

MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON EACH SIDE OF A VALVE OR FITTING FOR CLAYEY AND SILTY SOILS (CL, CH, ML, MH)

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	22.5° BEND	TEE OR CROSS		REDUCER <sup>b</sup>		VALVE	DEAD END
					LOW	HIGH	LOW	HIGH		
P	54	19	18	18	18	23	36	18	55	
V	6	26	18	18	18	32	40	36	77	
C	6	35	18	18	18	42	73	36	101	
P	10	42	18	18	18	50	98	54	121	
I	12	50	21	18	18	59	104	54	143	
E	14	64	23	18	36	20	67	106	72	163
E	18	71	29	18	36	23	76	109	72	183
	20	78	32	18	36	28	84	109	72	202
	24	92	38	18	36	33	107	140	90	258
	30	110	46	22	54	40	127	193	90	308

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	22.5° BEND	TEE OR CROSS		REDUCER <sup>b</sup>		VALVE	DEAD END
					LOW	HIGH	LOW	HIGH		
D	54	19	18	18	18	20	25	36	49	
U	6	22	18	18	18	20	25	36	49	
O	8	29	18	18	18	27	46	36	64	
T	10	35	18	18	18	32	62	54	77	
I	12	41	18	18	18	37	66	54	90	
L	14	47	20	18	18	43	67	72	103	
E	16	53	22	18	36	19	48	68	72	115
I	18	59	24	18	36	21	53	69	72	127
R	20	65	27	18	36	23	58	70	72	140
O	24	76	31	18	36	27	67	89	90	162
N	30	91	38	18	36	32	80	122	90	194

PIPE THRUST RESTRAINTS: MECHANICAL RESTRAINTS SHALL BE INSTALLED AS REQUIRED TO PROPERLY RESTRAIN ALL PIPING SYSTEMS. AT A MINIMUM, RESTRAINTS SHALL BE PROVIDED ON ALL BELOW-GRADE VALVES AND FITTINGS AND AT THE REQUIRED NUMBER OF PIPE JOINTS IN EACH SECTION OF PIPE FOUND UNDER THE RESTRAINTS. THE REQUIRED NUMBER OF PIPE RESTRAINTS SHALL BE AS SHOWN IN PIPE RESTRAINT SCHEDULES BELOW.

BASIS OF SCHEDULES

1. TEST PRESSURE: 150 PSIG
2. MINIMUM PIPE DEPTH: 3 FEET
3. TYPE 3 LAYING CONDITION
4. FACTOR OF SAFETY = 2.0

A "LOW" REPRESENTS THE MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON THE LOW SIDE OF THE VERTICAL OFFSET, WHICH IS TYPICALLY DOWNSTREAM OF THE OFFSET FITTING. "HIGH" REPRESENTS THE MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON THE HIGH SIDE OF THE VERTICAL OFFSET, WHICH IS TYPICALLY UPSTREAM OF THE OFFSET FITTING. REQUIRED RESTRAINED LENGTHS ASSUME AN OFFSET ANGLE # 49E.

B DISTANCE REPRESENTS THE LINEAR FEET OF LARGE DIAMETER PIPE TO BE RESTRAINED BEYOND A RESTRAINED AREA. RESTRAINTS SHALL BE INSTALLED UPSTREAM OF THE RESTRAINED AREA. RESTRAINTS SHALL BE INSTALLED UNOBSTRUCTED RUN DOWNSTREAM OF THE RESTRAINED AREA. RESTRAINTS SHALL BE INSTALLED AT LEAST 2.5 TIMES THE REQUIRED LENGTH OF LARGE DIAMETER PIPE TO BE RESTRAINED. IF SMALL END OF REDUCER IS MORE THAN THREE PIPE SIZES SMALLER THAN LARGE END, CONSULT ENGINEER FOR REQUIRED LENGTH TO BE RESTRAINED.

**CITY OF GROVELAND STANDARD DETAILS: WATER**

PIPE RESTRAINT SCHEDULE

DATE: JULY 7, 2008  
SCALE: N.T.S.

