SECTION A-A

1. WALLS AND BOTTOM MUST BE BRICK OR PLAIN MIX #3 CONCRETE, POURED IN PLACE. WHERE BRICK IS USED, INVERT MUST BE BRICK Laid ON EDGE.

2. WHERE COVER (A) OVER PIPE IS LESS THAN 4'-0", USE TYPE B SHALLOW MANHOLE (SEE PLATE D-3.03).

3. FOR PIPE 42" AND LARGER IN HORIZONTAL DIAMETER, USE STORM DRAIN TYPE C MANHOLE (SEE PLATE D-3.04).

4. WHERE CENTER LINE OF HORIZONTAL CURVATURE EXCEEDS 4°, USE BEND STRUCTURE (SEE DETAILS D-4.01 AND D-4.02).

5. THICKNESS OF WALLS TO BE INCREASED TO 12", 12'-0" BELOW UNDERSIDE OF FRAME.

6. SEE PLATE D-3.01 FOR PRECAST ALTERNATIVE MANHOLE.

7. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS & BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
TYPE A MANHOLE
(FOR PIPE 15" THRU 36"
HORIZONTAL DIAMETER)

PLATE D-3.00

ISSUED: OCTOBER, 1977
REVISED: JULY, 1985
REVISED: FEBRUARY, 2002

APPROVED
DIRECTOR
D-3.00

STORM DRAINAGE DETAILS
TYPE A MANHOLE
(3/18/02)
48" PRECAST MANHOLE TYPE A
(STANDARD)

1. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS AND BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

2. ALL CONCRETE SHALL BE 4,500 PSI COMPRESSIVE STRENGTH.

3. REINFORCING FOR TYPE B THE SAME AS FOR TYPE A.

4. SEE STANDARD DETAIL PLATE G-4 FOR MANHOLE STEP SPECIFICATIONS, SPACING AND PLACEMENT. STEP LOCATION SHOWN IS FOR ILLUSTRATION ONLY. LOCATE STEPS 90° FROM MAIN FLOW CHANNEL WITHIN MANHOLE.

5. A PRECAST MANHOLE SECTION MAY BE PLACED OVER EXISTING PIPE. SEE DETAIL FOR PRECAST MANHOLE "DOUGHHOUSE" RISER, STANDARD DETAIL PLATE D-3.07.


7. USE A MINIMUM OF 1 MANHOLE STEP IN BASE UNIT.

NOTES:

8. PRECAST MANHOLE RISER JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.

9. SEE STANDARD DETAIL PLATE G-3 FOR SPECIFICATIONS & PLACEMENT OF PRECAST CONCRETE GRADE RINGS.

10. USE LARGEST APPLICABLE RISER UNIT LENGTHS. USE A MAXIMUM OF ONE - 1 FOOT LENGTH RISER UNIT PER STRUCTURE, PLACED IMMEDIATELY UNDER ECCENTRIC CONE SECTION.

11. SEE DETAIL PLATE D-3.028 FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MANHOLE.

12. MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
PRECAST A & B
MANHOLE
FOR PIPES 15" TO 24" HORIZ. DIA

ISSUED: OCTOBER 1977
REVISED: JULY 1986
REVISED: OCTOBER, 2006
PLATE D-3.01
STANDARD PRECAST MANHOLE

1. UNLESS OTHERWISE NOTED, MANHOLE TAPERS, RISERS AND BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

2. ALL CONCRETE SHALL BE 4,500 PSI COMPRESSIVE STRENGTH.

3. SHALLOW MH REINFORCEMENT SAME AS STANDARD MH.

4. SEE STANDARD DETAIL PLATE G-4 FOR MANHOLE STEP SPECIFICATIONS, SPACING AND PLACEMENT. STEP LOCATION SHOWN IS FOR ILLUSTRATION ONLY. LOCATE STEPS 90" FROM MAIN FLOW CHANNEL WITHIN MANHOLE.

5. A PRECAST MANHOLE SECTION MAY BE PLACED OVER EXISTING PIPE. SEE DETAIL FOR PRECAST MANHOLE "DOUGHHOUSE" RISER, STANDARD DETAIL PLATE D-3.07.


