



Janet T. Mills
GOVERNOR

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

Bruce A. Van Note
COMMISSIONER

February 20, 2020
Subject: Highway Reconstruction &
Bridge Culvert Replacements
State WINs: 018283.00, 022608.00
& 022610.00
Location: **Camden**
Amendment No. 1

Dear Sir/Ms.:

Please make the following changes to the Bid Documents:

In the Bid Book:

REMOVE pages 17 – 25, Proposal Schedule of Items, 9 pages, dated 1/27/2020, and **REPLACE** with the attached, revised Proposal Schedule of Items, 9 pages, dated 2/18/2020.

REMOVE page 56, SPECIAL PROVISION - SECTION 105 - GENERAL SCOPE OF WORK - (Limitations of Operations), 1 page, dated August 5th, 2019, and **REPLACE** with the attached, revised SPECIAL PROVISION - SECTION 105 - GENERAL SCOPE OF WORK - (Limitations of Operations), 1 page, dated January 14, 2020.

REMOVE page 101, SPECIAL PROVISION - SECTION 401 – HOT MIX ASPHALT PAVEMENT - (HMA with Fine Micro-Deval Requirement), 1 page, dated January 19, 2017, and **REPLACE** with the attached, revised SPECIAL PROVISION - SECTION 401 – HOT MIX ASPHALT PAVEMENT - (HMA with Fine Micro-Deval Requirement), 1 page, dated January 25, 2020.

ADD the attached SPECIAL PROVISION - SECTION 509 - COMPOSITE ARCH BRIDGE SYSTEM, 9 pages, dated January 2020.

In the Plan Set:

CHANGE on SHEET NUMBER 4 OF 163, ESTIMATED QUANTITIES & EARTHWORK SUMMARY, the quantity for Item No. 627.780 - 4" TEMPORARY PAVEMENT MARKING LINE, WHITE OR YELLOW from 8,250.00 LF to read "**70,000 LF**". Make this change in pen and ink.

On SHEET NUMBER 7 OF 163 – GENERAL NOTES, **REMOVE** GENERAL NOTE 34, which begins "Any base pavement not surfaced...", and **REPLACE** with: "34. Temporary center line

and edge lines shall be painted on all matched pavement within one week. Multilane sections, truck lanes, and milled surfaces must be striped daily on all matched pavement layers. TOMs must be used on all pavement layers until temporary paint is applied. TOMs will be removed before final striping. TOM removal will be addressed in the Traffic Control Plan. Only painted temporary line will be paid under this item. TOMs will be considered incidental to the contract. Any Base Pavement not surfaced before winter will require temporary pavement markings of paint. Both yellow centerline and white edge lines will be considered part of Item 627.78." Make this change in pen and ink.


The following question has been received:

Question: There is 24" thru 60" RCP class III on the project. Will the DOT allow the use of Triple wall Sanitite HP pipe as an alternate on these locations.

Response: This material is not allowed as a concrete substitute on Priority 1 roadways. Route 1 in this area is a Priority 1 roadway, so the substitution will not be allowed.

Consider these changes and information prior to submitting your bid on **February 26, 2020**.

Sincerely,


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

WIN 18283.00 – Camden, Route 1
WIN 22608.00 – Camden, Spring Brook Bridge #2794
WIN 22610.00 – Camden, Great Brook Bridge #2326
January 14, 2020

SPECIAL PROVISION
SECTION 105
GENERAL SCOPE OF WORK
(Limitations of Operations)

1. At a minimum, one lane of alternating one-way traffic shall be maintained on Route 1 at all times.
2. A minimum lane width of 11'-0" shall be maintained at all times.
3. Between the Tuesday following Labor Day and July 3rd, the Maximum lane closure length on Route 1 shall not exceed 2,500'. Traffic delays shall not exceed a maximum of 10 minutes with alternating one-way flow.
4. Between July, 4th and Labor Day, the Maximum lane closure length on Route 1 shall not exceed 2,500'. Traffic delays shall not exceed a maximum of 5 minutes with alternating one-way flow.

