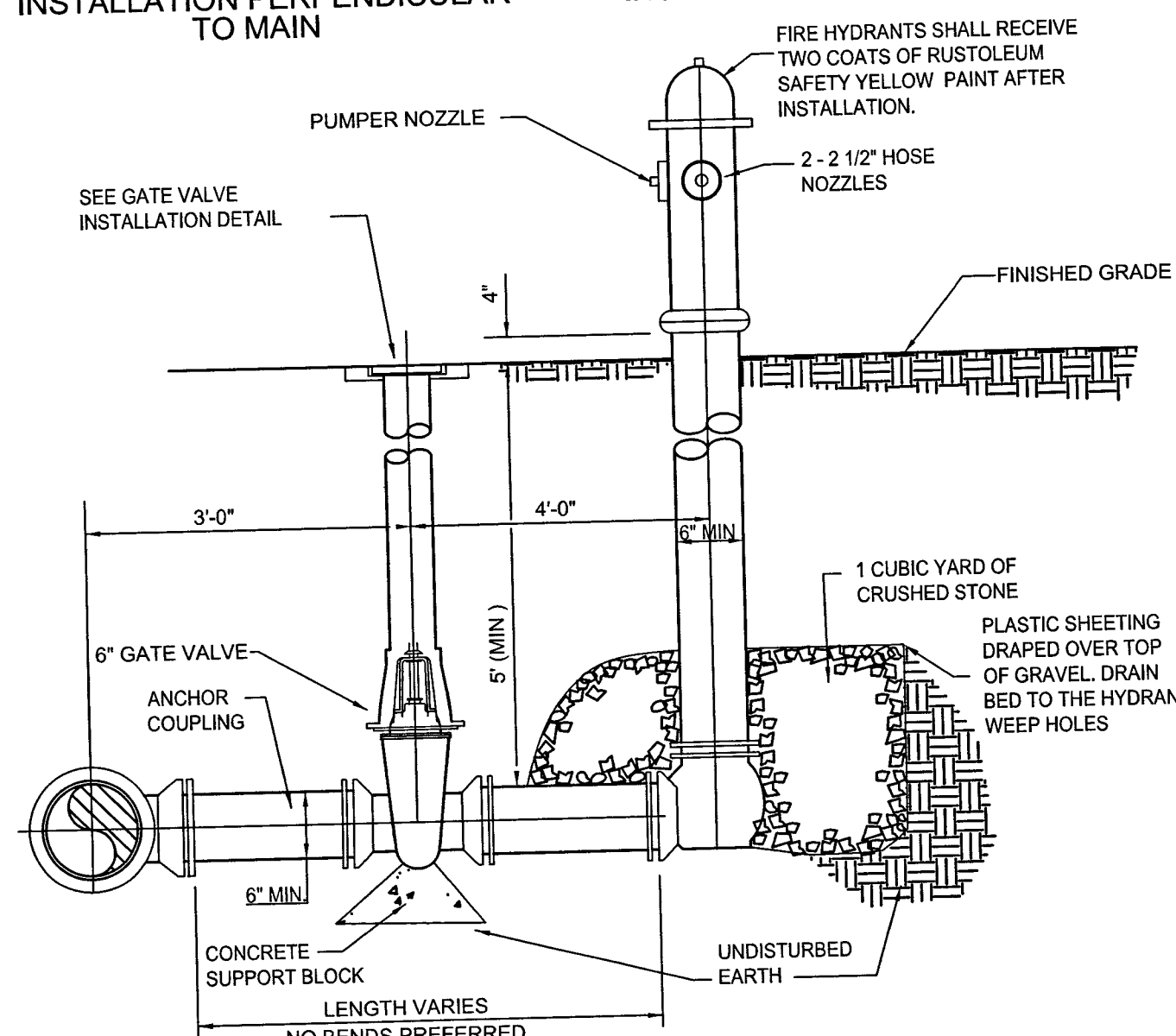


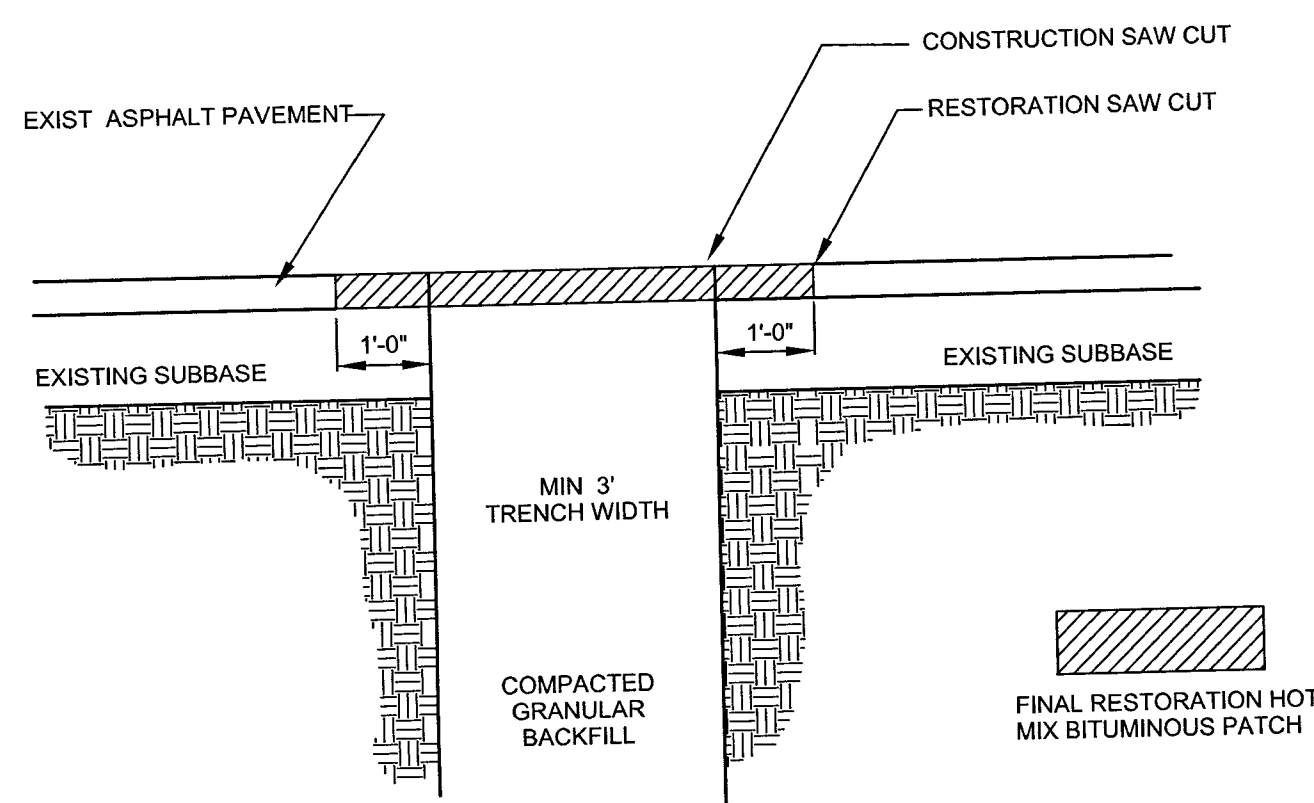
INSTALLATION PERPENDICULAR TO MAIN

INSTALLATION PARALLEL TO MAIN



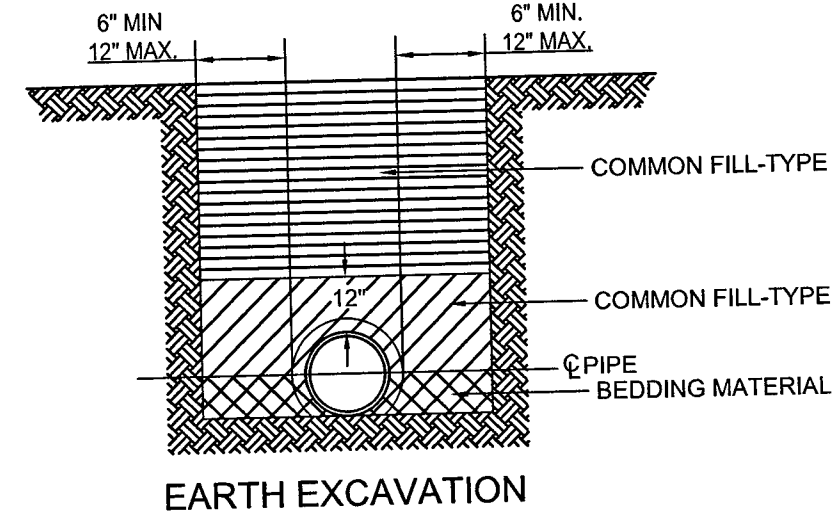
SECTION
Fire Hydrant Detail

NO SCALE



Bituminous Pavement Restoration

NOT TO SCALE



EARTH EXCAVATION

NOTE

WIDTHS OF TRENCHES SHALL BE HELD TO A MINIMUM TO ACCOMMODATE THE PIPE AND APPURTENANCES. THE TRENCH WIDTH SHALL BE MEASURED AT THE TOP OF THE PIPE BARREL AND SHALL CONFORM TO THE LIMITS DEPICTED ABOVE.

