SP00558 (Special Provisions for the 2024 Book) (Bidding on or after: 10-01-24
Last updated: 06-26-24
This Section requires SP00504 or SP00505, SP00540, SP02001, SP02011 and SP02690.)

SECTION 00558 – HIGH EARLY STRENGTH CONCRETE OVERLAY

(Follow all instructions and make all edits with "Track Changes" turned on. This Section is not published in the Oregon Standard. If there are no instructions [orange text] above a subsection, paragraph, sentence, or bullet, then include it in the project, unless the item(s) that are included in the subsection, paragraph, sentence, or bullet are not required on the Project and then they should be deleted. In general do not re-number or re-letter subsections when item(s) are deleted. Delete all orange text before preparing the final document. All other modifications to this Section will require ODOT Technical Resource and State Specifications Engineer approval.)

Section 00558, which is not a Standard Specification, is included in this Project by Special Provision.

Description

00558.00 Scope - This Work consists of constructing high early strength concrete (HESC) overlays.

00558.03 Submittals – At least 21 Calendar Days before the pre-placement conference, provide the following information and samples to the Engineer for approval:

- Personnel qualifications according to 00558.30 and 00558.31.
- The HESC mix design.
- A detailed work plan, by the hour, for the HESC preparation, resurfacing, and cleanup.
- Equipment specifications for all Work.

00558.04 Preplacement Conferences:

(a) Supervisory Personnel - Hold a pre-placement conference with all supervisory personnel, Subcontractors, Suppliers, QCT, CCT, and all other personnel who will be involved in the resurfacing Work. Meet at a mutually agreed time at least 14 Calendar Days in advance of the Work. Present and discuss all phases of the resurfacing Work.

(b) Placement Crew - Hold a second pre-placement conference with the Engineer and the entire resurfacing work crew and the QCT, at the job site 1/2 hour before resurfacing Work begins to discuss placement duties and procedures. Hold additional pre-placement conferences for additional shifts or changes in personnel. Do not begin the resurfacing Work until this meeting is held.

Materials

00558.10 Materials - Furnish Materials meeting the following requirements:

Concrete.....02001
Rapid Hardening Hydraulic Cement.....02011
Curing Materials 02050
Portland Cement Concrete Repair Material.....02015
Preformed Joint Fillers for Concrete.....02440.10
Synthetic Macro Fiber Reinforcing 02045.20

00558.11 Class of Concrete - Furnish Class HESC4000 - 3/4" concrete designed to attain high early strength, according to Section 02001 except as modified by this Section.

Furnish macro fiber reinforcement according to 02045.20. Introduce and mix the fibers in a way that will achieve uniform distribution.

00558.12 Permeability - Furnish the following permeability reducing admixture, dosed at the manufacturer's recommended rate.

Liquid Low-PTM (Liquid admixture)
CTS Cement Manufacturing Corp.
12442 Knott Street
Garden Grove, CA 92841
Contact: Tony Tomasini
Phone: (360) 607-3553

00558.13 Maturity - Establish a strength-maturity relationship for HESC mix designs according to AASHTO T 276 and AASHTO T 325 during the mix design phase for the purpose of opening to traffic. A minimum of seven early age readings will be taken at 1, 2, 3, 4, 5, 6, and 24 hours. Each reading requires averaging the two maturity cylinders and breaking two compressive strength specimens. Submit the required concrete maturity data outlined in the "Reports" sections 11.1.1 through 11.1.10 of AASHTO T 276 and 11.1.1 through 11.1.5 of AASHTO T 325 for approval by the Engineer.

00558.15 Quality Control - Provide quality control according to Section 00165 and the following:

- Sample and test according to Section 00165, matching the frequencies from Section 00559
- For all HESC, provide personnel according to 02001.50 to sample and test the mix for temperature, air content, water-cementitious ratio, density, and yield when:
  - The first load of each placement is made.
  - There is a visible change in the slump of the concrete.
  - A set of cylinders is obtained.
- Sample and cast maturity cylinders from the last truck of the shift.

If the results of any test are outside of the specification limits, stop placement of the load. Correct the load or, if the load cannot be corrected, do not incorporate it into the Work. Test subsequent loads before any further concrete placement. Correct subsequent loads if any of

the tests are still outside the specification limits. Return to the specified test frequency when the test results from two consecutive loads are shown to meet the specification limits.

