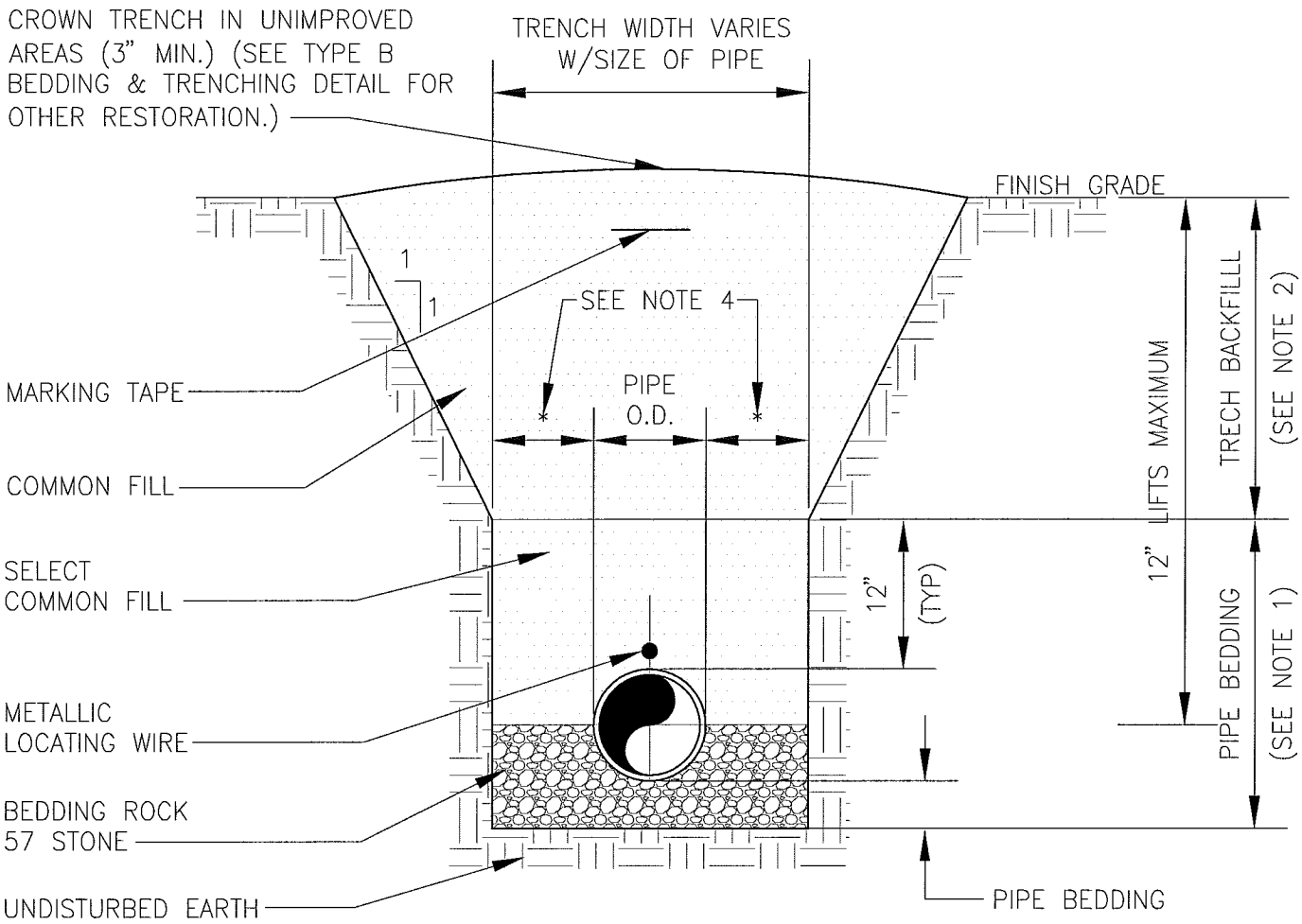
GENERAL CONSTRUCTION DETAILS

APPENDIX A

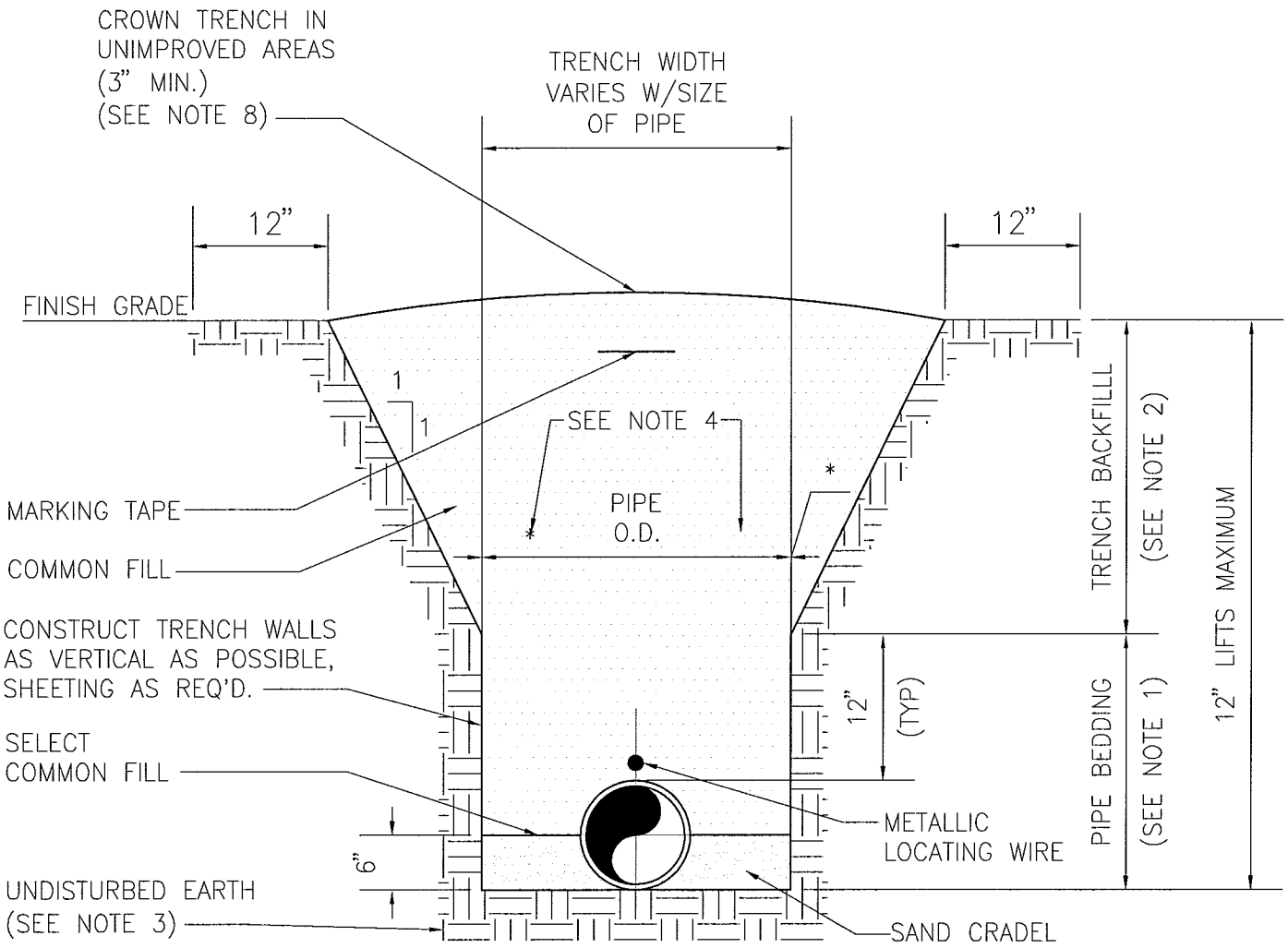
GENERAL CONSTRUCTION DETAILS
INDEX



NOTES:

1. PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO Y-180.
2. TRENCH BEDDING: COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO Y-180.
3. PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE A BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY THE COUNTY.
4. (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
7. REFER TO SECTION 32.5 OF THE MANUAL FOR SHEETING AND BRACING IN EXCAVATIONS.
8. GRAVITY SEWERS SHALL UTILIZE TYPE A BEDDING, IF REQUIRED BY THE BEDDING DEPTH SHALL BE 4" MINIMUM FOR PIPE DIAMETER LESS THAN 15", AND 6" MINIMUM FOR PIPE DIAMETER 16" AND LARGER.
9. DEPTH FOR REMOVAL OF UNSUITABLE MATERIAL SHALL GOVERN DEPTH OF BEDDING ROCK BELOW THE PIPE. COUNTY SHALL DETERMINE IN THE FIELD REQUIRED REMOVAL OF UNSUITABLE MATERIAL TO REACH SUITABLE FOUNDATION.
10. SEE DETAIL ENTITLED "NON-METALLIC PIPE LOCATION AND WARNING WIRE DETAIL".

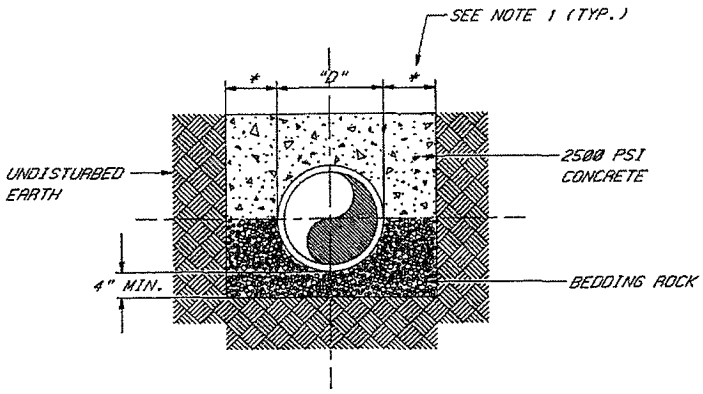
G-1
TYPE A BEDDING AND TRENCHING DETAIL



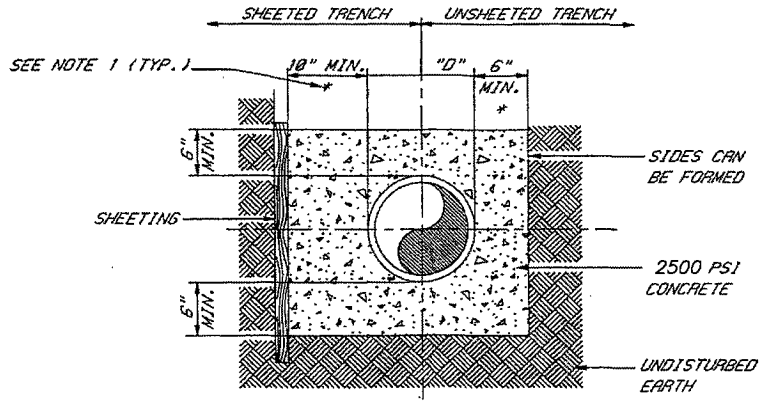
NOTES:

1. PIPE BEDDING: SELECT COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO Y-180.
2. TRENCH BEDDING: COMMON FILL COMPACTED TO 95% OF THE MAXIMUM DENSITY AS PER AASHTO Y-180.
3. PIPE BEDDING UTILIZING SELECT COMMON FILL OR BEDDING ROCK IN ACCORDANCE WITH TYPE A BEDDING AND TRENCHING DETAIL MAY BE REQUIRED AS DIRECTED BY THE COUNTY.
4. (*): 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIAMETER 24" AND LARGER.
5. WATER SHALL NOT BE PERMITTED IN THE TRENCH DURING CONSTRUCTION.
6. ALL PIPE TO BE INSTALLED WITH BELL FACING UPSTREAM TO THE DIRECTION OF THE FLOW.
7. REFER TO SECTION 32.5 OF THE MANUAL FOR SHEETING AND BRACING IN EXCAVATIONS.
8. FINAL RESTORATION IN IMPROVED AREAS SHALL BE IN COMPLIANCE WITH ALL APPLICABLE REGULATIONS OF GOVERNING AGENCIES. SURFACE RESTORATION WITHIN THE CITY RIGHT-OF-WAY SHALL COMPLY WITH REQUIREMENTS OF RIGHT-OF-WAY UTILIZATION REGULATIONS AND ROAD CONSTRUCTION SPECIFICATIONS.
9. SEE DETAIL ENTITLED "NON-METALLIC PIPE LOCATION AND WARNING WIRE DETAIL".

