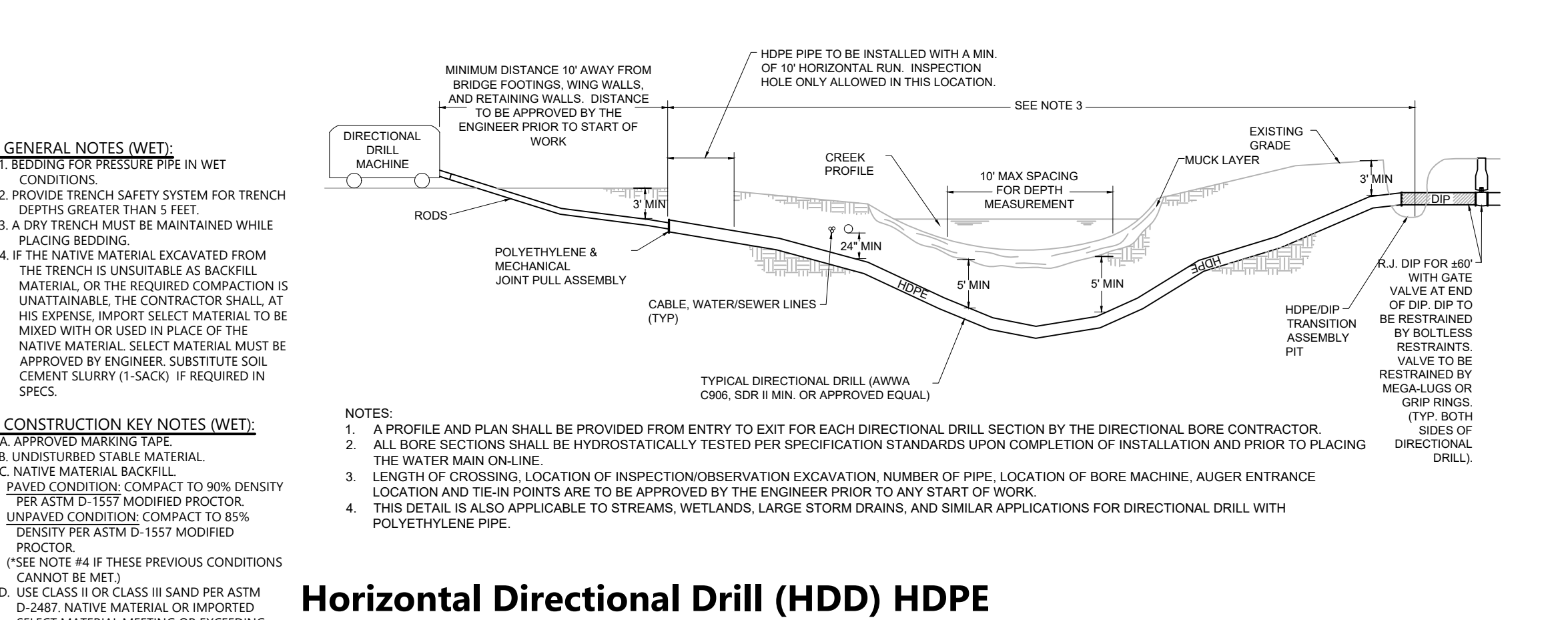
