

**DEPARTMENT OF TRANSPORTATION
STATE OF GEORGIA**

SUPPLEMENTAL SPECIFICATION

Section 509—Prestressing Concrete by Post Tensioning

Delete Subsection 509.1 and substitute the following:

509.1 General Description

This work consists of prestressing concrete by post-tensioning cast-in-place concrete. The work includes furnishing, placing, and tensioning prestressing steel according to the Plan details and these Specifications.

509.1.01 Definitions

Working Force and Working Stress: The force and stress remaining in the prestressing steel after the following losses:

- Creep and shrinkage of concrete
- Elastic compression of concrete
- Creep of steel
- Loss in post-tensioned prestressing steel from the sequence of stressing
- Friction and anchor set (see [Subsection 509.3.05.J](#), “Post-Tension the Tendons,” steps 18 to 19)
- Other losses peculiar to the method, technique, or system of prestressing (see [Subsection 509.3.05.J](#), “Post-Tension the Tendons,” step 21)

509.1.02 Related References

A. Standard Specifications

[Section 501—Steel Structures](#)

[Section 535—Painting Structures](#)

B. Referenced Documents

AASHTO Specifications for Highway Bridge, Article 9.16.1

AASHTO Specifications for Highway Bridge, Article 9.16.2

ASTM C 109

ASTM A 416

ASTM A 722

ASTM C 939

509.1.03 Submittals

A. Coupler Use and Location

The use and location of couplers in bars entering into the prestressing work is subject to the Engineer’s approval.

B. Alternate Stressing or Anchorage Block Drawings and Calculations

When using stressing or anchorage blocks not shown on the Plans, submit shop drawings and calculations for the blocks to Bridge and Structural Design when submitting the prestressing system calculations and shop drawings.

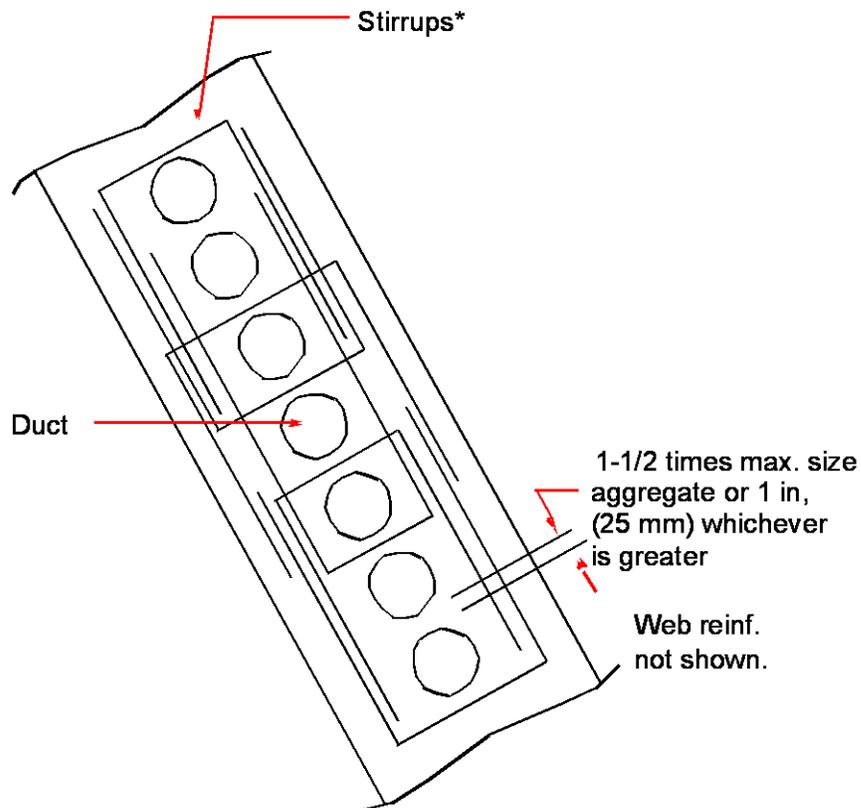
C. Design Calculations

Submit design calculations for the proposed post-tensioning system to Bridge and Structural Design for Department review and approval. Design calculations may be on letter size sheets.

Submit calculations for the size and spacing of the reinforcing around the ducts, as shown in [Figure 1 \(metric\)](#), to Bridge and Structural Design. Include the following in the calculations:

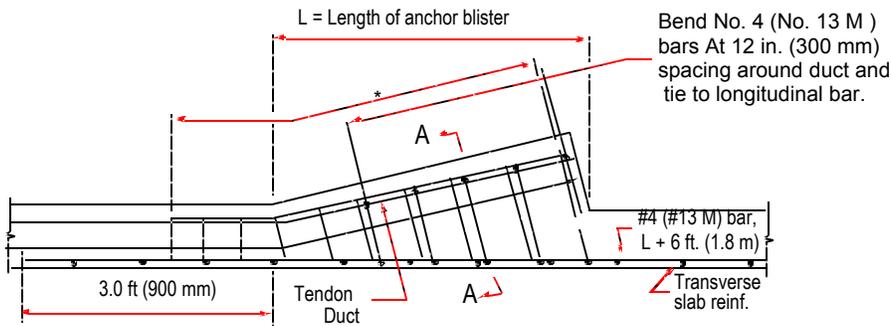
- Required jacking force and elongation of tendons during tensioning
Using the initial jacking force, design the reinforcing to prevent ducts from pulling out because of the effects of web curvature and slope.
- Stresses in anchorages and distribution plates
Ensure that the calculations account for reinforcing to prevent the peeling of anchorages from the top and bottom slab. See Figure 2 for minimum reinforcing requirements for tying ducts to the deck reinforcing.
- Stress-strain curves typical of the prestressing steel to be furnished
- Seating losses
- Temporary overstresses
- Reinforcing in the concrete to resist tensioning loads

