### Supplementary Details for Manholes & Inlets

**Weights of Castings (lb)**

<table>
<thead>
<tr>
<th>Frame Type</th>
<th>2' Opening Frame</th>
<th>Cover (Std.)</th>
<th>Frame</th>
<th>3' Opening 2-Piece Cover</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>155</td>
<td>190</td>
<td>220</td>
<td>190</td>
</tr>
<tr>
<td>II</td>
<td>145</td>
<td>190</td>
<td>255</td>
<td>190</td>
</tr>
<tr>
<td>III</td>
<td>90</td>
<td>190</td>
<td>180</td>
<td>190</td>
</tr>
</tbody>
</table>

* Includes Type I Adjustable

**Notes (Frames, and Cover)**

1. The standard cover is to be used for all frames Types I, II, III and the 2-piece cover, and is the replacement cover for all previous frames with 1½" deep seats (traffic type). The 185 lb. cover (nontraffic type), 1984 Roadway and Traffic Design Standards Index No. 201, is the replacement cover for existing frames with 1½" deep seats. Installation of frame with 1½" deep seats is not permitted.

2. Use the 3'-2" cover, unless the 3-piece cover is called for in the plans, except at inlets and manholes with sump bottoms use the 2-piece cover when the sump depth exceeds 2', unless otherwise noted.

**Designer Note:**

Consider using the 2-piece cover where depths exceed 8' and manual entry may be required for cleaning. Clearly note the requirement for a 2-piece cover on the Drainage Structure sheets in the plans.

**Design Standards Index No. 201**

**2016**

**Supplementary Details for Manholes & Inlets**
**SEPARATE RISER SEGMENTS WITH CONSTRUCTION JOINTS OTHER THAN DOWEL OPTION**

**WALL JOINTS**

- Dowel joint construction (Location Varies)
- Dowel Construction Joint or Monolithically Cast Only
- Cold Cast Joint Between Segments
- Wall Reinforcing Splice Details

**BOTTOM SLABS TO WALLS**

- Top or Bottom Segment, h ≥ 2" (H (min.) Tabulated Above Do Not Apply)
- Then (Reqd.) as shown below.

**MINIMUM DIMENSIONS FOR BOX AND RISER SEGMENTS**

**COMPARATIVE SIDE VIEWS**

**REBAR STRAIGHT END EMBEDMENT FOR TOP AND BOTTOM SLABS**

**OPTIONAL CONSTRUCTION JOINTS**

1. Dowel reinforcing bars are to be #4 bars, 12" long with a minimum of 6 bars per joint approximately evenly spaced for circular structures or at minimum 12" spacing for rectangular structures. Bars may be either Adhesive Bonded Dowels in accordance with Specification Section 416, or placed approximately 6" into fresh concrete leaving the remainder to extend into the secondary cast. Welded wire reinforcement may be substituted for the dowel bar in accordance with the equivalent steel area table on Sheet 4.

2. Minimum cover on dowel reinforcing bars is 2" to outside face of structure.

3. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

4. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

5. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

6. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

7. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

8. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

9. Joints between wall segments and between wall segments and top or bottom slabs may be sealed either by preformed plastic gasket material using the procedures given in Section 430 of the Specifications or by non-shrink grout, in accordance with Section 612 of the Specifications.

**NOTE: NOT APPLICABLE AROUND MANHOLE AND RISER OPENINGS**

**SUPPLEMENTARY DETAILS FOR MANHOLES & INLETS**

**INDEX NO.**

201

**SHEET NO.**

3 of 5
Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required and Grade 60. Smooth welded wire reinforcement, will be recognized as having a design strength other than 60 ksi may be used, however only two grades are recognized; Grade 40 Reinforcement can be either deformed bar reinforcement or welded wire reinforcement. Bar structures constructed with 6" wall or slab thickness.

Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast dimensions.

Interior dimensions of an Alt. "B" Bottom can be adjusted to reflect these inlet interior.

When precast units are used in conjunction with Alt. "B" Structure Bottoms, Index No. 200, the Details for optional precast inlet construction up to depths of 15' are shown on the inlet indexes.