IF, FOR ANY REASON THE TRENCH WIDTH EXCEEDS THE MAXIMUM TRENCH WIDTH DEFINED IN THE ABOVE DETAIL, THE CONTRACTOR SHALL PROVIDE ADDITIONAL BEDDING AND BACKFILL MATERIAL AS SPECIFIED IN THE FILL AND BEDDING MATERIAL SPECIFICATIONS SHOWN HEREON TO FILL THE ADDITIONAL WIDTH OF TRENCH, AT NO ADDITIONAL COST.

SEE SPECIFICATION: TRENCHING, BACKFILLING AND COMPACTING FOR DESCRIPTIONS OF FILL AND BEDDING MATERIAL.

Trench Backfill Materials

NO SCALE

THRUST RESTRAINT GUIDE for FIELD LOCK GASKETS ON 6-INCH, 8-INCH AND 12 INCH D.I. PIPE

- GENERAL INFORMATION
- 1) FIELD LOCK GASKETS ARE TO BE USED ON ALL FITTING OPENINGS.
 - 2) TEES ARE TO BE RESTRAINED ALONG THE BRANCH.
 - 3) REDUCERS ARE TO BE RESTRAINED ALONG THE LARGER DIAMETER PIPE.
 - 4) BENDS ARE TO BE RESTRAINED ON EACH SIDE OF THE BEND.
 - 5) VALVES ARE TO BE RESTRAINED ON EACH SIDE OF THE VALVE.
 - 6) WHEN RESTRAINED LENGTHS OF FITTINGS ENCRDACH, THE LONGER RESTRAINED LENGTH PREVAILS.
 - 7) CALCULATIONS ARE FOR POLYETHYLENE ENCASED PIPE.
 - 8) ALL JOINTS WITHIN CASINGS ARE TO BE RESTRAINED WITH FIELD LOCK GASKETS.
 - 9) TABLES ARE TO BE USED AS A GUIDE ONLY. FOR FURTHER QUESTIONS, THE CONTRACTOR SHOULD CONSULT THE DUCTILE IRON PIPE RESEARCH ASSOCIATION'S THRUST RESTRAINT DESIGN FOR DUCTIVE IRON PIPE MANUAL.