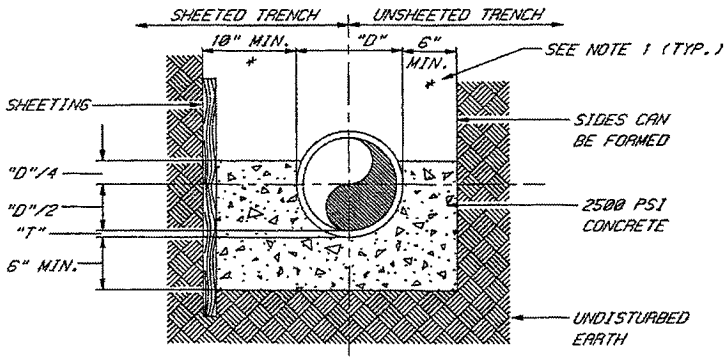
G-2
TYPE B BEDDING AND TRENCHING DETAIL



CONCRETE ARCH



FULL ENCASEMENT



CRADLE OR HALF ENCASEMENT

NOTES:
1. (*), 15" MAX. FOR PIPE DIAMETER LESS THAN 24", AND 24" MAX. FOR PIPE DIA. 24" AND OVER
2. "D" REFERS TO THE DIAMETER OF PIPE.
3. "T" REFERS TO THE THICKNESS OF THE PIPE.
4. USE OF CONCRETE ARCH HALF ENCASEMENT OR FULL ENCASEMENT TO BE DETERMINED IN THE FIELD AS DIRECTED BY THE CITY.
5. REFER TO SECTION 32.5 OF THE MANUAL FOR SHEETING AND BRACING IN EXCAVATIONS.

G-3
CONCRETE ARCH AND ENCASEMENT DETAILS

PVC PIPE RESTRAINT JOINT SCHEDULE

LENGTH (L) TO BE RESTRAINED (SEE G-7 AND G-8 FOR ADDITIONAL DETAILS)

NOMINAL PIPE SIZE (IN.)	HORIZONTAL BENDS				VERTICAL OFFSETS		VALVES OR DEAD-ENDS
	90° BENDS L(FT.)	45° BENDS L.(FT.)	22.5° BENDS L.(FT.)	11.25° BENDS LR(FT.)	45° BENDS (SEE NOTE 4) LU(FT.)	Li(FT.)	L(FT.)
4	20	8	4	2	20	3	50
6	28	10	5	2	28	4	70
8	36	14	6	3	36	5	90
10	40	18	8	4	45	6	110
12	50	20	9	4	52	8	120
14	56	23	10	5	60	9	140
16	60	26	11	6	67	10	160
18	69	29	12	6	74	12	180
20	75	32	13	7	80	13	195
24	76	33	15	7	81	14	200
30	88	36	18	9	97	16	235
36	100	40	20	10	110	20	270
42	115	48	23	11	125	24	300
48	125	52	25	12	140	30	340

REDUCERS	
SIZE	L FT
6X4	35
8X6	35
8X4	65
10X8	35
10X6	65
12X10	35
12X8	65
16X12	65
16X10	95
20X18	35
20X16	65
20X12	120
24X20	65
24X18	95
24X16	120
30X24	80
30X20	150
36X30	80
36X24	150
42X36	80
42X30	150
48X42	80
48X36	150

TEES (NOTE 5)		
RUN SIZE	BRANCH SIZE	L FT
4"	4"	F.O.
6"	6"	10
	4" < LESS	F.O.
8"	8"	30
	6" < LESS	F.O.
10"	10"	48
	8"	14
	6" < LESS	F.O.
12"	12"	65
	10"	35
	8" < LESS	F.O.
16"	16"	100
	12"	40
	10" < LESS	F.O.
20"	20"	130
	16"	80
	12" < LESS	F.O
24"	24"	130
	20"	90
	16"	40
	12" < LESS	F.O.
30"	30"	140
	24"	80
	20"	50
	16" < LESS	F.O.
36"	36"	180
	30"	120
	24"	50
	20" <LESS	F.O.
42"	42"	220
	36"	160
	30"	80
	24"	40
	20" < LESS	F.O.
48"	48"	250
	42"	180
	36"	90
	30"	40
	24" < LESS	F.O.

F.O. = FITTING ONLY

PVC PIPE RESTRANT NOTES:

1) THIS SCHEDULE SHALL BE UTILIZED ON ALL WATER, SEWER FORCE MAIN OR RECLAIMED WATER SYSTEMS. ALL FITTINGS SHALL BE RESTRAINED TO LENGHTS INDICATED ON THE ABOVE SCHEDULE, AT A MINIMUM.

2) ASSUMPTIONS: PVC PIPE, SAFETY FACTOR=1.5, TEST PRESSURE=150PSI, SOIL=GM OR SM, TRENCH TYPE 3, DEPTH OF COVER=36".

3) BENDS AND VALVES: SHALL BE RESTRAINED ON EACH SIDE OF FITTING.

4) VERTICAL OFFSETS: ARE APPROX. 3 FEET COVER ON TOP AND APPROX. 8 FEET COVER ON BOTTOM. PER THE DETAILS, Lu IS THE RESTRAINED LENGTH FOR THE UPPER (TOP) LEVEL. Li IS THE RESTRAINED LENGTH FOR THE LOWER (DEEPER) LEVEL. ASSUME 45 DEGREE BENDS.

5) TEES: TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGHT ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN). SEE SCHEDULE ABOVE FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.

6) HDPE TO PVC TRANSITIONS: THE PVC PIPE SIDE SHALL BE RESTRAINED 35 FT (MIN).

G-4
PVC PIPE RESTRAINT JOINT SCHEDULE

DUCTILE IRON PIPE RESTRAINT JOINT SCHEDULE

LENGTH (L) TO BE RESTRAINED (SEE G-7 AND G-8 FOR ADDITIONAL DETAILS)

NOMINAL PIPE SIZE (IN.)	HORIZONTAL BENDS				VERTICAL OFFSETS		VALVES OR DEAD-ENDS
	90° BENDS L(FT.)	45° BENDS L.(FT.)	22.5° BENDS L.(FT.)	11.25° BENDS LR(FT.)	45° BENDS (SEE NOTE 4) LU(FT.)	Li(FT.)	L(FT.)
4	18	6	4	2	12	2	30
6	22	10	5	2	17	3	40
8	30	13	6	3	22	4	50
10	35	14	7	4	26	5	64
12	42	16	8	4	31	6	75
14	46	20	9	5	35	7	85
16	53	22	11	5	40	8	95
18	57	24	12	6	44	9	105
20	62	26	13	6	48	10	110
24	64	27	14	6	50	11	111
30	73	30	15	7	57	13	137
36	85	34	18	8	66	17	159
42	93	38	20	9	75	20	176
48	102	43	22	10	82	22	198

REDUCERS	
SIZE	L (FT)
6X4	20
8X6	20
8X4	40
10X8	20
10X6	40
12X10	20
12X8	40
16X12	40
16X10	57
20X18	20
20X16	40
20X12	73
24X20	40
24X18	50
24X16	60
30X24	50
30X20	76
36X30	50
36X24	88
42X36	40
42X30	88
48X42	40
48X36	88

TEES (NOTE 5)		
RUN SIZE	BRANCH SIZE	L (FT)
4"	4"	F.O.
6"	6"	6
	4" < LESS	F.O.
8"	8"	18
	6" < LESS	F.O.
10"	10"	27
	8"	8
	6" < LESS	F.O.
12"	12"	38
	10"	20
	8" < LESS	F.O.
16"	16"	60
	12"	20
	10" < LESS	F.O.
20"	20"	78
	16"	40
	12" < LESS	F.O.
24"	24"	76
	20"	53
	16"	20
	12" < LESS	F.O.
30"	30"	99
	24"	60
	20"	37
	16" < LESS	F.O.
36"	36"	118
	30"	88
	24"	52
	20"	20
	16" < LESS	F.O.
42"	42"	138
	36"	110
	30"	78
	24"	37
	20" < LESS	F.O.
48"	48"	154
	42"	132
	36"	99
	30"	59
	24" < LESS	F.O.

F.O. = FITTING ONLY

DUCTILE IRON PIPE RESTRANT NOTES:

1) THIS SCHEDULE SHALL BE UTILIZED ON ALL WATER, SEWER FORCE MAIN OR RECLAIMED WATER SYSTEMS. ALL FITTINGS SHALL BE RESTRAINED TO LENGHTS INDICATED ON THE ABOVE SCHEDULE, AT A MINIMUM.

2) ASSUMPTIONS: DUCTILE IRON PIPE (WITHOUT POLY WRAP), SAFETY FACTOR=1.5, TEST PRESSURE=150PSI, SOIL=GM OR SM, TRENCH TYPE 3, DEPTH OF COVER=36".