NOTES:

7. USE A MINIMUM OF 1 MANHOLE STEP IN BASE UNIT.

8. PRECAST MANHOLE RISER JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHO-APPROVED SEALANT.

9. SEE STANDARD DETAIL PLATE G-3 FOR SPECIFICATIONS & PLACEMENT OF PRECAST CONCRETE GRATE RINGS.

10. USE LARGEST APPLICABLE RISER UNIT LENGTHS. USE A MAXIMUM OF ONE- 1 FOOT LENGTH RISER UNIT PER STRUCTURE, TO BE PLACED IMMEDIATELY BELOW ECCENTRIC CONE SECTION.

11. SEE DETAIL PLATE D-3.02B FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MH.

12. MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.

13. BOTTOM SLAB THICKNESS: 8" MIN. (60", 72" & 84" DIA.)

10" MIN. (96" DIA.)
HEAVY TRAFFIC MANHOLE FRAME & COVER – SEE DETAIL D-3.05

SECTION A - A

REDUCER UNIT

FLAT TOP REDUCER

FLAT TOP REDUCER REINFORCEMENT, 2 WAYS

SEE TABLE

FLAT TOP SLAB

(Shown without frame & cover)

1/8" (48" to 84" I.D.)
1/9" (96" I.D.)

4 ADD'L. NO. 5 BARS (48" to 84" I.D.)
OR #6 BARS (96" I.D.), PLACED DIAGONALLY AROUND OPENING

4 ADD'L. NO. 5 BARS (60" to 84" I.D.)
OR #6 BARS (96" I.D.), PLACED DIAGONALLY AROUND OPENING

ECCENTRIC CONE REDUCER

1. USE 4500 psi CONCRETE.

2. ECCENTRIC CONES, RISERS & BASE UNITS SHALL HAVE WALL REINFORCEMENT (BARS OR WWF) WITH A MINIMUM AREA (SQUARE INCHES PER FOOT) AS SHOWN IN TABLE FOR EACH I.D.

3. SEE DETAIL C-4 FOR MANHOLE STEPS.

4. USE GRADE RING ADJUSTERS (DETAIL C-3) AS REQUIRED TO BRING MANHOLE FRAME TO GRADE.

5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.