SILT SOIL CONDITION

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 8 REDUCER EXCEEDS 153 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 6 REDUCER EXCEEDS 278 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 8 x 6 REDUCER EXCEEDS 75 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

SAND SILT SOIL CONDITION

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 8 REDUCER EXCEEDS 147 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 6 REDUCER EXCEEDS 268 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 8 x 6 REDUCER EXCEEDS 73 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

GOOD SAND SOIL CONDITION

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 8 REDUCER EXCEEDS 70 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 6 REDUCER EXCEEDS 128 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

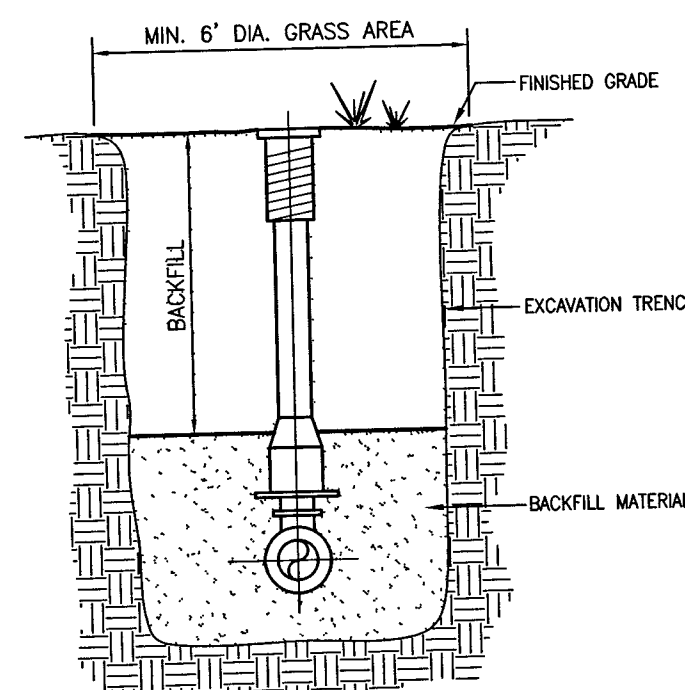
IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 8 x 6 REDUCER EXCEEDS 35 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

CLAY SOIL CONDITION

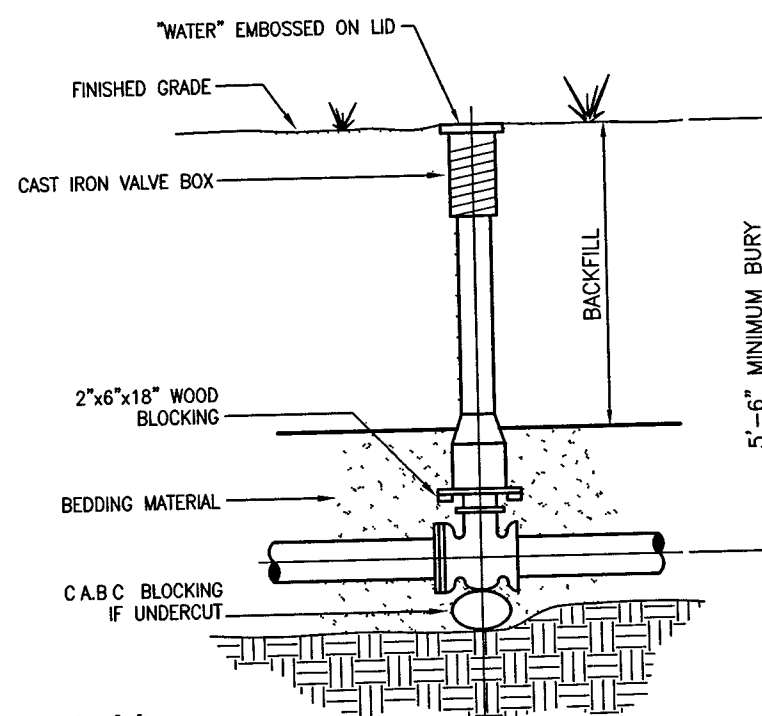
IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 8 REDUCER EXCEEDS 66 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 12 x 6 REDUCER EXCEEDS 118 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.

IF THE STRAIGHT RUN OF PIPE ON THE SMALL SIDE OF THE 8 x 6 REDUCER EXCEEDS 32 FT, THEN NO RESTRAINED JOINTS ARE NECESSARY.



