

# SEWER DESIGN STANDARDS

PREPARED BY

CITY OF NEW YORK  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
DIVISION OF INFRASTRUCTURE  
BUREAU OF DESIGN

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SEWER DESIGN STANDARDS  
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STANDARD FOR SEWER DESIGN CRITERIA -  
MANHOLE SPACING AND LOCATION ON PIPE SEWERS

A. MAXIMUM SPACING OF MANHOLES ON PIPE SEWERS

PIPE SIZE:	RECOMMENDED		ABSOLUTE	
	MAXIMUM SPACING		MAXIMUM SPACING	
10" DIA. TO 36" DIA. CIRCULAR PIPE				
14"H x 23"W TO 29"H x 45"W HORIZONTAL ELLIPTICAL PIPE		250'		300'
23"H x 14"W TO 45"H x 29"W VERTICAL ELLIPTICAL PIPE				
42" DIA. TO 72" DIA. CIRCULAR PIPE				
34"H x 53"W TO 58"H x 91"W HORIZONTAL ELLIPTICAL PIPE		400'		500'
53"H x 34"W TO 91"H x 58"W VERTICAL ELLIPTICAL PIPE				
78" DIA. AND LARGER CIRCULAR PIPE				
63"H x 98"W AND LARGER HORIZONTAL ELLIPTICAL PIPE		600'		800'
98"H x 63"W AND LARGER VERTICAL ELLIPTICAL PIPE				

B. MANHOLE LOCATION ON PIPE SEWERS


1. AT ALL CHANGES IN GRADE OR ELEVATION FOR ALL SIZES OF SEWERS.
2. AT ALL CHANGES IN ALIGNMENT FOR ALL SIZES OF SEWERS.
3. AT ALL STREET INTERSECTIONS FOR SEWERS UP TO AND INCLUDING 24" DIAMETER.
4. AT ALL JUNCTIONS OF 2 OR MORE SEWERS.
5. AT ALL CATCH BASIN CONNECTIONS WHERE IT IS NOT PRACTICAL TO CONNECT DIRECTLY TO THE SEWER. A DIRECT CONNECTION SHALL NOT BE MADE TO A SEWER LESS THAN 60" IN DIAMETER.
6. THE TERM "DRY LOCATION" SHALL MEAN ANY LOCATION WHERE THE ENTIRE MANHOLE IS LOCATED ABOVE THE WATER TABLE AND IS IN NORMALLY DRY SOIL.
7. THE TERM "WET LOCATION" SHALL MEAN ANY LOCATION WHERE THE MANHOLE IS LOCATED IN WHOLE OR IN PART BELOW THE WATER TABLE OR IN NORMALLY WET SOIL.
8. SPECIAL CONSIDERATION WILL BE REQUIRED FOR SITUATIONS NOT COVERED HEREIN.

  
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7/9/07

  
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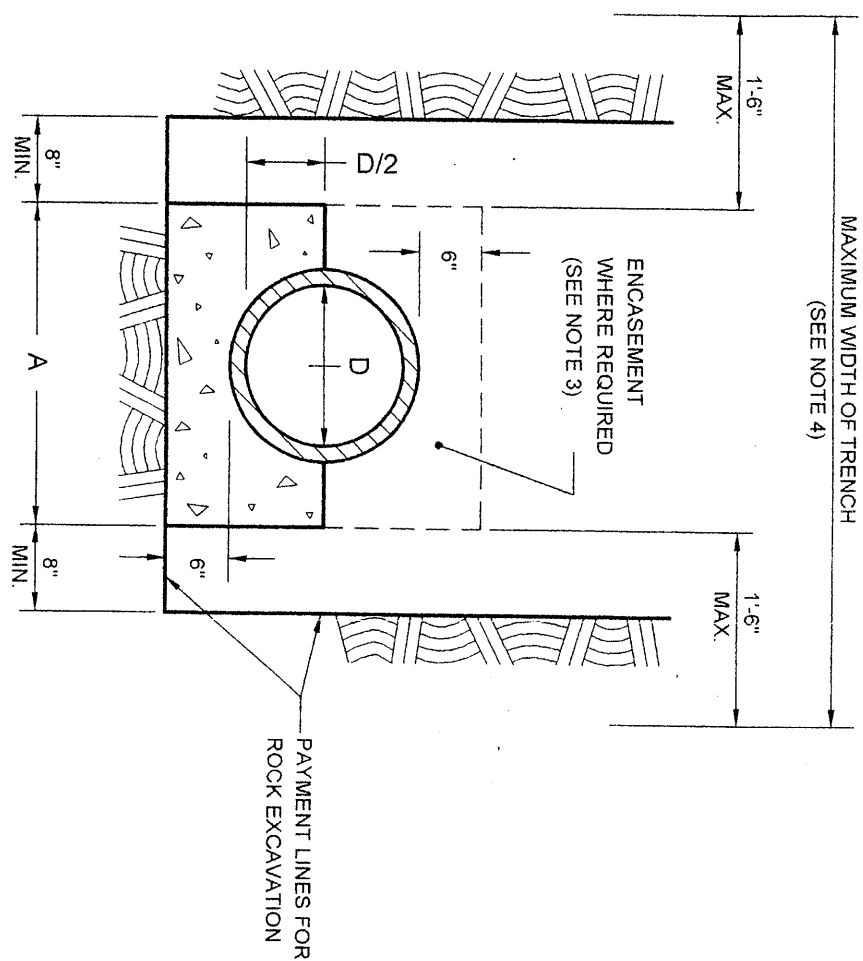
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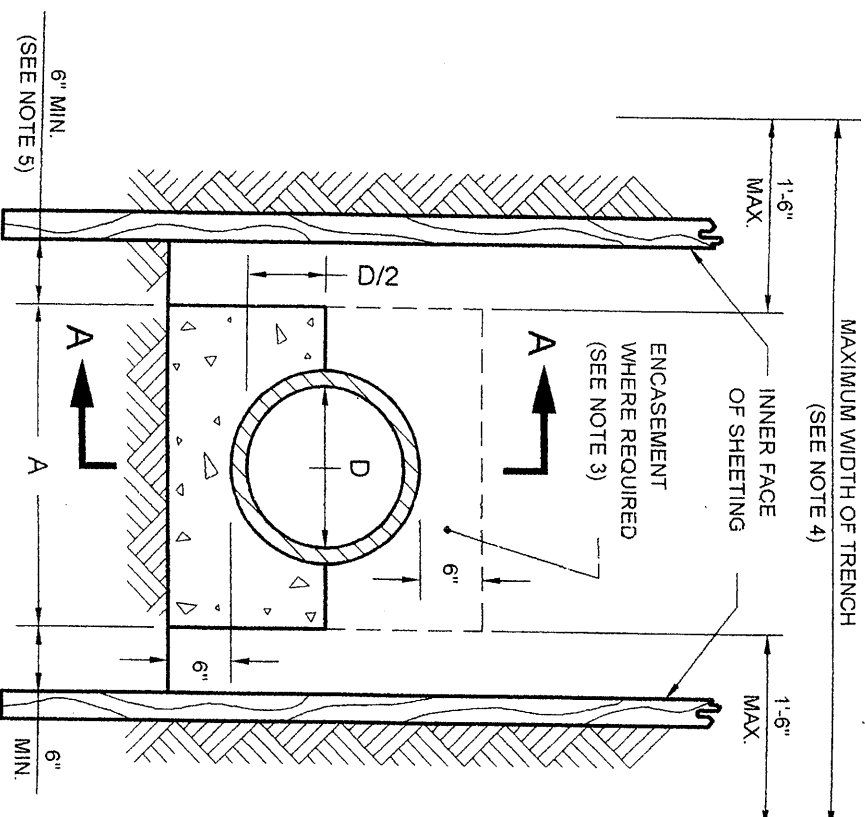
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# STANDARD FOR VITRIFIED CLAY PIPE ON CONCRETE CRADLE ON EARTH OR ON ROCK

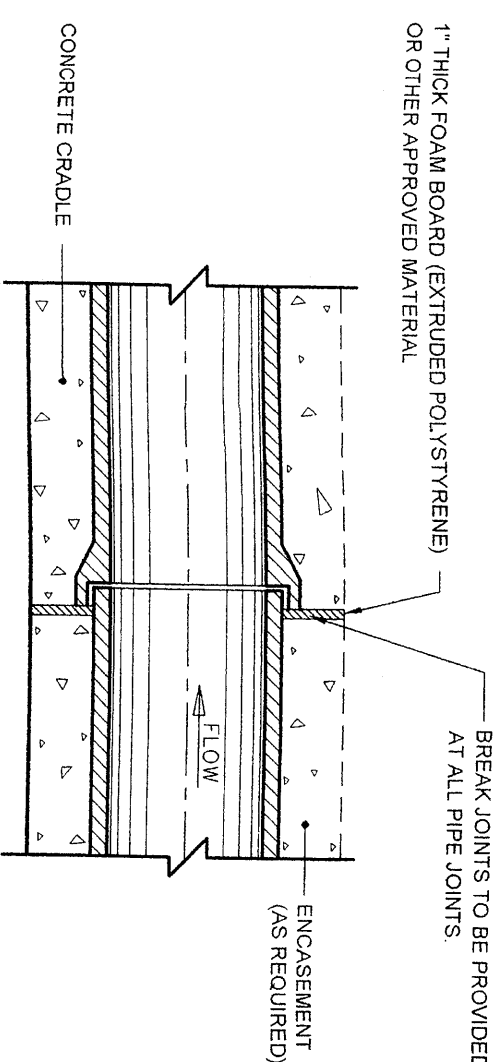
D	A	MAX. COVER WITHOUT ENCSMT.	CONC. CRADLE CU. YD./L.F.	CONC. ENCSMT. CU. YD./L.F.
8"	1'-6"	22'	0.0408	0.0815
10"	2'-0"	20'	0.0596	0.1191
12"	2'-3"	18'	0.0708	0.1415
15"	2'-6"	16'	0.0831	0.1661
18"	2'-10"	15'	0.0998	0.1996



## SECTION ON ROCK



## SECTION ON EARTH



## SECTION A-A

## BREAK JOINTS TO CONCRETE BEDDING

- NOTES:
- (1) CRADLE AND ENCASUREMENT ARE CLASS 40 CONCRETE.
  - (2) ENTIRE CRADLE OR ENCASUREMENT IS TO BE PLACED MONOLITHICALLY.
  - (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO THE OUTER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER IS EXCEEDED.
  - (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
  - (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.