6. THE BASE SHALL BE CAST MONOLITHIC WITH BASE UNIT OR JOINTED PER MANUFACTURER'S DESIGN.

7. A LARGER DIAMETER UNIT OR SPECIAL DESIGN SHALL BE USED WHEN PIPE OPENINGS HAVE LESS THAN 6" BETWEEN THEM.

8. LIFT HOLES OR EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.

9. DRAIN STONE LANDINGS (SEE DETAIL D-3.09A) SHALL BE USED ONLY WHEN PIPES ARE CONNECTED THROUGH RISER UNITS.

10. PRECAST UNITS ARE UNACCEPTABLE IF INNER OR OUTER JOINT IS CRACKED OR BROKEN.

<table>
<thead>
<tr>
<th>I.D.</th>
<th>A</th>
<th>O.D.</th>
<th>B</th>
<th>T</th>
<th>WALL REINF.</th>
<th>FLAT TOP REDUCER REINF.</th>
<th>TOP SLAB REINF.</th>
</tr>
</thead>
<tbody>
<tr>
<td>48&quot;</td>
<td>5&quot;</td>
<td>58&quot;</td>
<td>-</td>
<td>8&quot;</td>
<td>0.12 SQ.IN./FT (NOTE 2)</td>
<td>-</td>
<td>#5 BARS @ 12&quot; C/C</td>
</tr>
<tr>
<td>60&quot;</td>
<td>6&quot;</td>
<td>72&quot;</td>
<td>2-6&quot;</td>
<td>10&quot;</td>
<td>0.15 SQ.IN./FT (NOTE 2)</td>
<td>#5 BARS @ 10&quot; C/C</td>
<td>#5 BARS @ 10&quot; C/C</td>
</tr>
<tr>
<td>72&quot;</td>
<td>7&quot;</td>
<td>86&quot;</td>
<td>2-7&quot;</td>
<td>10&quot;</td>
<td>0.18 SQ.IN./FT (NOTE 2)</td>
<td>#5 BARS @ 10&quot; C/C</td>
<td>#5 BARS @ 10&quot; C/C</td>
</tr>
<tr>
<td>84&quot;</td>
<td>8&quot;</td>
<td>100&quot;</td>
<td>2-8&quot;</td>
<td>10&quot;</td>
<td>0.21 SQ.IN./FT (NOTE 2)</td>
<td>#5 BARS @ 10&quot; C/C</td>
<td>#5 BARS @ 10&quot; C/C</td>
</tr>
<tr>
<td>96&quot;</td>
<td>9&quot;</td>
<td>114&quot;</td>
<td>2-9&quot;</td>
<td>10&quot;</td>
<td>0.24 SQ.IN./FT (NOTE 2)</td>
<td>#4 BARS (TOP) &amp; #6 BARS (BOTTOM) @ 8&quot; C/C</td>
<td>#5 BARS @ 10&quot; C/C</td>
</tr>
</tbody>
</table>
MANHOLE STEP CENTERED ON 1/2 OF BOTH SLAB OPENING & MANHOLE. SEE DETAIL G-4.

PLAN

STORM DRAIN HEAVY TRAFFIC MANHOLE FRAME AND COVER (SEE DETAIL D-3.05)

INSTALL FRAME, THEN MORTAR IN PLACE AROUND ENTIRE FRAME.

PRECAST CONCRETE GRADE RINGS (SEE STD. DETAIL G-3) OR BRICK MASONRY (16 IN. MAXIMUM, TWO COURSES MINIMUM) SHALL BE USED TO BRING MH FRAME TO GRADE AS REQUIRED.

SECTION A-A

NOTES:

1. WALLS, BOTTOM SLAB AND INVERT SHALL BE MIX #3 CONCRETE Poured IN PLACE.

2. BENCH FULL HEIGHT OF PIPE AS SHOWN FOR TYPE A MANHOLE ON DETAIL D-3.00.

3. WHERE COVER IS GREATER THAN 4', USE TYPE A MANHOLE.

4. FOR PIPE SIZES 42" AND LARGER, USE TYPE C MANHOLE.

5. FOR PIPE 30" HORIZONTAL & LARGER WITH CURVE CENTERLINE LENGTH GREATER THAN 4', USE BEND STRUCTURE. SEE DETAIL D-4.01.

6. USE OF SIDEWALK FRAME AND COVER (SEE DETAIL D-3.06) IN PLACE OF HEAVY TRAFFIC FRAME & COVER SHALL BE LIMITED TO SIDEWALK AREAS EXCEPT WITH PRIOR APPROVAL OF BUREAU OF ENGINEERING.

7. SEE DETAIL D-3.01 FOR PRECAST ALTERNATE SHALLOW MANHOLE.
NOTES:

1. WALLS, BOTTOM SLAB AND INVERT SHALL BE MIX NO. 3 CONCRETE POURED IN PLACE.

2. FOR PIPES 36" AND SMALLER, USE TYPE A MANHOLE, OR TYPE B MANHOLE WHERE "H" (COVER) IS LESS THAN 3'-6".

3. WHERE "H" IS LESS THAN 3'-6", USE ALTERNATE MANHOLE STACK.

4. FOR CURVE CENTERLINE LENGTH OVER 4 FT., USE BEND STRUCTURE PLATE D-4.01.

5. UNLESS OTHERWISE NOTED, MANHOLE TAPERS SHALL BE FURNISHED IN STRICT ACCORDANCE WITH A.S.T.M. DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

SECTION

BRICK SHALL BE ASTM C32 GRADE SS.
#4 BARS @ 12" C/C EACH WAY & WALLS

ALTERNATE MANHOLE STACK
(SEE NOTE 3)
WHERE FRAME & COVER IS USED OUTSIDE OF BALTIMORE COUNTY R/W OR EASEMENTS, SUBSTITUTE THE WORDS "PRIVATE STORM DRAIN" FOR "BALTIMORE COUNTY STORM DRAIN" ON THE COVER.