**Example Table of Equivalent Steel Area**

<table>
<thead>
<tr>
<th>Schedule</th>
<th>Bar Size &amp; Spacing</th>
<th>Steel Area (in²/ft)</th>
<th>Style Designation</th>
<th>Min. Steel Area (in²/ft)</th>
<th>Style Designation</th>
<th>Min. Steel Area (in²/ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>3 @ 65' Cts.</td>
<td>0.20</td>
<td>3 @ 65'x65'</td>
<td>0.30</td>
<td>3 @ 65'x65'</td>
<td>0.1846</td>
</tr>
<tr>
<td>B</td>
<td>3 @ 50' Cts.</td>
<td>0.24</td>
<td>3 @ 50'x50'</td>
<td>0.36</td>
<td>3 @ 50'x50'</td>
<td>0.2215</td>
</tr>
<tr>
<td>Special 1</td>
<td>3 @ 35' Cts.</td>
<td>0.267</td>
<td>3 @ 35'x35'</td>
<td>0.40</td>
<td>3 @ 35'x35'</td>
<td>0.2463</td>
</tr>
<tr>
<td>C</td>
<td>3 @ 25' Cts.</td>
<td>0.37</td>
<td>3 @ 25'x25'</td>
<td>0.555</td>
<td>3 @ 25'x25'</td>
<td>0.3415</td>
</tr>
<tr>
<td>D</td>
<td>3 @ 20' Cts.</td>
<td>0.53</td>
<td>3 @ 20'x20'</td>
<td>0.795</td>
<td>3 @ 20'x20'</td>
<td>0.4892</td>
</tr>
<tr>
<td>E</td>
<td>3 @ 15' Cts.</td>
<td>0.73</td>
<td>3 @ 15'x15'</td>
<td>1.095</td>
<td>3 @ 15'x15'</td>
<td>0.6738</td>
</tr>
<tr>
<td>F</td>
<td>3 @ 10' Cts.</td>
<td>1.06</td>
<td>3 @ 10'x10'</td>
<td>1.59</td>
<td>3 @ 10'x10'</td>
<td>0.9783</td>
</tr>
<tr>
<td>Special 2</td>
<td>3 @ 5' Cts.</td>
<td>1.24</td>
<td>3 @ 5'x5'</td>
<td>1.86</td>
<td>3 @ 5'x5'</td>
<td>1.1446</td>
</tr>
<tr>
<td>G</td>
<td>3 @ 3' Cts.</td>
<td>1.46</td>
<td>3 @ 3'x3'</td>
<td>2.19</td>
<td>3 @ 3'x3'</td>
<td>1.3477</td>
</tr>
</tbody>
</table>

**General Notes**

1. For square or rectangular precast drainage structures, either deformed or smooth welded wire reinforcement in accordance with Section 931:
   a) Width and length of the unit is four times the spacing of the cross wires.
   b) Wire reinforcement shall be continuous around the box, and tacked in accordance with Option 1 or 3 as shown in the Wall Reinforcing Splice Details.

2. Horizontal steel in the walls of rectangular structures shall be top spaced in accordance with Option 1, 2 or 3 as shown in the Wall Reinforcing Splice Details.

3. Welding of splices and laps is permitted. The requirements and restrictions placed on welding in AASHTO M259 shall apply.

4. Rebar straight end embedment of peripheral reinforcement may be used in lieu of ACI standard hooks for top and bottom sides except when hooks are specifically called for in the plans or standard drawings.

5. Concrete as specified in ASTM C478, (4000 psi) may be used in lieu of Class II concrete in precast items manufactured in plants which meet the requirements of Section 449 of the Specifications.

6. Precast opening for pipe shall be the pipe OD plus 6" (+ 2" tolerance) Mortar used to seal the pipe into the opening will be of such a mix that shrinkage will not cause leakage into or out of the structure. Dry-pack mortar may be used in lieu of brick and mortar construction to seal openings less than 29" wide.

