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DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
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WILLIAM D. ANKNER, Ph.D.
SECRETARY

June 17, 2009

STATE PROJECT NO. 064-01-0040
FEDERAL AID PROJECT NO. 5201(600)
CAMINADA BAY BRIDGE
ROUTE LA 1
JEFFERSON PARISH

SUBJECT: ADDENDUM NO. 3 (CONSTRUCTION PROPOSAL REVISION)

Gentlemen:

The following proposal revisions dated 06/17/09 on the captioned project for which bids will be received on Wednesday, June 24, 2009 have been posted on http://www.dotd.la.gov/cgi-bin/construction.asp.

1. Revised the following special provisions: (13 pages)
   a. **NS BUCKET DREDGING**
   b. **NS-STEEL FINGER JOINTS**
   c. **NS-PRECAST PRESTRESSED CONCRETE GIRDERS CLASS P(HPC) CONCRETE AND CLASS P(X)(HPC) CONCRETE**
   d. **NS-BEARING PADS (ELASTOMERIC)**
   e. **NS-PILE DYNAMIC MONITORING INSTRUMENTATION**
2. Deleted the following special provisions:
   a. **NS-CLASS A(HPC) CONCRETE PIERS, CLASS A(HPC) CONCRETE BENTS AND CLASS AA(HPC) CONCRETE**
   b. **NS-DEFORMED REINFORCING STEEL(STAINLESS STEEL)**
3. Added the following special provisions: (14 pages)
   a. **NS CLASS A(HPC) OR CLASS AA(HPC) HIGH PERFORMANCE CONCRETE**
   b. **NS CORROSION RESISTING DEFORMED REINFORCING STEEL**

Please note these revisions in the proposal and bid accordingly. Mandatory electronic bidding is required for this project, and electronic bids and electronic bid bonds must be submitted via www.bidx.com for this letting date.

Sincerely,

Randal D. Sanders

RANDAL D. SANDERS, P. E.
CONTRACTS & SPECIFICATIONS ENGINEER

Attachments
ec: Mr. Brian Buckel
Mr. Michael Stack
Mr. Gary Gisclair
Mr. Brian Delatte
Mr. Eric Burges
Mr. Masood Rasoulian

NS BUCKET DREDGING (06/09):

DESCRIPTION. This work consists of localized dredging required to facilitate bridge construction. This work shall be in accordance with the plans and permits and as directed by the engineer. The contractor shall become familiar with and comply with all Federal, State, and Local regulatory and reporting agencies of the permitting network.

MATERIALS. Vacant.

EQUIPMENT. The contractor shall provide and maintain the necessary equipment for proper dredging operations. The Department shall approve dredging equipment prior to dredging operations.

CONSTRUCTION REQUIREMENTS. When dredging is deemed necessary to facilitate bridge construction, the contractor shall notify the Department one week prior to commencing dredging. The engineer shall approve the proposed dredging operations within the vicinity of the bridge.

When furnishing the dredging areas, the contractor shall supply the Department with evidence that proposed dredging areas are within the area shown by the project permits and plans. Dredging operations shall be done in accordance with the guidelines and terms set forth by the project permits and plans.

Disposal of dredged material shall be in accordance with the guidelines and terms set forth by the project permits and plans. When contaminated soils are encountered, disposal of materials shall be in accordance with Subsection 202.05. When placing fill on submerged land, construct dikes prior to beginning of dredging, and maintain the dikes throughout the dredging operation.

The contractor shall comply with Subsection 107.09 for work in, over, or adjacent to navigable waters and wetlands, and shall comply with Subsection 107.27 when cultural artifacts, historical sites, or archaeological sites are encountered.

MEASUREMENT. Bucket dredging, completed and accepted will be measured for payment per cubic yard (cu m) of solid material removed, which includes all labor, equipment, tools, and incidentals necessary to complete the work. No payment will be made for embankment material used to replace material dredged beyond the lines and grades shown in the plans and permits.

PAYMENT. Payment for bucket dredging will be made at the contract unit price per cubic yard (cu m).

Payment will be made under:

Item No.	Pay Item	Pay Unit
NS-203-00001	Bucket Dredging	Cubic Yard (cu m)

NS STEEL FINGER JOINTS (06/09):

DESCRIPTION. Except as modified herein, all materials, testing, and construction for finger joints shall be in accordance with the plans and shall conform to the State of Louisiana Department of Transportation and Development Standard Specifications for Roads and Bridges, 2006, the Supplemental Specifications to the State of Louisiana Department of Transportation and Development Standard Specifications for Roads and Bridges, and other Special Provisions for the project, hereinafter referred to as the "Project Specifications."

(a) General

This work consists of fabricating, furnishing and installing finger joints, including steel finger plates, elastomeric drainage troughs, structural steel bolts, shapes, studs, anchors or fixing devices, barrier armor assemblies, and all other required components of the expansion joint system required to complete the work in accordance with the details and requirements of the Contract Documents and Project Specifications.

(b) Requirements

Finger joints and barrier sliding plate assemblies shall be fabricated, furnished, and installed in accordance with the details shown on the plans, the provisions contained in this Special Provision, and the recommendations of the manufacturer. The joint system shall accommodate the longitudinal movements shown in the plans while maintaining a smooth riding surface conforming to the profile grade of the bridge, with minimal space between fingers. In place, the joint system, when required, shall prevent the passage of water, debris, and other deleterious substances through the deck joint.

The Contractor shall use the finger joint system as designed and detailed in the plans, or may submit for review and approval an alternate design, provided that the alternate design conforms to the requirements shown in the plans and is designed in accordance with the specified AASHTO LRFD Bridge Design Specification edition, including all fatigue requirements. Alternate designs shall provide all the features of the joint system as shown in the plans. This includes removable and replaceable plates, troughs, and parts (short, manageable sections), watertight drainage troughs, pre-tensioned anchor bolts, and other elements. Steel finger plates and armor plates shall sustain all loads and impacts without damage or fatigue of the joint or structure to which it is secured. If an alternate design is submitted by the contractor, the contractor will be responsible for all cost associated with the review by the Department or the Department's consultant.

Regardless of whether the design shown in the plans or an alternate design is chosen, the Contractor shall submit to the Engineer for review and acceptance complete shop drawings detailing the joint, trough, barrier armoring, plates, bolts, setting/installation tables and procedures, and all other elements of the work in accordance with the Project Specifications and Subsection (c) below.

Maximum and minimum joint openings and finger plate requirements shall be as shown in the plans. Fingers (teeth) shall be aligned parallel to the direction of movement and shall provide the minimum and maximum spacing required. The installed finger joint surface shall provide a smooth riding surface that conforms to the profile grade. A smooth riding surface is defined as no more than $^{1}/_{8}$" deviation of plates and finished concrete surface from a 10'-0" straight edge placed anywhere across the joint.

The fingers of the joint shall be shaped and installed as shown in the plans to ensure that the fingers remain below the level of the riding surface at all times under all anticipated movements and rotations of the superstructure and substructure.

A formed surface shall be provided to contain the secondary pour concrete at the front edges of the opening underneath both sides of the finger joint.

When drainage troughs are required, elastomeric drainage troughs, sheets, seals or other membranes shall be fabricated and installed to collect all water, moisture, debris, and other deleterious substances from the roadway passing through the openings between fingers. Troughs, sheets, seals and membranes shall be so attached and sealed to the finger joint assembly that no leakage occurs and adjacent parts of the structure remain protected during normal operation and flushing of the joints by maintenance personnel. Details shall conform to the plans.

