consider species listed as endangered and threatened pursuant to Maine state law.

11. Essential Fish Habitat. Any work in the following rivers and streams, including all tributaries to the extent that they are currently or were historically accessible for salmon migration, shall not be authorized under Category 1 of the GP and must be screened for potential impacts to EFH (see Appendix E for more information).

Androscoggin River	Aroostook River	Boyden River	Dennys River
Ducktrap River	East Machias River	Hobart Stream	Kennebec River
Machias River	Narraguagus River	Orland River	Passagassawaukeag River
Patten Stream	Penobscot River	Pleasant River	Presumpscot River
Saco River	Sheepscot River	St. Croix River	Tunk Stream
			Union River

The above does not apply to the following activities which may qualify for Category 1 work:

- Exploratory drilling and borings for bridges.
- Moorings (see Appendix A, Page 6 for Category 1 thresholds and requirements)
- Structures and floats (see Appendix A, Page 7 for Category 1 thresholds and requirements)
- Other activities specified in a programmatic agreement with NMFS.

¹ See Appendix A, Page 1 for definition.

² See Appendix A, Page 4 for definition.

³ For areas considered occupied by listed Atlantic salmon and/or shortnose sturgeon in Inland Waters and Wetlands, and in Navigable Waters, see: www.nero.noaa.gov/prot_res/altsalmon/dpsmaps.html. Tidal portions of navigable waters occupied by listed Atlantic salmon are more specifically described as those waters from the Kennebec River to its mouth at Merrymeeting Bay, northeast to the Dennys River, including the Androscoggin River upstream to the Brunswick Dam, and other streams northeast of this line to the limit of their tidal reaches.

12. Wild and Scenic Rivers. Any activity that occurs in the designated main stem of, within 0.25 mile up or downstream of the designated main stem of, or in tributaries within .25 miles of the designated main stem of a National Wild and Scenic River, or in “bordering and contiguous wetlands” (see Appendix A, Endnote 1) that are adjacent to the designated main stem of a National Wild and Scenic River, or that has the potential to alter flows within a river within the National Wild and Scenic River System, is not eligible for Category 1 regardless of size of the impacts. This condition applies to both designated Wild and Scenic Rivers and rivers officially designated by Congress as study rivers for possible inclusion while such rivers are in an official study status. National Wild and Scenic Rivers System segments for Maine as of October 2010 include: Allagash River beginning at Telos Dam continuing to Allagash checkpoint at Eliza Hole Rapids, approximately 3 miles upstream of the confluence with the St. John River (length = 92 miles).

13. Federal Navigation Project. Any structure or work that extends closer to the horizontal limits of any Corps Federal Navigation Project (see Appendix F) than a distance of three times the project’s authorized depth shall be subject to removal at the owner’s expense prior to any future Corps dredging or the performance of periodic hydrographic surveys. This is applicable to Category 1 and 2. Reference Appendix A, Page 6 (Moorings) and Page 7 (Structure and Floats).

14. Navigation.

(a) There shall be no unreasonable interference with navigation by the existence or use of the activity authorized herein and no attempt shall be made by the permittee to prevent the full and free use by the public of all navigable waters at or adjacent to the activity authorized herein.

(b) The permittee understands and agrees that, if future U.S. operations require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the U.S. No claim shall be made against the U.S. on account of any such removal or alteration.

15. Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following: (a) damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes; (b) damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the U.S. in the public interest; (c) damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit; (d) design or construction deficiencies associated with the permitted work; (e) damage claims associated with any future modification, suspension, or revocation of this permit.

16. Avoidance, Minimization and Compensatory Mitigation.

Discharges of dredged or fill material into waters of the U.S., including wetlands, shall be avoided and minimized to the maximum extent practicable through consideration of alternatives. The Corps may require compensatory mitigation of unavoidable direct and secondary impacts associated with Category 2 projects on a case-by-case basis (see Appendix E).

17. Heavy Equipment in Wetlands. Operating heavy equipment other than fixed equipment (drill rigs, fixed cranes, etc.) within wetlands shall be minimized, and such equipment shall not be stored, maintained or repaired in wetlands, to the maximum extent practicable. Where construction requires heavy equipment operation in wetlands, the equipment shall either have low ground pressure

(typically <3 psi), or it shall be placed on swamp/construction/timber mats (herein referred to as “construction mats” and defined at Appendix A, Endnote 4) that are adequate to support the equipment in such a way as to minimize disturbance of wetland soil and vegetation. Construction mats are to be placed in the wetland from the upland or from equipment positioned on swamp mats if working within a wetland. Dragging construction mats into position is prohibited. Other support structures that are capable of safely supporting equipment may be used with written Corps authorization (Category 2 authorization or Individual Permit). Similarly, the permittee may request written authorization from the Corps to waive use of mats during frozen, dry or other conditions. An adequate supply of spill containment equipment shall be maintained on site.

18. Temporary Fill.

Temporary fill that qualifies for Category 1 (e.g., <15,000 SF of combined temporary and permanent fill associated with the single and complete project) or is authorized in writing under Category 2, shall adhere to the following:

- (a) All temporary fill shall be stabilized to prevent its eroding into portions of waters of the U.S., including wetlands, where it is not authorized.
- (b) Unconfined temporary fill authorized for discharge into waters of the U.S., including wetlands, shall consist of material that minimizes impacts to water quality (e.g. sandbags, clean gravel, stone, aggregate, etc.).
- (c) Temporary fill authorized for discharge into wetlands should be placed on geotextile fabric or other material (e.g., straw) laid on the pre-construction wetland grade where practicable to minimize impacts.
- (d) Temporary fill shall be removed as soon as it is no longer needed, disposed of at an upland site, and suitably contained to prevent subsequent erosion into waters of the U.S, including wetlands.

To qualify for Category 1, temporary fill placed during the:

- i. Growing season must be removed before the beginning of the next growing season.
 - ii. Non-growing season may remain throughout the following growing season, but must be removed before the beginning of the next growing season.
- (e) Waters of the U.S., including wetlands, where temporary fill was discharged shall be restored (see GC 19).
 - (f) Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must be placed in a manner that will not be eroded by expected high flows (see GC 21).

(g) Construction mats and corduroy roads (see GC 17 above) are considered as temporary fill when they are removed immediately upon work completion. The area must be restored (see GC 19).

19. Work Site Restoration.

- (a) Wetland areas where permanent disturbance is not authorized shall be restored to their original condition and elevation, which under no circumstances shall be higher than the pre-construction elevation. Original condition means careful protection and/or removal of existing soil and vegetation, and replacement back to the original location such that the original soil layering and vegetation schemes are approximately the same, unless otherwise authorized.
- (b) Upon completion of construction, all disturbed wetland areas (the disturbance of these areas must be authorized) shall be properly stabilized. Any seed mix shall contain only plant species native to New England and shall not contain any species listed in the “Invasive and Other Unacceptable Plant Species” Appendix in the “New England District Compensatory Mitigation Guidance” (see Appendix E, Paragraph 6). This list may be updated periodically.
- (c) In areas of authorized temporary disturbance, if trees are cut they shall be cut at ground level and

not uprooted in order to prevent disruption to the wetland soil structure and to allow stump sprouts to revegetate the work area, unless otherwise authorized.

20. Bank Stabilization.

(a) Projects involving construction or reconstruction/maintenance of bank stabilization structures within Corps jurisdiction shall be designed to minimize environmental effects, effects to neighboring properties, scour, etc. to the maximum extent practicable.

(b) Project proponents must design and construct bank stabilization projects using this sequential minimization process: avoidance of aquatic resource impacts, diversion of overland flow, vegetative stabilization, stone-sloped surfaces, and walls/bulkheads. Vertical walls/bulkheads shall only be used in situations where reflected wave energy can be tolerated. Refer to Appendix E for design guidance.

(c) Inland Water bank stabilization activities necessary for erosion prevention must meet all of the following criteria: (i) No material is placed in excess of the minimum needed for erosion protection; (ii) The activity is no more than 500 feet in length along the bank; (iii) The activity will not exceed an average of one cubic yard per running foot placed along the bank below the plane of the ordinary high water mark; (iv) Structures angled steeper than 1H:1V and any material other than angular or subangular stone or fiber roll revetments require at least a Category 2 review. (v) The activity does not involve discharges of dredged or fill material into special aquatic sites; (vi) No material is of the type, or is placed in any location, or in any manner, to impair surface water flow into or out of any water of the U.S.; (vii) No material is placed in a manner that will be eroded by normal or expected high flows (properly anchored trees and treetops may be used in low energy areas); and, (viii) The activity is not a stream channelization activity.

(d) Navigable Water bank stabilization activities are provided at Appendix A, Page 4.

21. Sedimentation and Erosion Control.

(a) Adequate sedimentation and erosion control management measures, practices and devices, such as phased construction, installation of sediment control barriers (i.e. silt fence, vegetated filter strips, geotextile silt fences, erosion control mixes, hay bales or other devices) downhill of all exposed areas, retention of existing vegetated buffers, application of temporary mulching during construction, and permanent seeding and stabilization shall be installed and properly maintained to reduce erosion and retain sediment on-site during and after construction. They shall be capable of preventing erosion, of collecting sediment, suspended and floating materials, and of filtering fine sediment.

(b) Temporary sediment control barriers shall be removed upon completion of work, but not until all disturbed areas are permanently stabilized. The sediment collected by these sediment barriers shall be removed and placed at an upland location and stabilized to prevent its later erosion into a waterway or wetland.

(c) All exposed soil and other fills shall be permanently stabilized at the earliest practicable date (see GC 19).

22. Stream Work and Crossings¹.

Notes:

(a) GC 22(a) and (b) apply to Inland Waters and Wetlands (see Appendix A, Page 1 for definition) and Navigable Waters (see Appendix A, Page 4 for definition). GC 22(c)-(l) only apply to Inland Waters and Wetlands that are streams. All new and replacement crossings in Navigable Waters require an application to the Corps and at least a Category 2 review.

(b) In-stream work in a watershed occupied by listed Atlantic salmon or shortnose sturgeon [see GC 10(b)] and some stream work such as crossings on EFH waters (see GC 11) is not eligible for Category 1.

(c) “High-Quality Stream Segments” are shown at www.maine.gov/dep/gis/datamaps and may be useful in evaluating impacts to fisheries. GIS shape files are under “Other Google Earth Interactive Maps” and PDFs by county are under “DEP GIS Maps.” See Appendix E, 8(b) for more information.

Conditions:

(a) All permanent crossings of rivers, streams, brooks, etc. (hereon referred to as “streams”) shall be suitably culverted, bridged, or otherwise designed to i) withstand and to prevent the restriction of high flows to qualify for Category 1, and ii) not obstruct the movement of or not substantially disrupt the necessary life-cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, beyond the actual duration of construction unless the activity’s primary purpose is to impound water to qualify for Category 1 or 2. (NOTE: Areas of fill and/or cofferdams must be included in total waterway/wetlands impacts to determine applicability of this GP).

(b) Any work that temporarily or permanently impacts upstream or downstream flood conditions, or permanently impacts wetlands in excess of Category 1 thresholds, must be reviewed at least under Category 2. See the documents referenced in Appendix E, 8(c) and (d) for guidance.

(c) New Stream Crossings. For new stream crossings to qualify for Category 1:

i. Must ensure compliance with GC 22(a) and GC 22(b) above.

ii. Shall be designed and constructed in accordance with the Corps General Stream Crossing Standards provided on Page 14 and the stream simulation document listed at Appendix E, 8(a).

(d) Replacement Stream Crossings. For replacement stream crossings to qualify for Category 1:

i. Must ensure compliance with GC 22(a) and GC 22(b) above.

ii. Shall be designed and constructed in accordance with the Corps General Stream Crossing Standards provided on Page 14 and the stream simulation document listed at Appendix E, 8(a).

(e) Culvert Extensions. Culvert extensions on culverts that do not meet the Corps General Stream Crossing Standards do not qualify for Category 1 and require an application to the Corps at least as a Category 2 project.