2/18/2020

Maine Department of Transportation

Proposal Schedule of Items

Page 1 of 9

Proposal ID: 018283.00

Project(s): 018283.00, 022608.00, 022610.00

SECTION: 1 Project 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	4.000 AC	_____	 _____	_____	 _____
0020	201.23 REMOVING SINGLE TREE TOP ONLY	52.000 EA	_____	 _____	_____	 _____
0030	201.24 REMOVING STUMP	65.000 EA	_____	 _____	_____	 _____
0040	202.203 PAVEMENT BUTT JOINTS	540.000 SY	_____	 _____	_____	 _____
0050	203.20 COMMON EXCAVATION	43,500.000 CY	_____	 _____	_____	 _____
0060	203.2318 DISPOSAL OF SPECIAL WASTE	30.000 T	_____	 _____	_____	 _____
0070	203.25 GRANULAR BORROW	250.000 CY	_____	 _____	_____	 _____
0080	203.33 SPECIAL FILL	350.000 CY	_____	 _____	_____	 _____
0090	206.07 STRUCTURAL ROCK EXCAVATION - DRAINAGE AND MINOR STRUCTURES	100.000 CY	_____	 _____	_____	 _____
0100	206.092 STRUCTURAL ROCK EXCAVATION - MAJOR STRUCTURES	195.000 CY	_____	 _____	_____	 _____
0110	304.10 AGGREGATE SUBBASE COURSE - GRAVEL	27,100.000 CY	_____	 _____	_____	 _____
0120	403.2081 12.5 MM POLYMER MODIFIED HOT MIX ASPHALT	2,600.000 T	_____	 _____	_____	 _____

2/18/2020

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Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0130	403.209 HOT MIX ASPHALT 9.5 MM (SIDEWALKS, DRIVES, INCIDENTALS)	350.000 T	_____	 _____	_____	 _____
0140	403.213 HOT MIX ASPHALT 12.5 MM BASE	5,900.000 T	_____	 _____	_____	 _____
0150	409.15 BITUMINOUS TACK COAT - APPLIED	1,550.000 G	_____	 _____	_____	 _____
0160	502.22 STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS (PLACED UNDER WATER)	145.000 CY	_____	 _____	_____	 _____
0170	502.565 CONCRETE FILL	10.000 CY	_____	 _____	_____	 _____
0180	511.07 COFFERDAM: GREAT BROOK DOWNSTREAM	LUMP SUM	_____	 LUMP SUM	_____	 _____
0190	511.07 COFFERDAM: GREAT BROOK UPSTREAM	LUMP SUM	_____	 LUMP SUM	_____	 _____
0200	511.07 COFFERDAM: SPRING BROOK DOWNSTREAM	LUMP SUM	_____	 LUMP SUM	_____	 _____
0210	511.07 COFFERDAM: SPRING BROOK UPSTREAM	LUMP SUM	_____	 LUMP SUM	_____	 _____
0220	511.07 COFFERDAM: Sta. 155+38, Lt (Inlet)	LUMP SUM	_____	 LUMP SUM	_____	 _____
0230	511.07 COFFERDAM: Sta. 155+38, Rt (Outlet)	LUMP SUM	_____	 LUMP SUM	_____	 _____

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			Dollars	Cents	Dollars	Cents
0240	511.07 COFFERDAM: Sta. 87+66, Lt (Inlet)	LUMP SUM	LUMP	SUM	_____	_____
0250	511.07 COFFERDAM: Sta. 87+66, Rt.(outlet)	LUMP SUM	LUMP	SUM	_____	_____
0260	524.301 TEMPORARY STRUCTURAL SUPPORT - Great Brook	LUMP SUM	LUMP	SUM	_____	_____
0270	524.301 TEMPORARY STRUCTURAL SUPPORT - Spring Brook	LUMP SUM	LUMP	SUM	_____	_____
0280	526.301 TEMPORARY CONCRETE BARRIER TYPE I	LUMP SUM	LUMP	SUM	_____	_____
0290	527.34 WORK ZONE CRASH CUSHIONS	4.000 UN	_____	_____	_____	_____
0300	531.51 BRIDGE STRUCTURE - DETAIL BUILD - SPRING BROOK	LUMP SUM	LUMP	SUM	_____	_____
0310	531.51 BRIDGE STRUCTURE - DETAIL BUILD GREAT BROOK	LUMP SUM	LUMP	SUM	_____	_____
0320	603.159 12 INCH CULVERT PIPE OPTION III Sta. 155+38, Rt (Outlet)	74.000 LF	_____	_____	_____	_____
0330	603.17 18 INCH CULVERT PIPE OPTION I	704.000 LF	_____	_____	_____	_____
0340	603.179 18 INCH CULVERT PIPE OPTION III	337.000 LF	_____	_____	_____	_____
0350	603.19 24 INCH CULVERT PIPE OPTION I	188.000 LF	_____	_____	_____	_____