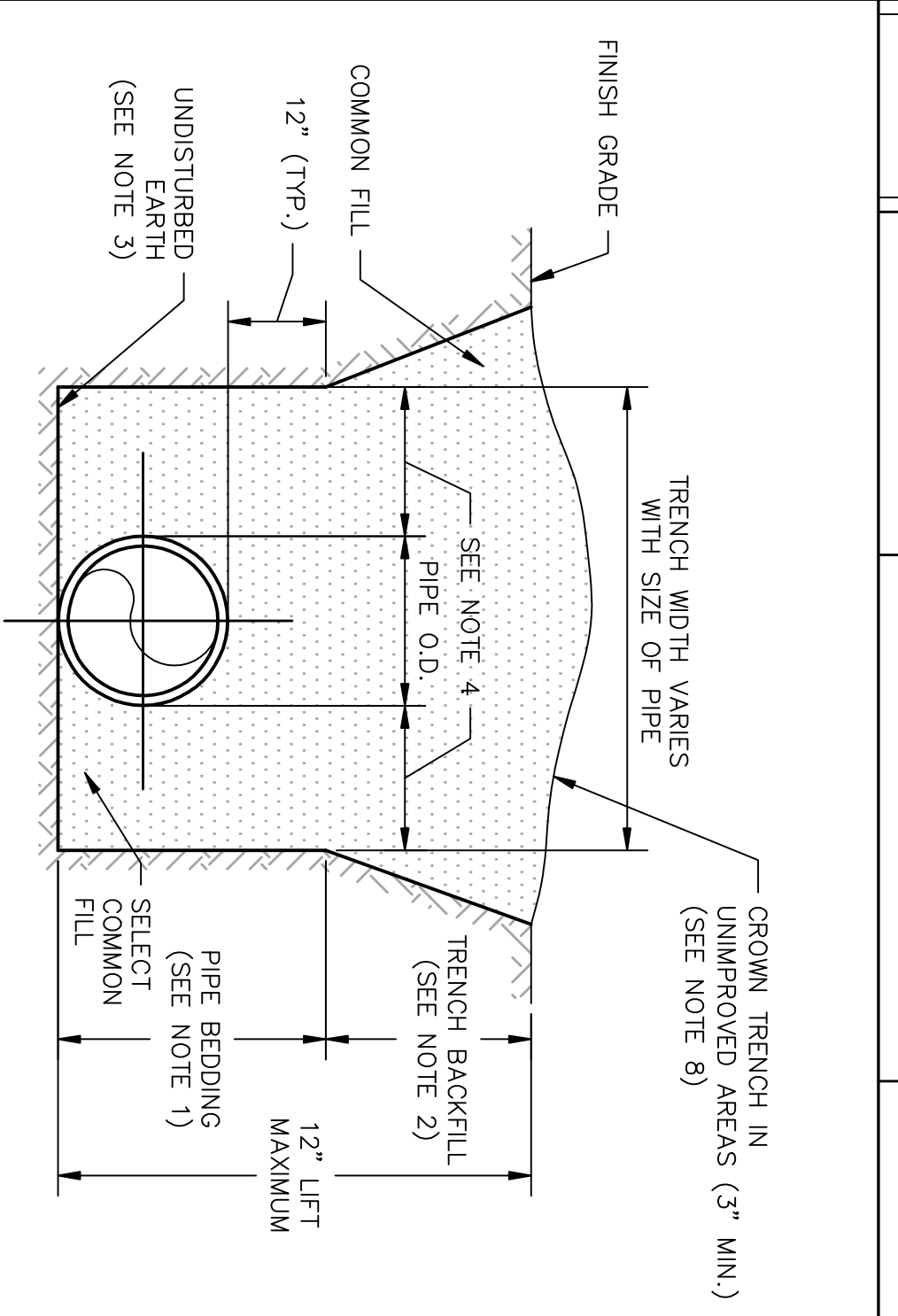