00558.17 Acceptance of Concrete – Acceptance of concrete will be according to Section 00165 and the following:

(a) Aggregate - Acceptance of Aggregate will be according to 02690.12.

(b) Plastic Concrete - Acceptance of the plastic concrete will be based on the tests performed by the Contractor's QCT, according to the tolerances and limits for water/cementitious ratio, air entrainment, and temperature of Section 02001.

(c) Hardened Concrete - Acceptance of hardened concrete will be based on one set of three cylinders cast from each 50 cubic yards of concrete placed. Cast a minimum of one set per production shift. Cast and cure the test specimens according to AASHTO T 23 in 4 x 8 inch single-use plastic molds and test at 28 Days according to AASHTO T 22.

(1) General - For all HESC, acceptance of hardened concrete will be based on an analysis of compressive strength tests of cylinders cast by the QCT. Test the cylinders at an Agency certified laboratory.

(2) Actual Strength Test Value (ASTV) - The ASTV at 28 Days is the average compressive strength of the three cylinders tested. Discard all specimens that show definite evidence, other than low strength, of improper sampling, molding, handling, curing, or testing. The average strength of the remaining cylinders is considered the test result.

(3) Acceptance - Hardened concrete with an ASTV meeting or exceeding the specified design strength, $f'c$ will be accepted for strength. If the ASTV is less than $f'c$ but at least 85 percent of $f'c$, the Engineer may review the results to determine if the concrete represented by the cylinders is suitable for the intended purpose. Remove concrete that has an ASTV less than 85 percent of $f'c$ unless otherwise authorized in writing by the Engineer. If the concrete is removed, the cost of removal, replacement and all related Work shall be the Contractor's responsibility. If the Engineer determines that the concrete is suitable for the intended purpose, the concrete may be allowed to remain in place, subject to a price adjustment according to 00150.25.

If an ASTV falls below $f'c$, the Contractor may submit a written plan outlining a proposed alternate method of evaluating compressive strength. Submit the plan for review by the Engineer within 3 Days of the test. Provide evidence that a reasonable $f'cr$ (over-design) was maintained and that there is credible evidence (besides low strength) which warrants consideration of this option. The Engineer may allow an alternate method of acceptance if the compressive strength test results are determined to be suspect from definable external factors.

Equipment

00558.20 Equipment - Remove all Equipment that leaks oil or other contaminants from the work area until they are repaired.

00558.21 Mobile Mixer for HESC - Furnish self-contained, mobile, continuous mixing Equipment for proportioning, mixing and placing HESC that:

- is self-propelled and carries sufficient unmixed dry bulk cement, Sand, Coarse Aggregate, admixtures, and water to produce a minimum of 6 cubic yards of concrete on site.
- provides positive measurement of cement being introduced into the mix by meter or counter.
- provides positive control of the flow of water into the mixing chamber. Water flow is readily adjustable to provide for minor variations in Aggregate moisture.
- is calibrated to automatically proportion and blend all components according to the mix design on a continuous or intermittent basis as required by the placing operation.

Perform a calibration and yield test on each mixer prior to the first placement to accurately proportion the specified mix. Use a written calibration procedure from the mixer manufacturer, a procedure provided by the Agency or other written procedure acceptable to the Agency. Calibrate the mixer in the presence of the Engineer. Provide the Engineer with information about the scheduled date, time and place for the calibration. Perform a new calibration on every Project and when the source of Materials changes, when the mixer undergoes a major repair, or when requested by the Engineer.

00558.22 Finishing Equipment - Furnish a roller screeds or truss screeds capable of providing a smooth travel surface. Roller screeds are to be of adequate diameter and weight as to not float on the surface of the placement or flex during finishing operations.

00558.23 Miscellaneous Equipment:

(a) Hand Tools - Furnish hand tools for placing and finishing concrete. Use manual type screeds with approved vibrators attached to consolidate and finish smaller areas where it is impracticable to use a finishing machine. Use spud vibrators when depths exceed 2 1/2 inches. Use supplemental vibration along the meet lines where adjacent pours come together at bulkheads, and along curb lines, unless it can be shown that vibration reaches the meet lines.

(b) Straightedge - Furnish a 12 foot metal straightedge.

(c) Recording Thermometer - Furnish a 24 hour recording thermometer accurate to ± 1 °F.

(d) Coring Equipment - Furnish core cutting Equipment that can produce a core at least 3 inches in diameter.

