



CITY OF ORLANDO

STANDARD ENGINEERING DETAILS

Part 2 - Wastewater

Revised 2014

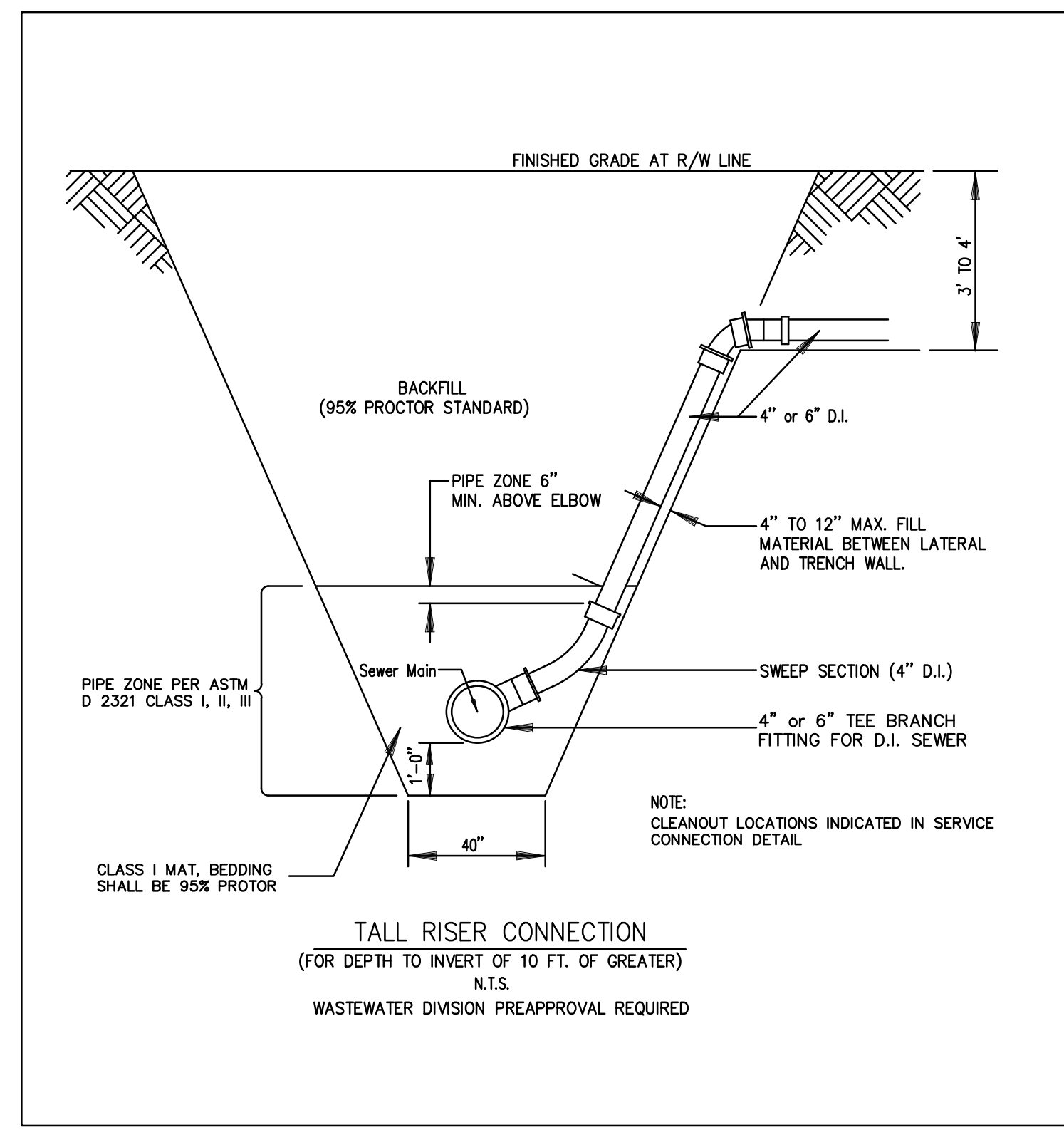
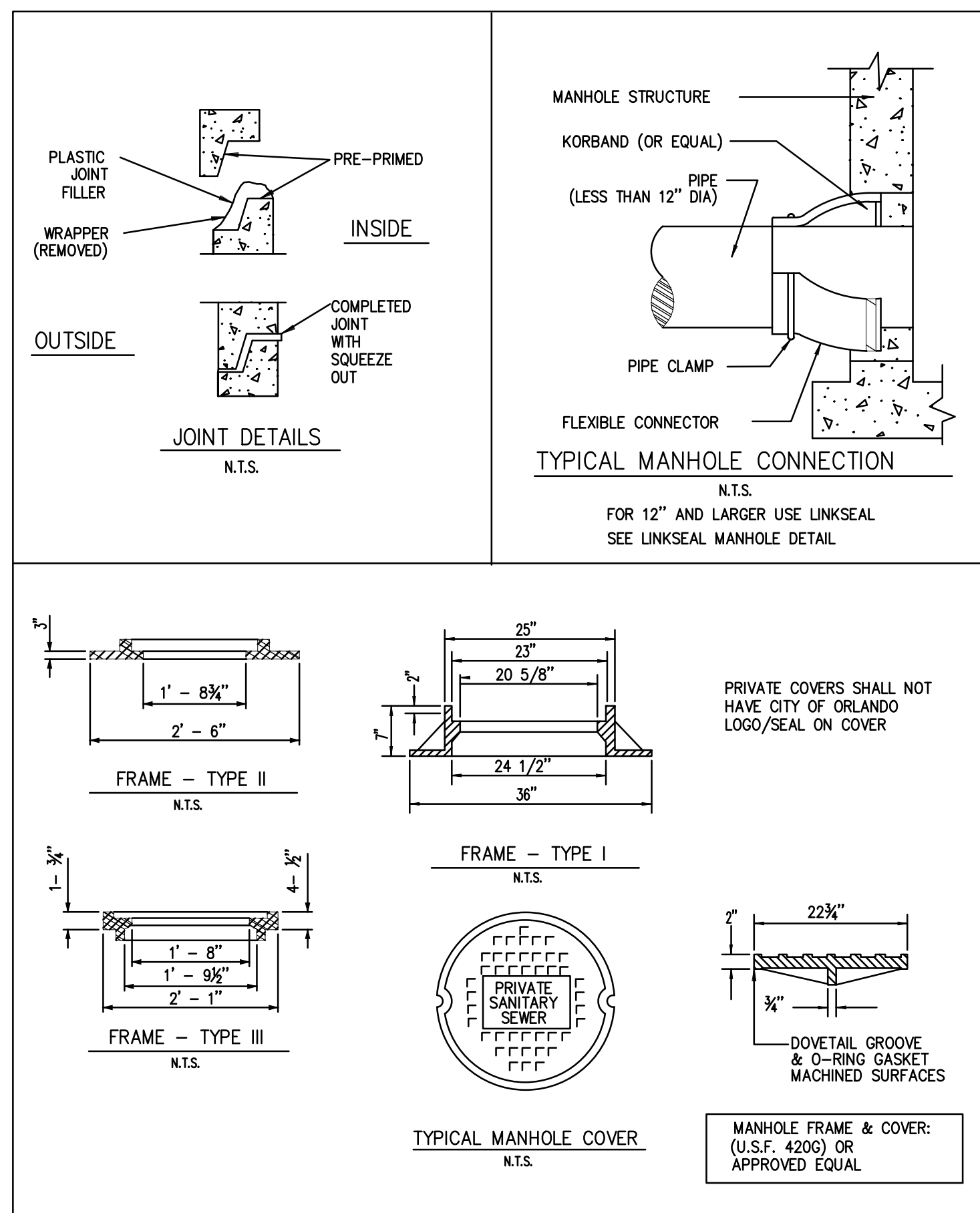
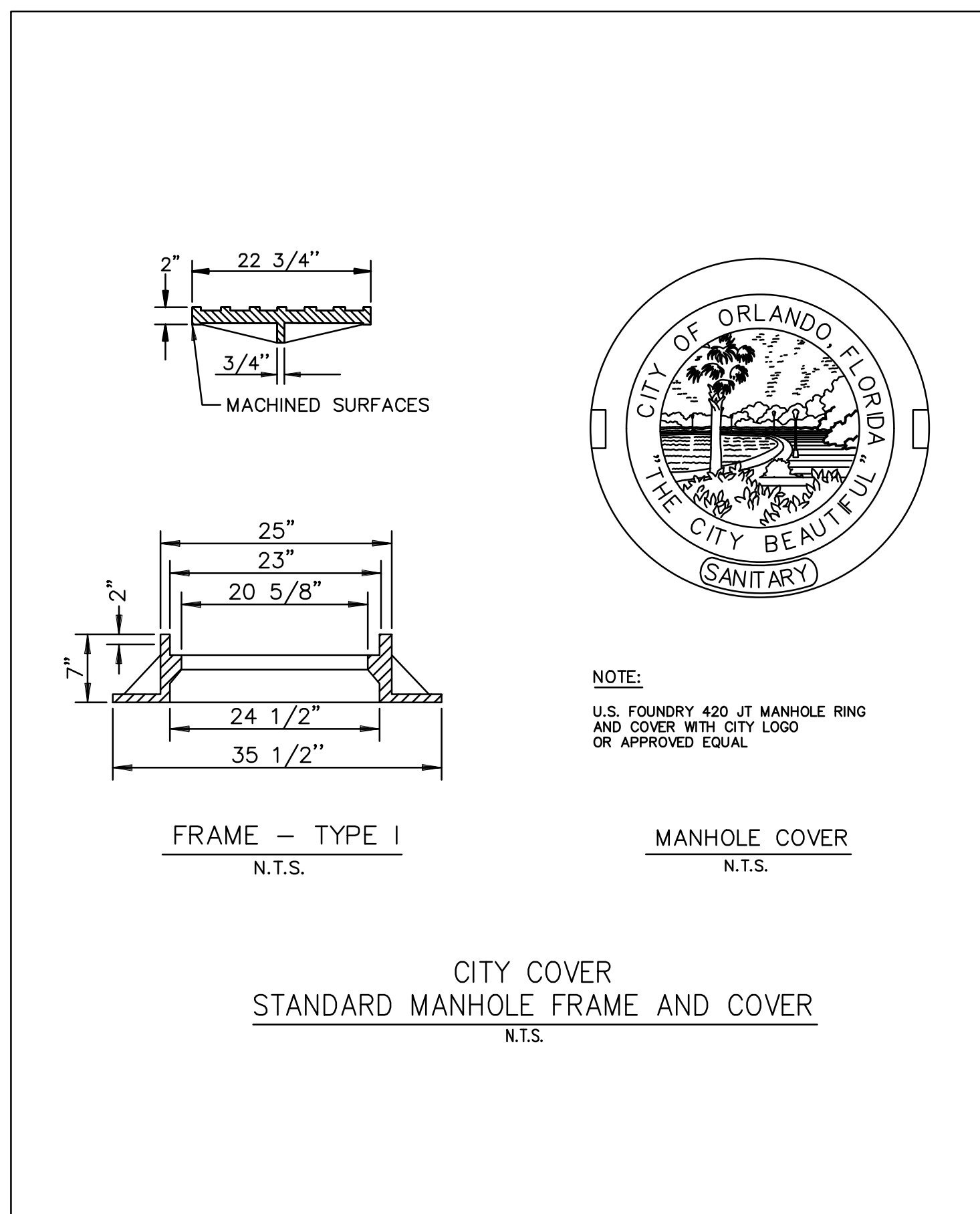
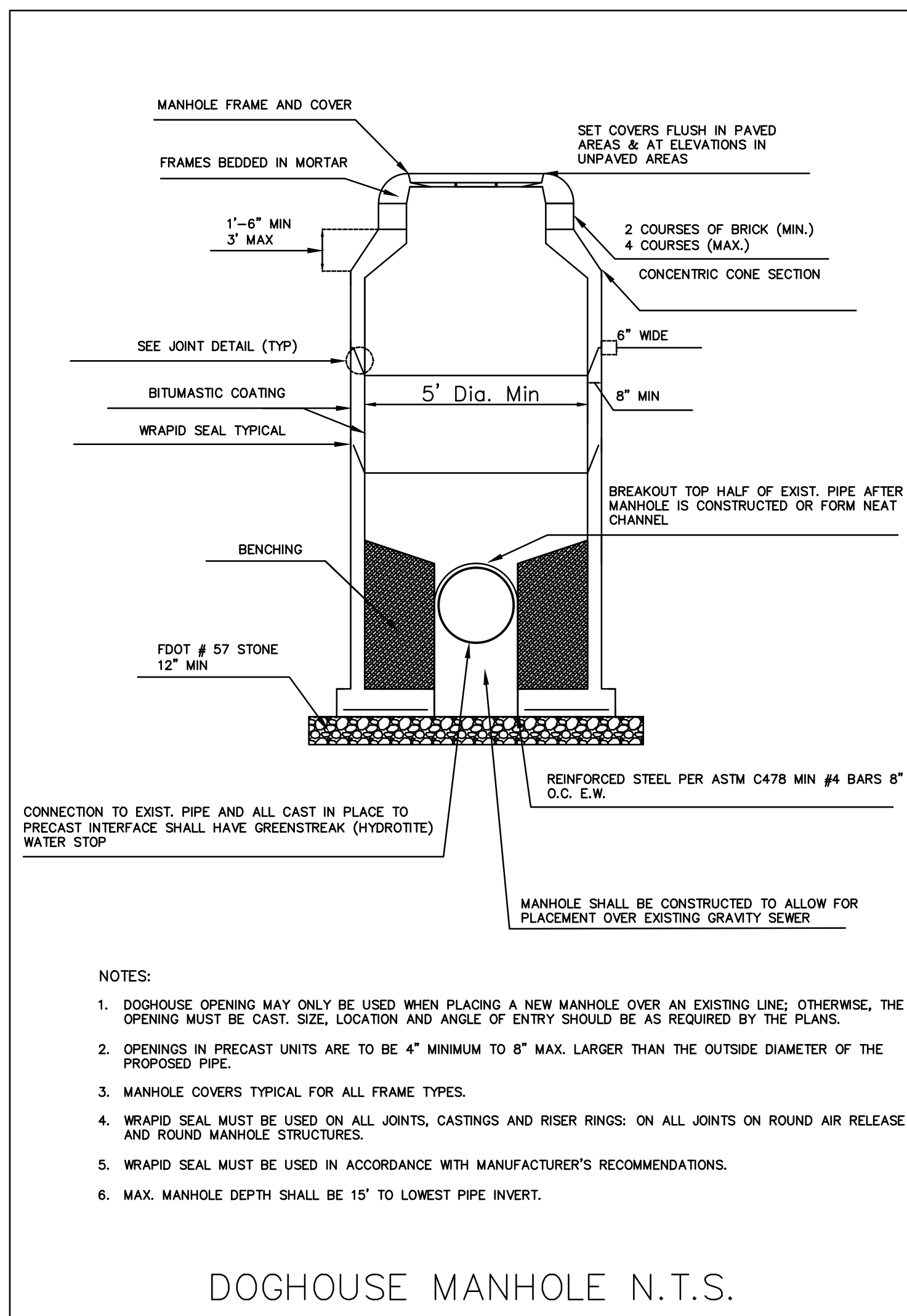