(f) Temporary Stream Crossings.

Note: The General Stream Crossing Standards don’t apply to temporary stream crossings.

i. Temporary stream crossings or cofferdams shall be used for equipment access across streams [see Appendix E, 8(e)]. Note: Areas of fill and/or cofferdams must be included in total waterway/wetlands impacts to determine the review category in Appendix A.

ii. Temporary stream crossings shall be removed within 180 days to qualify for Category 1.

iii. Temporary stream crossings that are not spans² (typically culverts) must be designed in accordance with 1-6 below to qualify for Category 1. Category 2 applications should include information demonstrating 2-6 below:

¹ This condition does not apply to non-tidal drainage systems and irrigation ditches excavated on dry land.

² For the purposes of this GP, spans are bridges, three-sided box culverts, open-bottom culverts or arches that span the stream with footings landward of bankfull width.

1. Installed and removed during the low flow period specified in GC 22(l) below.
2. Placed on geotextile fabric or other material where practicable to ensure restoration to the original grade. Soil may not be used to construct or stabilize these structures and rock must be large enough to allow for easy removal without disrupting the streambed.
3. Designed and maintained to withstand and pass high flows. Water height should be no higher than the top of the culvert's inlet. A minimum culvert diameter of two feet is required to pass debris. Culverts must be aligned to prevent bank erosion or streambed scour.
4. Equipped with energy dissipating devices installed downstream if necessary to prevent scour.
5. Designed and maintained to prevent soil from entering the waterbody.
6. Removed upon the completion of work. Impacts to the streambed or banks requires restoration to their original condition using stream simulation methods¹.

(g) Slip Lining. Work using slip lining (retrofitting an existing culvert by inserting a smaller diameter pipe), invert lining, or resulting in decreased diameter, do not qualify for Category 1, either as new work or maintenance activities.

(h) Work in Flowing Waters. To qualify for Category 1, no unconfined fill [see GC 18(b)] or excavation in flowing waters is allowed. To accomplish this:

i. Bank stabilization work below ordinary high water (OHW) shall utilize erosion controls such as inflatable cofferdams, jersey barrier, silt screen, turbidity curtain, etc. where practicable to prevent sediment input to the stream and to minimize turbidity and sedimentation impacts for sensitive life stages. Bank stabilization above OHW must utilize erosion controls.

ii. Management techniques such as temporary flume pipes, culverts, cofferdams, etc. must be used to maintain normal flows within the stream boundary's confines, or water diversions may be used immediately up and downstream of the work footprint (see Appendix A, Endnote 6) or work must be performed in the dry under no flow conditions, or under very low flow conditions following the practices in GC 22(a).

(i) Minimization. In order to make the Category 2 review process more efficient and result in a faster decision, new and replacement stream crossings should be designed using the least intrusive and environmentally damaging method following this sequential minimization process: 1) spans with no stream impacts, 2) spans with stream impacts, and 3) embedded culverts with stream simulation or low-slope design.

(j) Maintenance Requirements. The permittee shall maintain the work authorized herein in good condition and in conformance with the terms and general conditions of this permit to facilitate aquatic life passage as stated in GC 22(a). Culverts that develop "hanging" inlets or outlets, result in bed washout, or a stream that doesn't match the characteristics of the substrate in the natural stream channel such as mobility, slope, stability confinement will require maintenance or repair to comply with this GC. This does not apply to GC 22(f) above.

(k) Maintenance and Replacement Information. An existing stream crossing must be authorized and in compliance with all conditions of its authorization(s) to qualify for maintenance not subject to regulation. See Appendix A, Endnote 7. A non-serviceable crossing is not eligible for maintenance and is therefore considered as a replacement crossing [see 22(d)].

(l) Work Window. For projects that otherwise meet the terms of Category 1, in-stream construction work shall be conducted during the low flow period July 15 - October 1 in any year. Projects that are not to be conducted during that time period are ineligible for Category 1 and shall be screened pursuant to Category 2, regardless of the waterway and wetland fill and/or impact area.

(See next page for Corps General Stream Crossing Standards.)

¹ Design and construction shall be in accordance with the stream simulation document listed at Appendix E, 8(a).

Corps General Stream Crossing Standards (required for Category 1, recommended for Category 2):

(a) Culverts must be embedded:

- ≥ 2 feet for box culverts and other culverts with smooth internal walls,
- ≥ 1 foot for corrugated pipe arches
- ≥ 1 foot and at least 25 percent for corrugated round pipe culverts

(b) For new crossings, spans¹ are required to avoid or cause minimal disruption to the streambed and to meet the requirements of General Condition 22(a) and 22(b). Footings and abutments must be landward of 1.2 times bankfull width. To the greatest extent practicable, work in the stream shall be minimized, and design and construction shall allow the streambed's natural structure and integrity to remain intact. Any fill or excavation of the streambed below bankfull width other than footings, support pilings, or work specified in 22(h)ii requires Category 2 review and, unless demonstrated otherwise, stream simulation² to establish substrate and banks in the span structure and work area as specified in (d) and (e) below.

(c) For replacement crossings, spans¹ are required to meet the requirements of General Condition 22(a) and 22(b). Footings and abutments shall be landward of 1.2 times bankfull width. Unless demonstrated otherwise, stream simulation² is required to establish substrate and banks in the span structure and work area as specified in (d) and (e) below.

(d) Crossings must have a natural bottom substrate within the structure matching the characteristics of the substrate in the natural stream channel and the banks (mobility, slope, stability, confinement, grain and rock size)² at the time of construction and over time as the structure has had the opportunity to pass significant flood events. To allow terrestrial passage for wildlife and prevent undermining the footings, crossings shall have a bank on both sides of the stream matching the horizontal profile of the existing stream and banks².

(e) Crossings must be designed and constructed² with appropriate bed forms and streambed characteristics so that water depths and velocities are comparable to those found in the natural channel at a variety of flows. In order to provide appropriate water depths and velocities at a variety of flows and especially low flows, it is usually necessary to reconstruct the streambed or preserve the natural channel within the structure. Otherwise, the width of the structure needed to accommodate higher flows will create conditions that are too shallow at low flows. The grain and rock size, and arrangement of streambed materials within the structure should be in accordance with (d) above. Flows could go subsurface within the structure if only large material is used without smaller material filling the voids.

23. Wetland Crossings.

(a) All temporary and permanent crossings of wetlands shall be suitably culverted, bridged, or otherwise designed to: **i)** Withstand and prevent the restriction of high flows, **ii)** Not obstruct the movement of or not substantially disrupt the necessary life-cycle movements of those species of aquatic life indigenous to the wetland, including those species that normally migrate through the area, beyond the actual duration of construction unless the activity's primary purpose is to impound water. See Appendix E for the Maine DEP's crossing standards.

(b) To qualify for Category 1, new and replacement wetland crossings that are permanent shall be culverted, spanned or bridged in such a manner as to preserve hydraulic and ecological connectivity, at its present level, between the wetlands on either side of the road. To meet this requirement, we

¹ For the purposes of this GP, spans are bridges, three-sided box culverts, open-bottom culverts or arches that span the stream with footings landward of bankfull width.

² Design and construction shall be in accordance with the stream simulation document listed at Appendix E, 8(a).

recommend that culverts, spans or bridges be placed at least every 50 feet with an opening at least 2 feet high and 3 feet wide at ground level where practicable. Closed bottom culverts shall be embedded at least 6 inches with a natural bottom.

(c) In the case of non-compliance, the permittee shall take necessary measures to correct wetland damage due to lack of hydraulic and ecological connectivity.

(d) Any work that results in flooding, results in impacts to wetlands on either side of the wetland crossing in excess of Category 1 thresholds, or impacts wetland drainage from the upgradient side of the wetland crossing does not qualify for Category 1.

24. Discharge of Pollutants.

(a) All activities involving any discharge of pollutants into waters of the U.S., including wetlands, authorized under this GP shall be consistent with applicable water quality standards, effluent limitations, standards of performance, prohibitions, and pretreatment standards and management practices established pursuant to the Clean Water Act (CWA) (33 USC 1251), and applicable state and local laws. If applicable water quality standards, limitations, etc., are revised or modified during the term of this GP, the authorized work shall be modified to conform with these standards within six months of the effective date of such revision or modification, or within a longer period of time deemed reasonable by the Corps in consultation with the EPA. Issuance of a LURC or DEP NRPA permit confirms that state water quality standards are met.

(b) All projects authorized by this GP shall be designed, constructed and operated to minimize or eliminate the discharge of pollutants.

(c) All activities involving any discharge of pollutants into waters of the U.S., including wetlands, authorized under this GP must comply with Section 402 [33 U.S.C. 1342] of the CWA and the requirements of the National Pollutant Discharge Elimination System (40 CFR 122).

25. Spawning, Breeding and Migratory Areas. Activities and impacts such as excavations, discharges of dredged or fill material, and/or suspended sediment producing activities, in fish migratory areas, fish and shellfish spawning or nursery areas, or amphibian and migratory bird breeding areas, during spawning or breeding seasons shall be avoided and minimized to the maximum extent practicable.

26. Storage of Seasonal Structures. Coastal structures, such as pier sections and floats, that are removed from the waterway for a portion of the year (often referred to as seasonal structures) shall be stored in an upland location located above mean high water (MHW) and not in tidal wetlands or mudflats. These seasonal structures may be stored on the fixed, pile-supported portion of the structure that is seaward of MHW. This is intended to prevent structures from being stored on the marsh substrate, mudflats, or the substrate seaward of MHW. Seasonal storage of structures in navigable waters, e.g., in a protected cove on a mooring, requires Corps and local harbor master approval.

27. Environmental Functions and Values. The permittee shall make every reasonable effort to carry out the construction or operation of the work authorized herein in a manner that maintains as much as is practicable, and minimize any adverse impacts on existing fish, wildlife, and natural environmental functions and values.

28. Protection of Vernal Pools (VPs).

(a) Impacts to VP Management Areas¹ for all VPs on, and known VPs surrounding, the project site shall be minimized to the maximum extent practicable.

(b) The following management practices must be followed for all work within the VP Management Area (750' of a VP's edge) of all VPs in order to qualify for Category 1 when there is fill placed in a water of the U.S., including wetlands:

i. Similar to the DEP's Significant Wildlife Habitat regulations²:

1. No disturbance within the VP Depression or VP Envelope (area within 100 feet of the VP Depression's edge)³;
2. Maintain a minimum of 75% of the Critical Terrestrial Habitat (area within 100-750 feet of the VP Depression's edge) as unfragmented forest with at least a partly-closed canopy of overstory trees to provide shade, deep litter and woody debris³;
3. Maintain or restore forest corridors connecting wetlands and significant vernal pools;
4. Minimize forest floor disturbance; and
5. Maintain native understory vegetation and downed woody debris.

ii. Cape Cod style-curbing or no curbing options shall be used on new roads to facilitate amphibian passage².

(c) For work not complying with the requirements in (b) above, applicants shall submit an application to the Corps for at least Category 2 review with information on directional buffers in accordance with the VP Directional Buffer Guidance document². Conservation of the unimpacted area within the VP Management Area will often be required.

(d) GC 2 requires applicants to delineate or approximately identify on the project plans all waters of the U.S., which include vernal pools. Appendix A, Page 1 lists VP Category 1 thresholds.

29. Invasive Species.

(a) The introduction, spread, or the increased risk of invasion of invasive plant or animal species on the project site, into new or disturbed areas, or areas adjacent to the project site caused by the site work is prohibited (see Appendix E, Paragraph 6).

(b) Unless otherwise directed by the Corps, all applications for Category 2 inland projects and Category 2 coastal fill projects proposing fill in Corps jurisdiction shall include an Invasive Species Control Plan (ISCP) (see Appendix E, Paragraph 6).

30. Cranberry Development Projects. For cranberry development projects authorized under the GP, the following conditions apply:

(a) If a cranberry bog is abandoned for any reason, the area must be allowed to revert to natural wetlands unless an Individual Permit is obtained from the Corps allowing the discharge of fill for an alternate use.

