SECTION 503 - CONCRETE STRUCTURES

Make the following amendments to said Section:

(I) Amend **503.02 Materials** by adding the following after line 28:

"Grout 712.04"

(II) Amend **503.03(B) Falsework, Formwork, or Centering** as follows:

Add the following two sentences at the end of the first paragraph at line 63: "Formwork is a temporary structure or mold used to retain the plastic on fluid concrete in its designated shape until it hardens. Formwork must have enough strength to resist the fluid pressure exerted by plastic concrete and any additional fluid pressure effects generated by vibrations.

Replace the words "AASHTO LRFD Bridge Specifications" with "AASHTO Guide Design Specifications for Bridge Temporary Works at line 78."

(III) Amend **503.03(B) Falsework, Formwork, or Centering** by adding the following sentence to the seventh paragraph at line 106:

"Temporary bracing shall be provided, as necessary to withstand all imposed loads during erection, construction and removal of falsework."

(IV) Amend **503.03(B) Falsework, Formwork, or Centering** by revising the ninth paragraph from lines 112 to 122 as follows:

"Show stresses and deflection of load supporting members in design calculations. Show anticipated total settlements of falsework and forms on falsework drawings, including falsework footing pressure and settlement, and joint take-up. Construct deck slab form between girders with no allowance for settlement relative to girders. Do not exceed 1 inch for anticipated settlements of falsework. Provide tell-tales attached to soffit forms, readable from the ground, at sufficient locations to determine total settlements and deflections resulting form concrete placement. Check for any movement or deformation of forms and falsework that may exceed the calculated or anticipated deflection or settlement. If the movement or deformation is exceeded, take appropriate action. This action may include halting concrete placement to install additional bracing or changing the rate or sequence of concrete placement to achieve the required lines and grade. Discontinue concrete placement when settlements deviate more than ± 3/8 inch from those indicated on falsework drawings. In such affected areas, provide corrective measures prior to initial set of concrete. Remove unacceptable concrete."

(V) Amend **503.03(C)(1) Construction** by revising the first paragraph between lines 169 and 172 as follows:

(1) Construction. "Use wood or metal forms that are impervious to moisture, non-staining to concrete, mortar tight and sufficiently rigid to prevent distortion due to pressure of concrete and other loads, including vibration, incidental to construction. Construct and maintain forms to prevent joints from opening. Formwork joints shall be filled with approved material that is impervious to moisture, will not stain concrete, and produces tight joints."

(VI) Amend **503.03(C)(1) Construction** by revising the second paragraph between lines 174 and 176 to read as follows:

"Unless otherwise indicated in the contract documents, place minimum ¾ inch by ¾ inch chamfer at sharp edges of exposed concrete surfaces. Give girder and coping forms bevels or drafts to ensure easy removal."

(VII) Amend **503.03(C)(1) Construction** by adding the following sentence to the ninth paragraph at line 209:

"The Engineer will stop the use of the forms or forming systems which produce a concrete surface with excessive undulations until the Contractor makes modification acceptable to the Engineer."

(VII) Amend **503.03(C)(2) Form Lumber** by adding the following sentence to the first paragraph after line 223:

"When requested by the Engineer, submit certificates verifying grade and species of any piece of lumber which does not have a grade or species stamp."

(IX) Amend **503.03(D) Removal of Falsework and Forms** by revising Table 503.03-1 – Removal of Falsework and Forms at line 297 to read as follows:

"TABLE 503.03-1 – REMOVAL OF FALSEWORK AND FORMS						
Railing and Barriers – 12 Hours Removal Time						
Beams, Arches, and Other Members – 14 days Removal Time						
Slabs With Maximum Thickness of (Inches)	9		12		More Than 12	
Removal Time (Days)	7		10		14	
Walls, Columns, and Vertical Sides of Beams With Maximum Height of (Feet)	2	5	10	20	30	**40 or More**
Removal Time (Days)	0.5	1	2	3	5	7
Note: Where forms also support vertical or horizontal loads imposed on slab or beam soffits, use 14 days for removal time."						

(X) Amend **503.03(D) Removal of Falsework and Forms** by deleting the last paragraph between lines 329 and 334.

(XI) Amend **503.03(E) Loading** by deleting the words, "except abutment walls and wing walls" in line 337.

(XII) Amend **503.03(F)(1) General** by adding the following paragraphs after line 419:

"At the time of placement, the concrete temperature shall not exceed 85 degrees Fahrenheit.