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			Dollars	Cents	Dollars	Cents
0360	603.195 24 INCH REINFORCED CONCRETE PIPE CLASS III	208.000 LF	_____	 _____	_____	 _____
0370	603.20 30 INCH CULVERT PIPE OPTION I	160.000 LF	_____	 _____	_____	 _____
0380	603.205 30 INCH REINFORCED CONCRETE PIPE CLASS III	192.000 LF	_____	 _____	_____	 _____
0390	603.215 36 INCH REINFORCED CONCRETE PIPE CLASS III	88.000 LF	_____	 _____	_____	 _____
0400	603.219 36 INCH CULVERT PIPE OPTION III	204.000 LF	_____	 _____	_____	 _____
0410	603.225 42 INCH REINFORCED CONCRETE PIPE CLASS III	80.000 LF	_____	 _____	_____	 _____
0420	603.229 42 INCH CULVERT PIPE OPTION III	74.000 LF	_____	 _____	_____	 _____
0430	603.235 48 INCH REINFORCED CONCRETE PIPE CLASS III	100.000 LF	_____	 _____	_____	 _____
0440	603.255 60 INCH REINFORCED CONCRETE PIPE CLASS III	76.000 LF	_____	 _____	_____	 _____
0450	603.55 CONCRETE PIPE TIES	40.000 GP	_____	 _____	_____	 _____
0460	604.09 CATCH BASIN TYPE B1	4.000 EA	_____	 _____	_____	 _____
0470	604.092 CATCH BASIN TYPE B1-C	10.375 EA	_____	 _____	_____	 _____

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			Dollars	Cents	Dollars	Cents
0480	604.096 60 INCH CATCH BASIN TYPE B1-C	1.000 EA	_____	 _____	_____	 _____
0490	604.244 CATCH BASIN TYPE F4	6.000 EA	_____	 _____	_____	 _____
0500	605.09 6 INCH UNDERDRAIN TYPE B	2,106.000 LF	_____	 _____	_____	 _____
0510	605.10 6 INCH UNDERDRAIN OUTLET	262.000 LF	_____	 _____	_____	 _____
0520	605.11 12 INCH UNDERDRAIN TYPE C	822.000 LF	_____	 _____	_____	 _____
0530	605.13 18 INCH UNDERDRAIN TYPE C	616.000 LF	_____	 _____	_____	 _____
0540	606.1301 31" W-BM GR, MID-WAY SPLICE-SGL FACED	2,818.750 LF	_____	 _____	_____	 _____
0550	606.1303 31" W-BM GR, MID-WAY SPLICE-15' RAD AND LESS	175.000 LF	_____	 _____	_____	 _____
0560	606.1305 31" W-BM GR, MID-WAY SPLICE FLARED TERMINAL	4.000 EA	_____	 _____	_____	 _____
0570	606.1306 31" W-BM GR, MID-WAY SPLICE TANGENT TERMINAL	2.000 EA	_____	 _____	_____	 _____
0580	606.1308 BURIED-IN-SLOPE GUARDRAIL END, MID-WAY SPLICE	1.000 EA	_____	 _____	_____	 _____
0590	606.265 TERMINAL END - SINGLE RAIL - GALVANIZED STEEL	7.000 EA	_____	 _____	_____	 _____

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			Dollars	Cents	Dollars	Cents
0600	606.353 REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	28.000 EA	_____	 _____	_____	 _____
0610	606.356 UNDERDRAIN DELINEATOR POST	14.000 EA	_____	 _____	_____	 _____
0620	609.31 CURB TYPE 3	1,548.000 LF	_____	 _____	_____	 _____
0630	610.08 PLAIN RIPRAP	2,300.000 CY	_____	 _____	_____	 _____
0640	610.16 HEAVY RIPRAP	878.000 CY	_____	 _____	_____	 _____
0650	610.18 STONE DITCH PROTECTION	420.000 CY	_____	 _____	_____	 _____
0660	610.210 STREAM CHANNEL ROCK	400.000 CY	_____	 _____	_____	 _____
0670	610.212 STREAMBED ROCK FEATURES	320.000 CY	_____	 _____	_____	 _____
0680	613.319 EROSION CONTROL BLANKET	2,520.000 SY	_____	 _____	_____	 _____
0690	613.40 TURF REINFORCEMENT MAT - (TRM)	290.000 SY	_____	 _____	_____	 _____
0700	615.07 LOAM	2,250.000 CY	_____	 _____	_____	 _____
0710	618.13 SEEDING METHOD NUMBER 1	20.000 UN	_____	 _____	_____	 _____
0720	618.14 SEEDING METHOD NUMBER 2	350.000 UN	_____	 _____	_____	 _____

