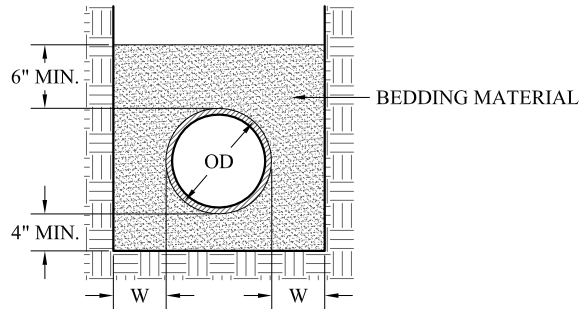
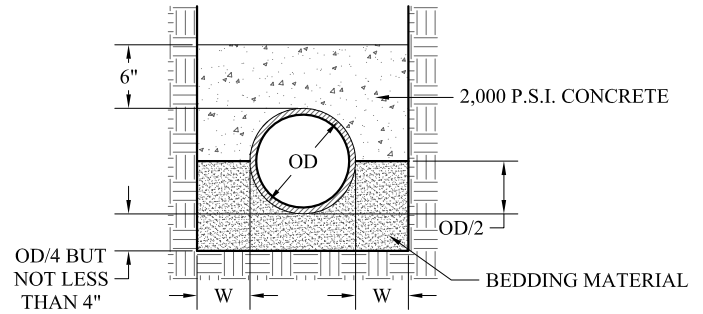


EMBEDMENT ZONE

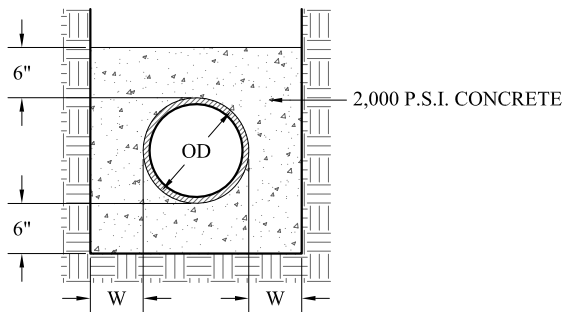
WATER AND SEWER MAINS



GRAVEL EMBEDMENT



CONCRETE CAP



CONCRETE ENCASEMENT

PIPE SIZE	W
16" OR LESS	6"
GREATER THAN 16"	AS SPECIFIED BY PIPE MFG. & APPROVED BY OWNER

BEDDING MATERIAL:

GRANULAR MATERIAL THAT WILL REMAIN FIRM AND NOT PERMIT DISPLACEMENT OF THE PIPE EITHER DURING PIPE LAYING AND BACKFILLING OR FOLLOWING COMPLETION OF CONSTRUCTION. THE MATERIAL SHALL MEET THE REQUIREMENTS OF ASTM C33, GRADATION 67 (3/4" TO NO.4) CRUSHED STONE OR PEA GRAVEL MEETING TXDOT GRADE 5 GRADATION PER TEST METHOD TEX-200-F, PART I AND TURNER PIT 'D-BEDDING' ARE ACCEPTABLE. TORPEDO BEDDING IS ALSO AN ACCEPTABLE BEDDING MATERIAL.

* TRENCH SPOILS ARE NOT ACCEPTABLE FOR "EMBEDMENT ZONE MATERIAL"