The rate of evaporation shall be measured by using the nomograph: ACI 308R Figure 4.1 Nomograph for Estimating the Maximum Potential Rate of Evaporation of the Environment Assuming a Water-Covered Surface in Which the Water Temperature Is Equal to the Concrete Temperature or by using an evaporation rate calculator e.g., Kestrel 5200 hat has been reviewed and accepted by the Engineer. Use procedures as stated in ACI 308R Chapter 4 – Monitoring Curing and Curing Effectiveness. Approximately 30 minutes prior to the scheduled start of concrete placement measure the ambient air temperature, relative humidity and wind velocity with industrial grade weather monitoring instruments or with an evaporation rate calculator to determine the on-site evaporation rate. When the rate of evaporation is equal to or exceeds 0.05 lb/sq ft/h fogging shall begin. During the placement of the concrete recalculate

evaporation rate every 15 minutes using new real-time data including actual temperature of concrete being placed. The concrete shall be fogged before, during and after finishing. Fogging shall start at the point the bleed water starts to evaporate. Fogging may stop when the curing compound application is complete. Fogging shall be accomplished by self-powered atomized mister, e.g. BossTek DustBoss, that creates a mist of water droplets above the concrete surface that will float in the air. The droplets should float in the air, not fall on the concrete. The goal is to humidify the air, not wet the concrete. Let the water evaporate before finishing. If the concrete is fogger before floating, brooming or trowelling, do not finish the accumulated surface water into the concrete surface or it will weaken it. Do not allow water to run off the concrete surface. Adjust foggers or pause its operation. Foggers shall not drip water on the poured concrete surface. Point foggers into the air above the concrete pour not at it and not in the direction of the incoming wind. It shall not be acceptable to use a water hose to spray water into the air as a substitute. This will be considered adding additional water to the deck surface. If plastic shrinkage cracks appear during the finishing, the cracks shall be closed by striking each side of the crack with a float and refinishing the concrete."

(XIII) Amend **503.03(F)(7) Hot Weather Concreting** by adding the word "ambient" in front of the word "temperature" at line 560.

(XIV) Amend **503.03(F) Placing Concrete** by adding the following Subsection after line 565:

> **"(8) Certified Concrete Flatwork Finisher Requirement.** Perform the placement, and finishing operations of concrete flatwork with a minimum ratio of one certified ACI Concrete Flatwork Finisher and Technician with 4,500 hours of acceptable work experience (certified craftsman) per three concrete finishers (concrete finishers without ACI Concrete Flatwork Finisher and Technician certification and 4,500 hours of acceptable work experience) at each location having flatwork done. The concrete flatwork shall be under the direct supervision of a certified craftsman. Designate the certified craftsman who will be supervising and responsible for determining the quality of the finish of the concrete flatwork being performed. No flatwork shall be performed without the required amount of certified craftsman present.
>
> > **(a)** Flatwork concrete is defined as any concrete work that requires tools or machines to be used during the placement and finishing operations of concrete. Concrete flatwork includes concrete work that requires a specified finishing, smoothness or rigid surface tolerances such as sidewalks, walkways, Portland cement concrete pavement, concrete white-topping, girder seats, pier caps, bridge decks, on-grade concrete slabs, approach slabs,

concrete overlays, and concrete repairs which exceed one square foot per day.

(b) Areas that are not considered flatwork concrete are the top of foundations or structures that will have backfill material placed directly on the concrete surface.

(c) Submit copies of the craftsman's current ACI certification 30 days before concrete flatwork begins for the Engineer's review and acceptance. The Engineer has the right to require the removal, replacement, retraining and re-certification of a certified craftsman if that person does not, in the opinion of the Engineer, demonstrate the ability to place and finish concrete in accordance with the practices recommended in the ACI Concrete Flatwork Finisher Certification Program and to meet the finishing standards required by the contract documents.

(d) Any cost or impact to the contractor in providing, training, certification, retraining, replacement or re-certification is incidental to the contract items that require concrete flatwork."

(XV) Amend **503.03(G) Joints** by adding the following sentence after line 566:

"Prior to backfilling with earth or other materials against the joints, all construction, expansion, contraction, and control joints shall be waterproofed with flashing compound waterproofing as detailed in the Standard Plans."

(XVI) Amend **503.03(G)(1) Construction Joints** by revising the second paragraph between lines 572 and 579 to read as follows:

"Before placing concrete on substrate concrete at construction joint, the following work shall be performed:

(a) Remove laitance, loose particles, dust, dirt, impervious membrane curing compound, and any other material foreign to the construction joint and projecting reinforcement.

(b) Roughen horizontal construction joint by abrasive blast cleaning or other approved methods to full amplitude of approximately ¼ inch."

(XVII) Amend **503.03(G)(3) Contraction Joints** by revising the first paragraph from lines 661 to 665 to read as follows:

"(3) Contraction Joints. Contraction joints in walls and in other structures shall be spaced at not more than 20 feet on centers and shall

be spaced, at abrupt changes in height or thickness and at obtuse corners unless otherwise directed by the Engineer."

(XVIII) Amend **503.03(I)(3) Flashing Compound for Joints** between lines 755 and 757 by deleting this subsection.