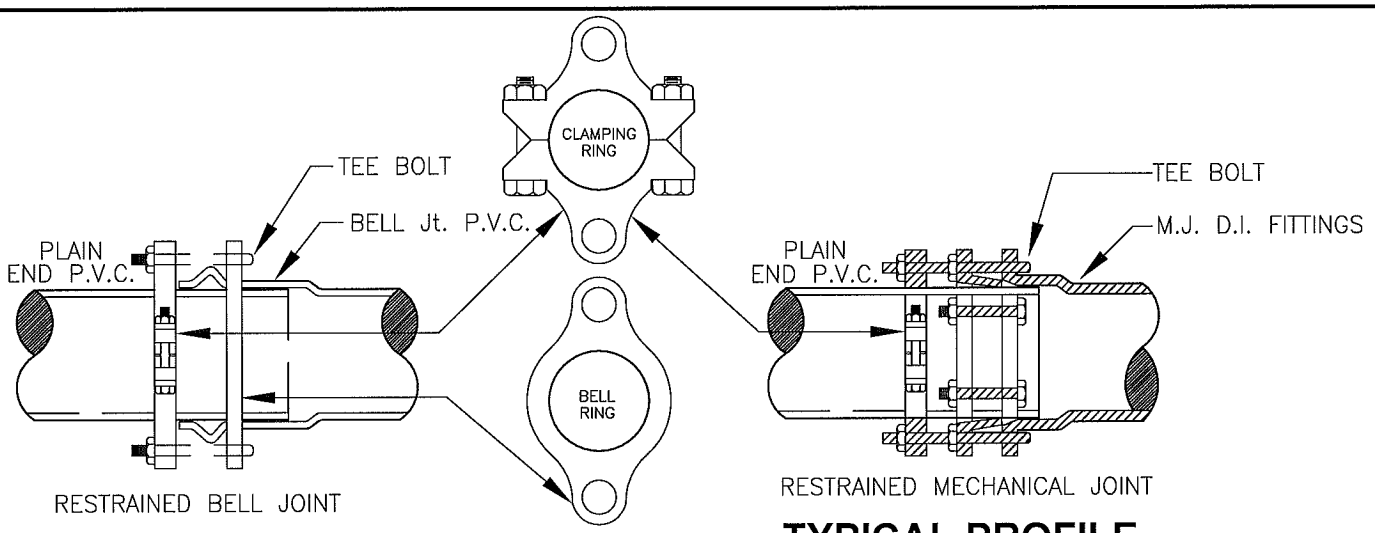
3) BENDS AND VALVES: SHALL BE RESTRAINED ON EACH SIDE OF FITTING.

4) VERTICAL OFFSETS: ARE APPROX. 3 FEET COVER ON TOP AND APPROX. 8 FEET COVER ON BOTTOM. PER THE DETAILS, Lu IS THE RESTRAINED LENGTH FOR THE UPPER (TOP) LEVEL. Li IS THE RESTRAINED LENGTH FOR THE LOWER (DEEPER) LEVEL. ASSUME 45 DEGREE BENDS.

5) TEES: TOTAL LENGTH BETWEEN FIRST JOINTS OR RESTRAINED LENGHT ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN). SEE SCHEDULE ABOVE FOR RESTRAINT LENGTH ON TEE "BRANCH" LINE.

6) HDPE TO D.I.P. TRANSITIONS: THE D.I.P. PIPE SIDE SHALL BE RESTRAINED 35 FT (MIN).

G-5
D.I.P. RESTRAINT JOINT SCHEDULE



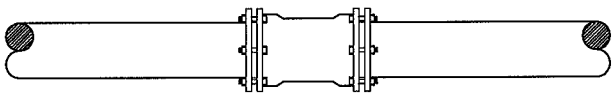
TYPICAL PROFILE

BELL JOINT TO PLAIN END
W/MECHANICAL RESTRAINERS

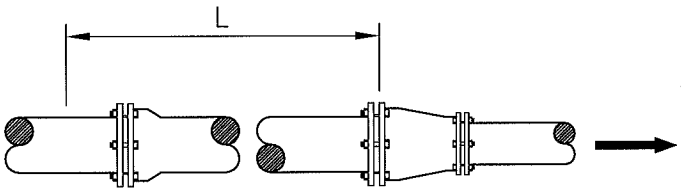
SECTION

TYPICAL PROFILE

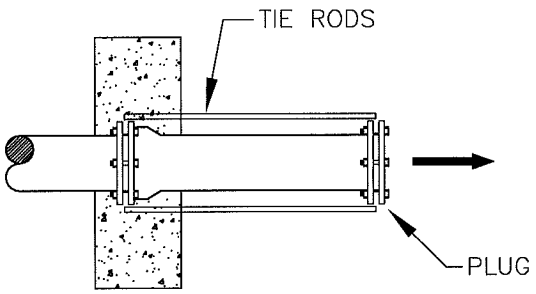
MECHANICAL JOINT TO PLAIN END
W/MECHANICAL RESTRAINERS



MECHANICAL JOINT SLEEVES



REDUCER



NUMBER OF 3/4" SST TIE RODS REQUIRED

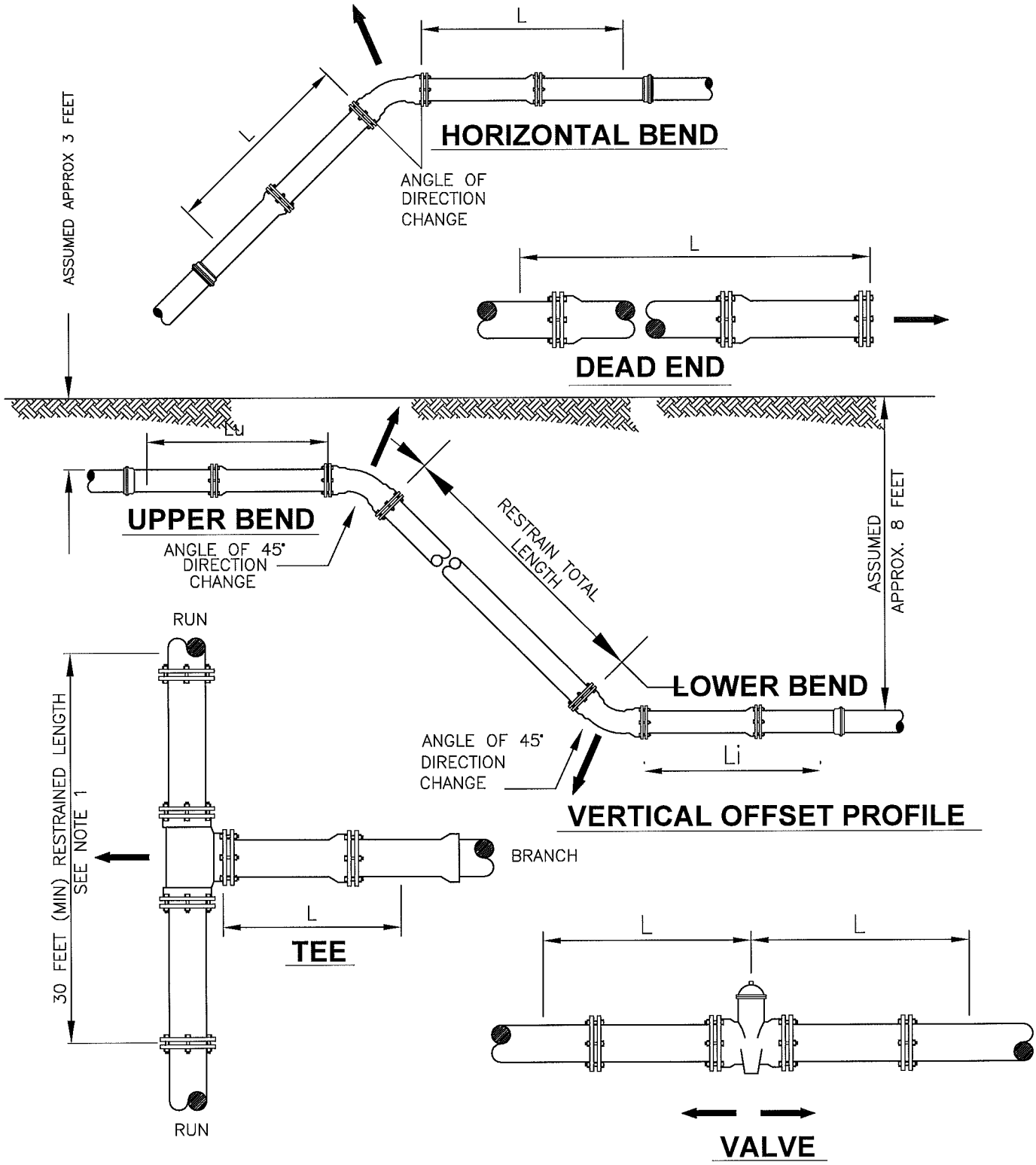
03"–08" MAIN – 2 RODS
10"–12" MAIN – 4 RODS
14"–20" MAIN – 6 RODS
24"–36" MAIN – 8 RODS
42"–48" MAIN – 10 RODS

DEAD - END THRUST COLLAR ANCHOR

TO BE USED INSTEAD OF TOTAL
RESTRAINED LENGTH (OPTIONAL)

GENERAL NOTE

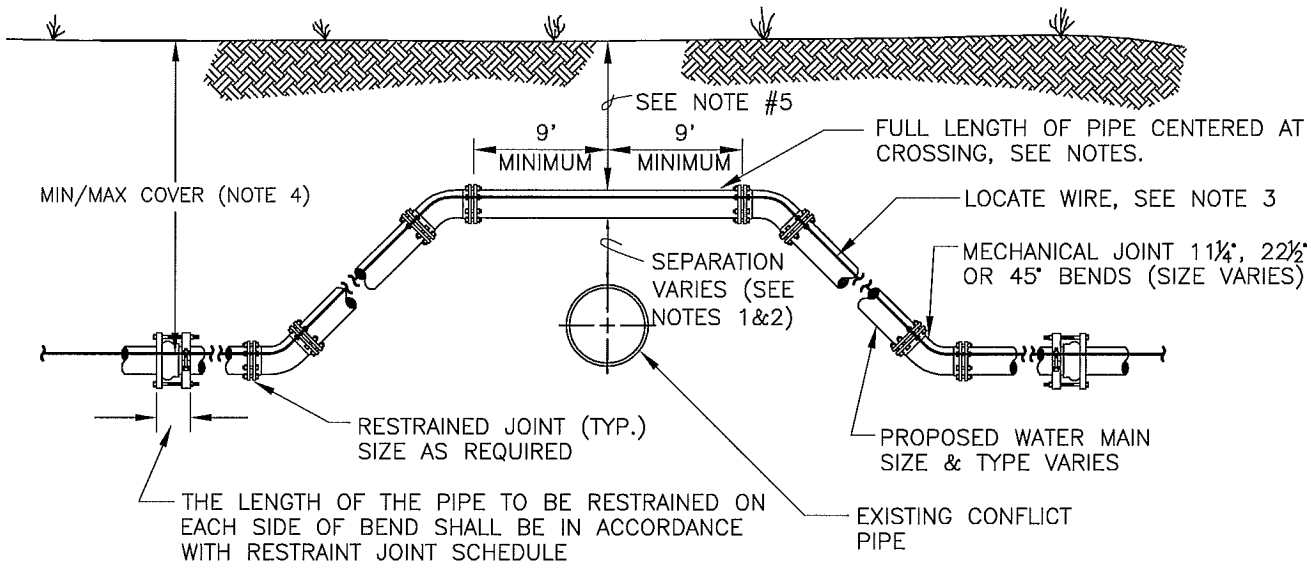
1. ➡ INDICATES DIRECTION OF (WATER HAMMER) FORCE.



NOTES

1. TOTAL LENGHT BETWEEN FIRST JOINTS OR RESTRAINED LENGTH ON EITHER SIDE OF TEE (RUN) SHALL BE A TOTAL DISTANCE OF 30 FEET (MIN.).