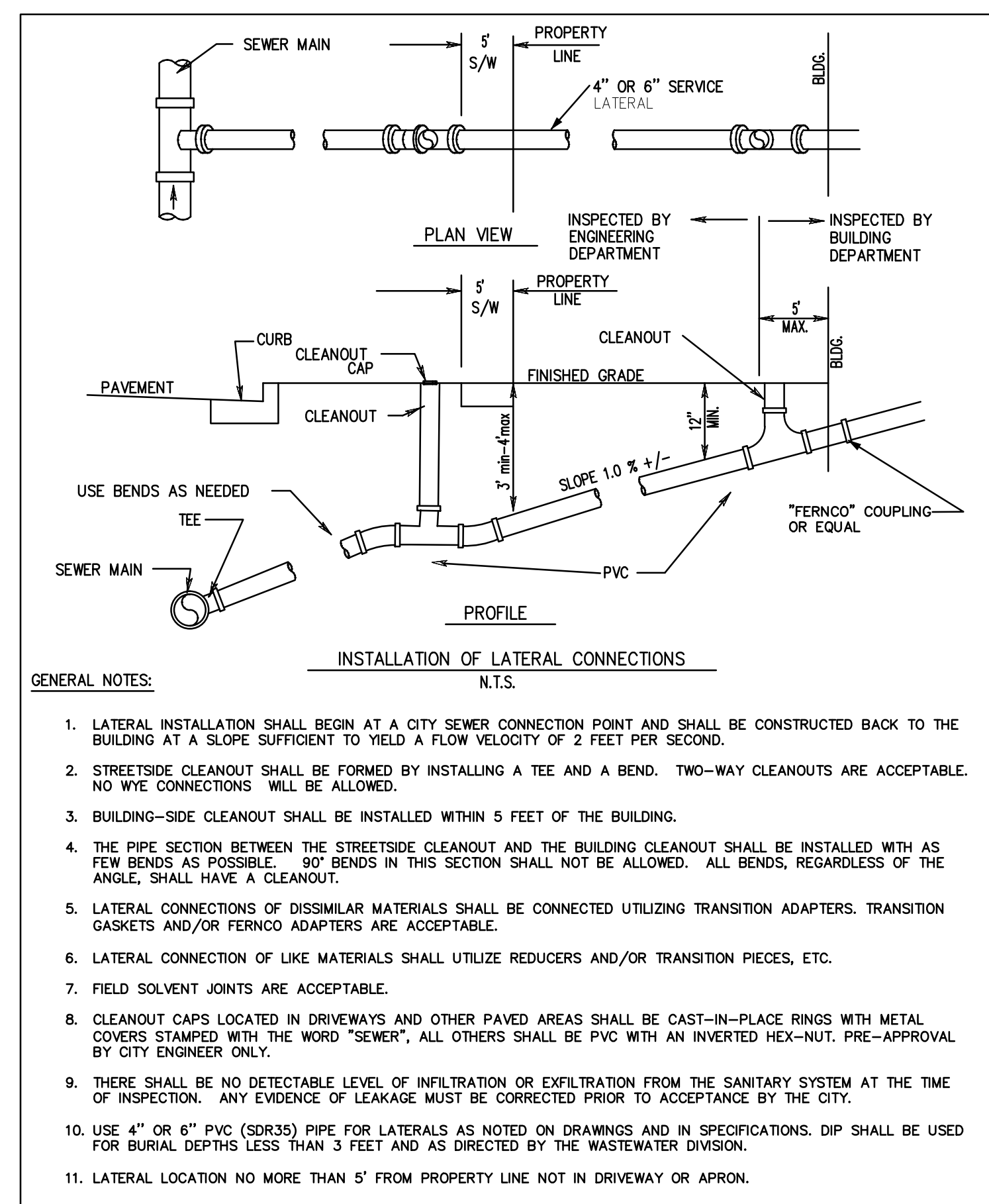
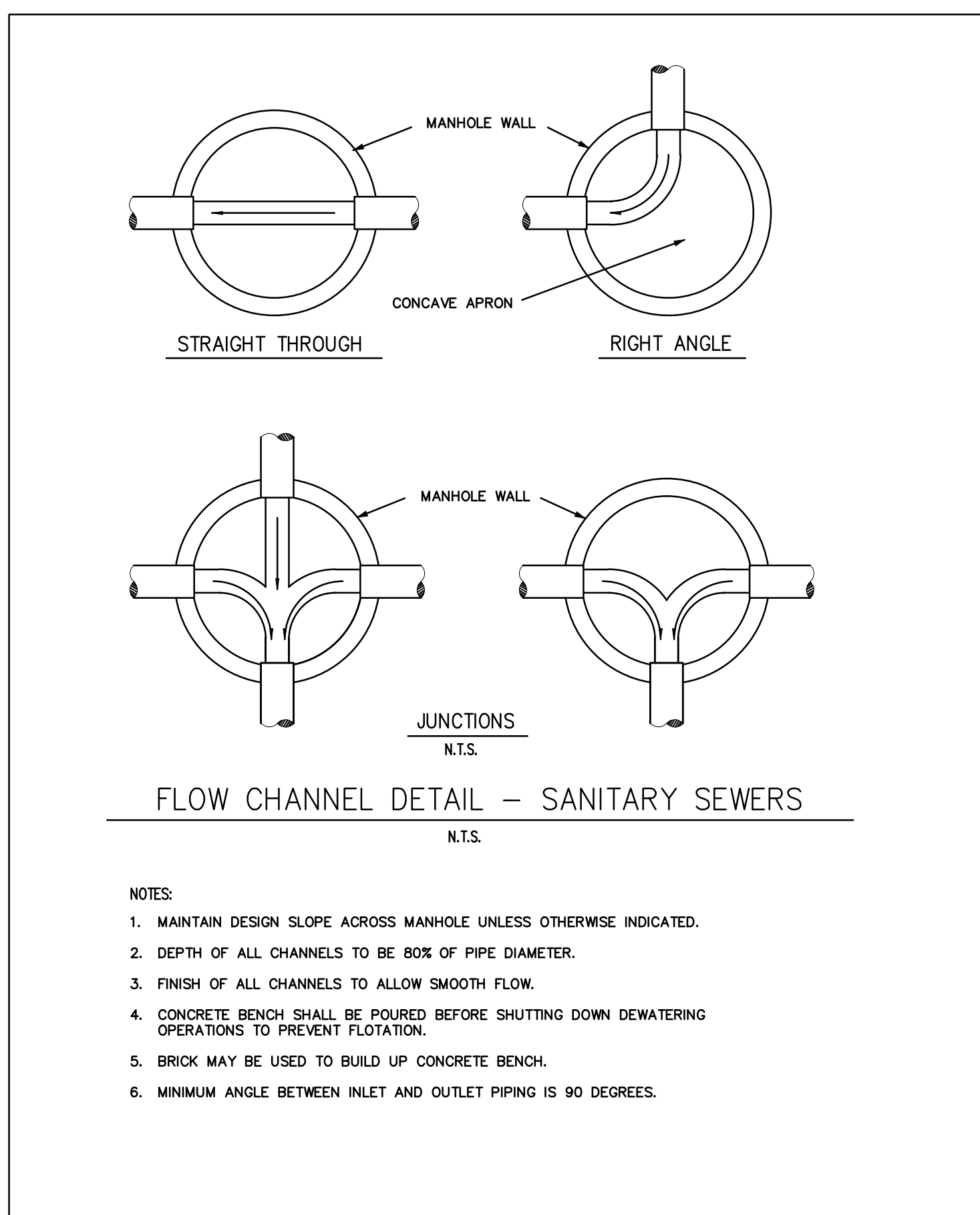
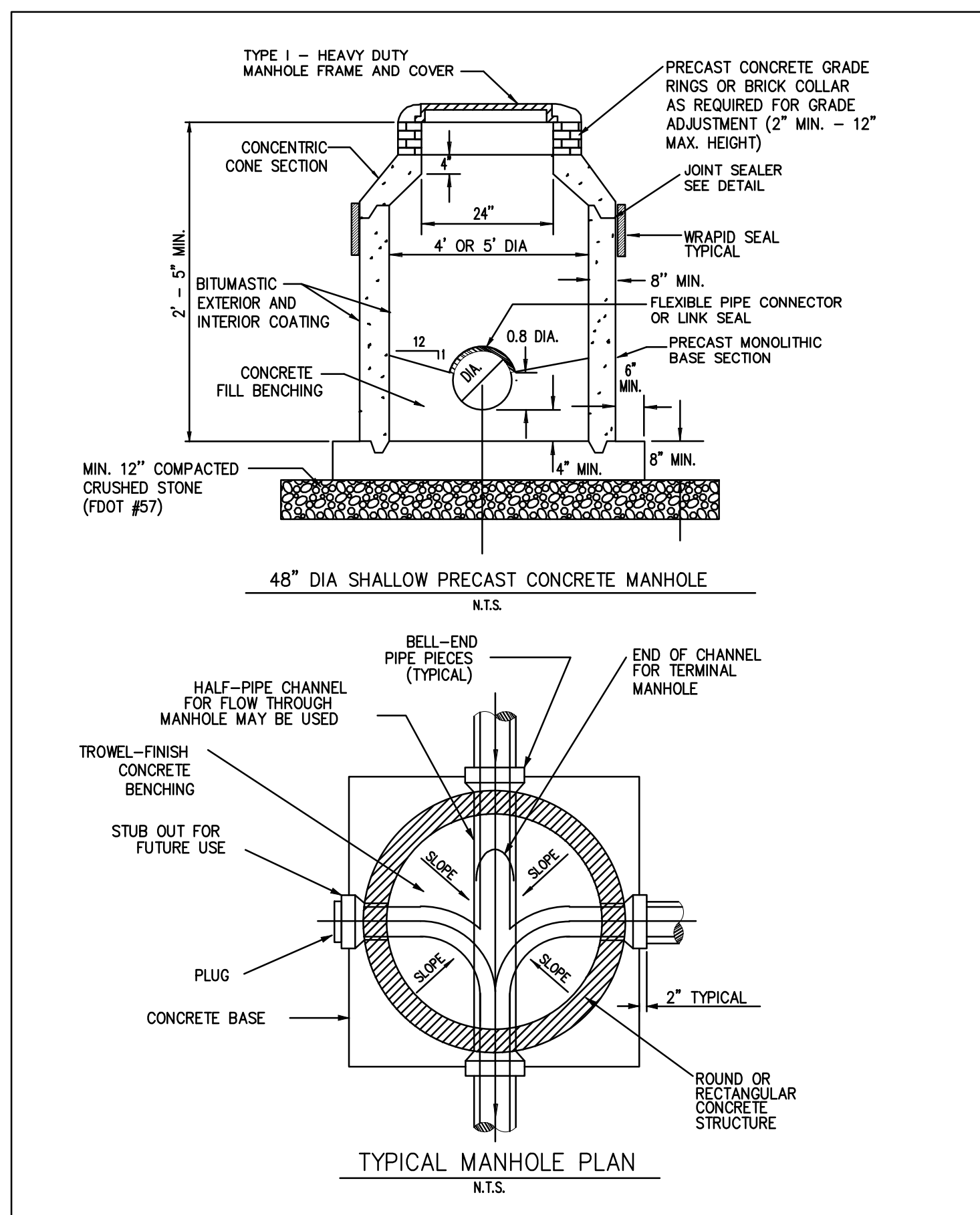
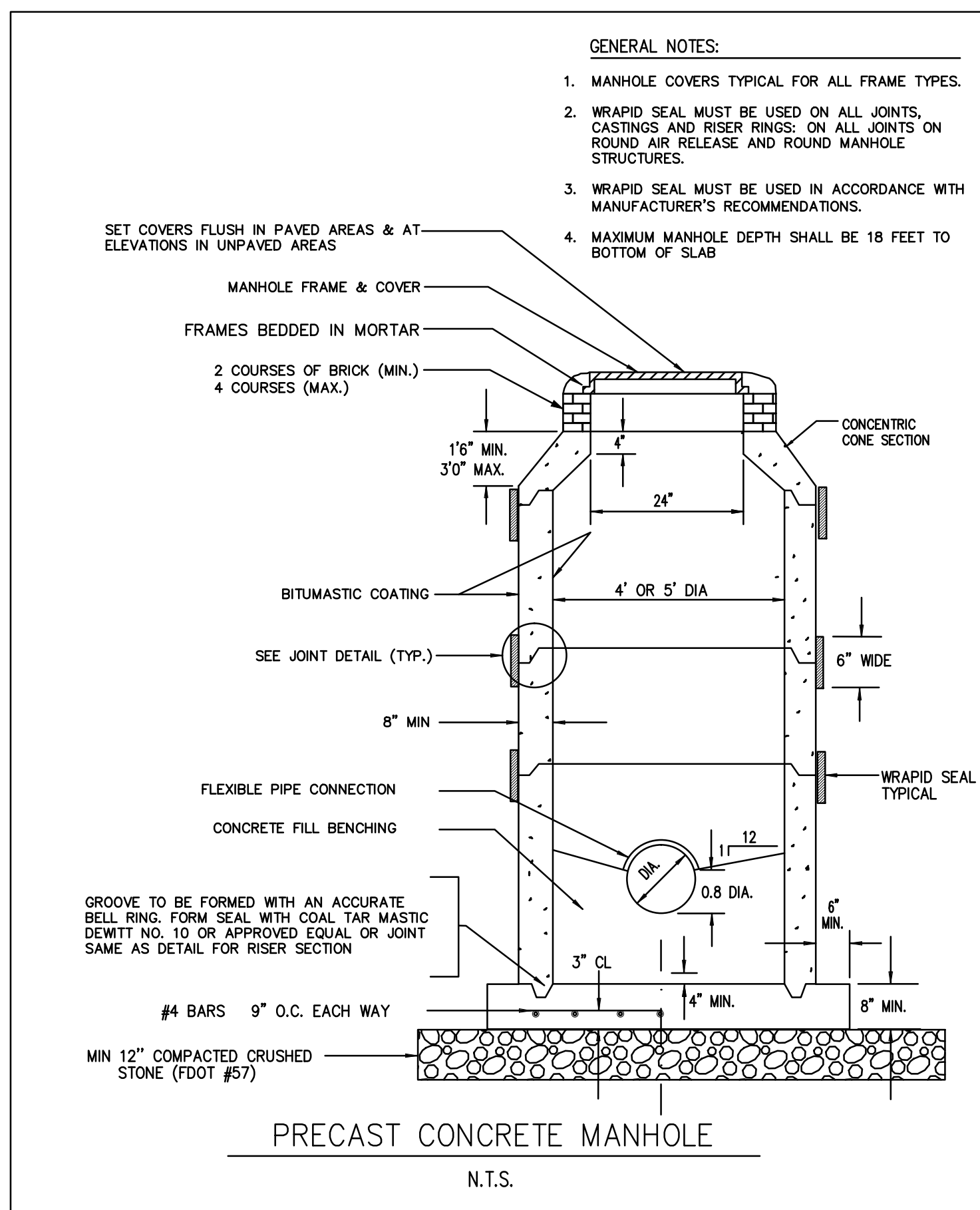
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ENGINEERING BUREAU • PUBLIC WORKS DEPARTMENT