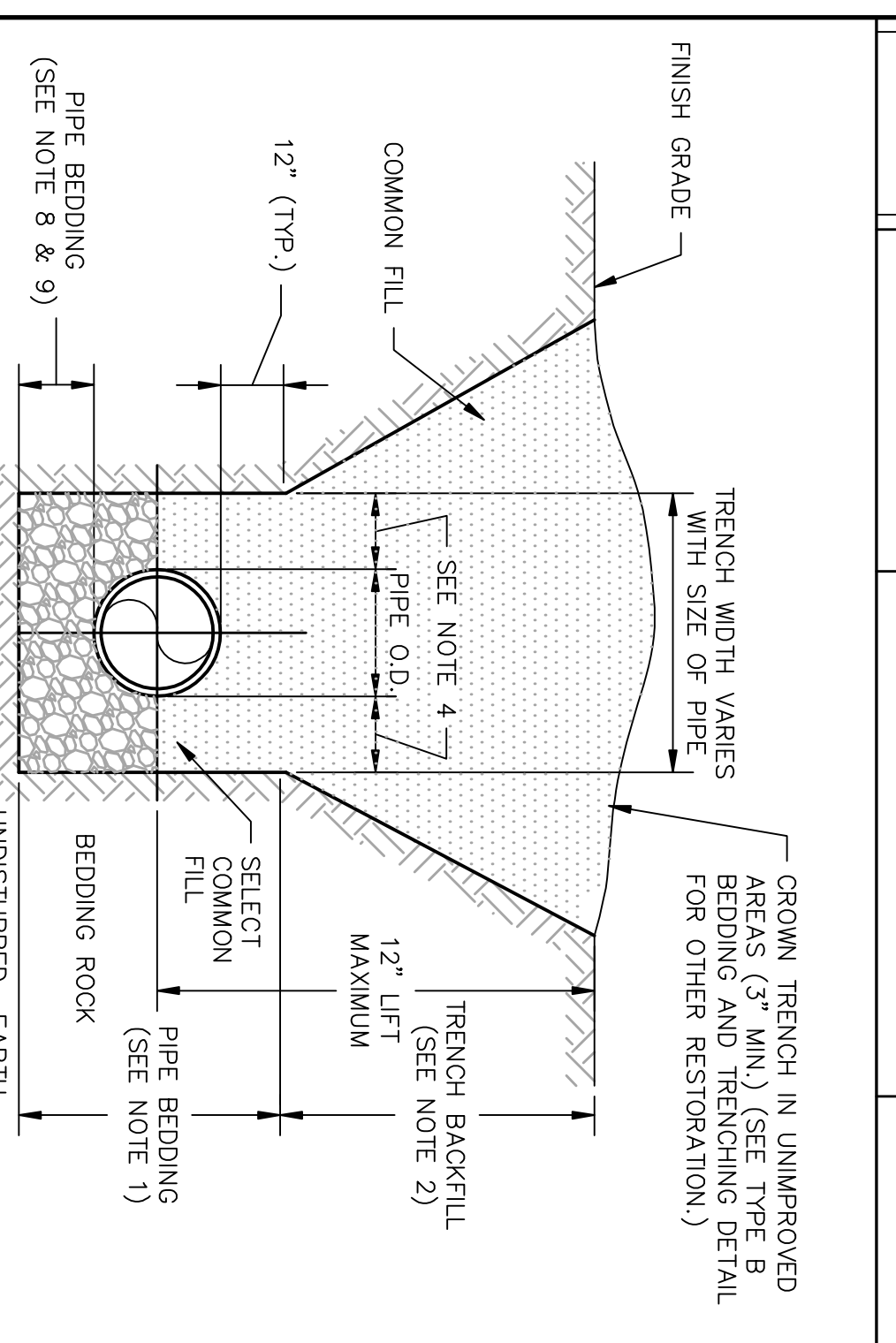
W-14B

