GEOMETRIC LIMITS FOR PIPE PENETRATION HOLES

1. A minimum of 9 (230) of monolithic reinforced concrete shall be maintained above pipe penetration holes > 15 (380).
2. A minimum 9 (230) of monolithic 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 one pipe penetration holes ≤ 15 (380) are allowed in riser sections.

FLAT SLAB TOP JOINT CONFIGURATIONS
(Shown at access hole)

SECTION PARALLEL TO PIPE
(Shown at access hole)

SECTION PERPENDICULAR TO PIPE
(with conical top riser)

BASE SLAB JOINT CONFIGURATIONS

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, except as noted.

See Standard 602701 for details of manhole steps.

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

DATE
REVISIONS
2-19
Moved wall reinforcement from inside face to middle.
1-19
Expanded / refined reinforcement options. Increased manhole depths.

PRECAST MANHOLE TYPE A
6' (1.83 m) DIAMETER

(remains standard in 2019)
(remains standard in 2019)

STANDARD 602406-10
(Worksheet 1 of 3)
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)

* #5 (#16) bars for risers ≤ 10 ft (3.05 m) tall or #6 (#19) bars for risers > 10 ft (3.05 m) tall bottom. Bundle first bar with closest WWR bar to the opening and place second bar ±3" (75) away.
**FLAT SLAB TOP REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Riser Height (RH)</th>
<th>WWR (each direction)</th>
<th>Steel (each direction except as noted)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>All</td>
<td>0.11 sq in./ft.</td>
<td>0.11 sq in./ft.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.11 sq in./ft.</td>
<td>0.11 sq in./ft.</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>RH ≤ 10 ft. (3.05 m)</td>
<td><strong>0.06 sq in./ft.</strong></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>RH &gt; 10 ft. (3.25 m)</td>
<td><strong>0.08 sq in./ft.</strong></td>
<td>8</td>
</tr>
</tbody>
</table>

**WALL REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Orientation</th>
<th>WWR or Rebar</th>
<th>A, (min.)</th>
<th>Spacing (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 ft. (1.22 m) Ø Riser</td>
<td>Circumferential</td>
<td>0.12 sq in./ft.</td>
<td>6</td>
<td>(120)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq in./ft.</td>
<td>6</td>
<td>(200)</td>
</tr>
<tr>
<td>6 ft. (1.83 m) Ø Barrel</td>
<td>Circumferential</td>
<td>0.18 sq in./ft.</td>
<td>6</td>
<td>(300)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq in./ft.</td>
<td>6</td>
<td>(200)</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>
<th>A, (min.)</th>
<th>Spacing (max.)</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>0.08 sq in./ft.</td>
<td>6</td>
<td>(150)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RH &gt; 10 ft. (3.25 m) or TH &gt; 20 ft. (6.10 m)</td>
<td>0.45 sq in./ft.</td>
<td>6</td>
<td>(150)</td>
<td></td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>All</td>
<td>0.11 sq in./ft.</td>
<td>18</td>
<td>(450)</td>
<td></td>
</tr>
</tbody>
</table>

**PRECAST MANHOLE TYPE A**

6' (1.83 m) DIAMETER

STANDARD 602406-10

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**NOTES:**

- All holes shall be brought to a snug tight condition.
- All nuts shall be brought with 2¼x2¼xƉ (55x55x8) washers under each nut.
- Holes in the walls may be drilled using core bits in lieu of formed holes.
- **Only one layer of WWR permitted to avoid congestion.**

---

**Holes in the walls:**

- Ø 3 in. (75)
- Ø 1½ (38)
- Ø 1 in. (25)
- Ø 1/2 (13)
- Ø 5/8 (16)
- Ø 1/4 (6)
- Ø 3/8 (10)
- Ø 1/8 (3)
- Ø 5/32 (0.25)
- Ø 9/32 (0.29)

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**Dimensions:**

- 6 ft. (1.83 m) DIAMETER
- PRECAST MANHOLE TYPE A
- STANDARDS 602406-10

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** construcción:**

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