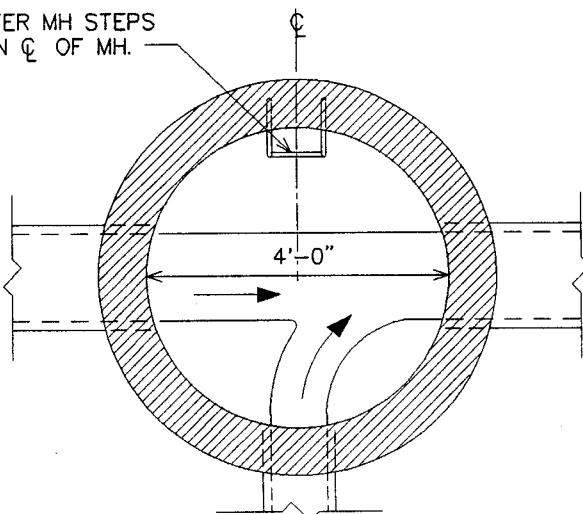


#### NOTES:

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".

CENTER MH STEPS ON  $\phi$  OF MH.



#### SECTION A-A



APPROVAL  
*William H. Korman*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 3/18/02  
 DATE

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

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

**D-3.00**

STANDARD STORM DRAIN  
HEAVY TRAFFIC MANHOLE  
FRAME AND COVER

CEMENT  
MORTAR

PRECAST CONCRETE GRADE RINGS (SEE STD.  
DETAIL G-3) OR BRICK MASONRY (16" MAX.,  
2 COURSES MIN.)

ECCENTRIC CONE UNIT

MIN. CIRCUMFERENTIAL  
REINFORCING (48" DIA. TAPER):  
 $A_s = 0.12 \text{ SQ. IN./FT.}$

NOTE 4 (STEPS SHOWN IN THIS  
LOCATION FOR ILLUSTRATION ONLY)

RISER UNIT

RISERS IN 1', 2', 3' OR 4'  
LENGTHS - SEE NOTE 10

JOINTS - NOTE 8

BACKFILL ALL SIDES - SEE  
STANDARD DETAIL G-2

MIN. CIRCUM. REINFORCING  
PER A.S.T.M. C - 478

NOTE 6  
GROUT WITH NON-SHRINK GROUT  
JOINT FILLER OR USE OPTIONAL  
FLEXIBLE GASKET CONNECTOR

THROUGH PIPE DIA.	LATERAL PIPE DIA.
27" OR LARGER	SEE D-3.02,3
24"	15"
21"	15", 18"
18"	15", 18"
15"	15"

TABLE BASED ON MAINTENANCE OF  
6" MINIMUM REINFORCED WALL  
BETWEEN PIPE OPENINGS, MEASURED  
ALONG INSIDE WALL.

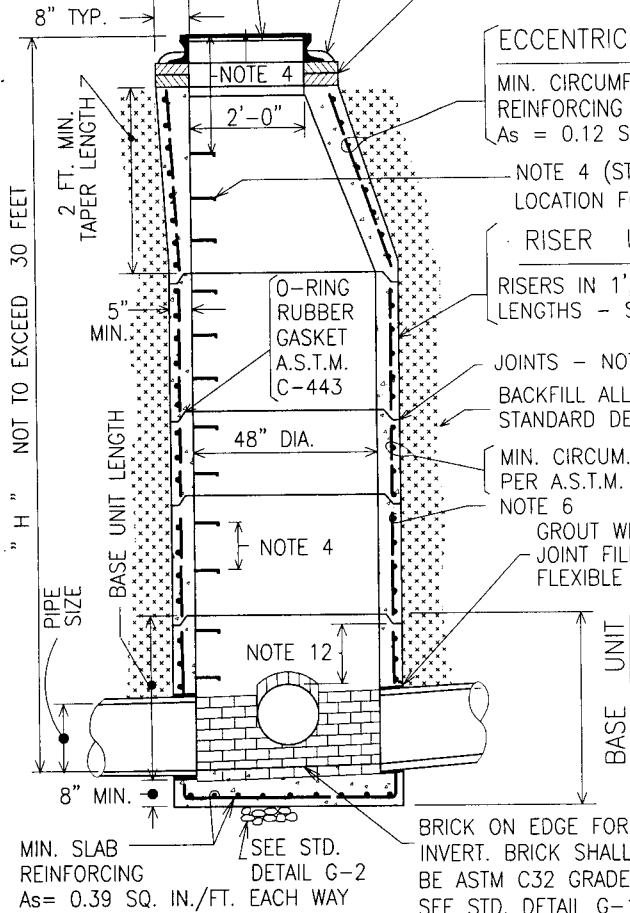
PRECAST CONCRETE GRADE RINGS  
(STD. DETAIL G-3) OR BRICK  
MASONRY (16 IN. MAX., 2 COURSES  
MINIMUM)

CEMENT MORTAR

NOTE 11  
NOTE 12

NOTE 4  
NOTE 7  
NOTE 11  
NOTE 12  
PIPE SIZE  
BASE UNIT  
BASE UNIT LENGTH  
8" MIN.  
BRICK ON EDGE  
SEE STD. DETAIL G-2  
BRICK ON EDGE FOR  
INVERT. BRICK SHALL  
BE ASTM C32 GRADE SS.  
SEE STD. DETAIL G15.

BACKFILL ALL SIDES -  
SEE STANDARD DETAIL G-2



**48" PRECAST MANHOLE TYPE A  
(STANDARD)**

**48" PRECAST MANHOLE TYPE B  
(SHALLOW)**

**NOTES:**

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 "DOGHOUSE" RISER, STANDARD DETAIL PLATE D-3.07.
6. MINIMUM CIRCUMFERENTIAL REINFORCEMENT PER A.S.T.M. C 478.
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 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-3.02B FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MANHOLE.
12. MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.

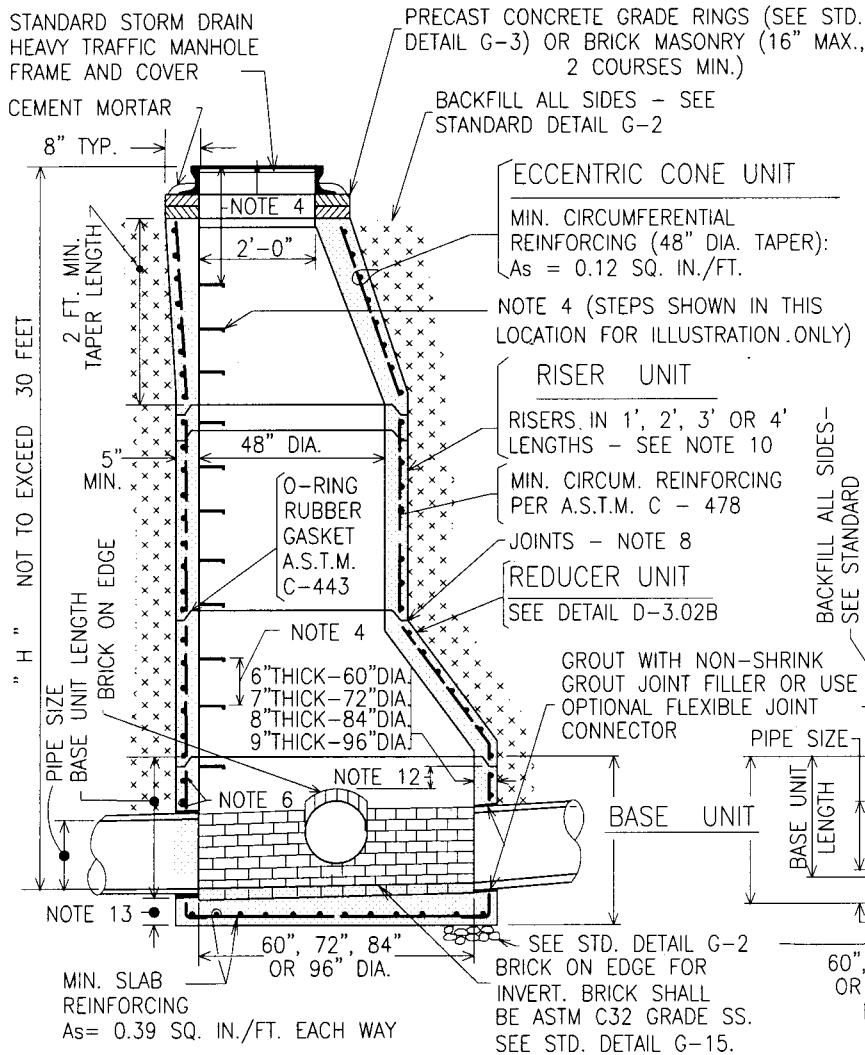


APPROVAL  
*[Signature]*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
1-2-07  
DATE

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

ISSUED: OCTOBER 1977  
REVISED: JULY 1985  
REVISED: OCTOBER, 2006

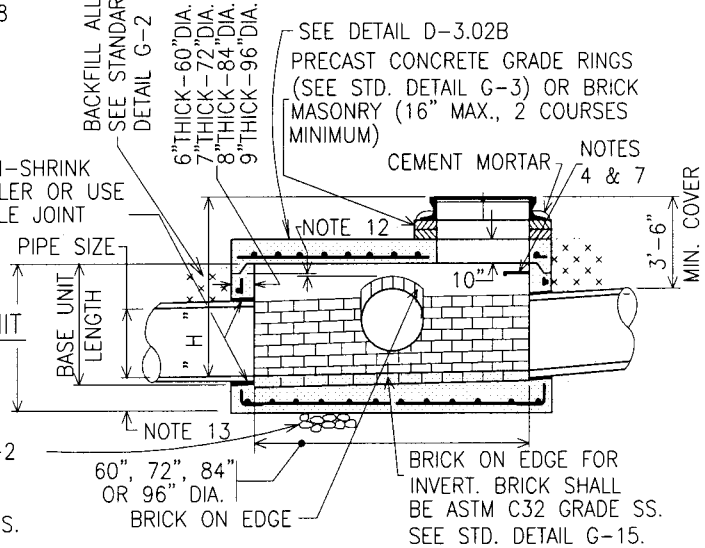
PLATE  
**D-3.01**



THROUGH PIPE DIA.	LATERAL PIPE DIA.			
	60" DIA. BASE	72" DIA. BASE	84" DIA. BASE	96" DIA. BASE
21"	*21"	USE ONLY WITH PRIOR APPROVAL		
24"	*18"-24"			
27"	15"-27"			
30"	15"-24"			
36"	15"	*27"-30"		
42"		*18"-30"	*36"	
48"	THROUGH PIPE TOO LARGE FOR MANHOLE	15"-24"	*27"-42"	
54"		15"	*18"-30"	*36"-48"
60"			15"-27"	*30"-42"
			15"	*18"-36"

TABLE BASED ON MAINTENANCE OF 6" MINIMUM  
REINFORCED WALL BETWEEN PIPE OPENINGS,  
MEASURED ALONG INSIDE WALL.

\* PIPE SMALLER THAN INDICATED ONLY WITH  
APPROVAL OF BCBEC-DESIGN.



## STANDARD PRECAST MANHOLE

## SHALLOW PRECAST MANHOLE

### NOTES:

- 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".
- ALL CONCRETE SHALL BE 4,500 PSI COMPRESSIVE STRENGTH.
- SHALLOW MH REINFORCEMENT SAME AS STANDARD MH.
- 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.
- A PRECAST MANHOLE SECTION MAY BE PLACED OVER EXISTING PIPE. SEE DETAIL FOR PRECAST MANHOLE "DOGHOUSE" RISER, STANDARD DETAIL PLATE D-3.07.
- MINIMUM CIRCUMFERENTIAL REINFORCEMENT PER A.S.T.M. C 478.
- USE A MINIMUM OF 1 MANHOLE STEP IN BASE UNIT.
- 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.
- SEE STANDARD DETAIL PLATE G-3 FOR SPECIFICATIONS & PLACEMENT OF PRECAST CONCRETE GRADE RINGS.
- 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.
- SEE DETAIL PLATE D-3.02B FOR PRECAST TOP SLAB DETAIL FOR SHALLOW MH.
- MAINTAIN 2" MIN. FROM PIPE OPENING TO JOINT OR PROVIDE A SPECIAL REINFORCED DESIGN.
- BOTTOM SLAB THICKNESS: 8" MIN. (60", 72" & 84" DIA.)  
10" MIN. (96" DIA.)