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			Dollars	Cents	Dollars	Cents
0730	619.12 MULCH	370.000 UN	_____	 _____	_____	 _____
0740	620.58 EROSION CONTROL GEOTEXTILE	4,713.000 SY	_____	 _____	_____	 _____
0750	627.733 4" WHITE OR YELLOW PAINTED PAVEMENT MARKING LINE	74,250.000 LF	_____	 _____	_____	 _____
0760	627.75 WHITE OR YELLOW PAVEMENT & CURB MARKING	80.000 SF	_____	 _____	_____	 _____
0770	627.78 TEMPORARY 4 INCH PAINTED PAVEMENT MARKING LINE, WHITE OR YELLOW	70,000.000 LF	_____	 _____	_____	 _____
0780	629.05 HAND LABOR, STRAIGHT TIME	65.000 HR	_____	 _____	_____	 _____
0790	631.12 ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	440.000 HR	_____	 _____	_____	 _____
0800	631.172 TRUCK - LARGE (INCLUDING OPERATOR)	50.000 HR	_____	 _____	_____	 _____
0810	631.18 CHAIN SAW RENTAL (INCLUDING OPERATOR)	10.000 HR	_____	 _____	_____	 _____
0820	631.20 STUMP CHIPPER (INCLUDING OPERATOR)	10.000 HR	_____	 _____	_____	 _____
0830	631.22 FRONT END LOADER (INCLUDING OPERATOR)	10.000 HR	_____	 _____	_____	 _____

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Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0840	639.18 FIELD OFFICE TYPE A	1.000 EA	_____	 _____	_____	 _____
0850	643.72 TEMPORARY TRAFFIC SIGNAL - Great Brook	LUMP SUM	LUMP SUM		_____	 _____
0860	643.72 TEMPORARY TRAFFIC SIGNAL - Spring Brook	LUMP SUM	LUMP SUM		_____	 _____
0870	645.106 DEMOUNT REGULATORY, WARNING, CONFIRMATION AND ROUTE MARKER ASSEMBLY SIGN	19.000 EA	_____	 _____	_____	 _____
0880	645.116 REINSTALL REGULATORY, WARNING, CONFIRMATION AND ROUTE MARKER ASSEMBLY SIGN	19.000 EA	_____	 _____	_____	 _____
0890	652.31 TYPE I BARRICADE	25.000 EA	_____	 _____	_____	 _____
0900	652.311 TYPE II BARRICADE	25.000 EA	_____	 _____	_____	 _____
0910	652.312 TYPE III BARRICADE	18.000 EA	_____	 _____	_____	 _____
0920	652.33 DRUM	120.000 EA	_____	 _____	_____	 _____
0930	652.34 CONE	200.000 EA	_____	 _____	_____	 _____
0940	652.35 CONSTRUCTION SIGNS	1,300.000 SF	_____	 _____	_____	 _____

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Contractor: _____

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price		Bid Amount	
			Dollars	Cents	Dollars	Cents
0950	652.36 MAINTENANCE OF TRAFFIC CONTROL DEVICES WIN. 018283.00 - Highway	400.000 CD	_____	 _____	_____	 _____
0960	652.361 MAINTENANCE OF TRAFFIC CONTROL DEVICES - Bridges	LUMP SUM	LUMP SUM		_____	 _____
0970	652.38 FLAGGER	8,240.000 HR	_____	 _____	_____	 _____
0980	652.41 PORTABLE CHANGEABLE MESSAGE SIGN	8.000 EA	_____	 _____	_____	 _____
0990	656.75 TEMPORARY SOIL EROSION AND WATER POLLUTION CONTROL	LUMP SUM	LUMP SUM		_____	 _____
1000	659.10 MOBILIZATION	LUMP SUM	LUMP SUM		_____	 _____
1010	660.21 ON-THE-JOB TRAINING (BID)	2,000.000 HR	_____	 _____	_____	 _____
1020	801.141 4" PVC SANITARY SEWER (SDR-35)	125.000 LF	_____	 _____	_____	 _____
1030	801.16 6 INCH PVC SANITARY SEWER (SDR-35)	50.000 LF	_____	 _____	_____	 _____
Section: 1			Total:		_____	 _____
			Total Bid:		_____	 _____