Drainage troughs shall be manufactured and installed in accordance with the plans such that a minimum true slope of 8% is maintained across the structure with due consideration for superelevation at the joint location. A minimum sag of 6-inches shall be provided measured from the trough attachment points at the maximum joint opening at centerline of girder. Trough and sheet limits shall be as shown on the plans.

(c) Shop Drawings

Shop drawings shall be submitted in accordance with the Project Specifications and requirements herein. At least 60-days prior to manufacture, the Contractor shall provide to the Engineer for review and acceptance all necessary shop drawings and pertinent information for the finger joint system, including barrier armoring. This shall include, but not necessarily be limited to, complete shop details of the joint system, manufacturer's data sheets, engineering calculations, material specifications, results of testing, certifications, temperature setting and installation tables, and complete directions for the fabrication, delivery, handling, lifting, storing, and installation of the joint, including the barrier armoring assembly.

MATERIALS.

(a) Structural Steel and Bolts

Unless otherwise noted in the plans, all steel used in the fabrication of the finger joint system, including barrier armoring, shall be AASHTO M270 Grade 50, and shall be zinc metallized after fabrication in accordance with Section 811 of the Louisiana DOTD Standard Specifications. Surfaces shall be prepared according to Section 811.06. All bolts shall be A325 heavy hex structural bolts with heavy hex nuts and washers provided in the sizes and lengths required. Type 1 Bolts, nuts and washers shall be mechanical galvanized in accordance with Section 811.12.

(b) Reinforced Elastomeric Troughs and Sheets

Elastomeric troughs, sheets, and membranes shall be of virgin polychloroprene (neoprene) or EPDM (Ethylene Propylene Dienemonomer) with excellent environmental resistance to weather, salts, chlorides, oxygen, ozone, radiation, water, and common roadway substances such as gasoline and products of combustion. Elastomeric sheets shall be internally reinforced with synthetic or natural fabric, and shall conform to the following:

Durometer Hardness (Shore A)	50 minimum (ASTM D 2240)
Tensile Strength	1500 psi minimum (ASTM D 412)
Maximum Elongation at Ultimate Tensile Capacity	> 30%

Ozone resistance	No cracks when tested to ASTM D 1149 Ozone resistance procedure "B" 100 PPHM Ozone for 70 hours @ 100 degrees F under 20% strain.

Preformed troughs, seals and membranes shall be fabricated as a single piece without splices. Joints in troughs, seals or membranes shall be properly made according to manufacturer's requirements and shall not leak. All material shall be cut cleanly, with a true edge using suitable, sharp tools and methods to provide a straight and accurate installation.

(c) Concrete

Secondary concrete for filling of expansion joint blockouts and details shall be of the same class and strength as that specified for the cast-in-place bridge deck or bridge superstructure segments, unless otherwise specified on the plans or accepted shop drawings. The Contractor may propose a mix design utilizing a maximum coarse aggregate size of 3/8 inch provided the proposed mix results in the same strength, permeability and durability requirements as the cast-in-place bridge deck or superstructure segment concrete as required by the Project Specifications. Mix designs shall be submitted to the Engineer for review and approval prior to use.

CONSTRUCTION REQUIREMENTS.

(a) Installation Plan

The Contractor shall submit an installation procedure for the specific expansion joint system to be provided. This plan shall be in accordance with the recommendations of the joint manufacturer, and shall include at a minimum:

- Means of delivery, handling, lifting, and storing
- Step-by-step installation procedures
- Temperature setting and Adjusting Tables
- Methods for securing the joint temporarily during adjustment
- Methods for adjusting the joint for temperature considerations
- Methods for insuring rideability
- Methods for installing and securing the joint, blockout reinforcing and post-tensioning, and for placing surrounding concrete to the lines required
- Methods for adjusting barrier shape and attaching barrier rail inserts, bolts, and sliding cover plate assemblies

(b) Storage

Expansion joint material delivered to the site shall be stored under cover on platforms above ground. It shall be protected at all times from damage and, when installed, shall be free of dirt, oil, grease or other foreign substances. Field welding is not permitted.

(c) Joint Installation

The Contractor shall exercise care during installation to avoid damage to components of the finger joint system. Any damaged plates, fingers, shapes, bolts, troughs, seals, membranes, or other elements of the work shall be removed and repaired or replaced with new components in a manner acceptable to the Engineer and at no cost to the Department.

Anchor bolts, armor plates, and fixing devices shall be accurately located and securely held to correct line and level during placement of secondary concrete to fill the blockout region. All concrete shall be placed, properly consolidated with no voids, finished, and cured to ensure proper strength and durability. The Contractor shall detail his method for aligning and securing the joint to account for thermal movements of the structure and to provide a smooth riding surface within the required tolerances.

All deck surface preparation, including grinding and/or grooving required to meet rideability specifications, shall occur before installation of the joints. Joints shall be temporary bridged to allow movement of construction personnel using suitable materials and means that prevent damage to the structure until joints can be installed. Joint installation shall not proceed without the approval by the Engineer of all material and installation methods.

All materials used to form the secondary pour of the expansion device blockout and to temporarily support the expansion device until concrete set shall be removed prior to final acceptance.

MEASUREMENT. Finger joints shall be measured by the length of the completed joint between curb-lines parallel to the joint across the deck. Measurement shall include all necessary work to provide the finger joint system, including barrier armoring, in accordance with the details shown in the plans or accepted shop drawings, and as required by the Project Specifications and these Special Provisions, including but not necessarily limited to all materials, fabrication, testing, certification, transport, delivery, storage, handling, installation, adjustment, and acceptance in place by the Engineer. Secondary concrete and reinforcing in blockout and the placement of this concrete in the expansion joint blockouts shall be included in the measurement of this item.

PAYMENT. Payment shall be made at the contract unit price per linear foot (linear m) of installed joint as specified above.

Payment shall be made under:

Item No.	Pay Item	Pay Unit
NS-800-00160	Steel Finger Joints	Linear Foot (Lin m)

NS PRECAST PRESTRESSED CONCRETE GIRDERS CLASS P(HPC) CONCRETE AND CLASS P(X)(HPC) CONCRETE (06/09)

DESCRIPTION.

This item includes the requirements for furnishing, placing, finishing and curing high performance portland cement concrete for precast prestressed concrete girder bridges. Except as amended by this special provision, high performance concrete (HPC) shall conform to Sections 805, 901, 1001, 1003, and 1009 of the 2006 Louisiana Standard Specifications for Roads and Bridges as previously amended by supplemental specifications.

MATERIALS.

Section 805, Structural Concrete is amended as follows.

Subsection 805.02 Materials is amended to include the following in Table 805-1:

Concrete Class	Use
P(HPC)	High Performance concrete precast bridge girders
P(X)(HPC)	High Performance concrete precast bridge girders

Section 901, Portland Cement Concrete is amended as follows.

Subsection 901.02 Materials is amended to include the following:

The use of silica fume conforming to AASHTO M307, with the exception of Loss on Ignition (LOI) which shall not exceed 6.0 percent, or ASTM C 1240, will be permitted.

CONSTRUCTION REQUIREMENTS.

Section 805, Structural Concrete is further amended as follows.

