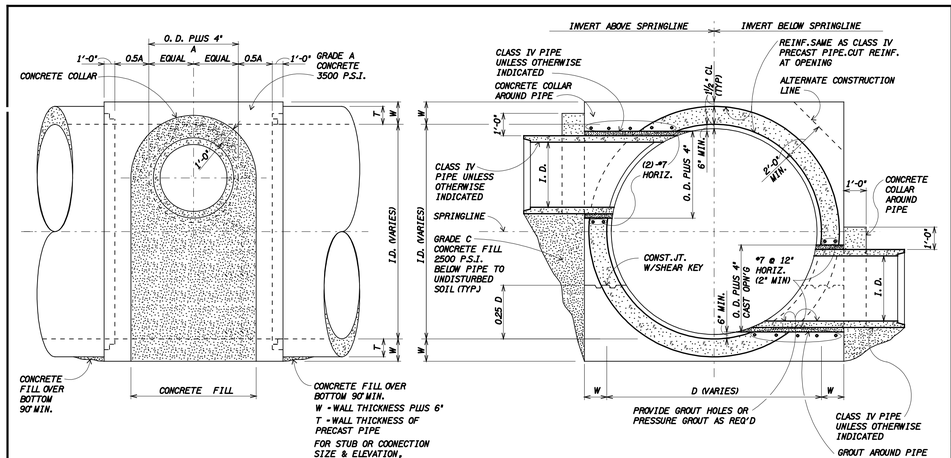
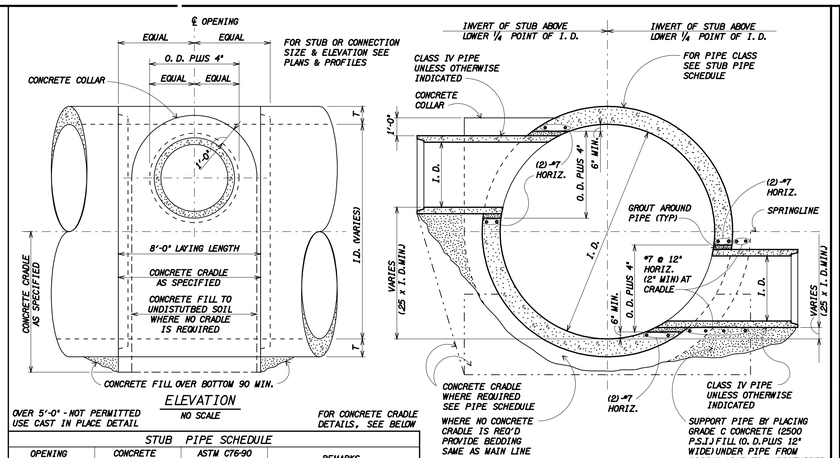
Appendix H:
Storm Drain Backfill Detail

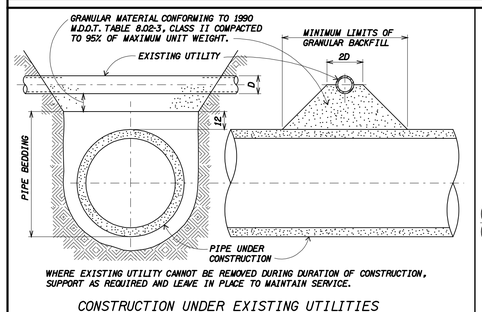




STUB PIPE SCHEDULE

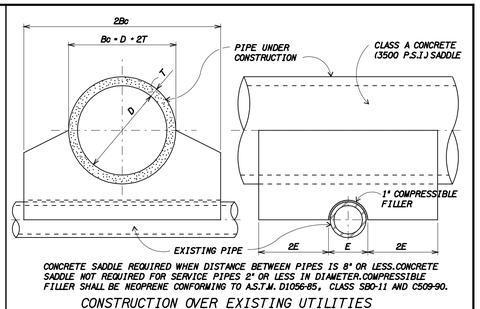
OPENING SIZE	CONCRETE CRADLE TYPE	ASTM C76-90 CLASS	REMARKS
2'-0" & SMALLER	NONE	ONE CLASS OVER MAIN LINE	#7 BARS ABOVE & BELOW OPN'G IN PIPE NOT REQUIRED
2'-1" THRU 4'-0"	NONE	IV	
	B	SAME AS MAIN LINE	USE CLASS V & CLASS IV MAIN LINE
4'-1" THRU 5'-0"	B	IV	USE CLASS V & CLASS IV MAIN LINE

STANDARD STUBS & CONECTIONS TO SEWERS



WHERE EXISTING UTILITY CANNOT BE REMOVED DURING DURATION OF CONSTRUCTION, SUPPORT AS REQUIRED AND LEAVE IN PLACE TO MAINTAIN SERVICE.