¹ The Corps VP Management Area, which includes the VP and a 750' radius from the VP's edge, is defined at Appendix A, Endnote 5.

² Appendix E, 10(a)-(d) provides links to the state's Significant Wildlife Habitat regulations and references that provide impact minimization measures to reference when designing projects.

³ The no disturbance requirement in the VP envelope [see (b)(i)(1)], and (b)(i)(2), do not apply to temporary impacts associated with construction mats in previously disturbed areas of existing utility project (e.g., transmission lines, gas pipelines) or linear transportation project (e.g., roads, highways, railways, trails, airport runways and taxiways) right-of-ways provided there is a Vegetation Management Plan that avoids, minimizes and mitigates impacts to aquatic resources.

(b) No stream diversion shall be allowed under Category 1 of this GP.

(c) No impoundments of intermittent or perennial streams shall be allowed under Category 1 and an application to the Corps is required for at least Category 2 review.

(d) The project shall be designed and constructed to not cause flood damage on adjacent properties.

31. Inspections. The permittee shall allow the Corps to make periodic inspections at any time deemed necessary in order to ensure that the work is being or has been performed in accordance with the terms and conditions of this GP. The Corps may also require post-construction engineering drawings for completed work or post-dredging survey drawings for any dredging work.

To facilitate these inspections, the permittee shall complete and return to the Corps:

- For Category 1 projects, the Category 1 Notification Form (Appendix B).
- For Category 2 projects, the 1) Work-Start Notification Form and 2) Compliance Certification Form whenever either is provided with a Category 2 authorization letter.

32. Maintenance.

(a) The permittee shall maintain the work authorized herein in good condition and in conformance with the terms and general conditions of this permit.

(b) This does not include maintenance of dredging projects. Each maintenance dredging event exceeding the Category 1 thresholds (see Appendix A, Page 6) requires a new written Corps authorization unless an unexpired, written Corps authorization specifies that the permittee may “dredge and maintain” an area for a particular time period. Category 1 or 2 maintenance dredging includes only those areas and depths previously authorized and dredged.

(c) Some maintenance activities may not be subject to regulation under Section 404 in accordance with 33 CFR 323.4(a)(2) (see Appendix A, Endnote 7).

33. Property Rights. This PGP does not convey any property rights, either in real estate or material, or any exclusive privileges, nor does it authorize any injury to property or invasion of rights or any infringement of Federal, State, or local laws or regulations.

34. Transfer of GP Verifications. When the structures or work authorized by this GP are still in existence at the time the property is transferred, the terms and conditions of this GP, including any special conditions, will continue to be binding on the entity or individual who received the GP verification, as well as the new owner(s) of the property. The permittee may transfer responsibilities and obligations under the GP verification to the new owner by submitting a letter to the Corps (see Appendix D for address) to validate the transfer. A copy of the GP verification must be attached to the letter and the letter must contain the following statement and signature: “When the structures or work authorized by this GP are still in existence at the time the property is transferred, the terms and conditions of this GP, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer of this GP and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.”

35. Modification, Suspension, and Revocation. This GP or any work authorized under Category 1 or 2 may be either modified, suspended, or revoked, in whole or in part, pursuant to the policies and procedures of 33 CFR 325.7. Any such action shall not be the basis for any claim for damages against the United States.

36. Restoration Directive. The permittee, upon receipt of a notice of revocation of authorization under this GP, shall restore the wetland or waterway to its former condition without expense to the United States and as directed by the Secretary of the Army or his authorized representative. If the permittee fails

to comply with such a directive, the Secretary or his designee may restore the wetland or waterway to its former condition, by contract or otherwise, and recover the cost from the permittee.

37. Special Conditions. The Corps may independently, or at the request of the Federal resource agencies, impose other special conditions on a project authorized pursuant to this GP that are determined necessary to minimize adverse navigational and/or environmental effects or based on any other factor of the public interest. Failure to comply with all conditions of the authorization, including special conditions, constitutes a permit violation and may subject the permittee to criminal, civil, or administrative penalties and/or an ordered restoration.

38. False or Incomplete Information. If the Corps makes a determination regarding the eligibility of a project under this GP and subsequently discovers that it has relied on false, incomplete, or inaccurate information provided by the permittee, the GP authorization shall not be valid and the U.S. government may institute appropriate legal proceedings.

39. Abandonment. If the permittee decides to abandon the activity authorized under this GP, unless such abandonment is merely the transfer of property to a third party, he/she may be required to restore the area to the satisfaction of the Corps.

40. Enforcement Cases. This GP does not apply to any existing or proposed activity in Corps jurisdiction associated with an on-going Corps or EPA enforcement action, until such time as the enforcement action is resolved or the Corps and/or EPA as appropriate determines that the activity may proceed independently without compromising the enforcement action.

41. Duration of Authorization. This GP expires on October 11, 2015. Activities authorized under this GP that have commenced (i.e., are under construction) or are under contract to commence before this GP expires will have until October 11, 2016 to complete the activity under the terms and conditions of the current GP.

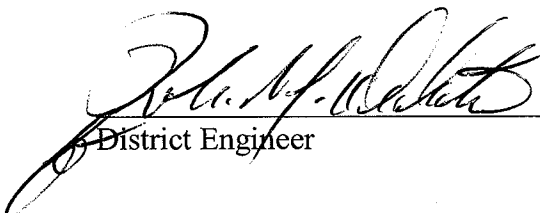
42. Previously Authorized Activities.

(a) Projects that have received authorization (Category 1 or 2) from the Corps and that were completed under the previous PGPs, nationwide permits, regional general permits or letters of permission, shall remain authorized.

(b) Activities authorized pursuant to 33 CFR Part 330.3 ("Activities occurring before certain dates") are not affected by this GP.

(c) Any work not commenced nor completed that was authorized in a written letter from the Corps under the PGP in effect between October 11, 2005 and October 11, 2010 remains authorized subject to the terms and general conditions of this GP along with any special conditions in the authorizing written letter.

43. NEPA Compliance. The Maine PGP was authorized in full compliance with Council for Environmental Quality ("CEQ") NEPA regulations. The Corps has determined that individual permit actions taken under the terms and conditions of the PGP are not a major federal action significantly affecting the quality of the human environment.


District Engineer 10/12/10
Date

APPENDIX A: DEFINITION OF CATEGORIES		
A. INLAND WATERS AND WETLANDS	<p>Inland Waters and Wetlands: Waters that are regulated under Section 404 of the Clean Water Act, including rivers, streams, lakes, ponds and wetlands, and excluding Section 10 Navigable Waters of the U.S. The jurisdictional limits are the ordinary high water (OHW) mark in the absence of adjacent wetlands, beyond the OHW mark to the limit of adjacent wetlands when adjacent wetlands are present, and the wetland limit when only wetlands are present. For the purposes of this GP, fill placed in the area between the mean high water (MHW) and the high tide line (HTL), and in the bordering and contiguous wetlands¹ to tidal waters are reviewed in the Navigable Waters section. (See II. Navigable Waters on page 4 below.)</p> <p>Projects not meeting Category 1 require an application for review as a Category 2 or Individual Permit project.</p> <p>All Category 1 and 2 projects must comply with all of this GP's applicable terms (Pages 1 – 4) and general conditions (Pages 5–18).</p>	
ACTIVITY	CATEGORY 1	CATEGORY 2
<p>(a) NEW FILL/ EXCAVATION DISCHARGES</p> <p>(You must reference (b) – (e) below for other thresholds that may be relevant to your project.)</p>	<p>1. <15,000 square feet (SF) (in LURC or DEP territories) of inland waterway and/or wetland fill and associated secondary impacts² (e.g., areas drained, flooded, fragmented, mechanically cleared or excavated). Fill area includes all temporary and permanent fill, and regulated discharges associated with excavation. Construction mats are considered as fill. [See General Condition (GC) 18(g).]</p> <p><u>Provided:</u></p> <ul style="list-style-type: none"> • Historic fill + proposed impact area <15,000 SF and subdivision fill complies with GC 5, Single and Complete Projects. • No work in special aquatic sites (SAS)⁴ other than wetlands. <p>2. Construction mats⁴ of any area necessary to conduct activities that were previously authorized, authorized under Category 1, or not subject to regulation (see Endnote 7). Authorized construction mats must be in place for <3 months, removed immediately upon work completion, and the wetlands must be restored (see GC 19).</p> <p>3. For work in Vernal Pool (VP) Management Areas (includes VPs)⁵:</p> <ul style="list-style-type: none"> • See GC 2 and Appendix C for VP delineation requirements. • See GC 28 to determine if work qualifies for Category 1 or 2. • See Appendix E, Page 3 for VP documents providing mitigation guidance. 	<p>1. ≥15,000 square feet (SF) (in LURC or DEP territories) to <3 acres of inland waterway and/or wetland fill and associated secondary impacts (e.g., areas drained, flooded, fragmented, or excavated). Fill area includes all temporary and permanent fill, and regulated discharges associated with excavation. Mechanical clearing without grubbing or other soil disturbance >3 acres as a secondary impact may still be eligible for Category 2 at the discretion of the Corps.</p> <p>2. Specific activities with impacts of any area ≥15,000 SF required to affect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. Wetlands must be restored in place.</p> <p>3. Temporary structures, work, and discharges (including construction mats⁴) ≥15,000 SF necessary for construction activities or access fills or dewatering of construction sites, provided that the associated primary activity is authorized by the Corps, authorized under Category 1, or not subject to Corps regulation. GCs 16 -19 are particularly relevant.</p> <p>See GC 2 and Appendix C for wetland delineation requirements.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(b) BANK STABILIZATION PROJECTS	<p>1. Inland bank stabilization <500 FT long and <1 CY of fill per linear foot below OHW, provided:</p> <ul style="list-style-type: none"> • ≤1 cubic yard of fill per linear foot placed along the bank waterward of ordinary high water. • Work complies with the GCs (GC 20 in particular), including: <ul style="list-style-type: none"> ◦ No structures angled steeper than 1H:1V allowed. Only rough-faced stone or fiber roll revetments allowed. ◦ No in-stream work involving fill or excavation in flowing waters (see GC 22(h)). • In-stream work limited to Jul 15 - Oct 1 [see GC 22 (l)]. • No work in vernal pools⁵ or SAS³. • GC 10 Endangered Species and GC 11 Essential Fish Habitat are particularly relevant. 	<p>1. Inland bank stabilization ≥500 FT long and/or ≥1 CY of fill per linear foot, or any amount with fill in wetlands.</p>
(c) RIVER/ STREAM/ BROOK WORK & CROSSINGS and WETLAND CROSSINGS	<p>1. River, stream and brook work and crossings:</p> <ul style="list-style-type: none"> • Must comply with GC 22 in particular, including: <ul style="list-style-type: none"> ◦ No slip lining [see GC 22 (g)]. ◦ No in-stream work involving fill or excavation in flowing waters [see GC 22(h)]. ◦ In-stream work limited to Jul 15 - Oct 1 [see GC 22 (l)]. • No work in riffles and pools³. • No stream relocations. • No dams or dikes⁶. • Work in areas designated as Atlantic salmon critical habitat or occupied by listed Atlantic salmon, or any other area occupied by a listed species is not eligible for Category 1 (see GC 10). • No work in EFH streams except for the activities stated in GC 11. <p>2. Wetland crossings must comply with the particularly relevant GC 23.</p>	<p>1. Work not qualifying for Category 1.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(d) REPAIR, REPLACEMENT, & MAINTENANCE OF AUTHORIZED FILLS	<p>1. Repair or maintenance of existing, currently serviceable, authorized fills with no expansion or change in use:</p> <ul style="list-style-type: none"> • Conditions of the original authorization apply • Minor deviations in fill design allowed.⁷ • The repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events is authorized, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. 	<p>2. Replacement of non-serviceable fills, or repair/maintenance of serviceable fill, with expansion <3 acres, or with a change in use.</p>
(e) MISCELL-ANEOUS	<p>1. Activities required for the containment and cleanup of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) provided that the work is done in accordance with the Spill Control and Countermeasure Plan required by 40 CFR 112.3 and any existing state contingency plan and provided that the Regional Response Team (if one exists in the area) concurs with the proposed containment and cleanup action. SAS³ must typically be restored in place at the same elevation.</p> <p>2. Scientific measurement devices whose purpose is to measure and record scientific data, such as staff gages, water recording devices, water quality testing and improvement devices, and similar structures. This excludes any biological sampling devices. Structures may not restrict movement of aquatic organisms.</p> <p>3. Survey activities, such as core sampling, seismic exploratory operations, plugging of seismic shot holes and other exploratory-type bore holes, exploratory trenching, soil surveys, sampling, and historic resources surveys (but not recovery). Exploratory trenches must be restored in accordance with GC 19. The construction of temporary pads is authorized provided the discharge doesn't exceed 25 CY. This doesn't authorize permanent structures or the drilling and the discharge of excavated material from test wells for oil and gas exploration (the plugging of such wells is authorized).</p> <p>4. Any work not commenced nor completed that was authorized in a written letter from the Corps under the PGP in effect between October 11, 2005 and October 11, 2010. The terms and general conditions of this GP apply along with any special conditions in the written authorization.</p>	<p>1. Aquatic habitat restoration, establishment, and enhancement of wetlands and riparian areas and the restoration and enhancement of streams and other open waters with impacts of any area $\geq 15,000$ SF, provided those activities result in net increase in overall aquatic resource functions and services.⁸</p> <p>2. Projects where an EIS is required by the Corps are not eligible for Category 2.</p>