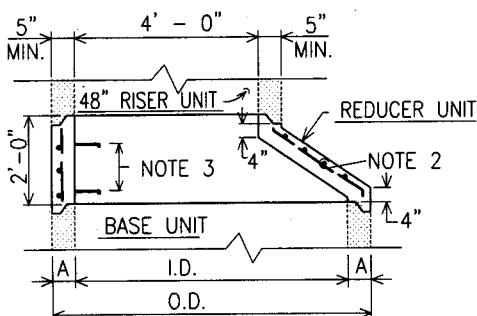
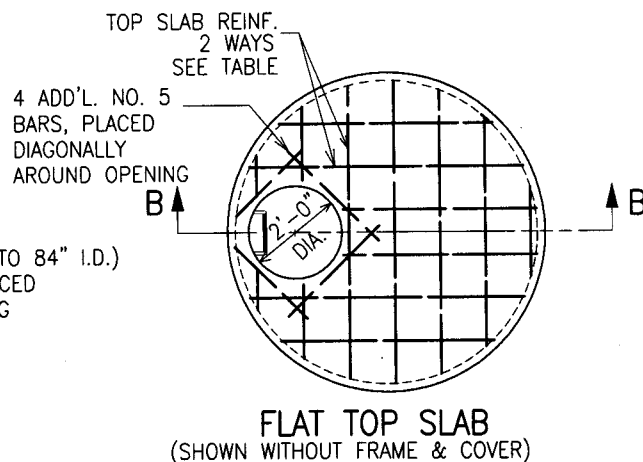
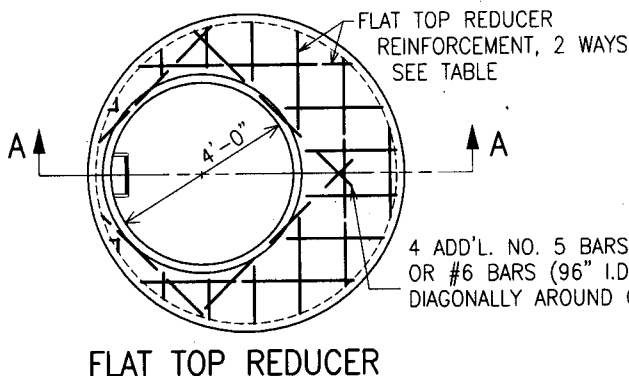
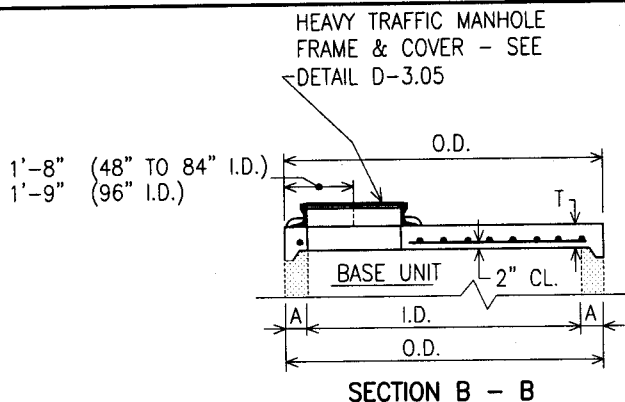
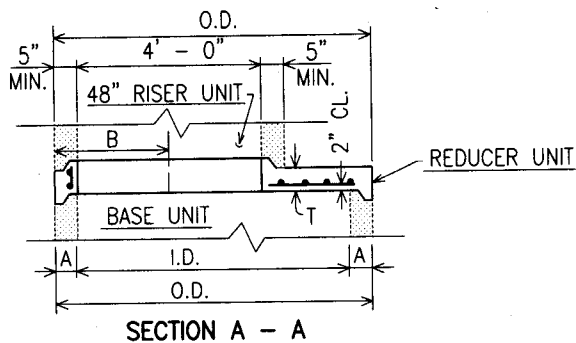
APPROVAL  
*[Signature]*  
DIRECTOR  
*[Signature]*  
BUR. OF ENGINEERING/CONSTRUCTION  
01-31-07  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
PRECAST TYPE C  
MANHOLE  
FOR PIPES 21" TO 60" HORIZ. DIA

ISSUED: OCTOBER 1977  
REVISED: JULY 1985  
REVISED: JANUARY 2007

PLATE

D-3.02A



I.D.	A	O.D.	B	T	WALL REINF.	FLAT TOP REDUCER REINF.	TOP SLAB REINF.
48"	5"	58"	-	8"	0.12 SQ.IN./FT (NOTE 2)	-	#5 BARS @ 12" C/C
60"	6"	72"	2'-6"	10"	0.15 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
72"	7"	86"	2'-7"	10"	0.18 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
84"	8"	100"	2'-8"	10"	0.21 SQ.IN./FT (NOTE 2)	#5 BARS @ 10" C/C	#5 BARS @ 10" C/C
96"	9"	114"	2'-9"	10"	0.24 SQ.IN./FT (NOTE 2)	#4 BARS (TOP) & #6 BARS (BOTTOM) @ 8" C/C	#5 BARS @ 10" C/C

- USE 4500 psi CONCRETE.
- 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.
- SEE DETAIL G-4 FOR MANHOLE STEPS.
- USE GRADE RING ADJUSTERS (DETAIL G-3) AS REQUIRED TO BRING MANHOLE FRAME TO GRADE.
- 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.
- THE BASE SHALL BE CAST MONOLITHIC WITH BASE UNIT OR JOINTED PER MANUFACTURER'S DESIGN.

- A LARGER DIAMETER UNIT OR SPECIAL DESIGN SHALL BE USED WHEN PIPE OPENINGS HAVE LESS THAN 6" BETWEEN THEM.
- LIFT HOLES OR EYES SHALL BE PROVIDED IN EACH SECTION FOR HANDLING.
- DRIP STONE LANDINGS (SEE DETAIL D-3.09A) SHALL BE USED ONLY WHEN PIPES ARE CONNECTED THROUGH RISER UNITS.
- PRECAST UNITS ARE UNACCEPTABLE IF INNER OR OUTER JOINT IS CRACKED OR BROKEN.



APPROVAL  
  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 DATE 7/10/05

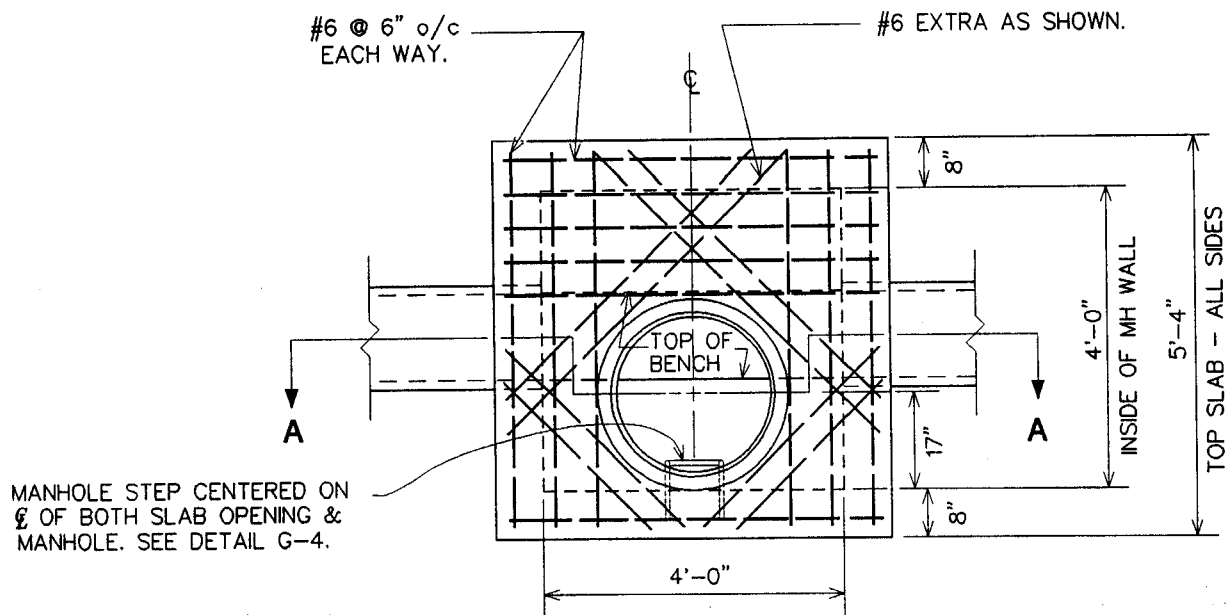
DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS

TYPE C MANHOLE  
 PRECAST REDUCERS

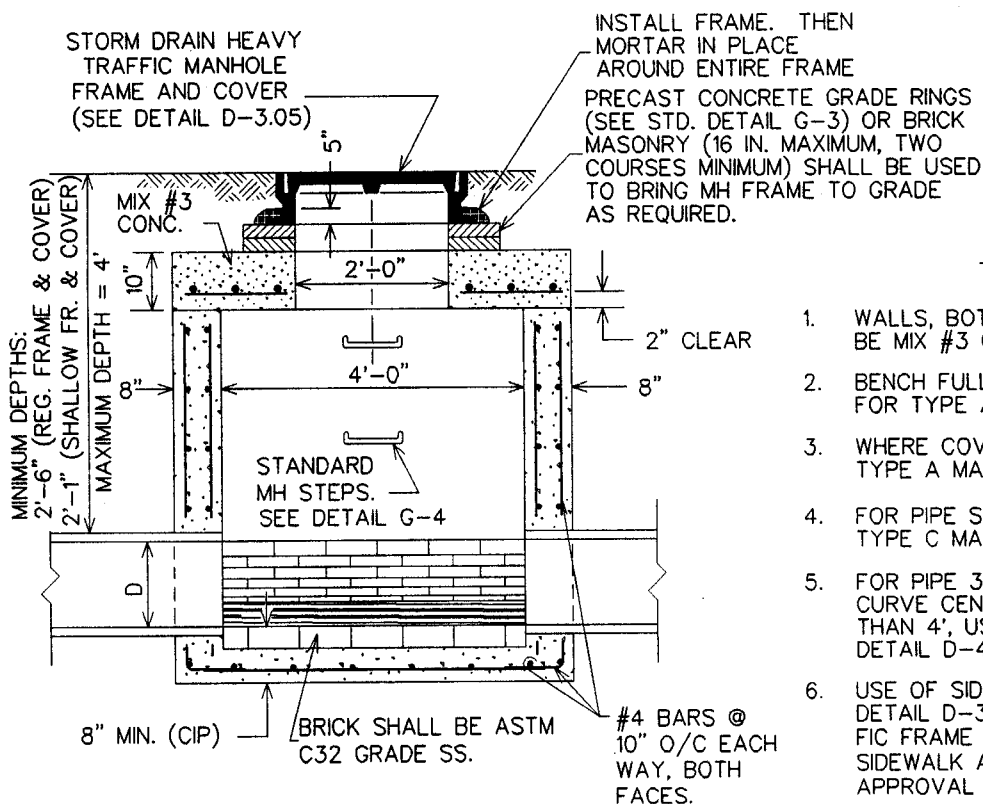
ISSUED: AUGUST, 1997  
 REVISED: DECEMBER 2001  
 REVISED: FEBRUARY 2005

PLATE

D-3.02B



**PLAN**



**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.



APPROVAL  
*William H. Koppman*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 3/18/02  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**TYPE B SHALLOW MANHOLE**  
 (FOR PIPES 15" TO 36" HORIZ. DIA.)

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

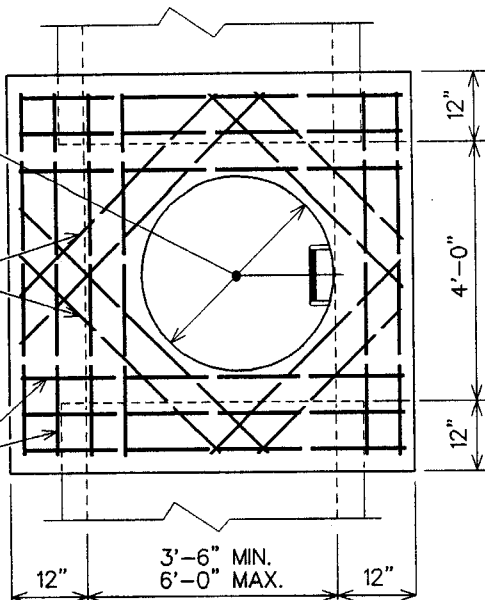
PLATE

**D-3.03**

2'-0" OR 3'-0"  
SEE NOTE 3

#7 EXTRA  
AS SHOWN

#7 @ 6" O/C  
EACH WAY



**TOP SLAB**

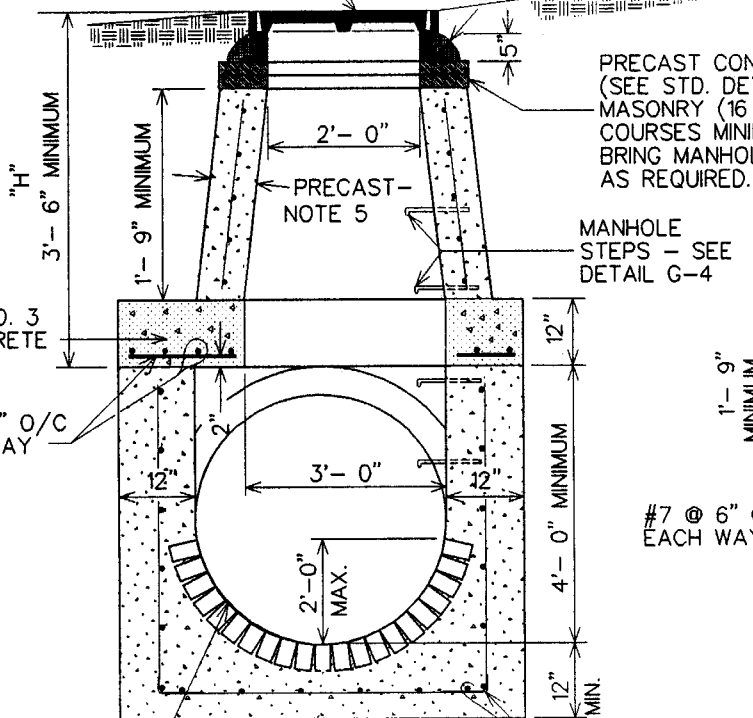
**NOTES :**

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".

STORM DRAIN HEAVY  
TRAFFIC MANHOLE  
FRAME AND COVER

MORTAR

GRADE



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

MANHOLE  
STEPS - SEE  
DETAIL G-4

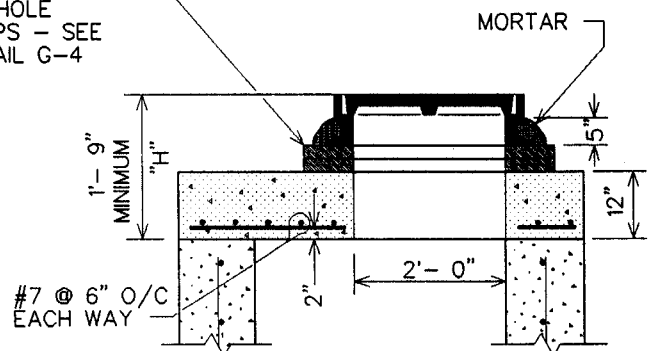
MIX NO. 3  
CONCRETE  
SLAB

#7 @ 6" O/C  
EACH WAY

BRICK SHALL BE ASTM  
C32 GRADE SS.