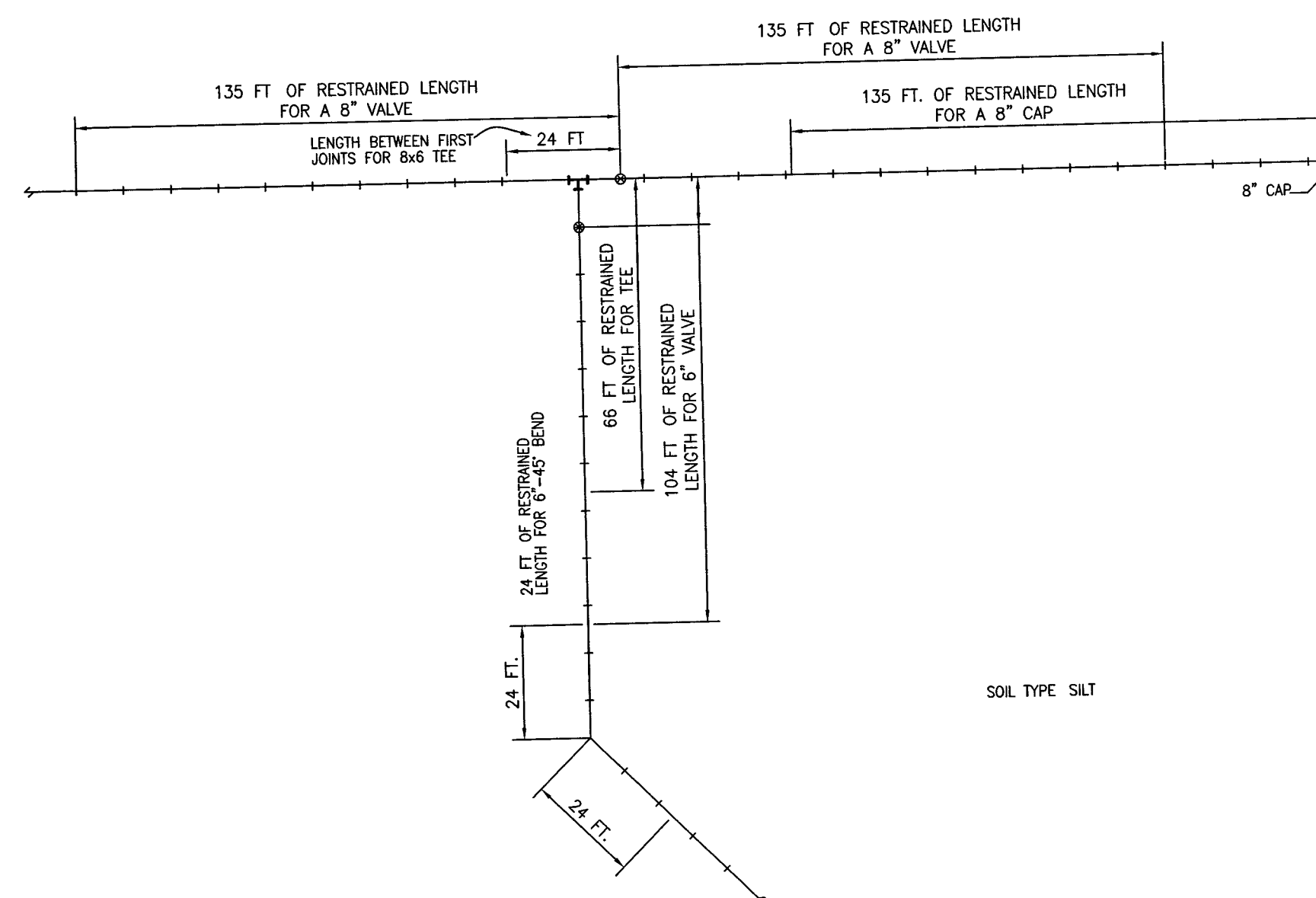
Front View



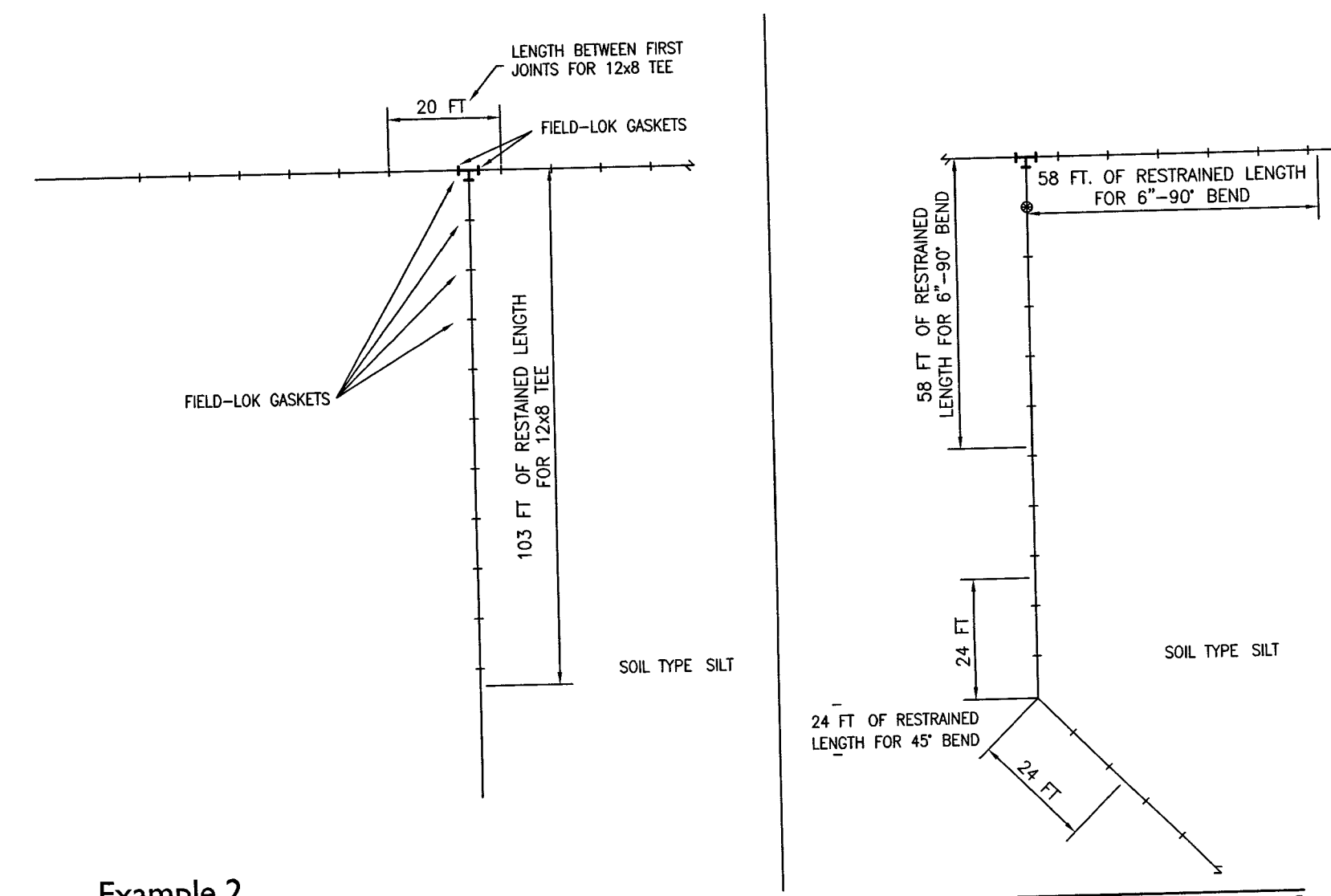
Side View

Standard Gate Valve and Box Setting

NO SCALE



Example 1



Example 2

REQUIRED RESTRAINED LENGTHS FOR TEES																																											
LENGTH BETWEEN FIRST JOINTS	SILT SOIL						SAND SILT SOIL						GOOD SAND SOIL						CLAY SOIL																								
	6"	12"	18"	24"	30"	36"	6"	12"	18"	24"	30"	36"	6"	12"	18"	24"	30"	36"	6"	12"	18"	24"	30"	36"	6"	12"	18"	24"	30"	36"	6"	12"	18"	24"	30"	36"							
12x12	185	178	170	163	156	149	171	156	147	137	127	117	90	79	69	59	49	39	29	19	9	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR				
12x8	124	113	103	92	81	70	109	87	75	63	51	39	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR			
12x6	90	79	67	55	43	32	17	72	43	21	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
8x8	128	121	114	106	99	92	116	102	87	73	58	44	30	15	3	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR		