7. For pay item purposes, the height used to determine if a drainage structure is greater than 10 feet shall be computed using:
   a) The elevation of the top of the manhole lid,
   b) the grate elevation or the theoretical gutter grade elevation of an inlet, or
   c) the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

8. **Supplementary Details for Manholes & Inlets**

   a) wrench should be selected to correspond with the size of the bar.
   b) length, if 10 feet shall be computed using:
   a) The elevation of the top of the manhole lid,
   b) the grate elevation or the theoretical gutter grade elevation of an inlet, or
   c) the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

   i) The elevation of the top of the manhole lid,
   b) the grate elevation or the theoretical gutter grade elevation of an inlet, or
   c) the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

   ii) The elevation of the top of the manhole lid,
   b) the grate elevation or the theoretical gutter grade elevation of an inlet, or
   c) the outside top elevation of a junction box less the flow line elevation of the lowest pipe or to top of sump floor.

**Notes for Precast Options & Equivalent Reinforcement Substitution**

1. Details for optional precast inlet construction up to depths of 15 are shown on the Indexes.

2. When precast units are used in conjunction with All "B" Structure Bottoms, Index No. 200, the lateral dimensions of an All "B" Bottom can be adjusted to reflect these inlet interior dimensions.

3. Concrete which meets the requirements of ASTM C478 or Class IV must be used for precast structures constructed with 6" wall or slab thickness.

4. Reinforcement other than 60 ksi may be used, however only two grades are recognized. Grade 40 reinforcement will be recognized as having a design strength of 60 ksi and deformed welded wire reinforcement will be recognized as having a design strength of less than 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required can be determined by the following equations:

   Grade 40 Steel Area = A40 = 0.60 x A60
   Smooth Welded Wire Reinforcement Steel Area = A65 = 0.60 x A60
   Deformed Welded Wire Reinforcement Steel Area = A70 = 0.60 x A60

5. When an increased area of reinforcement is provided, then the maximum bar spacing may be increased by the squared ratio of increased steel area, but not to exceed 12:

   Max. Grade 40 Bar Spacing = Grade 60 Bar Spacing
   Max. Smooth Welded Wire Spacing = Grade 60 Bar Spacing x 1.16
   Max. Deformed Welded Wire Spacing = Grade 60 Bar Spacing x 1.34

   In no case will reinforcement with wires smaller than W3.1 or D3.1, or spacings greater than 12" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or be recognized as having a design strength of 60 ksi and deformed welded wire reinforcement will be recognized as having a design strength of less than 70 ksi. The area of reinforcement required may be adjusted in accordance with the Equivalent Steel Area Table provided. For bars and spacings not given, the steel area required can be determined by the following equations:

   Grade 40 Steel Area = A40 = 0.60 x A60
   Smooth Welded Wire Reinforcement Steel Area = A65 = 0.60 x A60
   Deformed Welded Wire Reinforcement Steel Area = A70 = 0.60 x A60

   For increased area of reinforcement is provided, then the maximum bar spacing may be increased by the squared ratio of increased steel area, but not to exceed 12.

   Max. Bar Spacing Provided = Max. Bar Spacing Required x √Steel Area Provided

   In no case will reinforcement with wires smaller than W3.1 or D3.1, or spacings greater than 12" be permitted. Bar reinforcement shall show the minimum yield designation grade mark or either the number 60 or one (1) grade mark line to be acceptable at the higher value.

   The maximum bar spacing shall not be greater than two (2) times the slab thickness with a maximum spacing of 12" of three (3) times the wall thickness, with a maximum spacing of 18" for vertical bars and 12" for horizontal bars. Wires smaller than W3.1 or D40 may be used in the walls of ASTM C478 round structure bottoms and round risers.
Pictorial View

Note:
1. Submit shop drawings of corner openings for approval by the engineer of record.
2. \( h_2 \) may be less than 1'-0" when a minimum 1'-0" deep segment, 8" slab or curb inlet is provided above the corner opening.
3. For inlet segments at finish grade elevation substitute a #8 bar for the top corner bar when \( 1'-0" \leq h_2 < 2'-0" \).

Rectangular Segment with Pipe Opening at Corner

Details for Skewed Pipes in Rectangular Structures

Design Note: Use only when round structures are not practical, engineer of record approval required.