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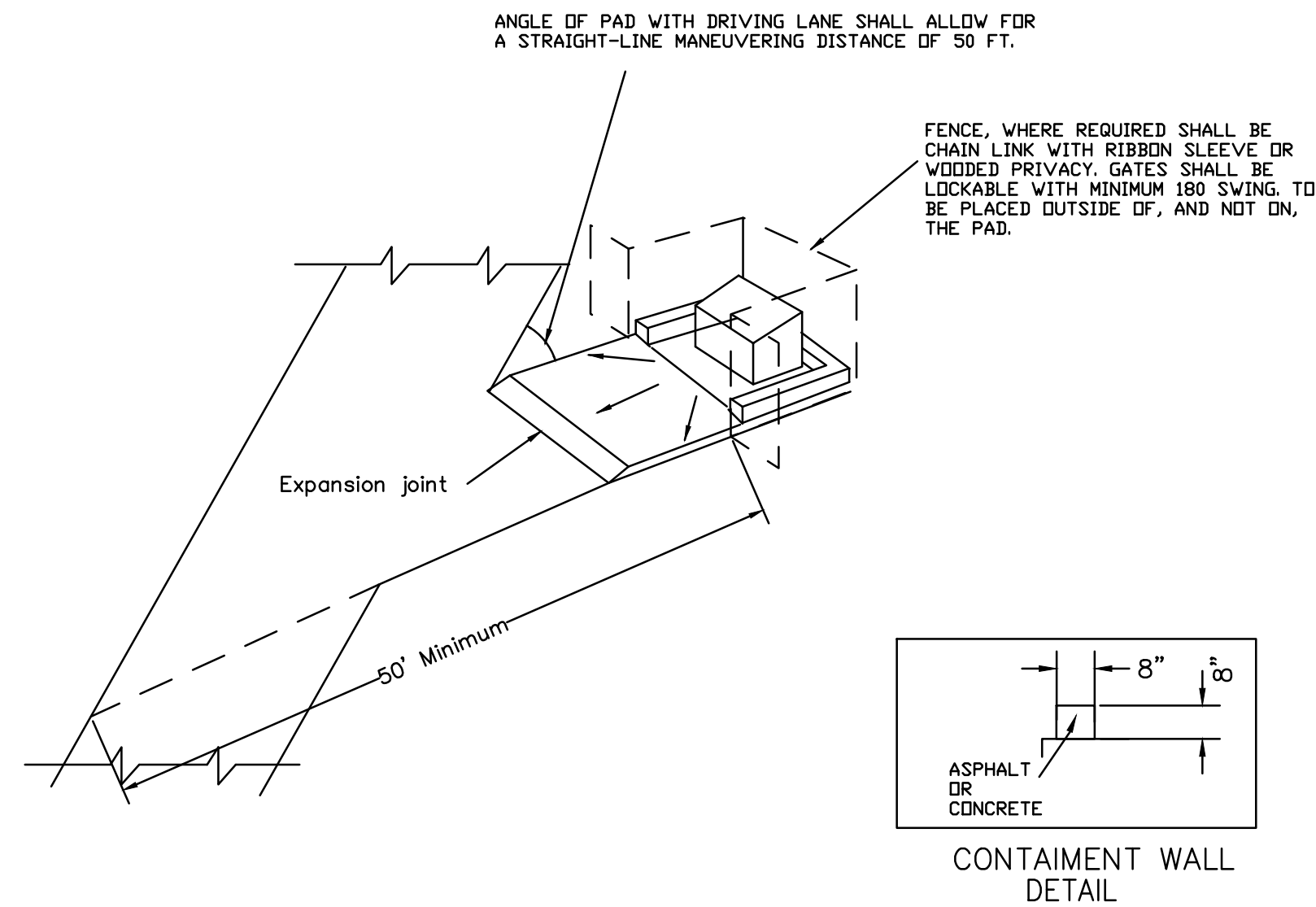


