



STANDARD CONSTRUCTION SPECIFICATIONS

532 – PRESTRESSED CONCRETE CONSTRUCTION

1 GENERAL

- 1.1 These Prestressed Concrete Construction Specifications are adopted by Railroad and are supplemental and complimentary to the requirements of the Contract issued by Railroad to Contractor for the purpose of performing construction and maintenance of Railroad's Structure(s) as specified in the Scope of Work and the Contract Documents. They apply to Contractor, its employees, agents, invitees and subcontractors.
- 1.2 Prestressed Concrete construction shall consist of commercially available prestressed or post tensioned Portland cement concrete components formed, reinforced, prestressed or post-tensioned, placed and maintained in accordance with these Specifications, the requirements of Part 1 – Materials, Tests and Construction Requirements, Part 2 – Reinforced Concrete Design, and Part 17 – Prestressed Concrete of Chapter 8 – Concrete Structures and Foundations of the American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering (Manual), and the details shown on the Plans.
- 1.3 Non-prestressed units that are locally precast for use in a structure shall be formed, reinforced and cast in accordance with the requirements of Standard Specification 531 – Cast in Place Concrete Construction. Placement of these units shall be in accordance with this specification.
- 1.4 Contractor is responsible for performing all prestressed concrete construction operations in compliance with local, state, and federal laws, Railroad safety and operating rules, and Federal Railroad Administration regulations pertaining to workplace safety.
- 1.5 With regard to the Work, Contractor is encouraged to provide value engineering that considers best practices. Any proposed changes to the work shall be prepared with sufficient detail and cost analysis that Engineer can make an informed decision on Contractor's proposed change.
- 1.6 Concrete components are numbered in the direction of increasing mileposts and from left to right when facing the direction of increasing mileposts.

2 MATERIALS

- 2.1 Portland cement concrete shall be of a mix design conforming to the requirements of Standard Specification 530 – Portland Cement Concrete General and the requirements of Part 1 – Materials, Tests and Construction of Chapter 8 – Concrete Structures and Foundations of the AREMA Manual as approved by Engineer.
- 2.2 Unless otherwise specified in the plans, the minimum compressive strength at 28 days for prestressed and post-tensioned concrete shall be at least 5,000 psi.
- 2.3 Unless otherwise specified in the Plans, reinforcing steel shall be deformed Billet Steel Bars in accordance with the requirements of ASTM A615 Grade 60, Deformed Steel Wire not smaller than size W4 in accordance with the requirements of ASTM A496 or Uncoated Seven-Wire Steel Strand in accordance with the requirements of ASTM A416.
 - 2.3.1 Reinforcement, except prestressing tendons, with rust, mill scale, or a combination of both, shall be considered as satisfactory, provided the minimum dimensions, including height of deformations, and weight of a hand wire-brushed test specimen do not exceed the applicable ASTM requirements.
 - 2.3.2 Prestressing tendons shall be clean and free of oil, excessive soaps, dirt, scale, pitting and excessive rust. A light coating of rust without pitting shall be permitted.
- 2.4 All grout for post-tensioning tendons shall comply with the provisions of the current PTI GUIDE SPECIFICATION "SPECIFICATION FOR GROUTING OF POST-TENSIONED STRUCTURES"



532 – PRESTRESSED CONCRETE CONSTRUCTION

prepared by the Post-Tensioning Institute Committee on Grouting Specifications and published by the Post-Tensioning Institute.

- 2.5 Rigid ducts shall have sufficient strength to maintain their correct alignment without visible wobble during placement of concrete. Rigid ducts may be fabricated with either welded or interlocked seams. Galvanizing of the welded seam will not be required.
- 2.6 Contractor is solely responsible for delivering all material to the project site.
- 2.7 All material shall be stored and handled to avoid damage or unnecessary disfiguring.
 - 2.7.1 Material shall be stored properly above the ground upon platforms, skids, or other supports. It shall be kept free from dirt, grease and other foreign matter, and shall be protected as far as practicable from corrosion.
 - 2.7.2 Materials stored at the site shall be kept in a neat manner at proper clearance to operated tracks.
 - 2.7.3 Hardware received at the job site shall be protected from corrosion by storing under cover or by a protective coating.
 - 2.7.4 Care shall be exercised to prevent fires in material held in storage. The ground underneath and in the vicinity of stored material should be kept clear of all weeds, rubbish and combustible material.
- 2.8 Contractor shall be responsible for ensuring that all material meets the requirements as identified in the applicable paragraphs of the Contract Documents.
- 2.9 All materials of any kind rejected by the Engineer shall be immediately removed from the site and any work affected by the defective material shall be remedied by the Contractor at his own expense and to the satisfaction of the Engineer.
- 2.10 Final acceptance of the material shall be based upon satisfactory performance in the field.

