

## 714-R-437 OVERSIZE PRECAST REINFORCED CONCRETE BOX CULVERT

(Revised 11-01-06)

The Standard Specifications are revised as follows:

SECTION 714, AFTER LINE 13, INSERT AS FOLLOWS:

*Flowable Backfill*.....213

SECTION 714, AFTER LINE 16, INSERT AS FOLLOWS:

*Oversize Precast Reinforced Concrete Box Culverts*.....907.06

SECTION 714, AFTER LINE 41, INSERT AS FOLLOWS:

**714.03.2 Shop Drawings**

*The Contractor shall submit, for approval, three copies of design computations and five sets of detailed shop drawings with each sheet signed by and bearing the seal of a professional engineer. A longhand example of the design methodology shall be furnished if the design calculations are in a computer printout format. The shop drawings shall include all details, dimensions, and quantities necessary to construct the culvert, and shall include, but not be limited to, culvert section details showing all concrete dimensions and reinforcing steel requirements. These shop drawings will be reviewed for design features only. The Contractor shall be responsible for dimensions, accuracy, and fit of work. Two sets will be returned either approved or showing changes or corrections required. If required to be changed or corrected, copies shall be resubmitted until they receive approval. Such approval will not relieve the Contractor from responsibility of errors. No deviations will be allowed from the approved working drawings without written consent.*

*Fabrication shall not begin until written approval of the shop drawings and design computations has been received from the Engineer.*

*The Contractor shall consider the effects of hydrostatic pressure on the box culvert.*

**714.03.3 Headwall**

*The vertical headwall reinforcement shall be attached to the top of the precast reinforced concrete box culvert by either drilling holes or precasting holes, the diameter of which shall be not more than 1.25 times the diameter of the bar. The dimensions, spacing, and depth of anchoring shall be as shown on the plans. If drilled holes are used, the drilled holes shall be blown clean and allowed to dry after drilling. The reinforcing bars shall be installed with a slight twisting motion such that the entire void between the hole and the reinforcing bar shall be filled with approved chemical anchoring material from the back of the hole outward. The chemical anchoring material shall be one from the Department's list of approved materials.*

**714.03.4 Operation of Equipment**

*The operation of equipment over the culvert shall be in accordance with the culvert manufacturer's recommendation.*

**714.03.5 Design**

*The structure sections shall be designed for HL-93 loading in accordance with the AASHTO LRFD Bridge Design Specifications, except as modified herein.*

SECTION 714, AFTER LINE 147, INSERT AS FOLLOWS:

*No direct payment will be made for design of the oversize box culvert or furnishing of shop drawings. The cost of these items is to be included in the cost of the oversize box culvert.*

SECTION 907, LINE 83, DELETE AND INSERT AS FOLLOWS:

**907.06 ~~Blank~~ Oversize Precast Reinforced Concrete Box Sections**

*Certifications shall be in accordance with 907.02. Box sections with less than 2 ft (0.6 m) of cover which are subject to highway loadings shall be designed in accordance with 907.06(a). Box sections with 2 ft (0.6 m) of cover or more and which are subject to highway loadings shall be designed in accordance with 907.06(b).*

**(a) Less Than 2 ft (0.6 m) of Cover**

*Box sections shall be designed in accordance with AASHTO M 273 (M 273M), except as follows:*

1. *Minimum 28 day concrete compressive strength shall be 5,000 psi (35 MPa) as determined by concrete cores.*
2. *Minimum reinforcement area shall be at least 0.002 of the gross concrete area  $A_g$  or 0.013 in.<sup>2</sup>/ft (265 mm<sup>2</sup>/m), whichever is greater.*
3. *The precast reinforced concrete box culvert shall be designed for HL-93 loading, a cover range from 0 to 2 ft (0 to 0.6 m), and impact loading, in accordance with AASHTO LRFD Bridge Design Specifications, using load factor or ultimate strength principles.*
4. *Minimum thickness of top slab  $T_t$ , bottom slab  $T_b$ , and sidewalks  $T_s$ , shall be 12 in. (300 mm) as shown in Figure 1.*
5. *Reinforcing steel in the structure sections shall be epoxy coated in accordance with 910.01((b)9).*
6. *4.1 Precast reinforced concrete box sections manufactured in accordance with this specification shall be designated by type, span, and rise.*
7. *Delete Tables 1 and 2.*
8. *7.1 Design Tables – The box section span and rise shall be as shown on the plans. The reinforcement and box section shall be designed using the methodology presented in Appendix A and Figures 1 and 2, subject to the provisions of Section 11.*

9. *9.4 Handling – Not more than four holes may be cast, drilled, or otherwise neatly made in the shell of each piece of box section for the purpose of handling or laying. The holes shall be tapered unless drilled, and the tapered holes shall be filled with portland cement mortar or with precast concrete plugs, which shall be secured with portland cement mortar or other approved adhesive, before backfilling. Drilled holes shall be filled with portland cement mortar.*
10. *11.1 Metric Internal Dimensions – Permissible variations of the metric internal dimensions shall be as prescribed in Table 3, with the addition of the following:*