ASSISTANT ~~COMMISSIONER~~, DESIGN  
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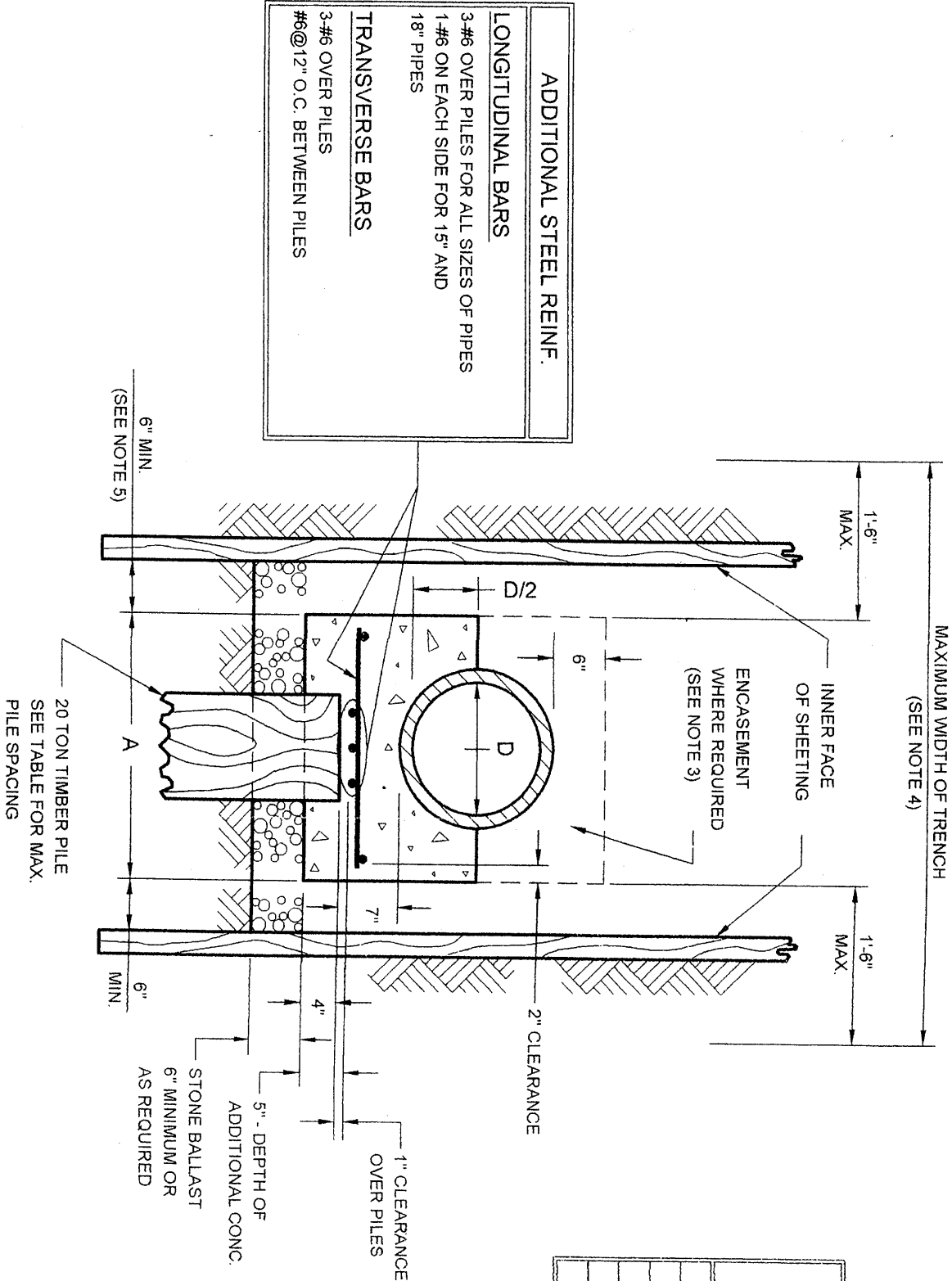
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STANDARD FOR VITRIFIED CLAY PIPE  
ON CONCRETE CRADLE ON PILES



D	A	MAXIMUM PILE SPACING				ADDITIONAL ITEMS/L.F.					STONE BALLAST CU. YD. PER L.F.
		10' COVER	15' COVER	20' COVER	25' COVER	ADD. CONC. CU. YD.	ADDITIONAL STL. REINF. (LBS.)				
							10' COVER	15' COVER	20' COVER	25' COVER	
8"	1'-6"	6'-0"	6'-0"	6'-0"	6'-0"	0.0232	6.85	6.85	6.85	6.85	0.0834
10"	2'-0"	6'-0"	6'-0"	6'-0"	6'-0"	0.0309	7.85	7.85	7.85	7.85	0.0926
12"	2'-3"	6'-0"	6'-0"	6'-0"	5'-0"	0.0348	8.35	8.35	8.35	8.54	0.0973
15"	2'-6"	6'-0"	6'-0"	5'-0"	4'-0"	0.0386	11.85	11.85	12.07	12.40	0.1019
18"	2'-10"	6'-0"	5'-0"	4'-0"	3'-6"	0.0438	12.52	12.77	13.15	13.95	0.1081

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS: GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO THE INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.

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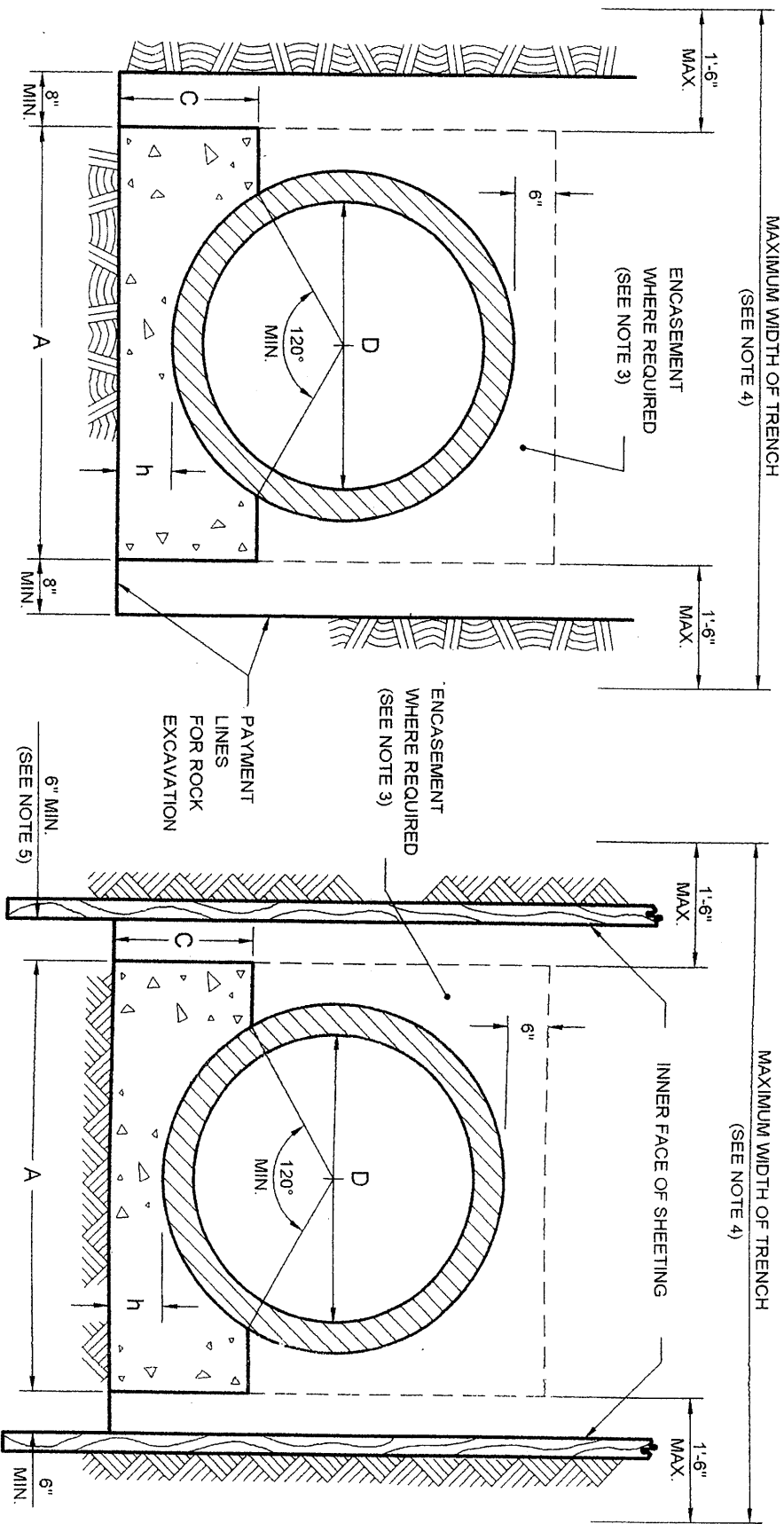
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# STANDARD FOR CIRCULAR PRECAST REINFORCED CONCRETE PIPE ON CONCRETE CRADLE ON EARTH OR ON ROCK



D	A	h	C	CONC. CRADLE CU. YD./L.F.	CONC. ENCSMT. CU. YD./L.F.	MAX. COVER FOR PIPE CLASS		
						III	IV	V
24"	3'-6"	6"	1'-2"	0.1124	0.2719	12'-0"	18'-0"	27'-0"
30"	4'-1"	6"	1'-4"	0.1414	0.3410	12'-6"	18'-6"	27'-6"
36"	4'-8"	7"	1'-6"	0.1829	0.4300	12'-6"	18'-6"	28'-0"
42"	5'-3"	8"	1'-9"	0.2348	0.5279	12'-6"	18'-6"	28'-0"
48"	5'-10"	9"	2'-0"	0.2928	0.6348	12'-6"	18'-6"	28'-6"
54"	6'-5"	10"	2'-3"	0.3570	0.7507	13'-0"	19'-0"	28'-6"
60"	7'-0"	11"	2'-5"	0.4219	0.8757	13'-0"	19'-0"	29'-0"
66"	7'-7"	12"	2'-8"	0.4981	1.0097	13'-0"	19'-0"	29'-0"
72"	8'-2"	13"	2'-11"	0.5806	1.1526	13'-0"	19'-6"	29'-6"
78"	8'-9"	14"	3'-2"	0.6691	1.3046	13'-6"	19'-6"	29'-6"
84"	9'-4"	15"	3'-4"	0.7574	1.4656	13'-6"	20'-0"	29'-6"
90"	9'-11"	17"	3'-8"	0.8686	1.6662	14'-0"	20'-0"	30'-0"
96"	10'-6"	18"	3'-11"	0.9972	1.8470	14'-0"	20'-0"	30'-0"

NOTES:

- (1) CRADLE AND ENCASMENT ARE CLASS 40 CONCRETE.
- (2) ENTIRE CRADLE OR ENCASMENT IS TO BE PLACED MONOLITHICALLY.
- (3) ENCASMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO THE INNER TOP OF THE PIPE, OR LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS V PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON WALL "B" FOR CLASS III, IV & V P.R.C.P.