SHALLOW FRAME

CASTINGS MUST BE MACHINED ON BEARING SURFACES.

SECTION "A-A"

SECTION "B-B"

NOTES:
FRAME AND COVER FOR 54" AND LARGER BENDS AND JUNCTION CHAMBERS SHALL BE 2'-6" WITH LETTERING AND HOLES AS SHOWN FOR 2'-0" FRAME.
CASTING MATERIALS SHALL BE GREY IRON.
USE OF SHALLOW FRAME SHALL BE APPROVED BY ENGINEER.

<table>
<thead>
<tr>
<th></th>
<th>NOMINAL WEIGHTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>9&quot; FRAME</td>
<td>FRAME : 250 Lbs.</td>
</tr>
<tr>
<td></td>
<td>COVER : 135 Lbs.</td>
</tr>
<tr>
<td>4&quot; SHALLOW FRAME</td>
<td>TOTAL : 385 Lbs.</td>
</tr>
</tbody>
</table>

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
24" HEAVY TRAFFIC MANHOLE FRAME & COVER

APPROVAL
DIRECTOR
Baltimore County

ISSUED: OCTOBER, 1977
REVISED: AUGUST, 1997
PLATE D-3.05
1. MATERIAL – CAST IRON ASTM A–48, CLASS 30
2. MACHINED ON HORIZONTAL BEARING SURFACE
3. LOADING – AASHTO H–20
4. EQUIVALENT DESIGN MAY BE USED WITH APPROVAL OF DEPARTMENT OF PUBLIC WORKS
5. OPENING AREA = 179 SQUARE INCHES
NOTE: ALL DIMENSIONS SHOWN ARE IN ENGLISH AND [METRIC] MEETS OR EXCEEDS H2O LOADING

MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B
FINISH: NO PAINT
WEIGHT: APPROX. 149# FRAME: SEE DETAIL G-14

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
STORM DRAIN MH PLATEN COVER
FOR USE WITH STRAIGHT WALL MH FRAME

APPROVED: ____________________________
DIRECTOR
BUREAU OF ENGINEERING & CONSTRUCTION
3/5/01

ISSUED: JANUARY, 2001
REVISION: ____________________________
PLATE D-3.05B
WHERE FRAME & COVER IS USED OUTSIDE OF BALTIMORE COUNTY R/W OR EASEMENTS, SUBSTITUTE THE WORDS "PRIVATE STORM DRAIN" FOR "BALTIMORE COUNTY STORM DRAIN" ON THE COVER.

NOTES

1. MATERIAL SHALL BE GREY IRON CASTING. CASTINGS MUST BE MACHINED ON BEARING SURFACES.

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
SIDEWALK FRAME & COVER

ISSUED: OCTOBER, 1977
REVISED: AUGUST, 1977
PLATE: D-3.06
NOTES.

1. MANHOLE TAPERS, RISERS & BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH ASTM DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".

2. MANHOLE BASE SHALL BE MIX NO. 3 (3,500 P.S.I.) POURED-IN-PLACE CONCRETE.

3. PROVIDE 12" MINIMUM CLEARANCE FROM INCOMING PIPE & FROM DOGHHOUSE OPENING TOP(S) TO UPPER RISER JOINT.

4. PROVIDE 6" MINIMUM CLEARANCE FROM INCOMING PIPE OPENING TO BOTTOM OF DOGHOUSE UNIT.

5. MINIMUM 1" CLEARANCE SHALL BE MAINTAINED BETWEEN PIPES AND PRECAST DOGHHOUSE PIPE OPENINGS. OPENINGS SHALL BE GROUTED WITH NON-SHRINK GROUT JOINT FILLER.

6. IN ALL CASES, A MINIMUM 12" WIDE SECTION OF MANHOLE WALL SHALL BE MAINTAINED BETWEEN PIPE OPENINGS IN DOGHOUSE RISER.

7. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60.

