

EXPECTED IMPLEMENTATION JULY 2024 (FY 2024-25)

450 PRECAST PRESTRESSED CONCRETE CONSTRUCTION. (REV 10-10-23) (FA 10-11-23) (FY 2024-25)

SUBARTICLE 450-3.1 is deleted and the following substituted:

450-3 Materials.

450-3.1 General: Meet the following requirements:

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| Concrete | Section 346 |
| Steel Strands*..... | Section 933 |
| Carbon Fiber Reinforcing Polymer (CFRP) Strands*..... | Section 933 |
| Steel Prestressing Bars | Section 933 |
| Steel Accessories | Section 933 |
| Steel Spirals | Section 931 |
| Reinforcing Steel and Metal Welded Wire Reinforcement..... | Sections 415 and 931 |
| FRP Reinforcing | Sections 415 and 932 |
| FRP Spirals** | Section 932 |
| Embedded Ducts | Section 960 |
| Membrane Curing compounds*** | Section 925 |
| Epoxy Resin Compounds..... | Section 926 |
| Burlap..... | Section 925 |
| Curing Blanket..... | 400-16 |
| Penetrant sealer*** | Section 413 |
| Methacrylate | Section 413 |
| Epoxy Injection of Cracks | Section 411 |

* Do not use strands from more than one source in any individual prestressed element, with the exception of the partially tensioned strands (dormant strands).

** The FRP spirals cannot be used in combination with steel prestressing strand.

*** Use membrane curing compounds and sealers that are compatible with coating or other materials that are applied to concrete surface.

Use inserts in accordance with the recommendations of the manufacturers and within their certified capacities and application qualifications. Do not use aluminum inserts.

Use draped strand devices of sufficient rigidity having adequate support to retain the position of the strand unchanged under the induced load. Do not allow the devices to induce friction to the strands such that the required jacking force and elongation cannot be attained.

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SUBARTICLE 450-3.2 is deleted and the following substituted:

450-3.2 Strand Chucks and Splice Chucks: For pretensioning, use strand chucks that are capable of anchoring the strands without slippage after seating and ensure against strand failure within the grips at loads less than 95% of ultimate tensile strength of the prestressing strand.

Submit manufacturer's certification that splice chucks used to transmit the prestressing force from one prestressing strand to another are capable to hold at least 95% of the ultimate tensile strength of the prestressing strand.

Do not use wedges that become worn, cracked, deformed, or that allow dead end seating in excess of 3/8 inch. Use components from the same manufacturer to make up chucks and to provide proper wedge fit.

Use chucks as complete units. Clean, inspect, and lubricate the chucks between each use. Use wedges and housing that are compatible and made for the specific type and size of prestressing strand used. Ensure proper fit and proper seating of wedges on the strands.

The Engineer will allow one splice per strand subject to the following:

1. Splices are located outside the concrete products (except for precast piling where up to two splices are permitted to be used in each pile, so long as they are not located in the same vertical cross section, perpendicular to longitudinal axis of the pile).
2. Strands which are being spliced have the "lay" or "twist" in the same direction.

SUBARTICLE 450-4.2.1 is deleted and the following substituted:

450-4.2.1 General: Identify all reinforcing steel, welded wire reinforcement and prestressing strand for pretensioning by LOTs. A LOT of reinforcing steel or welded wire is a shipment of material from the same manufacturer and heat. A LOT of prestressing steel is a shipment of material of the same size, production grade and heat from the same manufacturer. A LOT of FRP reinforcing bars or prestressing strands is a shipment of material of the same size, fiber lot and resin batch from the same manufacturer.

Acceptance of reinforcing bars, welded wire reinforcement and prestressing steel for pretensioning is based on manufacturer's certification and the Department's verification tests. The sampling for verification testing will be performed by the Department at each plant, on at least one LOT every six months. Additional samples may be taken at the manufacturing source of reinforcing bars, welded wire reinforcement and prestressing strands.

When products contain the material that has failed to meet the requirements of 450-3, reject the unused material of the failed LOT. The Engineer may

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require an engineering analysis of the products which contain the failed material, in accordance with Section 6.

SUBARTICLE 450-7.1 is deleted and the following substituted:

450-7 Protection and Placement of Prestressing Strand.