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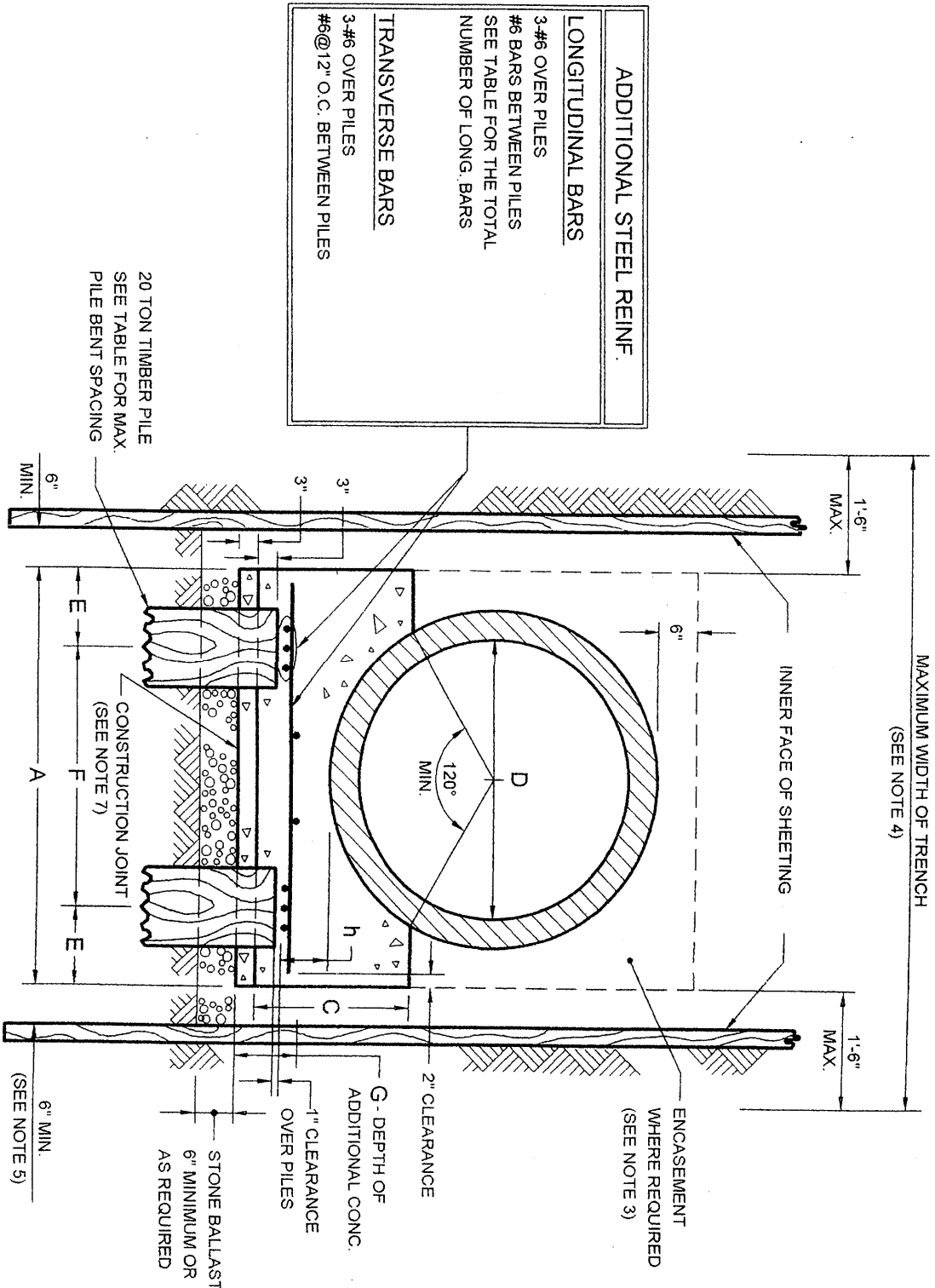
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DATE



STANDARD FOR 24" DIA. TO 48" DIA. CIRCULAR PRECAST REINFORCED  
CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 2 PILE BENTS  
(20' AND 25' COVER)



D	A	h	C	E	F	G	MAXIMUM PILE BENT SPACING			#6 LONG. BARS	ADD. STL. REINF. (LBS.)		ADD. CONC. CU YD.	STONE BALLAST CU. YD. PER L.F.
							20' COVER	25' COVER	3'-6"		20' COVER	25' COVER		
24"	3'-6"	11"	1'-9"	9"	2'-0"	11"	6'-0"	6'-0"	7	16.86	16.86	0.1189	0.1204	
30"	4'-1"	8"	1'-9"	9"	2'-7"	8"	5'-6"	5'-0"	7	17.69	18.40	0.1009	0.1312	
36"	4'-8"	7"	1'-9"	12"	2'-8"	6"	5'-0"	4'-6"	7	19.63	19.20	0.0865	0.1420	
42"	5'-3"	8"	2'-0"	12"	3'-3"	6"	4'-3"	4'-0"	8	22.45	23.10	0.0973	0.1528	
48"	5'-10"	9"	2'-3"	12"	3'-10"	6"	3'-9"	3'-6"	9	26.74	25.32	0.1081	0.1636	

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE, REBARS- GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS V PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON WALL "B" FOR CLASS III, IV & V P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT PROPER SUPPORT OF PIPE.

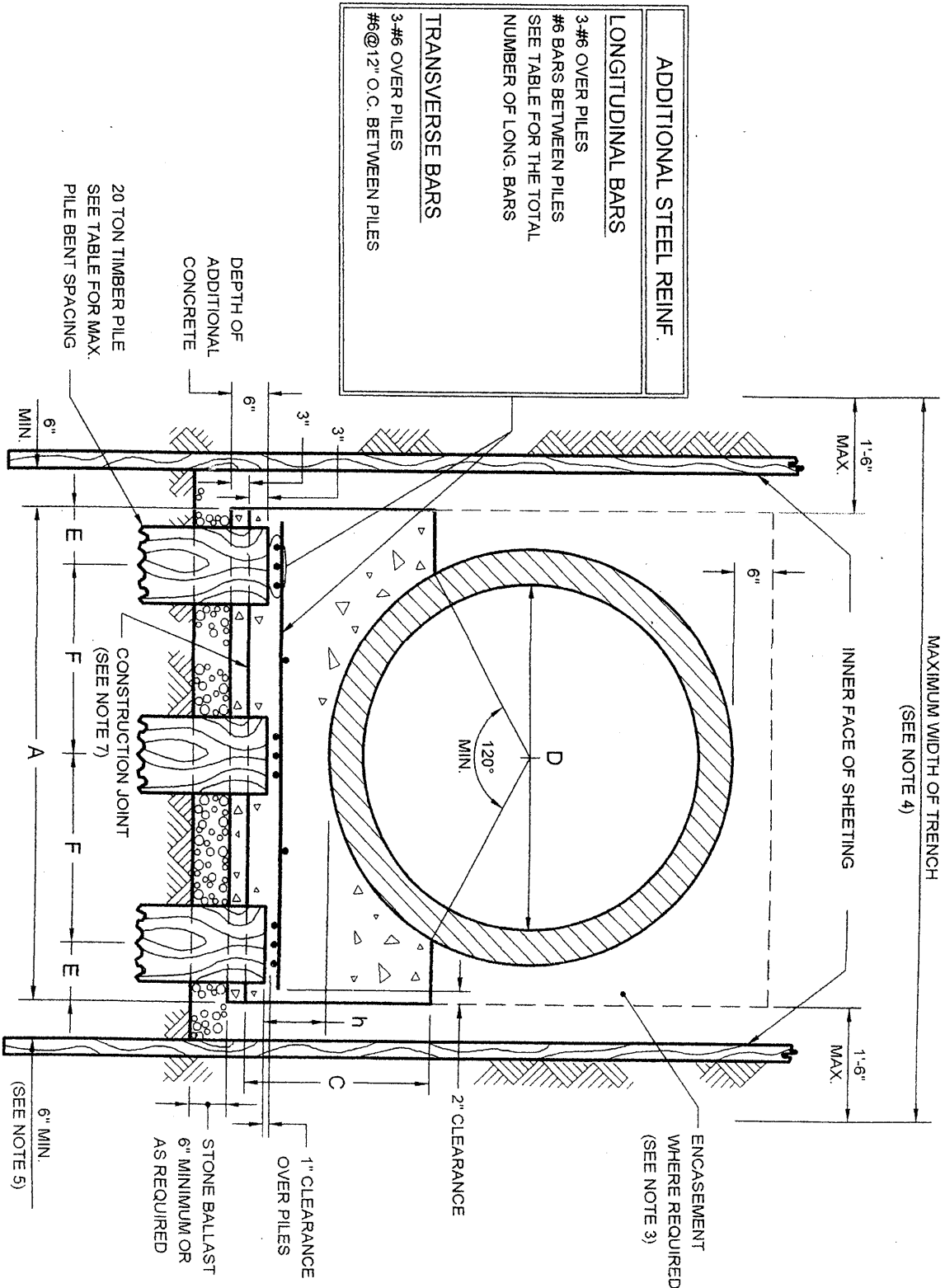
*Joe M. Loran*  
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*Wadi Faruq*  
DIRECTOR OF ENGINEERING  
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DATE  
*8/10/07*