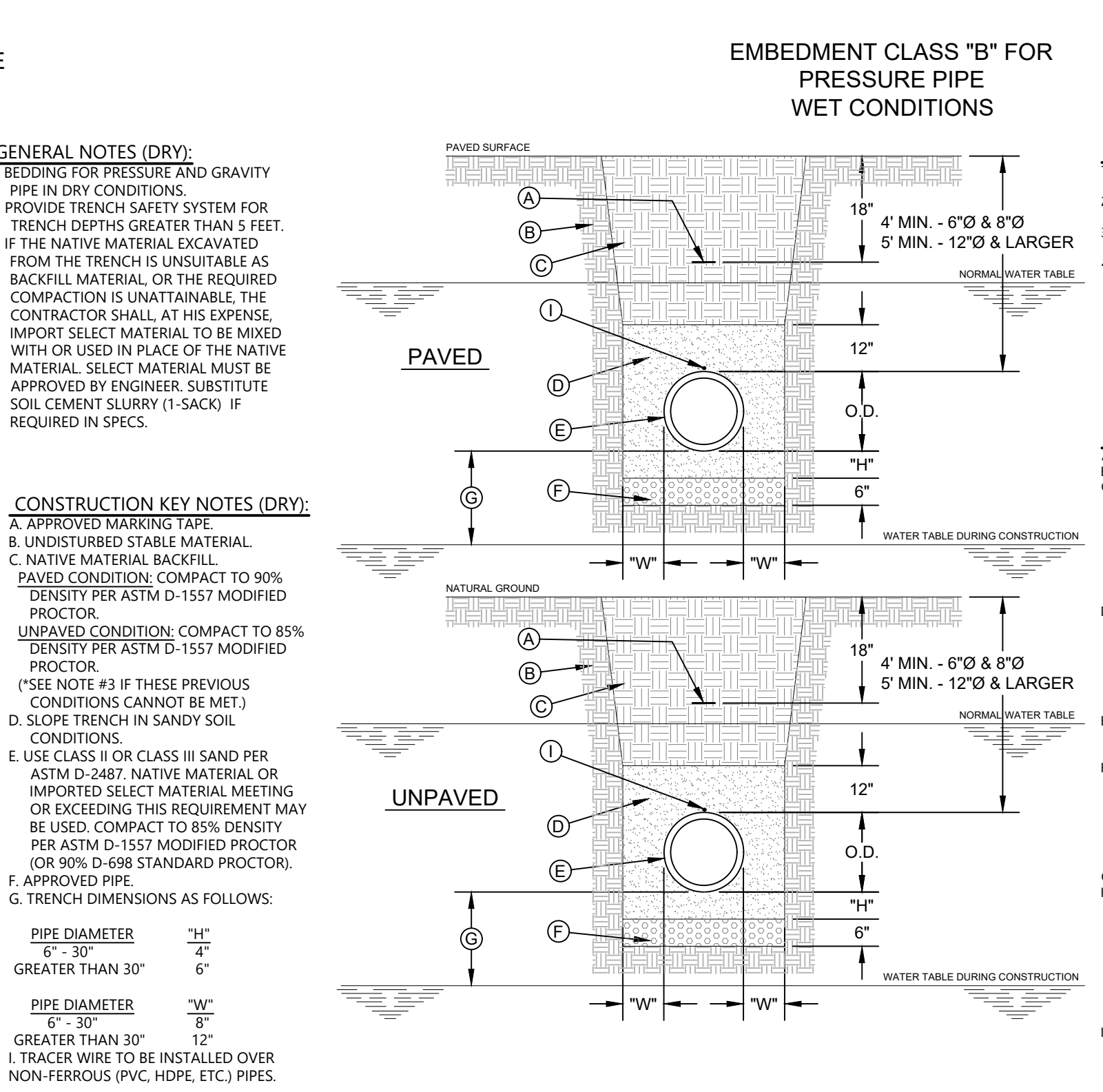