Subsection 805.14, Prestressed Concrete is amended as follows:

Heading (e), Curing, is deleted and the following substituted:

To establish adequacy of curing methods and to determine whether concrete has attained the required compressive strength, a minimum of ten test cylinders shall be made and cured under the same condition as the corresponding member using a thermocouple controlled device (TCD). Three cylinders shall be saved for testing on the 56th calendar day after casting to determine that the required strength has been achieved. The remaining seven cylinders may be tested at any time as required by the contractor. However, no more than three cylinders shall be tested in one day. If all seven cylinders have been tested and the concrete has not obtained the required strength, the members involved shall be held at the plant until the 56-day cylinders are tested. If the average 56-day concrete cylinder strength has not achieved the required strength, all members involved will be subject to rejection. Acceptance will be made in accordance with the Department's manual entitled "Application of Quality Assurance Specifications for Precast-Prestressed Concrete Plants." Concrete elements shall be cured for a minimum duration of 72 hours at 100 percent relative humidity. If the steam curing process stops before 72 hours, continue curing the concrete element for the remaining part of the 72-hour curing period by continuous moisture curing. Hot weather concrete limitations as stipulated in Subsection 901.11(b) shall not be applicable for steam curing; however, precautions such as cooling of forms will be required.

Steam curing shall be done under a suitable enclosure to contain the steam in order to minimize moisture and heat losses. The contractor shall ensure that the enclosure is closed around the ends of the girders closest to

the anchorage abutments at each end of the prestressing bed. Initial application of steam shall begin only after concrete has reached its initial set as determined by ASTM C403. When used, steam shall be at 100 percent relative humidity. Application of steam shall not be directly on concrete. During application of steam, concrete temperature shall be increased at a rate not to exceed 40° F per hour until the desired concrete temperature is achieved. The concrete temperature shall not exceed 160° F. Steam curing may continue until concrete reaches release strength. At the contractor's option, the application of steam may be reduced or discontinued to ensure that the concrete temperature does not exceed 160° F. If structural defects occur, the defective members will be rejected. Contractors shall detension strands before the internal concrete temperature has decreased to 20° F less than its maximum temperature. The contractor will be permitted to add steam to maintain the internal concrete temperature within 20° F of the maximum temperature. Two recording thermometers showing time-temperature relationship in the concrete shall be furnished for each 200 ft. of bed. For girders, one thermometer shall be located at the center of gravity of the top flange and one at the center of gravity of the bottom flange.

Heading (f), Transportation and Storage, is amended by deleting the fourth and fifth paragraphs and substituting the following:

Prestressed concrete girder members shall be held at the plant for at least 14 days after casting and until the concrete has attained the specified compressive strength. Specified compressive strength shall be attained no later than 56 days after casting.

Prestressed concrete girders may be installed after 14 days from casting, provided the concrete has attained the specified compressive strength. The concrete deck shall not be cast before 28 days after casting. The minimum age of the prestresssed concrete girder when the continuity is established shall be 90 days.

Heading (g), Pretensioning Method, is amended by deleting the first paragraph and substituting the following:

Prestressing strands shall be accurately held in position and stressed by approved jacks. A record shall be kept of the jacking force and tendon elongation produced. Several units may be cast in a continuous line and stressed at one time. Sufficient space shall be left between ends of members to permit access for cutting strands after concrete has attained required strength. Sufficient free strand shall be left in the line to ensure that cracking of the members does not occur as the temperature of the members decreases prior to the detensioning of the strand. No bond stress shall be transferred to concrete nor shall end anchors be released until concrete has attained specified release strength as shown by cylinders made in accordance with
DOTD TR 226 and cured under the same condition as the corresponding member using a thermocouple controlled device (TCD) and tested in accordance with DOTD TR 230. Strands shall be cut or released in such order that lateral eccentricity of prestress will be a minimum in accordance with approved shop drawings. Sheathing used to debond prestress strands shall be constructed of polyethylene having sufficient rigidity to prevent bonding of the pre-stressing strand and concrete. The sheathing shall be split type sheathing having a minimum thickness of 0.03 inch (0.75mm) and shall be of sufficient width to maintain a 0.75 inch, ±1/16 inch (20 mm, ±2 mm) overlap after being placed on the strand. The joints between segments of sheathing shall be taped to prevent leakage of concrete into the sheathing.

Section 901, Portland Cement Concrete, is amended as follows.

Subsection 901.05, Sampling and Testing, is amended to include the following:

Testing of samples (ACI 301) shall be performed by an AASHTO Materials Reference Laboratory(AMRL) with PCC certification or certified department personnel and labs.

Testing of the plastic properties of the concrete, including air content, shall be made only after the addition of all admixtures and at the discharge end of any pumping equipment.

Neoprene caps with a durometer hardness of at least 70 shall be used for testing all (HPC) concrete.

Subsection 901.06, Quality Control of Concrete, is amended to include the following paragraph:

A representative of the admixture manufacturer shall be present for batching start up and during initial concrete placement.

Subsection 901.06 is further amended as follows.

Heading (a), Mix Design, is amended to include the following paragraphs:

Concrete Class P(HPC) shall have an average compressive strength at
56 days $\geq$ 8,500 psi (59 MPa).
Concrete Class P(X)(HPC) shall have an average compressive strength at
56 days $\geq$ 10,000 psi (69 MPa).
Slump $\leq$ 10 inches ($\leq$ 250 mm)
Concrete mix design and slump shall be selected by contractor to ensure that concrete does not segregate.
Permeability (total charge passed) shall be $\leq$ 1,000 coulombs at 56 days.

For Class P(HPC) or Class P(X)(HPC) concrete, the contractor shall make two demonstration trial batches, of at least 3 cu. yd., on separate days at the prestressed concrete girder plant to show that the girder sections can be cast with the proposed mix design. Materials used in concrete batches shall be identical to those that will be used in production. These demonstration batches shall be made sufficiently before the production girders are cast to demonstrate that design compressive strength and permeability can be achieved. Cylinders shall be made and match cured with the girder section. The cylinders shall be cured and tested in the same manner as acceptance cylinders in a production mode. The design trial batch shall meet the minimum design compressive strength before mix design approval will be given. Test results for slump, air content, wet unit weight, permeability and compressive strengths at concrete ages of 1, 3, 7, 28, and 56 days shall be submitted. The verified time-temperature history of the concrete during the initial curing period shall be submitted. If requested, the contractor shall furnish materials to the engineer for further verification of trial mixes. The contractor shall strictly
adhere to the manufacturer's written recommendations regarding the use of admixtures, including storage, transportation and method of mixing.

Subsection 901.06 is further amended to add the following Heading.

Heading (e), Quality Acceptance and Verification Tests:

Rapid chloride permeability tests shall be performed by a Construction Engineering and Inspection Service (CEI) or DOTD laboratory for acceptance depending on the contract. If the contract provides for CEI then as a quality assurance (QA) verification measure, Louisiana Transportation Research Center (LTRC) will mirror the permeability testing by the CEI. The cylinders provided to LTRC for verification measures will be randomly selected by the engineer from the same set of cylinders provided to the CEI. This will require double the sample cylinders to be made for these occasions.
Sampling frequency for permeability testing will be as follows (based on a specified maximum permeability of 1000 coulombs):

The sampling frequency will be based upon the permeability results of the production samples. Based on historical results and statistical methods the sampling frequency may be increased up to 50%. The engineer will obtain from the Headquarters Construction Section Fabrication Engineer any approved changes in the sampling frequency.

Four[1] permeability cylinders will be made using cylinder molds with an inside diameter of 4 inches (100 mm) and a length of 8 inches (200 mm) and appropriately labeled for each of the following cast-in-place structural elements:

[1] (Eight (4" X 8") cylinders will be required for CEI jobs)

These four or eight permeability cylinders per structural element will constitute a group.