450-7.1 Protection of Prestressing Strand: Maintain and store prestressing steel above the ground surface on platforms, skids, or other supports, to prevent contamination from below, and protect them from mechanical injury. Do not use any packaging or wrapping material that retains moisture at the bottom of the reel. Clean contaminated prestressing strand before use or otherwise reject it. Handle prestressing strand carefully to prevent nicks or kinks. Do not expose prestressing strand to temperatures greater than 165°F at any time prior to concrete placement. Do not expose CFRP prestressing strand coupler assemblies to temperatures greater than 120°F at any time. Do not use arc welding equipment, including welding electrode lines, within 2 feet of prestressing strand. Do not perform welding on forms that have been set in place after the prestressing strand is placed in the bed. Reject prestressing strand that has sustained any physical damage at any time.

SUBARTICLE 450-8.2.4 is deleted and the following substituted:

450-8.2.4 Draped Strand Tensioning: Tension draped strands by either partial tensioning and subsequent strains or by final tensioning in draped position.

Partial stressing and subsequent strains applies when the strands are tensioned through a combination of applied jack loads and strand uplift. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Apply an initial force of 5% to 25% of the final force to eliminate slack in the system. After application of the initial force, establish reference marks for measuring elongation. Apply a pre-calculated jacking force and measure elongations on a minimum of four strands. The average measured elongation must agree within 5% of the theoretical elongation for strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. Allow the load indicated by the jacking system to control the tensioning for the pre-calculated load. Obtain the required final force by lifting or depressing the strand simultaneously at all pickup or hold down points or in an approved sequence as shown on the shop drawings. On each different bed setup, after lifting or depressing the strands to their final position, check the final force at the dead end of at least two strands on the bed. If the load is below the required tensioning force by more than 5%, adjust it to the final load.

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When the final stressing is performed in the draped position, apply the tensioning load in two increments with the strands being held in their draped positions. To verify the final force, place a load cell between the tensioning anchorage and anchor chucks at the dead end on at least two draped strands. Other methods as approved by the Engineer may be used to verify the final force in the dead end. Bring each strand to an initial tension of 5% to 25% of the final load before the application of the required final load. After application of the initial load, establish reference marks for measuring elongation. Then tension the strands to final load and measure the elongation. Allow the load indicated by the jacking system to control the tensioning for the initial and final loads. The measured elongation must agree within 5% of the theoretical elongation for the strand force measured by jack load, or the factors contributing to the difference must be identified and corrected before proceeding. When the jacking is performed at one end of the bed, check the applied load on two draped strands at the other end of the bed. If the load on the end opposite the jacking end is below the required value by more than 5%, adjust the load to the required final load.

SUBARTICLE 450-8.2.6 is deleted and the following substituted:

450-8.2.6 Position of Prestressing Strand: Position prestressing strand as shown in the Plans within the tolerances allowed in 450-2.3. Fix the required vertical and horizontal position of each prestressing strand at the ends of each product and at intervals within each product not exceeding 30 feet. Use the method of fixing the prestressing strand shown in the Producer QC Plan. When blocks are to be used for supporting prestressing strand, use those cast from concrete of the same concrete class or higher as used in the prestressed product. When the product's mix design requires a highly reactive pozzolan, use blocks cast from concrete of the same mix design. Stagger the location of blocks with an offset of 12 inches or greater and do not stack them.

SUBARTICLE 450-11.1 is deleted and the following substituted:

450-11 Detensioning.

450-11.1 General: The required concrete strength at which the prestressing force may be transferred to the concrete in a product will be a minimum of 4,000 psi, unless specified otherwise in the Plans. Verify the release strength by compressive strength cylinder tests or other approved means, no later than 24 hours after casting and every 24 hours thereafter until release strength is developed.

In lieu of every 24 hour testing, estimate the strength development of concrete using the maturity method in accordance with ASTM C1074, the pulse velocity method in accordance with ASTM C597, or any other nondestructive test method acceptable to the Engineer, until the time of the detensioning.

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Before detensioning, verify the concrete release strength by testing the compressive strength test cylinders. Make a minimum of two compressive strength release test cylinders daily for each individual mix or for each LOT, or fraction thereof, of a given concrete mix design where the daily consumption exceeds this volume or when non-continuous batching or dissimilar curing is used. The release strength test, representing the LOT, is the average compressive strength of two test cylinders, cured under conditions similar to the product or match-cured test specimens, which are match cured until the time of release.

For products cured using accelerated curing, release the prestressing force immediately after terminating the accelerated curing process. After the detensioning operation is completed, continue to 72 hour curing period using one of the methods listed in 450-10.6. For products cured using methods other than accelerated curing, release the prestressing force within a detensioning time limit, not to exceed five calendar days after the verification of release strength by compressive strength cylinder test or other approved strength gain monitoring system.

