

1 **Section 7-02, Culverts**

2 **January 3, 2017**

3 **7-02.2 Materials**

4 The following three new items are inserted after the item "Aggregate for Portland Cement
5 Concrete:

6

7	Gravel Backfill for Pipe Zone Bedding	9-03.12(3)
8	Butyl Rubber Sealant	9-04.11
9	External Sealing Band	9-04.12

10

11 The last paragraph is deleted.

12

13 **7-02.3(6) Precast Reinf. Conc. Three Sided Structures, Box Culverts and Split**
14 **Box Culverts**

15 This section is supplemented with the following new paragraph:

16

17 When the Plans include a complete set of design details for a Structure (defining panel
18 shapes and dimensions, concrete strength requirements, and steel reinforcing bar, joint,
19 and connection details), the design and load rating preparation and calculation submittal
20 requirements of Sections 7-02.3(6)A1 and 7-02.3(6)A2 do not apply for the components
21 shown in the Plans, but all other requirements of this Section remain in effect. The
22 Contractor may propose alternate concrete culvert designs, accommodating the same
23 rise, span, and length as shown in the Plans, to replace the Structure details shown in
24 the Plans. If an alternate concrete culvert design is proposed, all of the requirements of
25 this Section, including design and load rating preparation and calculation submittal,
26 apply.

27

28 **7-02.3(6)A General**

29 This section is supplemented with the following two new paragraphs:

30

31 Tolerances for PRCTSS shall be as follows:

32

- 33 1. Internal Dimensions – The internal dimension shall not vary more than 1
34 percent or 2 inches, whichever is less, from the Plan dimensions. The haunch
35 dimensions shall not vary more than $\frac{3}{4}$ inch from the Plan dimensions.
36
- 37 2. Slab and Wall Thickness – The slab and wall thickness shall not be less than
38 that shown in the Plans by more than 5 percent or $\frac{1}{2}$ inch, whichever is
39 greater. A thickness more than that required in the Plans will not be a cause
40 for rejection if proper joining is not affected.
41
- 42 3. Length of Opposite Surfaces – Variations in lengths of two opposite surfaces
43 of the three-sided section shall not be more than $\frac{3}{4}$ inch unless beveled
44 sections are being used to accommodate a curve in the alignment.
45
- 46 4. Reinforcing steel placement shall meet the tolerances specified in Section 6-
47 02.3(24)C.

48

49 Tolerances for PRCBC and PRCSBC shall be as follows:

50

- 1 1. Internal Dimensions – The internal dimensions shall not vary more than 1
2 percent from the Plan dimensions. If haunches are used, the haunch
3 dimensions shall not vary more than $\frac{1}{4}$ inch from the Plan dimensions.
4
- 5 2. Slab and Wall Thickness – The slab and wall thickness shall not be less than
6 that shown in the Plans by more than 5 percent or $\frac{3}{16}$ inch, whichever is
7 greater. A thickness more than that required in the Plans will not be a cause
8 for rejection.
9
- 10 3. Length of Opposite Box Segments – Variations in lengths of two opposite
11 surfaces of the box segments shall not be more than $\frac{1}{8}$ inch per foot of internal
12 span, with a maximum of $\frac{5}{8}$ inch for all sizes through 7 feet internal span, and
13 a maximum of $\frac{3}{4}$ inch for internal spans greater than 7 feet, except where
14 beveled sections are being used to accommodate a curve in the alignment.
15
- 16 4. Length of Box Segments – The underrun in length of a segment shall not be
17 more than $\frac{1}{8}$ inch per foot of length with a maximum of $\frac{1}{2}$ inch in any box
18 segment.
19
- 20 5. Length of Legs and Slabs – The variation in length of the legs shall not be
21 more than $\frac{1}{8}$ inch per foot of the rise of the leg per leg with a maximum of $\frac{5}{8}$
22 inches. The differential length between opposing legs of the same segment
23 shall not be more than $\frac{1}{2}$ inch. Length of independent top slab spans shall not
24 vary by more than $\frac{1}{8}$ inch per foot of span of the top slab, with a maximum of
25 $\frac{5}{8}$ inches.
26
- 27 6. Reinforcing steel placement shall meet the tolerances specified in Section 6-
28 02.3(24)C.
29

30 This section is supplemented with the following new subsection:

31
32 **7-02.3(6)A5 Wingwalls and Retaining Walls**

33 Wingwalls and retaining walls (including cutoff walls and headwalls) shall be
34 constructed in accordance with the Contractor's design and Working Drawing submittal
35 or when the Plans include a complete set of design details for a wall (defining panel
36 shapes and dimensions, concrete strength requirements, and steel reinforcing bar, joint,
37 and connection details), the details shown in the Plans.
38

39 Precast concrete construction shall conform to Sections 6-02.3(28) and 6-11.3(3).
40

41 Culvert bedding material shall be furnished, placed, and compacted in accordance with
42 Section 7-02.3(6)A4.
43

44 **7-02.3(6)A1 Design Criteria**

45 The first sentence of the last paragraph is revised to read:

46
47 Whenever the minimum finished backfill or surfacing depth above the top of the
48 Structure is less than 1'-0" (except when the top of the Structure is directly exposed to
49 vehicular traffic), either all steel reinforcing bars in the span unit shall be epoxy-coated
50 with 2" minimum concrete cover from the face of concrete to the face of the top mat of
51 steel reinforcing bars, or the minimum concrete cover shall be 2 $\frac{1}{2}$ ".
52

1 The last sentence of the last paragraph is revised to read:

2

3 Concrete cover from the face of any concrete surface to the face of any steel
4 reinforcement shall be 1-inch minimum end clearance at all joints, and 2-inches
5 minimum at all other locations.