If the permeability is less than 500 coulombs for the trial batch testing results, then the engineer shall randomly select one group of permeability cylinders for testing, at a frequency of one (1)for every 1000 linear feet (305 lin m) of girder.

If the permeability is less than 750 coulombs and greater than 500 coulombs for the trial batch testing results, then the engineer shall randomly select one group of permeability cylinders for testing, at a frequency of one (1) for every 750 linear feet (229 lin m) of girder.

If the permeability is less than 1000 coulombs and greater than 750 coulombs for the trial batch testing results, then the engineer shall randomly select one group of permeability cylinders for testing, at a frequency of one (1) for every 500 linear feet (152 lin m) of girder. For this category, the contractor is responsible for the cost of the increased testing frequency.

A test is defined as the average of four (4) specimens taken from four (4" X 8")
(100mm x 200mm) permeability cylinders prepared and tested for permeability in accordance with AASHTO T-277 (ASTM C1202) and cured under the same conditions as the concrete element represented for a minimum of 24 hours at the jobsite. The QA verification samples will then be transported by the CEI or department personnel to LTRC for continued lab curing and storage until testing. The remaining cylinders or parts of cylinders will be appropriately labeled and kept in case of failing permeability results which will require retesting or in case of any disputes in the results. Only after passing test results with no possibility of dispute will the remaining cylinders/parts be discarded.

Acceptance permeability test results shall be below the maximum value of
1000 coulombs (56 day test). If test results exceed the allowable criteria (1000 coulombs) the product will be rejected. Further production will cease and investigation and/or testing will be required subject to review by the Fabrication Engineer prior to resumption of fabrication.

Subsection 901.07, Substitutions, is amended to include the following in Table 901-2:

Structural Class	Substitute
P(HPC)	No Substitutions
P(X)(HPC)	No Substitutions

Subsection 901.08, Composition of Concrete, is amended as follows.

Heading (a), Cement, is amended to include the following paragraphs:

For Class P(HPC) and Class P(X)(HPC) concrete, the contractor will be permitted the use of silica fume up to a maximum of 10 percent by weight of the total combination of cement, fly ash and silica fume; and fly ash, with Type I, I(B), I(C), II or III portland cement, up to a maximum of 35 percent by weight for the total combination of cement, fly ash and silica fume.

Subsection 901.08, Composition of Concrete, is further amended to add the following Headings.

(e) Compressive Strength, Structural Concrete:

Cylinders by which strength of Class P(HPC) and Class P(X)(HPC) concrete are to be determined shall be cured under the same condition as the corresponding members using a thermocouple controlled device (TCD), until detensioning of the strand. Thereafter, cylinders shall be cured alongside the members that they represent. For girders, thermocouples for use with match-curing system shall be placed within 1 in.(25 mm) of the center of gravity of the bottom flange.

(f) Permeability:

High performance concrete (HPC) mix designs shall be tested for rapid chloride permeability in accordance with AASHTO T-277 and ASTM C1202. The permeability samples shall have a 4 inch (100 mm) diameter and a length of at least 8 inches (200 mm). Class P(HPC) and Class P(X)(HPC) concrete shall be cured under the same condition as the corresponding members using a thermocouple controlled device (TCD), until tested 56 days after casting. The average value of three specimens shall be reported.

Subsection 901.11 Temperature Limitations is amended as follows.

Heading (c), Cold Weather Limitations, is amended by deleting the last sentence of the first paragraph.

Heading (c), Cold Weather Limitations, is further amended to include the following paragraph:

Due to the strength acceleration characteristics of silica fume inherent in Class P(HPC) and Class P(X)(HPC) mixes, cold weather limitations for mixes containing GGBFS (slag) and Class F fly ash are waived. Class C fly ash will not be permitted. Both Class P(HPC) and Class P(X)(HPC) concretes shall adhere to the cold weather limitations for plain portland cement mixes as stated in this subsection.

Section 1003, Aggregates, is amended as follows.

Subsection 1003.02, Aggregates for Portland Cement Concrete and Mortar, is amended as follows.

Heading (a), Fine Aggregate, is amended to include the following paragraph:

For Class P(HPC) and Class P(X)(HPC) concrete, other gradations of concrete sand will be permitted if demonstrated in trial mixes to produce the required concrete properties and accepted as part of the proposed mix design.

Heading (b), Coarse Aggregate, is amended to include the following paragraph:

For Class P(HPC) and Class P(X)(HPC) concrete, other gradations of uncrushed and crushed concrete coarse aggregate will be permitted if demonstrated in trial mixes to produce the required concrete properties and accepted as part of the proposed design mix.

Section 1009, Reinforcing Steel and Wire Rope, is amended as follows.

Subsection 1009.05, Steel Strand for Pretensioning, is amended to include the following:

The contractor shall obtain certification from the strand supplier that the strand will bond to the concrete of normal strength and consistency in conformation with the prediction equations for transfer and development length given in the AASHTO specifications referenced in the plans.

MEASUREMENT.

Quantities of high performance concrete for Classes P(HPC) and P(X)(HPC) concrete will be design quantities specified on the plans and adjustments thereto. The design quantities will be adjusted if the engineer makes changes to adjust to field conditions, if plan errors are proven, or if design changes are made. Measurement for concrete girders will be per linear foot (lin m).

PAYMENT.

Subsection 901.12, Acceptance and Payment Schedule, is amended to include the following paragraph:

In addition, Class P(HPC) and Class P(X)(HPC) concrete shall not be accepted and shall be removed if the specified permeability of less than or equal to 1,000 coulombs is not achieved in 56 days.

Also, Class P(HPC) and Class P(X)(HPC) concrete shall not be accepted and shall be removed if the specified compressive strengths, of greater than or equal to 8,500 psi for Class P(HPC) and 10,000 psi for Class P(X)(HPC), is not achieved in 56 days.

Payment for high performance concrete girders will be at the contract unit price per linear foot (lin m) and will include all material, labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
NS-800-00181	Precast Prestressed Concrete Girder (Type III) Class P (HPC)	Linear Foot (Lin m)
NS-800-00184	Precast Prestressed Concrete Girder (Type BT-78) Class P(HPC)	Linear Foot (Lin m)
NS-800-00224	Precast Prestressed Concrete Girder (Type BT-78)(HPC)	Linear Foot (Lin m)

NS BEARING PADS (ELASTOMERIC) (05/09):

DESCRIPTION. This item consists of furnishing and installing elastomeric bearing pads and all other associated materials and equipment required to complete the work as shown on the plans and in accordance with the 2006 Louisiana Standard Specifications for Roads and Bridges.

MATERIALS. Elastomeric bearing pads shall conform to the requirements of Subsections 805.12, 807.46 and 1018.14.

CONSTRUCTION REQUIREMENTS. The contractor shall set the elastomeric bearing pads directly on the concrete masonry. Bearings shall be level, in exact position, and shall have full and even bearing on the concrete masonry. The bearing areas of the masonry, upon which the elastomeric bearing pads are to rest, shall be carefully finished to a smooth level surface of the required elevation.

MEASUREMENT. This item will be measured for payment per each, and will include all materials, labor, equipment, tools, and incidentals necessary to complete the work.

PAYMENT. Payment for elastomeric bearing pads will be made at the contract unit price per each.

Payment will be made under:

Item No.	Pay Item	Pay Unit
NS-800-00241	Bearing Pads (Elastomeric) (Slab Span)	Each
NS-800-00244	Bearing Pads (Elastomeric) (Type III Girder)	Each
NS-800-00248	Bearing Pads (Elastomeric) (Type BT-78 Girder)	Each

NS PILE DYNAMIC MONITORING INSTRUMENTATION:

DESCRIPTION. This item consists of furnishing pile dynamic monitoring accessories to be used by the contractor during all pile driving operations. The work will be in accordance with the plans, the 2006 Louisiana Standard Specifications for Roads and Bridges, and as directed.