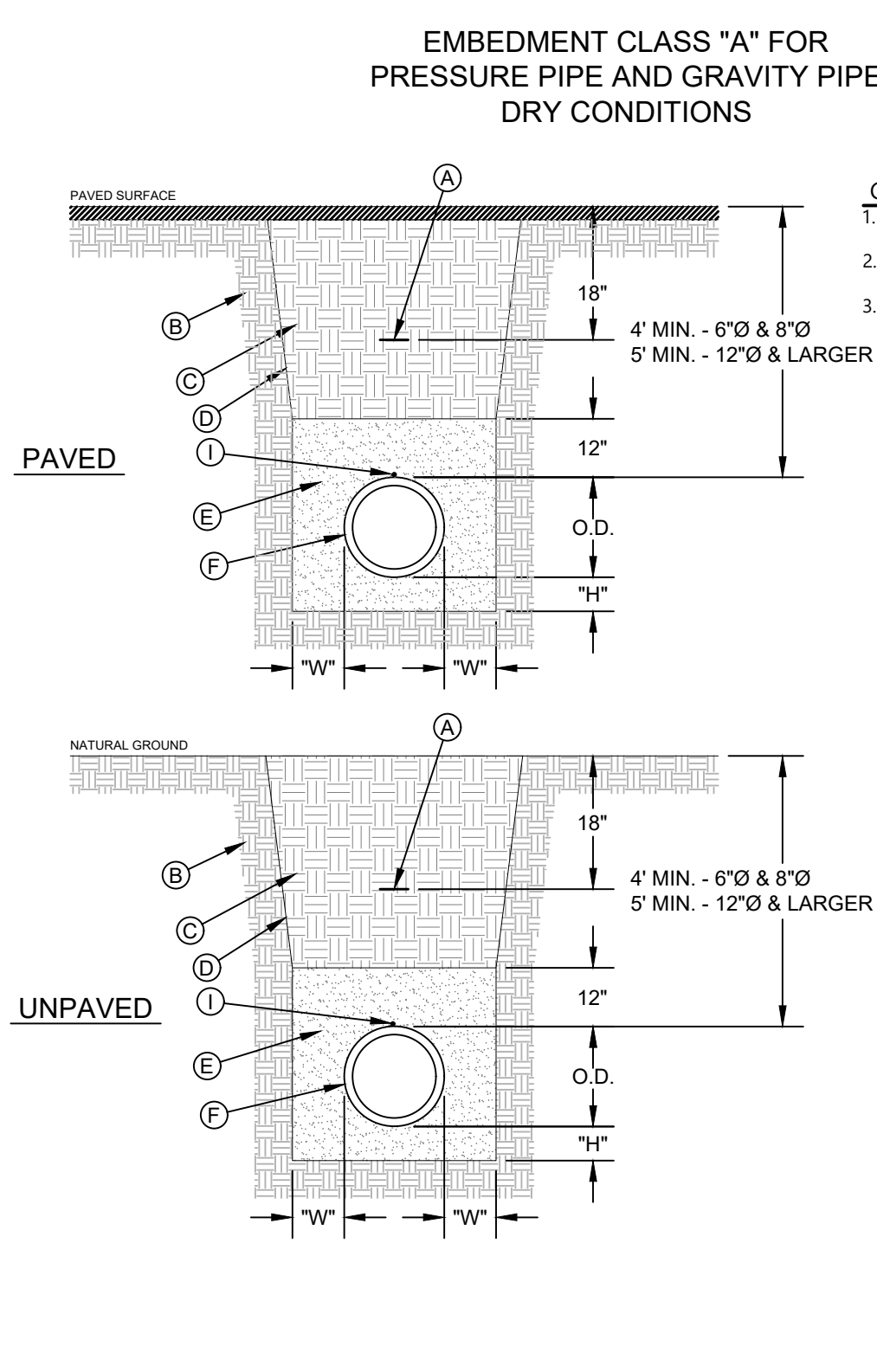