#4 BARS @  
12" C/C EACH  
WAY, 1/2 WALLS  
& BASE

**SECTION**



**ALTERNATE  
MANHOLE STACK**

( SEE NOTE 3 )



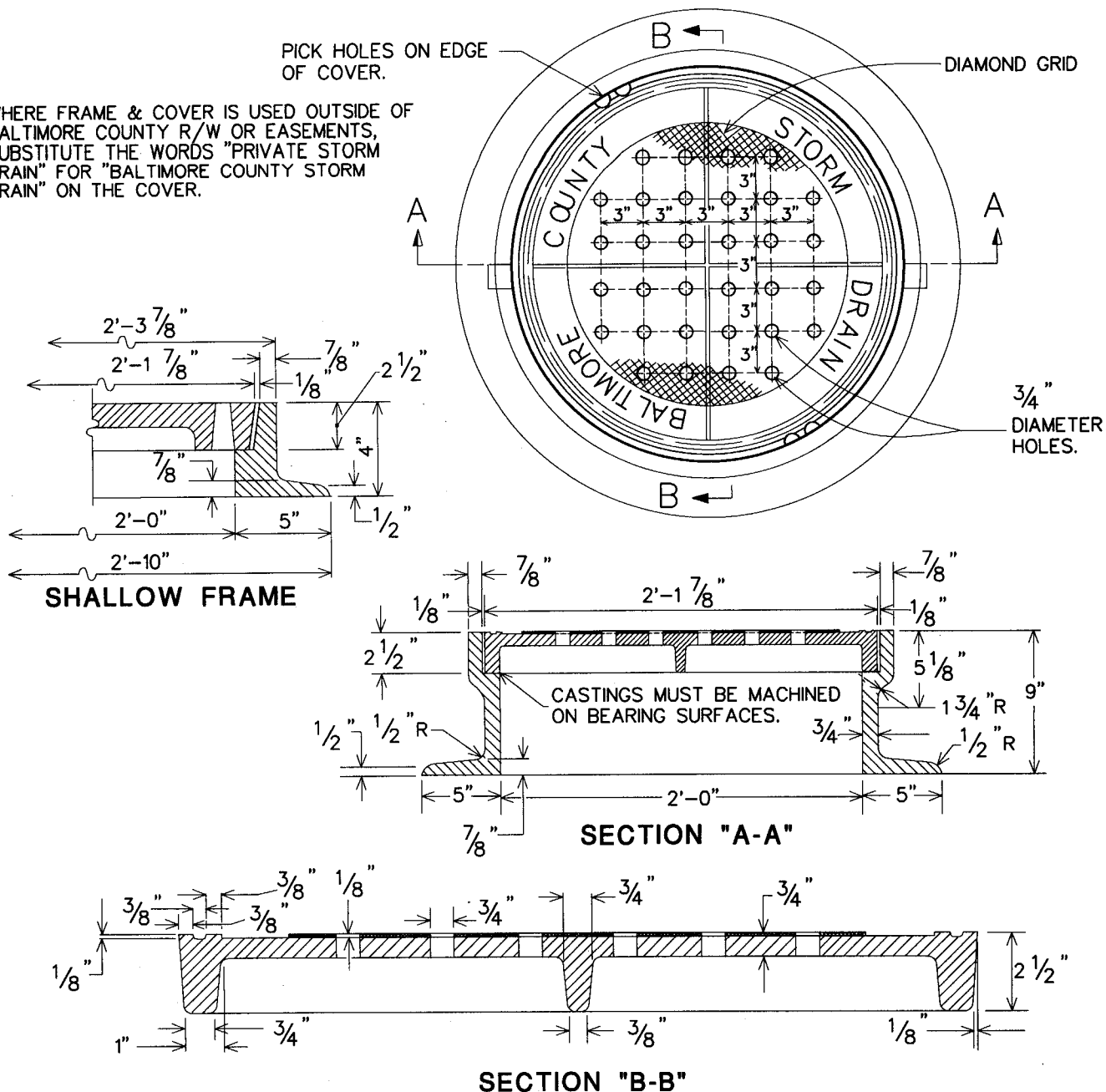
APPROVAL  
*William Kopman*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
3/18/02  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
**TYPE C MANHOLE**  
**42" & LARGER PIPES**  
(DEFLECTION @ LENGTH ≤ 4")

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

**D-3.04**

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 :

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.

#### NOMINAL WEIGHTS

	9" FRAME	4" SHALLOW FRAME
FRAME :	250 Lbs.	165 Lbs.
COVER :	135 Lbs.	135 Lbs.
TOTAL :	385 Lbs.	300 Lbs.



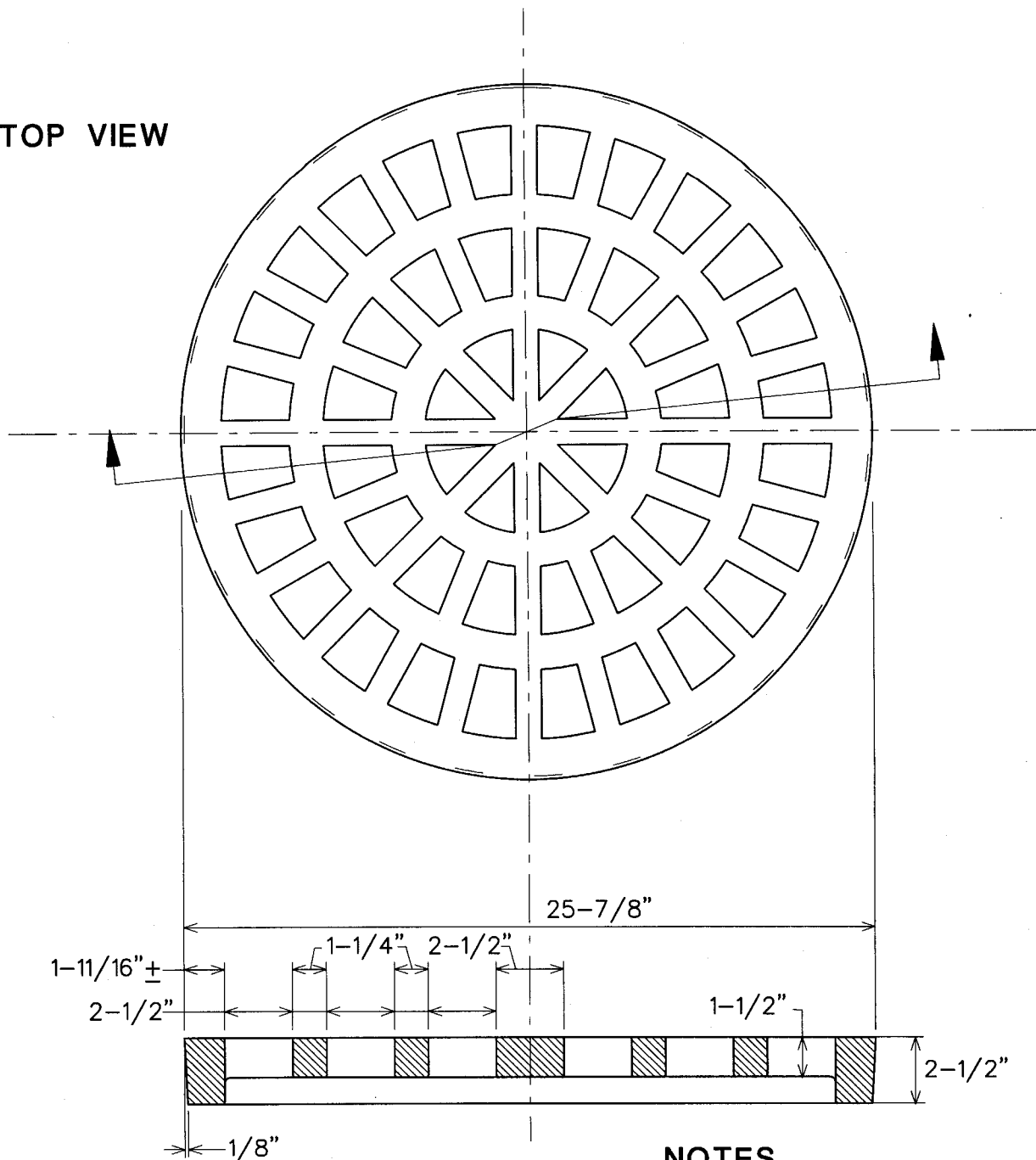
APPROVAL  
*William Kopman*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 10/23/97  
 DATE

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

ISSUED: OCTOBER, 1977  
 REVISED: AUGUST, 1997  
 REVISED:

PLATE  
 D-3.05

# TOP VIEW



# SECTION

## NOTES

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



APPROVAL  
*William F. Kopman*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 DATE 10/23/97

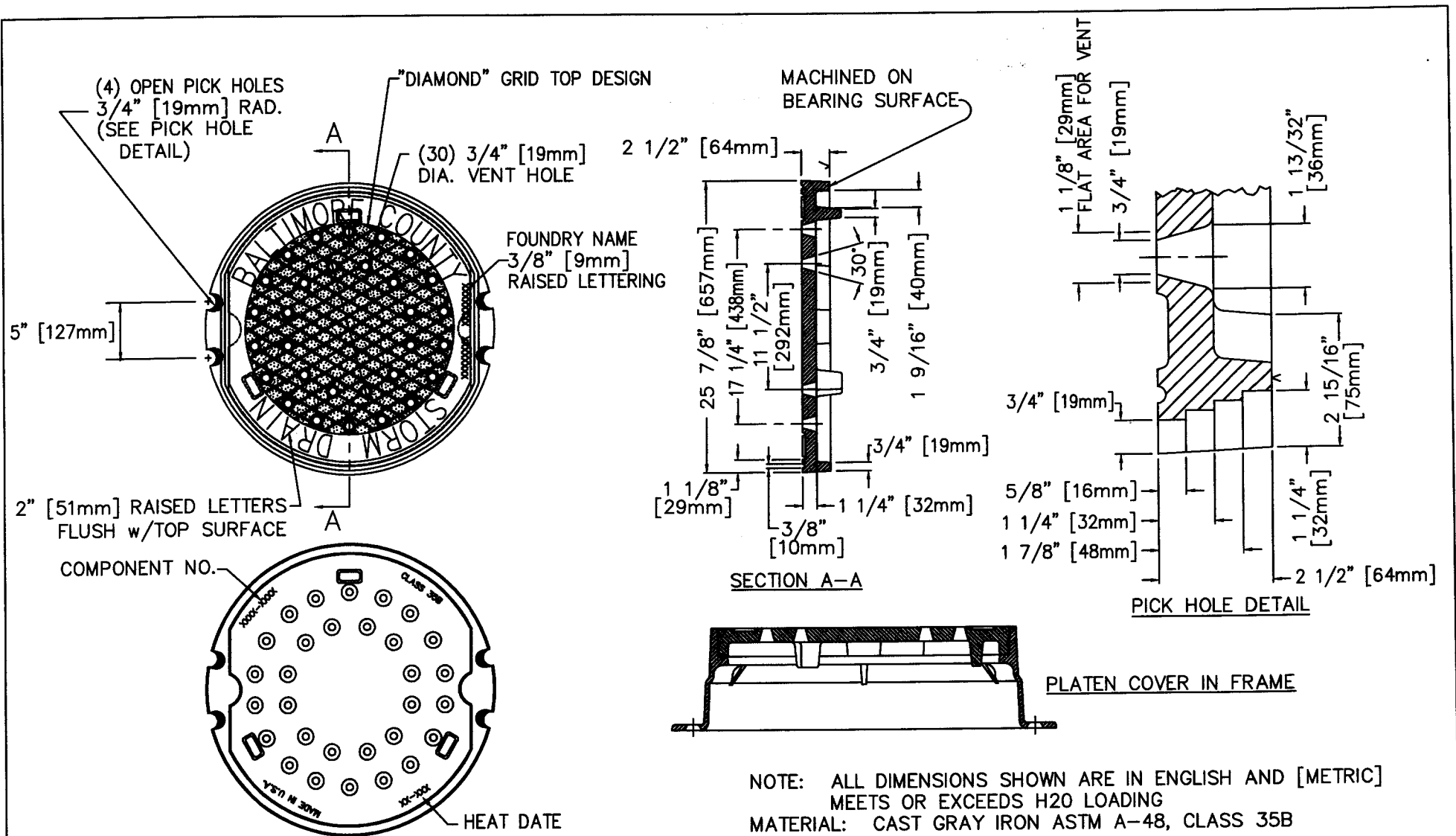
DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**RADIAL GRATE**  
 FOR USE WITH 24" HEAVY  
 TRAFFIC MANHOLE FRAME

ISSUED: AUGUST, 1997  
 REVISED:  
 REVISED:

PLATE  
**D-3.05A**

AUGUST 1997 003





NOTE: ALL DIMENSIONS SHOWN ARE IN ENGLISH AND [METRIC]  
MEETS OR EXCEEDS H20 LOADING  
MATERIAL: CAST GRAY IRON ASTM A-48, CLASS 35B  
FINISH: NO PAINT  
WEIGHT: APPROX. 149#  
FRAME: SEE DETAIL G-14

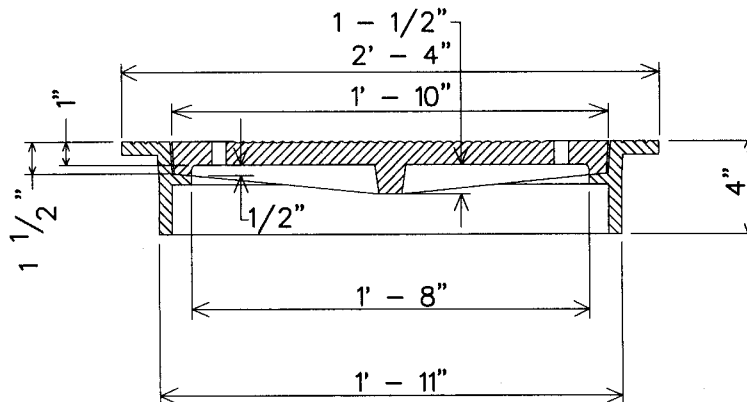
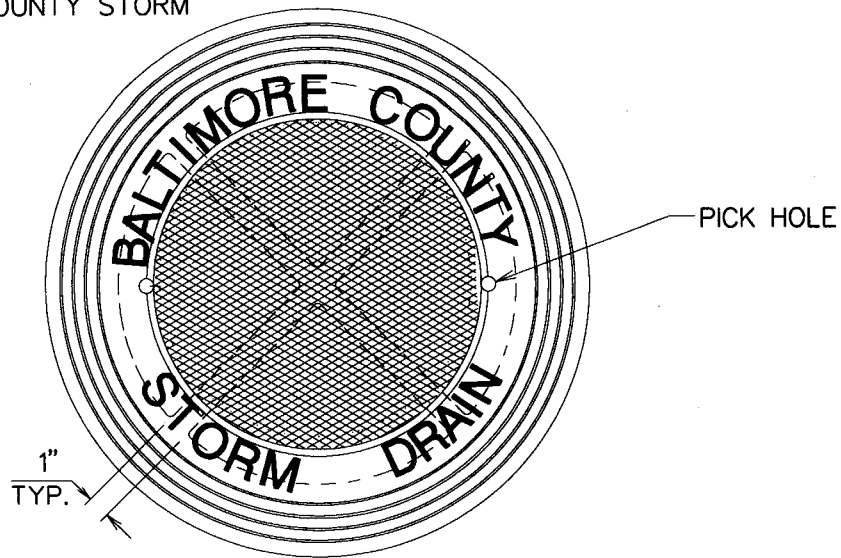


APPROVAL  
*William C. Blum, Jr.*  
DIRECTOR  
*William C. Blum, Jr.*  
BUR. OF ENGINEERING/CONSTRUCTION  
3/5/01  
DATE

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

ISSUED: JANUARY, 2001  
REVISED: \_\_\_\_\_  
REVISED: \_\_\_\_\_  
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.