8. SEE STANDARD PLATE D-301 FOR TYPE A & TYPE B MANHOLE DETAILS FOR USE WITH DOGHHOUSE RISER SHOWN HERE. SEE STANDARD PLATE D-302 FOR 60" DIA. MANHOLE DETAILS FOR USE WITH DOGHOUSE RISER SHOWN HERE.

9. MAXIMUM MANHOLE HEIGHT SHALL BE 30 FT. WHEN USING PRECAST DOGHOUSE RISER.

10. PRECAST INLET JOINTS: THE MANUFACTURER SHALL FORM MALE AND FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. THE JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO APPROVED SEALANT.


12. BREAK OUT ADDITIONAL PIPE AS REQUIRED TO PROVIDE POSITIVE FLOW FROM INCOMING PIPE TO CENTER MANHOLE CHANNEL.

**PRECAST MANHOLE "DOGHOUSE" RISER BUILT OVER EXISTING DRAIN (FOR USE WITH PIPES 36" AND SMALLER)**
GRANITE DRIp STONES ARE PREFERABLE BUT IF NOT AVAILABLE SOME OTHER APPROVED TYPE MAY BE USED. LOCATION OF DRIp STONES MAY BE ADJUSTED TO MEET THE REQUIREMENTS OF EACH CASE BUT NORMALLY SHALL BE 6" APART.

WALL THICKNESS:
8" TO DEPTH OF 12'-0"
13" BELOW DEPTH OF 12'-0" TO DEPTH OF 24'-0"

BASE THICKNESS:
8" WALL - USE 12" BASE
13" WALL - USE 16" BASE

NOTE: MANHOLE SHALL BE CONSTRUCTED OF REINFORCED CONCRETE (MIX NO. 2). REINFORCING TO BE NO. 4 DEFORMED BARS @ 6" C/C, 2 WAYS, 2" COVER.

HEAVY TRAFFIC MH FRAME & COVER
SEE DETAIL D-3.05

PRECAST CONCRETE GRADE RINGS
(SEE STD. DETAIL G-3) OR BRICK-MASONRY (16 IN. MAXIMUM, TWO COURSES MINIMUM)

MANHOLE STEPS
SEE DETAIL G-4

BENCH HEIGHT
ABOVE OUTGOING PIPE INVERT
SHALL BE HALF THE DIAMETER OF PIPE.

SECTION A-A

SECTION B-B

SECTION C-C

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
STANDARD DROP MANHOLE

D-3.08
**METHOD OF PLACING DRIP STONE LANDINGS**

1. USE 4500 psi CONCRETE.

2. THE DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS.

3. REINFORCEMENT: ASTM A 615 GRADE 60.

4. COST OF BASE, RISERS, TOP SLAB, FRAME, COVER & DRIP STONE LANDING IS INCIDENTAL TO MANHOLE COST.

5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.

6. LIFT EYES SHALL BE PROVIDED FOR HANDLING 48" DRIP STONE LANDING.

7. SEE DETAIL D-3.01 FOR 48" DIAMETER RISER & BASE UNITS. SEE DETAIL D-3.02A FOR LARGER DIAMETER BASE UNITS.


9. SEE DETAIL D-3.09B FOR PRECAST REDUCERS COMBINED WITH DRIP STONE LANDINGS.

10. PRECAST CONCRETE RISER RINGS (SEE STD. DETAIL G-3) OR BRICK MASONRY (16 IN. MAXIMUM OR TWO COURSES MINIMUM) SHALL BE USED TO BRING MANHOLE FRAME TO GRADE AS REQUIRED.
ECCENTRIC CONE REDUCER & DRIP STONE

1. USE 4500 psi CONCRETE.

2. THE COMBINATION REDUCER - DRIP STONE LANDING SHALL BE USED ONLY WHEN THERE ARE PIPES CONNECTED TO THE RISER UNITS. SEE DETAIL D-3.09A FOR PLACEMENT.

3. REINFORCEMENT: ASTM A 615 GRADE 60.

4. COST FOR THE COMBINATION REDUCER AND DRIP STONE LANDING IS INCIDENTAL TO MANHOLE COST.

5. PRECAST MANHOLE JOINTS: THE MANUFACTURER SHALL FORM MALE & FEMALE ENDS OF JOINTS USING THEIR OWN DESIGN. JOINTS SHALL BE SEALED BY THE CONTRACTOR AND MADE WATER-TIGHT USING THE MANUFACTURER'S RECOMMENDED ASTM OR AASHTO-APPROVED SEALANT.