STANDARD FOR 54" DIA. TO 96" DIA. CIRCULAR PRECAST REINFORCED  
CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 3 PILE BENTS  
(20' AND 25" COVER)



D	A	h	C	E	F	MAXIMUM PILE BENT SPACING		#6 LONG. BARS	ADD. STL. REINF. (LBS.)		ADD. CONC. CU. YD.		STONE BALLAST CU. YD. PER L.F.
						20' COVER	25' COVER		20' COVER	25' COVER			
54"	6'-5"	10"	2'-6"	9"	2'-5 1/2"	5'-3"	4'-9"	11	28.71	29.99	0.1189		0.1744
60"	7'-0"	11"	2'-8"	12"	2'-6"	4'-9"	4'-3"	11	31.28	30.66	0.1297		0.1852
66"	7'-7"	12"	2'-11"	12"	2'-9 1/2"	4'-3"	4'-0"	11	31.90	32.86	0.1405		0.1960
72"	8'-2"	13"	3'-2"	12"	3'-1"	4'-0"	3'-6"	13	37.18	36.34	0.1513		0.2068
78"	8'-9"	14"	3'-5"	12"	3'-4 1/2"	3'-6"	3'-3"	13	37.59	38.98	0.1621		0.2176
84"	9'-4"	15"	3'-7"	12"	3'-8"	3'-3"	3'-0"	13	40.33	42.06	0.1729		0.2284
90"	9'-11"	17"	3'-11"	12"	3'-11 1/2"	3'-0"	2'-9"	15	46.53	48.71	0.1837		0.2392
96"	10'-6"	18"	4'-2"	12"	4'-3"	3'-0"	2'-6"	15	47.99	53.01	0.1945		0.2500

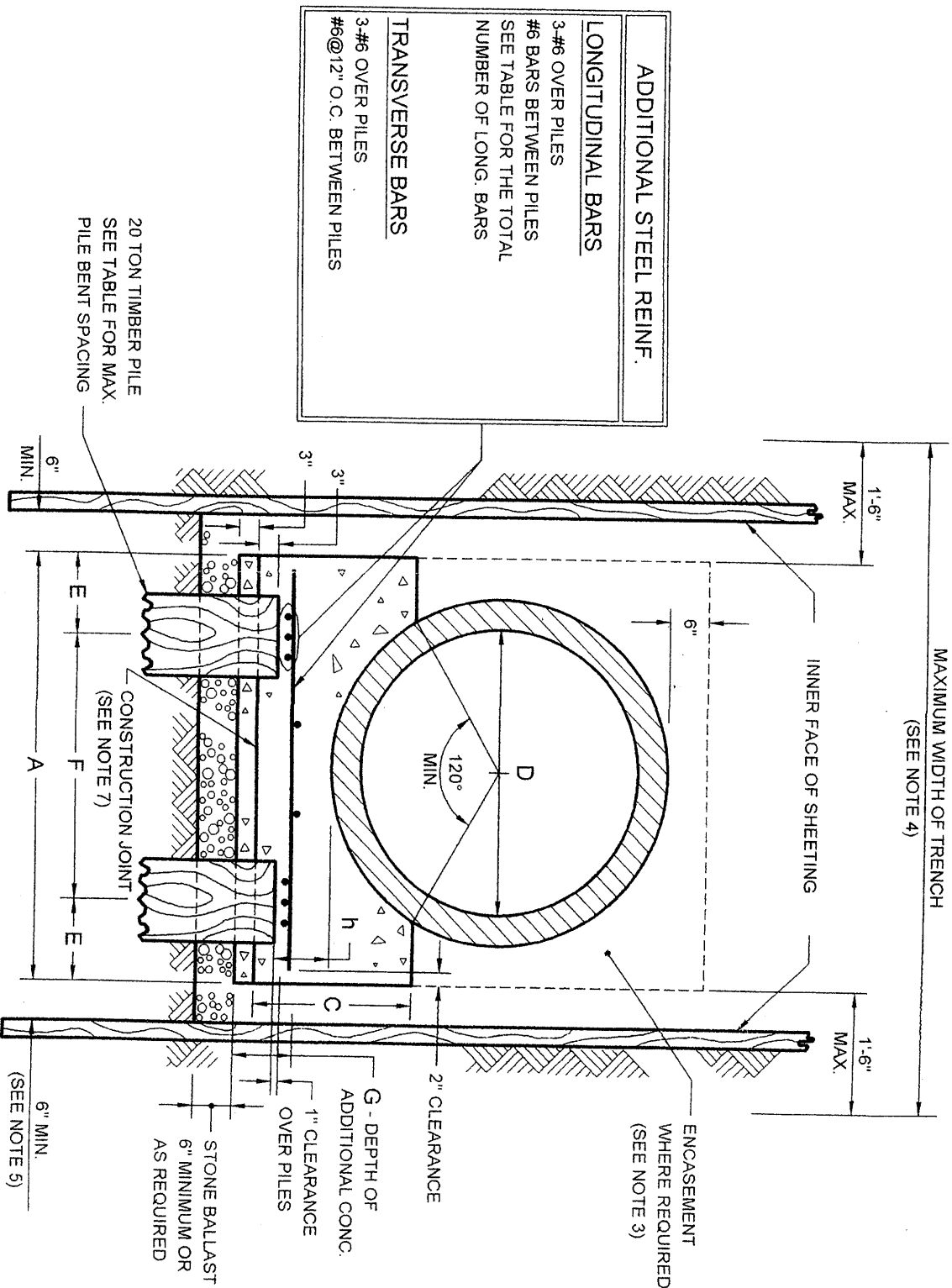
NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS- GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS V PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON WALL "B" FOR CLASS III, IV & V P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT PROPER SUPPORT OF PIPE.

*George W. Loran* P.E. 7/9/07  
ASSISTANT COMMISSIONER, DESIGN  
DEPARTMENT OF DESIGN AND CONSTRUCTION

*Maedi Funa* P.E. 8/10/07  
DIRECTOR OF ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

STANDARD FOR 24" DIA. TO 60" DIA. CIRCULAR PRECAST REINFORCED  
CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 2 PILE BENTS  
(5', 10' AND 15' COVER)



D	A	h	C	E	F	G	MAXIMUM PILE BENT SPACING				#6 LONG. BARS	ADDITIONAL ITEMS/L.F.				STONE BALLAST CU YD. PER L.F.
							5'	10'	15'	COVER	COVER	COVER	COVER	COVER	ADD. CONC. CU. YD.	
24"	3'-6"	9"	1'-8"	9"	2'-0"	9"	6'-0"	6'-0"	6'-0"	6'-0"	7	16.86	16.86	16.86	0.0973	0.1204
30"	4'-1"	8"	1'-9"	9"	2'-7"	8"	6'-0"	6'-0"	6'-0"	6'-0"	7	18.03	18.03	18.03	0.1009	0.1312
36"	4'-8"	7"	1'-9"	12"	2'-8"	6"	6'-0"	6'-0"	5'-6"	7	19.20	19.20	18.80	18.80	0.0865	0.1420
42"	5'-3"	8"	2'-0"	12"	3'-3"	6"	6'-0"	6'-0"	4'-9"	8	21.87	21.87	22.90	22.90	0.0973	0.1528
48"	5'-10"	9"	2'-3"	12"	3'-10"	6"	6'-0"	5'-6"	4'-3"	9	24.54	24.04	25.19	25.19	0.1081	0.1636
54"	6'-5"	10"	2'-6"	12"	4'-5"	6"	6'-0"	4'-9"	4'-0"	9	25.70	26.99	27.23	27.23	0.1189	0.1744
60"	7'-0"	11"	2'-8"	12"	5'-0"	6"	6'-0"	4'-3"	3'-6"	10	28.38	29.16	29.33	29.33	0.1297	0.1852

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS: GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS V PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON WALL "B" FOR CLASS III, IV & V P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT PROPER SUPPORT OF PIPE.