MATERIALS. All accessory materials shall be compatible with the Department's PILE DRIVING ANALYZER® model PAX. The pile dynamic monitoring accessories shall include the following:

Description
Strain Transducer – twistlock
PE Accelerometer – twistlock
Main Cable - twistlock
PE Connection - Cable twistlock
Destination Shipping Charges

CONSTRUCTION REQUIREMENTS. This equipment will be delivered undamaged to the Department's Pavement and Geotechnical Design Section, 1201 Capitol Access Road, Room 500 B, Baton Rouge, Louisiana, 70804. The new pile dynamic monitoring instrumentation will become the property of the Department upon completion of all pile driving monitoring on this project. Warranty information, manuals, documentation, and invoice copies shall be furnished to the Department's Pavement and Geotechnical Section upon delivery of equipment. All warranties shall be registered in the name of the Department.

The contractor shall place an order for this equipment within 10 days following receipt of the Conditional Notice to Proceed. The contractor should allow 8 weeks delivery time for the new dynamic monitoring instrumentation items. All new equipment shall be purchased and scheduled for delivery by the contractor to the Department.

MEASUREMENT. Pile Dynamic Monitoring Instrumentation shall be measured as a lump sum, which includes all materials, equipment, tools and incidentals, necessary to complete this item. Quantities of materials and equipment will be shown on the plans.

PAYMENT. Payment for pile dynamic monitoring instrumentation will be made at the contract lump sum price.

Payment will be made under:

Item No.	Pay Item	Pay Unit
NS-800-00540	Pile Dynamic Monitoring Instrumentation	Lump Sum

NS CLASS A(HPC) OR CLASS AA(HPC) HIGH PERFORMANCE CONCRETE (06/09):

DESCRIPTION.

This item provides for furnishing, placing, finishing and curing of high performance portland cement concrete. Except as modified by this special provision, high performance concrete (HPC) shall conform to Sections 805, 810, 901, 1001, 1003, 1011, 1012, and 1018 of the 2006 Louisiana Standard Specifications for Roads and Bridges as previously amended by supplemental specifications.

MATERIALS.

Section 805, Structural Concrete, is amended as follows:

Subsection 805.02, Materials, is amended to include the following in Table 805-1, Classes and Uses of Concrete:

Concrete Class	Use
A(HPC)	High performance concrete cast-in-place substructure (Bent caps, pier caps, columns, and footings)
AA(HPC)	High performance concrete cast-in-place superstructure (Flat slabs, precast prestressed concrete girder span decks, steel girder span decks, approach slabs, and barriers)

Section 901, Portland Cement Concrete, is amended as follows

Subsection 901.02, Materials, is amended to include the following paragraph:

Materials for the concrete mixes shall be from approved and consistent sources for the duration of the project. Changing material sources during construction will not be permitted without prior approval of the engineer. If the engineer approves a change in material sourcing, new mix designs shall be developed, tested, and submitted for review.

CONSTRUCTION REQUIREMENTS.

Section 805, Structural Concrete, is further amended as follows:

Subsection 805.10, Curing, is amended to include the following paragraphs:

For Class AA(HPC) concrete used in bridge superstructures the contractor shall comply with ACI 302-Guide for Concrete and Slab Construction, ACI 308-Standard Practice for Curing Concrete, and ACI 305-Hot Weather Concreting. Since silica fume will be used in all HPC structural mixes, the contractor shall finish concrete by limiting finishing operations to screeding, minimal bull floating and then tining. Given that silica fume concrete exhibits virtually no bleed water and is cohesive in consistency, an immediate texturing and curing time (10 to 15 minutes after placement) is required.

The following curing shall be employed for the above Classes A(HPC) and AA(HPC) concrete:

For Class AA(HPC), two coats at 1 gallon per sq. ft. each of Type 2 liquid membrane-forming curing compound shall be applied immediately after tining. Fogging shall be used above the surface of the concrete to maintain a surface wet condition until placement of the curing compound. Exposed reinforcing steel and joints shall be covered or shielded to prevent contact with the curing compound. As soon as the surface will support the burlap without deformation, apply one layer of pre-wetted burlap and then a second layer consisting of pre-wetted burlap or burlene to the textured concrete surface. The concrete shall be kept continuously wet (potable water) with a fog nozzle system or soaker hoses for ten

(10) curing days as defined in Subsection 805.11 and until a concrete compressive strength of 4000 psi (27.6 MPa) is reached.

Class A(HPC) concrete shall be cured with wet burlap or burlene as defined in Subsection 805.10.

Materials, equipment, and labor necessary for continuous curing shall be supplied by the contractor.

The contractor may submit for approval other approved curing blanket systems (for A(HPC) or AA(HPC)) that meet the continuous moisture requirements of these specifications. The engineer is required to obtain approval from the Headquarters Construction Section.

The engineer may require placement to be made at night or during early morning hours if satisfactory surface finish cannot be achieved. Weather conditions (current and forecast) shall be within the limits of Subsection 901.11.

Subsection 805.11, Removal of Falsework and Forms, is amended to include the following in Table 805-3 in Method 1:

Concrete Class	Compressive Strength, psi (MPa)
A(HPC)	4,000 (27.6)
AA(HPC)	4,000 (27.6)

Subsection 805.13, Concrete Surface Finishes, is amended as follows.

Heading(d)(1) is amended by deleting the last paragraph and substituting the following:

Addition of water to the surface of Class AA(HPC) and Class A(HPC) concrete to assist in finishing will not be permitted.

Section 810, Bridge Railings and Barriers, is amended as follows:

Subsection 810.03, Construction, Fabrication, Erection and Painting, is amended by deleting the first sentence of the second paragraph and substituting the following:

After completing the deck pour, a minimum of 7 days shall elapse or concrete in the deck slab shall attain a minimum compressive strength of 4000 psi (27.6 MPa) before placing the reinforcing steel and forms for railings.

Section 901, Portland Cement Concrete, is amended as follows:

Subsection 901.01, General, is amended by deleting the first paragraph and substituting the following:

This section specifies requirements for portland cement concrete, including methods and equipment for handling and storing materials, and mixing and transporting concrete to the site for each of the bridge components to be constructed.

Subsection 901.01 is further amended to include a new paragraph as follows:

In accordance with Subsection 105.19, the contractor may submit the use of self- consolidating concrete for the construction of elements containing higher ratios of reinforcement. If approved and prior to use, the contractor shall demonstrate prior successful performance and implementation on a similar completed project, and compliance with the requirements of the project specifications. The engineer is required to obtain approval from the Headquarters Construction Section.

Subsection 901.05, Sampling and Testing, is amended to include the following:

Testing of samples (ACI 301) shall be performed by an AASHTO Materials Reference Laboratory(AMRL) with PCC certification or certified Department personnel and labs.

Testing of the plastic properties of the concrete including air content shall be made only after the addition of all admixtures and at the discharge end of any pumping equipment.

All concrete cylinders used for 28 day (or 56 day if more than 20 percent of cementitious material contains Class-F Fly Ash or GGBFS) compressive strength testing shall be cured in a moist room compliant with AASHTO M201. Neoprene caps with a durometer hardness of at least 70 shall be used for testing all (HPC) concrete.

Subsection 901.06, Quality Control of Concrete, is amended as follows.