II. NAVIGABLE WATERS	Navigable Waters of the United States: Waters that are subject to the ebb and flow of the tide and/or the tidal and non-tidal portions of the Federally designated navigable waters (the Penobscot River, Kennebec River, and Lake Umbagog) (Section 10 Rivers and Harbors Act of 1899). The jurisdictional limits are the mean high water (MHW) line in tidal waters and the ordinary high water (OHW) mark in non-tidal portions of the federally designated navigable rivers. For the purposes of this GP, fill placed in the area between the mean high water (MHW) and the high tide line (HTL), and in the bordering and contiguous wetlands ¹ to tidal waters are also reviewed in this Navigable Waters section.	
	Projects not meeting Category 1 require an application for review as a Category 2 or Individual Permit project.	
	All Category 1 and 2 projects must comply with all of this GP's applicable terms (Pages 1 - 4) and general conditions (Pages 5 - 18).	
ACTIVITY	CATEGORY 1	CATEGORY 2
(a) FILL	<p>1. Discharges of dredged or fill material incidental to the construction of bridges across navigable waters of the U.S., including cofferdams, abutments, foundation seals, piers, and temporary construction and access fills provided the U.S. Coast Guard authorizes such discharges as part of the bridge permit or appropriate approval. Causeways and approach fills are not included in this category and require Category 2 or Individual Permit authorization.</p> <p>2. Bank stabilization projects <200 linear feet:</p> <ul style="list-style-type: none">• ≤1 cubic yard of fill per linear foot placed along the bank waterward of high tide line. No fill or equipment will occur in SAS³.• Work conducted in the intertidal zone must be conducted in-the-dry during low water, or between Nov. 8 – Apr. 9.• No structures angled steeper than 1H:1V and only rough-faced stone or fiber roll revetments allowed.• No driving of piles or sheeting. <p>3. For 1 and 2 above:</p> <ul style="list-style-type: none">• Project proponents must contact the USFWS for work on coastal beaches to ensure no impacts to piping plovers, roseate terns or their habitat [see GC 10(b)ii].	<p>1. <1 acre temporary or permanent fill, excavation and/or secondary impacts (e.g., areas drained, flooded, fragmented or mechanically cleared). Fill area includes all temporary and permanent waterway fills, provided:</p> <ul style="list-style-type: none">• Temporary or permanent fill in eelgrass¹⁴ <1000 SF.• Permanent fill in SAS (excluding eelgrass¹⁴) <4300 SF.
(b) STREAM WORK & CROSSINGS, and WETLAND CROSSINGS	<p>1. No new fill for crossings allowed.</p>	<p>1. New crossings or replacement crossings that do not fit the (c) Repair and Maintenance activity below.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
<p>(c) REPAIR AND MAINTENANCE WORK</p>	<p>1. Repair, replacement in-kind, or maintenance⁷ of existing, currently serviceable⁷, authorized structures or fills:</p> <ul style="list-style-type: none"> • Conditions of the original authorization apply. • No substantial expansion or change in use. • Must be rebuilt in same footprint, however minor deviations in structure design allowed⁷. • The repair, rehabilitation, or replacement of those structures or fills destroyed or damaged by storms, floods, fire or other discrete events is authorized, provided the repair, rehabilitation, or replacement is commenced, or is under contract to commence, within two years of the date of their destruction or damage. Minor deviations for work involving piles shall adhere to one of the 4 methods in a - d below: <ul style="list-style-type: none"> a. Piles installed in-the-dry during low water or in-water between Nov. 8th - Apr. 9th, or b. Must be drilled and pinned to ledge, or c. Vibratory hammers used to install any size and quantity of wood, concrete or steel piles, or d. Impact hammers limited to one hammer and <50 piles installed/day with the following: wood piles of any size, concrete piles ≤18-inches diameter, steel piles <12-inches diameter if the hammer is ≤3000 lbs and a wood cushion is used between the hammer and steel pile, and <ul style="list-style-type: none"> • For b – d above: <ul style="list-style-type: none"> ○ In-water noise levels shall not exceed >187dB SEL re 1μPa or 206dB peak re 1μPa at a distance >10m from the pile being installed-, and ○ In-water noise levels >155dB peak re 1μPa shall not exceed 12 consecutive hours on any given day and a 12 hour recovery period (i.e., in-water noise below 155dB peak re 1μPa) must be provided between work days. • For a – d above: <ul style="list-style-type: none"> ○ Work is not eligible for Category 1 if conducted in tidal portions of the Penobscot river upstream of a line extending from Turner point in Castine to Moose Point (formerly squaw point) on Cape Jellison in Stockton Springs or in tidal portions of the Kennebec or Androscoggin Rivers upstream of a line extending from Doubling point in Arrowsic to Hospital Point in West Bath. 	<p>1. Replacement of non-serviceable structures and fills or repair/maintenance of serviceable structures or fills, with fill, replacement or expansion <1 acre, or with a change in use.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(d) DREDGING AND ASSOCIATED DISPOSAL	<p>1. Maintenance dredging¹⁰ for navigational purposes <1,000 CY with upland disposal. Includes return water from upland contained disposal area, provided:</p> <ul style="list-style-type: none"> • Proper siltation controls are used. • Dredging & disposal operation limited to Nov. 8 – Apr. 9. • No impact to SAS³. • No dredging in intertidal areas. • No dredging in areas considered occupied by listed Atlantic salmon [see GC 10(b)(ii)]. • For dredging in waters outside of Atlantic salmon critical habitat, applicants must contact NMFS (Appendix D) to ensure no impacts to listed species such as shortnose sturgeon. • Project proponents must contact the USFWS for work on coastal beaches to ensure no impacts to piping plovers, roseate terns or their habitat [see GC 10(c)]. 	<p>1. Maintenance dredging¹⁰ ≥1,000 CY, new dredging <25,000 CY, or projects not meeting Category 1. Includes return water from upland contained disposal areas. Disposal includes:</p> <ul style="list-style-type: none"> • Upland. • Beach nourishment (above mean high water) of any area provided dredging's primary purpose is navigation or sand is from an upland source. • Open water & confined aquatic disposal, if Corps finds the material suitable. <p>2. Beach nourishment associated with dredging when the primary purpose is not navigation requires at least a Category 2 review.</p> <p>3. Maintenance or new dredging¹⁰ and/or disposal in or affecting a SAS³ requires an Individual Permit. See II(a) above for dredge disposal in wetlands or waters.</p>
(e) MOORINGS	<p>1. Private, non-commercial, non-rental, single-boat moorings, provided:</p> <ul style="list-style-type: none"> • Authorized by the local harbormaster/town. • Not associated with any boating facility.¹¹ • Boat or mooring not located in a Federal Navigation Project¹² other than a Federal Anchorage¹². Moorings in Federal Anchorage not associated with a boating facility¹¹ and are not for rent. • No interference with navigation. • No new moorings located in SAS³. Prior to installation of moorings, a site-specific eelgrass survey should be conducted to document that eelgrass is not present. • When existing, authorized moorings in SAS³ are going to be replaced, they shall be replaced with elastic mooring systems that prevent mooring chains from resting or dragging on the bottom substrate at all tides and helical anchors, or equivalent SAS protection systems where practicable. <p>2. Minor relocation of previously authorized moorings and moored floats, provided:</p> <ul style="list-style-type: none"> • Authorized by the local harbormaster/town. • Not located in SAS³ • No interference with navigation. • Cannot be relocated into a Federal Navigation Project¹² other than a Federal Anchorage¹² 	<p>1. Moorings associated with a boating facility¹¹. An eelgrass¹⁴ survey may be required.</p> <p>2. Moorings that don't meet the terms in Category 1 and don't require an Individual Permit. This includes private moorings with no harbormaster or means of local approval.</p> <p>3. Moorings located such that they, and/or vessels docked or moored at them, are within the buffer zone of the horizontal limits¹³ of a Federal Channel¹². (See Appendix F.) The buffer zone is equal to 3 times the authorized depth of that channel.</p> <p>4. An IP is required for moorings within the horizontal limits¹¹, or with moored vessels that extend, into the horizontal limits of a Federal Navigation Project¹², except those in Federal Anchorages¹².</p> <p>For 1-4 above, siting of new individual moorings in SAS³, including eelgrass¹⁴, should be avoided to the maximum extent practicable. If SAS³ cannot be avoided, plans should show elastic mooring systems that prevent mooring chains from resting or dragging on the bottom substrate at all tides and helical anchors, or equivalent SAS protection systems, where practicable.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(f) STRUCTURES AND FLOATS	<p>1. Reconfiguration of existing, authorized structures or floats. <u>Provided:</u></p> <p>a. Piles shall adhere to one of the 4 methods in (i) –(iv) below:</p> <ul style="list-style-type: none"> i. Piles installed in-the-dry during low water or in-water between Nov. 8th – Apr. 9th, or ii. Must be drilled and pinned to ledge, or iii. Vibratory hammers used to install any size and quantity of wood, concrete or steel piles, or iv. Impact hammers limited to one hammer and <50 piles installed/day with the following: wood piles of any size, concrete piles ≤18-inches diameter, steel piles <12-inches diameter if the hammer is ≤3000 lbs and a wood cushion is used between the hammer and steel pile. <p>b. For (ii) – (iv) above:</p> <ul style="list-style-type: none"> i. In-water noise levels shall not exceed >187dB SEL re 1μPa or 206dB peak re 1μPa at a distance >10m from the pile being installed, and ii. In-water noise levels >155dB peak re 1μPa shall not exceed 12 consecutive hours on any given day and a 12 hour recovery period (i.e., in-water noise below 155dB peak re 1μPa) must be provided between work days. <p>c. For (i) –(iv) above:</p> <ul style="list-style-type: none"> i. Work is not eligible for Category 1 if conducted in tidal portions of the Penobscot river upstream of a line extending from Turner point in Castine to Moose Point (formerly squaw point) on Cape Jellison in Stockton Springs or in tidal portions of the Kennebec or Androscoggin Rivers upstream of a line extending from Doubling point in Arrowsic to Hospital Point in West Bath. 	<p>CATEGORY 2</p> <p>1. Private structures or floats, including floatways/skidways, built to access waterway (seasonal and permanent)</p> <p>2. Expansions to existing boating facilities¹¹.</p> <p>For 1 & 2 above, compliance with the following design standards is not required but recommended:</p> <ul style="list-style-type: none"> • Pile-supported structures <400 SF, with attached floats totaling ≤200 SF. • Bottom anchored floats ≤200 SF. • Structures are ≤4' wide and have at least a 1:1 height:width ratio¹¹. • Floats supported a minimum of 18" above the substrate during all tides. • Structures & floats not located within 25' of any eelgrass⁸. • Moored vessels not positioned over SAS⁴. • No structure located within 25' of the riparian property boundary without written approval from the abutter(s). • No structure extends across >25% of the waterway width at mean low water. • Not located within the buffer zone of the horizontal limits¹³ of a Corps Federal Navigation Project (FNP) (App. F). The buffer zone is equal to three times the authorized depth of that FNP. <p>3. An Individual Permit is required for structures or floats, including floatways/skidways, located such that they and/or vessels docked or moored at them are within the horizontal limits¹³ of a Corps Federal Navigation Project¹² (see App. F).</p> <p>4. An Individual Permit is required for structures & floats associated with a new or previously unauthorized boating facility¹¹.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(g) MISCELL- ANEOUS	<p>1. Temporary buoys, markers, floats, etc. for recreational use during specific events, provided they are removed within 30 days after use is discontinued.</p> <p>2. The placement of aids to navigation and regulatory markers which are approved by and installed in accordance with the requirements of the U.S. Coast Guard. (See 33 CFR 66, Chapter I, subchapter C).”</p> <p>3. Activities required for the containment and cleanup of oil and hazardous substances that are subject to the National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) provided that the work is done in accordance with the Spill Control and Countermeasure Plan required by 40 CFR 112.3 and any existing state contingency plan and provided that the Regional Response Team (if one exists in the area) concurs with the proposed containment and cleanup action. SAS³ must typically be restored in place at the same elevation.</p> <p>4. Fish and wildlife harvesting, enhancement, and attraction devices and activities such as pound nets, crab traps, crab dredging, eel pots, lobster traps, and clam and oyster digging, and small fish attraction devices such as open water fish concentrators (sea kites, etc.). This does not authorize artificial reefs or impoundments and semi-impoundments of waters of the U.S. for the culture or holding of motile species such as lobster, or the use of covered oyster trays or clam racks. No activity that results in a hazard to navigation. Note: A Category 1 Notification Form is not required for these devices and activities.</p> <p>5. Scientific measurement devices whose purpose is to measure and record scientific data, such as staff gages, water recording devices, water quality testing and improvement devices, and similar structures. Structures may not restrict movement of aquatic organisms. No activity results in a hazard to navigation.</p> <p>6. Survey activities such as exploratory drilling, surveying and sampling activities, excluding any biological sampling devices. Does not include oil and gas exploration and fill for roads or construction pads. No activity results in a hazard to navigation. Applicants must contact NMFS to ensure no impacts to listed species.</p>	<p>1. Structures or work in or affecting tidal or navigable waters, that are not defined under any of the previous headings listed above. Includes, but is not limited to, utility lines, aerial transmission lines, pipelines, outfalls, boat ramps, floatways/skidways, bridges, tunnels and horizontal directional drilling activities seaward of the mean high water line.</p> <p>2. Shellfish/finfish (other than Atlantic salmon), or other aquaculture facilities with no more than minimal individual and cumulative impacts to environmental resources or navigation. –Aquaculture guidelines are provided at: www.maine.gov/dmr/aquaculture/index.htm.</p> <p>3. Specific activities with impacts of any area required to affect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. Wetlands must typically be restored in place at the same elevation to qualify.</p> <p>4. Aquatic habitat restoration, establishment and enhancement provided those activities are proactive and result in net increases in aquatic resource functions and services.⁸</p> <p>5. Projects where an EIS is required by the Corps are not eligible for Category 2.</p>

