



AASHTO LRFD Bridge Design Specifications: Benefits of a Reorganized Article on Prestressing


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The first edition of American Association of State Highway and Transportation Officials’ (AASHTO’s) *AASHTO LRFD Bridge Design Specifications* were published in 1994. As is generally the case with standards and specifications, the AASHTO LRFD specifications then went through an “organic growth” period for about a quarter century before they were reorganized to address growing concerns expressed by various states about the logical flow of information. This type of evolution is to be expected because the knowledge creation, accumulation, vetting, and acceptance process is highly nonlinear. The article by R. Kent Montgomery, Shri Bhide, and Gregg Freeby published in the Winter 2017 issue of *ASPIRE*[®] discusses the reorganization of Section 5 in the 8th edition of the AASHTO LRFD specifications. This article focuses on the topic of prestressing and the reorganization of Article 5.9.

Article 5.9 covers the design of prestressed concrete elements. In this sense, the focus of Article 5.9 did not change from the 7th to the 8th edition of the AASHTO LRFD specifications.^{1,2} However, the 8th edition introduces significant differences in the content and organization of this article. Article 5.9 of the 8th edition does a much better job delineating pretensioning and post-tensioning requirements. Detailing requirements from Article 5.10 of the 7th edition of the AASHTO LRFD specifications were moved to logical places in Article 5.9. In this way, these requirements are no longer mixed with those that apply to ordinary reinforcement in Article 5.10. The principal stress check for the webs of flexural elements is now required for all concrete bridge types except for pretensioned concrete beams made with concrete with a design compressive strength less than 10 ksi – this exception was made because past experiences of the states showed that cracking in the webs of such elements has not been an issue.

An overall comparison of Articles 5.9 and 5.10 in the 7th and 8th editions clearly shows that the information flows in a more logical way in the new edition. However, some of these changes will take a little getting used to, especially for experienced designers who are accustomed to looking for certain provisions of the AASHTO LRFD specifications in certain places. Nevertheless, once you use the new specifications a few times, I am confident you will find the new organization intuitive.

References

1. American Association of State Highway and Transportation Officials (AASHTO). 2014. *AASHTO LRFD Bridge Design Specifications*, 7th ed. Washington, DC: AASHTO.
2. AASHTO. 2017. *AASHTO LRFD Bridge Design Specifications*, 8th ed. Washington, DC: AASHTO. 

Article	Title	Description
5.9.1	General Design Considerations	Section properties, crack control requirements, buckling, and harped or draped tendons.
5.9.2	Stress Limitations	Stresses due to imposed deformations, stress limits for prestressing steel, initial and long-term stress limits for concrete in compression or in tension, and principal tensile stress limits for webs.
5.9.3	Prestress Losses	Losses that apply to pretensioned and post-tensioned elements are covered separately. Furthermore, approximate and refined methods for determining time-dependent losses are treated in depth.
5.9.4	Details for Pretensioning	Provisions for detailing, including spacing of pretensioning strands, debonding limits, and anchorage zone detailing.
5.9.5	Details for Post-Tensioning	Provisions for minimum tendon and duct spacing and considerations for horizontally curved tendons, duct supports, tendon or duct couplers, design of anchorage zones, and all other details that are pertinent to post-tensioning technology.

Note: Adapted from C5.9.2.3.3-2 in *AASHTO LRFD Bridge Design Specifications*, 8th ed.