<i>Designated Size, <u>mm</u></i>	<i>Permissible Variation, <u>Internal Size, mm</u></i>	
	<i><u>Min.</u></i>	<i><u>Max.</u></i>
3900	3930	4000
4200	4240	4310
4500	4550	4620
4800	4850	4930
5100	5150	5230
5400	5450	5530
5700	5760	5840
6000	6070	6150

11. *11.5 Position of Reinforcement – The maximum variation in the position of the reinforcement shall be  $\pm 1/2$  in. (13 mm). In no case, however, shall the cover over the reinforcement be less than  $5/8$  in. (16 mm), as measured to the internal surface or the external surface of the box section except the cover over the reinforcement for the external surface of the top slab shall not be less than  $1 \frac{5}{8}$  in. (42 mm). The preceding minimum cover limitation does not apply at the mating surfaces of the joint.*
12. *11.6 Area of Reinforcement – Steel areas greater than those required by design shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the AASHTO specification for that type of reinforcement.*
13. *15.1.1 Box section span, rise, and specification designation.*
14. *APPENDIX A*
- a. *Delete A1, A2, and A3.*
- b. *A4.1 The load factor for dead load shall be 1.5.*

- c. Delete A4.2, A4.3, and A4.4.
- d. A4.5 Haunch dimensions are the same as the sidewalk thickness.
- e. Delete A5.
- f. Delete Table 3.

*Flowable backfill shall be brought up uniformly on each side of the box culvert to the fill line as shown on the plans.*

***(b) 2 ft (0.6 m) of Cover or More***

*Box sections shall be designed in accordance with AASHTO M 259 (M 259M), except as follows:*

1. *Minimum 28 day concrete compressive strength shall be 5000 psi (35 MPa) as determined by concrete cores.*
2. *Minimum reinforcement area shall be at least 0.002 of the gross concrete area  $A_g$  or 0.013 in.<sup>2</sup>/ft (265 mm<sup>2</sup>/m), whichever is greater.*
3. *The precast reinforced concrete box culvert shall be designed for HL 93 loading, cover of \_\_\_\_\_ ft (\_\_\_\_\_ m) and impact loading, in accordance with AASHTO LRFD Bridge Design Specifications, using load factor or ultimate strength principles.*
4. *Minimum thickness of top slab  $T_t$ , bottom slab  $T_b$ , and sidewalks  $T_s$ , shall be 12 in. (300 mm) as shown in Figure 1.*
5. *4.1 Precast reinforced concrete box sections manufactured in accordance with this specification shall be designated by type, span, rise, and design earth cover.*
6. *Delete Tables 1, 2, and 3.*
7. *7.1 Design Tables – The box section span and rise shall be as shown on the plans. The reinforcement and box section shall be designed using the methodology presented in Appendix A and Figures 1, 2, and 3, subject to the provisions of Section 11.*
8. *7.3 Placement of reinforcement – The cover of concrete over the circumferential reinforcement shall be 1 in. (25 mm) except in the outside top of the top slab where it shall be 2 in. (50 mm), subject to the provisions of Section 11.*
9. *9.4 Handling – Not more than four holes may be cast, drilled, or otherwise neatly made in the shell of each piece of box section for the purpose of handling or laying. The holes shall be tapered unless*

*drilled, and the tapered holes shall be filled with portland cement mortar or with precast concrete plugs, which shall be secured with portland cement mortar or other approved adhesive, before backfilling. Drilled holes shall be filled with portland cement mortar.*

10. *11.1 Metric Internal Dimensions – Permissible variations of the metric internal dimensions shall be as prescribed in Table 4, with the addition of the following:*

<i>Designated Size, <u>mm</u></i>	<i>Permissible Variation, <u>Internal Size, mm</u></i>	
	<i><u>Min.</u></i>	<i><u>Max.</u></i>
3900	3930	4000
4200	4240	4310
4500	4550	4620
4800	4850	4930
5100	5150	5230
5400	5450	5530
5700	5760	5840
6000	6070	6150

11. *11.5 Position of Reinforcement – The maximum variation in the position of the reinforcement shall be  $\pm 1/2$  in. (13 mm). In no case, however, shall the cover over the reinforcement be less than  $5/8$  in. (16 mm), as measured to the internal surface or the external surface of the box section. The preceding minimum cover limitation does not apply at the mating surfaces of the joint.*

12. *11.6 Area of Reinforcement – Steel areas greater than those required by design shall not be cause for rejection. The permissible variation in diameter of any reinforcement shall conform to the tolerances prescribed in the AASHTO specification for that type of reinforcement.*

13. *15.1.1 Box section span, rise, maximum and minimum design earth cover, and specification designation.*

14. *APPENDIX A*

- a. Delete A1.1, A1.2, and A1.3.*
- b. Delete A1.4.2, A1.4.3, and A1.4.4.*
- c. Delete A1.5 and A2.*
- d. Delete Tables 4 and 5.*

*Structure backfill or flowable backfill shall be brought up uniformly on each side of the box culvert to the fill line as shown on the plans.*

---