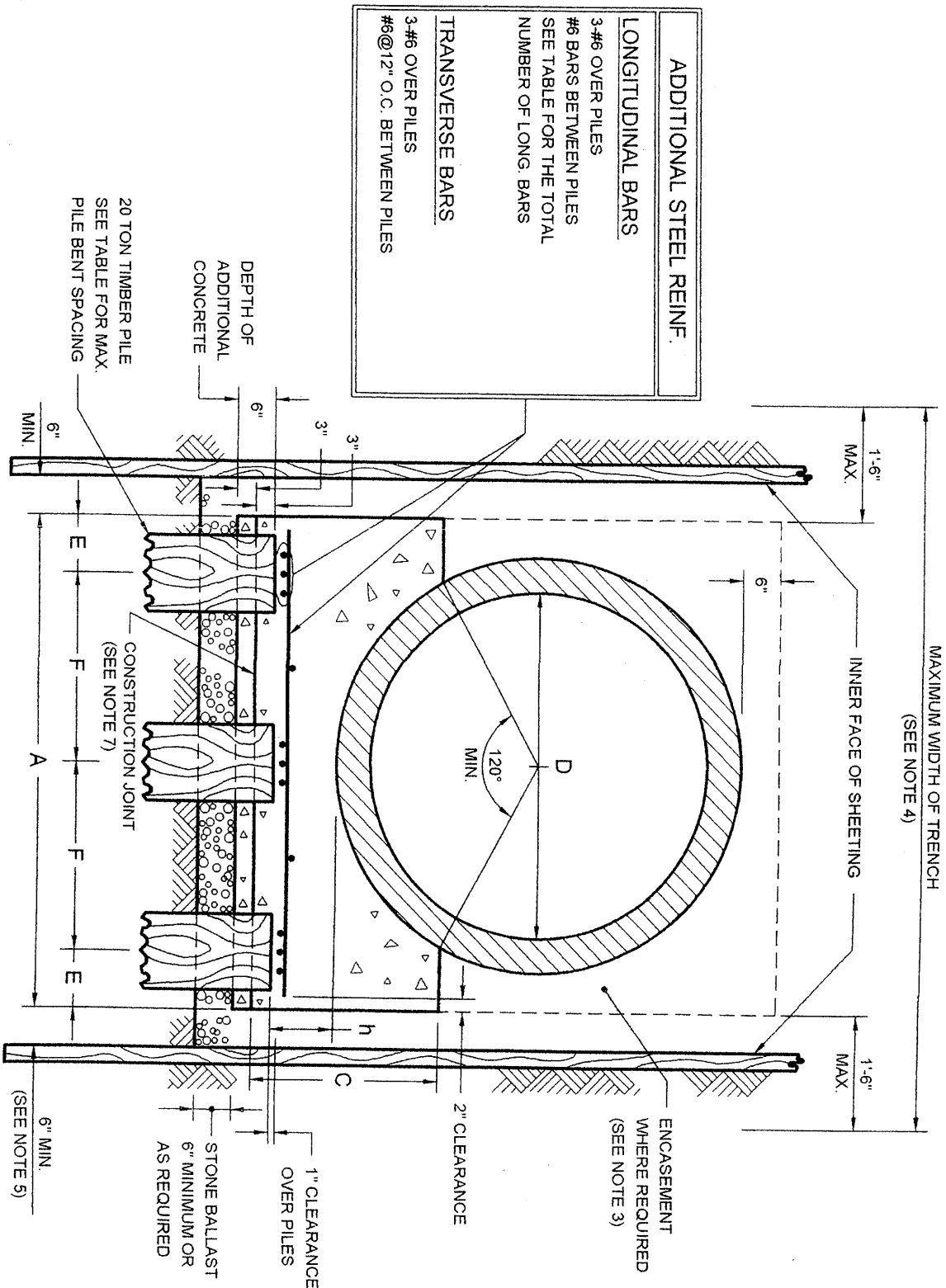
Assistant Commissioner, Design  
Department of Design and Construction  
*John M. Lane* P.E.

DATE  
7/9/07

Director of Engineering  
Department of Environmental Protection  
*Maedi Fawad* P.E.

DATE  
8/10/07

STANDARD FOR 66" DIA. TO 96" DIA. CIRCULAR PRECAST REINFORCED  
CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 3 PILE BENTS  
(5', 10' AND 15' COVER)



D	A	h	C	E	F	MAXIMUM PILE BENT SPACING			#6 LONG. BARS	ADDITIONAL ITEMS/L.F.					STONE BALLAST CU. YD. PER L.F.
						5'	10'	15'		ADD. STL. REINF. (LBS.)			ADD. CONC. CU YD.		
										COVER	COVER	COVER		5'	
66"	7'-7"	12"	2'-11"	12"	2'-9 1/2"	6'-0"	6'-0"	4'-9"	11	31.05	31.05	32.57	0.1401	0.1960	
72"	8'-2"	13"	3'-2"	12"	3'-1"	6'-0"	5'-6"	4'-6"	13	35.22	34.50	35.22	0.1513	0.2068	
78"	8'-9"	14"	3'-5"	12"	3'-4 1/2"	6'-0"	5'-0"	4'-0"	13	36.39	37.23	38.49	0.1621	0.2176	
84"	9'-4"	15"	3'-7"	12"	3'-8"	6'-0"	4'-6"	3'-9"	13	37.55	37.55	41.16	0.1729	0.2284	
90"	9'-11"	17"	3'-11"	12"	3'-11 1/2"	5'-9"	4'-3"	3'-6"	15	42.56	42.86	43.10	0.1837	0.2392	
96"	10'-6"	18"	4'-2"	12"	4'-3"	5'-3"	4'-0"	3'-3"	15	42.90	45.44	46.03	0.1945	0.2500	

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS-GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS V PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON WALL "B" FOR CLASS III, IV & V P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT PROPER SUPPORT OF PIPE.

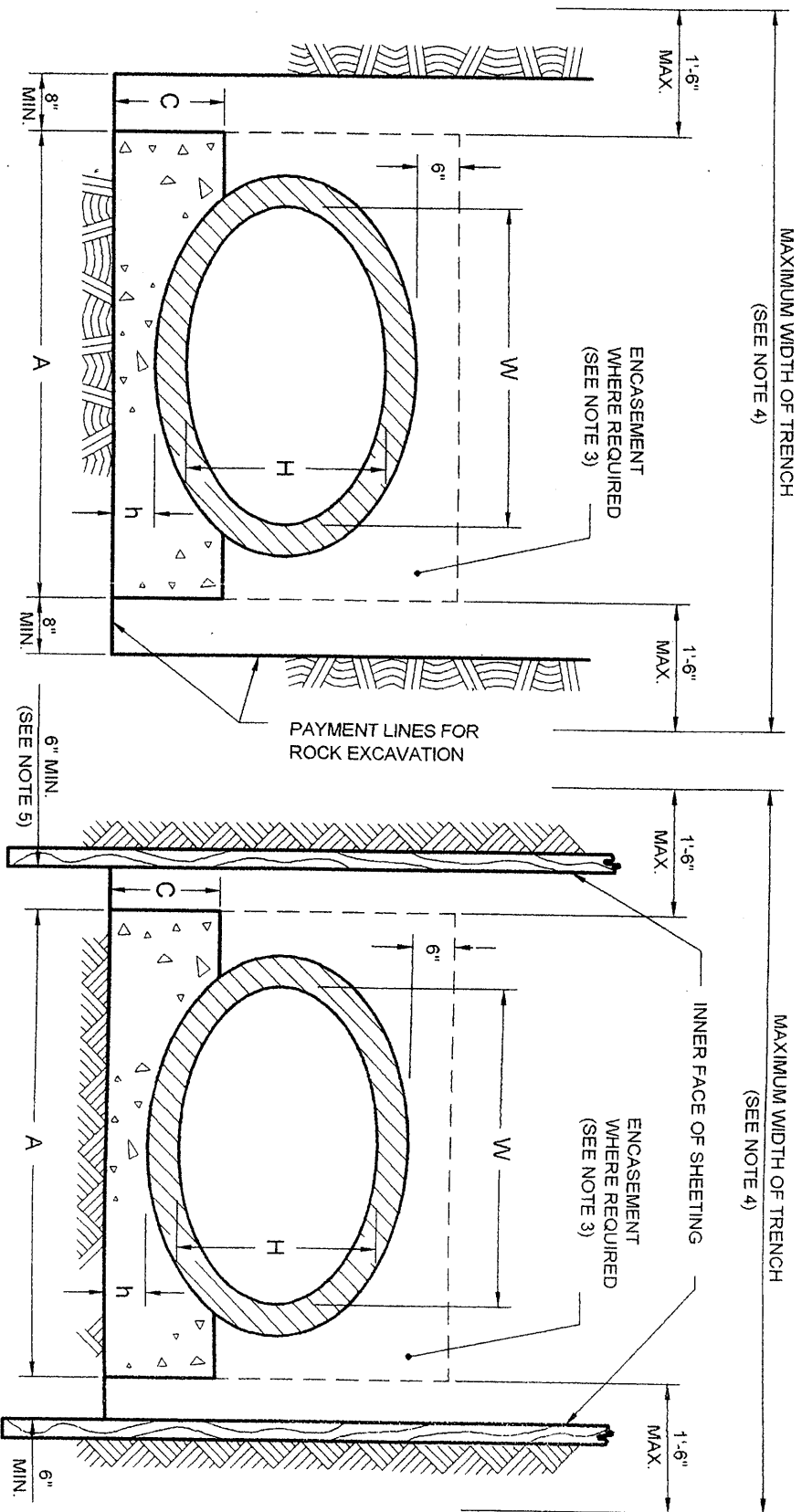
*Sege M. Lamm*  
ASSISTANT COMMISSIONER, DESIGN  
DEPARTMENT OF DESIGN AND CONSTRUCTION  
P.E.

7/9/07  
DATE

*Maedi Fera*  
DIRECTOR OF ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL PROTECTION  
P.E.

8/10/07  
DATE

STANDARD FOR HORIZONTAL ELLIPTICAL PRECAST REINFORCED  
CONCRETE PIPE ON CONCRETE CRADLE ON EARTH OR ON ROCK



W	H	EQUIV. DIA.	A	h	C	CONC. CRADLE CU. YD./L.F.	CONC. ENCSMT. CU. YD./L.F.	MAXIMUM COVER FOR PIPE CLASS	
								HE-III	HE-IV
23"	14"	18"	3'-6"	6"	0'-1 1/4"	0.0961	0.2281	12'-6"	19'-0"
30"	19"	24"	4'-1"	8"	1'-1"	0.1219	0.2846	13'-0"	19'-6"
38"	24"	30"	4'-10"	8"	1'-2"	0.1510	0.3594	13'-0"	19'-6"
45"	29"	36"	5'-6"	6"	1'-4"	0.1845	0.4343	13'-0"	19'-6"
53"	34"	42"	6'-3"	7"	1'-6"	0.2377	0.5395	13'-0"	20'-0"
60"	38"	48"	6'-11"	7"	1'-7"	0.2721	0.6207	13'-0"	20'-0"
68"	43"	54"	7'-8"	8"	1'-10"	0.3422	0.7437	13'-6"	20'-6"
76"	48"	60"	8'-5"	9"	2'-0"	0.4139	0.8774	13'-6"	20'-6"
83"	53"	66"	9'-1"	10"	2'-3"	0.4947	1.0137	13'-6"	20'-6"
91"	58"	72"	9'-10"	10"	2'-4"	0.5499	1.1376	14'-0"	21'-0"
98"	63"	78"	10'-6"	11"	2'-7"	0.6385	1.2725	14'-0"	21'-0"
106"	68"	84"	11'-3"	12"	2'-10"	0.7467	1.4638	14'-0"	21'-0"
113"	72"	90"	11'-11"	13"	3'-0"	0.8434	1.6266	14'-6"	21'-0"
121"	77"	96"	12'-8"	14"	3'-2"	0.9544	1.8192	15'-0"	21'-6"

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS HE-IV PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON MINIMUM WALL THICKNESS (ASTM C507) FOR CLASS HE-III AND HE-IV P.R.C.P.