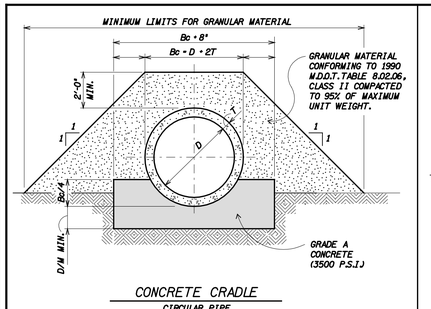
CONSTRUCTION UNDER EXISTING UTILITIES



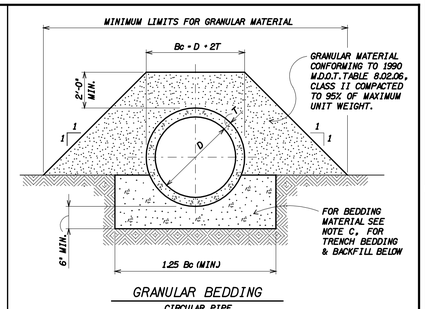
CONCRETE SADDLE REQUIRED WHEN DISTANCE BETWEEN PIPES IS 8" OR LESS. CONCRETE SADDLE NOT REQUIRED FOR SERVICE PIPES 2" OR LESS IN DIAMETER. COMPRESSIBLE FILLER SHALL BE NEOPRENE CONFORMING TO A.S.T.M. D1056-85, CLASS SB0-11 AND C509-90.

CONSTRUCTION OVER EXISTING UTILITIES

METHOD OF CROSSING EXISTING UTILITIES WITH NEW CONSTRUCTION

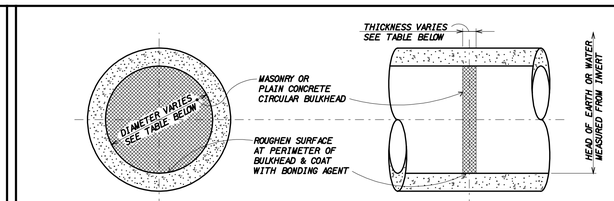


CONCRETE CRADLE
CIRCULAR PIPE



GRANULAR BEDDING
CIRCULAR PIPE

EMBANKMENT BEDDING & FILL



MASONRY BULKHEAD SHALL BE BRICK OR SOLID CONCRETE BLOCK WITH MORTAR CONSISTING OF ONE PART PORTLAND CEMENT, ¼ PART LIME & 3½ PARTS SAND.

PLAIN CONCRETE BULKHEAD SHALL BE CLASS A (3500 P.S.I.) CONCRETE.

BONDING AGENT SHALL BE GRACE PRODUCTS "DARAWELD", LARSON PRODUCTS "WELDCRETE", OR EQUAL.