6. LIFT EYES SHALL BE PROVIDED FOR HANDLING.

FLAT TOP REDUCER & DRIP STONE

7. ECCENTRIC CONE REINFORCEMENT SHALL BE REINFORCING BARS OR WELDED WIRE FABRIC AS SHOWN IN TABLE.

NOTE: FOR DRAINS OVER 24" DIAMETER, USE BRICK BEND OR MANHOLE
MANHOLE REQUIRED IN LIEU OF COLLAR AS DIRECTED BY DEPARTMENT OF PUBLIC WORKS.
1. MATERIAL: WALLS AND BOTTOM SHALL BE BRICK OR MIX #3 REINFORCED CONCRETE. SEE SECTION E - E.

2. DESIGN LOADING PER AASHTO H-27, WITH FILL UP TO 15 FEET ALLOWABLE.

3. MANHOLE DETAILS:
   - STEPS SEE DETAIL G-4
   - FRAME & COVER SEE DETAIL D-3.05
   - WALLS & MAX. BATTER SEE DETAIL D-3.00.

4. THE SMALLER OF D1 OR D2 SHALL DETERMINE Ε RADIUS, DIMENSIONS B & C AND REINFORCEMENT.

5. MANHOLE OPENING d SHALL BE BASED ON DOWNSTREAM PIPE SIZE D2.

6. FRAME & COVER FOR MANHOLE ON 54" & LARGER BENDS SHALL BE 30" WITH LETTERING AND HOLES AS SHOWN FOR 24" FRAME.

7. MINIMUM LENGTH OF CURVE IS 4'-0" FOR USE OF TYPE C MANHOLE STACK. STACK SHALL CONFORM TO THAT SHOWN ON DETAIL D-3.04.

8. SEE DETAIL D-4.02 FOR TABLES AND DIMENSIONS.

SECTION E - E

THIS DETAIL IS APPLICABLE TO HORIZONTAL ELLIPTICAL AND ROUND PIPE (SPAN = RISE = PIPE DIAMETER). SEE CHARTS, DETAIL D-4.02.
### CIRCULAR PIPE:

<table>
<thead>
<tr>
<th>Pipe Dia</th>
<th>C Radius</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Bars E</th>
<th>Bars F</th>
<th>d</th>
<th>Masonry Volume (CF/F) Below Slab</th>
</tr>
</thead>
<tbody>
<tr>
<td>30&quot;</td>
<td>5' -0&quot;</td>
<td>3'</td>
<td>10&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>3-#5</td>
<td>30&quot;</td>
</tr>
<tr>
<td>33&quot;</td>
<td>6' -0&quot;</td>
<td>4'</td>
<td>1&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>3-#5</td>
<td>30&quot;</td>
</tr>
<tr>
<td>36&quot;</td>
<td>6' -0&quot;</td>
<td>4'</td>
<td>4&quot;</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>3-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>42&quot;</td>
<td>7' -0&quot;</td>
<td>4'</td>
<td>10&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>4-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>48&quot;</td>
<td>8' -0&quot;</td>
<td>5'</td>
<td>4&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>4-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>54&quot;</td>
<td>9' -0&quot;</td>
<td>6'</td>
<td>6&quot;</td>
<td>12&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>5-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>60&quot;</td>
<td>10' -0&quot;</td>
<td>7'</td>
<td>0&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>6-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>66&quot;</td>
<td>11' -0&quot;</td>
<td>7'</td>
<td>6&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>7-#5</td>
<td>36&quot;</td>
</tr>
<tr>
<td>72&quot;</td>
<td>12' -0&quot;</td>
<td>8'</td>
<td>0&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>7-#5</td>
<td>36&quot;</td>
</tr>
</tbody>
</table>

