

FHWA

December 7, 1988

Prestressing Strand for Pretensioning
Development Length Revisited

5144

Mr. Maurice Smith, Director
Arkansas State Highway and
Transportation Department
Little Rock, Arkansas

Dear Mr. Smith:

In reference to our July 8, 1988, letter on development lengths our Washington office has received further data which suggests that the previously reported development lengths multipliers may be somewhat over conservative. We have attached a copy of an October 26 Washington office memorandum which indicates that the previously recommended multiplier of 2.5 has been reduced to 1.6 for the AASHTO equation 9-32. Similarly, the previous reported factor of 2.0 has been reduced to 1.3 for the Zia/Mostafa equations. The memorandum also provides guidance for the application to blanketed strands, Precast deck panels, and piling. These design criteria should be considered interim and should be applied to all federal-aid projects until further notice.

Sincerely yours,

R. G. Fairbrother
Division Administrator

Enclosure

FHWA MEMORANDUM

Prestressing Strand for Pretension
Applications - Development Length
Revisited

October 26, 1988

In our memorandum dated June 20, 1988, pertinent to the captioned subject, interim criteria for the determination of development length of prestressing strand was presented as 2.5 times AASHTO equation 9-32, as shown in the Standard Specifications for Highway Bridges.

At a meeting between representatives of the National Concrete Bridge Council and FHWA on September 15, 1988, the FHWA agreed to re-evaluate and consider a less conservative coefficient to be determined on the basis of new data to be submitted. Subsequently, data was provided to FHWA by the Prestressed Concrete Institute (PCI) in a letter dated September 28, 1988.

After evaluation of the data presented, FHWA discussed the proposed modification with the joint AASHTO Technical Committee for Prestressed Concrete and PCI Bridge Committee at meetings in Philadelphia on October 11, 1988. The Portland Cement Association in a letter dated October 13, 1988, provided FHWA with a copy of a Purdue University research report to substantiate a modification suggested at the October 11 meeting.

As a result of the above evaluations and discussions, the criteria for strand development length in pretensioned applications is revised as follows:

- (1) The use of 0.6 inch diameter strand in a pretensioned application shall not be allowed;
- (2) Minimum strand spacing (center-to-center of strand) will be four times the nominal strand diameter;
- (3) Development length for all strand sizes up to and including 9/16 inch special strand shall be determined as 1.6 times AASHTO equation 9-32; and,
- (4) Where strand is debonded (blanketed) at the end of a member, and tension at service load is allowed in the precompressed tensile zone, the development length shall be determined as 2.0 times AASHTO equation 9-32, as currently required by AASHTO article 9.27.3.

Exceptions to the above criteria are as follows:

1. Development length for prestressed piling subjected to flexural loading shall be determined as indicated above. Development length for embedded piling not subjected to flexural loading shall be determined as per AASHTO equation 9-32, and the use of 0.6 inch strand will be allowed.

2. Development length for pretensioned Precast sub-deck panels or Precast pretensioned voided deck plank, shall be determined as outlined above, or alternatively, by utilizing AASHTO equation 9-32 for development length and designing and tensioning on the basis of a guaranteed ultimate tensile strength (GUTS) of 250 ksi and release of prestress at 70 percent of GUTS regardless of the type of strand used (i.e., 250 or 270 ksi strand).

Research underway by Texas, Florida, PCI, and others may indicate further revisions to this criteria will become appropriate. Therefore, the above criteria and exceptions are an interim measure, until such time as the research indicates otherwise and AASHTO adopts the results.

This supercedes our memorandum of June 20, 1988.

Stanley Gordon