ACTIVITY	CATEGORY 1	CATEGORY 2
(g) MISCELL- ANEOUS (continued)	<p>7. Shellfish seeding (brushing the flats⁹) projects.</p> <p>8. Marine railway work not eligible for maintenance⁷ (i.e. not currently serviceable⁷ or in non-compliance) may be replaced “in-kind” with minor deviations⁷ provided:</p> <ul style="list-style-type: none"> • Work is in the intertidal zone • No fill expansion below high tide line. • Work conducted in-the-dry during low water or in-water between Nov. 8 – Apr. 9. <p>9. Test plots <100 SF for the planting of wetland species native to the area. No grading, no structures, no plant growing devices and no interference with navigation, which require at least Category 2 review.</p> <p>10. Any work not commenced nor completed that was authorized in a written letter from the Corps under the PGP in effect between October 11, 2005 and October 11, 2010. The terms and general conditions of this GP apply along with any special conditions in the written authorization</p>	

Endnotes/Definitions

¹ **Bordering and Contiguous Wetlands:** A bordering wetland is immediately next to its adjacent waterbody and may lie at, or below, the ordinary high water mark (mean high water in navigable waters) of that waterbody and is directly influenced by its hydrologic regime. Contiguous wetlands extend landward from their adjacent waterbody to a point where a natural or manmade discontinuity exists. Contiguous wetlands include bordering wetlands as well as wetlands that are situated immediately above the ordinary highwater mark and above the normal hydrologic influence of their adjacent waterbody. Note, with respect to the federally designated navigable rivers, the wetlands bordering and contiguous to the tidally influenced portions of those rivers are reviewed under “II. Navigable Waters.”

² **Direct, Secondary, and Cumulative Impacts/Effects:**

Direct Impacts: The immediate loss of aquatic ecosystem within the footprint of the fill.

Secondary Impacts: These are effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material. Information about secondary effects on aquatic ecosystems shall be considered prior to the time final section 404 action is taken by permitting authorities. Some examples of secondary effects on an aquatic ecosystem are a) fluctuating water levels in all impoundment and downstream associated with the operation of a dam, b) septic tank leaching and surface runoff from residential or commercial developments on fill, and c) leachate and runoff from a sanitary landfill located in waters of the U.S. Put another way, secondary effects are those impacts outside the footprint of the fill that arise from and are associated with the discharge of dredged or fill material, including the operation of an activity or facility associated with the discharge. Examples may include habitat fragmentation; interruption of travel corridors for wildlife (for example, for amphibians that migrate to and from seasonal or vernal pools used as breeding habitat); hydrologic regime changes; and impacts from operation and maintenance activities for constructed facilities; such as noise/lighting, storm water runoff, and road kill of wetland dependent wildlife. Using the directions contained in the guidelines, we consider the circumstances of a proposed discharge and the project of which it is a part to evaluate the scope, extent, severity, and permanence of direct, secondary, and cumulative adverse effects upon the aquatic ecosystem.

Cumulative Impacts: The extent of past, present, and foreseeable developments in the area may be an important consideration in evaluating the significance of a particular project's impacts. Although the impacts associated with a particular discharge may be minor, the cumulative effect of numerous similar discharges can result in a large impact. Cumulative impacts should be estimated only to the extent that they are reasonable and practical.

³**Special Aquatic Sites:** Includes wetlands and saltmarsh, mudflats, riffles and pools, and vegetated shallows (predominantly comprised of eelgrass in Maine).

⁴**Construction Mats:** Constructions, swamp and timber mats (herein referred to as "construction mats") are generic terms used to describe structures that distribute equipment weight to prevent wetland damage while facilitating passage and providing work platforms for workers and equipment. They are comprised of sheets or mats made from a variety of materials in various sizes. A timber mat consists of large timbers bolted or cabled together. Corduroy roads, which are not considered to be construction mats, are cut trees and/or saplings with the crowns and branches removed, and the trunks lined up next to one another. Corduroy roads are typically installed as permanent structures. Like construction mats, they are considered as fill whether they're installed temporarily or permanently.

⁵**Vernal Pools:** A vernal pool, also referred to as a seasonal forest pool, is a temporary to semi-permanent body of water occurring in a shallow depression that typically fills during the spring or fall and may dry during the summer. Vernal pools have no permanent inlet or outlet and no viable populations of predatory fish. A vernal pool may provide the primary breeding habitat for wood frogs (*Rana sylvatica*), spotted salamanders (*Ambystoma maculatum*), blue-spotted salamanders (*Ambystoma laterale*), and fairy shrimp (*Eubranchipus* sp.), as well as valuable habitat for other plants and wildlife, including several rare, threatened, and endangered species. A vernal pool intentionally created for the purposes of compensatory mitigation is included in this definition. For the purposes of this GP, the presence of any of the following species in any life stage in any abundance level/quantity would designate the waterbody as a vernal pool: fairy shrimp, blue spotted salamanders, spotted salamanders or wood frogs. The Corps may determine during a Category 2 review that a waterbody should not be regulated as a VP based on available evidence. For the purposes of this GP*, the VP Management Areas are the: Vernal Pool Depression (includes the vernal pool depression up to the spring or fall high water mark, and includes any vegetation growing within the depression), Vernal Pool Envelope (area within 100 FT of the VP Depression's edge) and Critical Terrestrial Habitat (area within 100-750 FT of the Vernal Pool Depression's edge). [*Note: Critical Terrestrial Habitat is defined as 100 -750 FT on page 243 of the document "Science and Conservation of Vernal Pools in Northeastern North America," Calhoun and deMaynadier, 2008, which is referenced in Appendix E, page 3, Paragraph 10(b).]

⁶**Water Diversions:** Water diversions are activities such as bypass pumping or water withdrawals. Temporary flume pipes, culverts or cofferdams where normal flows are maintained within the stream boundary's confines aren't water diversions. "Normal flows" are defined as no change in flow from pre-project conditions.

⁷**Maintenance:** a) In accordance with 33 CFR 323.4(a)(2), any discharge of dredged or fill material that may result from any of the following activities is not prohibited by or otherwise subject to regulation under Section 404 of the CWA: "Maintenance, including emergency reconstruction of recently damaged parts, of currently serviceable structures such as dikes, dams, levees, groins, riprap, breakwaters, causeways, bridge abutments or approaches, and transportation structures. Maintenance does not include any modification that changes the character, scope, or size of the original fill design." Otherwise, the following work is regulated and subject to the Category 1 or 2 thresholds in Appendix A above: The repair, rehabilitation, or replacement of any previously authorized, currently serviceable structure or fill, or of any currently serviceable structure or fill authorized by 33 CFR 330.3 – "Activities occurring before certain dates," provided that the structure or fill is not to be put to uses differing from those uses specified or contemplated for it in the original permit or the most recently authorized modification. b) Minor deviations in the structure's configuration or filled area, including those due to changes in materials, construction techniques, or current construction codes or safety standards that are necessary to make repair, rehabilitation, or replacement are authorized. c) Currently serviceable means useable as is or with some maintenance, but not so degraded as to essentially require reconstruction. d) No seaward expansion for bulkheads or any other fill activity is considered Category 1 maintenance. e) Only structures or fills that were previously authorized and are in compliance with the terms and condition of the original authorization can be maintained as a non-regulated activity under 33 CFR 323.4(a)(2), or in accordance with the Category 1 or 2 thresholds in Appendix A. f) The state's maintenance provisions may differ from the Corps and may require reporting and written authorization from the state. g) Contact the Corps to determine whether stream crossing replacements require a written application to the Corps for at least a Category 2 review.

⁸**Aquatic Habitat Restoration, Establishment and Enhancement:** The Corps will decide if a project qualifies and must determine in consultation with federal and state agencies that the net effects are beneficial. The Corps may refer to Nationwide Permit 27 published in the 3/12/07 Federal Register. Activities authorized here may include, but are not limited to: the removal of accumulated sediments; the installation, removal, and maintenance of small water control structures, dikes, and berms; the installation of current deflectors; the enhancement, restoration, or establishment of riffle and pool stream structure; the placement

of in-stream habitat structures; modifications of the stream bed and/or banks to restore or establish stream meanders; the backfilling of artificial channels and drainage ditches; the removal of existing drainage structures; the construction of small nesting islands in inland waters; the construction of open water areas; the construction of native shellfish species habitat over unvegetated bottom for the purpose of habitat protection or restoration in tidal waters; shellfish seeding; activities needed to reestablish vegetation, including plowing or discing for seed bed preparation and the planting of appropriate wetland species; mechanized land clearing to remove non-native invasive, exotic, or nuisance vegetation; and other related activities. Only native plant species should be planted at the site.