6

7 **7-02.3(6)A2 Submittals**

8 The first paragraph is revised to read:

9

10 The Contractor shall submit shop drawings of the precast Structures. Fabrication shop
11 drawings replicating complete design details when shown in the Plans shall be Type 2
12 Working Drawings. Submittals completing the design based on the schematic
13 geometric requirements shown in the Plans, or proposing a Contractor designed
14 alternative concrete culvert Structure shall be Type 2E Working Drawings with
15 supporting design calculations.

16

17 The last paragraph is revised to read:

18

19 For precast Structures with a span length greater than 20-feet (as defined in Section 7-
20 02.3(6)A1), except when the depth of fill above the top of culvert exceeds the Structure
21 span length, a Type 2E Working Drawing shall be submitted consisting of a load rating
22 report prepared in accordance with the AASHTO Manual for Bridge Evaluation and
23 WSDOT Bridge Design Manual LRFD M 23-50 Chapter 13. Soil pressures used shall
24 include effects from the backfill material and compaction methods, and shall be in
25 accordance with the WSDOT Geotechnical Design Manual M 46-03 and the
26 geotechnical report prepared for the project.

27

28 **7-02.3(6)A3 Casting**

29 This section is revised to read:

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31 Concrete shall conform to Section 6-02.3(28)B, with a 28-day compressive strength as
32 specified in the Plans or the Working Drawings submittal.

33

34 **7-02.3(6)A4 Excavation and Bedding Preparation**

35 The last paragraph is revised to read:

36

37 The upper layer of bedding course shall be a 6-inch minimum thickness layer of culvert
38 bedding material, defined as granular material either conforming to Section 9-03.12(3)
39 or to AASHTO Grading No. 57 as specified in Section 9-03.1(4)C. The plan limits of the
40 culvert bedding material shall extend 1-foot beyond the plan limits of the culvert or the
41 Structure footing as applicable. The culvert bedding material shall be compacted in
42 accordance with the Section 2-09.3(1)E requirements for gravel backfill for drains. After
43 compaction, the culvert bedding material shall be screeded transversely to the specified
44 line and grade. Voids in the screeded culvert bedding material shall be filled and then
45 rescreeded prior to erecting the precast Structure.

46

47 **7-02.3(6)B3 Erection**

48 The last paragraph is revised to read:

49

50 Adjacent precast sections shall be connected by welding the weld-tie anchors in
51 accordance with Section 6-03.3(25). Welding ground shall be attached directly to the
52 steel plates being welded when welding the weld-ties. The weld-tie anchor spacing shall

1 not exceed 6'-0". After connecting the weld-tie anchors, the Contractor shall paint the
2 exposed metal surfaces with one coat of field primer conforming to Section 9-08.1(2)F.
3 Keyways shall be filled with grout conforming to Section 9-20.3(2).
4

5 **7-02.3(6)C1 Casting**

6 This section is revised to read:
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8 PRCBC shall consist of lid elements and "U" shaped base elements. The vertical legs
9 of the "U" shaped base elements shall be full height matching the rise of the culvert,
10 except as otherwise specified for culvert spans greater than 20-feet. For PRCBC
11 spans greater than 20-feet (as defined in Section 7-02.3(6)A1), the lid elements may
12 include vertical legs of a maximum length of 4-feet.
13

14 All vertical and horizontal joints of PRCBC and PRCBC elements shall be tongue and
15 groove type joints, except PRCBC and PRCBC of 20-foot span or less may have
16 keyway joints connected by weld-tie anchors in accordance with Section 6-02.3(25)O.
17 The weld-tie anchor spacing shall not exceed 6'-0". There shall be at least two
18 galvanized steel tie plates across each top unit tongue and groove joint and each
19 tongue and groove joint between upper and lower units, unless otherwise shown in the
20 Plans or required by the seismic designed completed in accordance with Section 7-
21 02.3(6)A1.
22

23 **7-02.3(6)C3 Erection**

24 This section is revised to read:
25

26 PRCBC and PRCBC shall be erected and backfilled in accordance with the erection
27 sequence specified in the Working Drawing submittal, and the construction equipment
28 restrictions specified in Section 6-02.3(25)O.
29

30 The Contractor shall install a continuous strip of butyl rubber sealant within all tongue
31 and groove joints prior to connecting the precast elements together. The butyl rubber
32 sealant shall have a minimum cross section of 1/2-inch by 1 1/2-inch, unless otherwise
33 shown in the Plans.
34

35 After connecting the joints with weld-tie anchors, the Contractor shall paint the exposed
36 metal surfaces with one coat of field primer conforming to Section 9-08.1(2)F. Keyways
37 shall be filled with grout conforming to Section 9-20.3(2).
38

39 The Contractor shall wrap all exterior joints along the top and sides of the PRCBC and
40 PRCBC with a 12-inch wide strip of external sealing band centered about the joint and
41 adhesively bonded to the concrete surface.
42

43 Backfill beside the PRCBC and PRCBC shall be brought up in sequential layers,
44 compacted concurrently. The difference in backfill height on opposing sides of the
45 Structure shall not exceed 2-feet.
46

47 **7-02.4 Measurement**

48 This section is supplemented with the following:
49

50 Culvert bedding material will be measured by the cubic yard of material placed.
51

1 **7-02.5 Payment**

2 This section is supplemented with the following:

3

4 "Culvert Bedding Material", per cubic yard.