CIRCULAR SECTION DIAMETER (INCHES)	ALLOWABLE HEAD OF WATER ABOVE INVERT * (FEET)													
	MASONRY BULKHEAD THICKNESS (INCHES)					PLAIN CONCRETE BULKHEAD THICKNESS (INCHES)								
	8"	12"	16"	20"	24"	4"	6"	8"	10"	12"	14"	16"	18"	20"	22"	24"
36" & SMALLER	16	35	61	95		10	22	38	58	83	113	—	—	—	—	—
42"	12	26	45	70	100	8	16	28	43	61	83	108	—	—	—	—
48"	10	20	35	54	77	7	13	22	33	48	64	83	105	—	—	—
54"	8	16	28	43	62	6	11	18	27	38	51	66	83	103	—	—
60"	7	14	23	36	50	—	9	15	22	31	42	54	68	84	101	—
66"	—	12	20	30	42	—	8	13	19	26	35	45	57	70	84	100
72"	—	11	17	26	36	—	—	11	16	23	30	39	48	59	71	84
78"	—	10	15	22	31	—	—	9	14	20	26	33	42	51	61	72
84"	—	9	14	20	27	—	—	—	13	18	23	29	36	44	53	63
90"	—	—	12	18	24	—	—	—	12	16	21	26	32	39	47	55
96"	—	—	11	16	22	—	—	—	11	14	19	23	29	35	42	49
102"	—	—	10	15	20	—	—	—	10	13	17	21	26	31	37	44
108"	—	—	—	14	18	—	—	—	—	12	16	20	24	29	34	40
114"	—	—	—	13	17	—	—	—	—	11	15	18	22	26	31	36
120"	—	—	—	12	16	—	—	—	—	—	14	17	20	24	29	33
126"	—	—	—	—	15	—	—	—	—	—	13	16	19	23	26	31
132"	—	—	—	—	14	—	—	—	—	—	—	15	18	21	25	29
144"	—	—	—	—	—	—	—	—	—	—	—	—	14	16	22	25

* CONDITIONS BEYOND TABLE VALUES REQUIRE SPECIAL BULKHEADS AS SHOWN ON PLANS

STANDARD MASONRY & PLAIN CONCRETE BULKHEADS

GENERAL CONCRETE NOTES

1. THE CONTRACTOR SHALL VERIFY ALL CONDITIONS & MEASUREMENTS AT THE SITE & SHALL REPORT ANY DISCREPANCIES TO THE ENGINEER PROCEEDING WITH THE WORK.
2. CONCRETE SHALL BE GRADE A WITH A MINIMUM COMPRESSION STRENGTH OF 3500 P.S.I. AT 28 DAYS UNLESS OTHERWISE NOTED.
3. REINFORCEMENT STEEL SHALL BE NEW BILLET STEEL CONFORMING TO ASTM A615-90, GRADE 60, INCLUDING SUPPLEMENTARY REQM'TS S1, REINF. FOR TIES & STIRRUPS MAY BE NEW BILLET STEEL CONFORMING TO ASTM A615-90, GRADE 40.
4. REINFORCEMENT BAR DETAILING & PLACING SHALL CONFORM TO ACI 318-89 "BUILDING CODE", & TO DETAILS & DETAILING OF CONCRETE REINFORCEMENT ACI 315-80, & MANUAL OF ENGINEERING & PLACING DRAWINGS FOR REINFORCED CONC. STRUCT. ACI 315R-SP-66 (88) PLACE (2) #5 BARS, 4'-0" LONGER THAN OPENING, EACH FACE AROUND ALL OPENINGS IN WALLS & SLABS.
5. PROVIDE (1) #5 DIAGONAL x 3'-0" LONG, TOP & BOTTOM, EACH CORNER OF OPENING.
6. WALLS SHALL BE ADEQUATELY BRACED UNTIL SUPPORTING SLABS HAVE REACHED THEIR DESIGN STRENGTH.
7. PROVIDE CORNER BARS SAME SIZE & SPACING AS HORIZONTAL REINFORCEMENT ON OUTSIDE FACE OF ALL CORNERS.
8. MINIMUM COVER TO REINFORCEMENT SHALL BE AS FOLLOWS: A) 3" FOR CONCRETE POURED AGAINTS GROUND; B) WHERE FORMS ARE USED, MINIMUM COVER SHALL BE 2" FOR BARS LARGER THAN #5 & 1½" FOR BARS #5 & SMALLER.
9. MINIMUM LAP OF REINFORCEMENT SHALL BE CLASS C, AS CALLED FOR IN TABLE 20.2 OF SP-17A (78).
10. KEYWAYS SHALL BE 2"x4", UNLESS OTHERWISE NOTED.
11. PROVIDE ¾"x 45° CHAMFER AT EXPOSED EDGES UNLESS OTHERWISE NOTED.