Tuesday, April 12, 2022 ANSI A (8.50 X 11.00 inches)



PROJECT REFERENCE NO. R5819/R5820	SHEET NO. UC- DT1
REVISION NO.	UTILITIES ENGINEER
90% DESIGN - 11/30/21	
100% DESIGN - 3/02/22	

DOCUMENT NOT CONSIDERED FINAL UNLESS ALL SIGNATURES COMPLETED

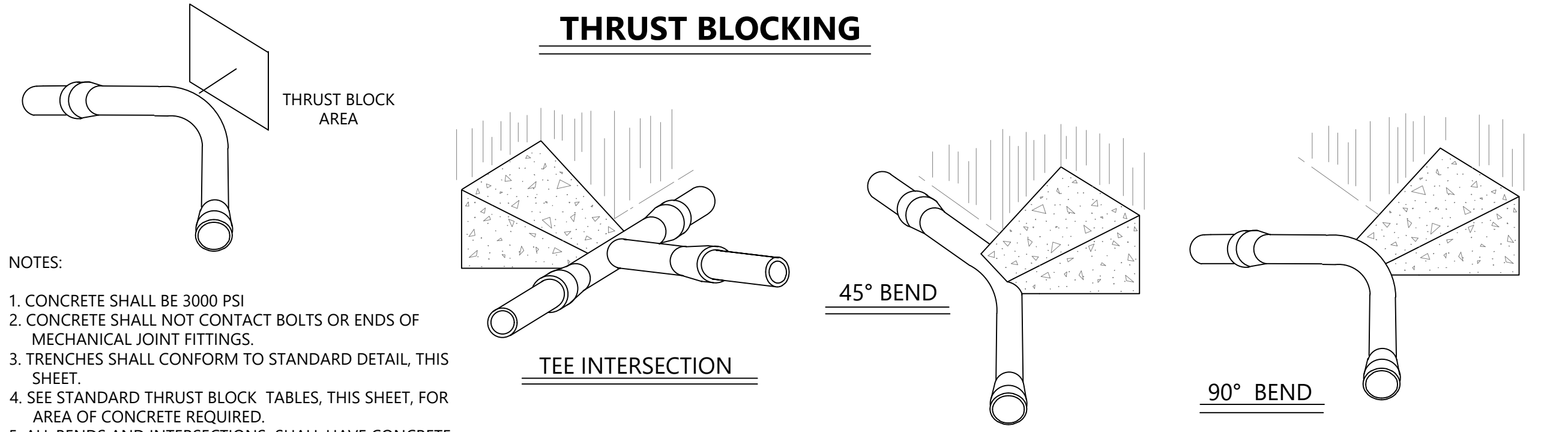
Prepared by VHB Engineering NC, P.C. (C-3705)
940 Main Campus Drive, Suite 500
Raleigh, NC 27606