3 SUBMITTALS

- 3.1 If not already identified during the bidding process, Contractor shall submit his proposed prestressed concrete manufacturer to Engineer for approval.
- 3.2 Prior to the start of work, Contractor shall submit a complete set of shop drawings for prestressed concrete components for review by Engineer. This shall be submitted at least fourteen (14) days prior to start of the scheduled production and shall include the following requirements:
 - 3.2.1 Concrete mix design meeting the requirements of Standard Specification 530 – Portland Cement Concrete General that is tailored to the intended service environment such as cold climate or exposure to salt water.
 - 3.2.2 Spacing of tendons, ducts and minimum concrete cover to meet the requirements of Section 17.5 – Details of Prestressing Tendons and Ducts of Chapter 8 – Concrete Structures and Foundations of the AREMA Manual
 - 3.2.3 Unless otherwise specified in the Plans the location of the center of gravity of the prestressing steel shall be not more than +/- 3/16 inch from that shown in the plans.
 - 3.2.4 The planned pretension force not to exceed 175,000 psi and the method of achieving uniform pretension force.
 - 3.2.5 The method of transferring the pretensioning force to the concrete in a smooth and gradual manner but not before the concrete has reached a strength of 4,000 psi.
 - 3.2.6 The method of handling members and removal from the casting bed but not before the concrete has reached a strength of 4,500 psi.



532 – PRESTRESSED CONCRETE CONSTRUCTION

- 3.3 Prior to the start of work Contractor shall submit a prestressed concrete construction plan for approval by Engineer. This plan shall provide detailed information on Contractor's proposed means and methods and shall include the following minimum information:
- 3.3.1 Contractor's proposed means and methods.
 - 3.3.2 Contractor's proposed rigging plan with lifting weights.
 - 3.3.3 Name and experience of personnel in responsible charge of the prestressed concrete construction.
 - 3.3.4 Roster of proposed equipment.
 - 3.3.5 Means of access for the personnel, equipment and material to the work location.
 - 3.3.6 Method of placement and securing of prestressed components.
 - 3.3.7 Procedures for accommodating existing utilities on the project site.
- 3.4 Prior to the start of work Contractor shall submit a post-tensioning concrete construction plan for approval by Engineer. This plan shall provide detailed information on Contractor's proposed means and methods and shall include the following minimum information:
- 3.4.1 Contractor's proposed means and methods.
 - 3.4.2 Contractor's proposed rigging plan with lifting weights.
 - 3.4.3 Name and experience of personnel in responsible charge of the post-tensioned concrete construction.
 - 3.4.4 Roster of proposed equipment.
 - 3.4.5 Means of access for the personnel, equipment and material to the work location.
 - 3.4.6 Method of placement and securing of post-tensioned components.
 - 3.4.7 The planned post-tensioned method and force not to exceed 175,000 psi and the method of achieving uniform post-tension force.
 - 3.4.8 The method of grouting the post-tensioning tendons and means of achieving uniform grout density within the ducts.
 - 3.4.9 Procedures for accommodating existing utilities on the project site.
- 3.5 Where falsework supports the structure during construction, Contractor shall submit to Engineer for approval the applicable designs and calculations.
- 3.6 Prior to the start of work, Contractor shall submit to Engineer mill affidavits and certifications, chemical and physical test reports for all concrete and reinforcing materials.
- 3.7 Upon completion of the Work, Contractor shall submit to Engineer a complete and accurate record of the work performed.

4 EXECUTION

- 4.1 Workmanship shall be of the best quality performed by competent railroad bridge construction workers. All component placing shall be true and exact.
- 4.2 The work of fabrication of the prestressed components must meet the requirements of Part 17 – Prestressed Concrete of Chapter 8 – Concrete Structures and Foundations of the AREMA Manual.
- 4.3 The Work of construction must be planned and performed by the Contractor in such a manner as to continually maintain the structure in a condition that it is safe for 10 MPH train traffic at the end of each work window.