### HORIZONTAL ELLIPTICAL CONCRETE PIPE:

<table>
<thead>
<tr>
<th>Pipe Dimen</th>
<th>C Radius</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>Bars E</th>
<th>Bars F</th>
<th>d</th>
<th>Masonry Volume (CF/F) Below Slab</th>
</tr>
</thead>
<tbody>
<tr>
<td>38&quot; x 24&quot;</td>
<td>6' -0&quot;</td>
<td>4'</td>
<td>8&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>36&quot;</td>
<td>12.0</td>
</tr>
<tr>
<td>42&quot; x 27&quot;</td>
<td>7' -0&quot;</td>
<td>4'</td>
<td>10&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>36&quot;</td>
<td>13.5</td>
</tr>
<tr>
<td>45&quot; x 29&quot;</td>
<td>8' -0&quot;</td>
<td>5'</td>
<td>1&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>36&quot;</td>
<td>14.7</td>
</tr>
<tr>
<td>53&quot; x 34&quot;</td>
<td>9' -0&quot;</td>
<td>5'</td>
<td>9&quot;</td>
<td>8&quot;</td>
<td>10&quot;</td>
<td>#5 @ 6&quot; o/c</td>
<td>36&quot;</td>
<td>18.4</td>
</tr>
<tr>
<td>60&quot; x 38&quot;</td>
<td>10' -0&quot;</td>
<td>6'</td>
<td>4&quot;</td>
<td>8&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>36&quot;</td>
<td>22.1</td>
</tr>
<tr>
<td>68&quot; x 43&quot;</td>
<td>11' -0&quot;</td>
<td>7'</td>
<td>8&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>36&quot;</td>
<td>33.7</td>
</tr>
<tr>
<td>76&quot; x 48&quot;</td>
<td>12' -0&quot;</td>
<td>8'</td>
<td>4&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>36&quot;</td>
<td>39.3</td>
</tr>
<tr>
<td>83&quot; x 53&quot;</td>
<td>13' -0&quot;</td>
<td>8'</td>
<td>11&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>36&quot;</td>
<td>44.1</td>
</tr>
<tr>
<td>91&quot; x 58&quot;</td>
<td>14' -0&quot;</td>
<td>9'</td>
<td>7&quot;</td>
<td>12&quot;</td>
<td>12&quot;</td>
<td>#6 @ 8&quot; o/c</td>
<td>36&quot;</td>
<td>50.4</td>
</tr>
</tbody>
</table>
NOTES:
1. SECTION E-E (BETWEEN LIMITS SHOWN) SHALL CONFORM TO BEND STRUCTURE.
2. WALLS AND BOTTOM SHALL CONFORM TO BEND STRUCTURE.
3. MANHOLE STACK AND ADDITIONAL SLAB REINFORCING SHALL CONFORM TO THAT OF TYPE C MANHOLE, DETAIL D-3.04. MANHOLE STACK REQUIRED UNLESS DELETION IS APPROVED BY BUREAU OF ENGINEERING AND CONSTRUCTION.
4. SLAB OPENING FOR MANHOLE STACK IS 3' DIA. EXCEPT WHERE FRAME INSTALLED WITHOUT MANHOLE RISER.

PLAN

LOWEST MANHOLE STEP WITHIN 2' VERTICAL OF ø INVERT

MIX #3 CONCRETE SLAB
2" CLEAR
#5 @ 6" O/C E. W.

FLOW

BRICK OR REINFORCED CONCRETE

#4 @ 6" E/W OR EQUIVALENT WELDED WIRE FABRIC

FLOW

#5 @ 6" O/C E. W.

SECTION E - E

TOP SLAB

#5 @ 6" O/C E. W.
MANHOLE STACK OPENING PER BEND STRUCTURE SLAB DETAIL.
REINFORCEMENT: 2 - #6 ADDITIONAL.

