**GEOMETRIC LIMITS FOR PIPE PENETRATION HOLES**

**Note 1:** A minimum of 6 (150) of monolithic reinforced concrete shall be maintained above pipe penetration holes > 15 (380).

**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.
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.

- 7'-2" (2.18 m)
- Diameter 4'-0" (1.22 m) diameter
- PRECAST MANHOLE TYPE A
- STANDARD 602406-11
- Sheet 2 of 3
**FLAT SLAB TOP REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Orientation</th>
<th>A_s (min.)</th>
<th>Spacing (max.)</th>
<th>WWR or Rebar (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>Circumferential</td>
<td>0.12 sq. in./ft. (254 sq. mm/m)</td>
<td>0.055 sq. in./ft. (59 sq. mm/m)</td>
<td>Ø 10 (13)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>Ø 4 (6)</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>Circumferential</td>
<td>0.16 sq. in./ft. (381 sq. mm/m)</td>
<td>0.055 sq. in./ft. (59 sq. mm/m)</td>
<td>Ø 10 (13)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>Ø 4 (6)</td>
</tr>
</tbody>
</table>

**BASE SLAB REINFORCEMENT**

<table>
<thead>
<tr>
<th>Location</th>
<th>Orientation</th>
<th>A_s (min.)</th>
<th>Spacing (max.)</th>
<th>WWR or Rebar (max.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Mat</td>
<td>Circumferential</td>
<td>0.45 sq. in./ft. (957 sq. mm/m)</td>
<td>0.08 sq. in./ft. (113 sq. mm/m)</td>
<td>Ø 6 (9)</td>
</tr>
<tr>
<td></td>
<td>Vertical</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>0.045 sq. in./ft. (64 sq. mm/m)</td>
<td>Ø 4 (6)</td>
</tr>
<tr>
<td>Bottom Mat</td>
<td>All</td>
<td>0.11 sq. in./ft. (281 sq. mm/m)</td>
<td>0.08 sq. in./ft. (113 sq. mm/m)</td>
<td>Ø 6 (9)</td>
</tr>
</tbody>
</table>

**WALL REINFORCEMENT**

- **A_6 (min.)**
- **Spacing (max.)**
- **Bar Size**

**BASE SLAB REINFORCEMENT**

- **Location**
- **Orientation**
- **A_s (min.)**
- **Spacing (max.)**
- **WWR or Rebar (max.)**

**WALL REINFORCEMENT**

- **Location**
- **Orientation**
- **A_s (min.)**
- **Spacing (max.)**
- **WWR or Rebar (max.)**

**PRECAST MANHOLE TYPE A**

- **6’ (1.83 m) DIAMETER**

**STANDARD 602406-11**

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**Connection Angle**

**Tie Plate**

**Joint Splice**

- **2½ (65)**
- **1½ (32)**
- **¾ (18)**
- **¾ (18)**
- **¾ (18)**
- **¾ (18)**
- **¾ (18)**

- **#5 or #6**
- **#3 or #4**
- **#2 or #3**
- **#1 or #2**

**Riser Height (RH)**

- **Top Mat**
- **Bottom Mat**

**Total Height (TH)**

- **Top Mat**
- **Bottom Mat**