TYPES OF PIPES & JOINTS

PIPE					JOINT	
MATERIAL	SIZE (ROUND)	SPEC.	CLASS	REMARKS	DESCRIPTION	SPEC.
PLAIN CONCRETE	4" - 26"	A.S.T.M. C14 - 90	1, 2 & 3			
REINFORCED CONCRETE	12" - 144"	A.S.T.M. C76 - 90	I -V		MODIFIED GROOVE TONGUE WITH RUBBER GASKET.	A.S.T.M C443 - 85A *
	12" - 144"	1990 M.D.O.T. 8.08.03	I -V	SPECIAL DESIGNS SUPPLEMENT A.S.T.M. C-76	INSIDE CEMENT POINTING FOR 42" & LARGER PIPE.	
	156" - 204"	A.S.T.M. C76 - 90	I -V	SPECIAL DESIGN		
	EQUIVALENT ROUND 18" - 144"	A.S.T.M. C507 - 90	HE - I THRU HE - IV	ELLIPTICAL PIPE	TONGUE & GROOVE BITUMINOUS JOINT WITH INSIDE CEMENT POINTING.	
	18" - 144"	A.W.W.A. C305 - 74	C76 - 83 EQUIVALENT I -V	PRESSURE PIPE, NON-CYLINDER TYPE	STEEL RINGS & RUBBER JOINTS	A.W.W.A. C302 - 74
VITRIFIED CLAY	4" - 26"	N.C.P.I. ER4 - 67	EXTRA STRENGTH		*AWIT* *O-RING* *AWIT-A-RING* *STRE-TITE* *DEFLEC/TITE* *TYLOX* *LDIXON* *UNILOC* *NOBEL* *WEDGELOCK*	A.S.T.M. C - 425 - 90a *

* EXCEPT AS SUCH SPECIFICATIONS RELATE TO INFILTRATION LIMITATION.

STANDARD SEWER DETAILS

BRIAN JONCKHEERE

LIVINGSTON COUNTY DRAIN COMMISSIONER

LIVINGSTON COUNTY — MICHIGAN

DATE	ADDITIONS AND/OR REVISIONS			
2-24-97	ISSUED FOR BIDS			

DRAWER	SCALE	DR.	CK.	APP.
		K.G.B.	E.P.D.	W.H.A.

JOB NO. 970785 — DATE

HUBBELL, ROTH & CLARK, INC.
CONSULTING ENGINEERS
555 HULET DRIVE, BLOOMFIELD HILLS, MICH. — P.O. BOX 824, 48303-0824

SHEET NO. SD-2 OF

TRENCH BACKFILL NOTES:

SPECIAL BACKFILL FOR TRENCHES (TRENCH "A") SHALL BE USED AT ALL LOCATIONS CALLED FOR ON THE PLANS & REQUIRED IN THE SPECIFICATIONS

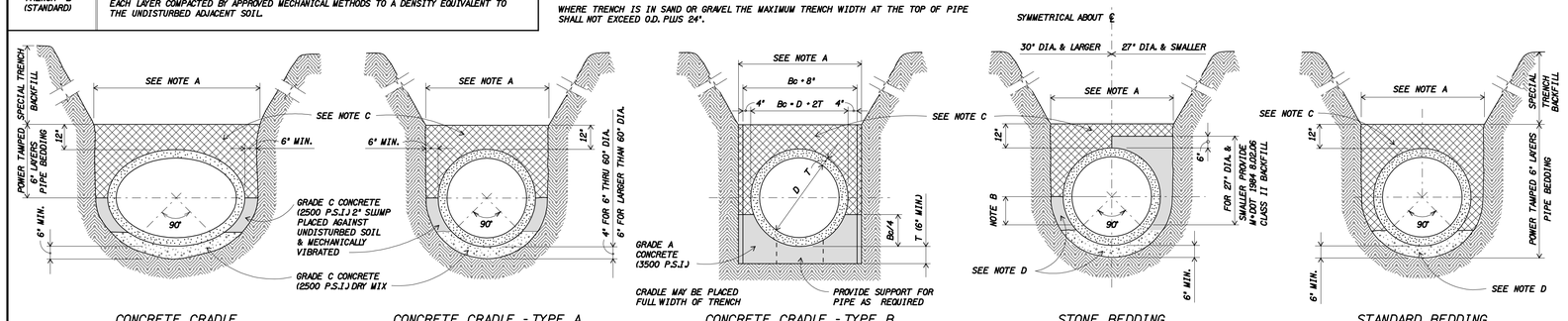
WHERE NOTED ON THE PLANS OR PROFILES THUS : |—TRENCH "A"—| TRENCH "A" SHALL BE USED AT LOCATIONS REQUIRED BY THE SPECIFICATIONS. TRENCH "B" SHALL BE USED FOR THE BALANCE OF THE WORK.