FILENAME: 4/8/2011	CATEGORY: WASTEWATER
DATE: 4/8/2011	SCALE: N.T.S.
DRAWN BY: DSG	APPROVED BY: RMH/CS

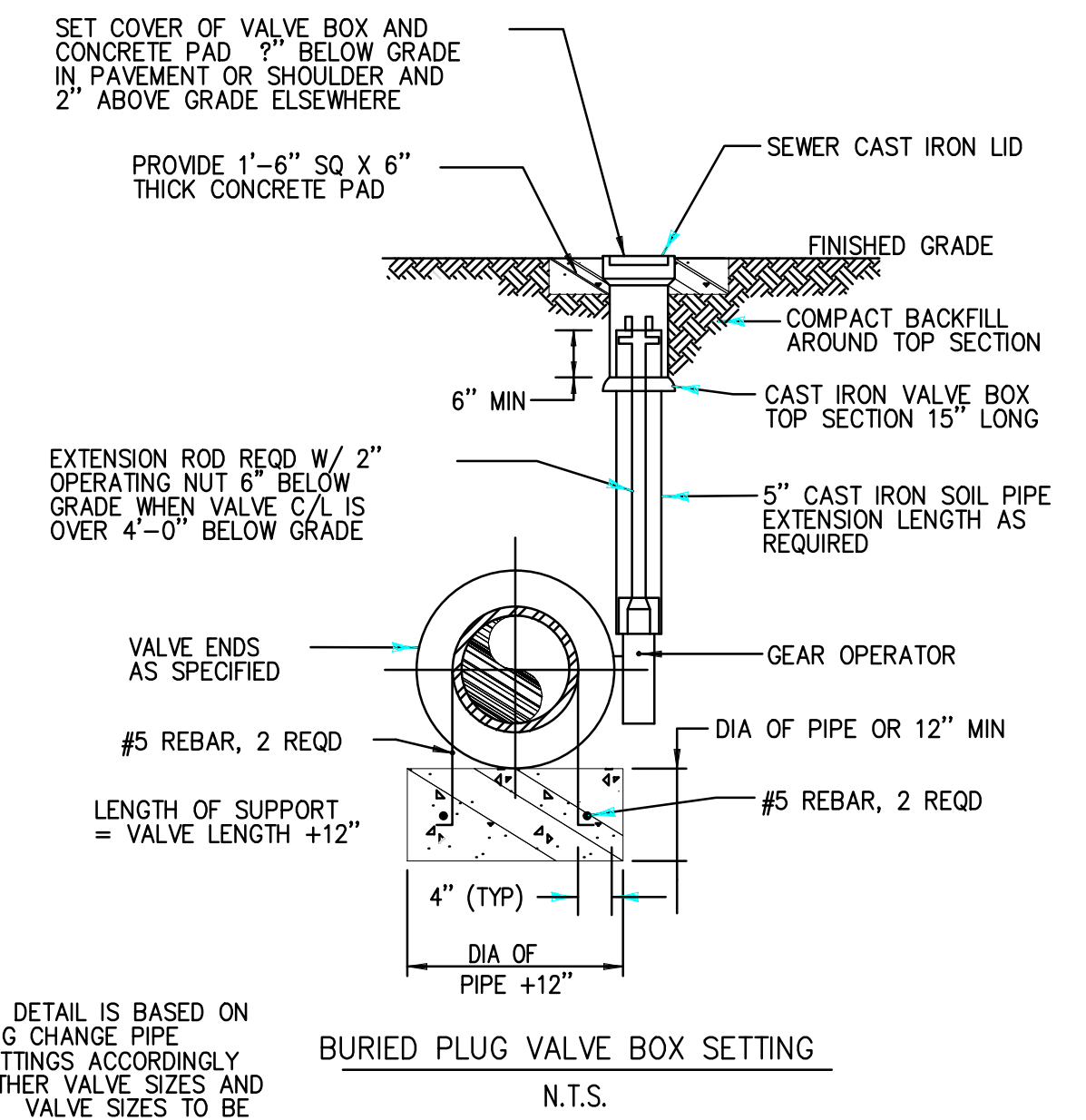
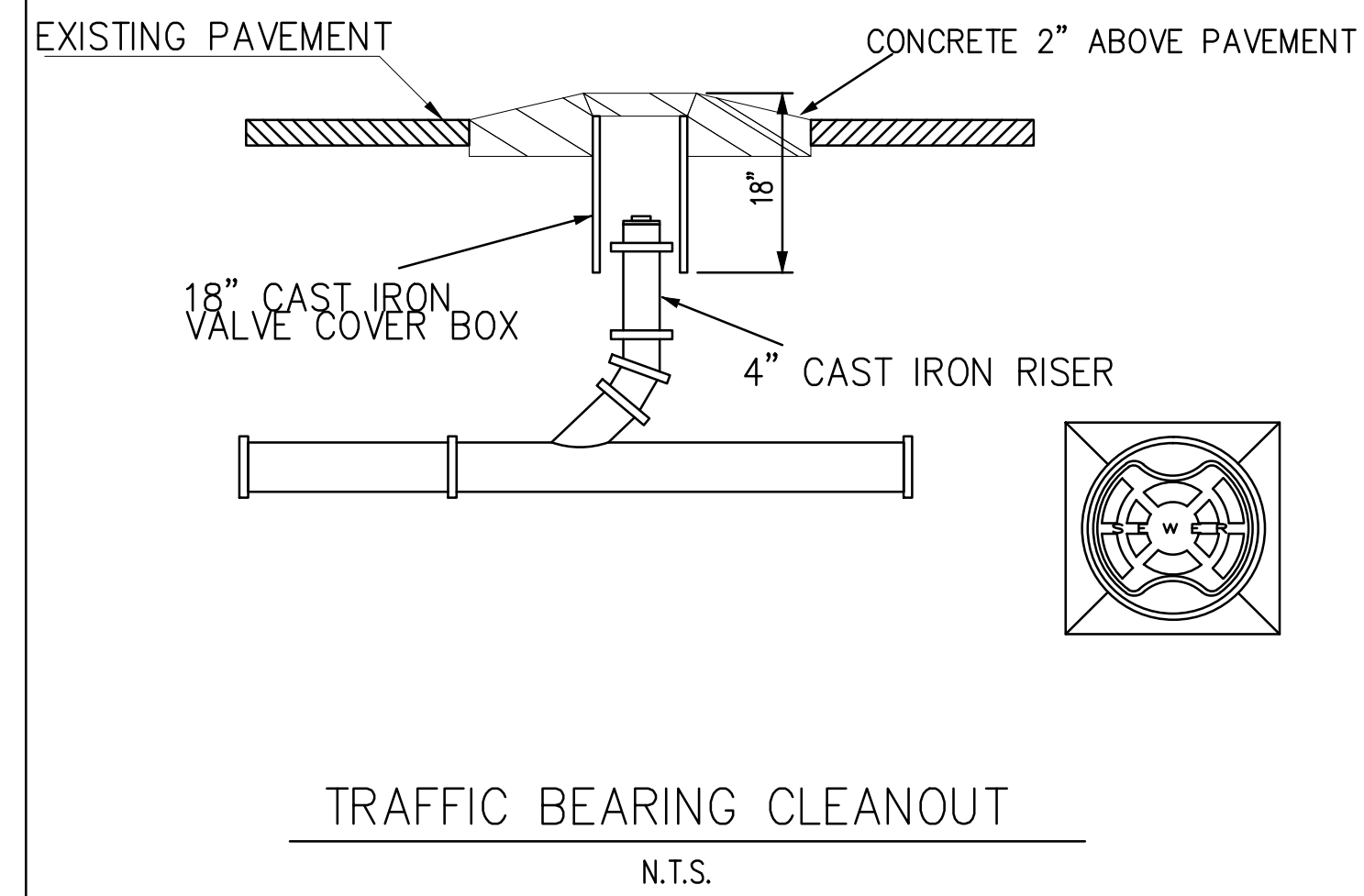
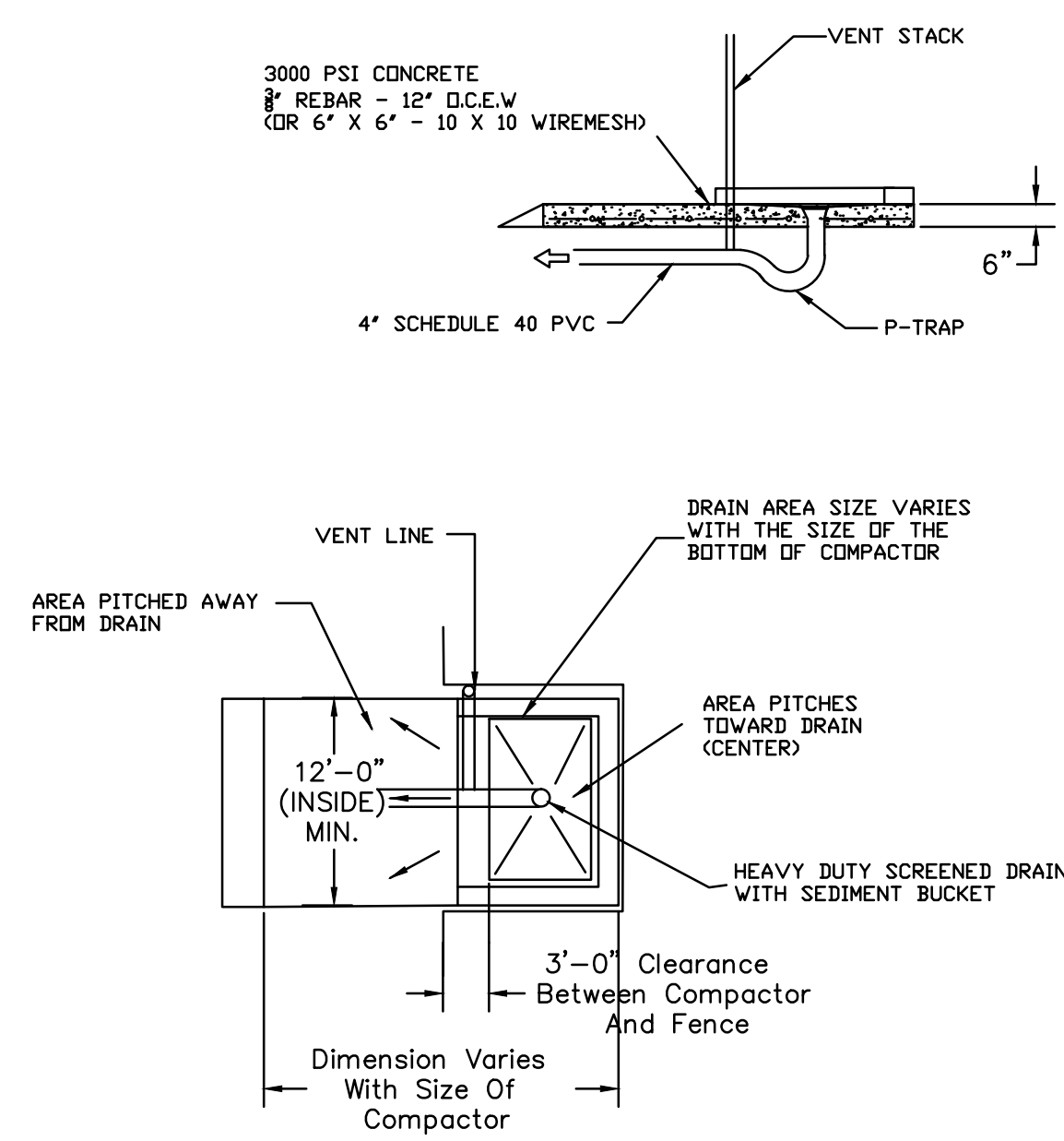
ENGINEERING STANDARDS MANUAL

CITY OF ORLANDO, FLORIDA
DEPARTMENT OF PUBLIC WORKS
WASTEWATER BUREAU
CITY OF ORLANDO, FLORIDA
TITLE:
SANITARY SEWER STRUCTURES

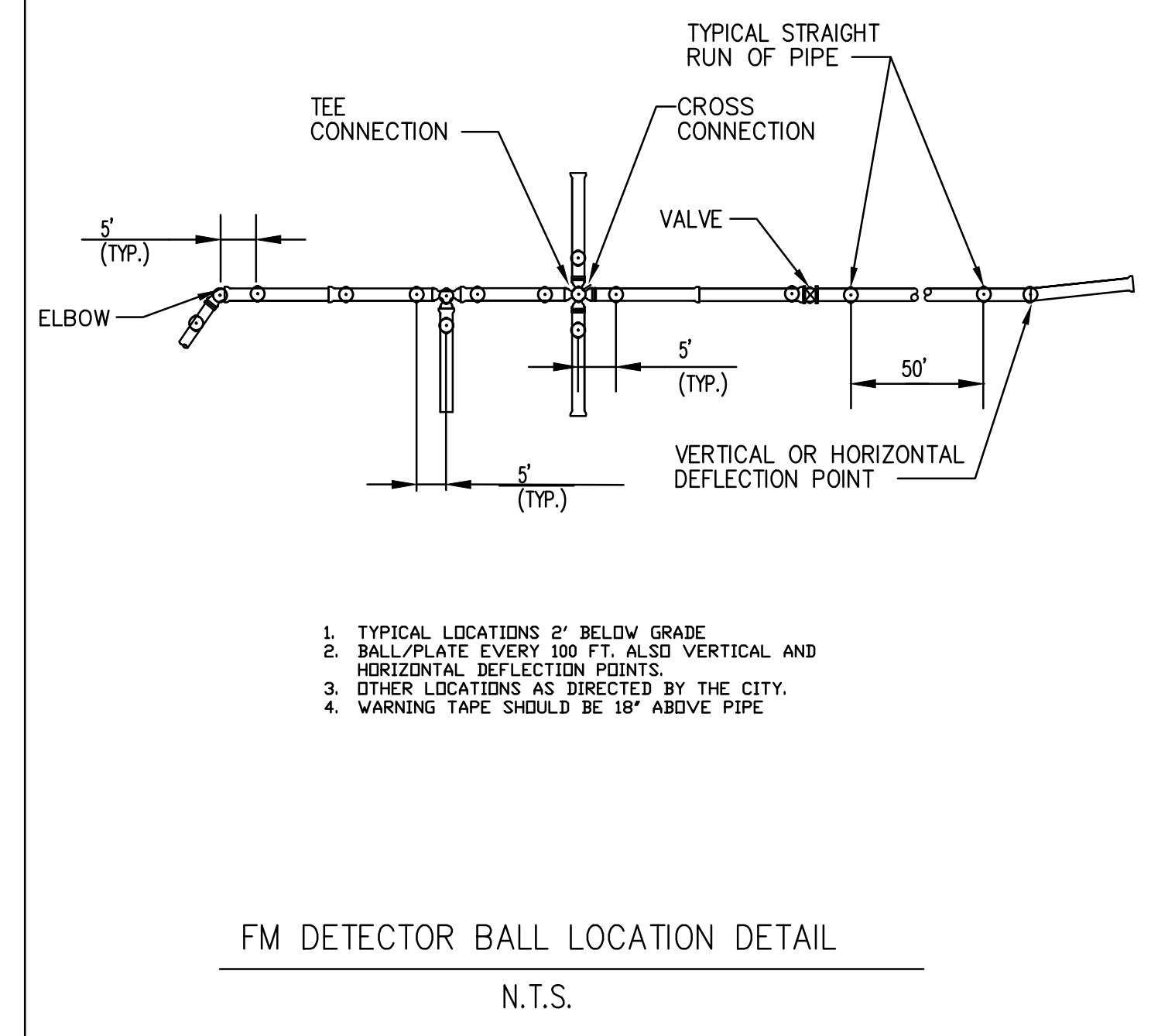
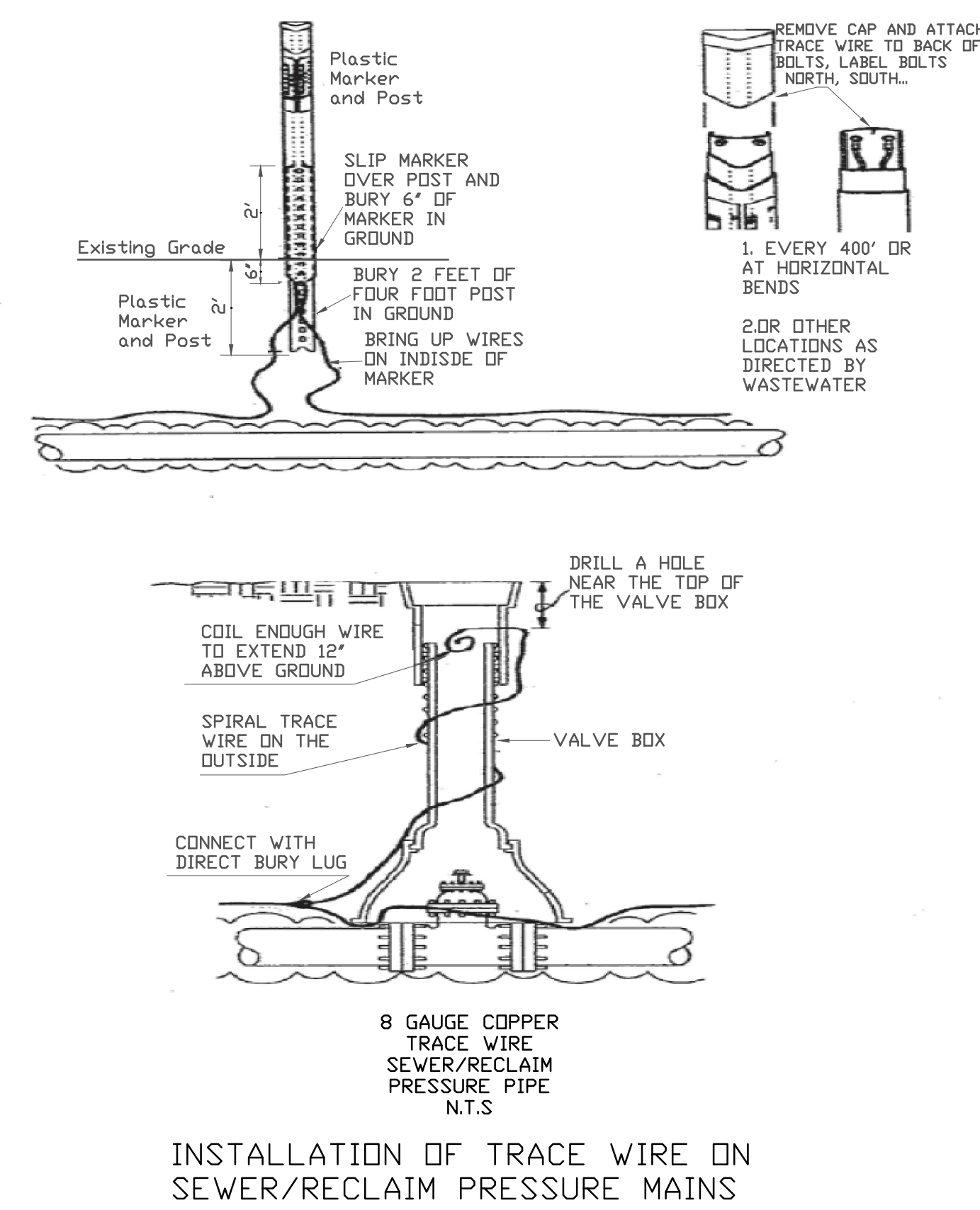
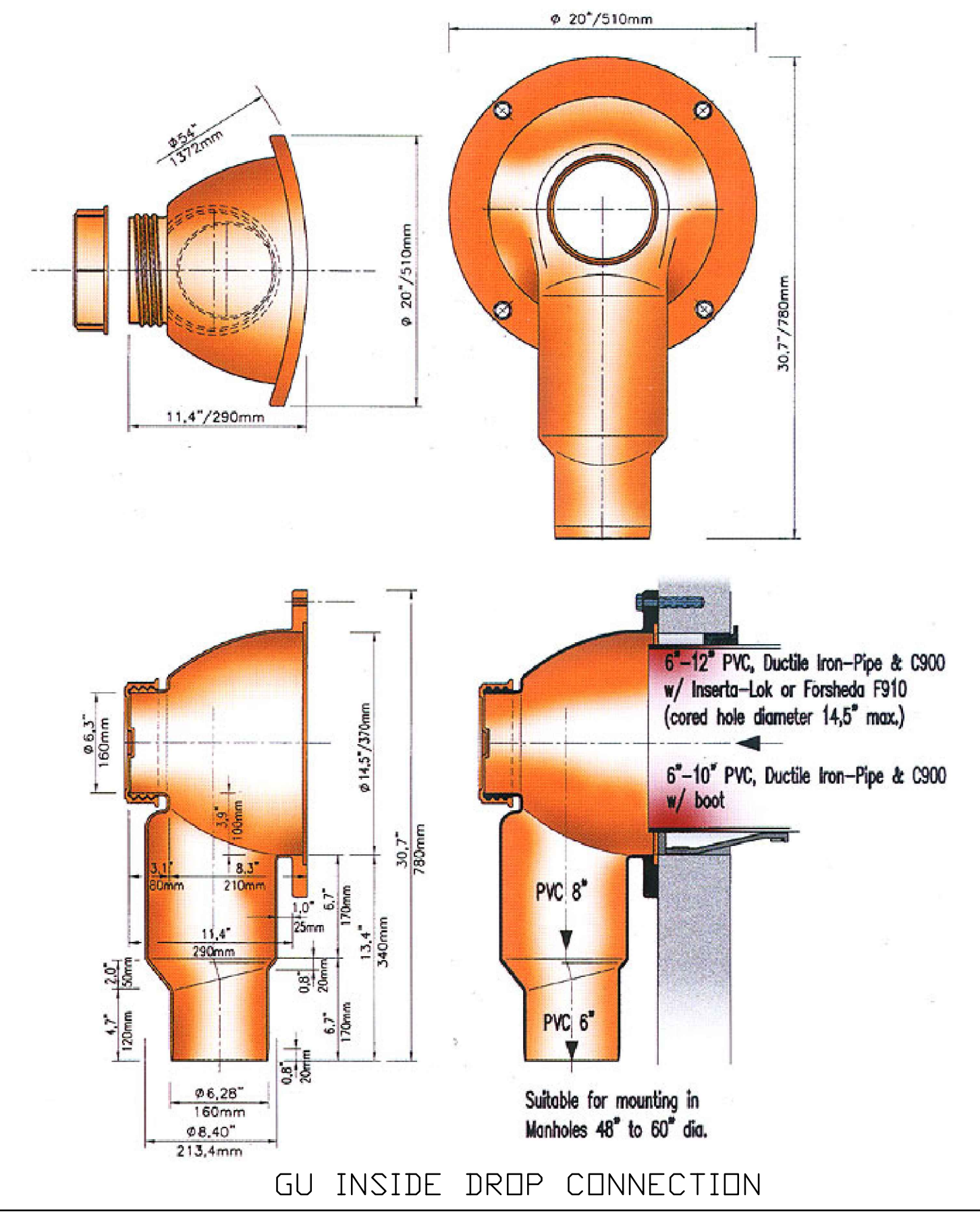
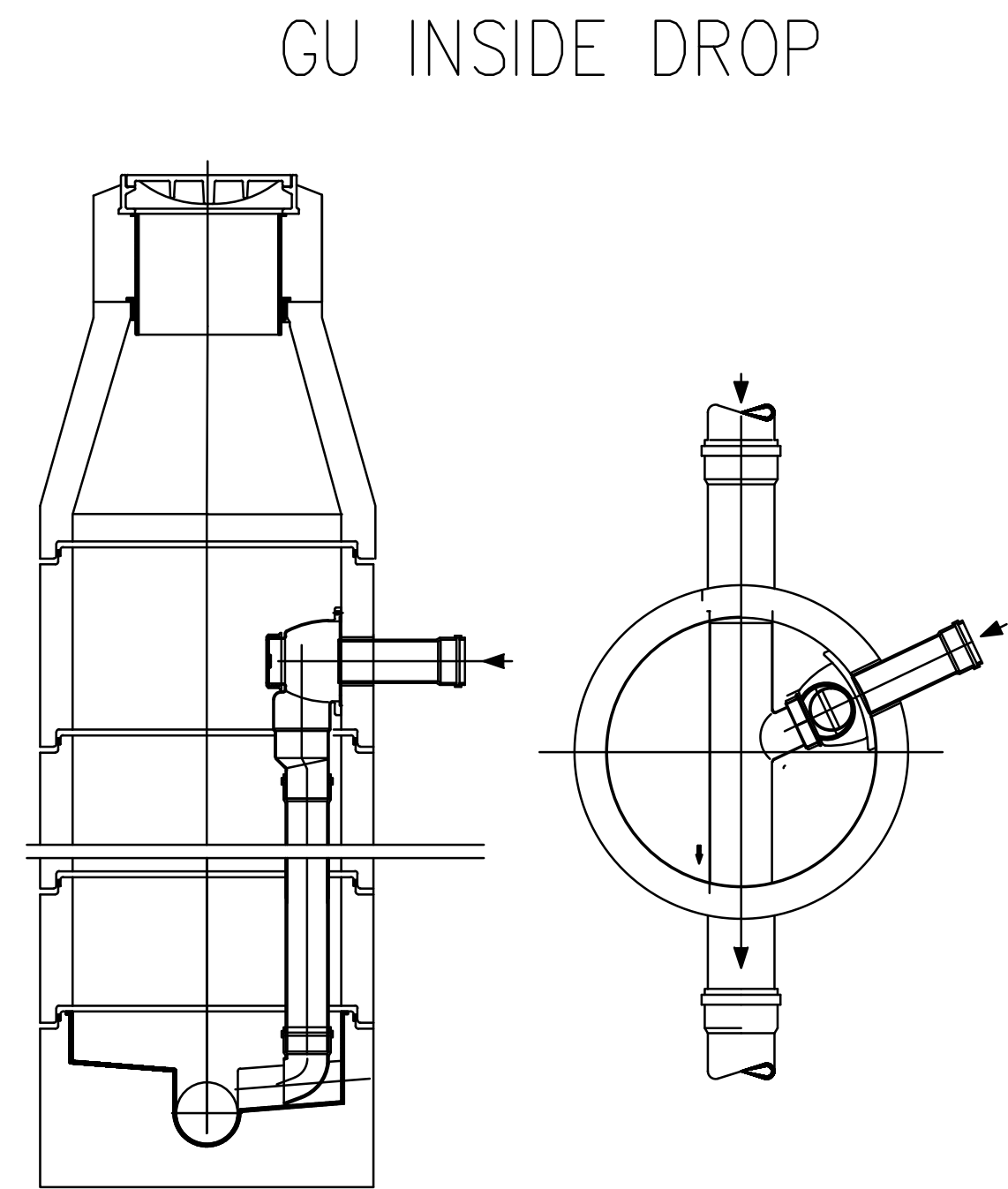
SHEET
9