Heading (a), Mix Design, is deleted and the following substituted:

The contractor shall submit mathematically accurate mix designs for each class of concrete required for each element on the project as specified herein. Each mix design submittal shall include certified test data documenting results for air content, slump, yield, unit weight, and strength (f'_{cr}), where strength is defined as the specified minimum compressive strength plus the required over-design in accordance with Table 901-4 of the standard specifications. Submittals shall be made at least 60 calendar days prior to the scheduled concrete placement.

Volume of coarse aggregate per unit volume of concrete shall adhere to Table 901-1 in the standard specifications 901.06(a).

The certified test data shall also include:

1. Weight, Source and Type of Fine Aggregates (lbs. - SSD)(kg –SSD)
2. Weight, Source, Type and Size of Coarse Aggregates (lbs. - SSD)(kg-SSD)
3. Percent Absorption for Aggregates
4. Weight, Source, and Type of Cement (lbs.)(kg)
   If blended cement is used, the mix design shall note the components of the blended cement, the proportions of those components, and the component proportionate weights
5. Weight and Source of Class-F fly ash (lbs.)(kg)

6. Weight, Source, and Grade of Ground Granulated Blast Furnace Slag (GGBFS) (lbs.)(kg)
7. Weight and Source of Silica Fume (Microsilica) (lbs.)(kg)
8. Weight of Water (lbs.)(kg)
9. Admixtures including Type, Brand Name, and Dosage
10. Concrete Temperature
11. Water/Cementitious Ratio
    (Include all cementitious material on a 1 to 1 basis, including all pozzolans)
12. Tested Slump
13. Tested Air Content
14. Unit weight
15. Yield
16. Tested Strength (f'_{cr}) at 28 days (or 56 days)(Moist Room Cured) and Standard Deviation
17. Strength Gain Curves (1, 3, 7, 28, and 56 day tests)
18. Specific Gravity for all Aggregates, Cements, and Mineral Admixtures
19. Resistance to Chloride Ion Penetration (Permeability)

Durability testing is required for mix design acceptance. Mix designs shall be tested for rapid chloride permeability in accordance with AASHTO T-277 and ASTM C1202. Results from rapid chloride permeability testing shall be submitted and shall show conformance with the requirements of these special provisions; including the maximum allowable rapid chloride permeability value (coulombs) which shall not exceed 1000 coulombs (56 days).

The contractor shall make two independent trial batches (minimum four cubic yard (cu m) each batch) of concrete mixes meeting these specifications to assure workability. Slump and workability of concrete mix shall be adjusted with water reducing admixtures (WRA) or high range water reducing admixtures (HRWRA). Modifications to aggregate weights, excluding adjustments for specific gravity or absorption changes, by more than 3percent, or a change in material source will constitute a change to the mix design. New certified test data will be required for approval of the mix.

Mix designs shall produce concrete complying with Subsection 901.08 of the standard specifications except as noted in herein. Acceptance will be based on conformance with the requirements of the standard specifications as well as the trial batching, testing, previous successful use, and successful implementation of the mix on this project.

Since silica fume will be present, as an addition to total cementitious content, in all high performance (HPC) structural concrete mixes (optional for mass concrete mixes), the contractor's ability to use concrete mixes containing silica fume shall be successfully demonstrated by a full-scale mock-up test including handling, placing, consolidating, finishing, and curing a 25foot by 25foot (7.5 m x 7.5 m) test slab at a location adjacent to the bridge acceptable to the engineer. A permanent element of the bridge may not be used for this test. The mock-up test will be considered successful if the contractor demonstrates proper handling, placing, consolidation, finishing, and curing resulting in a slab with no voids, honeycombing, cracking, or other imperfections to the satisfaction of the engineer. If the test and finished slab is not considered to be acceptable by the engineer, the contractor shall perform additional tests until deficiencies have been addressed as determined by the engineer. The contractor must have a successful mock-up test slab completed prior to beginning production of any cast-in- place concrete bridge elements utilizing silica fume. No separate payment will be made for any costs associated with completing a successful mock-up test to the satisfaction of the engineer.

The engineer may reject any mix design at any time when field quality control tests drop below specified acceptable limits. Review and acceptance of submitted mix designs does not relieve the contractor from the responsibility of producing concrete meeting the requirements of the project specifications.

Placement of unapproved concrete into any bridge element may result in rejection of that element. Rejected elements due to placement of unapproved concrete or improper methods shall be removed and

replaced at no cost to the Department. If a mix design is rejected, a new mix design shall be developed in accordance with the project specifications. The Department has seven (7) calendar days to review the mix design and related test for compliance with these provisions.

After approval of a concrete mix design, no changes shall be made in the design or its constituents without re-submittal of the design (including testing) to the engineer for review and acceptance. No elements shall be constructed until the engineer has approved the revised mix design. Elements constructed prior to engineer approval will be subject to rejection and replacement at no cost to the Department.

Subsection 901.06 is further amended to add the following heading.

(e) Quality Acceptance and Verification Tests:

Rapid chloride permeability tests shall be performed by a Construction Engineering and Inspection Service or the department laboratory for acceptance depending on the contract. If the contract provides for CEI then as a quality assurance (QA) verification measure, Louisiana Transportation Research Center (LTRC) will mirror the permeability testing by the CEI. The cylinders provided to LTRC for verification measures will be randomly selected by the engineer from the same set of cylinders provided to the CEI or department laboratory. This will require double the sample cylinders to be made for these occasions.

Sampling frequency for permeability testing will be as follows (based on a specified maximum permeability of 1000 coulombs):

The sampling frequency will be based upon the permeability results of the production samples. The engineer is required to obtain approval from the Headquarters Construction Section for any change in the sampling frequency.

Four[1] permeability cylinders will be made using cylinder molds with an inside diameter of 4 inches (100 mm) and a length of 8 inches (200 mm) and appropriately labeled for each of the following cast-in-place structural elements:

[1] (Eight (4" X 8") cylinders will be required for CEI jobs)

Precast Girder Spans:

Deck	1 Group
Bent Cap	1 Group
Column	1 Group (if applicable)
Footing	1 Group (if applicable)

For Flat Slab Spans:

Flat Slab	1 Group
Bent Cap	1 Group

These four or eight permeability cylinders per structural element will constitute a group.

If the permeability is less than 500 coulombs for the trial batch testing results, then the engineer will randomly select one group of permeability cylinders from every five groups for permeability testing.

If the permeability is less than 750 coulombs and greater than 500 coulombs for the trial batch testing results, then the engineer will randomly select one group of permeability cylinders from every four groups for permeability testing.

If the permeability is less than 1000 coulombs and greater than 750 coulombs for the trial batch testing results, then the engineer will randomly select one group of permeability cylinders from every two groups

for permeability testing. For this category, the contractor is responsible for the cost of the increased testing frequency.

A test is defined as the average of four (4) specimens taken from four (4" X 8") (100mm x 200mm) permeability cylinders prepared and tested for permeability in accordance with AASHTO T-277 and cured under the same conditions as the concrete element represented for a minimum of 24 hours at the jobsite. The QA verification samples will then be transported by the CEI to LTRC for continued lab curing and storage until testing. The remaining cylinders or parts of cylinders will be appropriately labeled and kept in case of failing permeability results which will require retesting or in case of any disputes in the results. Only after obtaining passing test results with no possibility of dispute will the remaining cylinders/parts be discarded.