**CITY OF GROVELAND STANDARD DETAILS: WATER**

PIPE RESTRAINT SCHEDULE

DATE: JULY 7, 2008  
SCALE: N.T.S.

W-14C

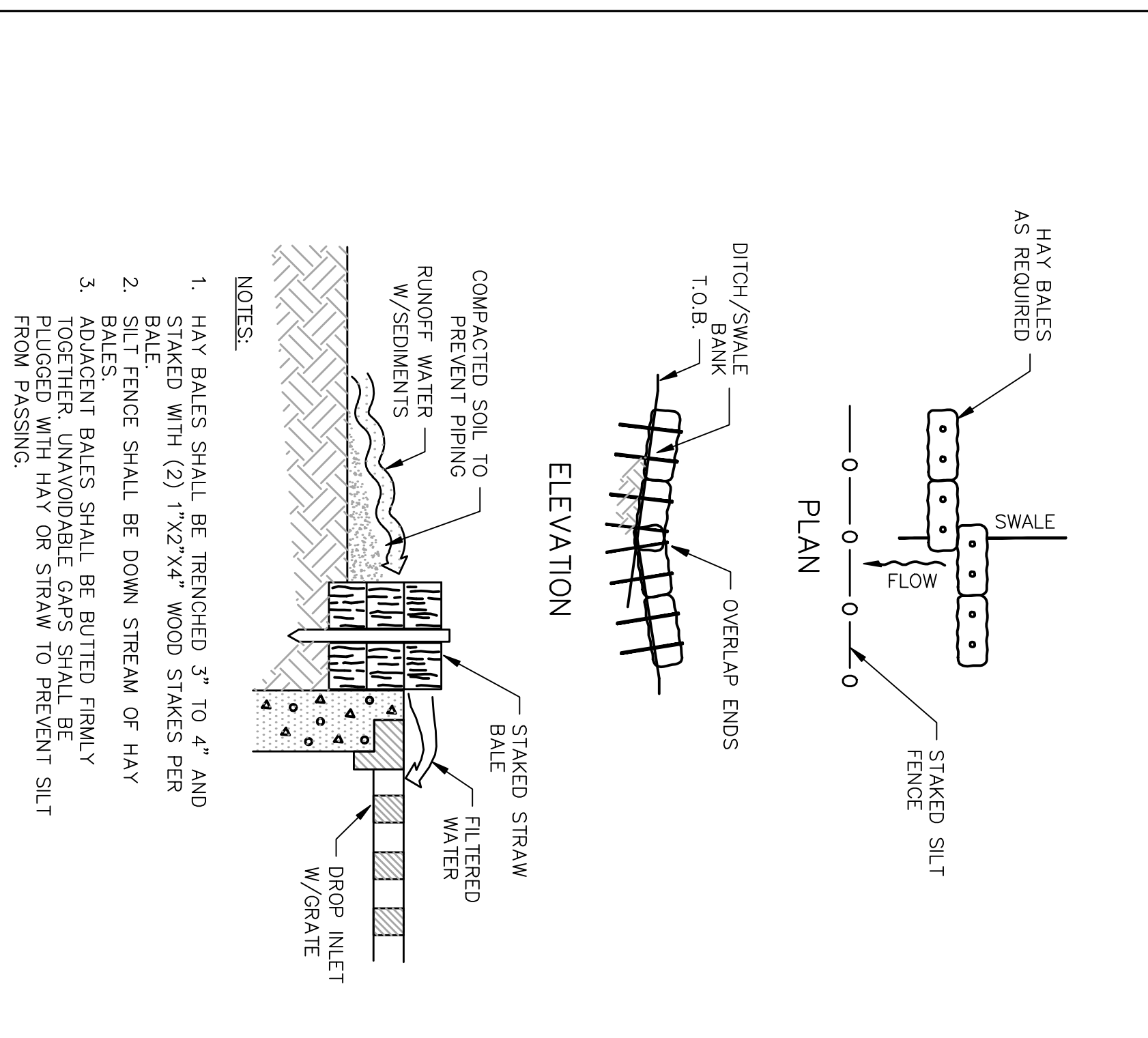


**CITY OF GROVELAND STANDARD DETAILS: GENERAL**

EROSION CONTROL FEATURES

DATE: JULY 7, 2008  
SCALE: N.T.S.

