GEOMETRIC LIMITS FOR PIPE PENETRATION HOLES

Note 1: A minimum of 12 (300) of monolithic reinforced concrete shall be maintained above pipe penetration holes > 3'-0" (1.12 m).

Note 2: A minimum 12 (300) inside arc length of reinforced concrete shall be maintained between pipe penetration holes > 15 (380).

Note 3: A maximum of 60 percent of the inside perimeter of the reinforced concrete manhole walls may be removed.

Note 4: Horizontal joints that intersect pipe penetration holes > 15 (380) shall have one joint splice for every location around the perimeter of the joint where the inside arc length between pipe penetration holes is < 24 (600). See joint splice detail.

Note 5: The recommended pipe penetration hole is equal to the O.D. of the pipe plus 4 (100).

Note 6: Only pipe penetration holes < 15 (380) are allowed in riser sections.

GENERAL NOTES

Pipe holes shall be formed to facilitate proper placement of hole reinforcement.

The manufacturer shall ensure that all precast manhole sections are additionally reinforced where required to resist damage from handling, shipping and installation stresses.

Lifting holes shall be located in the sections as per the manufacturer’s recommendations.

See Standard 602701 for details of manhole steps.

All dimensions are in inches (millimeters) unless otherwise noted.

FREE FORMING FOR PIPE PENETRATION HOLES

The manufacturer shall ensure that all precast manhole sections are additionally reinforced where required to resist damage from handling, shipping and installation stresses.

Lifting holes shall be located in the sections as per the manufacturer’s recommendations.

See Standard 602701 for details of manhole steps.

All dimensions are in inches (millimeters) unless otherwise noted.

SECTION PARALLEL TO PIPE

(Without conical top riser)

SECTION PERPENDICULAR TO PIPE

(WITH CONICAL TOP RISER)
PLAN - FLAT SLAB TOP
(Showing layout of bottom reinforcement bars and c bars)

PLAN - FLAT SLAB TOP
(Showing layout of welded wire reinforcement and c bars)

* #6 (#19) bars bottom. Bundle first bar with closest WWR bar in the opening and place second bar ±3 (75) away.
**FLAT SLAB TOP REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Riser Height (ft.)</th>
<th>WWR or Rebar (each direction)</th>
<th>Spacing (max.)</th>
<th>Bar Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>All</td>
<td>0.11 sq. in./ft.</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>RH ≤ 10 ft. (3.05 m)</td>
<td>0.08 sq. in./ft.</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>RH &gt; 10 ft. (3.05 m)</td>
<td>WWR not permitted</td>
<td></td>
<td>#6</td>
</tr>
</tbody>
</table>

**WALL REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Orientation</th>
<th>WWR or Rebar (each direction)</th>
<th>Spacing (max.)</th>
<th>Bar Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ft. (1.22 m) Ø Riser</td>
<td>Circumferential</td>
<td>0.12 sq. in./ft. (450 sq. mm/m)</td>
<td>6 (13)</td>
<td></td>
</tr>
<tr>
<td>9 ft. (2.74 m) Ø Barrel</td>
<td>Circumferential</td>
<td>0.08 sq. in./ft. (372 sq. mm/m)</td>
<td>6 (150)</td>
<td></td>
</tr>
<tr>
<td>9 ft. (2.74 m) Ø Barrel</td>
<td>Vertical</td>
<td>0.04 sq. in./ft. (95 sq. mm/m)</td>
<td>6 (200)</td>
<td></td>
</tr>
</tbody>
</table>

**BASE SLAB REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Riser Height (ft.)</th>
<th>Total Height (TH)</th>
<th>WWR or Rebar (each direction)</th>
<th>Spacing (max.)</th>
<th>Bar Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>RH ≤ 10 ft. (3.05 m) &amp; TH ≤ 20 ft. (6.10 m)</td>
<td>0.04 sq. in./ft. (233 sq. mm/m)</td>
<td>6 (200)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>RH &gt; 10 ft. (3.05 m) or TH &gt; 20 ft. (6.10 m)</td>
<td>0.04 sq. in./ft. (233 sq. mm/m)</td>
<td>6 (200)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**JOINT SPLICE**

- **Joint:**
  - 9 (230)
  - 4 ¼ (105)
  - 1 ¾ (45)

**TIE PLATE**

- ½ (13) Tie
- 6 (150) Flats
- 4 (100) Flats

**BASEMENT**

- 1 ½ (32) Ø Holes
- 2 ¾ (65) Ø Holes
- 1 ¼ (32) Ø Holes
- 2¼ (55)
- 1 ¾ (45)

**CONNECTION ANGLE**

- 4 (100)
- 3 (75)
- 6 (150)

**FLAT SLAB**

- 10 (250)
- 6 (150) Flats
- 4 (100) Flats

**TIE PLATE**

- ½ (13) Tie