532 – PRESTRESSED CONCRETE CONSTRUCTION

- 4.4 Contractor shall be responsible for the design of all shoring, falsework and centering required to complete the Work.
 - 4.4.1 Where the falsework supports the structure during construction such forms and falsework shall be designed by a licensed engineer.
 - 4.4.2 Falsework shall allow for and correct anticipated settlements so that the finished members conform to the desired line and grade.
- 4.5 All precast members shall be hauled, stored, and shipped in a manner to avoid chipping, cracking, fractures, and excessive bending stresses. These members shall be supported on firm blocking with foundations suitable to prevent differential settlement or twisting of the units.
 - 4.5.1 Transportation of members shall not be undertaken until the full 28 day concrete strength has been achieved, or by order of Engineer.
 - 4.5.2 Members shall be handled such that the points of support and directions of the reactions with respect to the unit are approximately the same during transportation and storage as when the member is in its final position. Members damaged by improper storage or handling shall be replaced or repaired to the satisfaction of Engineer by the Fabricator at his expense.
 - 4.5.3 The ends of precast members shall not be permitted to extend a distance exceeding the depth of the member beyond any point of bearing during hauling or stockpiling.
 - 4.5.4 Precast members shall be handled with a suitable hoisting device or crane provided with a spreader sling of sufficient length to prevent horizontal forces in the member due to lifting.
 - 4.5.5 Precast, prestressed members shall be maintained in upright position at all times and shall be supported only at the ends or points of bearing. During lifting, they shall be supported only by the lifting devices provided for that purpose.
 - 4.5.6 Storing of precast, prestressed members shall be done with adequate blocking so that warpage or cracking will not occur.
 - 4.5.7 Precast, prestressed members, when stacked, shall be separated by blocking capable of supporting the members in a level position without twisting. The blocking shall be arranged in vertical planes. Stacking of precast prestressed members shall be arranged such that lifting devices will be accessible and undamaged.
 - 4.5.8 Before moving a long member, Contractor shall check it for any tendency to buckle. Each girder that may buckle shall be braced on the sides to prevent buckling. This bracing shall be attached securely to the top flanges of the girder. The lateral bracing shall be in place during all lifting or handling necessary for transportation from the fabricating plant to the job site and erection of the girder.
- 4.6 Bearing areas on concrete caps and beams or girders which are to receive epoxy materials shall be abrasive blast cleaned to remove all form oil and curing agents and shall be left in a dust free condition.
- 4.7 In erecting members, care shall be taken to keep bridge seats and tops of bearing devices free of foreign materials. Any shifting of beams shall be done while they are held free of the foundation.
- 4.8 Contractor will be required to shift or interchange members to achieve a better fit when directed by Engineer. As the members are placed in their final position, and prior to securing anchor bolts, rods, or diaphragms, the members shall be brought to full and even bearing on the bearings.
- 4.9 Precast members shall be set in the proper location using care not to damage concrete members. After members are set, Contractor shall burn off lifting loops flush with the concrete surface. The



532 – PRESTRESSED CONCRETE CONSTRUCTION

remaining portion of lifting loops are to be coated with paint. Patch recesses, if necessary, around lifting loops with epoxy mortar.

- 4.10 Bearings shall be set level in exact position and shall have full and even bearing upon the bridge seat areas.
- 4.11 Anchor bolts and anchor rods shall be installed as shown on the Plans.
- 4.12 Upon completion of the work, all surplus material or material salvaged from an existing structure shall be delivered to and be neatly stacked in a location designated by the Engineer. Material not salvageable and other refuse shall be properly disposed of. The premises shall be left in a clean, neat and orderly condition.
 - 4.12.1 In no case shall any materials be left within 200 feet of the bridge, upstream of the bridge or within 15 feet of track centerline.

5 MEASUREMENT AND PAYMENT

- 5.1 Measurement:
 - 5.1.1 Prestressed concrete construction shall be measured for payment on the basis of individual components constructed and accepted into the finished structure up to the estimated quantity given in the Proposal.
 - 5.1.2 Concrete, reinforcing and other material disposal is considered incidental to prestressed concrete construction and shall not be measured for payment.
- 5.2 Payment
 - 5.2.1 Prestressed concrete construction shall be paid for at the contract unit price for the prestressed concrete bid items and shall constitute full payment for all labor, equipment, materials and supervision necessary to construct the concrete elements in accordance with the Plans and Specifications.

END OF SECTION

REVISION HISTORY

The following is the revision history for this standard:

5/1/2013 – Initial Issue