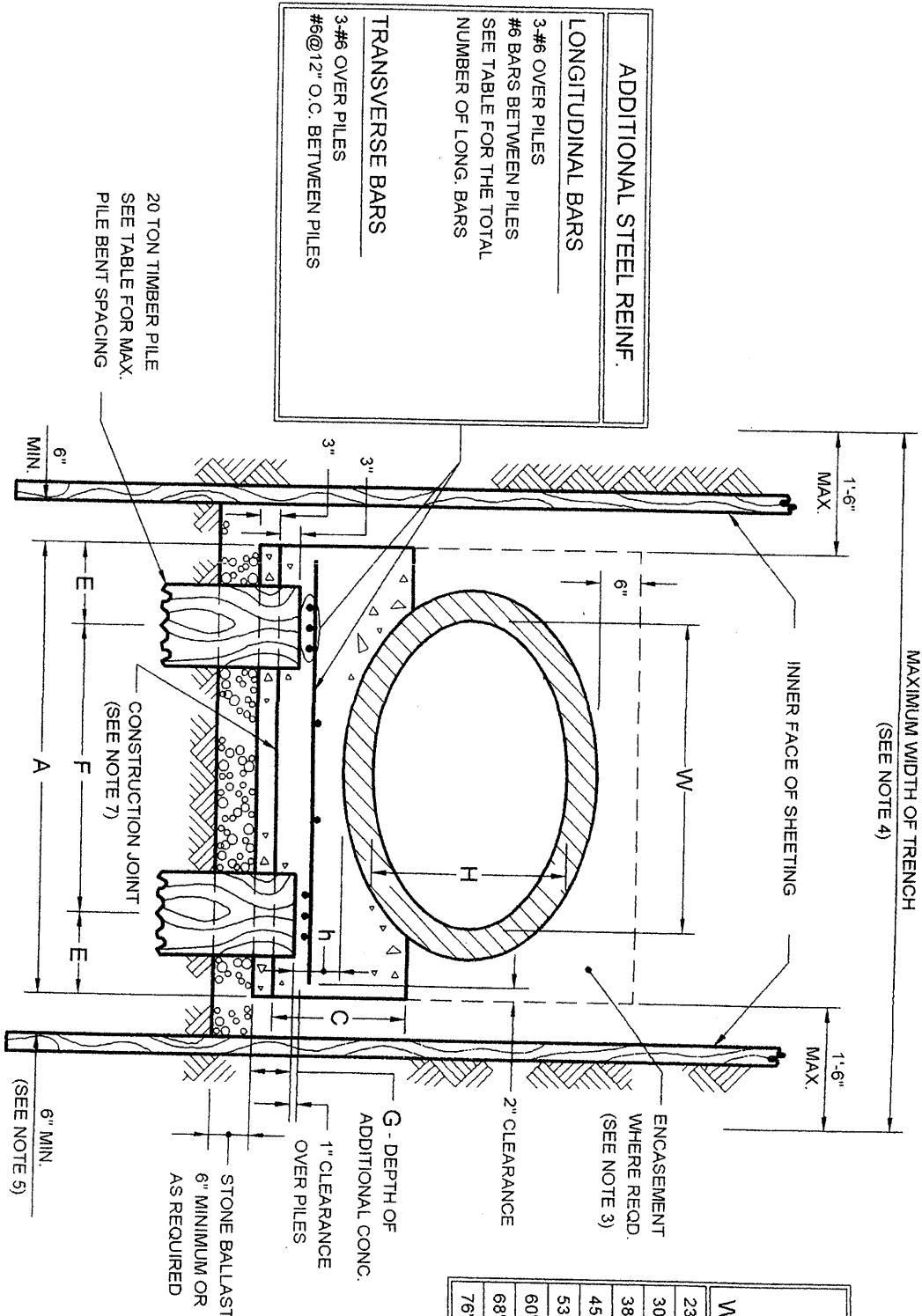
Assistant Commissioner, Design  
Department of Design and Construction  
*[Signature]* P.E.

7/9/07  
DATE

Director of Engineering  
Department of Environmental Protection  
*[Signature]* P.E.

8/10/07  
DATE

STANDARD FOR 23"W X 14"H TO 76"W X 48"H HORIZONTAL ELLIPTICAL PRECAST  
REINFORCED CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 2 PILE BENTS  
(5', 10' AND 15' COVER)



W	H	EQUIV. DIA.	A	h	C	E	F	G	MAXIMUM PILE BENT SPACING				#6 LONG. BARS	ADDITIONAL ITEMS/L.F.				STONE BALLAST CU. YD. PER L.F.
									5'	10'	15'	COVER		ADD. STL. REINF. (LBS.)	5' COVER	10' COVER	15' COVER	
23"	14"	18"	3'-6"	8"	1'-4"	9"	2'-0"	8"	6'-0"	6'-0"	6'-0"	6'-0"	7	16.86	16.86	16.86	0.0865	0.1204
30"	19"	24"	4'-1"	8"	1'-6"	9"	2'-7"	8"	6'-0"	6'-0"	6'-0"	6'-0"	7	18.03	18.03	18.03	0.1009	0.1312
38"	24"	30"	4'-10"	8"	1'-7"	12"	2'-10"	8"	6'-0"	6'-0"	6'-0"	6'-0"	8	21.03	21.03	21.03	0.1194	0.1451
45"	28"	36"	5'-6"	7"	1'-8"	12"	3'-6"	7"	6'-0"	6'-0"	5'-3"	5'-3"	8	22.37	22.37	22.37	0.1189	0.1574
53"	34"	42"	6'-3"	7"	1'-9"	12"	4'-3"	6"	6'-0"	5'-3"	4'-6"	4'-6"	9	25.37	25.37	25.37	0.1158	0.1713
60"	38"	48"	6'-11"	9"	2'-0"	12"	4'-11"	8"	6'-0"	4'-9"	4'-0"	4'-0"	10	28.21	29.60	29.86	0.1708	0.1836
68"	43"	54"	7'-8"	9"	2'-2"	15"	5'-2"	7"	6'-0"	4'-3"	3'-6"	3'-6"	10	29.71	30.57	30.76	0.1657	0.1975
76"	48"	60"	8'-5"	11"	2'-5"	15"	5'-11"	8"	5'-9"	4'-0"	3'-3"	3'-3"	11	33.42	34.74	35.20	0.2079	0.2114

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS- GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER. FROM FINAL GRADE TO INNER TOP OF THE PIPE. OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS HE-IV PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON MINIMUM WALL THICKNESS (ASTM C507) FOR CLASS HE-III AND HE-IV P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PROPER SUPPORT OF PIPE.

*[Signature]*  
ASSISTANT COMMISSIONER, DESIGN  
DEPARTMENT OF DESIGN AND CONSTRUCTION

P.E.

DATE

7/9/07

*[Signature]*  
DIRECTOR OF ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

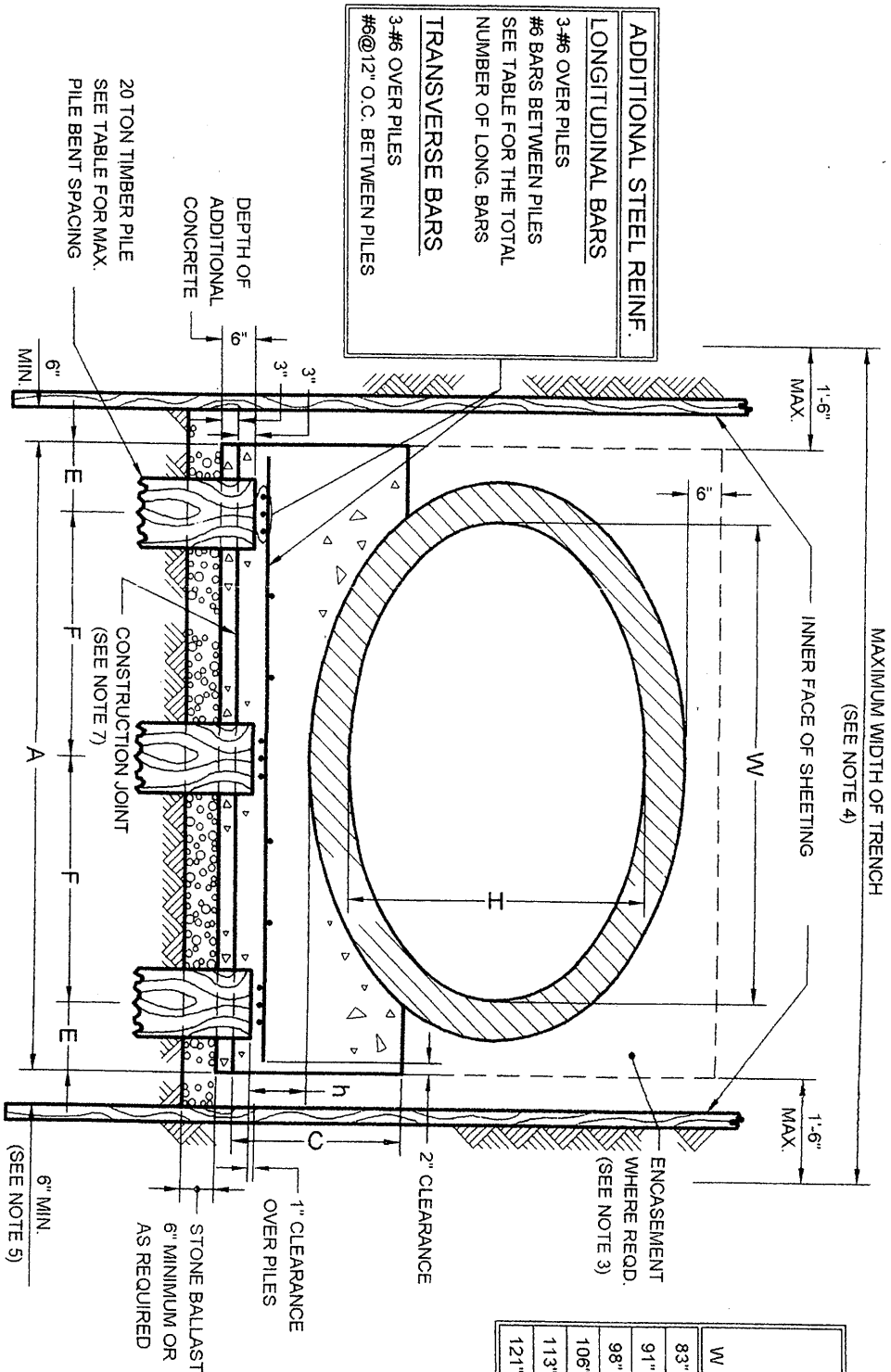
P.E.