G-1

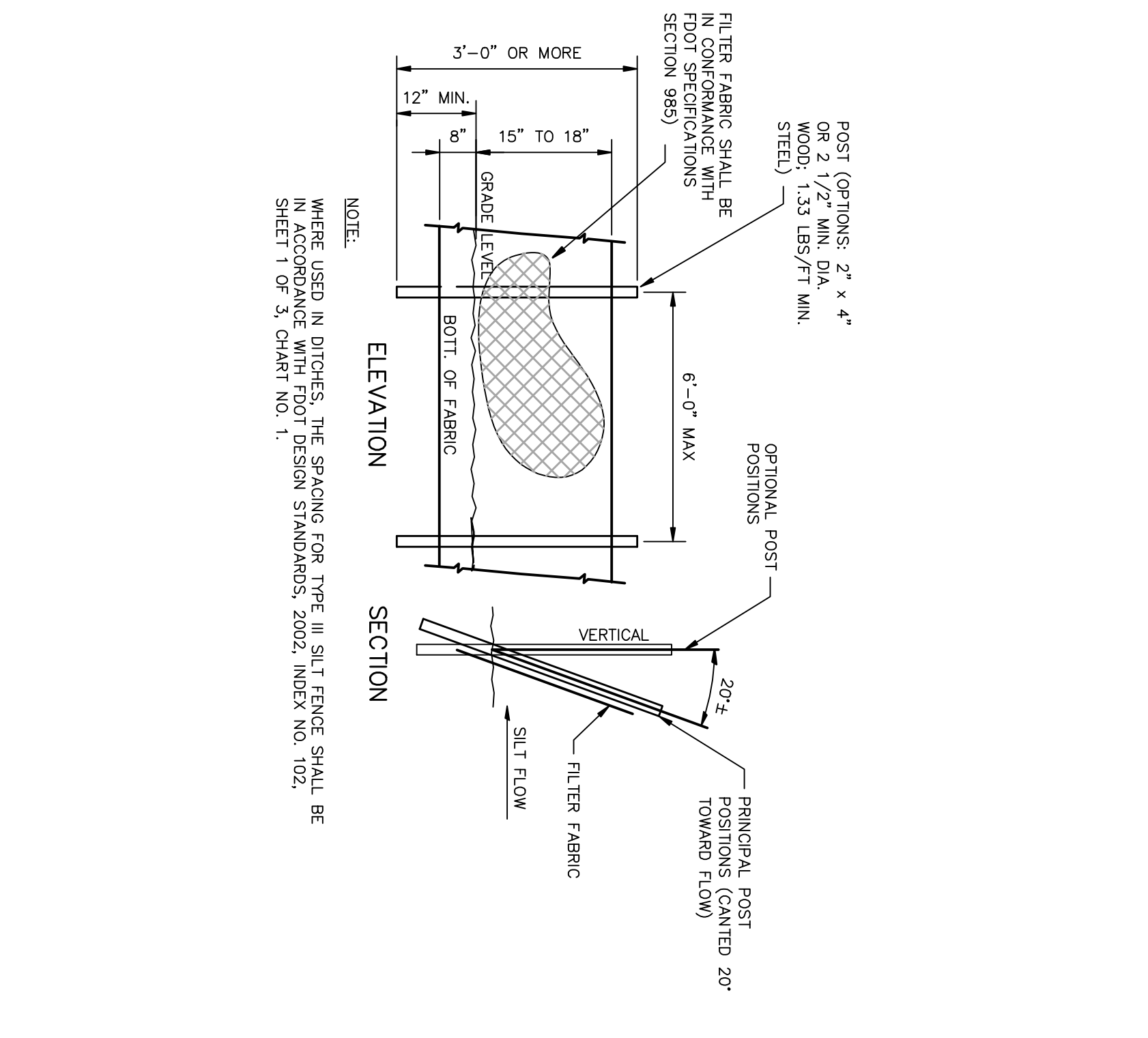


**CITY OF GROVELAND STANDARD DETAILS: GENERAL**

TYPE III SILT FENCE

DATE: JULY 7, 2008  
SCALE: N.T.S.