Utility Trench

N.T.S. Source: VHB

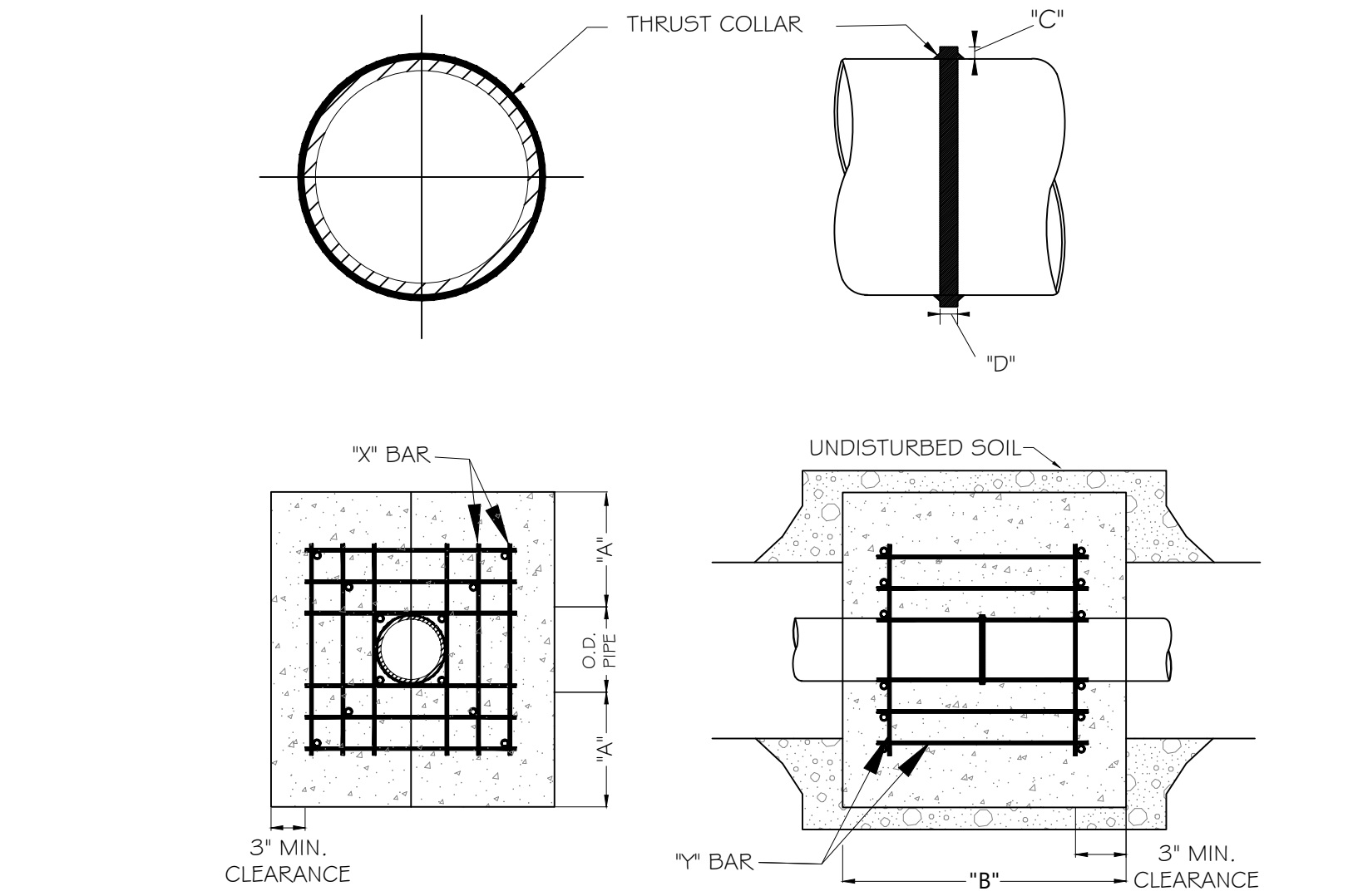
Horizontal Directional Drill (HDD) HDPE

N.T.S. Source: VHB



Standard Thrust Block Views

N.T.S. Source: VHB



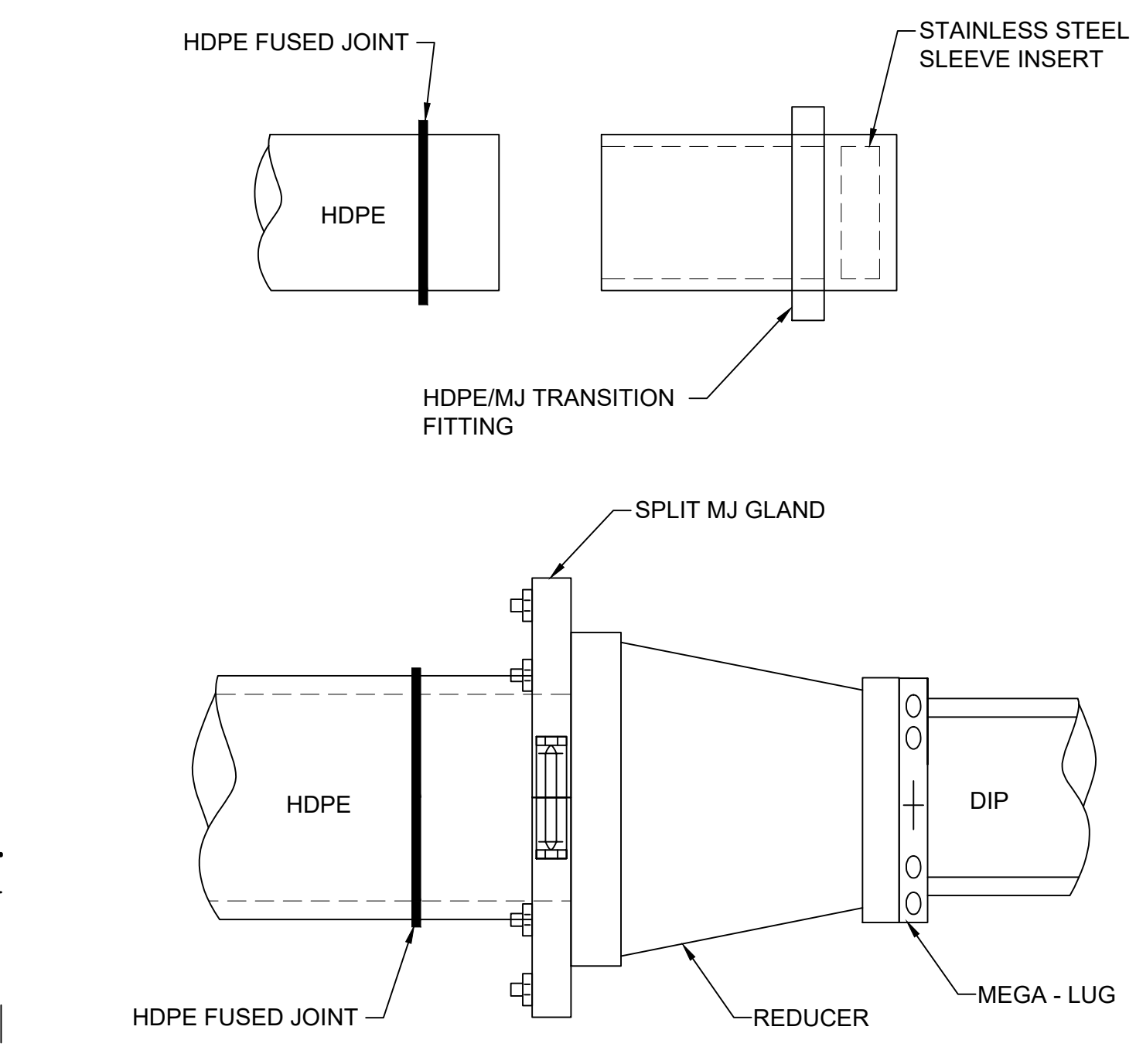
REINFORCING REQUIREMENTS

I.D. PIPE	REBAR SIZE	"X" BAR LENGTH	"X" BAR WEIGHT	"Y" BAR LENGTH	"Y" BAR WEIGHT	NO. REQUIRED
6" - 36"	#5	2'-2" + O.D. PIPE	1.043 LBS/FT	1'-1"	1.1 LBS EACH	X-24, Y-12
36" & GREATER	#6	3'-0" + O.D. PIPE	1.502 LBS/FT	1'-3"	1.9 LBS EACH	X-24, Y-12

THRUST COLLAR, AND THRUST SCHEDULE

I.D. PIPE	"A"	"B"	"C"	"D"
6" - 16"	1'-4"	1'-7"	0'-2"	3/8"
20" - 24"	1'-4"	1'-7"	0'-3"	1/2"
30" - 36"	1'-4"	1'-7"	0'-4"	5/8"
48" & GREATER	1'-8"	1'-9"	0'-6"	7/8"

N.T.S. Source: VHB



5/9 N.T.S. Source: VHB

REACTION BEARING AREAS FOR HORIZONTAL WATER PIPE BENDS BASED ON TEST PRESSURE OF 200 P.S.I.

ALL AREAS GIVEN IN SQUARE FEET.