8x6	95	85	76	66	57	47	67	53	42	34	25	17	9	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
6x6	97	90	83	76	69	62	66	57	48	39	30	21	13	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR

REQUIRED RESTRAINED LENGTHS FOR VALVES OR DEAD ENDS												
DIAMETER OF PIPE VALVE OR DEAD END	SILT SOIL TYPE			SAND SILT SOIL			GOOD SAND SOIL			CLAY SOIL		
	6 INCH	8 INCH	12 INCH	6 INCH	8 INCH	12 INCH	6 INCH	8 INCH	12 INCH	6 INCH	8 INCH	12 INCH
	104'	135'	192'	101'	131'	186'	48'	62'	89'	44'	58'	85'

GENERAL NOTES FOR THE ABOVE LISTED SOIL CONDITIONS:

- 1) RESTRAINED LENGTHS BASED ON MINIMUM FOUR FEET OF COVER, A DESIGN PRESSURE OF 150 PSI, AND A SAFETY FACTOR OF 1.5. RESTRAINED LENGTHS BASED ON WATER MAIN LYING ON UNDISTURBED EARTH AND THE BACKFILL MATERIAL LIGHTLY CONSOLIDATED TO CENTERLINE OF WATER MAIN.
- 2) NR - "NOT REQUIRED"

Required Restrained Length for: Bends, Reducers, Tees, Valves or Dead Ends

BEND (IN DEGREES)		REQUIRED RESTRAINED LENGTHS FOR BENDS																															