G-2

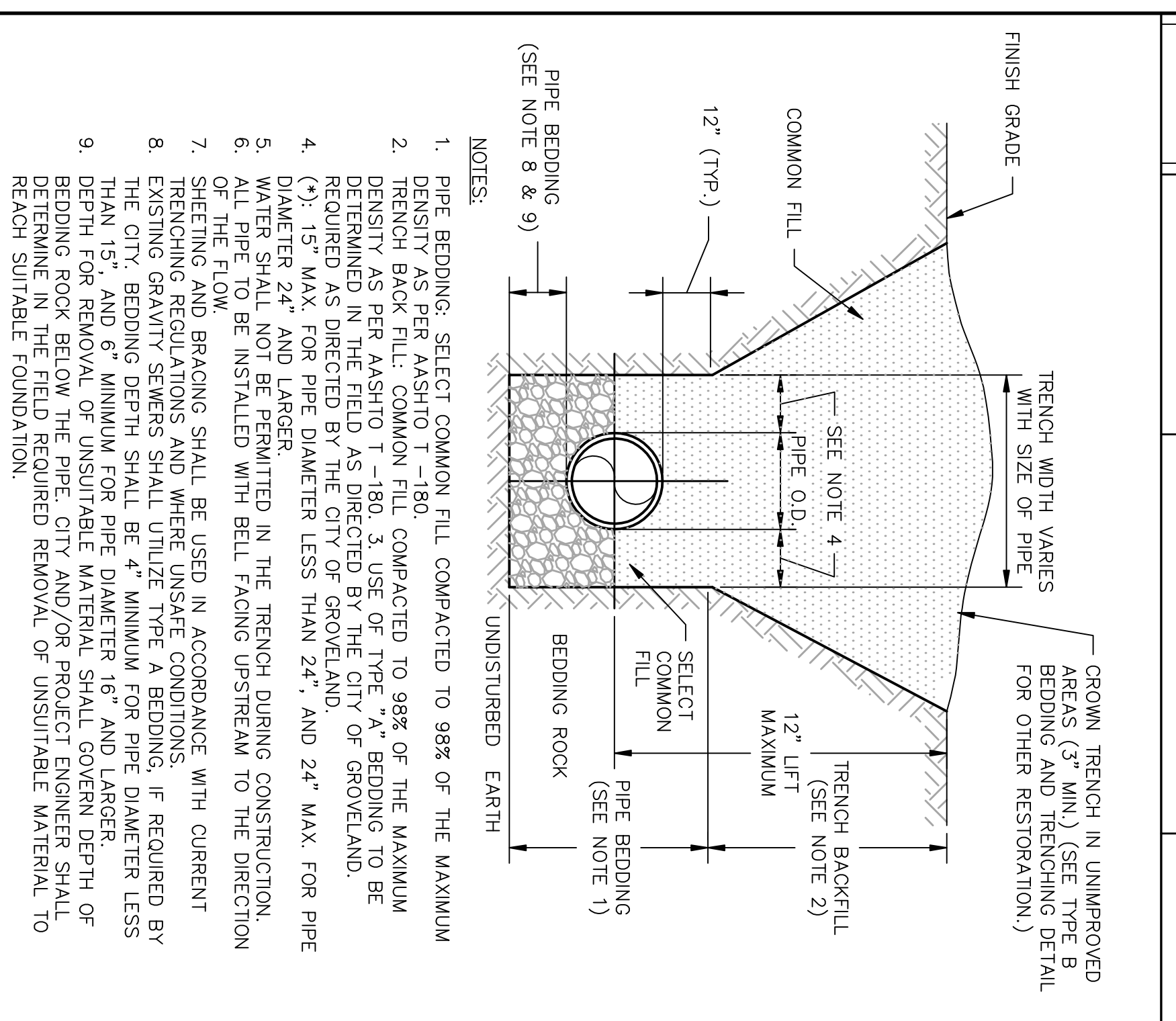


**CITY OF GROVELAND STANDARD DETAILS: GENERAL**

CLASS A BEDDING AND TRENCHING DETAIL

DATE: JULY 7, 2008  
SCALE: N.T.S.