APPROVAL  
*William H. Koppman*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
10/23/97  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS

**SIDEWALK  
FRAME & COVER**

ISSUED: OCTOBER, 1977  
REVISED: AUGUST, 1997  
REVISED:

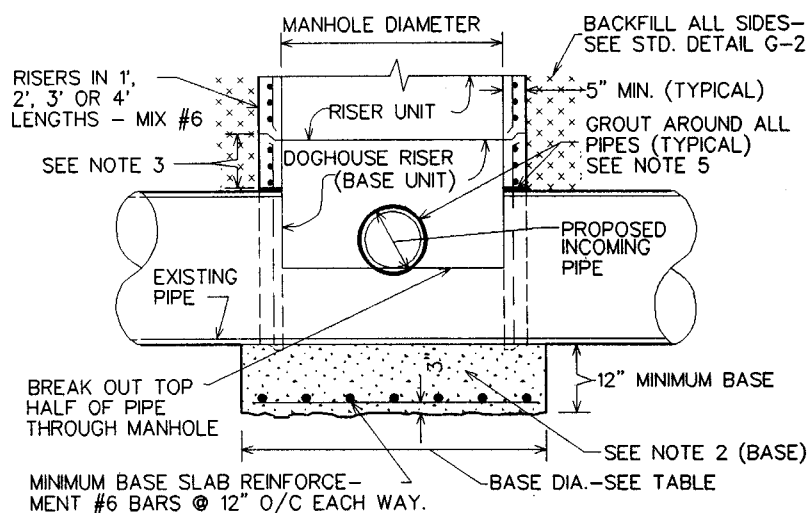
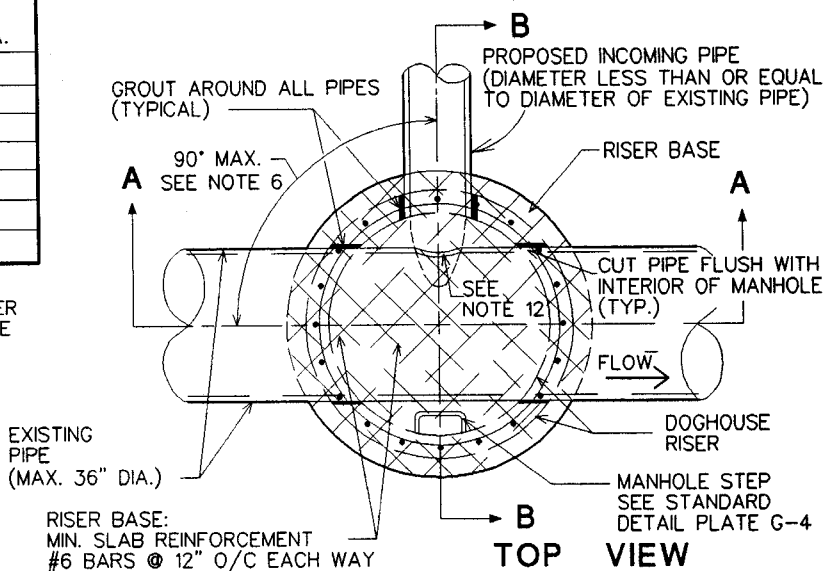
PLATE  
**D-3.06**

EX. PIPE DIA.	MANHOLE DIA.	MAXIMUM * LATERAL PIPE DIA.	MINIMUM BASE DIA.
42"	72"	24"	84"
30" OR 36"	72"	30"	84"
30"	60"	24"	72"
24" OR 27"	60"	SAME AS EX	72"
24"	48"	15"	60"
21"	48"	18"	60"
UP TO 18"	48"	SAME AS EX	60"

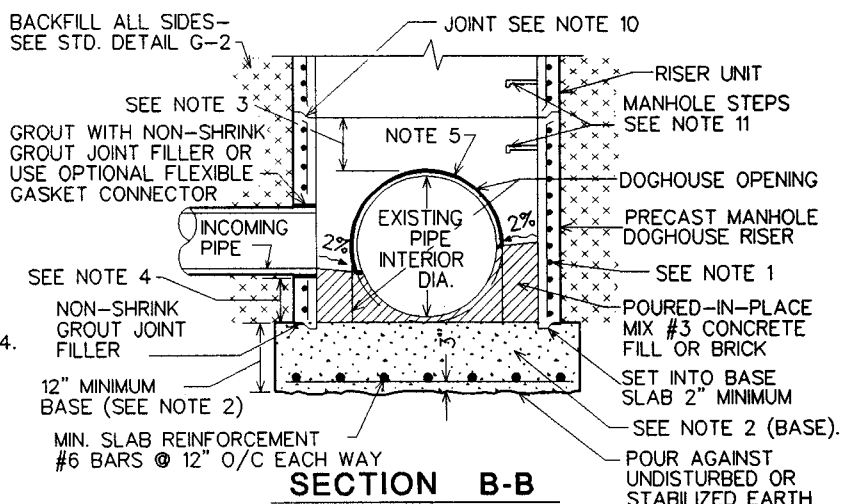
\* BASED ON LATERAL PIPE AT 90° TO EXISTING PIPE. WITH ABOUT THE SAME ELEVATION. OTHER ANGLES & ELEVATIONS MAY BE USED IF POSITIVE FLOW IS MAINTAINED WITHIN MANHOLE AND SIX INCHES OF REINFORCED "DOGHOUSE" WALL IS MAINTAINED BETWEEN PIPE OPENINGS.

### NOTES

- MANHOLE TAPERS, RISERS & BASES SHALL BE FURNISHED IN STRICT ACCORDANCE WITH ASTM DESIGNATION C-478 (LATEST) FOR "PRECAST REINFORCED CONCRETE MANHOLE SECTIONS".
- MANHOLE BASE SHALL BE MIX NO. 3 (3,500 P.S.I.) POURED-IN-PLACE CONCRETE.
- PROVIDE 12" MINIMUM CLEARANCE FROM INCOMING PIPE & FROM DOGHOUSE OPENING TOP(S) TO UPPER RISER JOINT
- PROVIDE 6" MINIMUM CLEARANCE FROM INCOMING PIPE OPENING TO BOTTOM OF DOGHOUSE UNIT
- MINIMUM 1" CLEARANCE SHALL BE MAINTAINED BETWEEN PIPES AND PRECAST DOGHOUSE PIPE OPENINGS. OPENINGS SHALL BE GROUTED WITH NON-SHRINK GROUT JOINT FILLER.
- IN ALL CASES, A MINIMUM 12" WIDE SECTION OF MANHOLE WALL SHALL BE MAINTAINED BETWEEN PIPE OPENINGS IN DOGHOUSE RISER.
- ALL REINFORCING STEEL SHALL CONFORM TO ASTM A-615, GRADE 60.
- SEE STANDARD PLATE D-3.01 FOR TYPE A & TYPE B SHALLOW MANHOLE DETAILS FOR USE WITH DOGHOUSE RISER SHOWN HERE. SEE STANDARD PLATE D-3.02 FOR 60" DIA. MANHOLE DETAILS FOR USE WITH DOGHOUSE RISER SHOWN HERE.
- MAXIMUM MANHOLE HEIGHT SHALL BE 30 FT. WHEN USING PRECAST DOGHOUSE RISER.
- 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.
- MANHOLE STEPS SHALL BE PROVIDED IF A RISER IS USED ABOVE THE DOGHOUSE RISER (BASE UNIT). SEE STANDARD DETAIL PLATE G-4.
- BREAK OUT ADDITIONAL PIPE AS REQUIRED TO PROVIDE POSITIVE FLOW FROM INCOMING PIPE TO CENTER MANHOLE CHANNEL.



### SECTION A-A



### SECTION B-B



APPROVAL  
*William E. Hoffman*  
 DIRECTOR  
 BUR. OF ENGINEERING / CONSTRUCTION  
 5/15/02  
 DATE

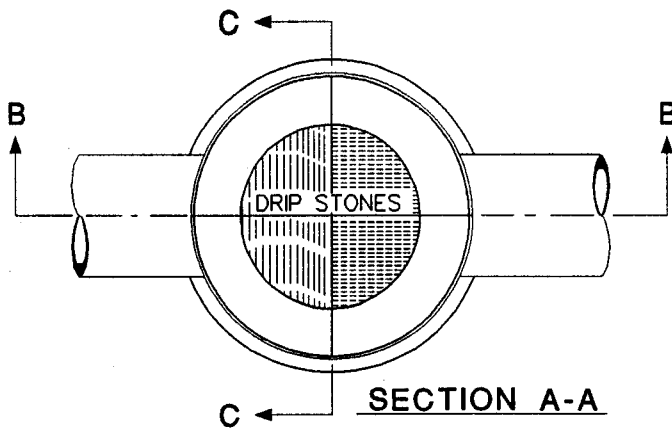
DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS

**PRECAST MANHOLE "DOGHOUSE"  
 RISER BUILT OVER EXISTING DRAIN  
 (FOR USE WITH PIPES 36" AND SMALLER)**

ISSUED: SEPTEMBER 16, 1991  
 REVISED: AUGUST, 1997  
 REVISED: MAY, 2002

PLATE

**D-3.07**



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"

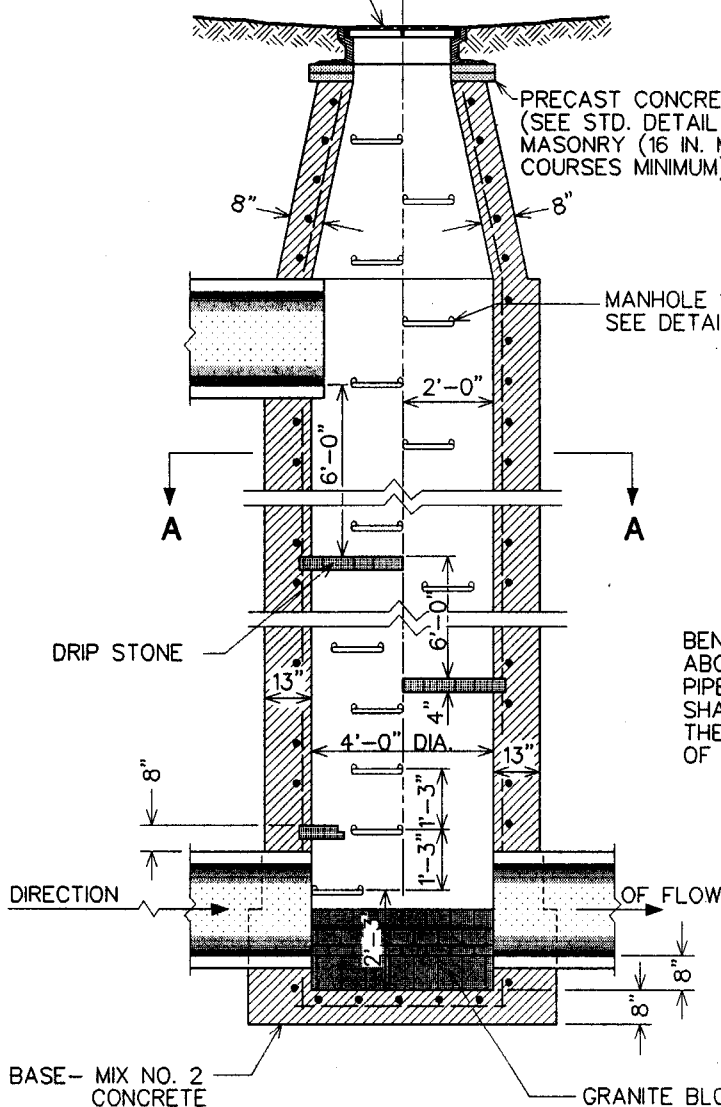
BASE THICKNESS:

8" WALL - USE 12" BASE

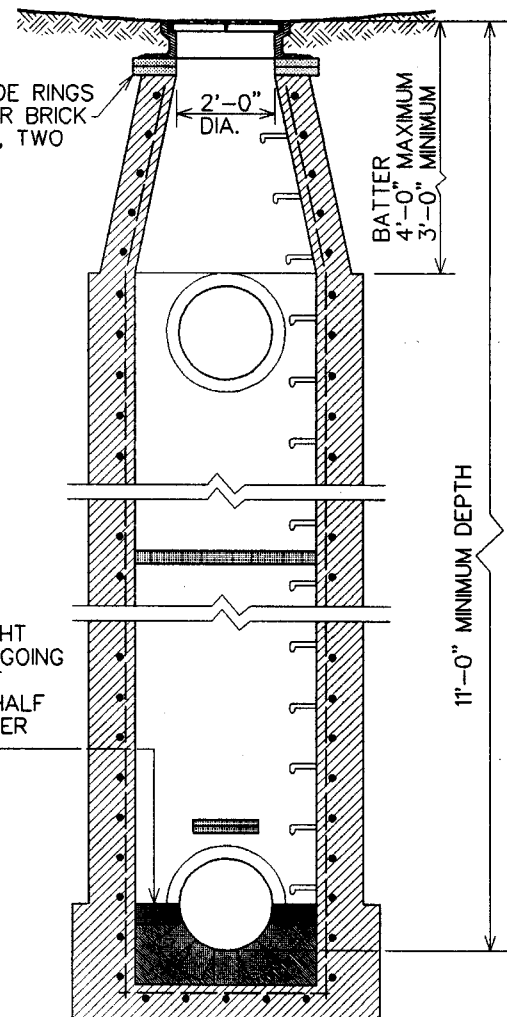
13" WALL - USE 16" BASE

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



SECTION B-B



SECTION C-C

GRANITE BLOCK OR  
BRICK MEETING ASTM  
C32 GRADE SS.