		SILT SOIL TYPE								SAND SILT SOIL								GOOD SAND SOIL								CLAY SOIL							
		PIPE DIAMETER				PIPE DIAMETER				PIPE DIAMETER				PIPE DIAMETER																			
		6 INCH	8 INCH	12 INCH	12 INCH	6 INCH	8 INCH	12 INCH	12 INCH	6 INCH	8 INCH	12 INCH	12 INCH	6 INCH	8 INCH	12 INCH	12 INCH	6 INCH	8 INCH	12 INCH	12 INCH												
22.5	12'	15'	21'	21'	8'	10'	14'	14'	6'	8'	8'	11'	14'	21'	21'	21'	21'	21'	21'	21'													
45	24'	31'	44'	44'	16'	21'	29'	10'	12'	17'	23'	30'	44'	44'	44'	44'	6'	8'	12'	14'													
90	58'	75'	105'	105'	39'	50'	71'	23'	30'	42'	56'	73'	105'	105'	105'	105'	6'	8'	12'	14'													

REDUCER SIZE	SILT SOIL TYPE						SAND SILT SOIL						GOOD SAND SOIL						CLAY SOIL					
	12 X 8	12 X 6	12 X 6	8 X 6	8 X 6	8 X 6	12 X 8	12 X 6	12 X 6	8 X 6	8 X 6	8 X 6	12 X 8	12 X 6	12 X 6	8 X 6	8 X 6	8 X 6	12 X 8	12 X 6	12 X 6	8 X 6	8 X 6	8 X 6
102'	140'	57'	98'	135'	55'	55'	47'	65'	26'	45'	62'	24'	47'	65'	26'	45'	62'	24'	47'	65'	26'	45'	62'	24'