SIZE AND DEGREE OF BEND	STATIC THRUST IN POUNDS	ALL AREAS GIVEN IN SQUARE FEET.						
		MODERATELY DRY CLAY 4000 LBS/FT ³	SOFT CLAY 2000 LBS/FT ³	GRAVEL / COARSE SAND 1800 LBS/FT ³	8000 LBS/FT ³ ALLWAY'S DRY SAND COMPACT FIRM 8000 LBS/FT ³	SAND, CLEAN DRY QUICK-SAND VERY POOR 10,000 LBS/FT ³	ROCK - POOR 10,000 LBS/FT ³	ROCK - POOR 10,000 LBS/FT ³
6"	11 1/4°	1,108	1	1	1	1	2	1
	22 1/2°	2,207	1	2	2	1	1	3
	45°	4,328	2	3	3	1	2	5
	90°	7,996	2	4	5	1	2	8
	PLUG	5,655	2	3	4	1	2	6
8"	11 1/4°	1,970	1	1	2	1	1	2
	22 1/2°	3,922	1	2	3	1	1	4
	45°	7,694	2	4	5	1	2	8
	90°	14,215	4	8	9	2	2	15
	PLUG	10,053	3	5	6	2	2	10
12"	11 1/4°	4,433	2	3	3	1	2	5
	22 1/2°	8,826	3	5	6	2	3	9
	45°	17,312	5	9	11	3	5	18
	90°	31,983	8	16	19	4	8	32
	PLUG	22,619	6	12	14	3	6	23
16"	11 1/4°	7,881	2	4	5	1	2	8
	22 1/2°	15,691	4	8	10	2	4	16
	45°	30,779	8	16	19	4	8	31
	90°	56,861	15	29	35	8	15	57
	PLUG	40,213	10	21	25	5	10	41

REACTION BEARING AREAS FOR HORIZONTAL WATER PIPE BENDS BASED ON TEST PRESSURE OF 200 P.S.I.

ALL AREAS GIVEN IN SQUARE FEET.

SIZE AND DEGREE OF BEND	STATIC THRUST IN POUNDS	ALL AREAS GIVEN IN SQUARE FEET.						
		MODERATELY DRY CLAY 4000 LBS/FT ³	SOFT CLAY 2000 LBS/FT ³	GRAVEL / COARSE SAND 1800 LBS/FT ³	8000 LBS/FT ³ ALLWAY'S DRY SAND COMPACT FIRM 8000 LBS/FT ³	SAND, CLEAN DRY QUICK-SAND VERY POOR 10,000 LBS/FT ³	ROCK - POOR 10,000 LBS/FT ³	ROCK - POOR 10,000 LBS/FT ³
24"	11 1/4°	17,734	5	9	11	3	5	18
	22 1/2°	35,305	9	18	22	5	9	36
	45°	69,252	18	35	42	9	18	70
	90°	127,936	32	64	77	16	32	128
	PLUG	90,478	23	46	55	12	23	91
30"	11 1/4°	27,709	7	14	17	4	7	2
	22 1/2°	55,163	14	28	34	7	14	5
	45°	108,206	28	55	65	14	28	109
	90°	199,900	50	100	120	25	50	200
	PLUG	141,372	36	71	85	18	36	142
36"	11 1/4°	39,901	10	20	24	5	10	4
	22 1/2°	79,439	20	40	48	10	20	30
	45°	155,816	39	78	94	20	39	156
	90°	287,855	72	144	172	36	72	288
	PLUG	203,575	51	102	122	26	51	204
48"	11 1/4°	70,935	18	36	43	9	18	8
	22 1/2°	141,218	36	71	85	18	36	142
	45°	277,007	70	139	166	35	70	277
	90°	511,742	128	256	320	64	128	512
	PLUG	361,911	91	181	217	46	91	362

REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90° TO THE THRUST VECTOR.

USE 6° - 90° BEND VALUE FOR HYDRANTS FOR ADDITIONAL SAFETY FACTOR.

THRUST BLOCKING DESIGN QUANTITY TABLE			
REVISIONS	DATE	REVISIONS	DATE

REACTION BEARING AREAS ARE IN SQUARE FEET MEASURED IN A VERTICAL PLANE IN THE TRENCH SIDE AT AN ANGLE OF 90° TO THE THRUST VECTOR.

USE 6° - 90° BEND VALUE FOR HYDRANTS FOR ADDITIONAL SAFETY FACTOR.

THRUST BLOCKING DESIGN QUANTITY TABLE			
REVISIONS	DATE	REVISIONS	DATE

4/12/2022 \\vhb.com\gbl\proj\Raleigh_38564.19 NCDOT Utilities\Rdy_Ut\Proj\Plan Sheets\R5819_UC_PLAN.dwg Mark Edwards