APPROVAL  
*William Kopman*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
DATE 3/18/02

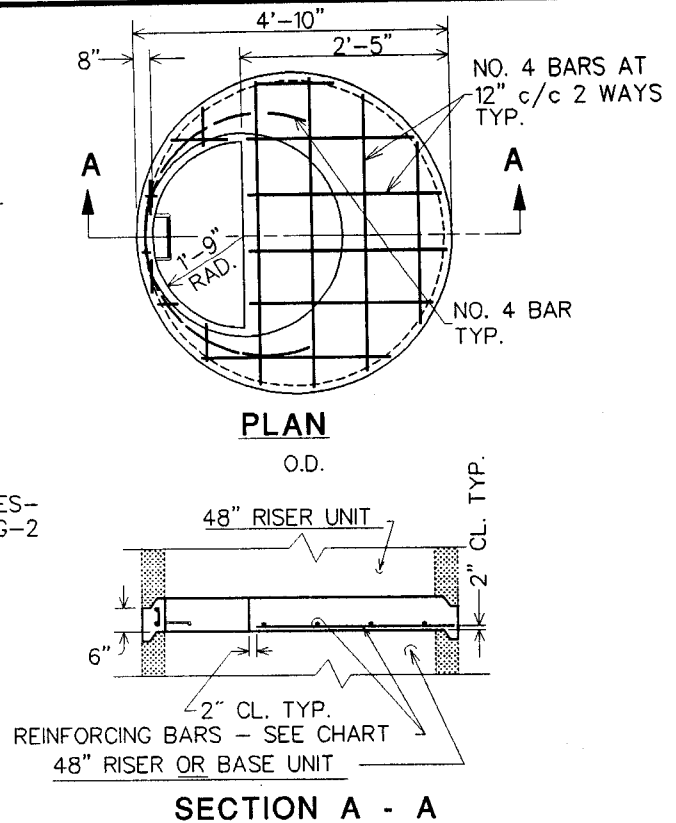
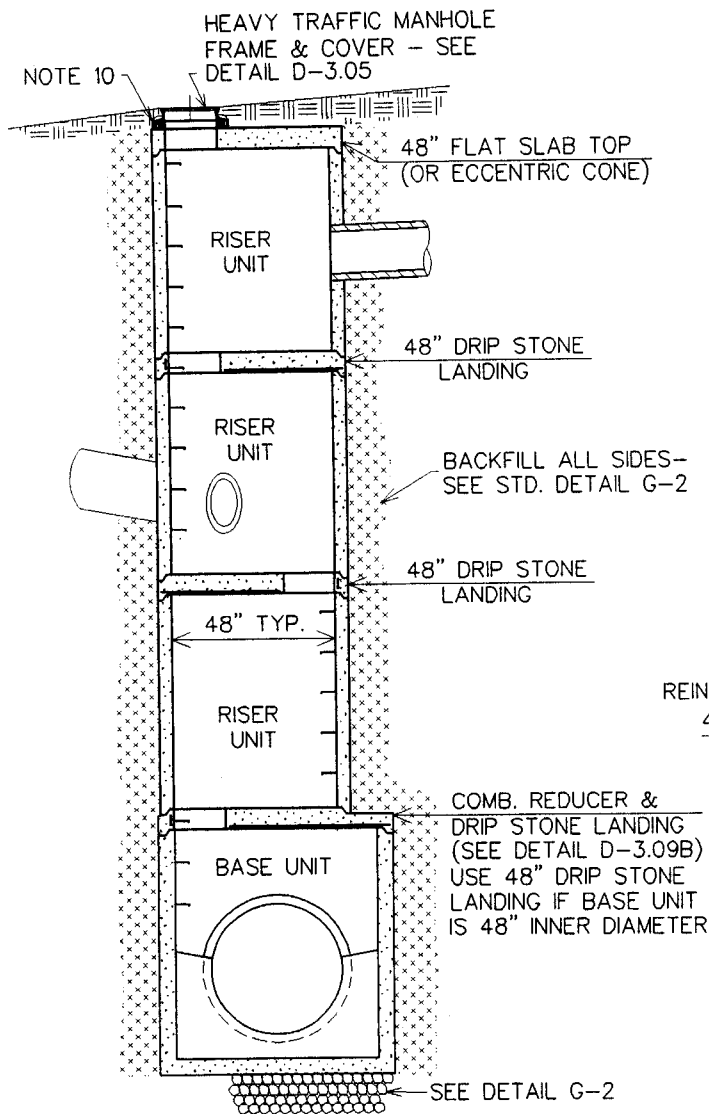
DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS

# STANDARD DROP MANHOLE

ISSUED: AUGUST, 1997  
REVISED: FEBRUARY, 2002  
REVISED:

PLATE

D-3.08



## 48" DIAMETER DRIP STONE LANDING

### 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.
8. MANHOLE STEPS: SEE DETAIL G-4.
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.



APPROVAL  
*William K. Korman*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
5/15/02  
DATE

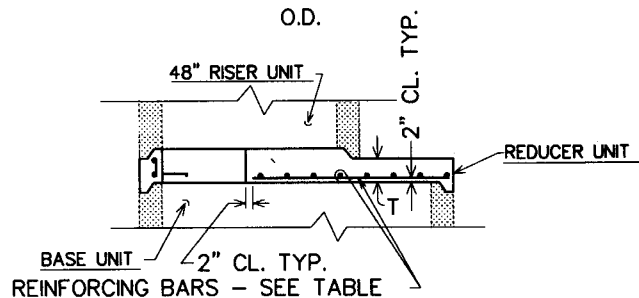
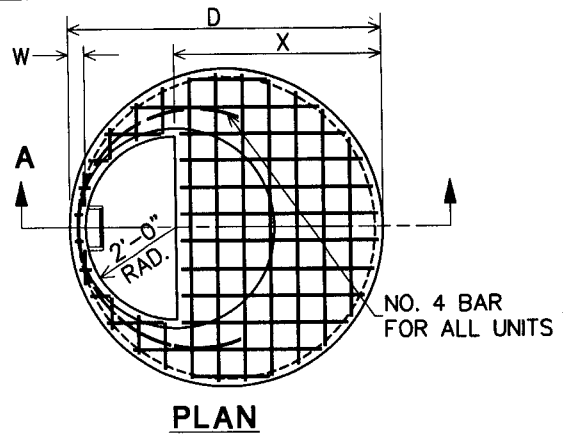
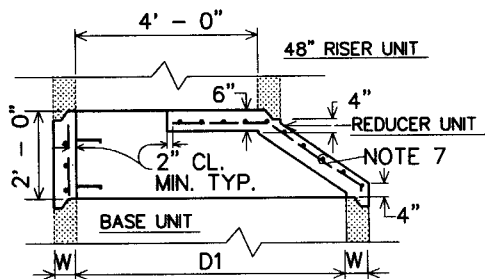
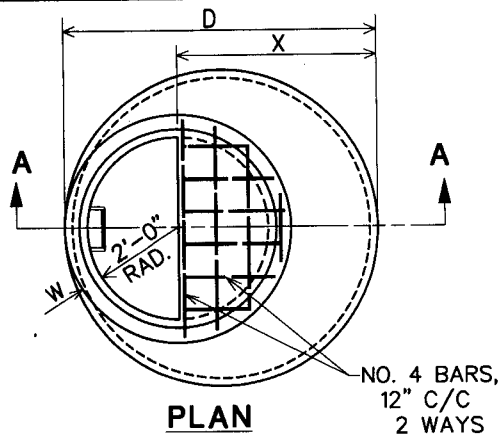
DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS

PRECAST  
DROP MANHOLE

ISSUED: AUGUST, 1997  
REVISED: MAY, 2002  
REVISED:

PLATE

D-3.09A



PRECAST MANHOLE DIAMETER	DIMENSIONS				REINF. IN <sup>2</sup> /FT
	D	D1	W	X	
60"	6'-0"	5'-0"	6"	3'-6"	0.15
72"	7'-2"	6'-0"	7"	4'-7"	0.18

### ECCENTRIC CONE REDUCER & DRIP STONE

PRECAST MANHOLE DIAMETER	DIMENSIONS				REINF. BARS PLACED 2 WAYS	
	D	T	W	X	TOP LAYER	BOTTOM LAYER
60"	6'-0"	5"	6"	3'-6"	N/A	NO. 5 AT 10"c/c
72"	7'-2"	6"	7"	4'-7"	N/A	NO. 5 AT 10"c/c
84"	8'-4"	7"	8"	5'-8"	N/A	NO. 5 AT 10"c/c

### FLAT TOP 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.

7. ECCENTRIC CONE REINFORCEMENT SHALL BE REINFORCING BARS OR WELDED WIRE FABRIC AS SHOWN IN TABLE
8. MANHOLE STEPS: SEE DETAIL G-4.

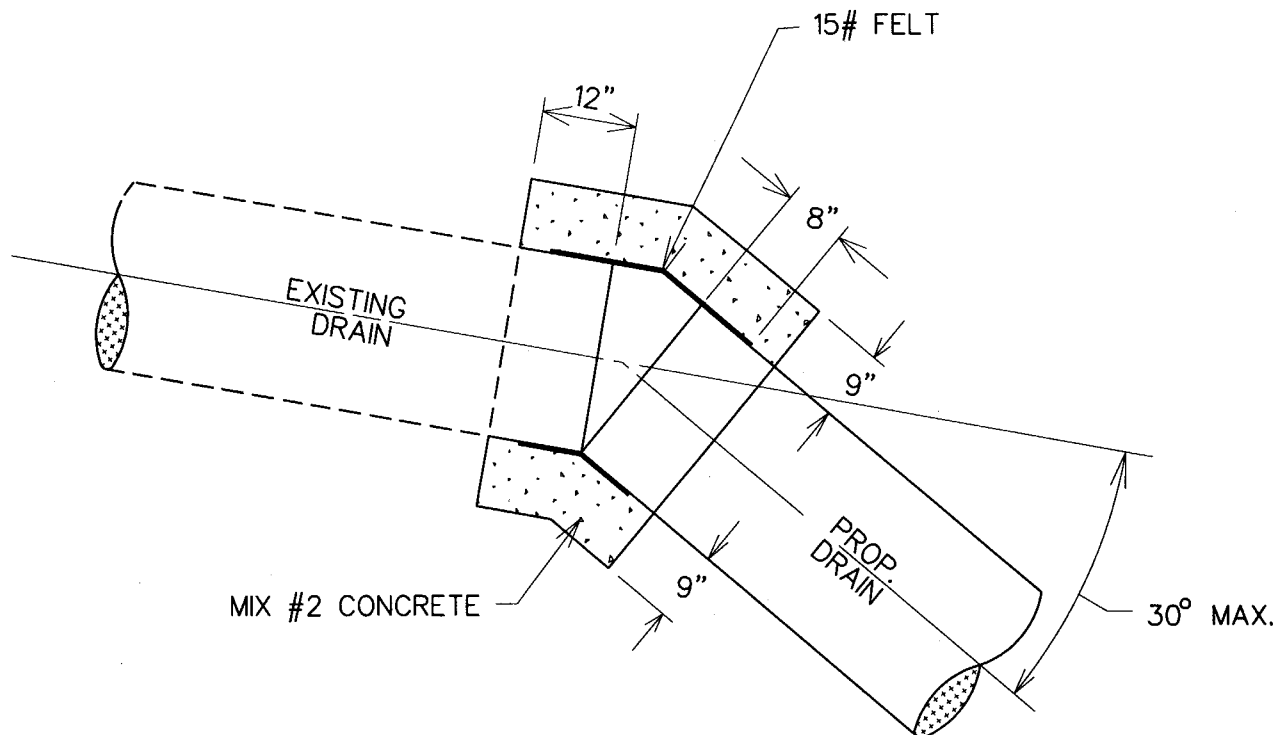


APPROVAL  
*William R. Ryan*  
DIRECTOR  
BUR. OF ENGINEERING/CONSTRUCTION  
10/23/97  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
**PRECAST REDUCERS  
WITH DRIP STONE LANDING**

ISSUED: AUGUST, 1997  
REVISED:  
REVISED:

PLATE  
**D-3.09B**



NOTE: FOR DRAINS OVER 24" DIAMETER, USE  
BRICK BEND OR MANHOLE

MANHOLE REQUIRED IN LIEU OF COLLAR  
AS DIRECTED BY DEPARTMENT OF  
PUBLIC WORKS.