⁹ **Brushing the Flats:** The placement of tree boughs, wooden lath structure, or small-mesh fencing on mudflats to enhance recruitment of soft-shell clams (*Mya arenaria*).

¹⁰ **Maintenance Dredging:** This includes only those areas and depths previously authorized by the Corps and dredged.

¹¹ **Boating Facilities:** Facilities that provide for a fee, rent, or sell mooring space, such as marinas, yacht clubs, boat clubs, town facilities, dockminiums, etc.

¹² **Federal Navigation Projects (FNPs):** FNPs are comprised of Federal Channels and Federal Anchorages. See Appendix F for their location and contact the Corps for more information. “Horizontal Limits” is the outer edge of an FNP. “Buffer Zone” is equal to three times the authorized depth of that channel.

¹³ **Horizontal Limits:** The outer edge of a Federal Navigation Project (FNP). See Appendix F and contact the Corps for information on FNP’s.

¹⁴ **Eelgrass (*Zostera marina*):** A type of rooted aquatic vegetation that exists in intertidal and shallow subtidal areas known as vegetated shallows. See www.nero.noaa.gov/hcd/ for eelgrass survey guidance.

¹⁵ **Structures:** The height of structures shall at all points be equal to or exceed the width of the deck. For the purpose of this definition, height shall be measured from the marsh substrate to the bottom of the longitudinal support beam.

- ☐ Provide information on secondary and cumulative effects associated with the project (see GC 3).
- ☐ Indicate that application materials were submitted to the Maine Historic Preservation Commission (MHPC) and the appropriate tribes (see Section 3(d) on Page 4).
- ☐ The name(s) of federal endangered and threatened “listed species or habitat” present in the action area (see GC 10 and Appendix E).
- ☐ Identify and describe potential impacts to Essential Fish Habitat (see GC 11).
- ☐ Invasive Species Control Plan (see GC 29).

Information typically required for dredging projects:

- ☐ Sediment testing, including physical (e.g., grain-size analysis), chemical and biological testing. For projects proposing open water disposal, applicants are encouraged to contact the Corps as early as possible regarding sampling and testing protocols. Sampling and testing of sediments without such contact should not occur and if done, would be at the applicant’s risk.
- ☐ The area in square feet and volume of material to be dredged below mean high water.
- ☐ Existing and proposed water depths.
- ☐ Type of dredging equipment to be used.
- ☐ Nature of material (e.g., silty sand).
- ☐ Any existing sediment grain size and bulk sediment chemistry data for the proposed or any nearby projects.
- ☐ Information on the location and nature of municipal or industrial discharges and occurrence of any contaminant spills in or near the project area.
- ☐ Shellfish survey.
- ☐ Location of the disposal site (include locus sheet).
- ☐ Identify and describe potential impacts to Essential Fish Habitat (see GC 11).
- ☐ Delineation of submerged aquatic vegetation (e.g., eelgrass beds).

Appendix D: Contacts and Tribal Areas of Interest

1. **FEDERAL**

U.S. Army Corps of Engineers

Maine Project Office
675 Western Avenue #3
Manchester, Maine 04351
(207) 623-8367; (207) 623-8206 (fax)

Federal Endangered Species

U.S. Fish and Wildlife Service
Maine Field Office
17 Godfrey Drive, Suite 2
Orono, Maine 04473
(207) 866-3344; (207) 866-3351 (fax)

Wild and Scenic Rivers

National Park Service
North Atlantic Region
15 State Street
Boston, Massachusetts 02109
(617) 223-5203

Bridge Permits

Commander (obr)
First Coast Guard District
One South Street - Battery Bldg
New York, New York 10004
(212) 668-7021; (212) 668-7967 (fax)

Federal Endangered Species

National Marine Fisheries Service
Maine Field Office
17 Godfrey Drive Suite 1
Orono, ME 04473
(207) 866-7379; (978) 866-7342 (fax)

Federal Endangered Species & EFH

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts 01930
(978) 281-9102; (978) 281-9301 (fax)

2. **STATE OF MAINE**

Maine Department of Environmental Protection (for State Permits & Water Quality Certifications)

Division of Land Resource Regulation
Bureau of Land and Water Quality
17 State House Station
Augusta, Maine 04333
(207) 287-7688

Southern Maine Regional Office
312 Canco Road
Portland, Maine 04103
(201) 822-6300

Eastern Maine Regional Office
106 Hogan Road
Bangor, Maine 04401
(207) 941-4570

Northern Maine Regional Office
1235 Central Drive - Skyway Park
Presque Isle, Maine 04769
(207) 764-0477

Maine Land Use Regulation Commission (LURC) (www.maine.gov/doc/lurc/offices.html)

22 State House Station
Augusta, Maine 04333-0022
(207) 287-2631; (207) 287-7439 (fax)

106 Hogan Rd, Suite 7
Bangor, Maine 04401
(207) 941-4052; (207) 941-4222 (fax)

Lakeview Drive
P.O. Box 1107
Greenville, Maine 04441
(207) 695-2466; (207) 695-2380 (fax)

45 Radar Road
Ashland, ME 04732-3600
(207) 435-7963; (207) 435-7184 (fax)

191 Main Street
East Millinocket, ME 04430
(207) 746-2244; (207) 746-2243 (fax)

(For CZM Determinations)

State Planning Office
Coastal Program
184 State Street
State House Station 38
Augusta, Maine 04333
(207) 287-1009

(For Aquaculture Leases)

Maine Department of Marine Resources
P.O. Box 8
West Boothbay Harbor, Maine 04575
(207) 633-9500

(For Submerged Lands Leases)

Maine Department of Conservation
Bureau of Parks and Lands
22 State House Station
Augusta, Maine 04333
(207) 287-3061

3. HISTORIC PROPERTIES

Maine Historic Preservation Commission
(MHPC)

State House Station 65
Augusta, Maine 04333-0065
(207) 287-2132; (207) 287-2335 (fax)

Houlton Band of Maliseet Indians

Attn: Sharri Venno, Environmental Planner
88 Bell Road
Littleton, Maine 04730
(207) 532-4273, x215; (207) 532-1883 (fax)
envplanner@maliseets.com

Passamaquoddy Tribe of Indians

Pleasant Point Reservation
Attn: Donald Soctomah, THPO
P.O. Box 343
Perry, Maine 04667
(207) 853-2600; (207) 853-6039 (fax)

Aroostook Band of Micmacs

Attn: Victoria Higgins, Chief
7 Northern Road
Presque Isle, Maine 04769
(207) 764-1972; (207) 764-7667 (fax)

Passamaquoddy Tribe of Indians

Indian Township Reservation
Attn: Donald Soctomah, THPO
P.O. Box 301
Princeton, Maine 04668
(207) 796-2301; (207) 796-5256 (fax)

Penobscot Indian Nation

Indian Island Reservation
Attn: Ms. Bonnie Newsom, THPO
12 Wabanaki Way
Indian Island, Maine 04468
(207) 817-7471; (207) 817-7450 (fax)

4. ORGANIZATIONAL WEBSITES:

Army Corps of Engineers, N.E. District
Army Corps of Engineers, Headquarters
Environmental Protection Agency
National Marine Fisheries Service
U.S. Fish and Wildlife Service
National Park Service
State of Maine
Maine Department of Environmental Protection
Maine Land Use Regulation Commission
State of Maine -Aquaculture Guidelines

www.nae.usace.army.mil/reg
www.usace.army.mil/CECW/Pages/cecwo_reg.aspx
www.epa.gov/owow/wetlands
www.nmfs.noaa.gov
www.fws.gov/mainefieldoffice
www.nps.gov/rivers/index.html
www.maine.gov
www.maine.gov/dep
www.maine.gov/doc/lurc
www.maine.gov/dmr/aquaculture/index.htm

Appendix E: Additional References

1. GC 2: Federal Jurisdictional Boundaries.

(a) Corps Wetlands Delineation Manual, regional supplements, and Corps Wetland Delineation Data Sheets: www.nae.usace.army.mil/reg and then “Wetlands and Jurisdictional Limits.”

(b) The USFWS publishes the 1988 National List of Plant Species that Occur in Wetlands (www.nwi.fws.gov).

The Natural Resources Conservation Service (NRCS) publishes the current hydric soil definition, criteria and lists: <http://soils.usda.gov/use/hydric>. For the Field Indicators for Identifying Hydric Soils in N.E., see www.neiwpcc.org/hydricsoils.asp.

2. GC 5:

Single and complete project means the total project proposed or accomplished by one owner/developer or partnership or other association of owners/developers. For example, if construction of a residential development affects several different areas of a headwater or isolated water, or several different headwaters or isolated waters, the cumulative total of all filled areas should be the basis for deciding whether or not the project will be covered by Category 1 or 2.

The *Independent utility* test is used to determine what constitutes a single and complete project in the Corps regulatory program. A project is considered to have independent utility if it would be constructed absent the construction of other projects in the project area. Portions of a multi-phase project that depend upon other phases of the project do not have independent utility. Phases of a project that would be constructed even if the other phases were not built can be considered as separate single and complete projects with independent utility.

3. GC 10: Threatened and Endangered Species.

(a) The following NMFS site must be referenced to ensure that listed species or critical habitat are not present in the action area [GC 10(b)] or to provide information on federally-listed species or habitat [GC 10(e)]: www.nero.noaa.gov/prot_res/esp/ListE&Tspec.pdf. Contact the USFWS for information to check for the presence of listed species (see Appendix D for contact information).

(b) The Endangered Species Act Consultation Handbook – Procedures for Conducting Section 7 Consultations and Conferences, defines action area as “all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. [50 CFR 402.02].”

4. GC 11: Essential Fish Habitat.

As part of the PGP screening process, the Corps may coordinate with NMFS in accordance with the 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act to protect and conserve the habitat of marine, estuarine and anadromous finfish, mollusks, and crustaceans. This habitat is termed “Essential Fish Habitat (EFH)”, and is broadly defined to include “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” There are EFH waters throughout inland and coastal waters in Maine. For additional information, see the EFH regulations 50 CFR 600 at www.nero.noaa.gov/hcd including the “Guide for EFH Descriptions” at www.nero.noaa.gov/hcd/list.htm. Additional information on the location of EFH can be obtained from NMFS (see Appendix D for contact information).

5. GC 16: Avoidance, Minimization and Compensatory Mitigation.

(a) See www.nae.usace.army.mil/reg and then “Mitigation” to view the April 10, 2008 “Final Compensatory Mitigation Rule” (33 CFR 332) and related documents. The Q&A document states: “In order to reduce risk and uncertainty and help ensure that the required compensation is provided, the rule establishes a preference hierarchy for mitigation options. The most preferred option is mitigation

bank credits, which are usually in place before the activity is permitted. In-lieu fee program credits are second in the preference hierarchy, because they may involve larger, more ecologically valuable compensatory mitigation projects as compared to permittee-responsible mitigation. Permittee-responsible mitigation is the third option, with three possible circumstances: (1) conducted under a watershed approach, (2) on-site and in kind, and (3) off-site/out-of-kind.

(b) Compensatory mitigation may take the form of wetland preservation, restoration, enhancement, creation, and/or in lieu fee (ILF) for inclusion into the Natural Resources Mitigation Fund for projects in DEP and LURC territories. Avoidance of wetland impacts will reduce the ILF dollar total for applicants. The ILF compensation program was established to provide applicants with a flexible compensation option over and above traditional permittee responsible compensation projects. See the Maine ILF Agreement at www.nae.usace.army.mil/reg, “Mitigation” and then “Maine,” or www.maine.gov/dep/blwq/docstand/nrpa/ILF_and_NRCP/index.htm.