COMPACTOR PAD DRAIN DETAILS CONNECTION W/SANITARY SEWER



- NOTES:
1. ABOVE DETAIL IS BASED ON 4" PLUG CHANGE PIPE AND FITTINGS ACCORDINGLY FOR OTHER VALVE SIZES AND TYPES. VALVE SIZES TO BE DETERMINED BY ENGINEER AND APPROVED BY THE CITY PRIOR TO INSTALLATION.
 2. THE MINIMUM DIMENSION FROM TOP OF PIPE TO FINISHED GRADE SHALL BE 4.0 FEET.
 3. IN LIEU OF CONCRETE SUPPORT, CONTRACTOR MAY USE No. 57 STONE FROM CENTER OF VALVE DOWN TO UNDISTURBED SOIL (6" MINIMUM) AND 12" BEYOND ALL SIDES AND ENDS OF VALVE.

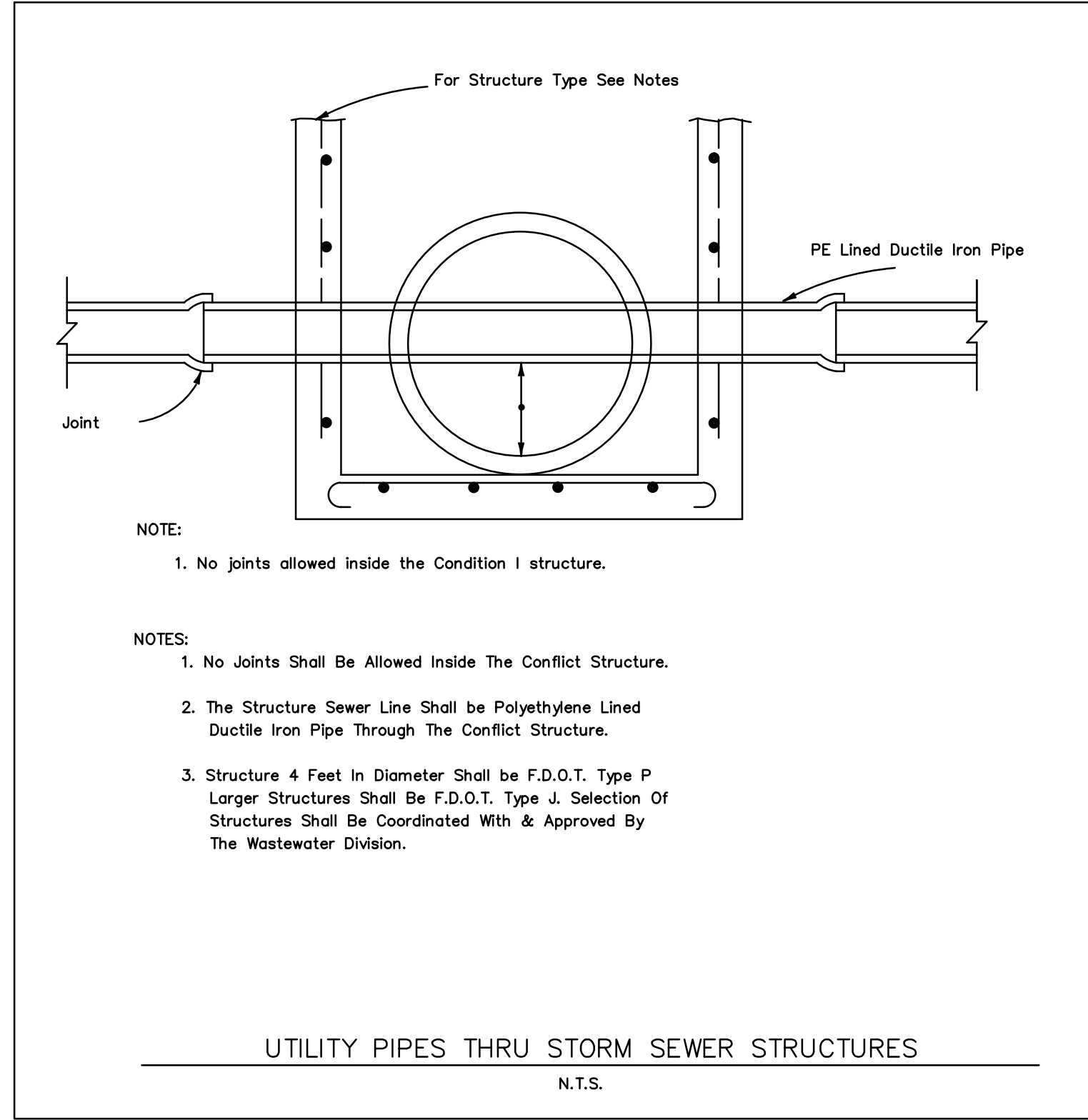
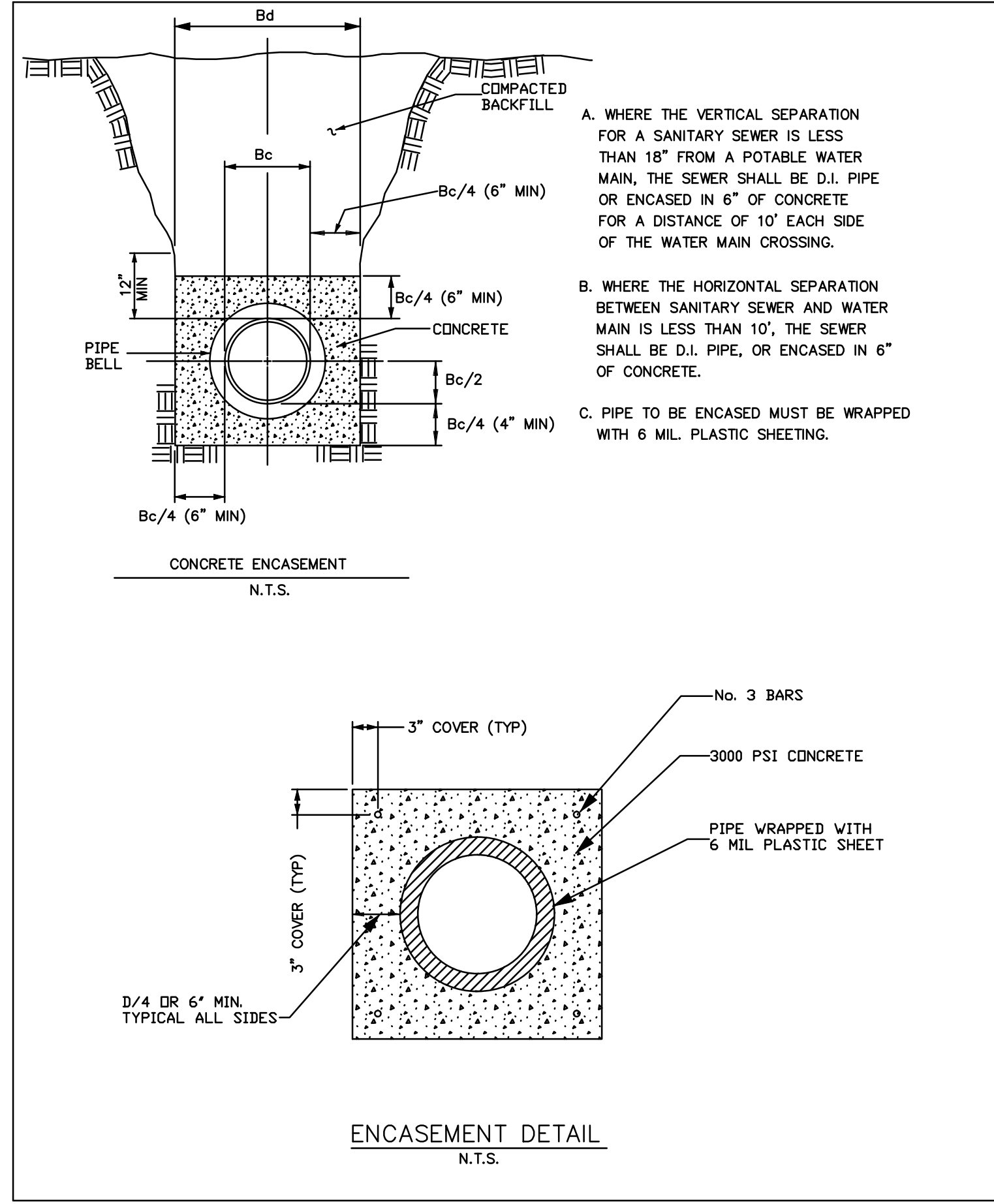
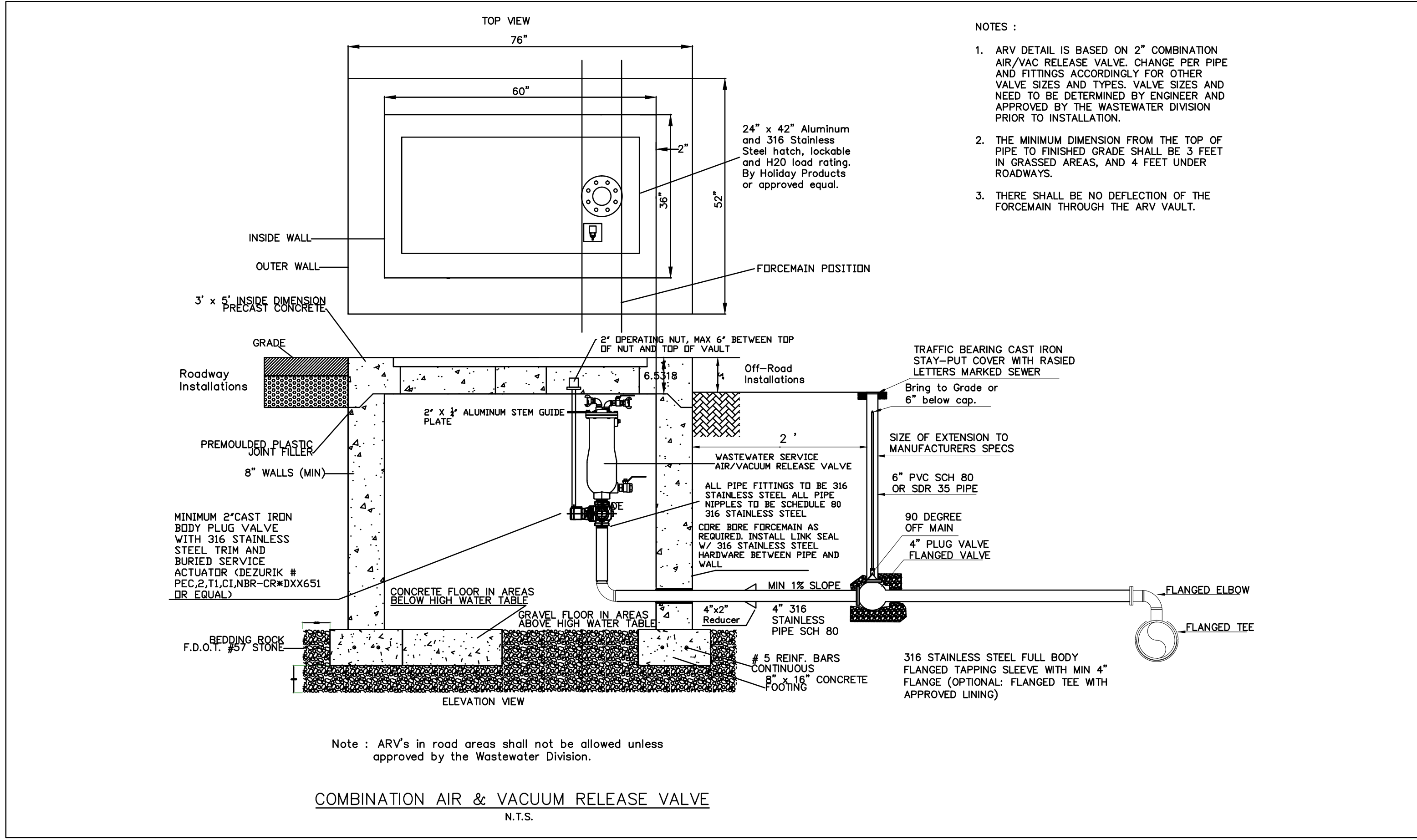
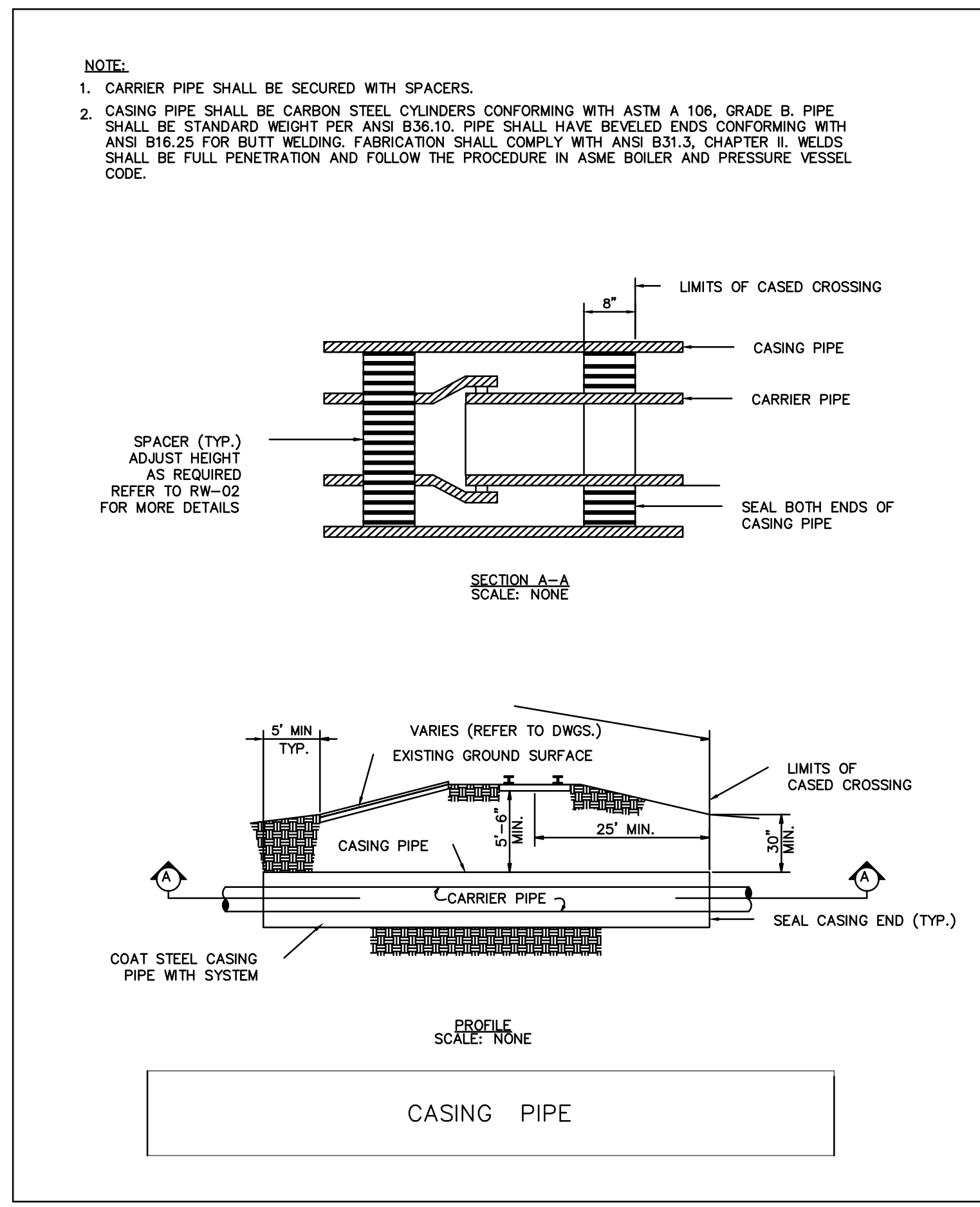
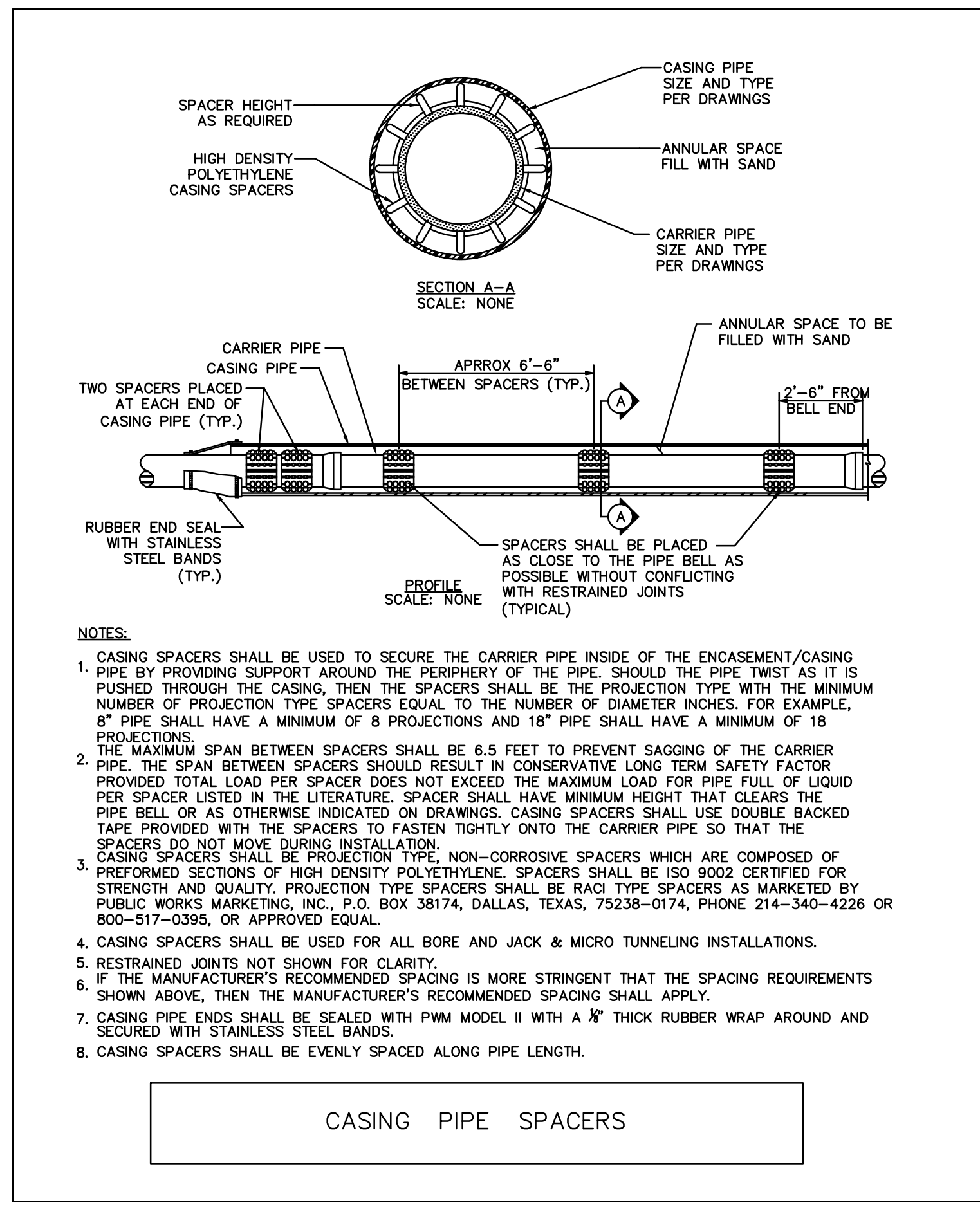
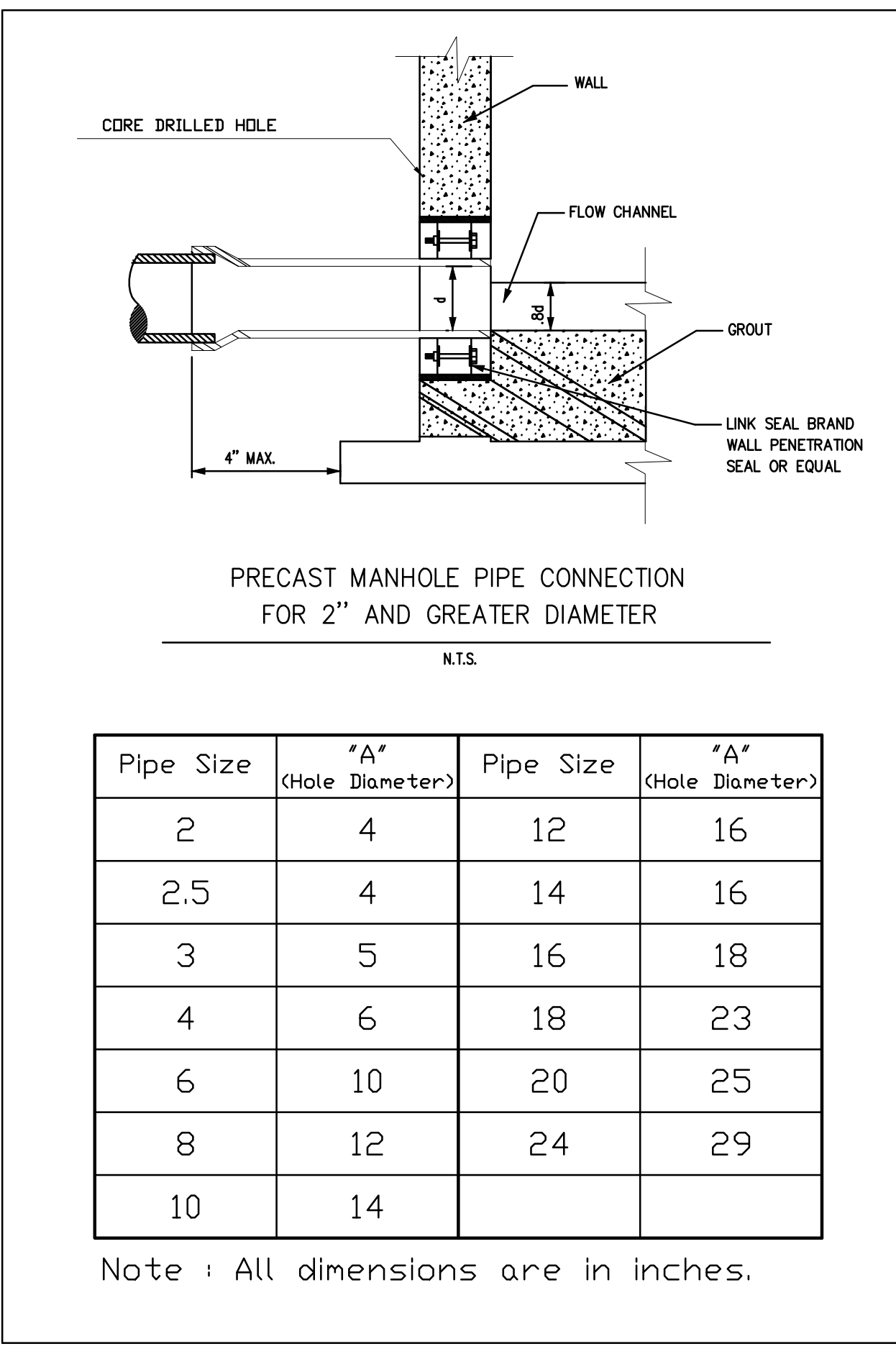
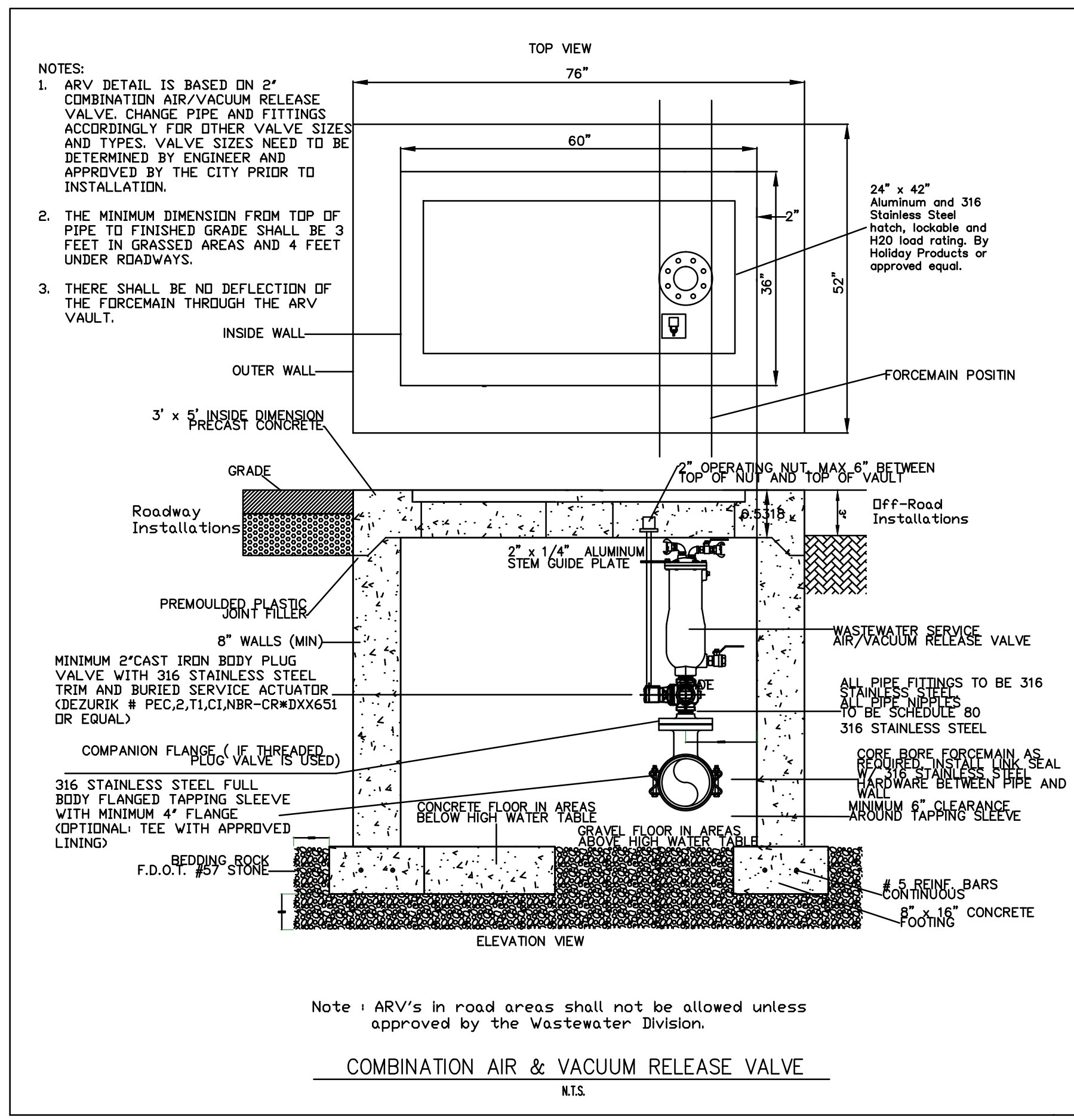


SHEET 10

CITY OF ORLANDO, FLORIDA
DEPARTMENT OF PUBLIC WORKS
WASTEWATER BUREAU
CITY OF ORLANDO, FLORIDA
TITLE: SANITARY SEWER STRUCTURES

ENGINEERING STANDARDS MANUAL

FILENAME:	CATEGORY:
DATE:	WASTEWATER
DRAWN BY:	SCALE:
AVG	N.T.S.
	APPROVED BY:

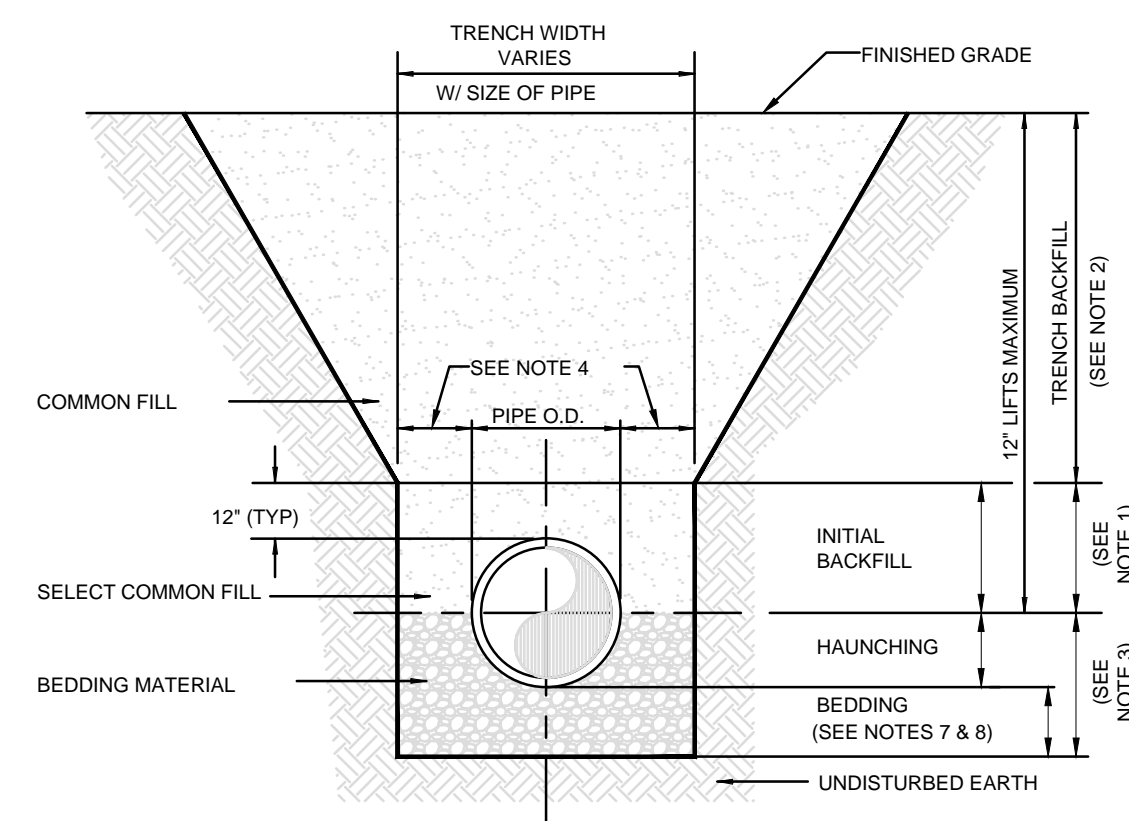


FILENAME: CATEGORY: WASTEWATER
DATE: 4/8/2011 **SCALE:** N.T.S.
DRAWN BY: DSG **APPROVED BY:** RMH/CS

ENGINEERING STANDARDS MANUAL

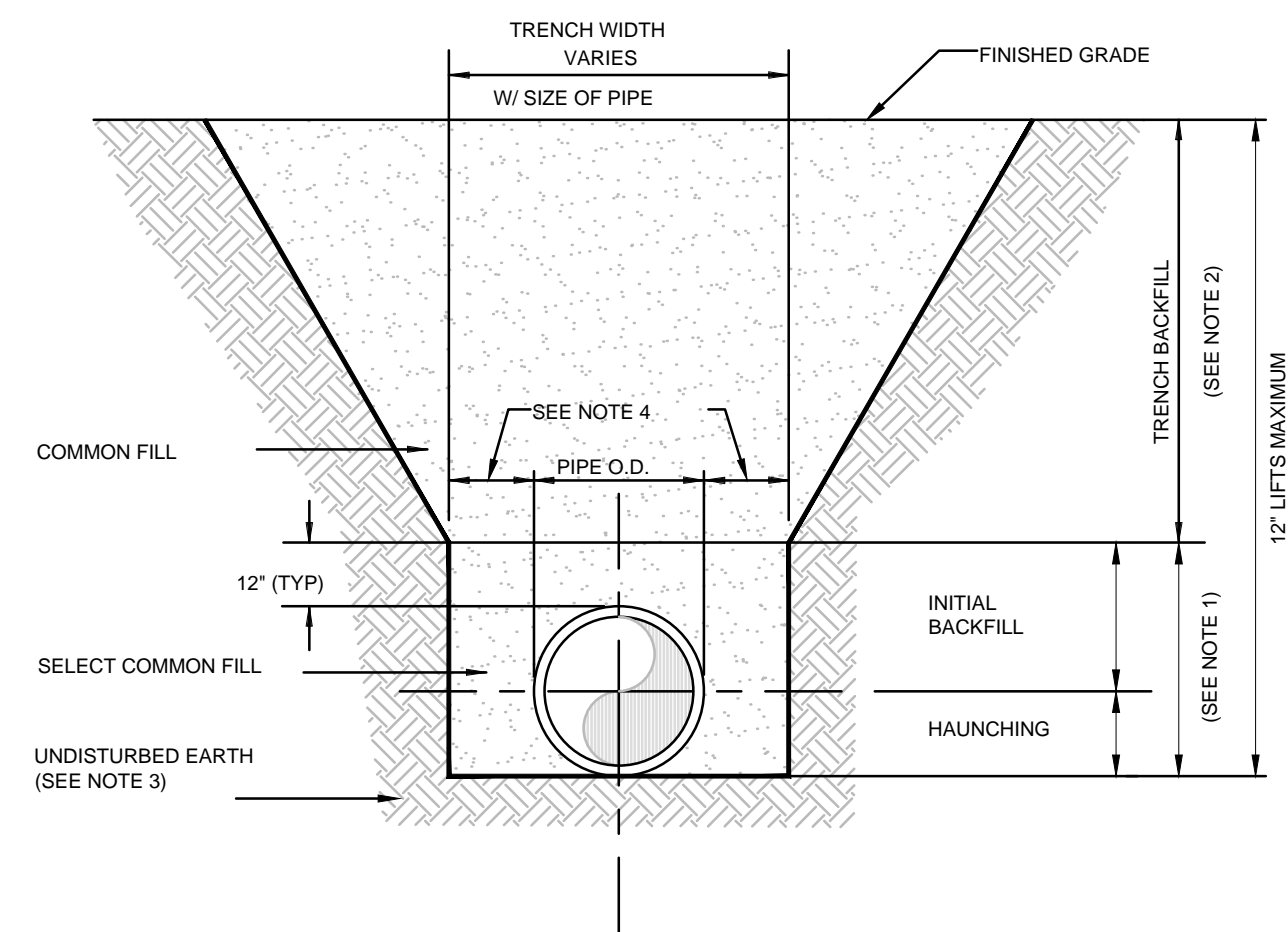
CITY OF ORLANDO, FLORIDA
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WASTEWATER BUREAU
CITY OF ORLANDO, FLORIDA

TITLE: SANITARY SEWER STRUCTURES



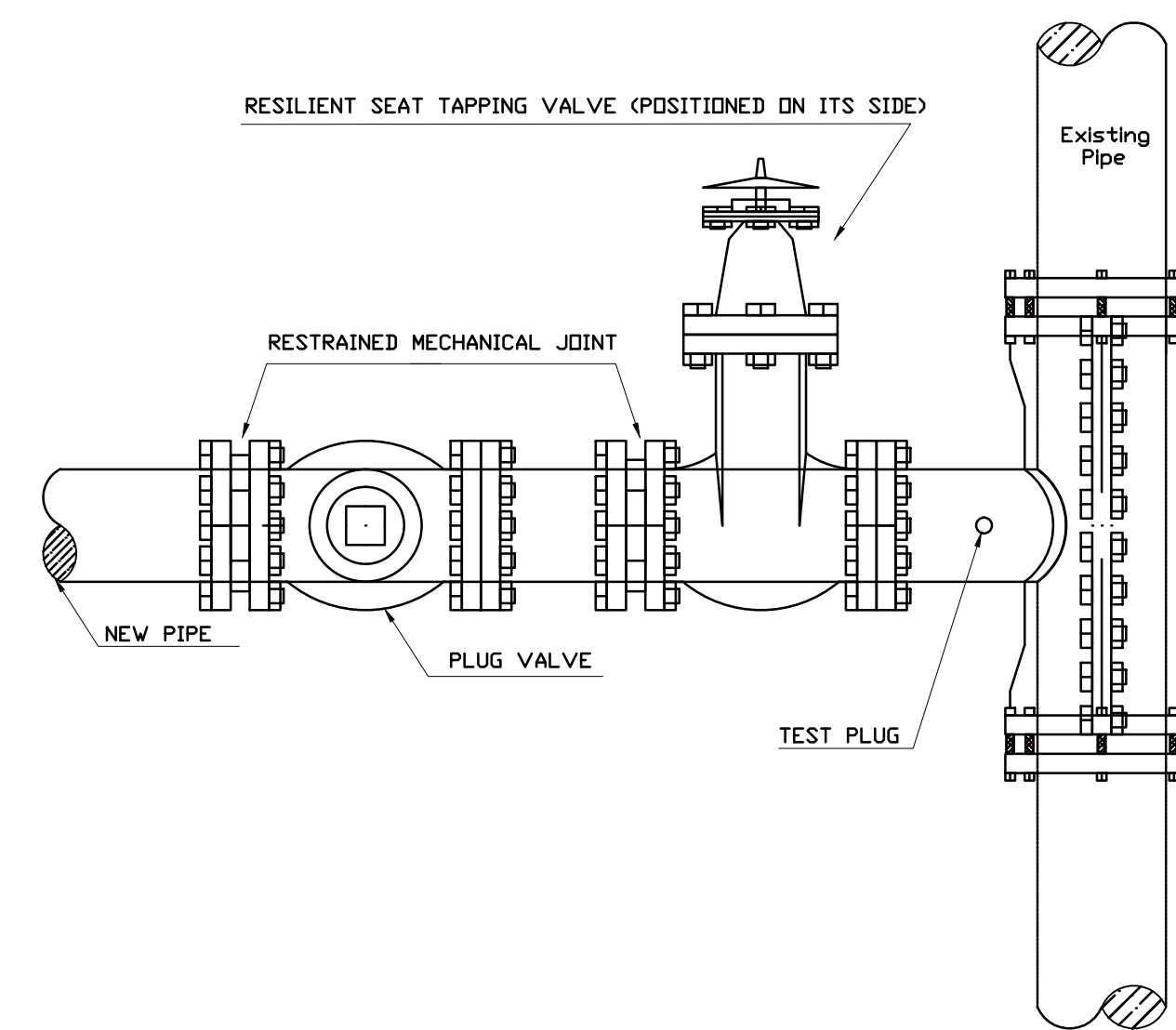
- NOTES:
- INITIAL BACKFILL: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
 - TRENCH BACKFILL: COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
 - TYPE A BEDDING MATERIAL SHALL CONFORM TO FOOT NO. 57 AGGREGATE.
 - 15" MAX. (12" MIN.) FOR PIPE DIAMETER LESS THAN 24" AND 24" MAX. (12" MIN.) FOR PIPE DIAMETER 24" AND LARGER.
 - WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
 - ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
 - BEDDING DEPTH SHALL BE 4" MINIMUM FOR PIPE DIAMETER UP TO 12" AND 6" MINIMUM FOR PIPE DIAMETER 16" AND LARGER.
 - DEPTH FOR REMOVAL OF UNSUITABLE MATERIAL SHALL GOVERN DEPTH OF BEDDING ROCK BELOW THE PIPE. UTILITIES SHALL DETERMINE IN THE FIELD REQUIRED REMOVAL OF UNSUITABLE MATERIAL TO REACH SUITABLE FOUNDATION.
 - FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES. SURFACE RESTORATION WITHIN ORANGE COUNTY RIGHT-OF-WAY SHALL COMPLY WITH REQUIREMENTS OF R/W UTILIZATION REGULATIONS AND ROAD CONSTRUCTION SPECIFICATIONS.

BEDDING AND TRENCHING - TYPE A

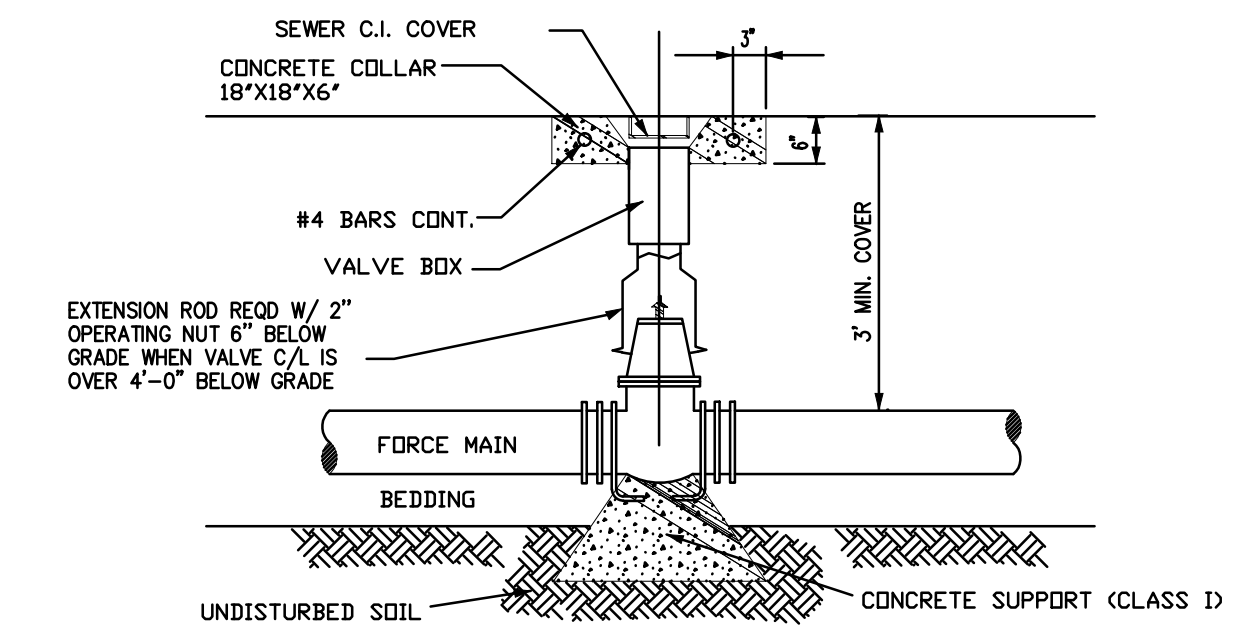


- NOTES:
- INITIAL BACKFILL AND HAUNCHING: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
 - TRENCH BACKFILL: COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO T-180.
 - PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE A BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY UTILITIES.
 - 15" MAX. (12" MIN.) FOR PIPE DIAMETER LESS THAN 24" AND 24" MAX. (12" MIN.) FOR PIPE DIAMETER 24" AND LARGER.
 - WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
 - ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
 - FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES. SURFACE RESTORATION WITHIN ORANGE COUNTY RIGHT-OF-WAY SHALL COMPLY WITH REQUIREMENTS OF R/W UTILIZATION REGULATIONS AND ROAD CONSTRUCTION SPECIFICATIONS.

BEDDING AND TRENCHING - TYPE B

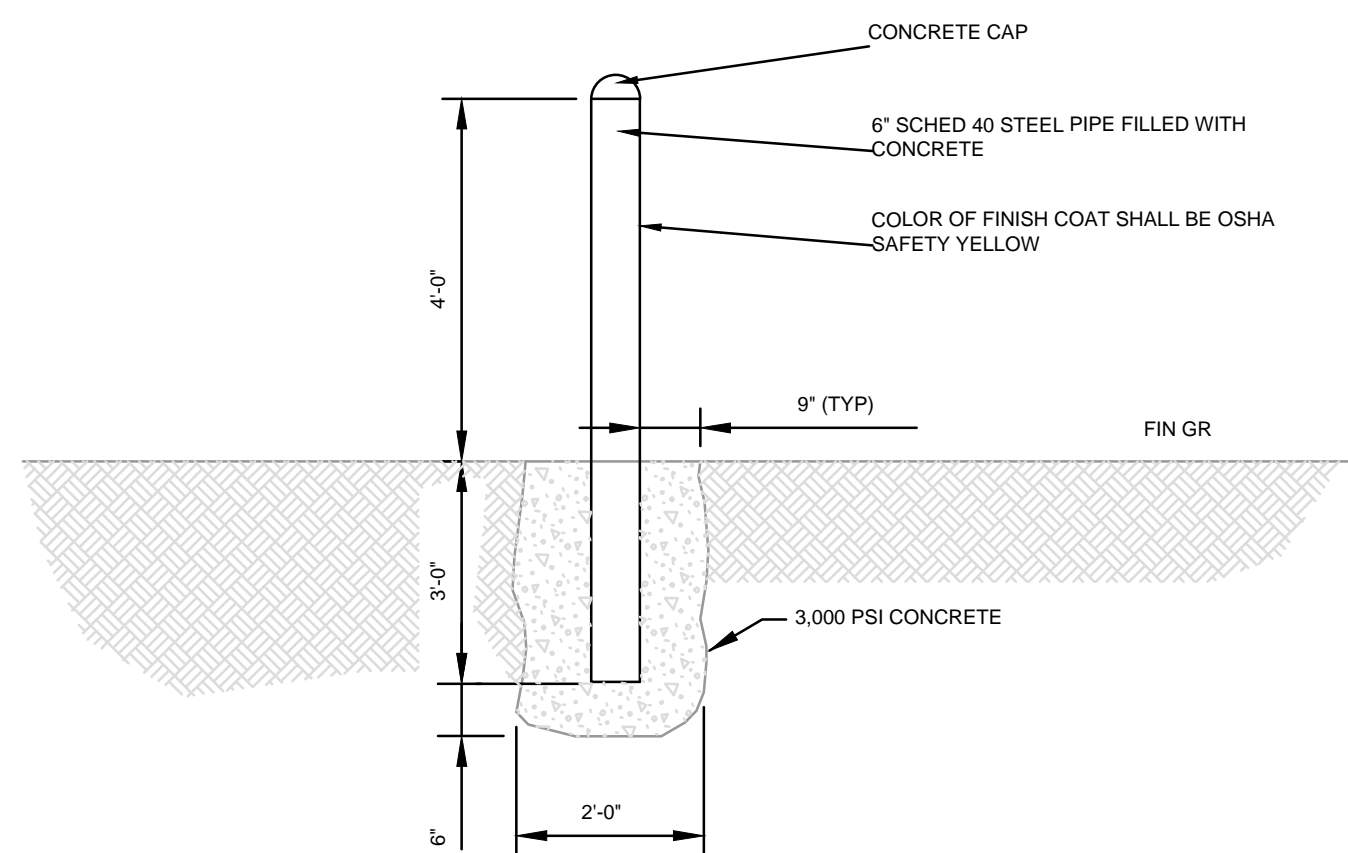


**TAPPING SLEEVE AND VALVE
SANITARY APPLICATION**
N.T.S.

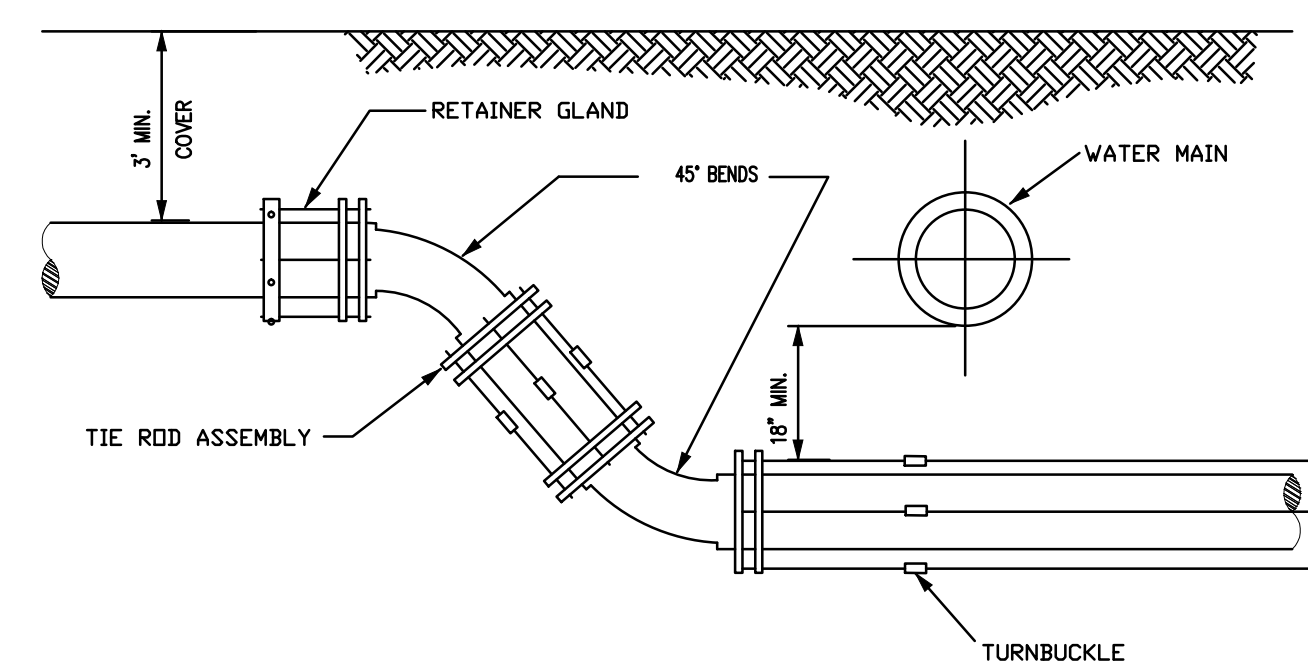


- NOTE:
- IN LIEU OF CONCRETE SUPPORT, CONTRACTOR MAY USE NO. 57 STONE FROM CENTER OF VALVE TO UNDISTURBED SOIL (6" MINIMUM) AND 12" BEYOND ALL SIDES AND ENDS OF VALVE.