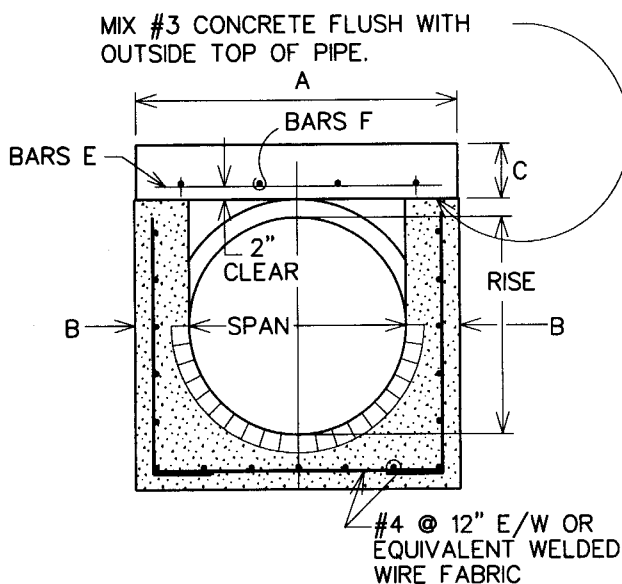
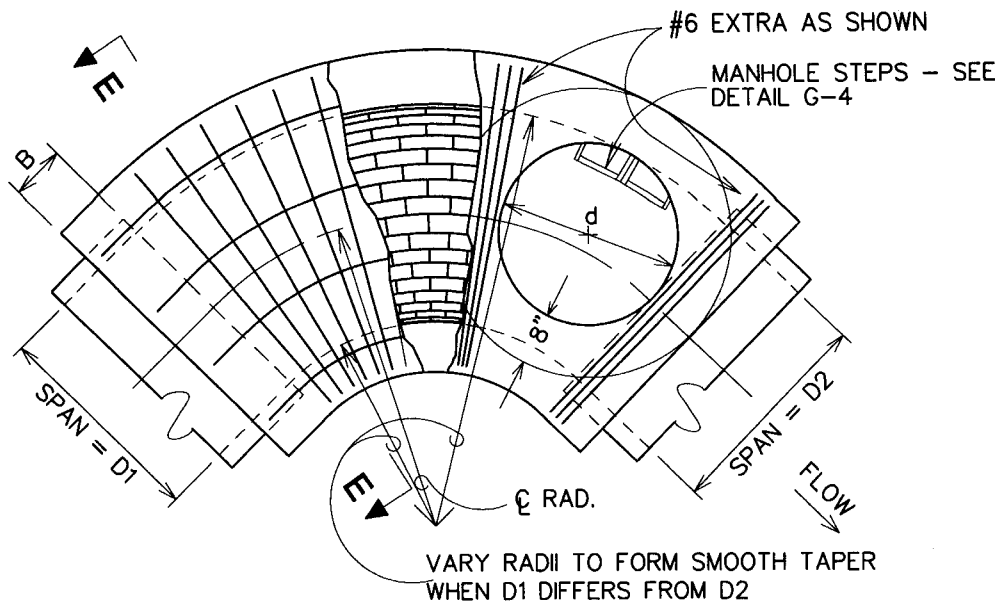


APPROVAL  
*William J. Hoffman*  
DIRECTOR  
BUR. OF ENGINEERING CONSTRUCTION  
10/23/97  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
**CONCRETE COLLAR**  
24" DRAIN & UNDER

ISSUED: OCTOBER, 1977  
REVISED: AUGUST, 1997  
REVISED:

PLATE  
**D-4.00**



## SECTION E - E

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

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  $C$  RADIUS, DIMENSIONS B & C AND REINFORCEMENT.
5. MANHOLE OPENING  $d$  SHALL BE BASED ON DOWN-STREAM 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.



APPROVAL  
*William J. Speman*  
 DIRECTOR  
 BUR. OF ENGINEERING CONSTRUCTION  
 10/23/97  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**BEND STRUCTURE**

ISSUED: OCTOBER 1977  
 REVISED: AUGUST, 1997  
 REVISED:

PLATE

**D-4.01**



## CIRCULAR PIPE:

PIPE DIA	CL RADIUS	A	B	C	BARS E CL SPACING	BARS F	d	MASONRY VOLUME (CF/F) BELOW SLAB
30"	5' -0"	3' -10"	8"	8"	#5 @ 6" o/c	3-#5	30"	6.9
33"	6' -0"	4' -1"	8"	8"	#5 @ 6" o/c	3-#5	30"	7.6
36"	6' -0"	4' -4"	8"	8"	#5 @ 6" o/c	3-#5	36"	8.3
42"	7' -0"	4' -10"	8"	10"	#5 @ 6" o/c	4-#5	36"	9.7
48"	8' -0"	5' -4"	8"	10"	#5 @ 6" o/c	4-#5	36"	11.2
54"	9' -0"	6' -6"	12"	10"	#5 @ 6" o/c	5-#5	36"	18.6
60"	10' -0"	7' -0"	12"	12"	#6 @ 8" o/c	6-#5	36"	20.7
66"	11' -0"	7' -6"	12"	12"	#6 @ 8" o/c	7-#5	36"	22.8
72"	12' -0"	8' -0"	12"	12"	#6 @ 8" o/c	7-#5	36"	25.0

## HORIZONTAL ELLIPTICAL CONCRETE PIPE:

PIPE DIMEN	CL RADIUS	A	B	C	BARS E CL SPACING	BARS F CL SPACING	d	MASONRY VOLUME (CF/F) BELOW SLAB
38" x 24"	6' -0"	4' -8"	8"	10"	#5 @ 6" o/c	#5 @ 8" o/c	36"	12.0
42" x 27"	7' -0"	4' -10"	8"	10"	#5 @ 6" o/c	#5 @ 8" o/c	36"	13.5
45" x 29"	8' -0"	5' -1"	8"	10"	#5 @ 6" o/c	#5 @ 8" o/c	36"	14.7
53" x 34"	9' -0"	5' -9"	8"	10"	#5 @ 6" o/c	#5 @ 8" o/c	36"	18.4
60" x 38"	10' -0"	6' -4"	8"	12"	#6 @ 8" o/c	#6 @ 10" o/c	36"	22.1
68" x 43"	11' -0"	7' -8"	12"	12"	#6 @ 8" o/c	#6 @ 10" o/c	36"	33.7
76" x 48"	12' -0"	8' -4"	12"	12"	#6 @ 8" o/c	#6 @ 10" o/c	36"	39.3
83" x 53"	13' -0"	8' -11"	12"	12"	#6 @ 8" o/c	#6 @ 10" o/c	36"	44.1
91" x 58"	14' -0"	9' -7"	12"	12"	#6 @ 8" o/c	#6 @ 10" o/c	36"	50.4



APPROVAL  
  
 DIRECTOR  
 BUR. OF ENGINEERING & CONSTRUCTION  
 10/23/97  
 DATE

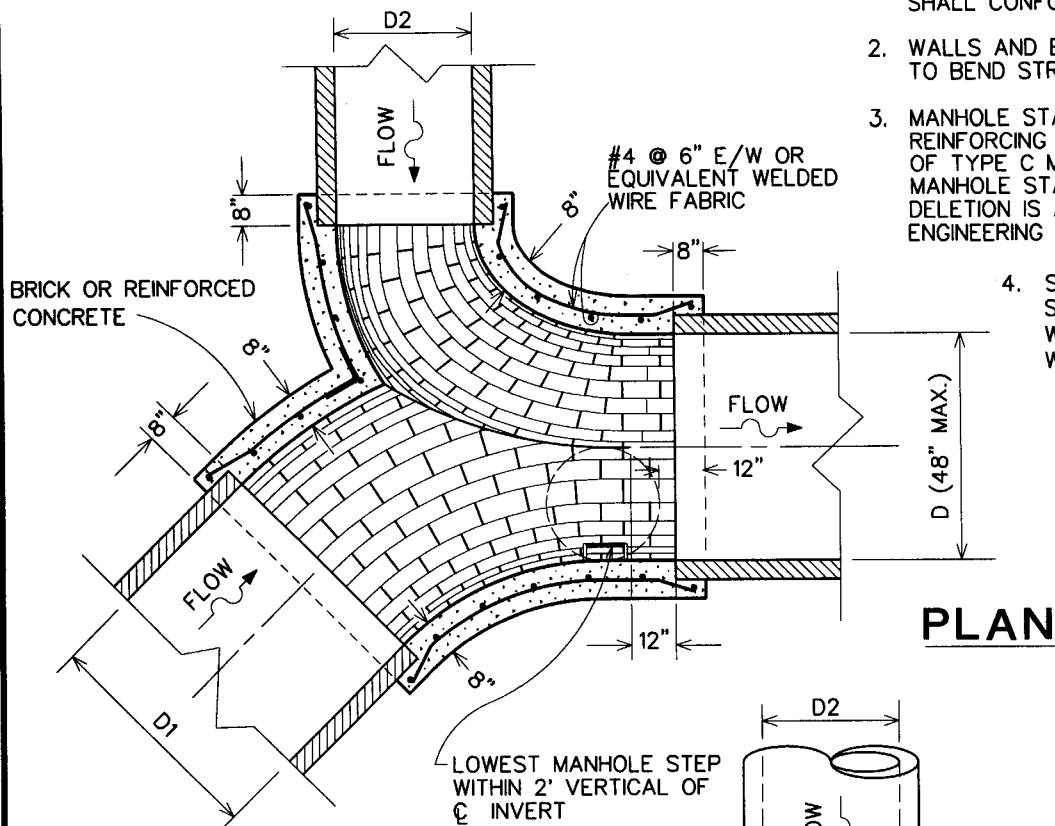
DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**BEND STRUCTURE**  
 TABLES & DIMENSIONS

ISSUED: OCTOBER 1977  
 REVISED: AUGUST, 1997  
 REVISED:

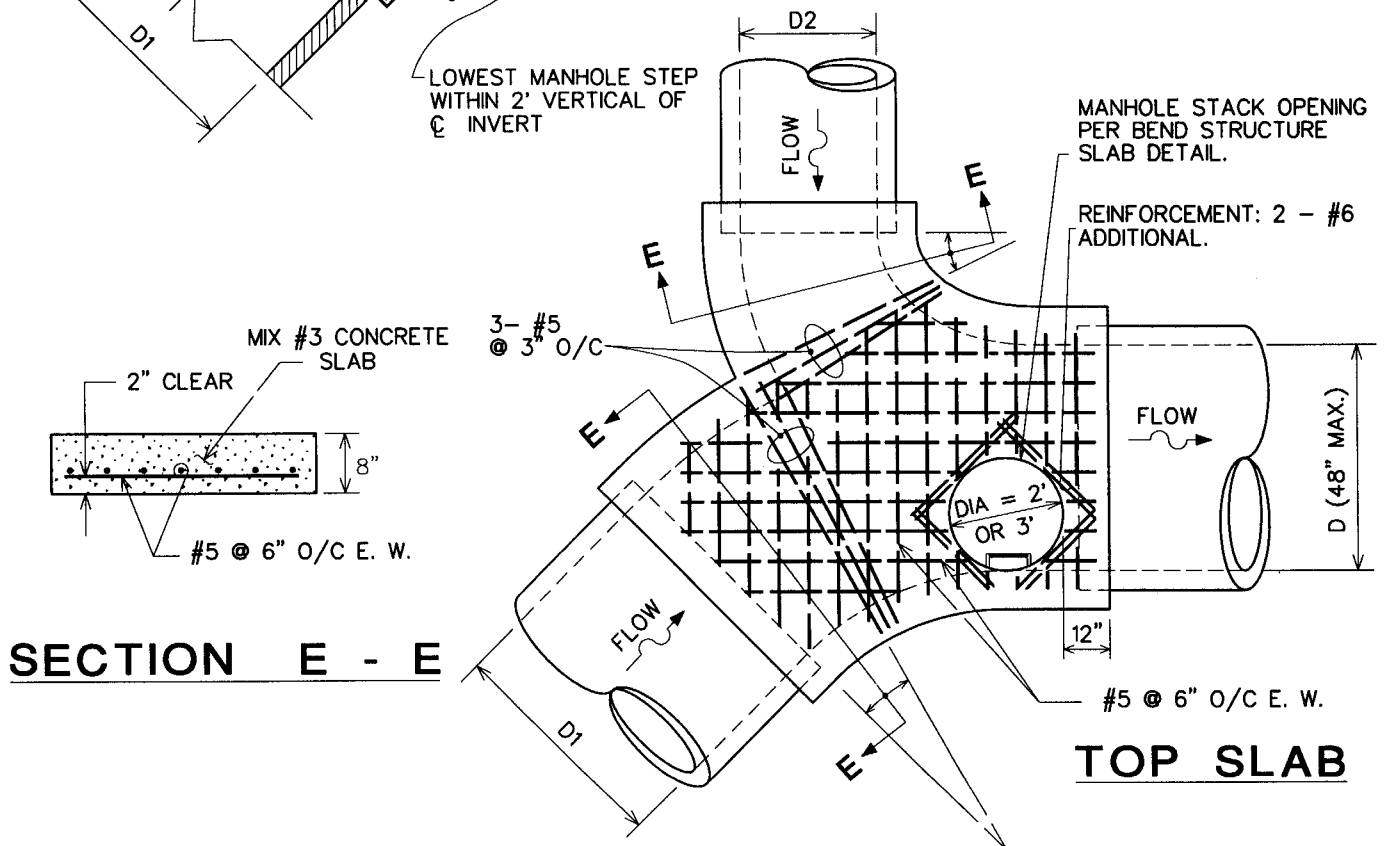
PLATE  
**D-4.02**

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



## SECTION E - E

## TOP SLAB



APPROVAL

~~DIRECTOR~~

BUR. OF ENGINEERING CONSTRUCTION

10/23/97  
DATE

DATE \_\_\_\_\_

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS

# TYPE I JUNCTION CHAMBER

ISSUED: OCTOBER 1977

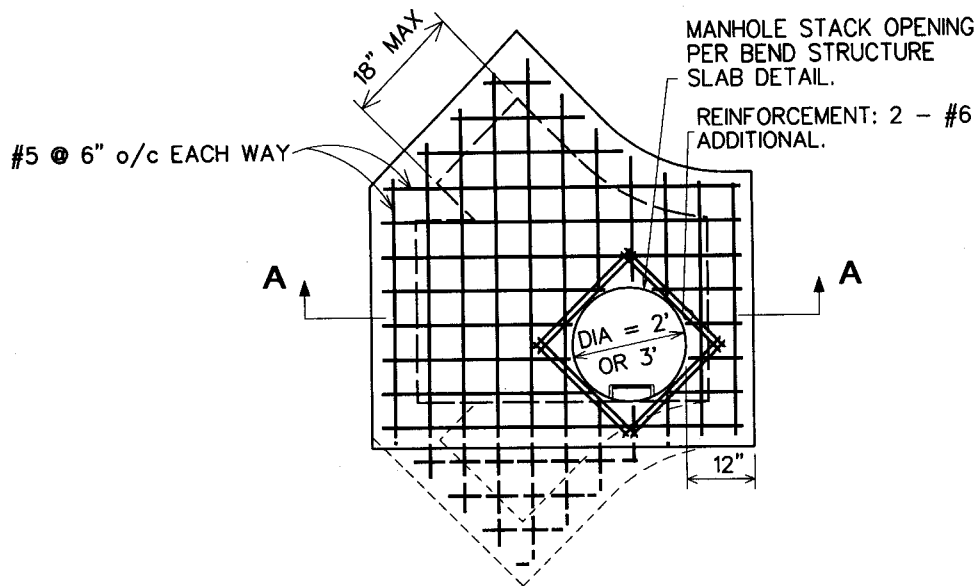
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REVISED: AUGUST, 1997