6. GCs 19 and 29: Invasive Species.

(a) Information on what are considered “invasive species” is provided in our “Compensatory Mitigation Guidance” document at www.nae.usace.army.mil/reg under “Mitigation.” The “Invasive Species” section has a reference to our “Invasive Species Control Plan (ISCP) Guidance” document, located at www.nae.usace.army.mil/reg under “Invasive Species,” which provides information on preparing an ISCP.

(b) The June 2009 “Corps of Engineers Invasive Species Policy” is at www.nae.usace.army.mil/reg under “Invasive Species” and provides policy, goals and objectives.

7. GC 20: Bank Stabilization.

This generally eliminates bodies of water where the reflected wave energy may interfere with or impact on harbors, marinas, or other developed shore areas. A revetment is sloped and is typically employed to absorb the direct impact of waves more effectively than a vertical seawall. It typically has a less adverse effect on the beach in front of it, abutting properties and wildlife. See the Corps Coastal Engineering Manual [EM 1110-2-1100](#) at www.nae.usace.army.mil/reg under “Useful Links and Documents” for design and construction guidance.

8. GC 22: Stream Crossings and Work.

(a) Projects should be designed and constructed to ensure long-term success using the most recent manual located at www.nae.usace.army.mil/reg under “Stream and River Continuity,” currently “Stream Simulation: An Ecological Approach to Providing Passage for Aquatic Organisms at Road-Stream Crossings, by the U.S. Forest Service.” Section 5.3.3 is of particular importance. Sections 7.5.2.3 Construction Methods and 8.2.11 Stream-Simulation Bed Material Placement both show important steps in the project construction.

(b) For more information on High-Quality Stream Segments and their components see:

i. High-Quality Stream Segments are shown at www.maine.gov/dep/gis/datamaps.

ii. Class A Waters or Class AA Waters:

www.mainelegislature.org/legis/statutes/38/title38sec465.html, and

www.mainelegislature.org/legis/statutes/38/title38sec467.html.

iii. Outstanding river segments www.mainelegislature.org/legis/statutes/38/title38sec480-P.html.

(c) The Massachusetts Dam Removal and the Wetland Regulations guidance may be used to evaluate the positive and negative impacts of culvert replacement, including the loss of upstream wetlands, which may be offset by the overall benefits of the river restoration. See www.nae.usace.army.mil/reg and then “Stream and River Continuity.”

(d) The ME DOT’s document “Waterway and Wildlife Crossing Policy and Design Guide for Aquatic Organism, Wildlife Habitat, and Hydrologic Connectivity,” 3rd Edition, July 2008, may be used to

evaluate impacts to aquatic, wildlife and surface water resources when designing, constructing, repairing and maintaining stream crossings. Note: Adherence to this DOT document does not ensure compliance with this GP. Projects must comply with the requirements of this GP including GC 22 and the Corps General Stream Crossing Standards contained therein.

www.maine.gov/mdot/environmental-office-homepage/fishpassage/3rd%20edition%20-%20merged%20final%20version%207-01-08a1.pdf.

(e) GC 22(f): The Skidder Bridge Fact Sheet at www.nae.usace.army.mil/reg under “Stream and River Continuity” may be a useful temporary span construction method.

9. GC 23: Wetland Crossings. The Maine DEP’s crossing standards are at 06-096 DEP, Chapter 305: Permit by Rule, 9) Crossings (utility lines, pipes and cables).
www.maine.gov/dep/blwq/rules/NRPA/2009/305/305_effective_2009.pdf

10. GC 28: Protection of Vernal Pools.

(a) The state’s Significant Wildlife Habitat rules ([Chapter 335](#), Section 9(C) “Habitat management standards for significant vernal pool habitat”) are located at www.maine.gov/dep/blwq/docstand/nrpapage.htm#rule under “Rules.”

(b) The following documents provide conservation recommendations:

i. Best Development Practices: Conserving pool-breeding amphibians in residential and commercial development in the northeastern U.S., Calhoun and Klemens, 2002. Chapter III, Management Goals and Recommendations, Pages 15 – 26, is particularly relevant. (Available for purchase at www.maineaudubon.org/resource/index.shtml and on Corps website*.)

ii. Science and Conservation of Vernal Pools in Northeastern North America, Calhoun and deMaynadier, 2008. Chapter 12, Conservation Recommendations section, Page 241, is particularly relevant. (Available for purchase via the internet. Chapter 12 is available on Corps website*.)

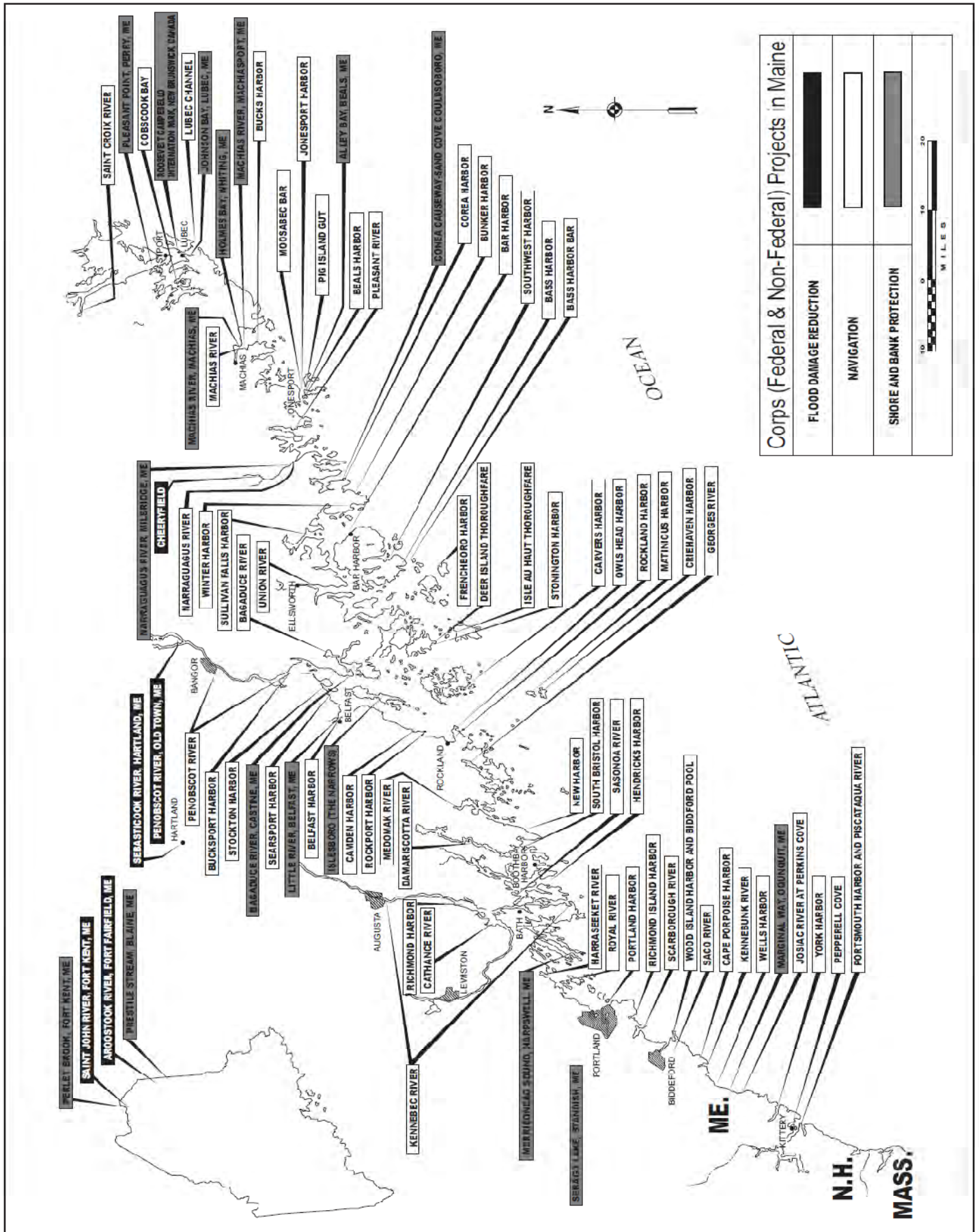
* www.nae.usace.army.mil/reg under “Vernal Pools.”

(c) Cape Cod Curbing: For smaller roads and driveways, the most important design feature to consider is curbing. Granite curbs and some traditional curbing can act as a barrier to amphibian and hatchling turtle movements. Large numbers of salamanders have been intercepted in their migrations by curbs and catch basins. Use of Cape Cod curbs rather than traditional curbing may be one solution. Alternatively, where storm water management systems require more traditional curbing, it may be possible to design in escape ramps on either side of each catch basin. Cape Cod curbing is shown on Page 35 of the document cited in 10.b.i above. Bituminous material is not required; other materials such as granite are acceptable.

(d) The VP Directional Buffer Guidance document is located at www.nae.usace.army.mil/reg under: 1) “State General Permits” and then “Maine,” and 2) “Vernal Pools.”

11. GC 32: Maintenance. River restoration projects that are designed to accommodate the natural dynamic tendencies of the fluvial system are maintained in accordance with the project’s design objectives (Category 1) or the Corps authorization letter (Category 2). These projects are generally designed to support and implement channel assessment and management practices that recognize a stream’s natural dynamic tendencies.

Appendix F: Corps Projects in Maine



DEPARTMENT OF ENVIRONMENTAL PROTECTION
PERMIT BY RULE NOTIFICATION FORM
 (For use with DEP Regulation, Chapter 305)

PLEASE TYPE OR PRINT IN **BLACK INK ONLY**

Name of Applicant: (owner)	Maine Department of Transportation	Name of Agent:	Kristen Chamberlain
Applicant Mailing Address:	16 State House Station	Agent Phone # (include area code):	(207) 557-5089
Town/City:	Augusta	PROJECT Information Name of Town/City:	Oxford
		MDOT WIN:	19268.00
State and Zip code:	ME 04344	Name of Wetland or Waterbody:	Little Androscoggin River
Daytime Phone # (include area code):	(207) 624-3100	Map #:	Lot #:
Detailed Directions to Site:	Bridge is located on Route 121, approximately 800' southwesterly of Skeetfield Road.		
	UTM Northing: (if known)		UTM Easting: (if known)
Description of Project:	The Maine Department of Transportation (MaineDOT) is proposing to replace the deficient, scour critical, 3 span bridge with a 2 span bridge located approximately 75' upstream of the existing bridge, which will be removed after the new bridge is complete. Existing piers will be removed to 1' below streambed.		
Part of a larger project? (check one) →	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	After the Fact? (check one) →	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Check one → This project <input checked="" type="checkbox"/> does (or) <input type="checkbox"/> does not involve work below mean low water (average low water).			

PERMIT BY RULE (PBR) SECTIONS: (Check at least one)

I am filing notice of my intent to carry out work which meets the requirements for Permit By Rule (PBR) under DEP Rules, Chapter 305. I and my agents, if any, **have read** and will comply with all of the standards in the Sections checked below.