Determine bearing offsets and expansion joint gaps and adjust for construction sequence, prestress shortening, and temperature.



- *A stirrup group is one pair of overlapping "U" shaped bars.
- Stirrups shall enclose vertical web reinforcement.
 - No more than 3 ducts shall be enclosed by a stirrup group.
 - Min. bar size: No. 4 (No. 13 M) bar.
 - Max. longitudinal bar spacing: 24 in. (600 mm)

Figure 1



* All necessary reinforcing may not be shown.

** Bend #4 (#13) bars as closely as possible to radius of duct. Tie duct to bars.

NOTE: #4 (13 M) longitudinal bars and #4 (#13 M) bars around duct are not included in reinforcing bar schedule. Include cost of bars in cost of the reinforcing steel.

NOTE: Top slab blister similar. See plans for additional details.

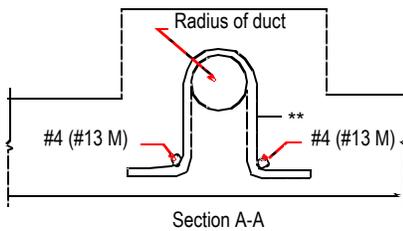


Figure 2

D. Certificates of Compliance

The Department will accept certificates of compliance for cements to be used. The Department reserves the right, however, to sample and test the cement before its use and at any time during the progress of the work.

E. Certified Mill Test Reports

Submit certified mill test reports for high tensile prestressing steel to the Project Engineer.

F. Shop Drawings

Submit Shop Drawings for review and approval according to [Subsection 501.1.03.B](#), "Shop Drawings." Place a title block in the lower right-hand corner of the drawings that includes the following:

- Project number
- Sheet numbering for the Shop Drawings
- Structure name
- Contractor and fabricator names

Submit Shop Drawings on 23 in by 36 in (575 mm by 900 mm) sheets with a 1-1/2 in (38 mm) left margin and a 1/2 in (13 mm) top, bottom, and right margins.

The Shop Drawings shall include the following:

1. Fully dimensional views showing all projections, recesses, notches, openings, blockouts, and pertinent design details

2. Details of mild steel reinforcing showing size, spacing, and location, including special reinforcing required as determined by the design calculations but not shown on the Plans
3. Details of ducts for post-tensioning tendons showing size, type, and horizontal and vertical profiles
4. Details of duct supports, grout tubes, and vents showing size, type, and location
5. Details of the relative positions of reinforcing steel, ducts, and anchorages
6. Details of the anchorage systems for the proposed post-tensioning system
7. A table giving jacking sequence, jacking forces, and initial elongation of the tendons at each erection stage for post-tensioning
8. Details and a complete description of the post-tensioning system to be used for permanent tendons
9. Details of the prestressing, including:
 - Method, sequence, and procedure for prestressing and securing tendons
 - Procedure for releasing tendons
 - Equipment supplier and type
 - Tendon size and properties
 - Anchorage plates and assemblies
10. Information on grouting, including:
 - Grout mix design
 - Method of mixing and placing the grout
 - Type and capacity of grouting equipment
11. Working drawings and bar schedules for each prestressing system
12. Details of reinforcing or coil ties under anchorage plates
13. Details for usage of high-strength steel bar (furnished by the bar manufacturer)
14. Friction factors used in the prestressing system of deformed bars

As an option, shop drawings may be submitted on plan sheet sizes of 12" x 18" (305 mm x 457 mm) or 11" x 17" (279 mm x 432 mm) for review and approval. Information contained on these sheets must be legible.

After shop drawings have been approved, submit an electronic file that is compatible with Bentley Microstation J (Version 7) Cadd operating system, or an electronic file in Adobe Acrobat Portable Document Format (.pdf) to the Engineer. For bridges carrying railroads only, after shop drawings have been approved, submit one full size set of reproducible drawings to the Department.

G. Ram Calibration Charts

Before using rams in the work, furnish the Engineer with a certified chart from the calibration for each ram.

H. Designs and Details of Distribution Reinforcing Steel

The Department plans for anchorages show only a minimum amount of distribution reinforcing steel.

Design and detail the reinforcement needed to prevent bursting, peeling, and splitting. Submit the designs and details to the Engineer for review and approval.

I. Gauge Readings and Elongations

Keep a record of gauge pressures or readings and elongations at the end of each jacking operation and submit it to the Engineer for review and approval.