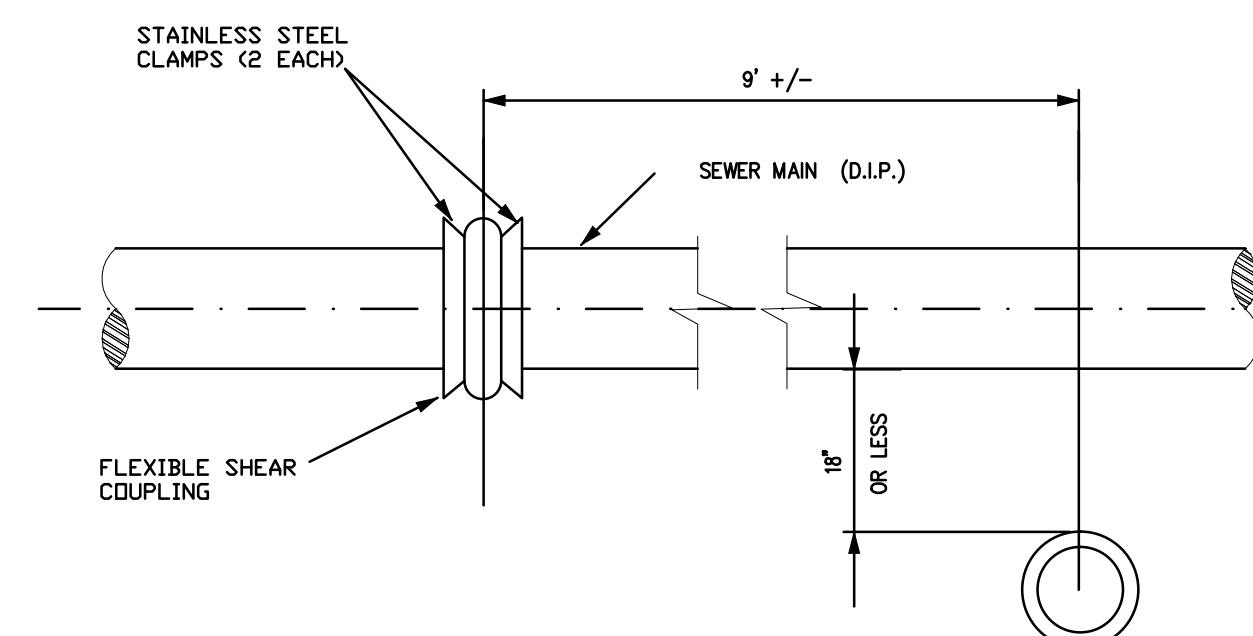
VALVE & BOX
N.T.S.



BOLLARD



FORCE MAIN
N.T.S.



GRAVITY
N.T.S.

STANDARD FITTINGS/APURTENANCES
REQUIRED LENGTH OF RESTRAINED PIPE EACH WAY (FT)

BEND	PIPE DIAMETER															
	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	42"	48"	54"	
11-1/4"	2	2	3	4	4	5	5	6	6	7	8	10	11	12	12	
22-1/2"	6	5	6	7	8	9	11	12	13	15	17	19	21	23	25	
45"	7	10	12	15	17	20	22	24	26	30	36	40	45	49	52	
90"	17	23	30	36	42	48	53	58	63	73	86	97	108	117	127	
DEAD END*	42	59	77	93	108	124	138	153	166	194	231	265	296	325	354	

*NOTE: IN-LINE VALVES AND TEES (BRANCH) SHALL BE RESTRAINED AS DEAD ENDS.

REDUCERS - REQUIRED LENGTH OF RESTRAINED PIPE AT LARGE SIDE (FT)**

DIAMETER	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	42"	48"	54"
4"	31	59	75	94	112										
6"	32	57	79	99	117										
8"	31	57	80	101	120	137									
10"	32	59	82	103	122	158									
12"		32	59	83	104	143	192								
14"			31	58	83	126	178								
16"				31	58	106	163								
18"					31	83	145								
20"						58	126	181	227						
24"							81	145	197	241					
30"								80	143	196	245				
36"									77	140	197				
42"										76	142				
48"											78				

**A MINIMUM OF 20 FEET OF PIPE SHALL BE RESTRAINED ON THE SMALL SIDE.

1. THE ABOVE REQUIREMENTS WERE CALCULATED IN ACCORDANCE WITH "THRUST RESTRAINT FOR DUCTILE IRON PIPE," THIRD EDITION, 1992, PUBLISHED BY DIPRA, WITH THE FOLLOWING ASSUMPTIONS:

- SOIL CONDITIONS: SAND/SILT
 - LAYING CONDITION: 4
 - MINIMUM COVER: 3 FT
- IF FIELD CONDITIONS DIFFER FROM THE ABOVE, CONTRACTOR SHALL NOTIFY ENGINEER.

- THE RESTRAINED JOINT LENGTHS CALCULATED ABOVE FOR BENDS WERE FOR BENDS IN THE HORIZONTAL DIRECTION OR VERTICAL UP DIRECTION. IF A BEND IS ORIENTED IN THE VERTICAL DOWN POSITION, THE RESTRAINED JOINT LENGTH CALCULATED ABOVE FOR THAT BEND SHALL BE MULTIPLIED BY 3.0.
- POLYETHYLENE WRAPPED PIPING SHALL BE RESTRAINED 1.25 TIMES THE ABOVE SHOWN LENGTHS.

PIPE RESTRAINT, RESTRAINED JOINT
BARE DUCTILE IRON PIPE 150 PSI TEST PRESSURE
**RESTRAINED JOINT TABLE FOR
SANITARY SEWER FORCEMAINS**

SHEET
12



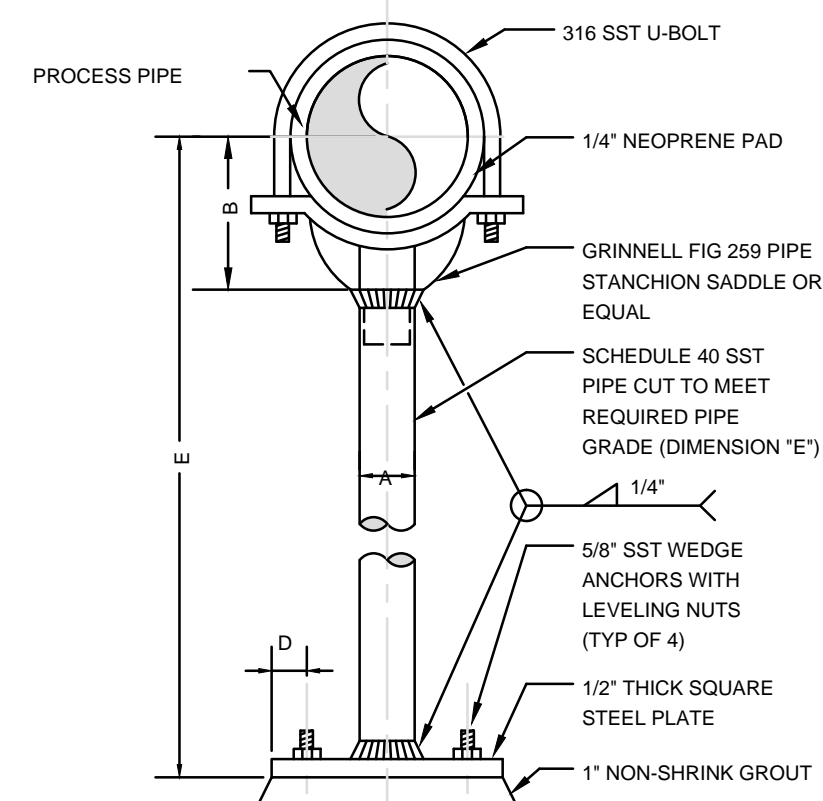
DEPARTMENT OF PUBLIC WORKS
WASTEWATER BUREAU

CITY OF
ORLANDO, FLORIDA

TITLE:
SANITARY SEWER STRUCTURES

ENGINEERING STANDARDS MANUAL

FILENAME:	CATEGORY: WASTEWATER
DATE: 4/12/2011	SCALE: N.T.S.
DRAWN BY: AVG	APPROVED BY:



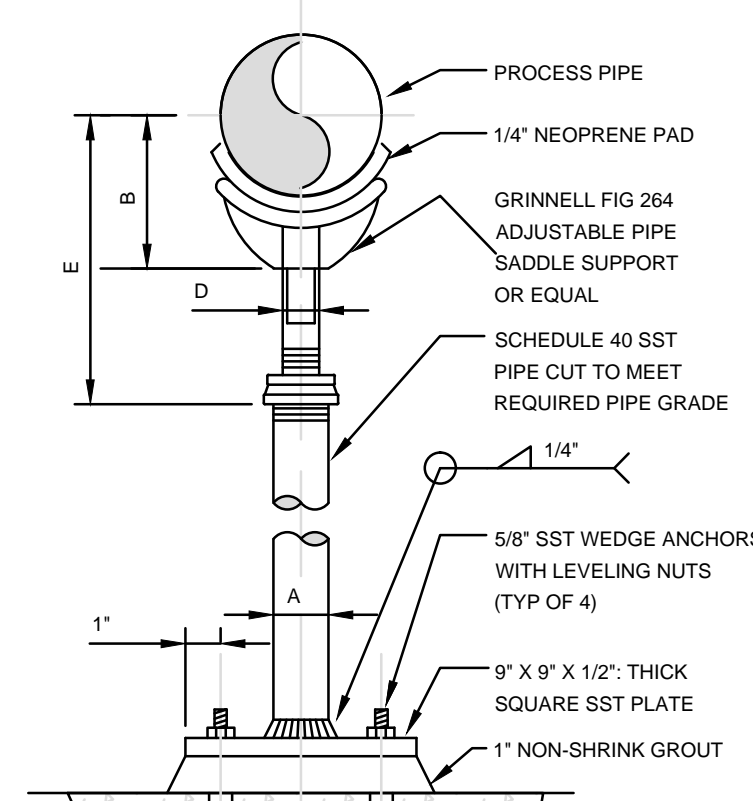
- NOTES:**
1. ALL METALS SHALL BE 316 OR 316L STAINLESS STEEL.
 2. SEE PLANS AND SECTIONS FOR PIPE GRADE REQUIREMENT (DIMENSION "E").
 3. PROVIDE INSULATION PROTECTION SHIELD (GRINNELL FIG 167 OR EQUAL) WHEN PIPING IS INSULATED.

CONSTRUCT 18" x 18" x 6" CONC BASE WITH #4 REINFORCING STEEL @ 5" OCEW IF SUPPORT IS NOT LOCATED ON AN EXISTING SLAB.

PIPE SIZE	A	B	C	D	E	
					MIN	MAX
4	3	4 3/16	7	1	6	60
5	3	4 13/16	7	1	6	60
6	3	5 7/16	7	1	8	60
8	3	6 15/16	7	1	8	60
10	3	8 7/16	7	1	10	60
12	3	9 15/16	7	1	12	60

* ALL DIMENSIONS IN INCHES.

PIPE SUPPORT - STANCHION SADDLE



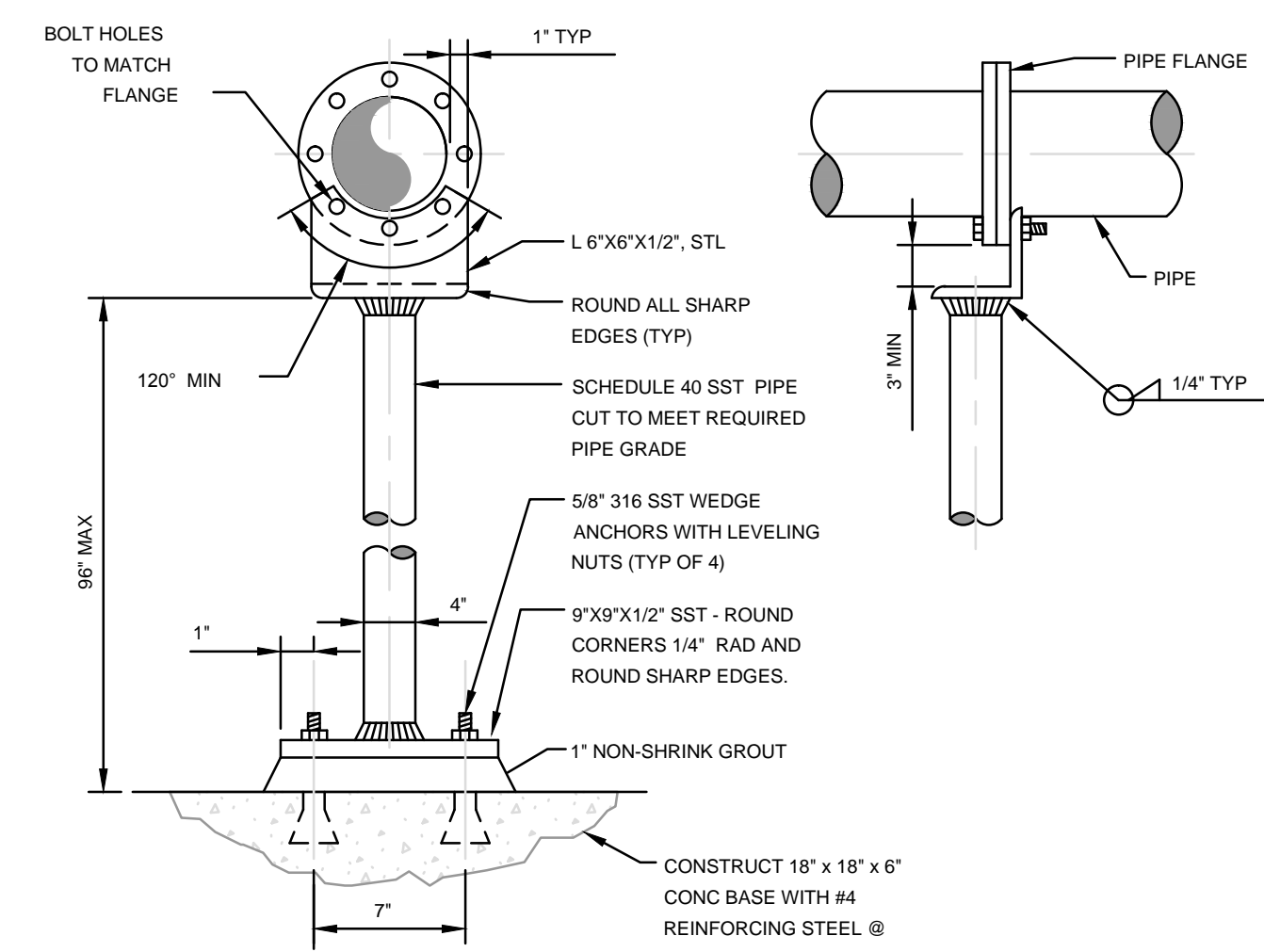
- NOTES:**
1. ALL METALS SHALL BE 316 OR 316L STAINLESS STEEL.
 2. SEE PLANS AND SECTIONS FOR PIPE GRADE REQUIREMENT (DIMENSION "E").
 3. PROVIDE INSULATION PROTECTION SHIELD (GRINNELL FIG 167 OR EQUAL) WHEN PIPING IS INSULATED.

CONSTRUCT 18" x 18" x 6" CONC BASE WITH #4 REINFORCING STEEL @ 5" OCEW IF SUPPORT IS NOT LOCATED ON AN EXISTING SLAB.

PIPE SIZE	A	B	C	D	E	
					MIN	MAX
2 1/2	2 1/2	3 1/2	7	1 1/2	8	13
3	2 1/2	3 3/4	7	1 1/2	8 1/4	13 1/4
3 1/2	2 1/2	4	7	1 1/2	8 1/2	13 1/2
4	3	4 1/4	7	2 1/2	9 1/4	14
5	3	4 7/8	7	2 1/2	10	14 3/4
6	3	5 1/2	7	2 1/2	10 1/2	15 1/4
8	3	6 7/8	7	2 1/2	11 3/4	16 1/2
10	3	8 1/2	7	2 1/2	13 1/2	18 1/4
12	3	9 15/16	7	2 1/2	15	19 3/4
14	4	10 15/16	7	3	16 1/4	20 3/4
16	4	12 3/8	7	3	17 3/4	22 1/4
18	6	13 7/8	9	3 1/2	19 1/2	24
20	6	15 3/8	9	3 1/2	21	25 1/2
24	6	17 15/16	9	4	23 1/4	28 1/4

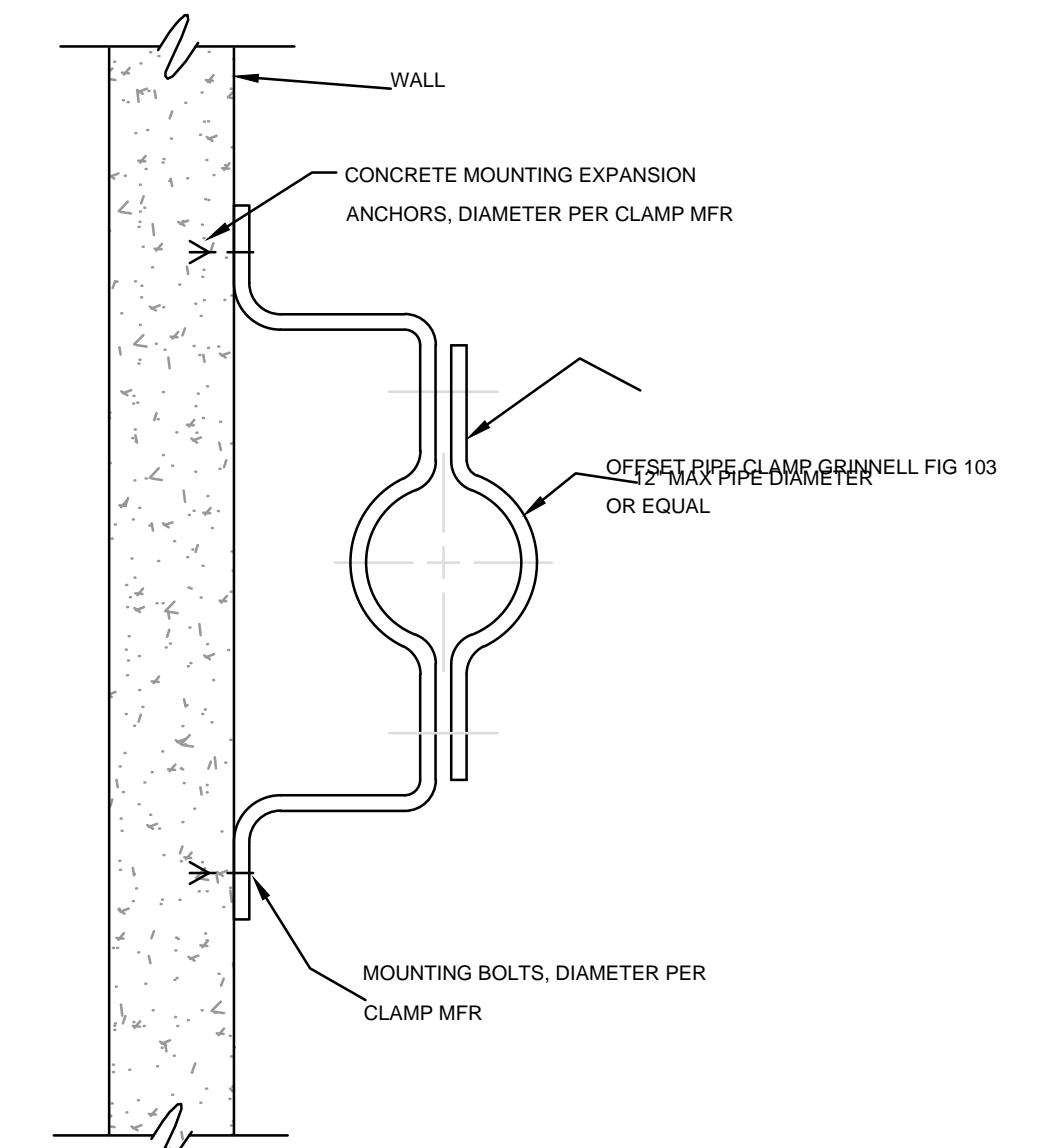
* ALL DIMENSIONS IN INCHES.