SPECIAL PROVISION
SECTION 401 - HOT MIX ASPHALT PAVEMENT
(HMA with Fine Micro-Deval Requirement)

The following subsections of the most current version of Specification 401 – Hot Mix Asphalt Pavements have been revised and amended by the following:

401.01 Description The Contractor shall compose Hot Mix Asphalt (HMA) Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. If denoted in Special Provision 403 - Hot Mix Asphalt Pavement, the mixtures shall meet the additional aggregate requirements of this special provision.

401.02 Materials Materials shall meet the requirements specified in Section 700 – Materials, unless otherwise revised in this special provision:

Aggregates for HMA Pavement	703.07
HMA Mixture Composition	703.09

The HMA blend, minus any RAP used, shall have a Fine Micro-Deval value of 15.0 or less as determined by weighted average of individual fine aggregate source values determined through ASTM D7428.

SPECIAL PROVISION
SECTION 509
COMPOSITE ARCH BRIDGE SYSTEM

1.0 Description

This work shall consist of procuring and constructing the Composite Arch Bridge System in accordance with these specifications and in conformity with the lines, grades, and dimensions shown on the contract drawings. The Composite Arch Bridge System is supplied by:

Advanced Infrastructure Technologies (AIT), LLC
55 Baker Blvd, Suite 205
Brewer, ME 04402
Phone: 207.573.9055
www.aitbridges.com

The Bridge System shall be designed by AIT in accordance with AASHTO *LRFD Bridge Design Specifications*, AASHTO *LRFD Guide Specifications for Design of Concrete-Filled FRP Tubes for Flexural and Axial Members*, and other applicable specifications. The composite arch bridge shall be designed by a licensed professional engineer. Calculations packages and drawings shall be provided to the customer by AIT for the bridge system supplied. As supplier, AIT will deliver to the jobsite all parts of the bridge system as detailed in the contract drawings. Each component is custom designed, detailed, and fabricated for the specific bridge project.

The Composite Arch Bridge System is a buried bridge structure consisting of two components:

1. ARCHES - The advanced FRP composite tubes designed, manufactured, and delivered by AIT.
2. DECKING PANELS - The decking panels shall be custom designed, manufactured and delivered by AIT.

Terms found within this specification shall be defined as follows:

Composite Arches: A hollow advanced FRP tube structural member comprised of an advanced fiber reinforced polymer shell which functions as external reinforcement and stay-in-place form for expansive self-consolidating concrete.

Manufacturer: A firm licensed by AIT for manufacturing the composite tubes

1.1 Composite Arches

This work shall consist of fabricating and delivering the composite arch tubes to the dimensions, details, and quantities shown on the contract drawings and according to the requirements of these specifications.

1.12 Design

Design loads shall be in accordance with AASHTO *LRFD Bridge Design Specifications* and project specific Special Provisions. Arch design shall be in accordance with the AASHTO *LRFD Guide Specifications for Design of Concrete-Filled FRP Tubes for Flexural and Axial Members*, supplemented by laboratory testing as necessary. AIT shall supply design computations and load rating as defined in Standard Specification 534. Design drawings, computations and load rating shall be stamped by a Professional Engineer licensed in the State of Maine.

1.13 Materials

Materials shall conform to the following specifications:

Glass Fibers shall be type E-glass manufactured in accordance with ASTM D578 Section 4.2.2 and tested in accordance with ASTM D2343.

Carbon Fibers shall be standard modulus fibers. Tensile strength, tensile modulus, and strain of the fibers shall be documented in accordance with the manufacturer's test specifications.

Resin shall be epoxy vinyl ester resin with viscosity suitable for infusion. Clear casting tensile strength and tensile modulus shall be tested in accordance with ASTM D638. Clear casting flexural strength and modulus shall be tested in accordance with ASTM D790. Heat distortion temperature shall be documented in accordance with ASTM D648.

