Standard Specifications

for Road, Bridge, and Municipal Construction

2018

M 41-10

Washington State Department of Transportation

AMERICAN PUBLIC WORKS ASSOCIATION
APWA
Washington State Chapter

6-02 Concrete Structures

6-02.1 Description

This Work consists of the construction of all Structures (and their parts) made of portland cement concrete with or without reinforcement, including bridge approach slabs. Any part of a Structure to be made of other materials shall be built as these Specifications require elsewhere.

6-02.2 Materials

Materials shall meet the requirements of the following sections:

Portland Cement	9-01
Aggregates for Portland Cement Concrete	9-03.1
Gravel Backfill	9-03.12
Joint and Crack Sealing Materials	9-04
Reinforcing Steel	9-07
Epoxy-Coated Reinforcing Steel	9-07
Pigmented Sealer Materials for Coating of Concrete Surface	9-08.3
Grout	9-20.3
Mortar	9-20.4
Curing Materials and Admixtures	9-23
Fly Ash	9-23.9
Ground Granulated Blast Furnace Slag	9-23.10
Microsilica Fume	9-23.11
Metakaolin	9-23.12
Plastic Waterstop	9-24
Water	9-25
Fabricated Bridge Bearing Assemblies	9-31

6-02.3 Construction Requirements

6-02.3(1) Classification of Structural Concrete

The class of concrete to be used shall be as noted in the Plans and these Specifications. The class includes the specified minimum compressive strength in psi at 28 days (numerical class) and may include a letter suffix to denote structural concrete for a specific use. Letter suffixes include A for bridge approach slabs, D for bridge decks, P for piling and shafts, and W for underwater. The numerical class without a letter suffix denotes structural concrete for general purposes.

Concrete of a numerical class greater than 4000 shall conform to the requirements specified for either Class 4000 (if general-purpose) or for the appropriate Class 4000 with a letter suffix, as follows:

1. Mix design and proportioning specified in Sections 6-02.3(2), 6-02.3(2)A and 6-02.3(2)A1.
2. Consistency requirements specified in Section 6-02.3(4)C.
3. Temperature and time for placement requirements specified in Section 6-02.3(4)D.
4. Curing requirements specified in Section 6-02.3(11).

The Contractor may request, in writing, permission to use a different class of concrete with either the same or a higher compressive strength than specified. The substitute concrete shall be evaluated for acceptance based on the specified class of concrete. The Engineer will respond in writing. The Contractor shall bear any added costs that result from the change.

6-02.3(2) Proportioning Materials

The soluble chloride ion content shall be determined by the concrete supplier and included with the mix design. The soluble chloride ion content shall be determined by (1) testing mixed concrete cured at least 28 days or (2) totaled from tests of individual concrete ingredients (cement, aggregate, admixtures, water, fly ash, ground granulated blast furnace slag, and other supplementary cementing materials). Chloride ion limits for admixtures and water are provided in Sections 9-23 and 9-25. Soluble chloride ion limits for mixed concrete

After reinforcing steel bars are placed in a traffic or pedestrian barrier and prior to slip-form concrete placement, the Contractor shall check clearances and reinforcing steel bar placement. This check shall be accomplished by using a template or by operating the slip-form machine over the entire length of the traffic or pedestrian barrier. All clearance and reinforcing steel bar placement deficiencies shall be corrected by the Contractor before slip-form concrete placement.

Mortar blocks (or other accepted devices) shall be used to maintain the concrete coverage required by the Plans. The Mortar blocks shall:

1. Have a bearing surface measuring not greater than 2 inches in either dimension, and
2. Have a compressive strength equal to that of the concrete in which they are embedded.

In slabs, each mortar cube shall have either: (1) a grooved top that will hold the reinforcing bar in place, or (2) an embedded wire that protrudes and is tied to the reinforcing steel. If this wire is used around epoxy-coated bars, it shall be coated with plastic.

Mortar blocks may be accepted based on a Manufacturer's Certificate of Compliance.

In lieu of mortar blocks, the Contractor may use metal or plastic chair supports to hold uncoated bars. Any surface of a metal chair support that will not be covered by at least ½ inch of concrete shall be one of the following:

1. Hot-dip galvanized after fabrication in keeping with AASHTO M232 Class D;
2. Coated with plastic firmly bonded to the metal. This plastic shall be at least 3/32 inch thick where it touches the form and shall not react chemically with the concrete when tested in the State Materials Laboratory. The plastic shall not shatter or crack at or above -5°F and shall not deform enough to expose the metal at or below 200°F; or
3. Stainless steel that meet the requirements of ASTM A493, Type 302. Stainless steel chair supports are not required to be galvanized or plastic coated.

In lieu of mortar blocks, epoxy-coated reinforcing bars may be supported by one of the following:

1. Metal chair supports coated entirely with a dielectric material such as epoxy or plastic,
2. Other epoxy-coated reinforcing bars, or
3. Plastic chair supports.

Plastic chair supports shall be lightweight, non-porous, and chemically inert in concrete. Plastic chair supports shall have rounded seatings, shall not deform under load during normal temperatures, and shall not shatter or crack under impact loading in cold weather. Plastic chair supports shall be placed at spacings greater than 1 foot along the bar and shall have at least 25 percent of their gross place area perforated to compensate for the difference in the coefficient of thermal expansion between plastic and concrete. The shape and configuration of plastic supports shall permit complete concrete consolidation in and around the support.

In bridge decks, a "mat" is two adjacent and perpendicular layers of reinforcing steel. Top and bottom mats shall be supported adequately enough to hold both in their proper positions. If No. 4 bars make up the lower layer of steel in a mat, it shall be blocked at not more than 3-foot intervals (or 4-foot intervals for bars No. 5 and larger). Wire ties to girder stirrups shall not be considered as blocking. To provide a rigid mat, the Contractor shall add other supports and tie wires to the top mat as needed.

If a bar will interfere with a bridge drain, it shall be bent in the field to bypass the drain.

Clearances for main bars shall be at least:

4 inches between:	Bars and the surface of any concrete masonry exposed to the action of salt or alkaline water.
3 inches between:	Bars and the surface of any concrete deposited against earth without intervening forms.
2½ inches between:	Adjacent bars in a layer. Bridge deck and bridge approach slab bars and the top of the slab.