PIPE SUPPORT - ADJUSTABLE SADDLE



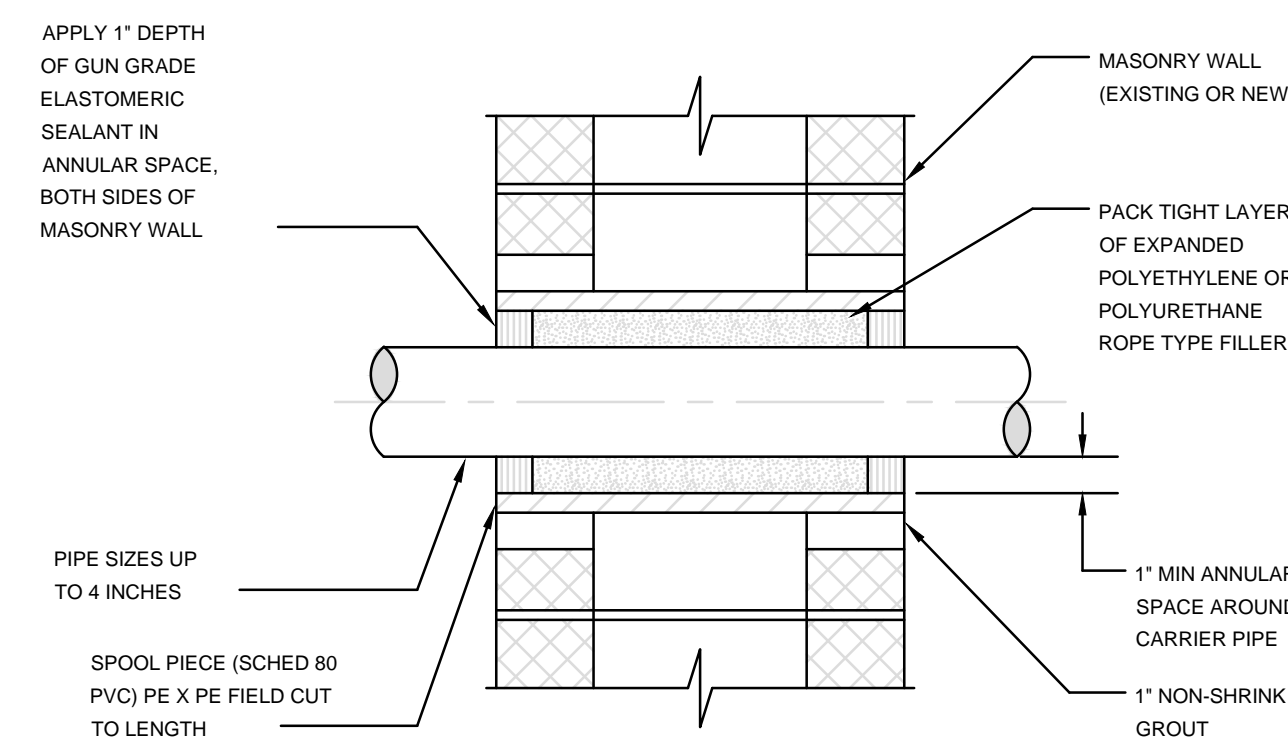
- NOTES:**
1. ALL METALS SHALL BE 316 OR 316L STAINLESS STEEL.
 2. SEE PLANS AND SECTIONS FOR PIPE GRADE REQUIREMENT.
 3. PIPE SUPPORT SUITABLE FOR PIPE SIZES 3" THROUGH 24" DIA.

PIPE SUPPORT - FLANGE



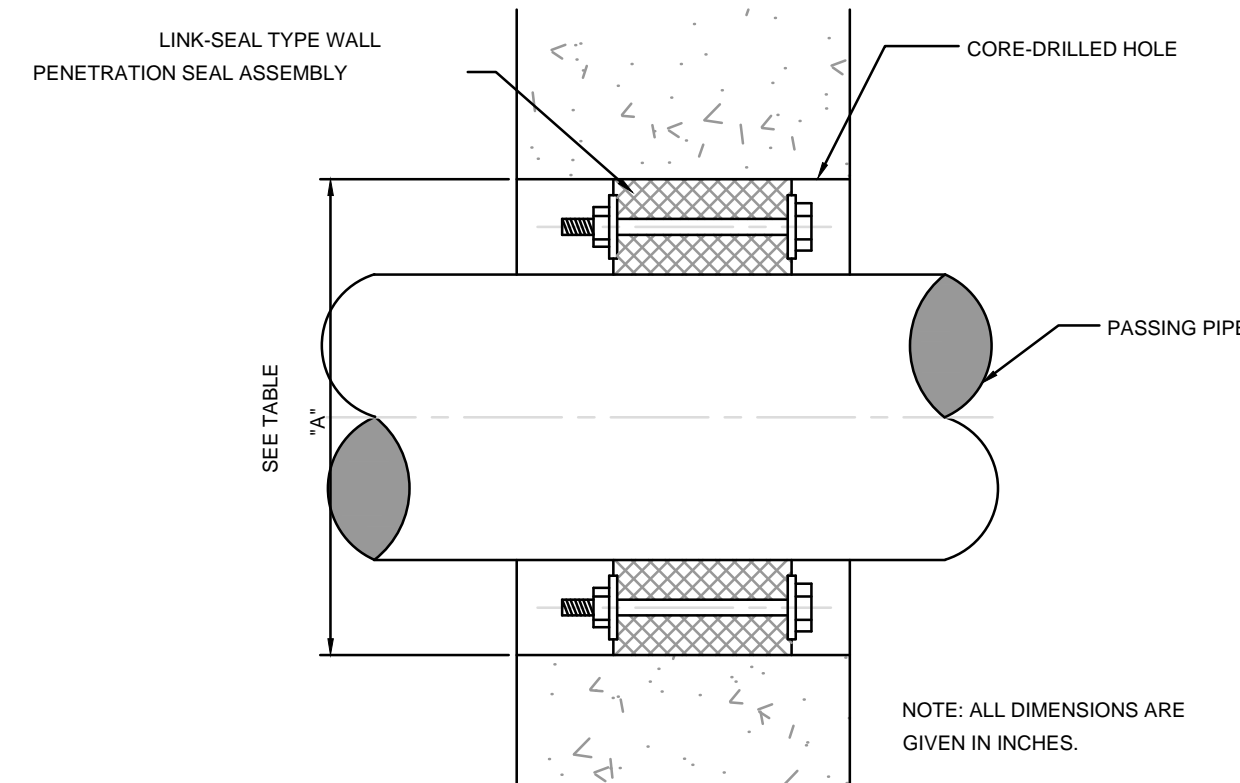
NOTE:
ALL MATERIALS OF CONSTRUCTION SHALL BE 316 STAINLESS STEEL OR ALUMINUM. ALL MOUNTING HARDWARE SHALL BE 316 STAINLESS STEEL.

PIPE SUPPORT - OFFSET



- NOTES:**
1. CORE DRILL HOLE IN CONCRETE MASONRY WALL.

PENETRATION SEAL MASONRY WALL (SMALL DIAMETER)

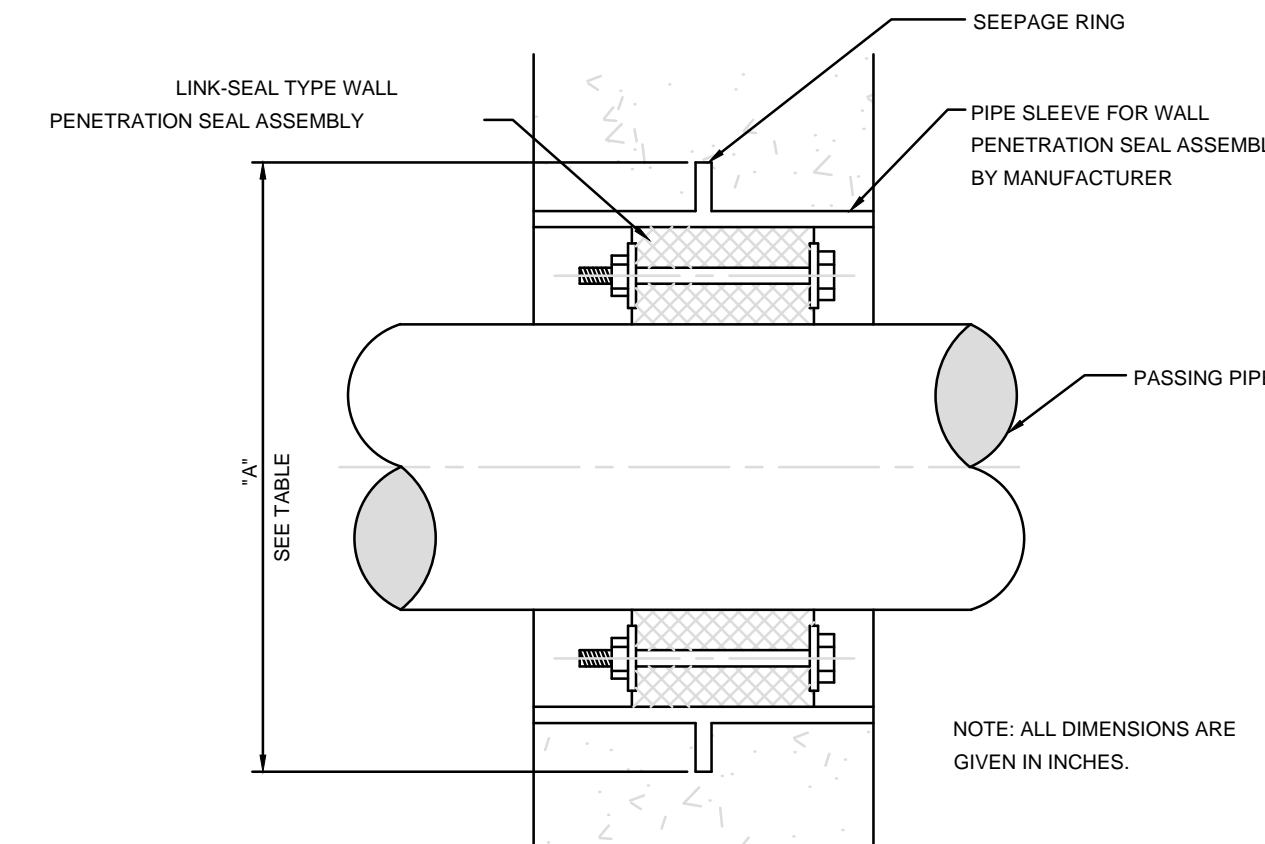


NOTE: ALL DIMENSIONS ARE GIVEN IN INCHES.

PIPE SIZE	"A" (HOLE DIA)	PIPE SIZE	"A" (HOLE DIA)
2	4	12	16
2-1/2	4	14	16
3	5	16	18
4	6	18	23
6	10	20	25
8	12	24	29
10	14		

For Application at Circular Precast Concrete Structures 48"-60" Diameter

PENETRATION SEAL, LINK SEAL (CORE-DRILLED)

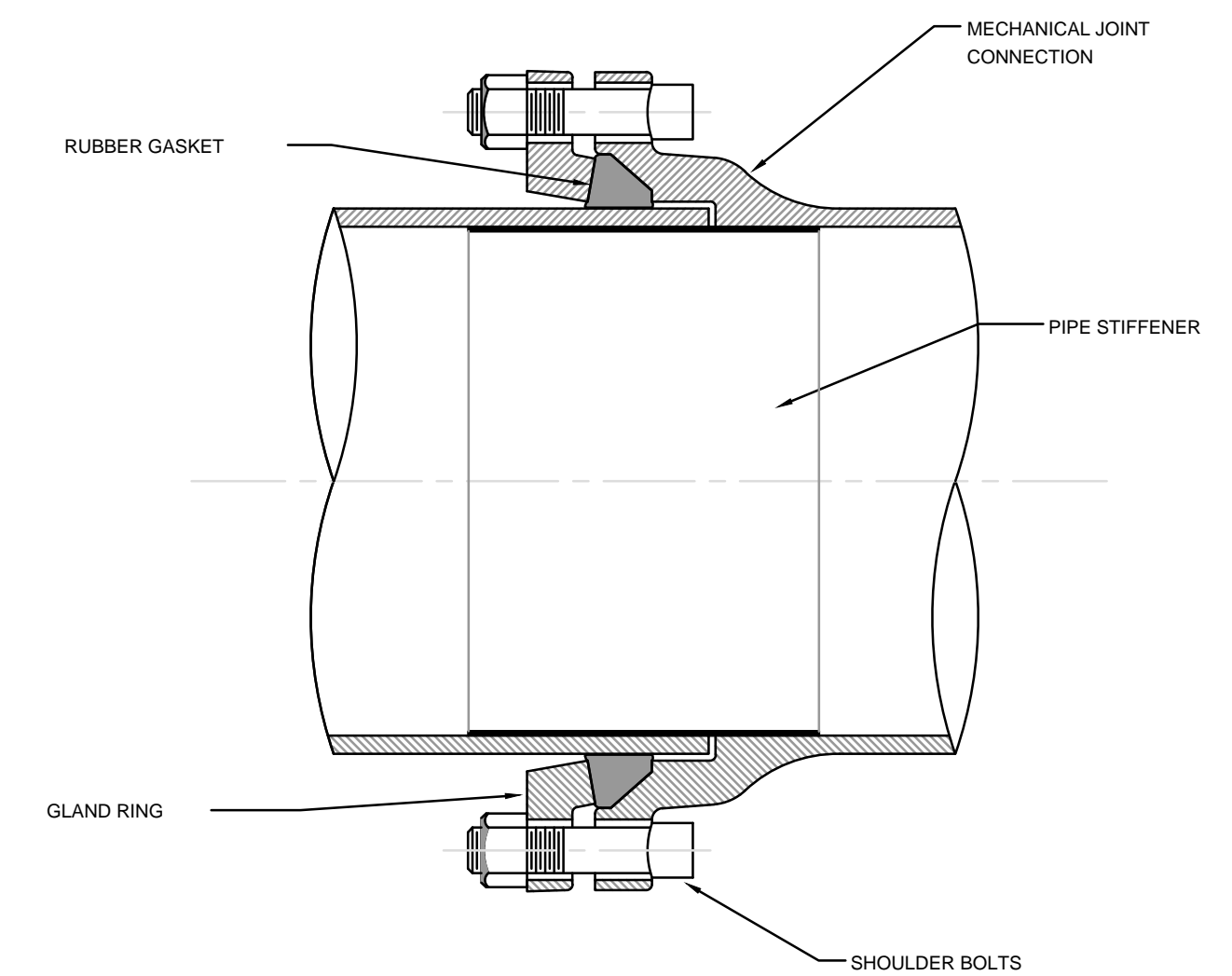


NOTE: ALL DIMENSIONS ARE GIVEN IN INCHES.

PIPE SIZE	NOMINAL SLEEVE DIA	"A"	PIPE SIZE	NOMINAL SLEEVE DIA	"A"
2	4	6	12	16	19
2-1/2	4	7	14	18	21
3	5	7-1/2	16	20	23-1/2
4	6	9	18	24	25
6	10	13	20	24	27-1/2
8	12	15	24	30	32
10	14	17			

For Application at Rectangular Precast and Cast-in-Place Concrete Structures

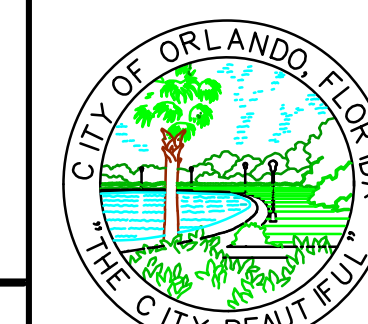
PENETRATION SEAL, LINK SEAL (CAST)



GENERAL NOTES:

1. PIPE STIFFENERS ARE REQUIRED FOR APPLICATIONS JOINING HDPE PIPE. PIPE STIFFENERS SHALL BE 304 STAINLESS STEEL TO MATCH INSIDE DIAMETER OF HDPE PIPE.

HDPE MJ CONNECTION



**DEPARTMENT OF PUBLIC WORKS
WASTEWATER BUREAU**

**CITY OF
ORLANDO, FLORIDA**

**SHEET
13**

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4/8/2011
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CATEGORY:
WASTEWATER
SCALE:
N.T.S.
APPROVED BY:
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ENGINEERING STANDARDS MANUAL

TITLE:
SANITARY SEWER STRUCTURES