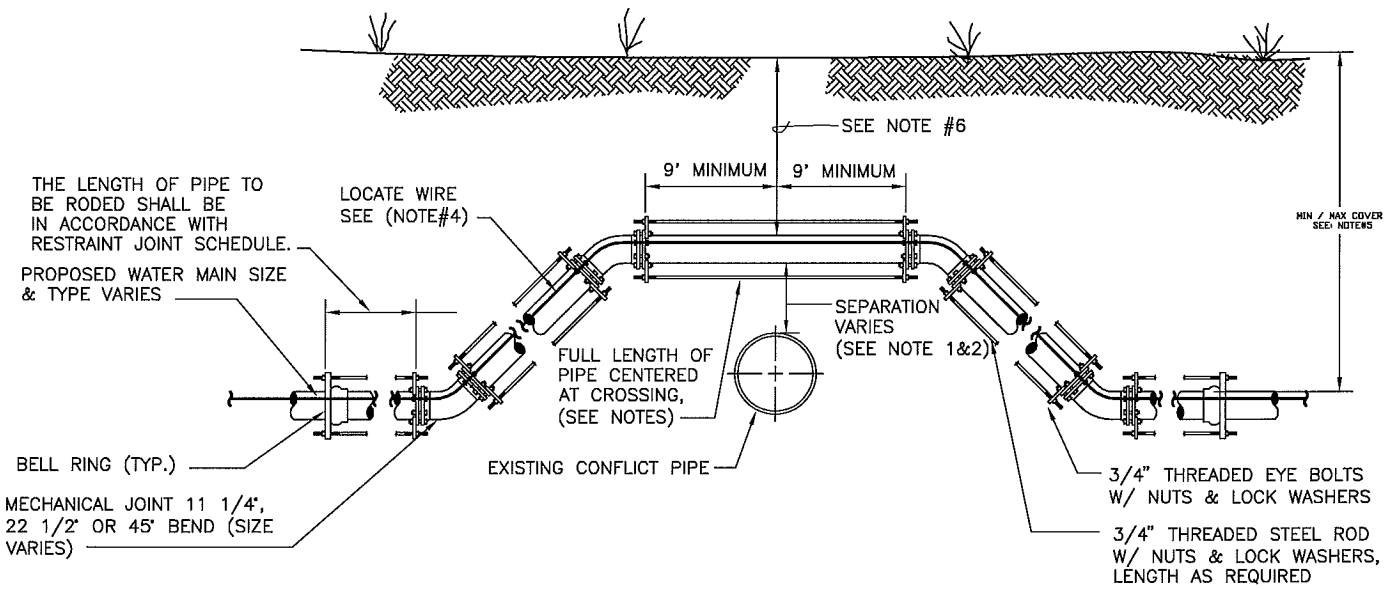
G-7
MECHANICAL RESTRAINT DETAILS-II



CASE "A" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN, 6–INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE TEXT.
3. LOCATING WIRE REQUIRED.
4. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 36" (MIN) AND A MAXIMUM COVER OF 60", UNLESS APPROVED. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) AND A MAXIMUM COVER OF 84", UNLESS APPROVED BY THE COUNTY.
5. IF UTILITY CONFLICT IS LOCATED IN A NON–TRAFFIC AREA (NO TRAFFIC LOADS) AND THE NEW PIPE IS D.I.P., THEN THE MINIMUM COVER MAY BE REDUCED TO 24 INCHES (ONLY IN THE AREA OF THE CONFLICT).



CASE "A" CROSSING

NOTES:

1) IF EXISTING CONFLICT PIPE IS A WATER MAIN, 6-INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557

2) FOR MINIMUM VERTICAL SEPARATION REQUIRMENTS SEE TEXT.

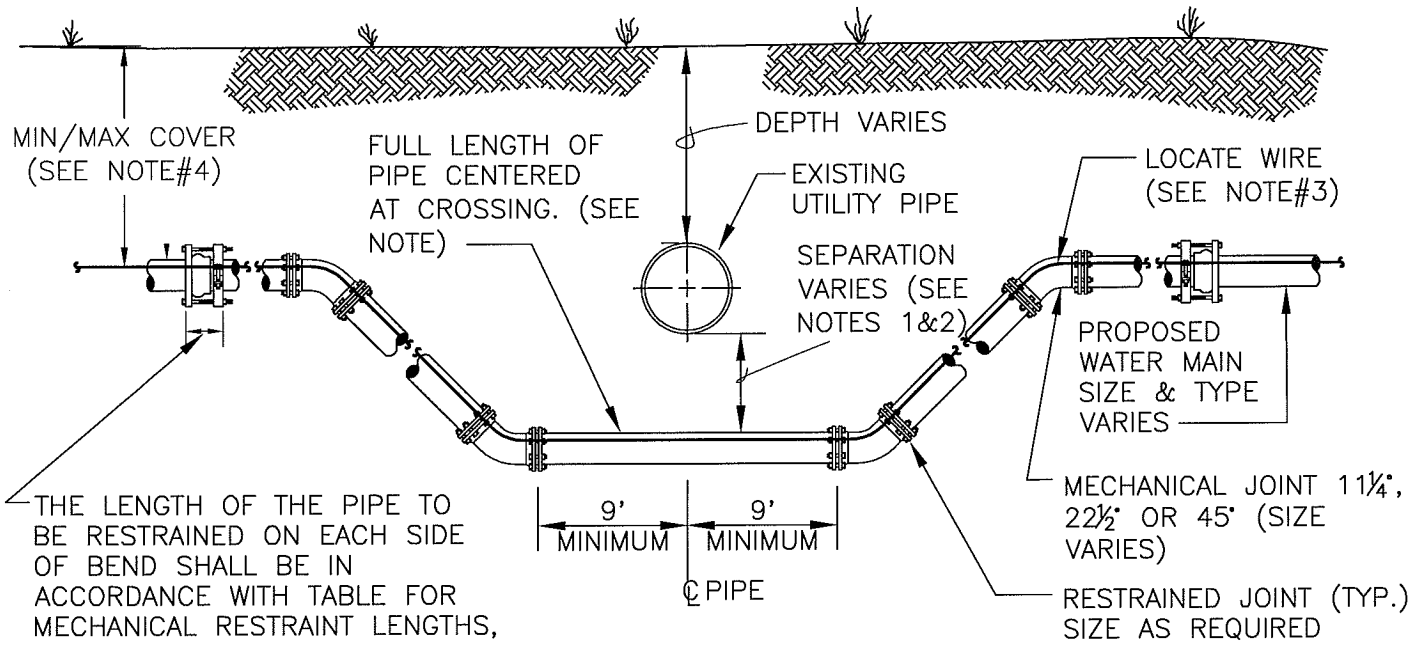
3) NUMBER OF 3/4" SST TIE RODS REQUIRED IS AS FOLLOWS:
   3" – 8" DIAMETER MAIN – 2 TIE RODS REQUIRED PER JOINT
   10" – 12" DIAMETER MAIN – 4 TIE RODS REQUIRED PER JOINT
   14" – 20" DIAMETER MAIN – 6 TIE RODS REQUIRED PER JOINT
   24" – 36" DIAMETER MAIN – 8 TIE RODS REQUIRED PER JOINT
   42" – 48" DIAMETER MAIN –10 TIE RODS REQUIRED PER JOINT

4) LOCATING WIRE REQUIRED.

5) THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 36" WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY THE COUNTY. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY THE COUNTY.

6) IF PIPING CONFLICT IS LOCATED IN A NON-TRAFFIC AREA (NO TRAFFIC LOADS) AND THE NEW PIPE IS D.I.P., THEN THE MINIMUM COVER MAY BE REDUCED TO 24 INCHES (ONLY IN THE AREA OF THE CONFLICT).

ADJUSTMENT OVER EXISTING UTILITIES USING TIE RODS



CASE "B" CROSSING

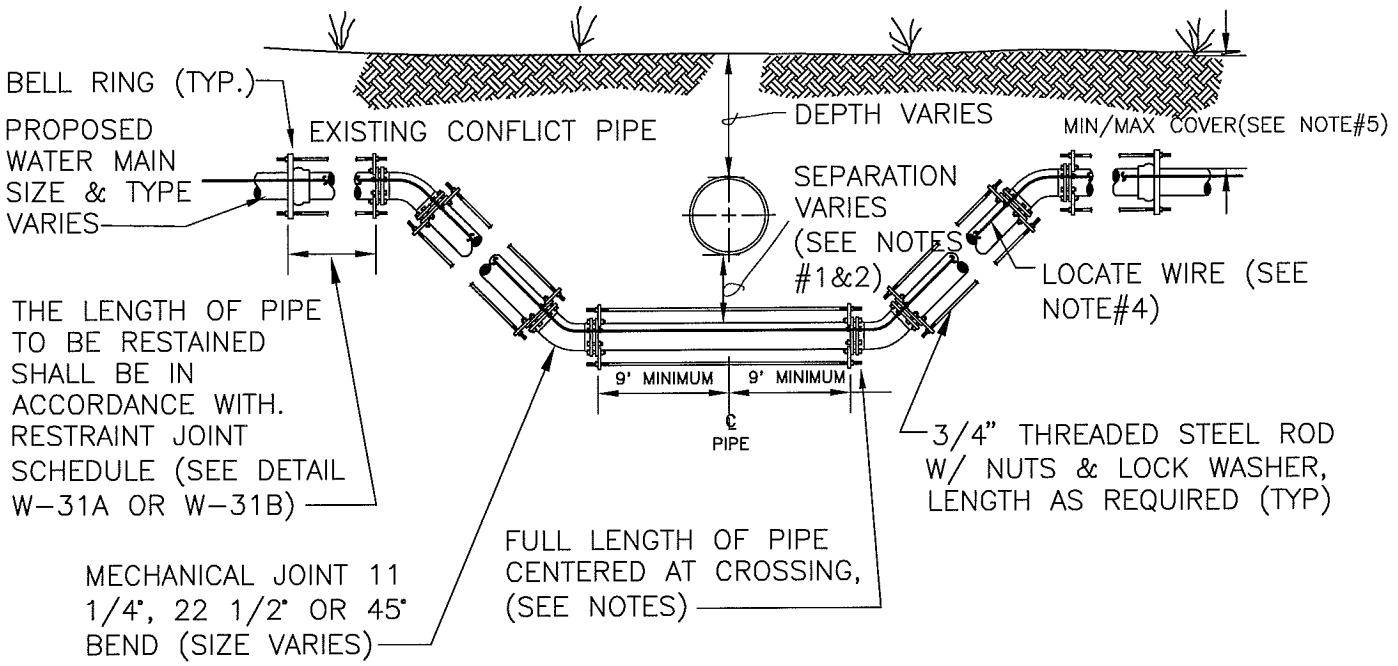
NOTES:

1. IF EXISTING UTILITY PIPE IS A WATER MAIN, 6–INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557

2. FOR MINIMUM VERTICAL SEPARATION SEE TEXT.

3. LOCATING WIRE REQUIRED.

4. THE COVER FOR PIPING LESS THAN 24" SIZE SHALL BE 36" (MIN) AND A MAXIMUM COVER OF 60", UNLESS APPROVED BY THE COUNTY. THE COVER FOR PIPING 24" SIZE AND LARGER SHALL BE 36" (MIN) AND A MAXIMUM COVER OF 84", UNLESS APPROVED BY THE COUNTY.