G-4

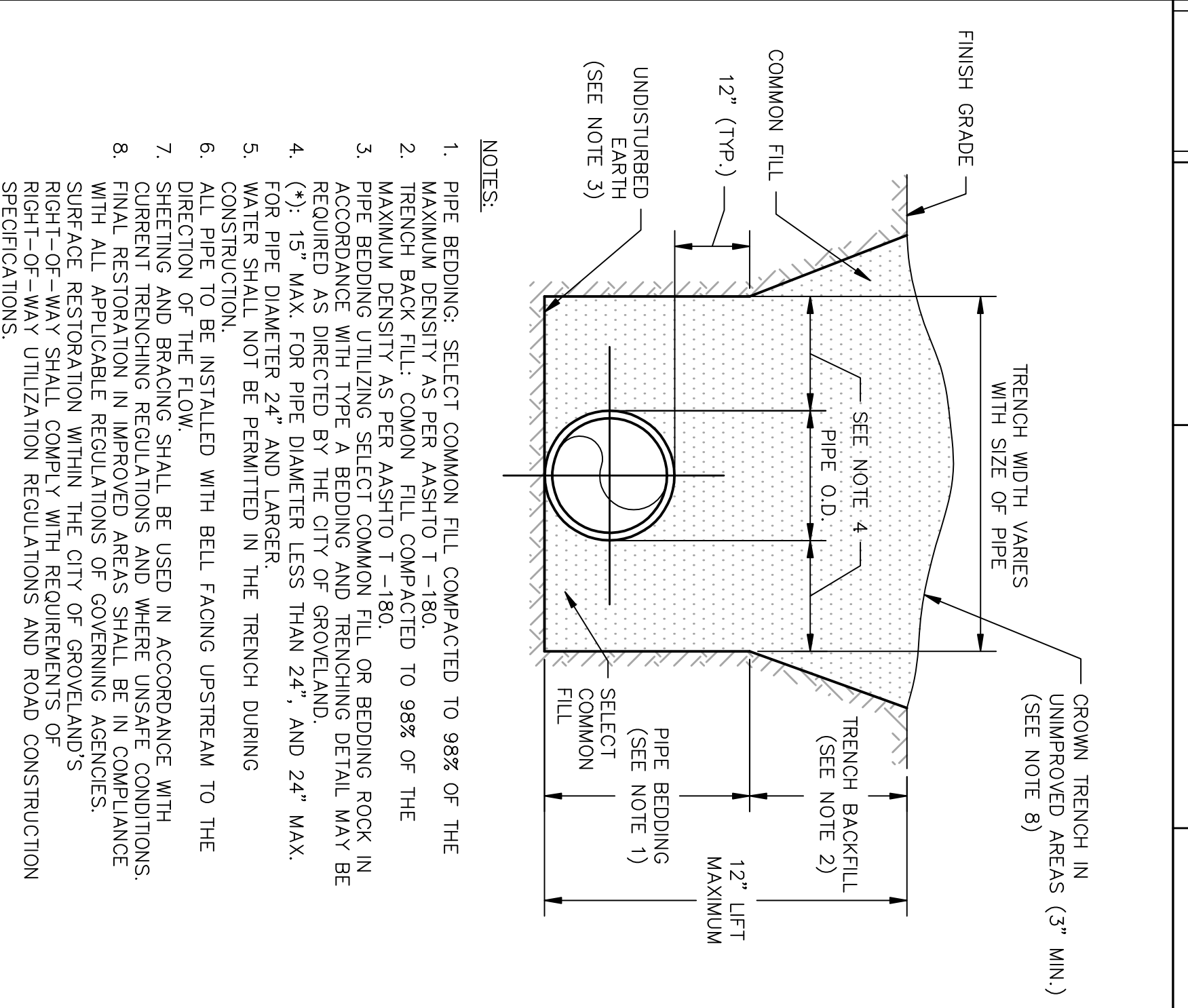


**CITY OF GROVELAND STANDARD DETAILS: GENERAL**

CLASS B BEDDING AND TRENCHING DETAIL

DATE: JULY 7, 2008  
SCALE: N.T.S.