(XIX) Amend **503.03(L) Curing Methods** by adding the following paragraph after line 794:

"The Contractor shall have the option to use curing compound SINAK WCE or SINAK LITHIUM for bridge structures when approved by the Engineer. Six copies of the manufacturer's brochure and certificates of test results shall be submitted. All work shall conform with the manufacturer's recommendations."

(XX) Amend **503.03(L)(2) Impervious Membrane Curing** by revising the third sentence of the first paragraph from lines 818 to 819, to read as follows:

"Use ratio of at least one gallon for each 100 square feet of concrete surface."

(XXI) Amend **503.03(L)(2) Impervious Membrane Curing** by adding the following sentences to the first paragraph after line 819:

"The curing compound shall be applied to the concrete following the surface finishing operation, immediately before the moisture sheen disappears from the surface, but before any drying shrinkage or craze cracks begin to appear. In the event of any drying or cracking of the surface, application of water with an atomizing nozzle (fog spray) as specified in Section 503.03(L)(1), "Water Curing", shall be started immediately and shall be continued until application of the compound is resumed or started; however, the compound shall not be applied over any resulting freestanding water. Should the film of compound be damaged from any cause before the expiration of 7 days after the concrete is placed in the case of structures and 72 hours in the case of pavement, the damaged portion shall be repaired immediately with additional compound."

(XXII) Amend **503.03(L)(2) Impervious Membrane Curing** by revising the last sentence of the second paragraph between lines 822 and 825 as follows:

"Do not apply membrane curing compound on surfaces to which concrete is to be bonded or to which waterproofing or epoxy is to be applied."

(XXIII) Amend **503.03(M) Finishing Concrete Surfaces** by adding the following sentences at line 841:

"No additional water shall be added to the concrete surfaces in an effort to aid the finishing operation as the application of water to aid the finishing operation

will result in the rejection of the concrete pour. Finishing aids or evaporation retarders may be used only with written authorization by the Engineer. Only finishing aids shall be used to finish the concrete surface and only evaporation retarders used to minimize the evaporation rate of the plastic concrete. These solutions shall not be used interchangeably. Using evaporation retarders or finishing aids interchangeably will damage the concrete surface and shall be cause for the pavement being non-compliant and be cause for its removal or remedial repair."

(XXIV) Amend **503.03(M)(3)(b) Sidewalk and Median Strip** by revising the first and second paragraphs from lines 1182 to 1191 to read as follows:

(b) Sidewalks and Median Strips. "Provide final finish for concrete sidewalks and median strips using wooden float and broom finish. Do not plaster surface. Use edging tool with ¼-inch radius to finish outside edges of sidewalk. Finish sidewalk as plane surface with 2-percent (allowable construction tolerance of plus or minus 0.4 percent maximum) cross slope towards roadway. Test surface of concrete sidewalk with 10-foot straightedge. Correct any deviation in excess of ¼ inch."

(XXV) Amend **503.03 Construction** by adding subsection 503.03(0) beginning at line 1200 as follows:

"**(0) Tolerance for Concrete Construction and Materials.** Conform to the stricter of tolerances specified in the specifications, ACI 117 Standard Specifications for Tolerance for Concrete Construction and Materials, PCI Tolerance for Precast and Prestressed Concrete, and PCI MNL-116 Manual for Quality Control of Plants and Production of Structural Precast Concrete Products."

(XXVI) Amend **503.4 Measurement** by revising lines 1201 to 1205 to read as follows:

"503.04 Measurement. The Engineer will measure the concrete by cubic yard according to the dimensions shown in the contract or as ordered by the Engineer.

The Engineer will not make deductions for the volume occupied by reinforcing steel, piles, floor drains, weepholes, timber bumpers, pipes less than eight (8) inches, conduits, or expansion joint materials."

(XXVII) Amend **503.05 Payment** by revising lines 1206 to 1223 to read as follows:

"**503.05 Payment.** The Engineer will pay for the accepted quantities of concrete complete in place at the contract unit price per cubic yard.

The contract unit price amount paid shall be full compensation for the concrete; for placing, curing and finishing; for furnishing materials including admixtures and cement (including extra cement added to concrete deposited under water); for furnishing and installing drains, scuppers, premolded joint fillers, joint seals, waterproofing at construction joints, waterstops, pipes and conduits; for furnishing and installing metal rockers, anchor bolts, structural shapes for expansion joints and other similar items; for timber bumpers, forms, form lining and falsework or centering, bearing pads, structural steel bearing plates; reinforcing bars conforming to ASTM A1035 Type CS Grade 100; and for equipment, tools, labor, materials and incidentals necessary to complete the work.

The Engineer will pay for the following pay item when included in the proposal schedule:

Pay Item	Pay Unit
Concrete for _____ (Class _____ if applicable)	Cubic Yard

The Engineer will pay for excavation and backfill for foundations in accordance with and under Section 205 – Excavation and Backfill for Bridge and Retaining Structures and Section 206 – Excavation and Backfill for Drainage Facilities."

END OF SECTION 503