CASE "B" CROSSING

NOTES:

1) IF EXISTING CONFLICT PIPE IS A WATER MAIN, 6-INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557

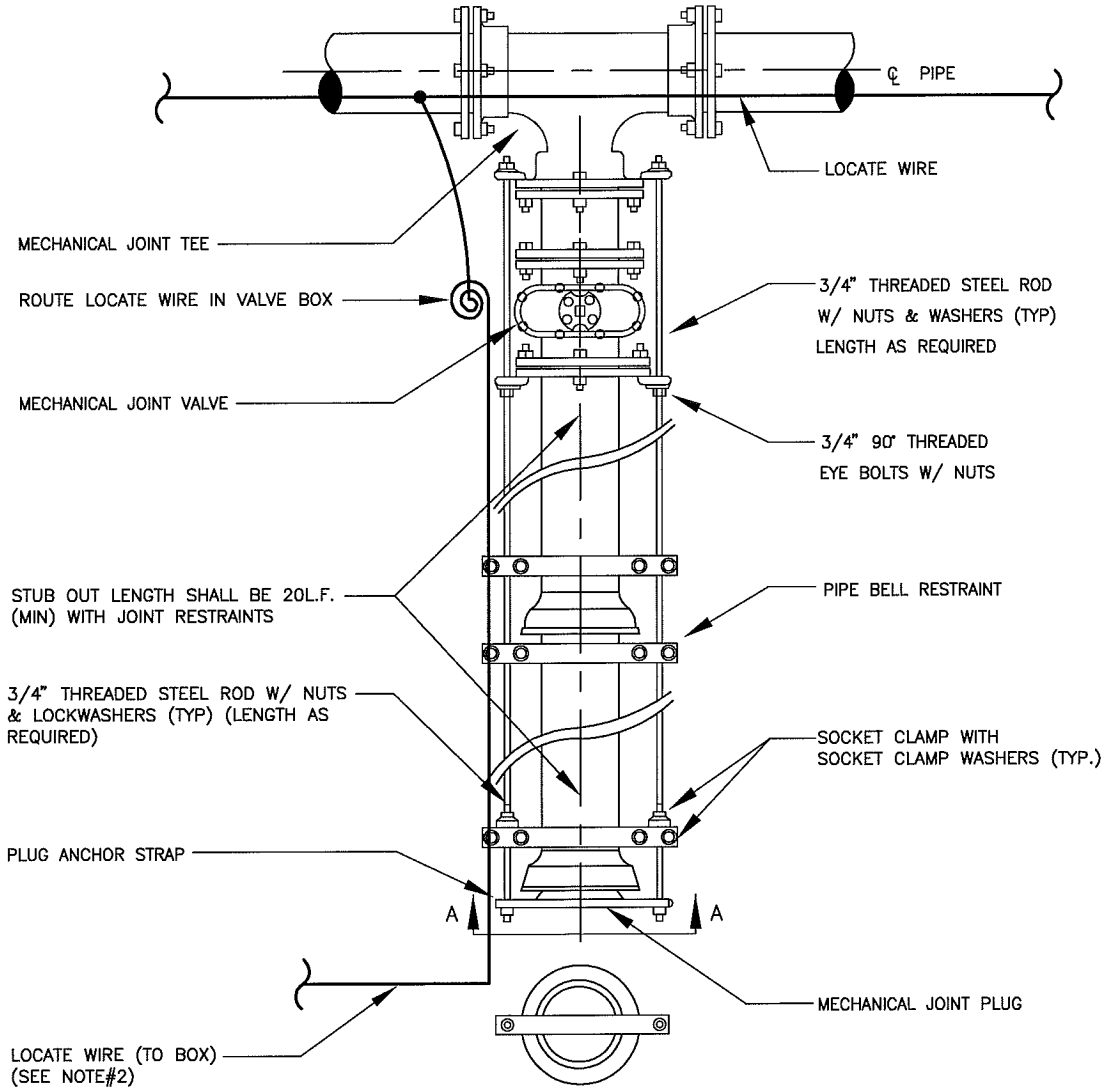
2) FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE TEXT.

3) NUMBER OF 3/4" SST RODS REQUIRED IS AS FOLLOWS:
   3" - 8" DIAMETER MAIN - 2 TIE RODS REQUIRED PER JOINT
   10" - 12" DIAMETER MAIN - 4 TIE RODS REQUIRED PER JOINT
   14" - 20" DIAMETER MAIN - 6 TIE RODS REQUIRED PER JOINT
   24" - 36" DIAMETER MAIN - 8 TIE RODS REQUIRED PER JOINT
   42" - 48" DIAMETER MAIN -10 TIE RODS REQUIRED PER JOINT

4) LOCATING WIRE REQUIRED: SEE DETAIL W-44.

5) THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 36" WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY THE COUNTY. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY THE COUNTY.

G-11
ADJUSTMENT UNDER EXISTING UTILITIES USING TIE RODS



SECTION "A-A"

NOTES:

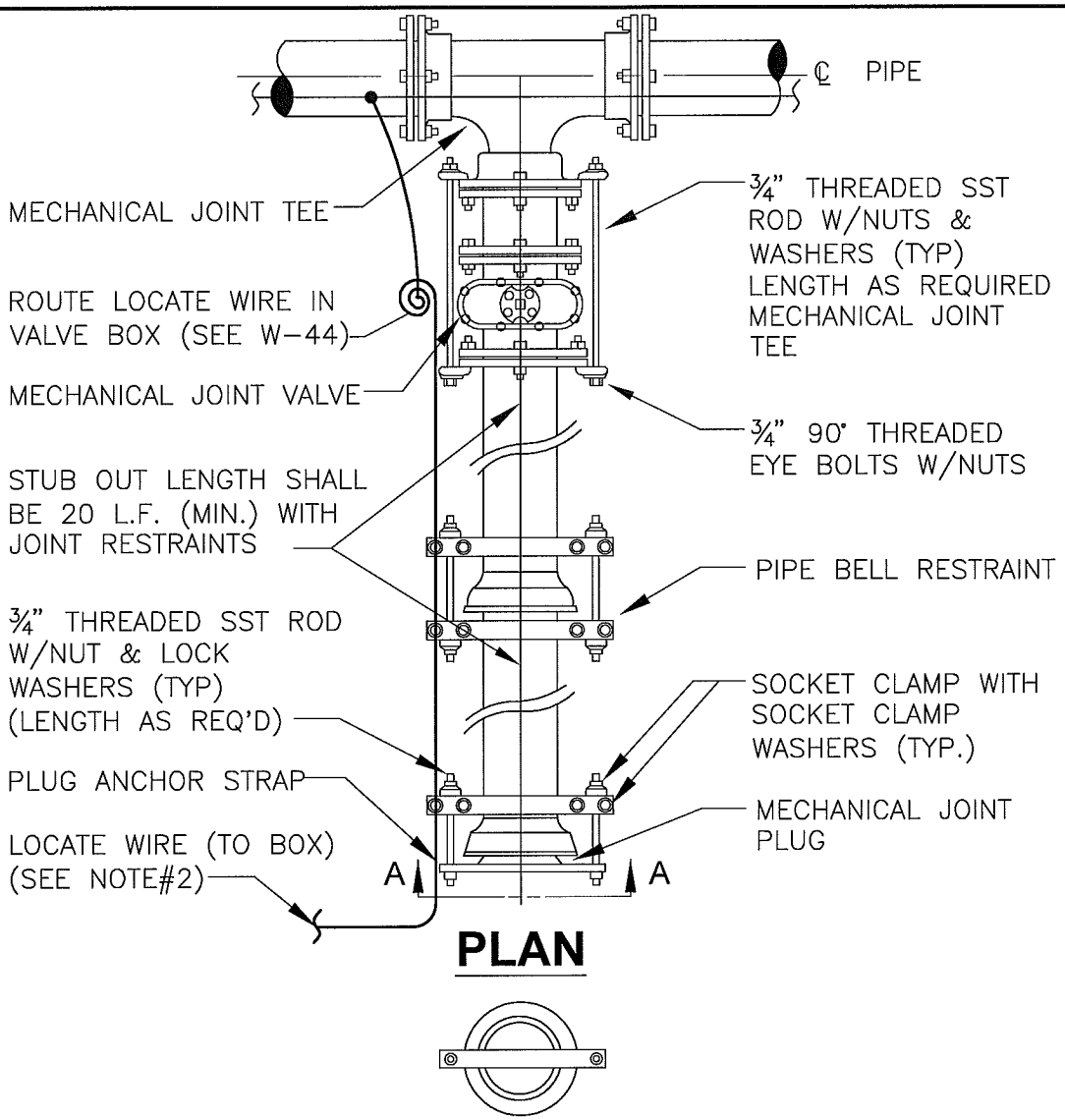
1) IN LIEU OF BELL/ROD RESTRAINTS, MECHANICAL JOINT RESTRAINTS MAY BE USED.

2) LOCATING WIRE REQUIRED, UTILIZING A LOCATE WIRE BOX INSTALLED AT PLUG LOCATION.

3) NUMBER OF 3/4" SST RODS REQUIRED IS AS FOLLOWS:
   3" – 8" DIAMETER MAIN – 2 TIE RODS REQUIRED PER JOINT
   10" – 12" DIAMETER MAIN – 4 TIE RODS REQUIRED PER JOINT
   14" – 20" DIAMETER MAIN – 6 TIE RODS REQUIRED PER JOINT
   24" – 36" DIAMETER MAIN – 8 TIE RODS REQUIRED PER JOINT
   42" – 48" DIAMETER MAIN –10 TIE RODS REQUIRED PER JOINT

4) THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

G–12
PLUGGED DEAD END USING TIE RODS



PLAN

SECTION "A-A"

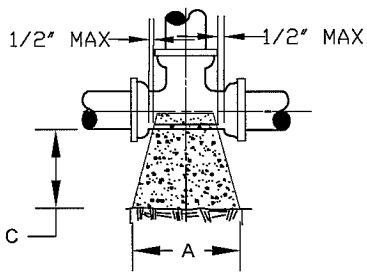
NOTES:

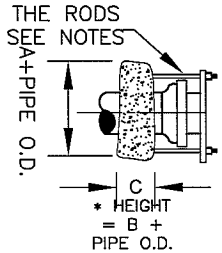
1. IN LIEU OF BELL/ROD RESTRAINTS, MECHANICAL JOINT RESTRAINTS MAYBE USED.

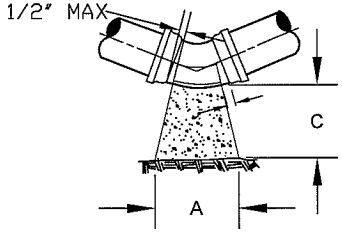
2. LOCATING WIRE REQUIRED, UTILIZING A LOCATE WIRE BOX INSTALLED AT PLUG LOCATION.