(e) Bond Testing Equipment - Furnish bond testing Equipment that:

- Is compatible with the core tested.
- Can exert a tensile load to the core sufficient to exceed 300 psi.
- Is equipped with a measuring device capable of reading tensile force exerted within 1 percent accuracy.

(f) Wet-dry Vacuum Equipment - Furnish vacuum Equipment that can remove puddled water ahead of the concrete placement.

(g) Strength-Maturity Relationship Testing Equipment - Provide temperature sensors that meet the requirements of AASTHO T 276 and AASHTO T 325.

Labor

00558.30 Personnel Qualifications - Demonstrate the company's qualifications and experience and the qualifications of personnel performing the HESC overlay work by providing the Engineer the following:

- A project reference list of at least three structural overlay projects, successfully completed within the last five years. Include the following information for each qualifying project:
  - A brief description of each project.
  - Each project's name.
  - The owner's contact person's name, title, and current phone number for each project.
  - Alternate owner's contact person's name, title, and current phone number for each project.
- Documentation that demonstrates that the mobile mixer operators and the finishing machine operators have completed at least one structural overlay project within the last three years.

The Engineer may suspend the HESC overlay work if the Contractor substitutes unapproved personnel during construction. Submit requests for substitution of mixer operators and finishing machine operators to the Engineer.

00558.31 Quality Control Personnel - Provide certified technicians according to 02001.50.

Construction

00558.40 Trial Overlay Strip - Conduct one or more trial overlays on a concrete base to demonstrate the effectiveness of deck preparation, mixing, placing, and finishing equipment and methods proposed. Construct trial overlay when weather conditions are similar to those expected during the construction of the overlay. Use the same Equipment and personnel, including deck preparation equipment that will be used for the overlay. Hydrodemolition equipment is not required to be demonstrated at the trial overlay. Acceptance of the trial overlay will be based on concrete plastic properties, hardened concrete ASTV, concrete strength-maturity, bond strength, and surface tolerance. Perform testing at locations designated by the Engineer. Construct each trial overlay the same width as the final overlay placement and at least 20 feet long.

(Select either Section 00504 or Section 00505. Delete parentheses and the words in parentheses as needed.)

00558.41 Surface Preparation - Perform surface preparation according to *(*Section 00504 or Section 00505*)*.

00558.42 Placing:

(a) Mixing and Delivering HESC - Mix HESC according to mobile mix supplier's recommendations.

(b) Placement Conditions - Place structural concrete overlays according to 00540.49 and the following:

- The surface temperature of the prepared deck is 40 °F or greater and less than 80 °F.
- If the surface temperature is between 40 °F and 45 °F, the temperature is rising.
- Measure the surface temperature with an infra-red thermometer at a minimum of three locations on the deck in the presence of the Engineer.

(c) Thickness - Place HESC with a minimum thickness of 2 inches, as shown.

(d) Construction Limitations - Place HESC against a firmly fixed bulkhead. Control sagging or running of freshly placed HESC in areas of steep gradient by one or both of the following methods:

- Modifying direction or method of placement
- Modifying slump

Slow traffic in the adjacent lane by flagging for at least 3 hours after completion of the pour. The Engineer may adjust the time limits due to weather or traffic conditions.

(e) Placement Procedures -

(1) Preceding Placement - Each Day before placing concrete operate the finishing Equipment, in the presence of the Engineer, over the deck to check that the required thickness of concrete overlay is achieved. Place concrete working up-grade, unless otherwise approved.

(2) Joints - At transverse and longitudinal joints, sawcut the section previously placed to form a straight, vertical edge before placing any adjacent sections. Sawcutting joints may be omitted if the bulkhead produces a straight, smooth, vertical surface. On both sawcut and formed joints remove all loose material by sand blasting or water blasting the face of the joints.

a. Longitudinal Joint - A longitudinal construction joint will be allowed only at the centerline of the Roadway or at lane lines unless otherwise shown or directed.

b. Transverse Joint - When placement operation is delayed by 1/2 hour or more, form a construction joint by removing all material not up to finish grade, in a straight line.