DATE

8/10/07



STANDARD FOR 83"W X 53"H TO 121"W X 77"H HORIZONTAL ELLIPTICAL PRECAST  
REINFORCED CONCRETE PIPE ON CONCRETE CRADLE ON PILES - 3 PILE BENTS  
(5', 10' AND 15' COVER)



W	H	EQUIV. DIA.	A	h	C	E	F	MAXIMUM PILE BENT SPACING				#6 LONG. BARS	ADDITIONAL ITEMS/L.F.				STONE BALLAST CU. YD. PER L.F.
								5'	10'	15'			ADD. STL. REINF. (LBS.)	ADD. CONC. CU. YD.			
83"	53"	66"	9'-1"	10"	2'-6"	12"	3'-6 1/2"	6'-0"	5'-3"	4'-6"	13	37.05	37.05	37.05	0.1682	0.2238	
91"	58"	72"	9'-10"	10"	2'-7"	12"	3'-1"	6'-0"	5'-0"	4'-0"	15	41.56	42.51	43.94	0.1821	0.2377	
98"	63"	78"	10'-6"	11"	2'-10"	12"	4'-3"	6'-0"	4'-6"	3'-6"	15	42.89	42.89	44.35	0.1945	0.2500	
106"	68"	84"	11'-3"	12"	3'-1"	12"	4'-7 1/2"	5'-6"	4'-0"	3'-3"	15	43.40	47.13	47.76	0.2084	0.2639	
113"	72"	90"	11'-11"	13"	3'-3"	12"	4'-11 1/2"	5'-3"	3'-9"	3'-0"	17	48.73	53.37	54.53	0.2207	0.2763	
121"	77"	96"	12'-8"	14"	3'-5"	12"	5'-4"	4'-9"	3'-6"	2'-9"	17	52.84	52.00	59.22	0.2346	0.2902	

NOTES:

- (1) CRADLE AND ENCASEMENT ARE CLASS 40 CONCRETE. REBARS- GRADE 60.
- (2) ENTIRE CRADLE OR ENCASEMENT IS TO BE PLACED MONOLITHICALLY ABOVE THE CONSTRUCTION JOINT.
- (3) ENCASEMENT REQUIRED ON PIPE WHICH HAS A COVER, FROM FINAL GRADE TO INNER TOP OF THE PIPE, OF LESS THAN FOUR (4) FEET OR WHEN THE UPPER LIMIT OF COVER FOR CLASS HE-IV PIPE IS EXCEEDED.
- (4) UNLESS OTHERWISE APPROVED BY THE ENGINEER, THE MAX. WIDTH OF TRENCH SHALL BE SUCH THAT THE MAX. WIDTH BETWEEN INNER FACES OF THE LOWEST STAGE OF SHEETING OR ROCK CUT LINES, FROM SUBGRADE OF TRENCH TO A MIN. HEIGHT OF TWO (2) FEET ABOVE THE OUTER TOP OF THE PIPE, SHALL NOT BE GREATER THAN THE STANDARD CRADLE WIDTH PLUS EIGHTEEN (18) INCHES MAXIMUM EACH SIDE.
- (5) SIX (6) INCH MINIMUM SHALL BE MAINTAINED AT ALL TIMES, EXCEPT WHERE SHEETING IS TO BE USED AS FORMWORK.
- (6) CRADLE WIDTH "A" IS BASED ON MINIMUM WALL THICKNESS (ASTM C507) FOR CLASS HE-III AND HE-IV P.R.C.P.
- (7) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT PROPER SUPPORT OF PIPE.

Assistant Commissioner, Design  
Department of Design and Construction

P.E.

DATE

Director of Engineering  
Department of Environmental Protection

P.E.

DATE





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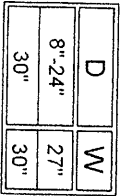
D	a	b
8"	20"	20"
10"	19"	19"
12"	18"	18"
15"	16 1/2"	16 1/2"
18"	15"	15"
24"	12"	12"
30"	12"	6"

ADDITIONAL STEEL REINF.  
3-#6@3" OVER PILES B.W.  
#6@12" BETWEEN PILES B.W.

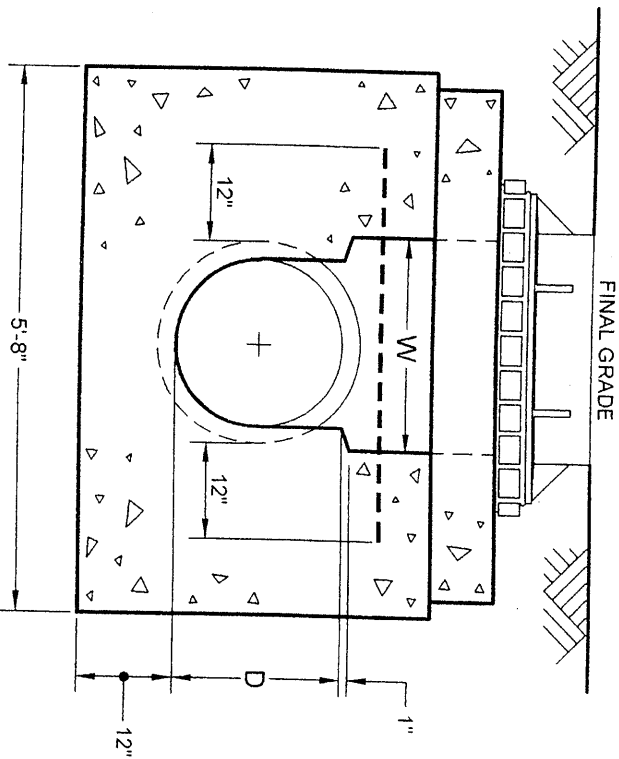
Diagram illustrating a 4' x 8' grid layout. The grid is composed of 4' x 8' sections. The total width is 4' (12" cover + 2' clearance + 12" cover). The total length is 8' (3'4" to 12' cover + 3'8" below 12'). The grid is divided into four 2' x 2' sections. The 2' x 2' sections are separated by 12" cover and 2' clearance. The 2' x 2' sections are separated by 12" cover and 2' clearance. The 2' x 2' sections are separated by 12" cover and 2' clearance. The 2' x 2' sections are separated by 12" cover and 2' clearance.

- (1) WHEN LEGAL GRADE IS BELOW FINAL GRADE SEE SEWER STANDARD NO. 38.
- (2) KEYED CONSTRUCTION JOINTS ARE REQUIRED BETWEEN ANY SUCCESSIVE POURS
- (3) CONCRETE IS TO BE CLASS 40. REBARS- GRADE 60.
- (4) FOR ALL PIPE SEWERS EIGHTEEN (18) INCHES IN DIAMETER AND GREATER, ADD 3-#6@3' ABOVE AND BELOW THE PIPE.
- (5) CONSTRUCTION JOINT TO BE UTILIZED WHENEVER GROUND CONDITIONS PREVENT