1.14 Quality Control/Quality Assurance

Arches shall be manufactured according to the requirements of AIT's QC/QA plan and standard operating procedures. AIT's QC/QA plan shall be submitted to the Fabrication Engineer for review. AIT shall submit standard repair procedures to the Fabrication Engineer for review.

The FRP laminate comprising the shell shall be tested for tensile strength. Test result documentation of the mechanical properties and the required design values shall be provided to the Department. A minimum of five (5) test specimens shall be obtained

from each arch. A minimum of two (2) specimens per arch shall be tested. If the mean of the two (2) tests from any one arch fails to meet or exceed the required design value, at least three (3) more specimens from the corresponding arch shall be tested. If the mean of the three (3) additional specimens does not meet or exceed the design value, the arch shall be rejected and replaced. All test results shall be submitted to the engineer prior to arch installation.

1.15 Fabrication

The composite arches shall be manufactured according to the requirements of this section using a closed mold vacuum assisted resin transfer method (VARTM) of composite manufacturing.

Reinforcement Storage and Preparation: Fabrics shall be stored in a clean, dry environment in the original packaging. They shall be protected from water, dirt, grease, grinding dust, and other foreign matter. The fabrics shall be cut on a clean cutting surface, free of any deleterious material that could adhere to the fabrics prior to layup. No splices shall be permitted in the longitudinal fabric. Splices may be permitted in the hoop reinforcement.

Chemicals: Vinyl ester resins and other chemicals necessary for catalyzing the infusion matrix shall be stored in accordance with the manufacturer's recommendations.

Vacuum Assisted Resin Transfer: Prior to vacuum infusion of the vinyl ester matrix, the manufacturer must thoroughly seal the tooling and demonstrate that the sealed tooling can obtain a minimum workable vacuum pressure and a drop test. Chemical additives and catalysts to be combined with the vinyl ester resin shall be measured by weight, or the corresponding volume, based on the batch weight of the vinyl ester resin. The manufacturer shall maintain documentation of the promotion rates and the actual amount of catalyst used for each infusion. The infusion tank must be charged with a sufficient amount of resin at all times to prevent air bubbles from entering the infusion ports in the tooling. Once resin is introduced into the tooling, the infusion process shall continue uninterrupted until it has been demonstrated that all evacuation ports have a surplus of resin flowing past the finished surface of the tooling and that no less than the predicted volume of resin has been introduced into the tool.

Post Processing: Once the laminate of the composite tube has been allowed to harden, the arches shall be removed from the form with care so as not to induce stresses into the curing laminate. The laminate shall reach a minimum Barcol hardness value of 35 prior to de-molding.

Tolerances: The finished arches shall conform to the dimensions set forth in the approved shop drawings. The diameter shall not vary in any one section by more than two percent of the dimension given on the shop drawings. The arches shall be checked for shape variations. No arch shall vary from the shop drawing shape by

more than one percent of the dimension. All arches shall be clearly marked by the manufacturer with the mark number and date of fabrication of the arch in the location shown on the shop drawings.

Fabrication Inspection: QA inspection is required. QA inspectors must be present for verification of materials, drop test, infusion, NCR repairs, and final inspection prior to shipping. QA office shall meet the requirements of QA office as defined in Standard Specification 535.

1.16 Composite Arch Erection

This work shall consist of installing the composite arches of the Composite Arch Bridge System in accordance with these specifications and in conformity with the lines, grades, and dimensions shown on the contract drawings. The Contractor is responsible for the complete installation of the composite arches including but not limited to unloading the arches and storing on the jobsite, erecting and casting the arches into the foundation, filling the arches with self-consolidating concrete (SCC), inspecting the filled arches for voids, and post filling voids if any are found.

Care shall be taken when handling the hollow composite arches such that no damage is caused to the unfilled tubes. When moved or placed by hand, arches shall be stabilized to prevent tipping over. When moved by hoist, straps shall provide at least 2 inches of padded contact area.

Installation: The arches shall be installed in a vertical position and decking installed prior to filling with concrete. The maximum allowable variation of installed arches shall be +/- 1/2 inch in plane and out of plane. The custom FRP decking as specified in section 2 shall be installed over the arches after the arches are erected and aligned. The arches shall be embedded into the foundations as shown on the approved shop drawings and the foundation placed and achieving the minimum strength as noted on the contract drawings prior to filling the arches with self-consolidating concrete as specified in section 3. Care shall be taken when placing the foundation and vibrating around the base of the arches as to not damage or displace the arches.