REVISÉ: \_\_\_\_\_  
REVISÉ: \_\_\_\_\_

PLATE

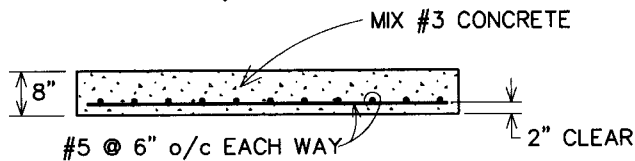
**D-4.03**

1999 / 2000 1997 1998 1999 2000



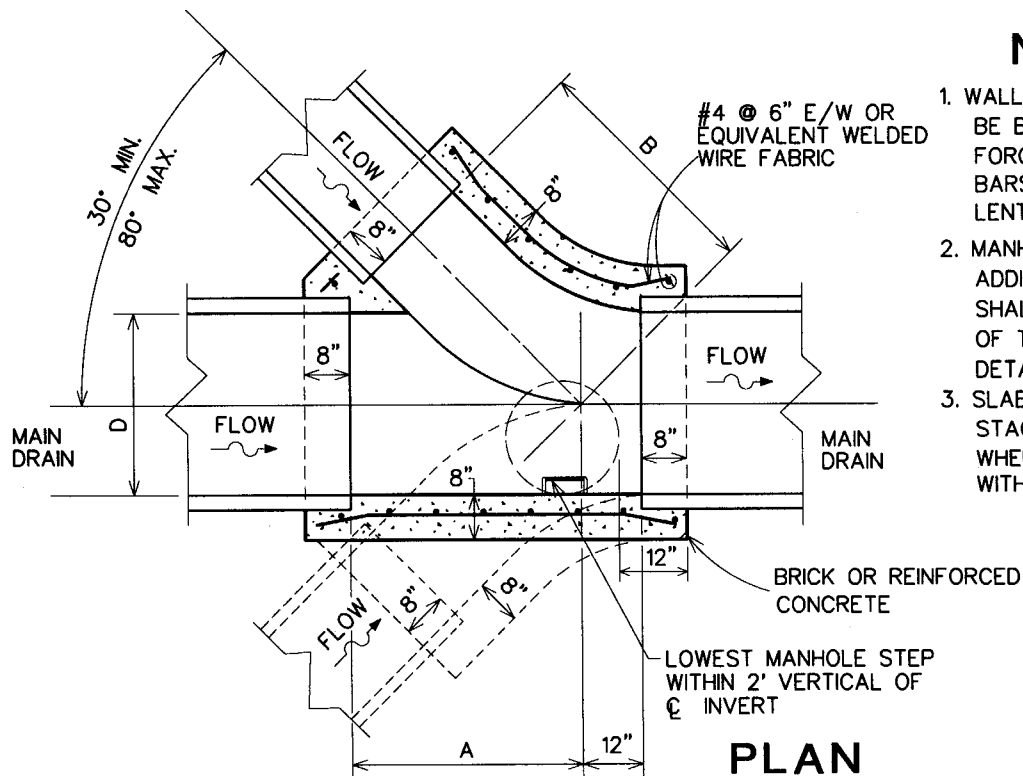
MINIMUM DIMENSIONS		
D	A	B
15"-18"	3'-9"	2'-9"
21"-30"	4'-4"	3'-7"
33"-36"	4'-7"	3'-11"

PLAN



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.



APPROVAL  
*William H. Hymon*  
 DIRECTOR  
 BUR. OF ENGINEERING CONSTRUCTION  
 10/23/97  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS

**BRICK "Y"  
 SINGLE & DOUBLE**

ISSUED: OCTOBER 1977  
 REVISED: AUGUST, 1997  
 REVISED:

PLATE

**D-4.04**

TRIM END OF SMALLER  
PIPE FLUSH WITH INSIDE  
OF LARGER PIPE

6 - 2" x 3/16" STAINLESS  
STEEL HANGERS

MORTAR

MIX #2  
CONCRETE

R

R + 18"

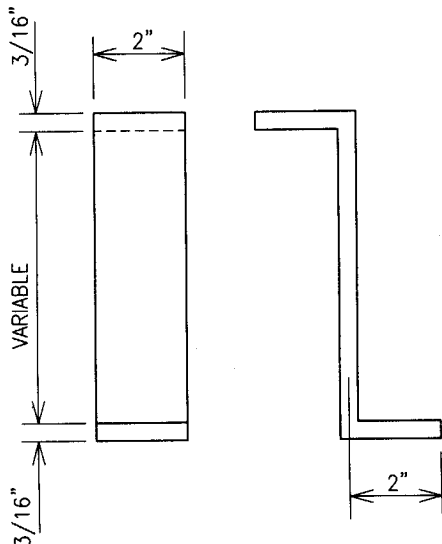
EXISTING CONCRETE PIPE

TRENCH WIDTH OF  
SMALLER PIPE

VARIABLE -  
45° TO 80°

FLOW

MORTAR AROUND JOINT  
TO FORM WATERTIGHT  
CONNECTION



STAINLESS STEEL PIPE HANGER

1. USE WITH CONCRETE PIPE ONLY.
2. MINIMUM DIAMETER OF LARGE PIPE = 30"
3.  $\frac{\text{SMALL PIPE DIAMETER}}{\text{LARGE PIPE DIAMETER}} = 0.45 \text{ MAX.}$
4. ONE FIELD CONNECTION MAXIMUM PER SINGLE LENGTH OF LARGE PIPE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
FIELD CONNECTION

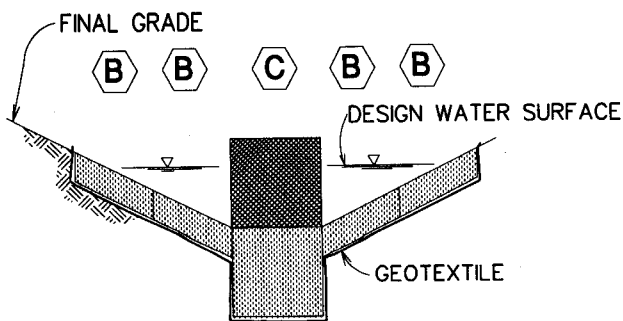
ISSUED: APRIL, 1999  
REVISED: JANUARY, 2005  
REVISED:

PLATE

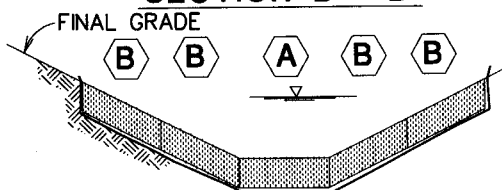
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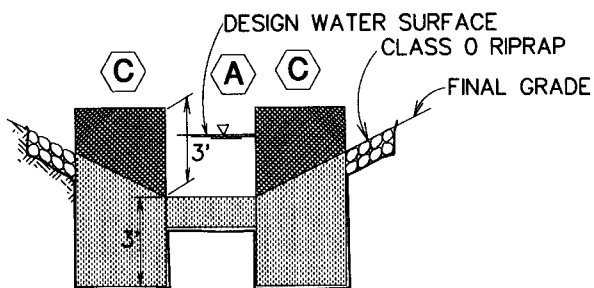
APPROVED  
*[Signature]*  
DIRECTOR  
*[Signature]*  
BUR. OF ENGINEERING/CONSTRUCTION  
3/17/05  
DATE



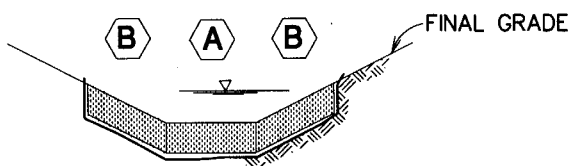
**SECTION B - B**



**SECTION C - C**

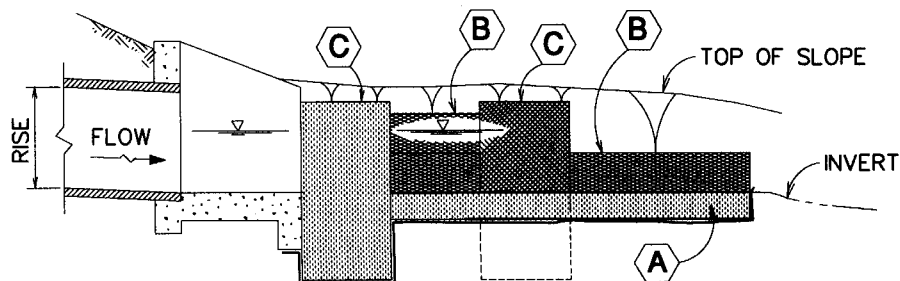


**SECTION D - D**



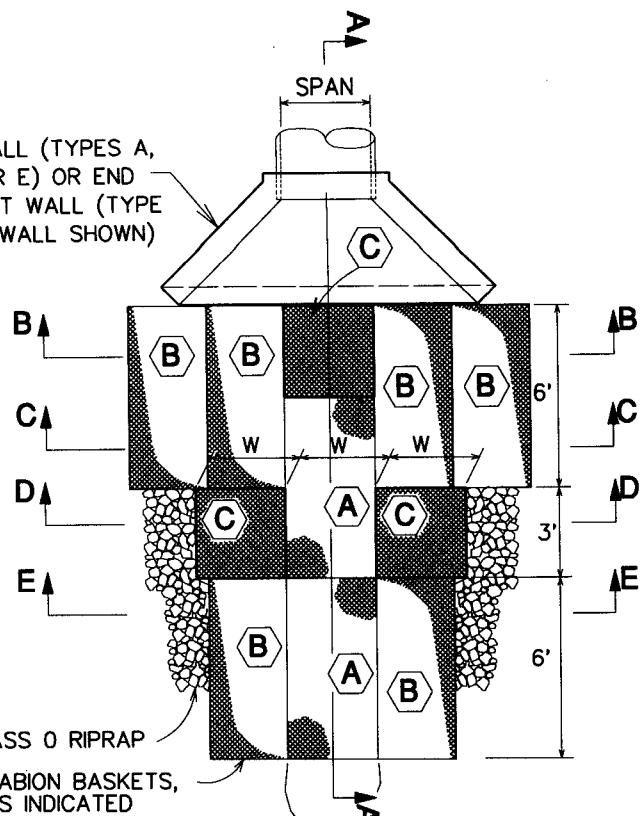
**SECTION E - E**

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



**SECTION A - A**

HEADWALL (TYPES A, B, C, OR E) OR END SUPPORT WALL (TYPE A HEADWALL SHOWN)



**PLAN**

EXISTING STREAM

- A** 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.

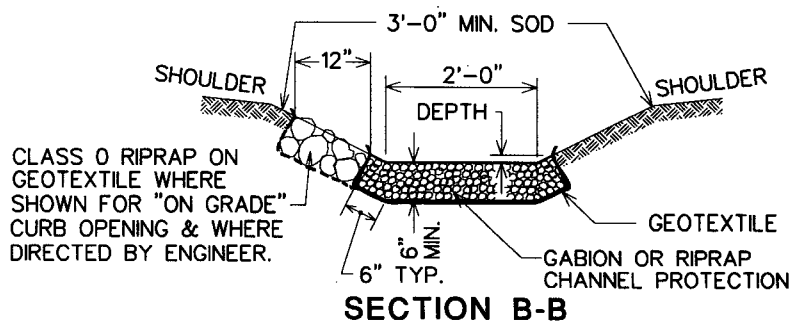


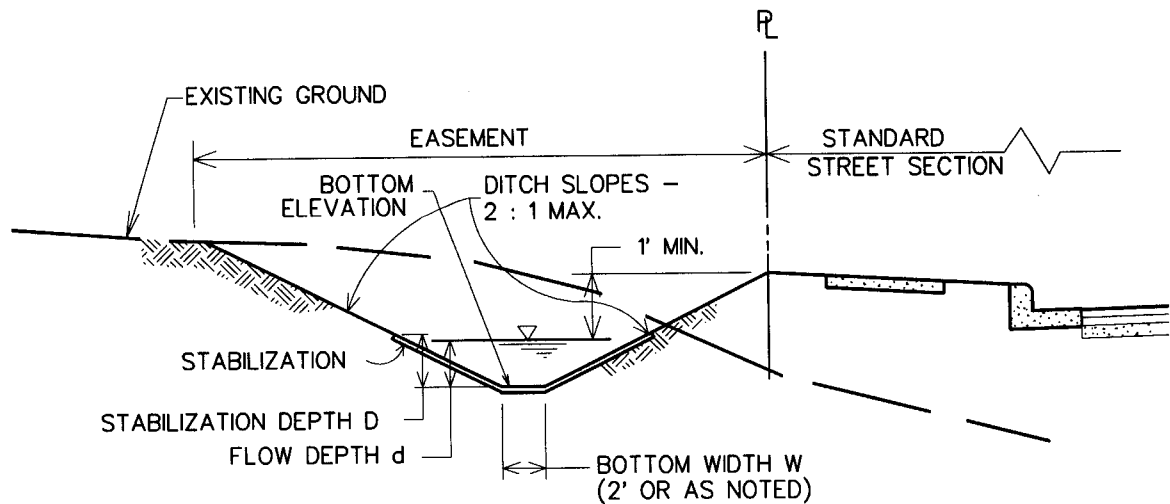
APPROVAL  
*William Hoffman*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 10/23/97  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**CHANNEL**  
**GABION VELOCITY BREAKER**

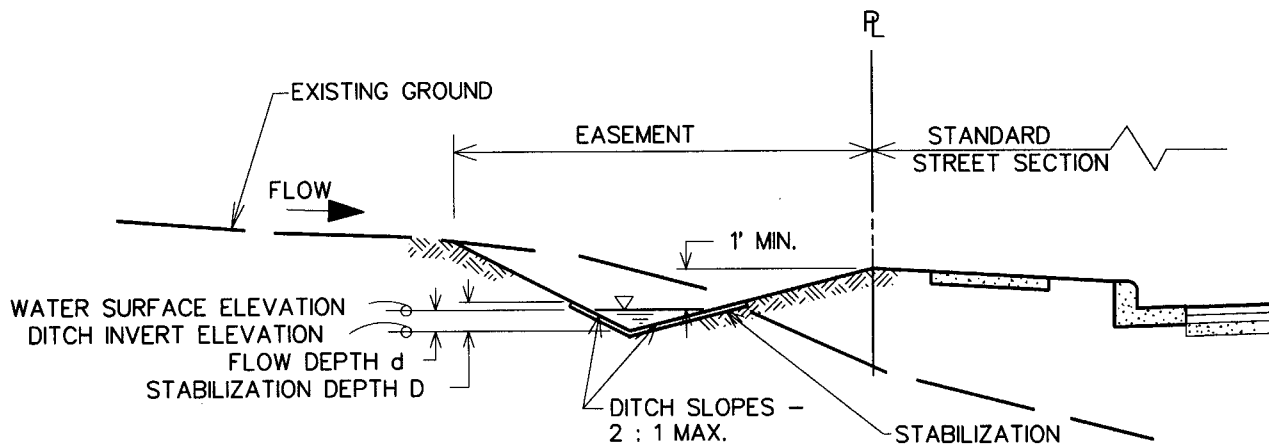
ISSUED: AUGUST, 1997  
 REVISED:  
 REVISED:

PLATE  
**D-5.02**





## STANDARD SIDE DITCH (SD)



## STANDARD SURFACE DRAIN DITCH (SDD)

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.