DATE \_\_\_\_\_

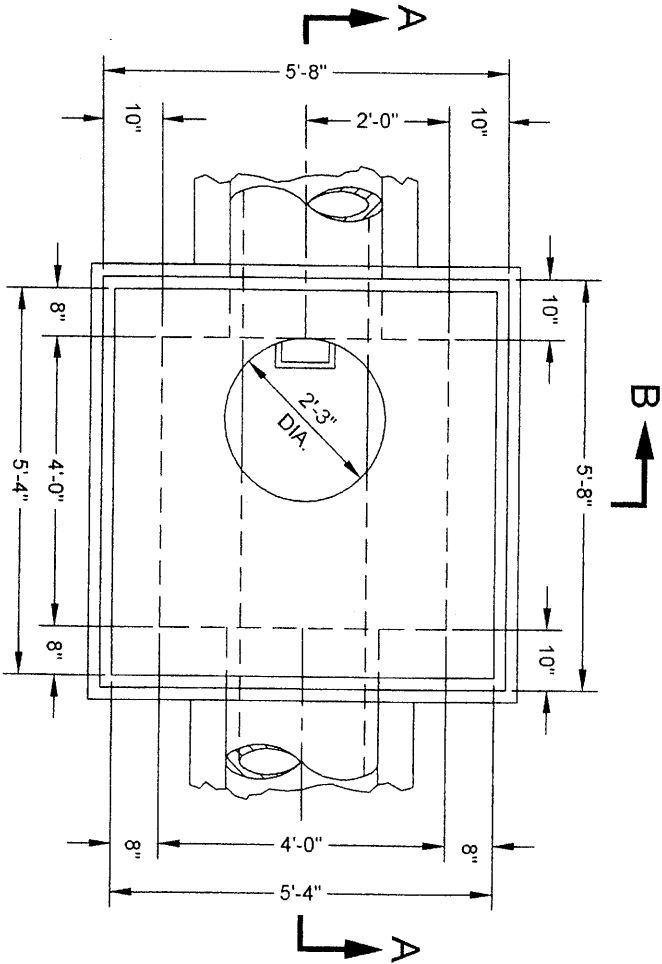
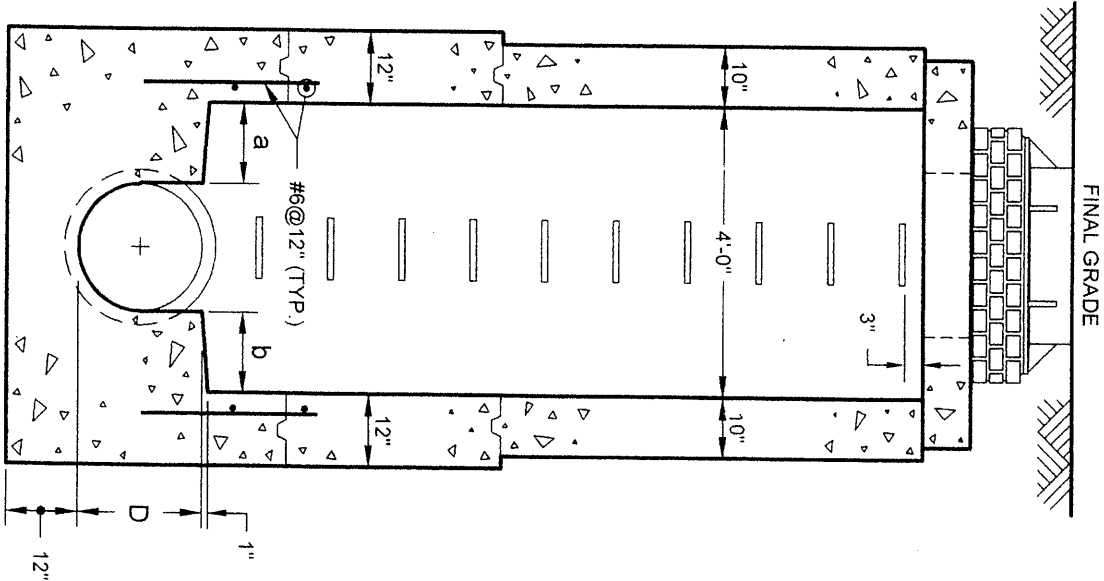
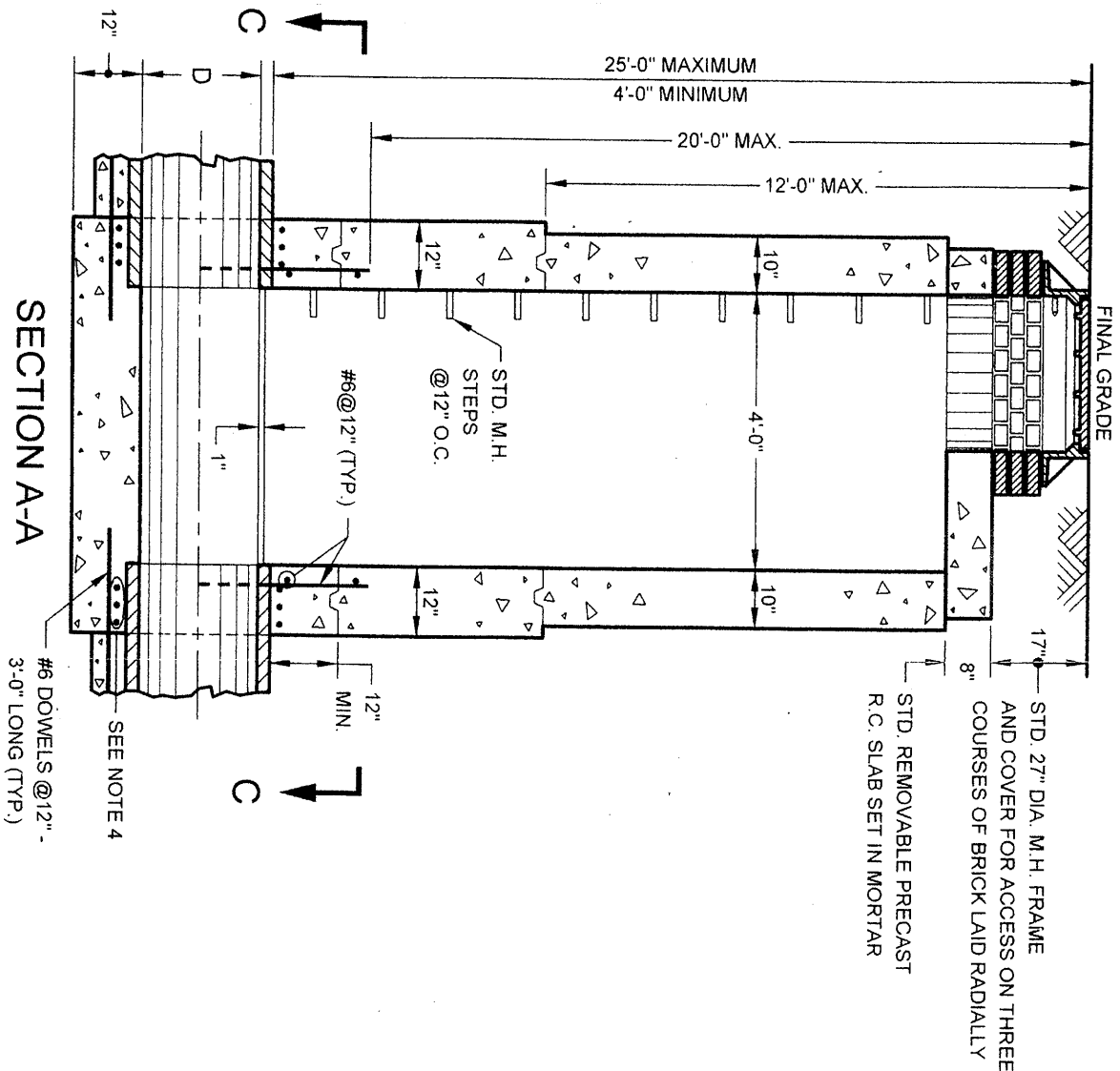


- (1) WHEN PILES ARE REQUIRED, REFER TO STANDARD MANHOLE TYPE A-2 FOR PILE DETAILS.
- (2) CONCRETE IS TO BE CLASS 40. REBARS-GRADE 60.



DATE \_\_\_\_\_

STANDARD FOR MANHOLE ON 8" DIA. TO 30" DIA. PIPE SEWERS IN WET LOCATION  
TYPE B-1 (12' MAX. COVER) AND TYPE B-2 (25' MAX. COVER)

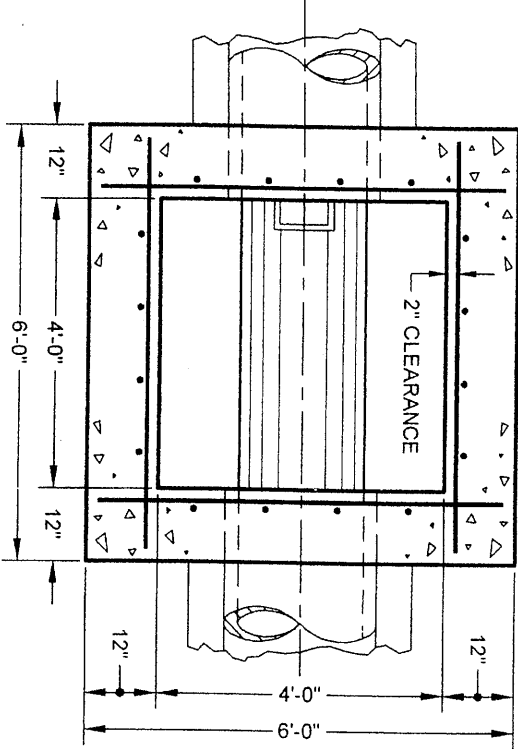


SECTION B-B

SECTION A-A

- NOTES:
- (1) WHEN LEGAL GRADE IS BELOW FINAL GRADE SEE SEWER STANDARD NO. 38.
  - (2) KEVED CONSTRUCTION JOINTS ARE REQUIRED BETWEEN ANY SUCCESSIVE POURS.
  - (3) CONCRETE IS TO BE CLASS 40. REBARS- GRADE 60.
  - (4) FOR ALL PIPE SEWERS EIGHTEEN (18) INCHES IN DIAMETER AND GREATER, ADD 3-#6@3" ABOVE AND BELOW THE PIPE.

D	a	b
8"	20"	20"
10"	19"	19"
12"	18"	18"
15"	16 1/2"	16 1/2"
18"	15"	15"
24"	12"	12"
30"	12"	6"



SECTION C-C

*Boyd W. Lawer*  
ASSISTANT COMMISSIONER, DESIGN  
DEPARTMENT OF DESIGN AND CONSTRUCTION

P.E.

DATE

7/9/07

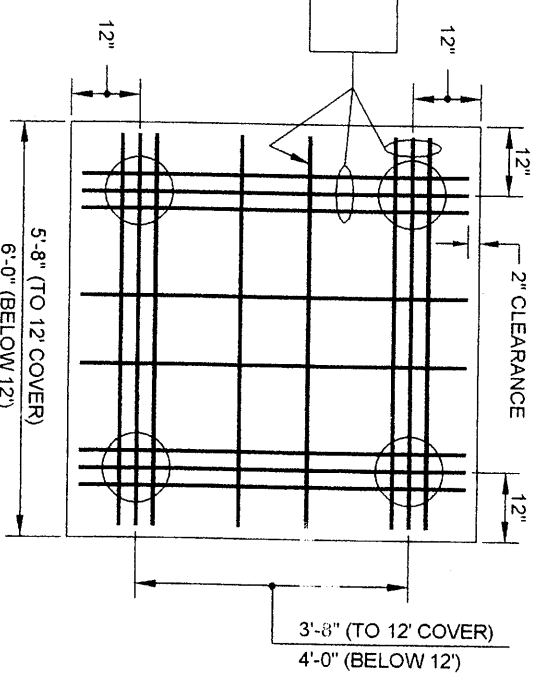
*Maedi Lawer*  
DIRECTOR OF ENGINEERING  
DEPARTMENT OF ENVIRONMENTAL PROTECTION

P.E.

DATE

8/10/07

TYPE B-1 (12' MAX. COVER) AND TYPE B-2 (25' MAX. COVER)



- DATE 8/10/07