Acceptance permeability test results shall be below the maximum value of 1000 coulombs (56 day test). If test results increase beyond this criterion (1000 coulombs) and after verified retesting, then all concrete operations for the affected element or span will cease and further investigation and/or testing will be required subject to review by the engineer. The engineer and the Department will decide on any corrective action to be taken by the contractor. Acceptance and Payment schedule for High Performance Concrete Permeability Test Results is included in Table 901-5 of Section 901.12 in this provision.

Subsection 901.07, Substitutions, is amended to include the following in Table 901-2, Portland Cement Concrete Mixture Substitutions:

Structural Class	Substitute
A(HPC)	No Substitutions
AA(HPC)	No Substitutions

Subsection 901.08, Composition of Concrete, is amended as follows.

Table 901-3, Master Proportion Table for Portland Cement Concrete is amended to include the following:

Structural Class[11]	Average Compressive Strength, psi at 28 days[16]	Grade of Course Aggregate	Min. Cement lb/yd^3 of Concrete[9,14]	Maximum Water/Cement ratio, lb/lb[1,9]	Total Air Content (Percent by volume)[4]	Slump Range[10], inches		
						Non-Vibrated	Vibrated	Slip Form Paving[2]
AA(HPC)	4400	A,B,P[8]	600	0.40	3 - 6	N.A.	2-4[15]	N.A.
A(HPC)[17] (Footings only)	4400	See Table 1003-1B	400	0.50[17]	3 - 6	N.A.	2-4[15]	N.A.
A(HPC) (All others)	4400	A,B, P[8]	550	0.40	3 - 6	N.A.	2-4[15]	N.A.

[15] For mixes containing a water-reducing admixture, the slump shall not exceed 8.5" (213 mm).

[16] Or at 56 days according to the project specifications.

[17] Substitutioon of GGBFS(slag) will be allowed up to 70%.

Subsection 901.08, Composition of Concrete, is further amended as follows.

Heading (a), Cement, is amended to include the following paragraphs:

As a minimum (for environmental exposure), high performance concrete mixes shall contain Type II portland cement conforming to the requirements of the project specifications.

For high performance concrete placements having a least dimension of 48 inches (1200 mm) or greater, or if designated on the plans or the project specifications as being mass concrete the cement, or combination of cement and fly ash or GGBFS (slag), shall be certified to generate a heat of hydration of not more than 70 calories/gram (290 kJ/kg) at 7 days.

The high performance concrete mixes specified herein shall be considered structural concrete. The contractor will be allowed to make partial substitution on a pound (kilogram) for pound (kilogram) basis of fly ash (Class F) or GGBFS (slag) for portland cement in concrete mixes when using Type II portland cement. The contractor may substitute either fly ash (Class F) at a rate of 20 percent minimum up to 30 percent maximum by weight (mass) of cement or GGBFS conforming to Subsection 1018.27 at a rate of 30 percent minimum up to 50 percent maximum by weight (mass) of cement for structural concrete. Only Class F fly ash or Grade 100 or 120 GGBFS will be permitted. In addition to fly ash or GGBFS, cement used for all AA(HPC) and A(HPC) structural concrete will include a minimum addition of 5 percent silica fume on a pound (kilogram) for pound (kilogram) basis up to a maximum of 10 percent by weight (mass) of cement. For all mass concrete in footings silica fume is not required but is allowed up to a maximum of 10 percent by weight (mass) of cement. Permeability requirements are not waived for these mass concrete structural elements.

Heading (b), Chemical Admixtures, is amended to include the following:

Air-entraining will be required in all high performance concrete classes for this project.

Accelerating admixtures will not be permitted in all high performance concrete classes for mass concrete placements.

Heading (d) (1), Coarse Aggregate, is deleted and the following substituted:

Crushed coarse aggregate shall comply with the requirements of Subsection 1003.02(b) and the permissible grades specified in Table 901-3 as amended herein.

Subsection 901.08 is further amended to add the following heading.

(e) Permeability:

High performance concrete (HPC) mix designs shall be tested for rapid chloride permeability in accordance with AASHTO T-277 and ASTM C1202. The permeability samples shall have a 4 inch (100 mm) diameter and a length of at least 8 inches (200 mm). The average of four specimens shall be used, and the rapid chloride permeability shall not exceed 1000 coulombs for all HPC concrete mixes.

Subsection 901.11, Temperature Limitations, is amended as follows.

Heading (b) (1), Bridge Decks, Approach Slabs, and Mass Concrete, is amended by deleting the second sentence and substituting the following:

When internal temperature of plastic concrete reaches 80° F (26° C), the contractor shall prevent the temperature of succeeding batches from going beyond 80° F (26° C) by approved methods.

Heading (c), Cold Weather Limitations, is amended to include the following paragraph:

Due to the strength acceleration characteristics of silica fume inherent in A(HPC) and AA(HPC) mixes, cold weather limitations for mixes containing GGBFS (slag) and Class F fly ash are waived. Both A(HPC) and AA(HPC) concretes shall adhere to the cold weather limitations for plain portland cement mixes as stated in this subsection.

Subsection 901.11 is further amended to add the following heading.

(d), Mass Concrete Placement:

It is the contractor's responsibility to produce a structure free from cracks that would result from heat of hydration during curing of mass concrete placements as defined in Subsection 901.08. These mass concrete placements shall be achieved using a continuous placement to eliminate the possibility of a cold joint.

The contractor shall provide his proposals for the mass concrete mix design, analysis, monitoring and control, including insulation and methods to the engineer for approval a minimum of 45 days prior to the placement of any mass concrete.

1. Mix Design:

The cement, or combination of cement and fly ash or GGBFS (slag), shall be certified to generate a heat of hydration of not more than 70 calories/gram3 (290 kJ/kg) at 7 days. Other precautions for reducing the heat of hydration may be taken, such as the addition of controlled quantities of ice in lieu of equal quantities of mixing water. However, the mix shall contain no frozen pieces of ice after blending and mixing components.

2. Analysis and Monitoring:

The contractor's plan shall provide an analysis of the anticipated thermal developments within the mass concrete elements for the anticipated project temperature ranges, along with the proposed mix design, casting procedures and materials. A copy of any software models (such as the Schmidt model) with the site and element specific data shall be transmitted to the engineer for approval with the analysis. This submittal shall include electronic files. Additionally, the proposed plan shall describe the measures and procedures intended to maintain, monitor and control the temperature differential between the interior and exterior of the mass concrete elements, with a maximum temperature of 150 °F (65 °C), during curing. During curing, the maximum differential temperatures shall not exceed 40° F (22° C).

3. Monitoring Devices:

The contractor shall provide temperature-monitoring devices to record temperature development between the interior and the exterior of the element at points approved by the engineer. A minimum of two independent sets of interior and exterior points shall be monitored for

each element to provide redundancy in case of failure of a device. The monitoring points shall be located at the geometric center of the element for the interior point and two inches from the surface along the shortest line from the geometric center to the nearest surface of the element for the exterior point.

Monitoring devices shall be automatic sensing and recording instruments that record information at a maximum interval of one hour. These devices shall operate for a maximum range of 0 to 180 °F (-18 to 82 °C) with an accuracy of

+ 2 °F (+ 1 °C). In addition, the contractor shall take readings and record data at intervals not greater than 6 hours to ensure that the automatic devices are working properly and that the temperatures are within allowable limits. The intervals of one and six hours shall begin immediately after casting is complete and shall continue until the maximum temperature differential is reached and begins to drop. These readings shall be transmitted to the engineer daily.

Prior to the first placement of mass concrete, the contractor shall perform a test of the automatic and manual thermal sensing and recording equipment on an unrelated placement.