2.0 FRP Deck Panels

This portion of the work shall consist of furnishing and installing the FRP deck panels, fasteners, and adhesive for the Composite Arch Bridge System in accordance with the contract drawings and these specifications. The custom panels shall be designed and supplied by AIT in accordance with the AASHTO *LRFD Bridge Design Specifications* and the ASCE *Pre-Standard for LRFD of Pultruded FRP Structures* to carry the required loading.

2.1 Materials

The FRP Deck Panels shall conform to the following:

1. The resin type shall be noted on the shop drawings as premium grade, chemically resistant, UV stabilized: polyurethane (TYPE A PANEL), vinyl ester (TYPE B PANEL), or polyester (TYPE C PANEL).
2. The glass reinforcement shall be E Glass that is straight and continuous, with fibers oriented in three directions (0, 45, 90 degrees with respect to the length of the panel). The glass content shall be a minimum of 70% by weight.
3. The panels shall have a class B flame spread rating (75 or less when tested in accordance with ASTM E84).
4. The panels shall be 0.25 inches thick, 3.75 inches high to top of corrugation and 20 7/8 inches wide.
5. The fasteners for attaching the deck panels to the arches shall be 2 inch long ¼-14 thread and a #3 drill point stainless steel screws.
6. The adhesive for sealing the longitudinal joint shall be polyurethane, Pliogrip or equal, as approved by the Resident.

2.2 Delivery and Installation

AIT will supply the custom FRP Deck Panels and the required stainless steel fasteners to the job site on the date requested by the Contractor. A notice of 30 days is required prior to the desired delivery date. The Contractor is responsible for receiving, unloading, and storing the deck panels. All FRP deck panels shall be handled with care and protected from cuts, scratches, and abrasions. Panels shall be stored on blocking off the ground and kept clean and dry. Damaged panels shall be replaced at the Contractor's expense.

The deck shall be installed as shown on the shop drawings using fasteners provided. Adhesive provided shall be used per the manufacturer's recommendations to seal the longitudinal joint between the panels. Panels shall be installed starting at the bottom at both sides of the arch and proceeding to the apex. The Contractor shall assure that the starter panels are placed as shown on the shop drawings to a level line. A closure plate shall be provided at the apex to be trimmed to fit in the field and attached after the arches are filled with SCC.

3.0 Self-Consolidating Concrete

The hollow composite arch tubes shall be filled with SCC. The arch fill SCC shall conform

to the Standard Specifications and this section.

3.1 Materials

Total Cementitious Materials (CM) shall include cement, fly ash, and an expansive cement component. Cement shall be Type I/II Portland Cement, in accordance with AASHTO M 85 (ASTM C150).

Fly Ash (ASTM C618 Class F) or Ground Granulated Blast Furnace Slag (GGBFS, ASTM C989 Grades 100 or 120) may be added at the rates allowed in this specification.

Expansive Cement (ASTM C845 Type K) shall be added at the rate as specified in this section. An acceptable product is CTS Komponent manufactured by CTS Cement Manufacturing, 11065 Knott Ave, Suite A, Cypress CA 90630.

3.2 Mix Design

Design the SCC mix in accordance with the Standard Specifications and the following requirements:

1. 28 Day Compressive Strength = 6000psi
2. Maximum size of Coarse Aggregate = 3/8 inches
3. Minimum Cementitious Material (CM) = 850 lbs. /CY
4. Use of a High Range Water Reducer at a dosage recommended by the supplier is mandatory for producing SCC.
5. A Viscosity Modifying Admixture may be added at a dosage recommended by the supplier to improve mix stability.
6. The use of a hydration stabilizer (retarder) may be required to ensure sufficient placement time.
7. Fine Aggregate shall not be less than 50% of the total aggregate by volume.
8. The mix shall contain expansive cement Type K at a rate of 15% by weight of total cementitious material.
9. The mix may include fly ash at a rate less than 25% by weight of cementitious material or grade 100 or 120 GGBFS at a rate less than 50% by weight of cementitious material.
10. The water/cementitious material ratio (W/CM) shall be between 0.40 and 0.45

11. Air content shall be 0% to 5.0%

The concrete shall meet the following requirements in accordance with ASTM C1611 or AASHTO TP 73 and AASHTO TP 80 for slump flow and visual stability index:

Slump Flow = 24-30 inches
Visual Stability Index = 0-1.0

SCC mix design shall be submitted to the Department for review and approval.

