**GEOMETRIC LIMITS FOR PIPE PENETRATION HOLES**

1. A minimum of 12 (300) of monolithic reinforced concrete shall be maintained above pipe penetration holes > 3'-4" (1.02 m).
2. A minimum 12 (300) inside arc length of reinforced concrete shall be maintained between pipe penetration holes > 15 (380).
3. A maximum of 60 percent of the inside perimeter of the reinforced concrete manhole walls may be removed.
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.
5. The recommended pipe penetration hole is equal to the O.D. of the pipe plus 4 (100).
6. Only pipe penetration holes > 15 (380) are allowed in riser sections.

**GENERAL NOTES**

Pipe holes shall be formed to facilitate proper placement of reinforcing.

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, except as noted.

See Section 602701 for details of manhole steps.

All dimensions are in inches (millimeters) unless otherwise noted.
Standard 602416-08

8' (2.44 m) Diameter

Precast Manhole Type A

Plan - Flat Slab Top

(Showing layout of bottom reinforcement bars and c bars)

Bar c #5 (#16),
12'-4" (3.81 m)
length, 4'-2" (1.27 m)
radius top and bottom

3 (75) typ.

Bar c #5 (#16),
9'-2" (2.79 m)
length, 4'-2" (1.27 m)
radius top and bottom

3 (75) typ.

Bar c #5 (#16),
4'-0" (1.22 m)
radius top and bottom

2 (50) typ.

Plan - Flat Slab Top

(Showing layout of welded wire reinforcement and c bars)

WWR not permitted for riser heights > 10' (3.05 m).

Bar c #5 (#16),
12'-4" (3.81 m)
length, 4'-2" (1.27 m)
radius top and bottom

2 (50) typ.

Bar c #5 (#16),
9'-2" (2.79 m)
length, 4'-2" (1.27 m)
radius top and bottom

2 (50) typ.

#6 (#19) bars bottom. Bundle first bar with closest WWR bar to the opening and place second bar ±3 (75) away.

Illinois Department of Transportation
APPROVED
ENGINEER OF DESIGN AND ENVIRONMENT
4-1-06
ENGINEER OF POLICY AND PROCEDURES
Sheet 2 of 3
**FLAT SLAB TOP REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Riser Height (RH)</th>
<th>WWR (each direction)</th>
<th>Rebar (each direction except as noted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>All</td>
<td>0.12 sq. in./ft.</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(254 sq. mm/mm)</td>
<td>(150)</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>RH ≤ 10 ft. (3.05 m)</td>
<td>0.045 sq. in./ft.</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>RH &gt; 10 ft. (3.05 m)</td>
<td>0.036 sq. in./ft.</td>
<td>6</td>
</tr>
</tbody>
</table>

**WALL REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Orientation</th>
<th>WWR or Rebar</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>A&lt;sub&gt;s&lt;/sub&gt; (min.)</td>
</tr>
<tr>
<td>4 ft. (1.22 m) Ø Riser</td>
<td>Circumferential</td>
<td>0.12 sq. in./ft. (254 sq. mm/mm)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq. in./ft. (95 sq. mm/mm)</td>
</tr>
<tr>
<td>8 ft. (2.44 m) Ø Barrel</td>
<td>Circumferential</td>
<td>0.24 sq. in./ft. (508 sq. mm/mm)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq. in./ft. (95 sq. mm/mm)</td>
</tr>
</tbody>
</table>

**BASE SLAB REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Riser Height (RH)</th>
<th>Total Height (TH)</th>
<th>WWR or Rebar each direction</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>A&lt;sub&gt;s&lt;/sub&gt; (min.)</td>
</tr>
<tr>
<td>Top Mat</td>
<td>RH ≤ 10 ft. (3.05 m)</td>
<td>&amp; TH ≤ 20 ft. (6.10 m)</td>
<td>0.36 sq. in./ft. (95 sq. mm/mm)</td>
</tr>
<tr>
<td></td>
<td>RH &gt; 10 ft. (3.05 m)</td>
<td>or TH &gt; 20 ft. (6.10 m)</td>
<td>0.60 sq. in./ft. (1270 sq. mm/mm)</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>All</td>
<td></td>
<td>0.13 sq. in./ft. (323 sq. mm/mm)</td>
</tr>
</tbody>
</table>

**Notes**
- Only one layer of WWR permitted to avoid congestion.
- **Only one layer of WWR permitted to avoid congestion.**
- See plan view for rebar orientation and spacing and this table for bar size.