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

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

4. SIDESLOPES AS SHOWN ON TYPICAL CROSS-SECTION.

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



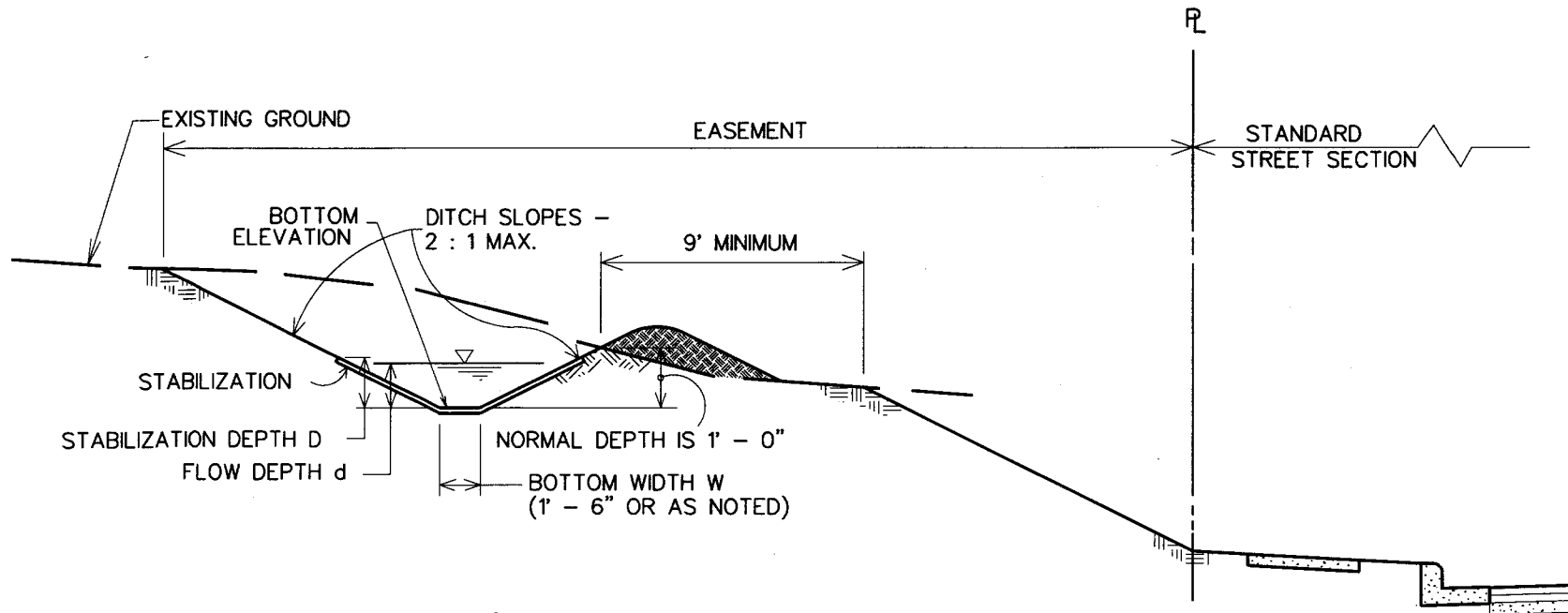
APPROVAL  
DIRECTOR  
*William Ruppman*  
BUR. OF ENGINEERING/CONSTRUCTION  
10/23/97  
DATE

DEPARTMENT OF PUBLIC WORKS  
STORM DRAINAGE DETAILS  
**STANDARD DITCHES**  
TOE OF SLOPE

ISSUED: AUGUST, 1997  
REVISED:  
REVISED:

PLATE

**D-5.04**



## 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.



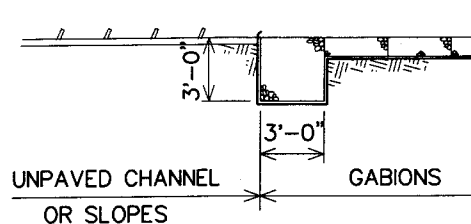
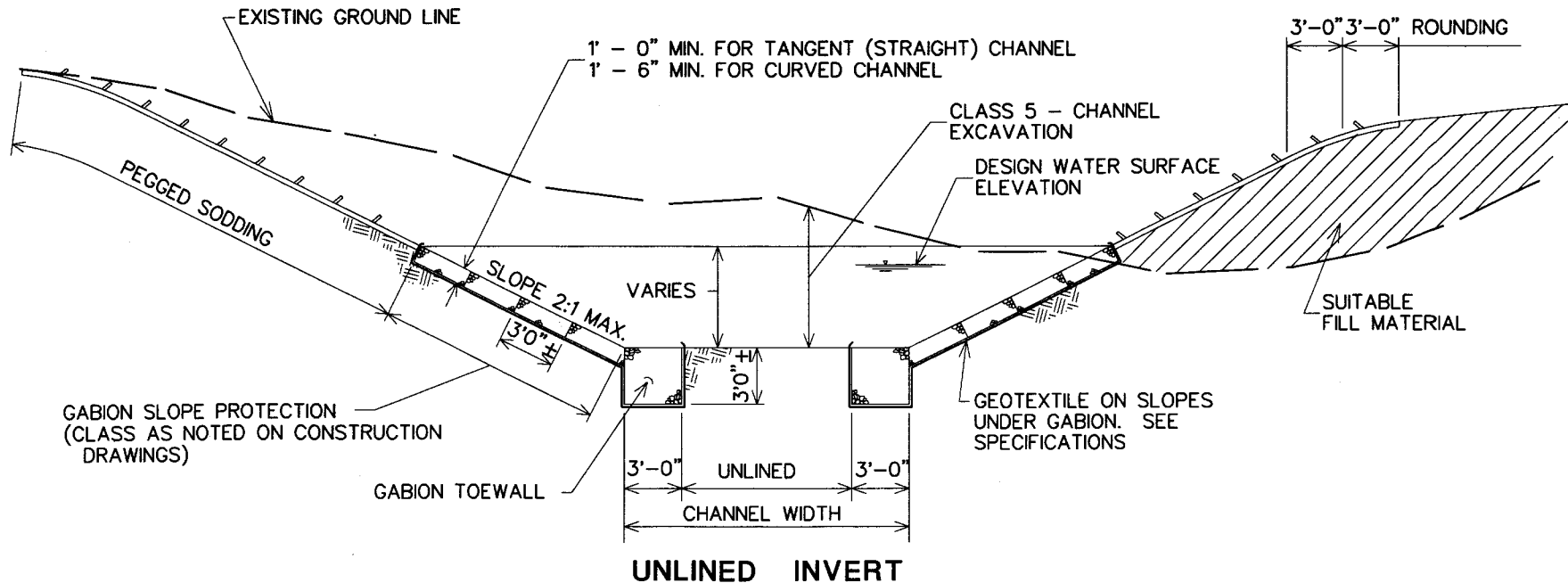
APPROVAL  
*Charles J. [Signature]*  
 DIRECTOR  
*William [Signature]*  
 BUR. OF ENGINEERING CONSTRUCTION  
 10/23/97  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**STANDARD DITCHES**  
 TOP OF SLOPE

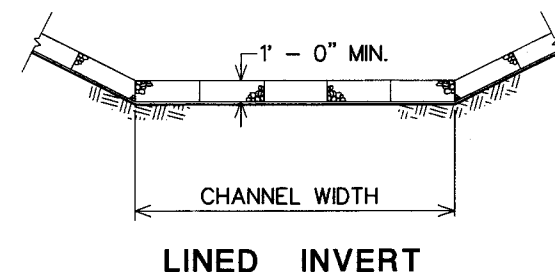
ISSUED: AUGUST, 1997  
 REVISED: \_\_\_\_\_  
 REVISED: \_\_\_\_\_

PLATE  
**D-5.05**





END TOEWALL DETAIL

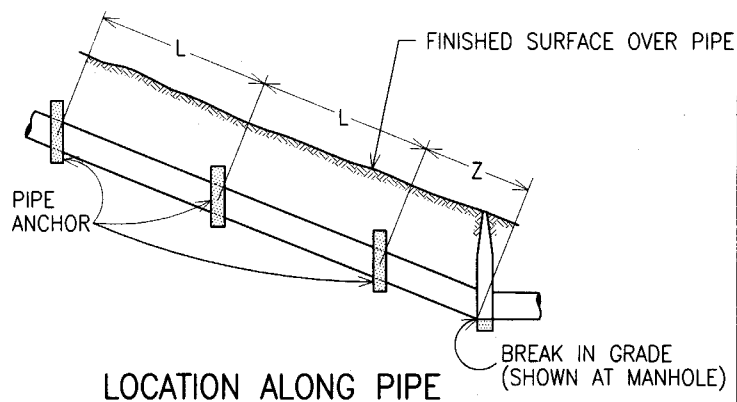
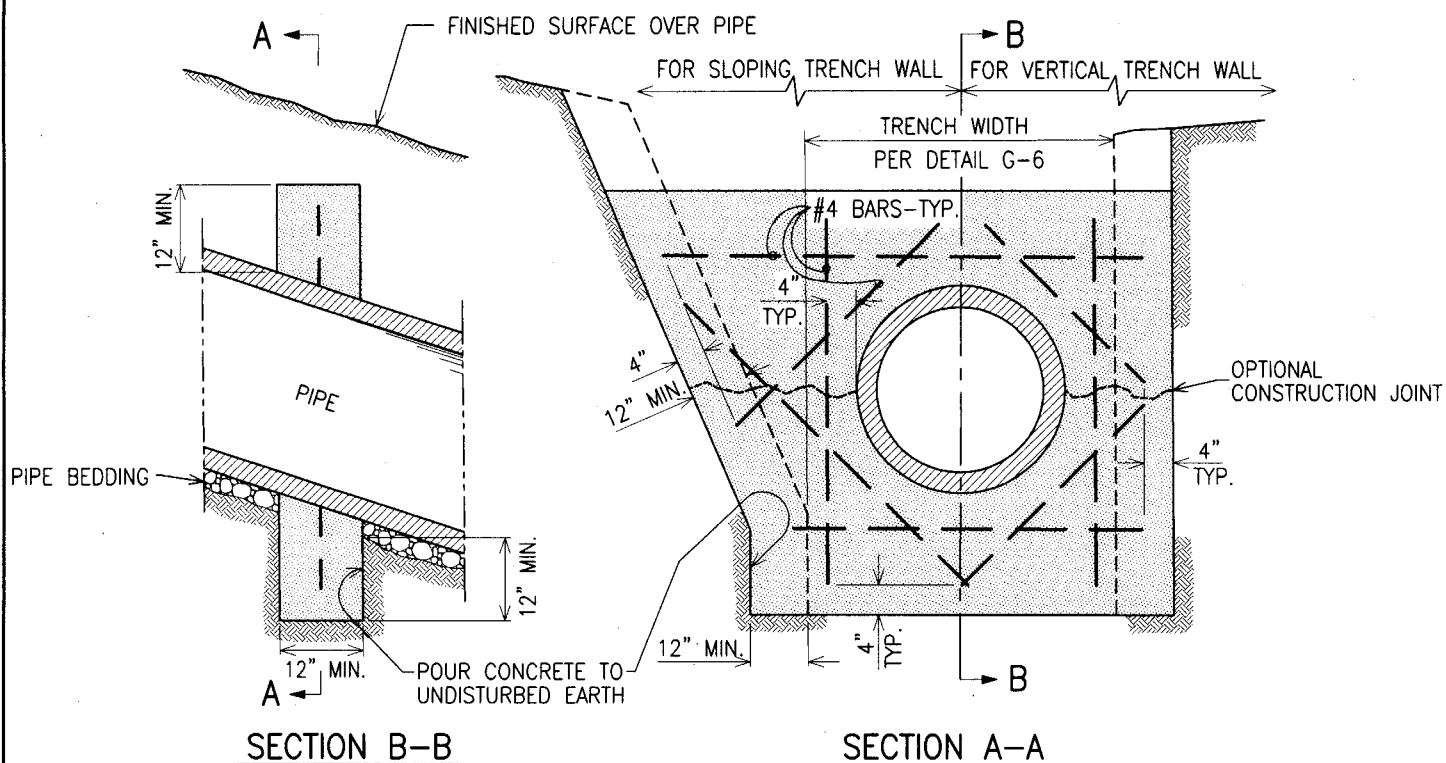


APPROVAL  
*William F. Rogers*  
 DIRECTOR  
 BUR. OF ENGINEERING/CONSTRUCTION  
 10/23/97  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS  
**GABION CHANNEL LINING**

ISSUED: OCTOBER, 1977  
 REVISED: NOVEMBER, 1983  
 REVISED: AUGUST, 1997

PLATE  
**D-5.06**



**TABLE A**

PIPE SLOPE	L (MAX.)	Z (MAX.)
100% (1:1)	12'	4'
67% (1.5:1)	14'	8'
50% (2:1)	16'	12'
40% (2.5:1)	18'	18'
33% (3:1)	20'	20'
25% (4:1)	22'	22'
20% (5:1)	24'	24'

**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.



APPROVAL  
  
 DIRECTOR  
  
 BUR. OF ENGINEERING/CONSTRUCTION  
 3/10/05  
 DATE

DEPARTMENT OF PUBLIC WORKS  
 STORM DRAINAGE DETAILS

**PIPE ANCHORS  
 FOR STEEP PIPES**

ISSUED: FEBRUARY, 2005  
 REVISED:  
 REVISED:

PLATE  
**D-6.03**