WHERE TRENCH IS IN SAND OR GRAVEL THE MAXIMUM TRENCH WIDTH AT THE TOP OF PIPE SHALL NOT EXCEED O.D. PLUS 24".

TRENCH	TRENCH BACKFILL
TRENCH "A" (SPECIAL)	BANK RUN SAND MEETING THE REQUIREMENTS OF 1990 M.D.O.T. 8.02.06 "GRANULAR MATERIALS FOR FILL & SUBBASE", CLASS II MATERIALS SHALL BE PLACED IN ACCORDANCE WITH 1990 M.D.O.T. 2.08.10-d-1 "CONTROLLED DENSITY METHOD" WITH EACH LAYER COMPACTED TO 95 PERCENT OF MAXIMUM UNIT WEIGHT.
TRENCH "B" (STANDARD)	SUITABLE EXCAVATED MATERIAL (EXCLUDING BLUE CLAY) PLACED IN ONE FOOT LAYERS WITH EACH LAYER COMPACTED BY APPROVED MECHANICAL METHODS TO A DENSITY EQUIVALENT TO THE UNDISTURBED ADJACENT SOIL.

TYPES OF BEDDING

STANDARD PIPE BEDDING SHALL BE USED EXCEPT WHERE THE OTHER TYPES OF PIPE BEDDING ARE CALLED FOR ON THE PLANS & PROFILES



NOTE A: BELOW A POINT 12" ABOVE THE TOP OF THE PIPE, THE TRENCH WIDTH SHALL PROVIDE A CLEARANCE OF NOT LESS THAN 6" BETWEEN PIPE & TRENCH. TRENCH WIDTH SHALL NOT EXCEED THAT SHOWN IN THE MAXIMUM TRENCH WIDTH TABLE.

NOTE B: FOR 30" DIA. AND LARGER PIPE, MATERIAL SHOWN THUS [▭] SHALL BE PEASTONE.

NOTE C: PIPE BEDDING MATERIALS SHOWN THUS [▭] SHALL BE SELECTED EXCAVATED MATERIAL (EXCEPT BLUE CLAY). WHERE TRENCH "A" IS SPECIFIED, SPECIAL TRENCH "A" BACKFILL MATERIAL SHALL BE USED FOR PIPE BEDDING BACKFILL.

NOTE D: PIPE BEDDING CUSHION MATERIALS SHOWN THUS [▭] SHALL CONSIST OF MEETING THE GRADING REQUIREMENTS OF 1990 M DOT, TABLE 8.02-1, COARSE AGGREGATE 6A, BLAST FURNACE SLAG OR CRUSHED STONE CONTAINING SUFFICIENT SMALLER SIZED AGGREGATE TO PREVENT MIGRATION OF EARTH OR BACKFILL MATERIAL INTO BEDDING MATERIAL & CAREFULLY PREPARED SO THAT THE ENTIRE BOTTOM ¼ OF THE PIPE WILL BEAR AGAINST THE CUSHION. THE TYPE & THICKNESS OF THE BEDDING SHALL BE AS REQUIRED TO MAINTAIN CORRECT ALIGNMENT & GRADE & SHALL NOT BE LESS THAN 6". (THIS BEDDING CUSHION SUPERCEDES CUSHION REQUIRED BY THE SPECIFICATIONS)

MAXIMUM TRENCH WIDTH TABLE (IN)

PIPE I.D.	TRENCH WIDTH
4 -12	32
15	36
18	39
21	43
24	46
27	50
30	53
36	68
42	75
48	82
54	89
60	96
66	103
72	110
78	117
84	124
90	136
96	143
102	149
108	156
114	163
120	170
132	184
144	198
156	212
168 & LARGER	O.D. PLUS 30

TRENCH BEDDING & BACKFILL

DESIGN FILE = F:\1997\1997DT\1997DT085\cadd\civil\sd2.dgn
STROKE TIME = 25-MAY-2005 13:00
PLOT NAME = N/A
USER NAME = rose