4. Construction:

The Contractor shall take measures to control differential and absolute temperatures by appropriate use of insulated forms and curing blankets.

If during the first 48 hours after the concrete placement, the internal concrete temperature differential nears 40 °F (22 °C), corrective measures shall be taken by the contractor to immediately retard further growth in the temperature differential such that the differential ultimately remains within the 40 °F (22 °C) limit. Furthermore, the contractor shall make revisions to the approved plan to maintain the required limits on differential temperature on any remaining placements of mass concrete. The contractor shall obtain the engineer's approval of revisions to the approved plan prior to implementation.

The contractor's attention is drawn to the fact that strength gain and cooling of the mass concrete placements can take a long time. He shall take all such time and strength considerations into account when planning his construction activities.

Section 1001, Hydraulic Cement, is amended as follows:

Subsection 1001.02, Portland-Pozzolan Cement is amended as follows. The second sentence of the second paragraph is deleted and the following substituted:

Fly ash shall comply with AASHTO M 295, Class F, except that loss on ignition shall not exceed 6 percent by weight (mass). Class C fly ash will not be permitted.

Section 1003, Aggregates, is amended as follows:

Subsection 1003.02, Aggregates for Portland Cement Concrete and Mortar, is amended to add the following heading.

(d) Aggregates for Structural Class A(HPC) Mass Concrete:

For the combined aggregates for the proposed mass concrete mix design to be used for mass concrete elements, the percent retained based on the dry weight (mass) of the total aggregates shall meet the requirements of Table 1003-1B. Additionally, the sum of the percents retained on any two adjacent sieves so designated in the table shall be at least 12 percent of the total combined aggregates. The maximum amounts by weight (mass) of deleterious materials for the total aggregate shall be the same as shown in Subsection 1003.02(b)

Table 1003-1B
Aggregates for Structural Class A(HPC)
Mass Concrete Elements

U.S. Sieve	Metric Sieve	Percent Retained of Total Combined Aggregates
2 ½ inch	63 mm	0
2 inch	50 mm	0-20
1 ½ inch	37.5 mm	0-20
1 inch	25.0 mm	5-20
¾ inch	19.0 mm	5-20
½ inch	12.5 mm	5-20
3/8 inch	9.5 mm	5-20
No. 4	4.75 mm	5-20
No. 8	2.36 mm	5-20
No. 16	1.18 mm	5-20
No. 30	600 µm	5-20
No. 50	300 µm	0-20
No. 100	150 µm	0-20
No. 200	75 µm	0-5
Note: For the sieves in the shaded areas, the sum of any two adjacent sieves shall be a minimum of 12 percent of the total combined aggregates.		

Section 1012, Bridge Railings and Barriers, is amended as follows:

Subsection 1012.01, Concrete, is deleted and the following substituted:

Concrete for bridge railings and barriers Class AA(HPC) as specified in the contract plans, complying with Section 901 and the requirements of this special provision.

Section 1018, Miscellaneous Materials, is amended as follows:

Subsection 1018.15, Fly Ash, is deleted and the following substituted:

Fly ash shall be from an approved source listed in QPL 50 and shall comply with AASHTO M 295 for Class F only. Class C fly ash will not be permitted.

MEASUREMENT.
Quantities of high performance concrete for Classes A(HPC) and AA(HPC) concrete will be design quantities as specified on the plans and adjustments thereto. The design quantities will be adjusted if the engineer makes changes to adjust to field conditions, if plan errors are proven, or if design changes are made.

PAYMENT.
Subsection 805.18, Payment, is amended as follows.

Heading (a), Structural Concrete, is amended to include the following after the first sentence of the second paragraph:

Class A(HPC) and AA(HPC) concrete will be accepted on a lot basis.

Heading (a), Structural Concrete, is further amended to replace the second sentence of the third paragraph with the following:

The six cylinders per lot for Class A(HPC) and Class AA(HPC) concrete will be tested for compressive strength in 28 days, or 56 days in accordance with the project specifications.

Subsection 805.18, Payment, is further amended to include the following paragraph:

No separate payment will be made for the materials, labor, equipment, tools, and incidental items associated with controlling the heat of hydration for mass concrete. The cost of this work will be included in payment for the elements being constructed.

Subsection 901.12, Acceptance and Payment Schedule, is amended to include following paragraphs:

References to concrete Classes A(M) and AA(M) in Table 901-5 and all associated footnotes shall apply to concrete classes A(HPC) and AA(HPC), respectively.

Acceptance and payment schedules in Tables 901-5 and 901-7(see below) will apply to all cast-in-place high performance structural concrete. The payment schedule for cast-in-place high performance structural concrete will be the lowest value of the percents of contract prices from Tables 901-5 and 901-7(see below). Acceptance and payment schedules in Table 901-7 will apply to precast high performance structural concrete. The acceptance and payment schedules in Table 901-5 do not apply to precast concrete.

Subsection 901.12 is further amended to include Table 901-7, Acceptance and Payment Schedules for High Performance Concrete Permeability Test (56 Day Test) Results.

Table 901-7
Acceptance and Payment Schedules
High Performance Concrete Permeability Test (56 Day Test) Results
Class A(HPC) and Class AA(HPC)

Permeability Test Results (Coulombs)	Percent of Contract Price (%)
1000 & below	100
1001 - 1500	98
1501 - 2000	90
2001 & above	50 or Remove and Replace

In addition to the above any concrete not meeting permeability requirements for 100% pay may be subject to remediation. Required remediation will not change or modify any pay penalty.

Payment for high performance concrete will be at the contract unit price per cubic yard (cu m), which will include all material, labor, equipment, tools and incidentals necessary to complete the work.

Payment will be made under:

Item No.	Pay Item	Pay Unit
NS-800-00202	Class A(HPC) Concrete(Piers)	Cubic Yard (Cu m)
NS-808-00203	Class A(HPC) Concrete (Bents)	Cubic Yard (Cu m)
NS-800-00204	Class AA(HPC) Concrete	Cubic Yard (Cu m)

NS CORROSION RESISTING DEFORMED REINFORCING STEEL (04/09):

DESCRIPTION. This item consists of furnishing, handling, fabricating and placing corrosion resistant, galvanized, or stainless steel deformed reinforcing steel.

MATERIALS. Deformed reinforcing steel for this item shall be as follows:
Corrosion Resistant steel shall conform to ASTM A 1035 / A 1035M. Material yield strength shall be 60,000 psi minimum.
Galvanized steel shall conform to ASTM A 767 / A 767M. Material yield strength shall be 60,000 psi.
Stainless steel shall conform to ASTM A 955 / A 955M and shall be Type 316LN UNS Designation S31653, UNS Designation S31803, or UNS Designation S32304. Material yield strength shall be 60,000 psi.
Accessories such as tie wires and metal bar supports used in the fabrication, storage and placement of the corrosion resisting deformed reinforcing steel shall not adversely affect the corrosion resistance of, nor cause corrosion of, the corrosion resisting deformed reinforcing steel.

CONSTRUCTION REQUIREMENTS. This item shall be installed in accordance with the plans, Section 806 of the 2006 Standard Specifications, and as directed.

MEASUREMENT. This item, completed and accepted, will be measured for payment per pound (kg), and will include all materials, labor, equipment and tools necessary to complete the work.

PAYMENT. Payment for Deformed Reinforcing Steel will be made at the contract unit price under:

Item No.	Pay Item	Pay Unit
NS-800-00560	Deformed Reinforcing Steel (Stainless Steel)	Pound (kg)