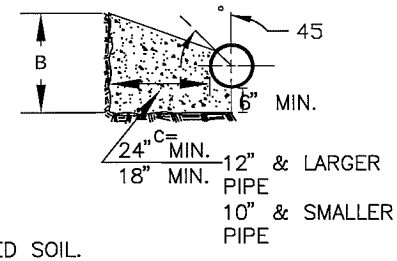
3. THE LOCATION OF THE DEAD END PLUG SHALL NOT BE UNDER PAVEMENT, IF POSSIBLE. THE STUB OUT SHALL EXTEND BEYOND THE INTERSECTION AREAS OR ROAD CROSSING BY 10 FEET (MIN.) WHERE POSSIBLE.

G-13
PLUGGED DEAD END USING MECHANICAL RESTRAINTS









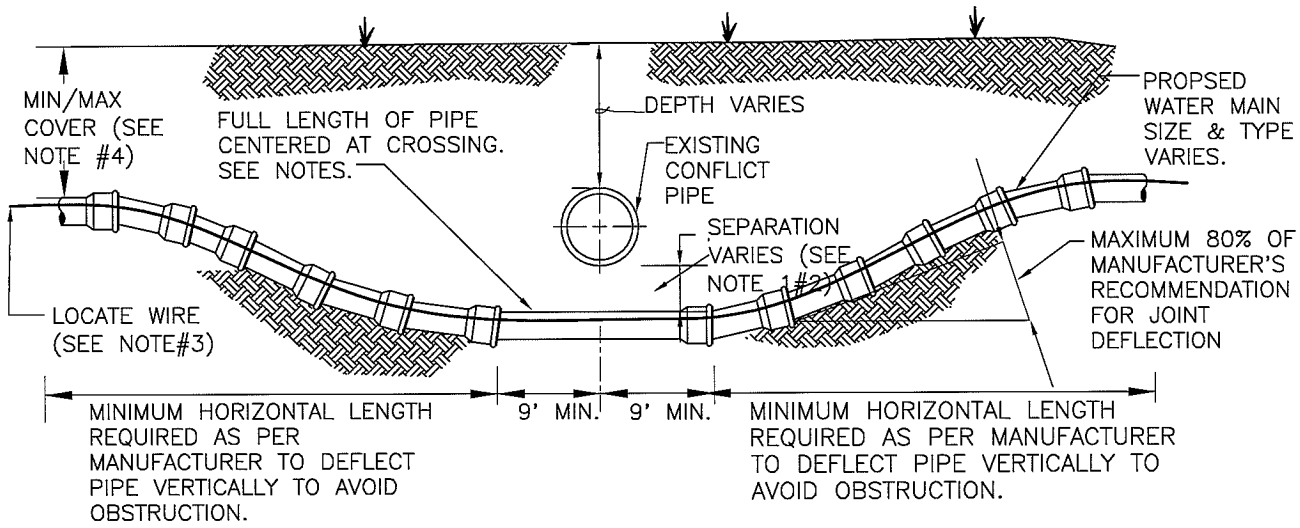
THRUST BLOCK FOR TEES & PLUGS				
SIZE	TEE			SQ. FT. BEARING
	A	B	C	SURFACE
4"	16"	16"	18"	1.78
6"	20"	24"	18"	3.33
8"	26"	32"	18"	5.78
10"	32"	40"	18"	8.89
12"	36"	48"	24"	12.00
14"	40"	56"	24"	15.56
16"	48"	60"	24"	20.00
18"	56"	64"	24"	24.89
20"	60"	76"	24"	31.67
24"	72"	90"	24"	45.00
30"	86"	102"	24"	60.67
36"	116"	108"	24"	86.11

NOTES:

1. ALL BEARING SURFACES TO BE CARRIED TO UNDISTURBED SOIL.
2. THESE TABLES SHOW MINIMUM SIZES FOR THRUST BLOCKS IN GOOD SOIL (A-1 THRU A-3, CLEAN SANDS AND GRAVELS) WITH MINIMUM BEARING CAPACITY OF 2000 psi.
3. POOR SOILS A-4 THRU A-8,SILTY SOILS, CLAYS, MUCK AND PEAT WILL REQUIRE LARGER THRUST BLOCKING.
4. BOTH CONCRETE THRUST BLOCKS AND TIE RODS MUST BE USED WHEN, IN THE JUDGEMENT OF THE ENGINEER, THE NATURE AND CRITICALITY OF AN INSTALLATION IS SUCH AS TO REQUIRE POSITIVE ASSURANCE OF STABILITY.
5. THE USE OF THRUST BLOCKS SHALL BE LIMITED TO SITUATIONS SUCH AS POINT REPAIR WHERE EXPOSING SEVERAL JOINTS OF PIPE IS NOT FEASIBLE DUE TO EXISTING GROUND CONDITIONS.
6. CONCRETE COLLARS WITH TIE RODS MAY BE USED ON DEAD END LINES AT THE CONTRACTOR'S DISCRETION. NUMBER OF 3/4" SST TIE RODS SHALL BE AS FOLLOWS:
   - 3"- 8" DIAMETER MAIN - 2 TIE RODS PER JOINT
   - 10"-12" DIAMETER MAIN - 4 TIE RODS PER JOINT
   - 14"-20" DIAMETER MAIN - 6 TIE RODS PER JOINT
   - 24"-36" DIAMETER MAIN - 8 TIE RODS PER JOINT
   - 42"-48" DIAMETER MAIN - 10 TIE RODS PER JOINT
7. MAXIMUM TEST PRESSURE TO BE 150 PSI.

THRUST BLOCK FOR BENDS																
SIZE	90° BEND			SQ. FT. BEARING	45° BEND			SQ. FT. BEARING	22 1/2° BEND			SQ. FT. BEARING	11 1/4° BEND			SQ. FT. BEARING
	A	B	C	SURFACE	A	B	C	SURFACE	A	B	C	SURFACE	A	B	C	SURFACE
4"	16"	16"	18"	1.78	14"	16"	18"	1.56	14"	16"	18"	1.56	14"	16"	18"	1.56
6"	22"	32"	18"	4.89	16"	18"	18"	2.00	14"	16"	18"	1.56	14"	16"	18"	1.56
8"	32"	36"	18"	8.00	24"	28"	18"	4.67	16"	18"	18"	2.00	14"	16"	18"	1.56
10"	36"	46"	18"	11.50	26"	36"	18"	6.50	20"	24"	18"	3.33	14"	18"	18"	1.75
12"	44"	56"	24"	17.11	32"	40"	24"	8.89	24"	30"	24"	5.00	16"	20"	24"	2.22
14"	52"	62"	24"	22.39	36"	48"	24"	12.00	26"	36"	24"	6.50	20"	24"	24"	3.33
16"	58"	72"	24"	29.00	40"	54"	24"	15.00	32"	38"	24"	8.44	22"	26"	24"	3.97
18"	64"	80"	24"	35.56	46"	60"	24"	19.17	36"	42"	24"	10.50	24"	32"	24"	5.33
20"	72"	88"	24"	44.00	52"	66"	24"	23.83	38"	48"	24"	12.67	26"	36"	24"	6.50
24"	96"	96"	24"	63.89	64"	78"	24"	34.67	46"	56"	24"	17.89	32"	40"	24"	8.89
30"	122"	102"	24"	86.11	72"	94"	24"	47.00	56"	62"	24"	24.11	36"	48"	24"	12.00
36"	166"	104"	24"	123.33	88"	108"	24"	66.00	64"	78"	24"	34.67	44"	54"	24"	16.50

G-14
THRUST BLOCK DETAIL

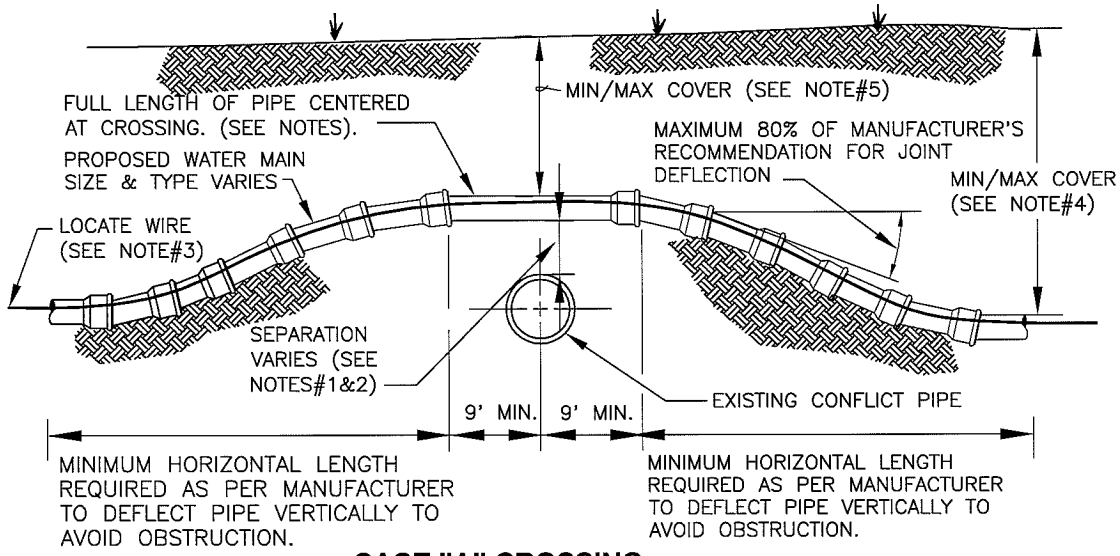


CASE "B" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN, 6–INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE TEXT.
3. LOCATING WIRE REQUIRED.
4. THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 36" WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY THE COUNTY. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY THE COUNTY.

G–15
ADJUSTMENT UNDER EXISTING UTILITIES PIPE JOINT DEFLECTION

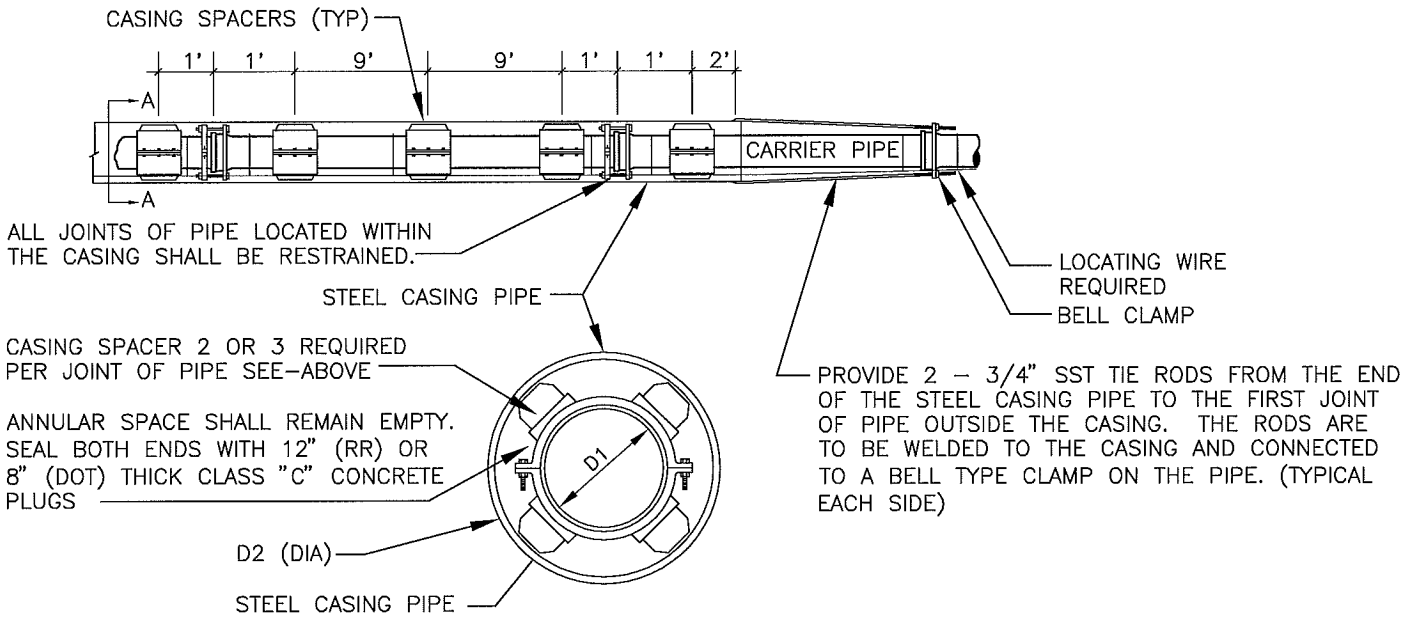


CASE "A" CROSSING

NOTES:

1. IF EXISTING CONFLICT PIPE IS A WATER MAIN, 6-INCHES OF SEPARATION IS REQUIRED. THE SOILS BETWEEN THE NEW MAIN AND THE CONFLICT PIPE SHALL BE COMPACTED TO 98% OF THE MAXIMUM DENSITY AS DETERMINED BY THE LABORATORY MODIFIED PROCTOR TEST, ASTM D 1557.
2. FOR MINIMUM VERTICAL SEPARATION REQUIREMENTS SEE TEXT.
3. LOCATE WIRE REQUIRED.
4. THE COVER OVER ALL PIPING LESS THAN 24" SIZE SHALL BE A MINIMUM OF 36" WITH A MAXIMUM COVER OF 60" UNLESS APPROVED OTHERWISE BY THE COUNTY. COVER FOR PIPING 24" SIZE AND LARGER SHALL BE MINIMUM OF 36" AND MAXIMUM OF 84" UNLESS APPROVED OTHERWISE BY THE COUNTY.
5. IF PIPING CONFLICT IS LOCATED AREA (NO TRAFFIC LOADS) AND THE NEW PIPE IS D.I.P., THEN THE MINIMUM COVER MAY BE REDUCED TO 24 INCHES (ONLY IN THE AREA OF THE CONFLICT).

G-16
ADJUSTMENT OVER EXISTING UTILITIES PIPE JOINT DEFLECTION



CASING SPACER DETAIL

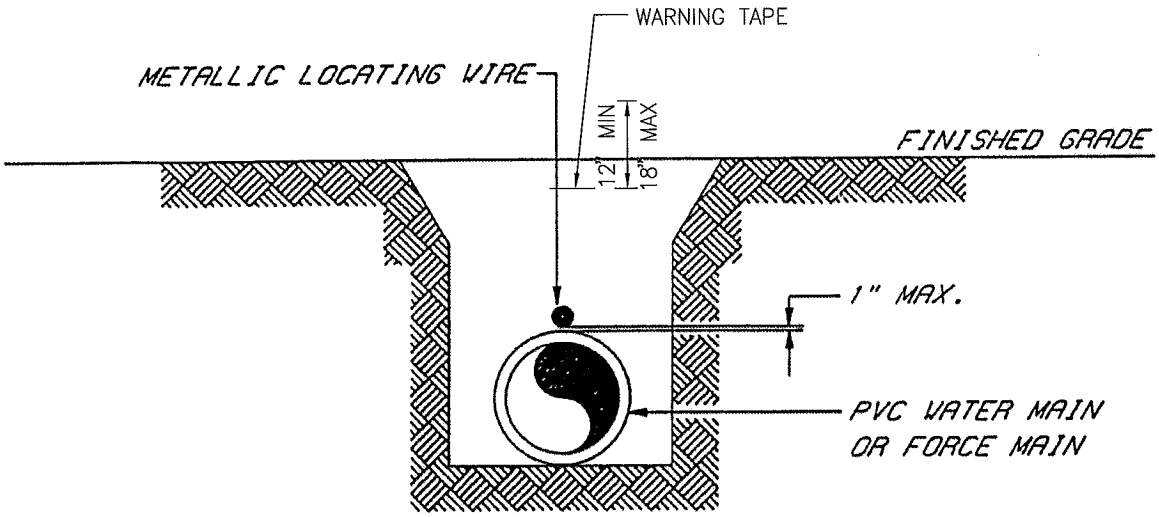
CARRIER PIPE AND CASING PIPE SIZES (MIN.) IN INCHES														
CARRIER PIPE NOM. DIA. (D_1)	4	6	8	10	12	14	16	18	20	24	30	36	42	48
CASING PIPE NOM. DIA (D_2)	14	16	20	20	24	30	30	30	36	42	48	54	60	66
WALL THICKNESS RAILROAD-(FEC)	0.25	0.25	0.375	0.375	0.375	0.50	0.50	0.50	0.562	0.625	0.625	0.688	0.781	0.781
WALL THICKNESS RAILROAD-(CSX)	0.25	0.281	0.375	0.375	0.375	0.469	0.469	0.469	0.562	0.625	0.688	0.781	0.844	0.938
WALL THICKNESS-DOT	0.25	0.25	0.25	0.25	0.25	0.312	0.312	0.312	0.375	0.50	0.50	0.50	0.50	0.50

PIPE MAIN CROSSINGS FOR RAILROADS OR HIGHWAYS

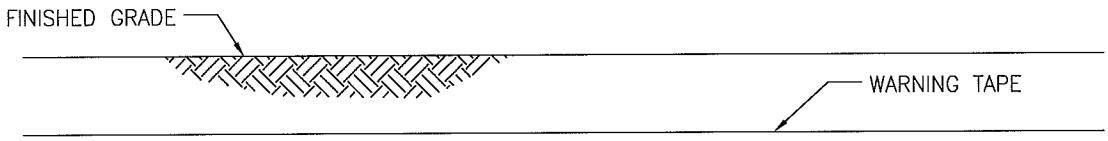
NOTES

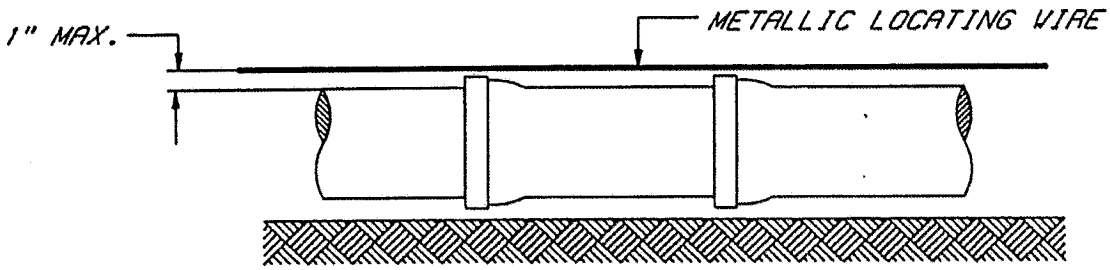
1. MIN. COVER TO TOP OF CASING; a) FDOT-3.0' b)RAILROAD-5.5' TO BASE OF RAIL, 4.5' FOR SECONDARY OR INDUSTRIAL TRACKS. EXCEPT FOR F..E.C. (SEE NOTE 3)
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4 INCHES GREATER THAN THE OUTSIDE DIAMETER OF THE CARRIER PIPE BELL OR COUPLING. HOWEVER, A MINIMUM OF 6 INCHES IS REQUIRED FOR FLORIDA EAST COAST R.R. CROSSSINGS.
3. THE MINIMUM COVER FOR CASING UNDER FLORIDA EAST COAST RAILROAD SHALL BE 5.0 FEET BELOW THE BOTTOM OF TIES FOR ALL TRACKS.
4. ALL JOINTS WITHIN CARRIES PIPE SHALL BE MECHANICAL RESTRAINED JOINTS.
5. FOR STREET USES WHICH ARE NOT DOT OR RAILROAD, USE DOT CASING THICKNESS UNLESS OTHERWISE INDICATED BY ENGINEER.
6. CASING PIPE SHALL BE FURNISHED IN NOMINAL 8 FOOT LENGHTS (MIN.) UNLESS OTHERWISE INDICATED ON THE DRAWING OR APPROVED BY JEA.
7. PIPE TO BE USED AS A CASING SHALL CONFORM TO EITHER ASTM STANDARD A139 FOR "ELECTRIC FUSION (ARC) WELDED STEEL PIPE". WITH A MINIMUM YIELD STRENGTH OF 35,000 PSI OR "API SPECIFICATION API-5LX, GRADE X-42 WELDED STEEL PIPE".