#5 @ 6" O/C EACH WAY

MINIMUM DIMENSIONS

<table>
<thead>
<tr>
<th></th>
<th>D</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>15&quot;-18&quot;</td>
<td>3'-9&quot;</td>
<td>2'-9&quot;</td>
<td></td>
</tr>
<tr>
<td>21&quot;-30&quot;</td>
<td>4'-4&quot;</td>
<td>3'-7&quot;</td>
<td></td>
</tr>
<tr>
<td>33&quot;-36&quot;</td>
<td>4'-7&quot;</td>
<td>3'-11&quot;</td>
<td></td>
</tr>
</tbody>
</table>

PLAN

MIX #3 CONCRETE

#5 @ 6" O/C EACH WAY

2" CLEAR

SECTION A-A

ROOF SLAB REINFORCEMENT

NOTES

1. WALLS AND BOTTOM SHALL BE BRICK OR MIX #3 REINFORCED CONCRETE. USE #4 BARS AT 6" E/W OR EQUIVALENT WELDED WIRE FABRIC.

2. MANHOLE STACK AND ADDITIONAL REINFORCING SHALL CONFORM TO THAT OF TYPE C MANHOLE. SEE DETAIL D-3.04.

3. SLAB OPENING FOR MANHOLE STACK IS 3' DIA. EXCEPT WHERE FRAME INSTALLED WITHOUT MANHOLE RISER.
1. USE WITH CONCRETE PIPE ONLY.

2. MINIMUM DIAMETER OF LARGE PIPE = 30".

3. \[ \frac{\text{SMALL PIPE DIAMETER}}{\text{LARGE PIPE DIAMETER}} \leq 0.45 \text{ MAX.} \]

4. ONE FIELD CONNECTION MAXIMUM PER SINGLE LENGTH OF LARGE PIPE.

STAINLESS STEEL PIPE HANGER

TRENCH WIDTH OF SMALLER PIPE

VARIABLE = 45° TO 80°

MORTAR AROUND JOINT TO FORM WATERTIGHT CONNECTION

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
FIELD CONNECTION

ISSUED: APRIL, 1999
REVISED: JANUARY, 2005
PLATE
D-4.06
HEADWALL (TYPES A, B, C, OR E) OR END SUPPORT WALL (TYPE A HEADWALL SHOWN)

CLASS 0 RIPRAP
GABION BASKETS, AS INDICATED

AB 6' x 3' x 1' GABION BASKETS, LAID FLAT ALONG OUTFALL INVERT
B 6' x 3' x 1' GABION BASKETS, LAID ALONG CHANNEL SLOPES
C 6' x 3' x 3' GABION BASKETS, SET ON END, 3 FEET BURIED, 3 FEET MAX. EXPOSED.

SECTION A - A

SPAN W
15" - 41" 3'
42" - 54" 6'

DEPARTMENT OF PUBLIC WORKS
STORM DRAINAGE DETAILS
CHANNEL
GABION VELOCITY BREAKER

PLATE D-5.02
1. Surface drain ditch to be used to collect runoff from areas draining toward road. Side ditch used when SDD is inadequate or to carry water along edge of road.

2. Stabilization to be seed and mulch, pegged stabilization fabric, SOD, RIP-RAP or gabions as directed on plans.

3. Stabilization, type of ditch (SDD or SD), bottom width W, depth of stabilization D and invert elevation at cross-section intervals as shown on plans.

4. Side slopes as shown on typical cross-section.
STANDARD BERM DITCH

1. STANDARD BERM DITCH TO BE USED TO COLLECT RUNOFF FROM AREAS DRAINING TOWARD TOP OF HIGHWAY CUT SLOPE.

2. STABILIZATION TO BE SEED AND MULCH, PEGGED STABILIZATION FABRIC, SOD, RIP-RAP OR GABIONS AS DIRECTED ON PLANS.

3. STABILIZATION, TYPE OF DITCH (SDD OR SD),

BOTTOM WIDTH W, DEPTH OF STABILIZATION D AND INVERT ELEVATION AT CROSS-SECTION INTERVALS AS SHOWN ON PLANS.

4. SIDESLOPES AS SHOWN ON TYPICAL CROSS-SECTION.
NOTES

1. Anchors shall be Mix No. 3 Concrete.
2. Anchors shall not be placed within 6" of a pipe joint.
3. Trench shall be backfilled in accordance with Standard Specifications.
4. Spacing of anchors for pipe slopes between values in Table A may be proportioned.