For all products in a casting line, use the same test method for determining their release strengths. Ensure the detensioning time limit is included in the Producer QC Plan. Cure concrete cylinders used for detensioning strength tests in the same manner and location as the prestressed concrete products they represent.

For I-Beams, when side forms are loosened upon setting of concrete or removed before the 72 hour curing period is complete, the top flange dormant strands may be released after the concrete reaches a compressive strength of 2,000 psi.

Production personnel will perform detensioning operations under the supervision of a QC Inspector/Technician in accordance with Section 105 for prestressed plant quality control personnel, or certified personnel may perform detensioning operations directly.

SUBARTICLE 450-12.3.1.2 is deleted and the following substituted:

450-12.3.1.2 Spall: A spall is a depression resulting when a fragment is detached from a larger mass by impact, action of weather, by pressure or by expansion within the larger mass.

A cosmetic spall is a circular or oval depression not greater than 1.0 inch in depth nor greater than 3.0 square inches in area, and must be repaired in accordance with 450-13.2.

With the exception of spalls in the bearing areas and edges of the top flange, a minor spall is defined as a spall not larger than 2.0 square feet and no deeper than one inch plus the sum of the concrete cover and the diameter of the bar in the first layer of reinforcing. Repair minor spalls in accordance with 450-13.4.

Repair cosmetic and minor spalls as described above, except for spalls with visually exposed reinforcing steel, prestressing strand, inserts, or weldment surfaces, which require repair in accordance with 450-13.5.

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Spalls located at the edges of the top flange are considered minor spalls as follows:

1. A spall on one edge of the top flange, without a coincident spall on the other edge of the top flange, is considered a minor spall if the total longitudinal length of the defect does not exceed 10 feet and any lateral dimensions of the spall measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

2. Coincident spalls on opposite edges of the top flange are considered minor spalls if the total length of the defects within both spalls does not exceed 10 feet and any lateral dimensions of the spalls at a given location measured perpendicular to the longitudinal axis of the beam are not greater than 25% of the width of the top flange.

Spalls are considered major when they are located in the extended bearing area of the beams as defined in 450-12.3.5, or if any depression exceeds the dimensions that are described for minor spalls.

SUBARTICLE 450-12.3.1.3 is deleted and the following substituted:

450-12.3.1.3 Chip: A chip is the local breaking of the corners or edges of the concrete with the resulting void containing angular surfaces. Repair chips in accordance with 450-12.3.1.2.

SUBARTICLE 450-13.1 is deleted and the following substituted:

450-13 Repair Methods and Materials.

450-13.1 General: Before beginning the repairs of bug holes, spalls, chips, surface porosity, and honeycomb, remove all laitance, loose material, form oil, curing compound and any other deleterious matter from the repair area. Repair cosmetic or minor deficiencies by methods specified herein. Submit alternative repair methods as needed.

For each project, maintain the record of deficiencies and their repair methods. Ensure the record includes information about product description, unit serial number, date cast, defect description including dimensions, repair method and materials, defect discovery date, and signature of producer's QC Manager indicating concurrence with the information.

Use materials for concrete repair that will meet or exceed the strength requirement of the concrete class used. Cure repaired surfaces for the full 72 hour curing time or for the curing time as recommended by the manufacturer of the repair material. Ensure the repaired surfaces have a surface texture, finish and color which matches the appearance of the unaffected surrounding area of the product.

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450-13.1.1 Product Acceptance on the Project: Use only materials listed on the Approved Product List (APL), in accordance with the following Sections:

- Epoxy Compounds (Type F) Section 926
- Materials for Concrete Repair..... Section 930
- Non-shrink Grout..... Section 934

SUBARTICLE 450-13.6 is deleted and the following substituted:



450-13.6 Removal and Restoration of Unsound Concrete: Carefully cut the area of unsound concrete to be repaired back perpendicular to (or slightly undercut from) the surface and to the depth of sound concrete or to a minimum depth of 1 inch, whichever is deeper. When reinforcement is exposed, remove the concrete from around the items to provide a 1-inch clearance all around. When less than one-half the reinforcement diameter is exposed, a positive connection utilizing anchor screws may be proposed in lieu of 1-inch clearance all around. Do not damage the reinforcement. Coat the prepared surface with an approved epoxy bonding compound applied in accordance with the manufacturer's recommendations. Fill the area to be repaired with an approved non-shrink grout, concrete repair material, or epoxy mortar. Mix, apply, and cure in accordance with the manufacturer's recommendations. Firmly consolidate the material in the area to be repaired. Restore surfaces and edges to the original dimensions and shape of the product.