(3) Grout Coat - After the deck surface has been cleaned and immediately before resurfacing, broom a thin coat of HESC (grout) onto the prepared deck. Remove

Coarse Aggregate during the brooming procedures. Ensure that all parts of the prepared deck receive a vigorous brooming that scrubs the grout into the deck surface and results in an even coat with no excess grout collecting in pockets. Broom the grout at a rate to prevent drying and remove excess Aggregate from the deck before being covered by the HESC Overlay. If the grout does dry, stop the overlay, remove the dried grout, clean and prepare the affected area of the deck, and reapply grout according to this subsection. Grout coat is not required on surfaces prepared by hydrodemolition.

(4) Roadway Finish - After the overlay has been struck off with a finishing machine, mist the surface horizontally with water and float it, if necessary, to produce a smooth, uniform, sealed surface. Hand finishing may be required along edges of concrete placement. Use a 12 foot straightedge during placement to verify deck grades and to correct defects in hand finished areas.

(5) Curing - Cure HESC by placing curing blankets and applying water to the deck surface within 15 minutes from placement and continually for a minimum of 3 hours. Prior to opening to traffic, place a curing compound on the deck surface. The Equipment, Materials, and method of curing must be approved by the Engineer.

00558.43 Bond Strength - Perform two bond tests for each placement in the presence of and at locations designated by the Engineer within 28 Calendar Days of overlay placement. Cut 3 inch diameter cores and conduct bond tests on the cores.

The bond tests consist of:

- Coring through the overlay and approximately 1 inch into the existing concrete. Locate reinforcement prior to coring, do not core through reinforcement.
- Attaching a device to the top of the core.
- Exerting a tensile load to the core sufficient to cause failure or achieve 300 psi, whichever occurs first.

A successful test is the failure of the concrete substrate or bond failure at or above 175 psi.

After coring and testing, restore the area voided by the cores by blowing with compressed air and filling with an approved PCC repair material.

00558.44 Delamination Inspection - The Engineer will inspect the surface for delamination, bond failure, or other damage by use of a chain drag, coring, or other devices. Core samples will be at no additional cost to the Agency.

Repair all delaminated areas of 1 square foot or greater as directed by the Engineer. Delaminated areas of less than 1 square foot will not require repair.

00558.45 Surface Finish, Tolerance, and Texturing:

(a) Surface Tolerance - The finished surface, when tested with a 12 foot straightedge, shall not vary by more than 1/8 inch. Furnish the straightedge and operate it under the direction of the Engineer.

If the concrete surface does not meet the surface tolerance, stop the operation until revised methods, changes in Equipment, or correction of procedures are proposed and approved.

Correct all non specification surface tolerance after curing and before texturing with a self propelled diamond grinder. Correct the surface tolerances before opening the Roadway to traffic at no additional cost to the Agency.

(b) Surface Texturing - Texture the concrete according to 00540.50(c) as early as feasible after duration of cure and a minimum of 2,500 psi strength is met, as determined by the strength-maturity relationship.

00558.46 Crack Inspection and Sealing - The Engineer will inspect the surface for cracks.

After correcting non specification surface tolerances and after texturing the deck surface, seal all visible cracks as follows:

- In areas where cracks are 10 feet or more apart, seal each crack separately.
- In areas where the cracks are numerous or are less than 10 feet apart, seal the entire area where the cracks occur.

Seal with a low modulus concrete and crack sealer from the QPL.

Perform all repair and sealing Work at no additional cost to the Agency. Complete all repair and sealing Work as soon as feasible.

00558.47 Use of New Surface - Do not open sections to traffic or allow vehicles or construction Equipment on the new HESC surface until curing is complete and the concrete has met a minimum average compressive strength of 2,500 psi.

Measurement

00558.80 Measurement - The quantities of Work performed under this Section will be measured according to the following:

(a) Furnish HESC Material - Furnishing concrete material will be measured on the volume basis. The quantities will be determined from the delivery vehicle batch tickets and checked using the yield factor according to AASHTO T 121 (ASTM C138).

A deduction will be made for Material placed and removed beyond sawcuts or formed construction joints.

(b) Construct HESC Overlay – Construct HESC overlay will be measured on the area basis. The area will be determined by measuring the actual surface area of the resurfaced bridge deck.

Payment

00558.90 Payment - The accepted quantities of Work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Furnish High Early Strength Concrete	Cubic Yard
(b) Construct HESC Overlay	Square Yard

Surface texturing will be paid for according to 00540.90.

Payment will be payment in full for furnishing and placing all Materials, and for furnishing all Equipment, labor, and Incidentals necessary to complete the Work as specified.