G-5

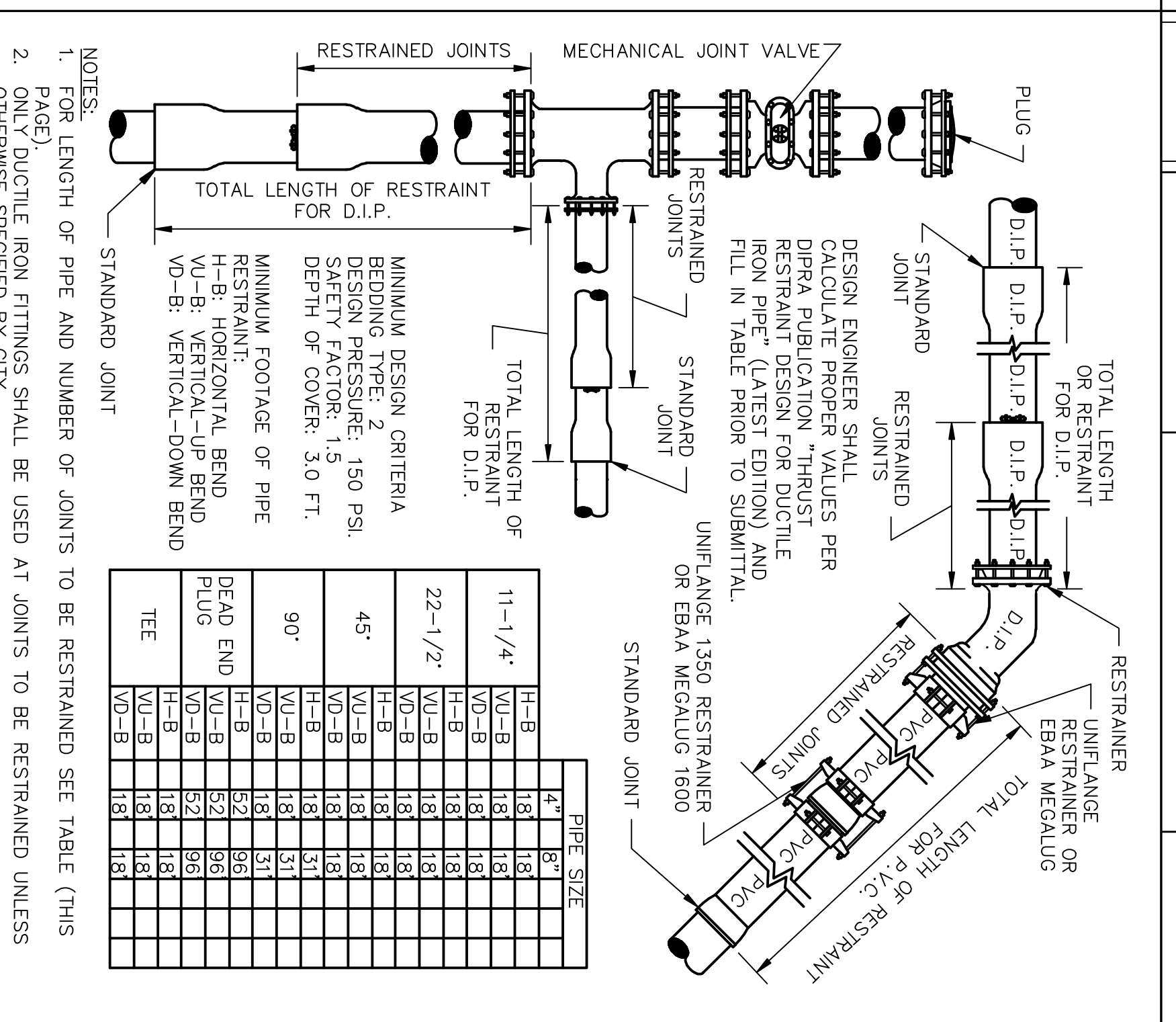


**CITY OF GROVELAND STANDARD DETAILS: GENERAL**

RESTRAINED JOINTS DETAILS

DATE: JULY 7, 2008  
SCALE: N.T.S.

G-7



**Lake Minneola Landings**  
C.R. 5614  
Groveland, FL 34711

**H & B CONSULTING ENGINEERS, INC.**  
Certificate of Authorization # 4829  
218 N. Florida Street, Suite 3  
Busnell, Florida 33513  
Phone : (352) 793-2113

*Site Plan*  
*Lake County Water*  
*Detail Sheet*