- | | | |
|---|---|---|
| <input type="checkbox"/> Sec. (2) Act. Adj. to Protected Natural Res. | <input type="checkbox"/> Sec. (10) Stream Crossing | <input type="checkbox"/> Sec. (17) Transfers/Permit Extension |
| <input type="checkbox"/> Sec. (3) Intake Pipes | <input checked="" type="checkbox"/> Sec. (11) State Transportation Facil. | <input type="checkbox"/> Sec. (18) Maintenance Dredging |
| <input type="checkbox"/> Sec. (4) Replacement of Structures | <input type="checkbox"/> Sec. (12) Restoration of Natural Areas | <input type="checkbox"/> Sec. (19) Activities in/on/over significant vernal pool habitat |
| <input type="checkbox"/> Sec. (5) REPEALED | <input type="checkbox"/> Sec. (13) F&W Creation/Enhance/Water Quality Improvement | <input type="checkbox"/> Sec. (20) Activities in existing dev. areas located in/on/over high or moderate value inland waterfowl & wading bird habitat or shorebird nesting, feeding & staging areas |
| <input type="checkbox"/> Sec. (6) Movement of Rocks or Vegetation | <input type="checkbox"/> Sec. (14) REPEALED | |
| <input type="checkbox"/> Sec. (7) Outfall Pipes | <input type="checkbox"/> Sec. (15) Public Boat Ramps | |
| <input type="checkbox"/> Sec. (8) Shoreline stabilization | <input type="checkbox"/> Sec. (16) Coastal Sand Dune Projects | |
| <input type="checkbox"/> Sec. (9) Utility Crossing | | |

I have attached the following required submittals. **NOTIFICATION FORMS CANNOT BE ACCEPTED WITHOUT THE NECESSARY ATTACHMENTS:**

- ☐ **Attach** a check for \$65 made payable to: "Treasurer, State of Maine". State agency-internally billed.
- ☒ **Attach** a U.S.G.S. topo map or Maine Atlas & Gazetteer map with the project site clearly marked.
- ☐ **Attach Proof of Legal Name.** If applicant is not an individual or municipality, provide a copy of Secretary of State's registration information (available at <http://icrs.informe.org/nei-sos-icrs/ICRS?MainPage=x>)
- ☐ **Attach photos of the proposed site where activity will take place as outlined in PBR Sections checked above.**
- ☒ **Attach** all other required submissions as outlined in the PBR Sections checked above.

I authorize staff of the Departments of Environmental Protection, Inland Fisheries & Wildlife, and Marine Resources to access the project site for the purpose of determining compliance with the rules. I also understand that **this permit is not valid until approved by the Department or 14 days after receipt by the Department, whichever is less.**

By signing this Notification Form, I represent that the project meets all applicability requirements and standards in the rule and that the applicant has sufficient title, right, or interest in the property where the activity takes place.

Signature of Agent or Applicant:		Date:	4/30/14
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Keep a copy as a record of permit. Send the form with attachments via certified mail or hand deliver to the Maine Dept. of Environmental Protection at the appropriate regional office listed below. The DEP will send a copy to the Town Office as evidence of the DEP's receipt of notification. No further authorization by DEP will be issued after receipt of notice. Permits are valid for two years. Work carried out in violation of any standard is subject to enforcement action.

AUGUSTA DEP
17 STATE HOUSE STATION
AUGUSTA, ME 04333-0017
(207)287-3901

PORTLAND DEP
312 CANCO ROAD
PORTLAND, ME 04103
(207)822-6300

BANGOR DEP
106 HOGAN ROAD
BANGOR, ME 04401
(207)941-4570

PRESQUE ISLE DEP
1235 CENTRAL DRIVE
PRESQUE ISLE, ME 04769
(207)764-0477

OFFICE USE ONLY	Ck.#		Staff	Staff	
PBR #	FP	Date	Acc. Date	Def. Date	After Photos

11. State transportation facilities

A. Applicability

- (1) This section applies to the maintenance, repair, reconstruction, rehabilitation, replacement or minor construction of a State Transportation Facility carried out by, or under the authority of, the Maine Department of Transportation (MaineDOT) or the Maine Turnpike Authority, including any testing or preconstruction engineering, and associated technical support services.
- (2) This section does not apply to an activity within a coastal sand dune system.

NOTE: The construction of a transportation facility other than roads and associated facilities may be subject to the Storm Water Management Law, 38 M.R.S.A. Section 420-D.

B. Standards

- (1) Photographs of the area to be altered by the activity must be taken before work on the site begins. The photographs must be kept on file and be made available at the request of the DEP.
- (2) The activity must be reviewed by the Department of Inland Fisheries and Wildlife and the Department of Marine Resources, as applicable. The applicant must coordinate with the reviewing agencies and incorporate any recommendations from those agencies into the performance of the activity.
- (3) All construction activities undertaken must be detailed in a site-specific Soil Erosion and Water Pollution Control Plan and conducted in accordance with MaineDOT's Best Management Practices for Erosion and Sediment Control, dated January 2000, and Standard Specifications, dated December 2002.
- (4) Alignment changes may not exceed a distance of 200 feet between the old and new center lines in any natural resource.
- (5) The activity may not alter more than 300 feet of shoreline (both shores added together) within a mile stretch of any river, stream or brook, including any bridge width or length of culvert.
- (6) The activity may not alter more than 150 feet of shoreline (both shores added together) within a mile stretch of any outstanding river segment identified in 38 M.R.S.A. 480-P, including any bridge width or length of culvert.
- (7) The activity must minimize wetland intrusion. The activity is exempt from the provisions of Chapter 310, the Wetland and Waterbodies Protection Rules, if the activity alters less than 15,000 square feet of natural resources per mile of roadway (centerline measurement) provided that the following impacts are not exceeded within the 15,000 square foot area:
 - (a) 1,000 square feet of coastal wetland consisting of salt tolerant vegetation or shellfish habitat; or

(b) 5,000 square feet of coastal wetland not containing salt tolerant vegetation or shellfish habitat; or

(c) 1,000 square feet of a great pond.

All other activities must be performed in compliance with all sections of Chapter 310, the Wetland Protection Rules, except 310.2(C), 5(A), 9(A), 9(B) and 9(C).

- (8) The activity may not permanently block any fish passage in any watercourse containing fish. The applicant must coordinate with the reviewing agencies listed in paragraph 2 above to improve fish passage and incorporate any recommendations from those agencies into the performance of the activity.

NOTE: For guidance on meeting the design objectives for fish passage, including peak flow, maximum velocity, mining depth and gradient, see the MaineDOT Waterbody and Wildlife Crossing Policy and Design Guide (July 2008), developed in conjunction with state and federal resource and regulatory agencies.

- (9) Rocks may not be removed from below the normal high water line of any coastal wetland, freshwater wetland, great pond, river, stream or brook except to the minimum extent necessary for completion of work within the limits of construction.
- (10) If work is performed in a river, stream or brook that is less than three feet deep at the time and location of the activity, the applicant must isolate the work area from the resource and divert stream flows around the work area, maintaining downstream flows while work is in progress.
- (11) Wheeled or tracked equipment may not operate in the water. Equipment operating on the shore may reach into the water with a bucket or similar extension. Equipment may cross streams on rock, gravel or ledge bottom. If avoiding the operation of wheeled or tracked equipment in the water is not possible, the applicant must explain the need to operate in the water. Approval from the DEP to operate in the water must be in writing, and any recommendations from the DEP must be incorporated into the performance of the activity.
- (12) All wheeled or tracked equipment that must travel or work in a vegetated wetland area must travel and work on mats or platforms.
- (13) Any debris or excavated material must be stockpiled either outside the wetland or on mats or platforms. Erosion and sediment control best management practices must be used, where necessary, to prevent sedimentation. Any debris generated during the activity must be prevented from washing downstream and must be removed from the wetland or water body. Disposal of debris must be in conformance with the Maine Hazardous Waste, Septage and Solid Waste Management Act, 38 M.R.S.A. Section 1301 *et seq.*
- (14) Work below the normal high water line of a great pond, river, stream or brook must be done at low water except for emergency work or work agreed to by the resource agencies listed in paragraph 2 above.
- (15) Perimeter controls must be installed before the work starts. Disturbance of natural resources beyond the construction limits shown on the plans is not allowed under this rule.

NOTE: Guidance on the location of construction limits can be obtained from the on site Construction Manager.

- (16) The use of untreated lumber is preferred. Lumber pressure treated with chromated copper arsenate (CCA) may be used only if necessary and only if use is allowed under federal law and not prohibited from sale under 38 M.R.S.A. 1682, and provided it is cured on dry land in a manner that exposes all surfaces to the air for a period of at least 21 days prior to construction. Wood treated with creosote or pentachlorophenol may not be used where it will contact water.
- (17) A temporary road for equipment access must be constructed of crushed stone, blasted ledge, or similar materials that will not cause sedimentation or restrict fish passage. Such roads must be completely removed at the completion of the activity. In addition, any such temporary roads which are in rivers, streams or brooks, must allow for a passage of stormwater flows associated with a 10-year storm.
- (18) Non-native species may not be planted in restored areas.
- (19) Disposal of debris must be in conformance with Maine Hazardous Waste, Septage and Solid Waste Management Act, 38 M.R.S.A. Sections 1301 *et seq.*
- (20) Disturbance of vegetation must be avoided, if possible. Where vegetation is disturbed outside of the area covered by any road or structure construction, it must be reestablished immediately upon completion of the activity and must be maintained.
- (21) A vegetated area at least 25 feet wide must be established and maintained between any new stormwater outfall structure and the high water line of any open water body. A velocity reducing structure must be constructed at the outlet of the stormwater outfall that will create sheet flow of stormwater, and prevent erosion of soil within the vegetated buffer. If the 25 foot vegetated buffer is not practicable, the applicant must explain the reason for a lesser setback in writing. Approval from the DEP must be in writing and any recommendations must be incorporated into the activity.

C. Definitions. The following terms, as used in this chapter, have the following meanings, unless the context indicates otherwise:

- (1) Diversion. The rerouting of a river, stream or brook around a construction site and then back to the downstream channel.
- (2) Fill. a. (verb) To put into or upon, supply to, or allow to enter a water body or wetland any earth, rock, gravel, sand, silt, clay, peat, or debris; b. (noun) Material, other than structures, placed in or immediately adjacent to a wetland or water body.
- (3) Floodplain wetlands. Freshwater wetlands that are inundated with flood water during a 100-year flood event based on flood insurance maps produced by the Federal Emergency Agency or other site specific information.
- (4) Riprap. Heavy, irregularly shaped rocks that are fit into place, without mortar, on a slope as defined in the MaineDOT Standard Specifications, dated December 2002.



Environmental Summary Sheet

WIN: 19268.00
Town: Oxford
CPD Team Leader: Kristen Chamberlain
ENV Field Contact: Mike Clark

Date Submitted: 4/2/14

NEPA Complete: 2/14/14

☒ Section 106
SHPO Concurrence-No Effect
Section 106 Resources: None

☒ Section 4(f) and 6(f)
Section 4(f)
Review Complete-No use
Section 6(f)
Not Applicable

☒ Maine Department of Inland Fisheries and Wildlife Essential Habitat
Not Applicable Timing Window: Not Applicable

☒ Section 7

Species of Concern: Northern Long-eared Bat
No Jeopardy-Clearing to be completed by 10/1/14
Comments/References: See Special Provision 105

☒ Maine Department of Conservation/Public Lands, Submerged Land Lease
Not Applicable

☒ Maine Land Use Regulation Commission
Not Applicable

☒ Maine Department of Environmental Protection
Permit by Rule (PBR)

**Applicable Standards and Permits are included with the contract*

☒ Army Corps of Engineers, Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act.
Category 2
-ACOE Work Start Notification Form and Compliance Certification Form must be completed by ENV
SWR Contact and/or resident and submitted to ACOE Maine Project Office with cc to David Gardner/CPD
Team Leader
-In-water work window July 15-October 1

**Applicable Standards and Permits are included with the contract*

☒ Stormwater Review
N/A

☒ Special Provisions Required

Special Provision 105-Timing of Work Restriction (Clearing-NLEB)	N/A <input type="checkbox"/>	Applicable <input checked="" type="checkbox"/>
Special Provision 105-Timing of Work Restriction (IWW)	N/A <input type="checkbox"/>	Applicable <input checked="" type="checkbox"/>
Special Provision 656-Erosion Control Plan	N/A <input type="checkbox"/>	Applicable <input checked="" type="checkbox"/>
Special Provision 203-Dredge Spec	N/A <input type="checkbox"/>	Applicable <input checked="" type="checkbox"/>
General Note for Hazardous Waste	N/A <input type="checkbox"/>	Applicable <input checked="" type="checkbox"/>
Special Provision 203-Hazardous Waste	N/A <input type="checkbox"/>	Applicable <input type="checkbox"/>
Special Provision 105.9	N/A <input type="checkbox"/>	Applicable <input type="checkbox"/>

**All permits and approvals based on plans/scope as of: 4/2/14*