G-17
TYPICAL CASING DETAIL - WATER



SECTION VIEW



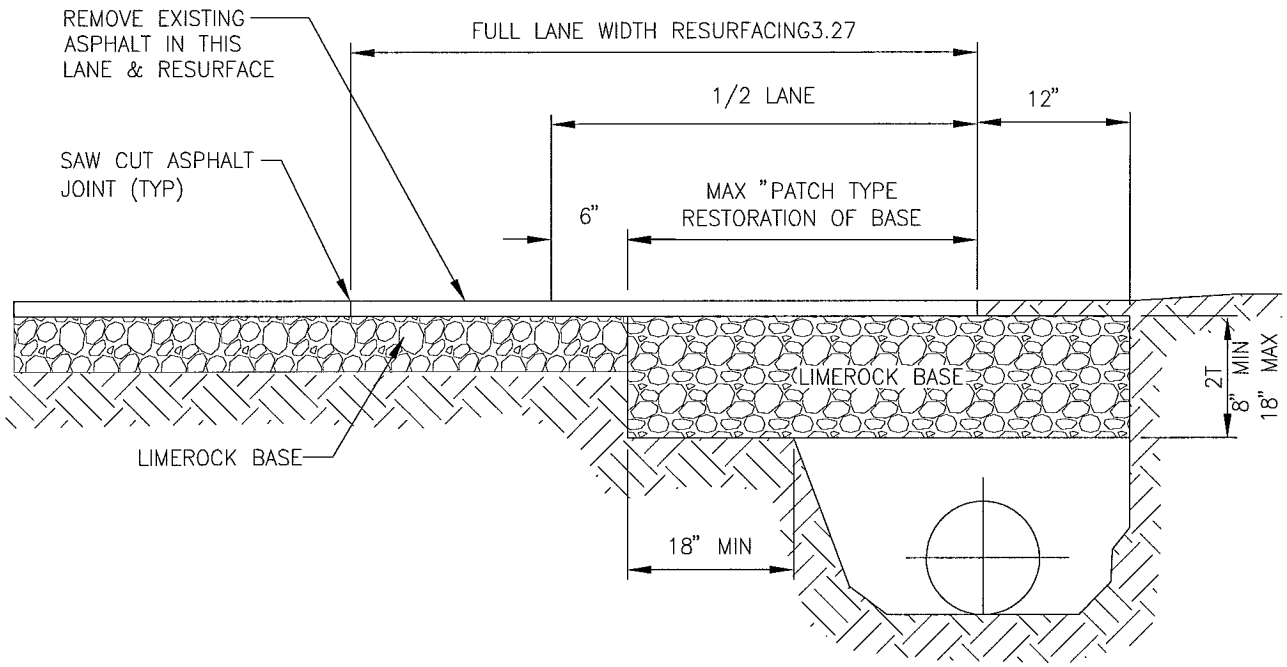


SIDE VIEW

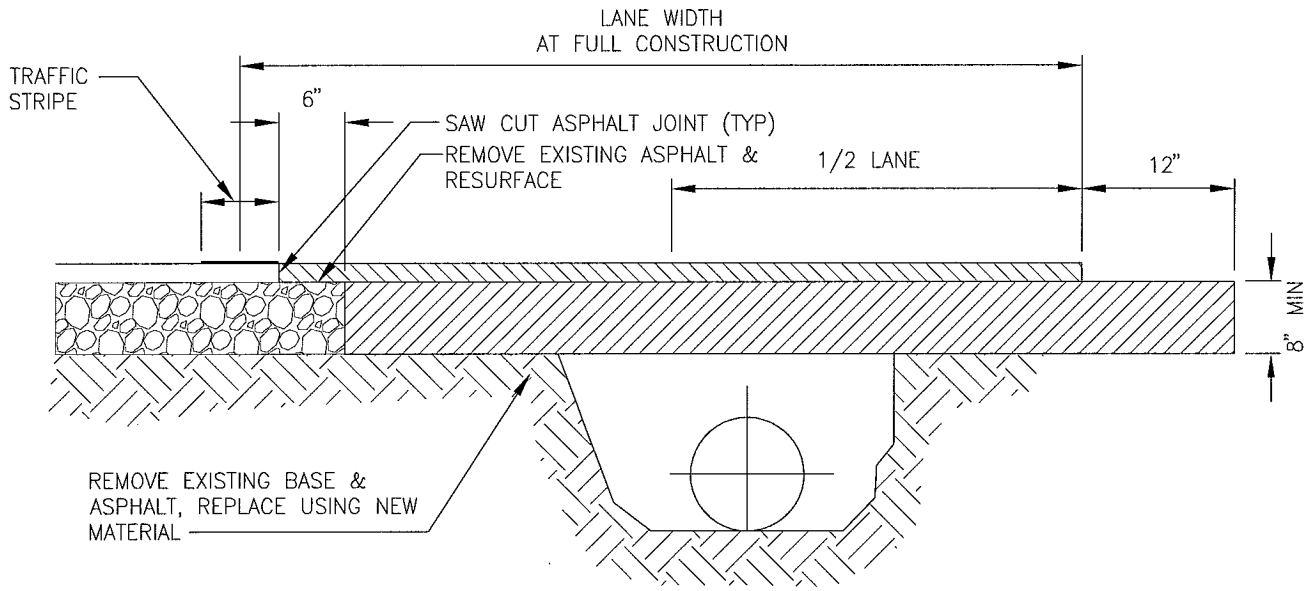
NOTES:

1. PVC PIPE SHALL REQUIRE INSULATED METALLIC LOCATING WIRE (10 GAUGE COPPER) CAPABLE OF DETECTION BY A CABLE LOCATOR AND SHALL BE BURIED DIRECTLY ABOVE THE CENTERLINE OF THE PIPE.
2. LOCATING WIRE SHALL BE CONTINUOUS & COILED AT THE TOP OF EACH VALVE BOX & BE CAPABLE OF EXTENDING 36" ABOVE TOP OF BOX IN SUCH A MANNER SO AS NOT TO INTERFERE WITH VALVE OPERATION.
3. USE DUCT TAPE OR PLASTIC TIES AS NECESSARY TO HOLD WIRE DIRECTLY ON THE TOP OF THE PIPE AT INTERVALS OF 10 FEET (MAXIMUM).

G-18
NON-METALLIC PIPE LOCATING AND WARNING WIRE DETAIL



TYPICAL RESTORATION OF LESS THAN 1/2 LANE OF ROCK BASE

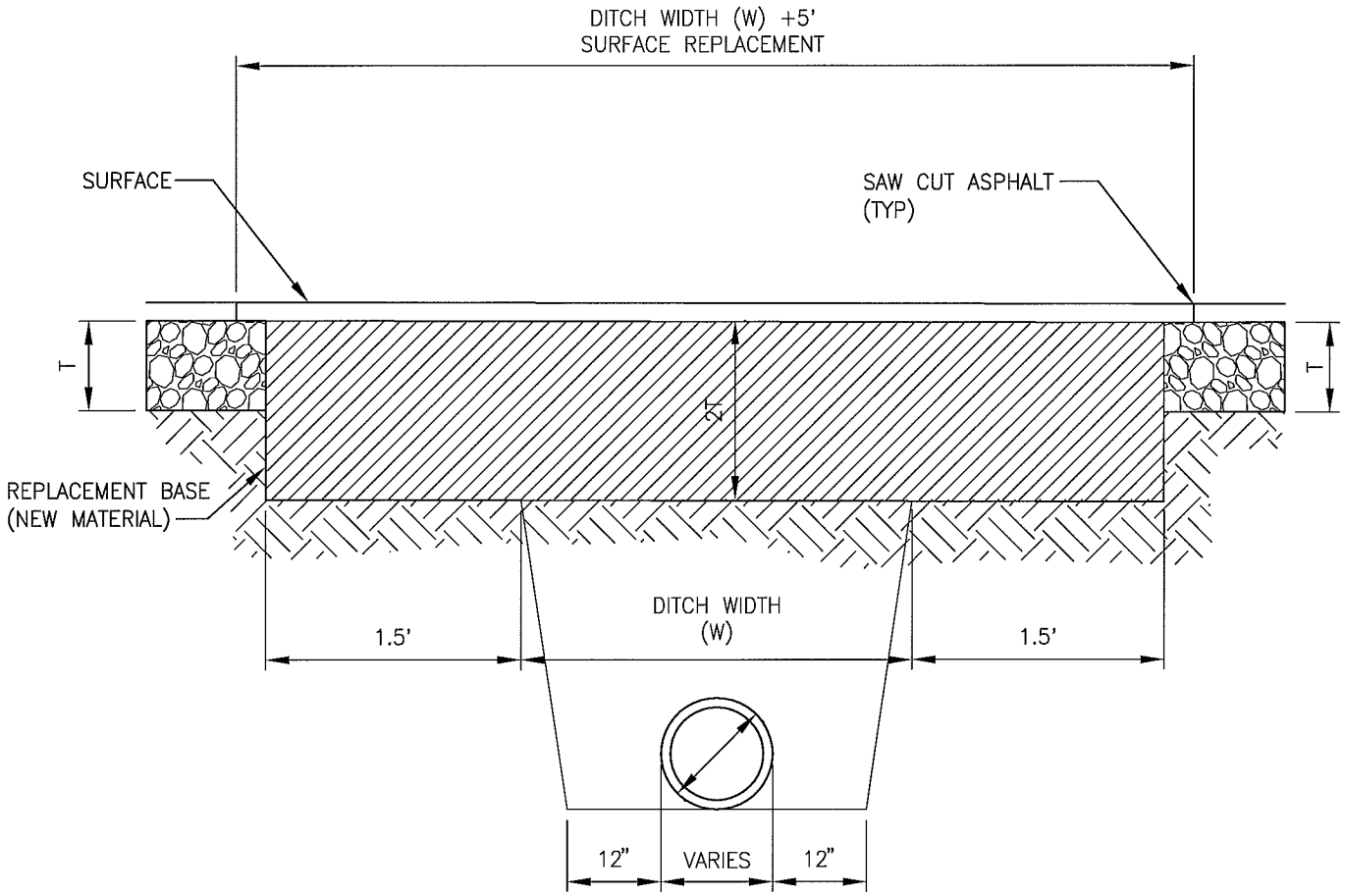


TYPICAL RESTORATION OF 1/2 LANE OR MORE OF ROCK BASE

NOTES:

1. BASE MATERIAL SHALL HAVE A MINIMUM LBR OF 100 & A MINIMUM CARBONATE CONTENT OF 70% (60% FOR LOCAL STREETS.)
2. BASE SHALL BE PLACED IN 6" MAXIMUM THICKNESS LAYERS WITH EACH LAYER COMPACTED AS REQUIRED & TESTED PRIOR TO THE PLACEMENT OF THE SUCCEEDING LAYERS.
3. SUBGRADE MATERIAL SHALL BE GRANULAR & ANGULAR & SHALL HAVE A MINIMUM LBR OF 40.
4. BACKFILL SHALL BE PLACED & COMPACTED IN 8" LAYERS, BUT TESTING WILL BEGIN 12" ABOVE THE INSTALLED FACILITY.
5. ALL EDGES OF EXISTING ASPHALT PAVEMENT WHERE RESURFACING WILL ABUT SHALL BE SAW CUT IN STRAIGHT LINES PARALLEL TO OR PERPENDICULAR TO THE ROADWAY, PRIOR TO THE RESURFACING.
6. RESURFACING MATERIAL SHALL BE CONSISTENT WITH SURROUNDING SURFACE, & SHALL BE APPLIED A MINIMUM OF ONE INCH & A MAXIMUM OF TWO INCHES IN THICKNESS.

G-19
RESTORATION OF ROADWAY CUT FOR PARALLEL UTILITY INSTALLATION



RESTORATION OF ROAD CUT FOR UTILITY CROSSING

NOTES:

1. REPLACED BASE MATERIAL OVER DITCH SHALL BE TWICE THE THICKNESS OF THE ORIGINAL BASE, MINIMUM 8", MAXIMUM 18".
2. BASE MATERIAL SHALL BE PLACED IN 6" MAXIMUM (LOOSE MEASUREMENT) LAYERS & EACH LAYER THOROUGHLY ROLLED OR TAMPED TO 98% OF MAXIMUM DENSITY, PER AASHTO T-180.
3. ASPHALT CONCRETE PAVEMENT JOINTS SHALL BE MECHANICALLY SAWED.
4. SURFACE MATERIAL SHALL BE CONSISTENT WITH THE SURROUNDING SURFACE MATERIAL.
5. BASE MATERIAL SHALL HAVE A MINIMUM LBR OF 100 & A MINIMUM CARBONATE CONTENT OF 70% (60% FOR LOCAL STREETS).
6. SUBGRADE SHALL BE TAMPED/COMPACTED TO 100% MAXIMUM DENSITY PER AASHTO T-99.
7. IF THE DITCH IS FILLED TEMPORARILY, IT SHALL BE COVERED WITH A 2" THICK ASPHALTIC CONCRETE PATCH TO KEEP THE FILL MATERIAL FROM RAVELING, UNTIL REPLACED WITH A PERMANENT PAVEMENT PATCH.

G-20
RESTORATION OF ROADWAY CUT FOR PARALLEL UTILITY INSTALLATION