3.3 Testing and Acceptance

Trial batches shall be performed prior to use to verify Compressive Strength, Slump Flow, Air Content, and Visual Stability Index. Results shall be made available to the Resident for review. The trial batch requirement may be waived at the discretion of the Resident if the concrete supplier is experienced in producing SCC. Each batch of SCC delivered to the jobsite shall be tested for Slump Flow, Visual Stability Index, and Air Content. If the concrete fails to meet the requirements, re-dosing with additives is permitted. The Resident may reject concrete that does not meet specifications.

3.4 Concrete Placement

All arches shall be filled with SCC under the supervision of the Resident. They shall be filled in one continuous operation and vibration is not allowed. The arches shall be filled through the fill holes that are field drilled by the Contractor to the sizes and locations shown on the shop drawings. The concrete placement shall be accomplished using a method capable of directing the concrete into the 3.0 inch fill hole and regulating placement speed to prevent voids.

The acceptable methods include the use of a boom type pump truck, a trailer pump, or a standard concrete bucket. The Contractor shall have a backup method available in the event of an equipment malfunction. All tubes shall undergo auditory tap testing after SCC placement to ensure complete filling of tubes. In the event that voids are discovered, they shall be injected with grout such as SIKA 212 or approved equal using a hand operated pump. The maximum permitted hole size for grout injection is $\frac{3}{4}$ inch diameter. AIT shall be given 48 hours notice, and offered the opportunity to be present for the filling of the arches and tap testing.

4.0 Fascia Plates

This portion of work shall include furnishing and installing the curved HDPE or concrete

fascia plates as detailed in the approved shop drawings. The custom designed fascia plates, connection angles, and fasteners shall be supplied by AIT.

4.1 Materials

The HDPE fascia plates shall be fabricated King Star Board ST or equivalent composite sheets. Fasteners shall be Stainless Steel.

4.2 Fabrication and Installation

The plates shall be cut to the geometries shown on the approved shop drawings by CNC and shall be segmented with a individual panel length of up to 8 feet. The plates shall be charcoal or dolphin gray. The fascia plates shall be installed to the lines and grades as shown on the approved shop drawings.

5.0 Backfilling and Compaction

Arch tube concrete must reach a minimum compressive strength of 2000psi prior to any backfilling or compaction activities on the structure other than minor headwall connection work.

5.1 Materials

Backfill material shall conform to the Standard Specifications and be classified as gravel borrow, maximum size of aggregate is 4 inches. The backfill material shall exhibit an angle of internal friction of not less than 32 degrees as determined by the standard direct shear test AASHTO T 236 on the portion finer than the number 10 sieve (2mm) compacted to 95 % per AASHTO T 99 Method C or D at optimum moisture content. Soil tests shall be submitted to the Resident for approval prior to the placement of any material.

5.2 Placement

Backfill shall extend to the lines and grades shown on the contract drawings, and shall be performed according to the standard specifications, and the additional requirements of this specification.

Backfill soil shall be placed in maximum 8 inch loose lifts. Compaction within four (4) feet of the structure shall be accomplished with hand compactors only. Vibratory rollers may be used outside of this zone and above the structure provided there is at least 12 inches of compacted cover above the structure.

All backfill shall be carefully placed and compacted to avoid damage to the structure.

Lightweight equipment (less than 12 tons) may be operated over the structure

provided there is at least 12 inches of cover. Construction equipment greater than 12 tons may be used after 24 inches of compacted backfill has been placed over the structure. In no case should the loading exceed the AASHTO design loading of HL-93 without the Resident's written permission.

Backfill shall be placed in lifts such that at no time will the elevation difference exceed 24 inches between opposite sides of the structure.

6.0 Basis of Payment

Payment for the accepted Composite Arch Bridge System will be made under the appropriate Bridge Structure - Detail Build pay item. Such payment shall be full compensation for furnishing, installing, and erecting the Composite Arch Bridge System including the arches, arch tube concrete, decking, FRP headwalls (if selected) and all necessary hardware, and the furnishing of all labor, materials, tools, equipment, and incidentals necessary to complete the work.