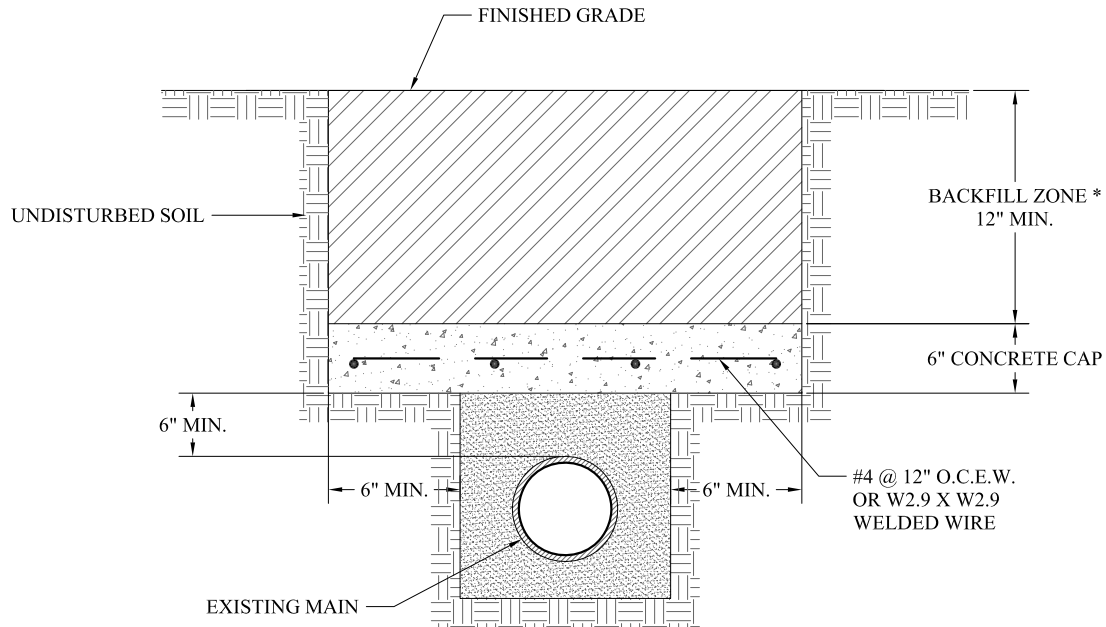
CITY OF SAN ANGELO

EMBEDMENT ZONE
WATER AND SEWER MAINS

W-BED-1

CONCRETE CAP

OVER EXISTING MAIN



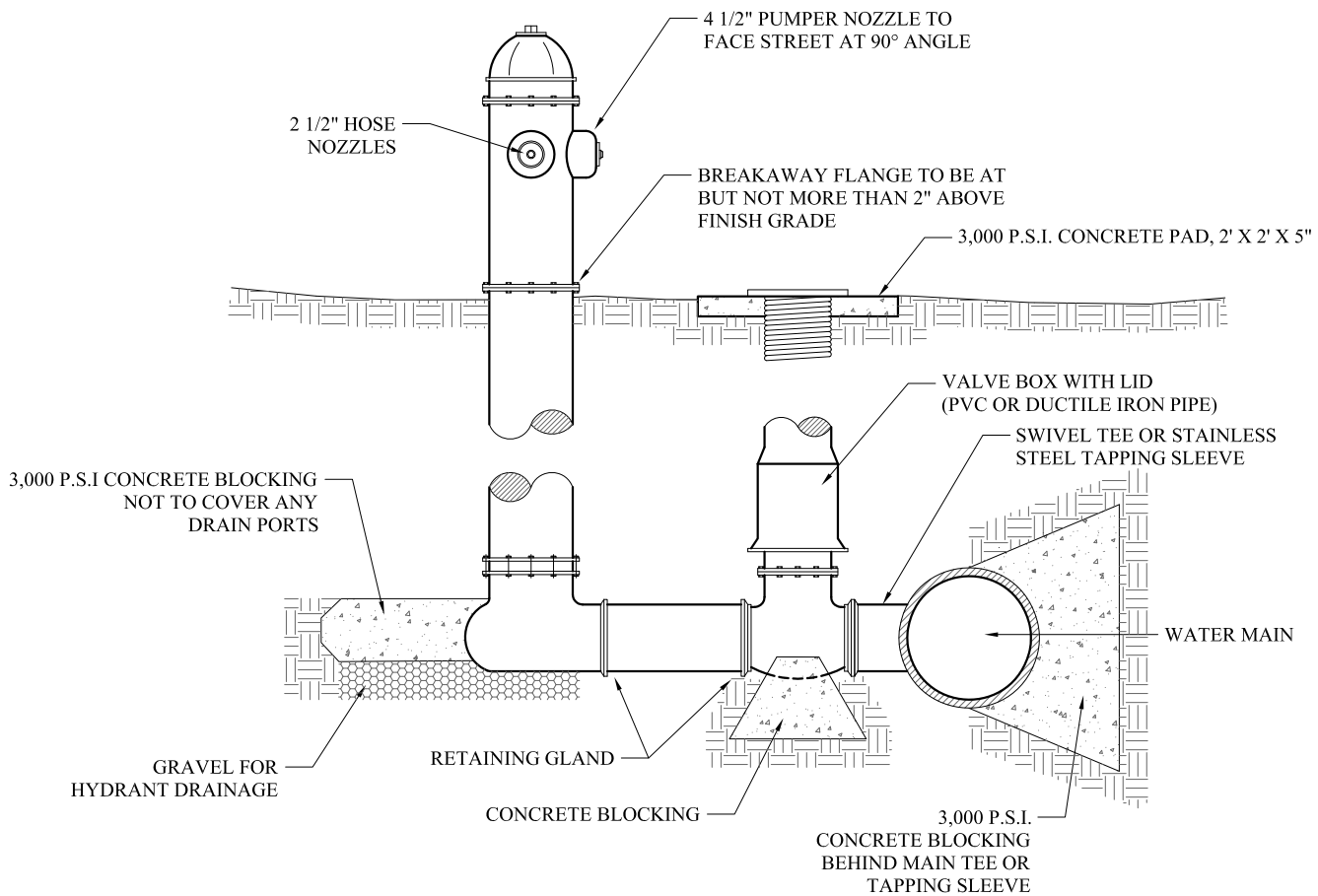
NOTES:

1. CONTRACTOR SHALL POT-HOLE EXISTING MAIN TO DETERMINE EXACT DEPTH PRIOR TO EXCAVATING FOR PLACEMENT OF CONCRETE CAP.
 2. CONTRACTOR SHALL POT-HOLE EACH MAIN A MINIMUM OF EVERY 35' UNLESS DEPTHS SHOW VARIATIONS THAT REQUIRE ADDITIONAL POT-HOLING.
 3. CONCRETE CAPS SHALL BE PLACED ON FIRM UNDISTURBED SOIL. ANY DISTURBED SOILS SHALL BE RECOMPACTED AT OPTIMUM MOISTURE TO MATCH OR EXCEED SURROUNDING UNDISTURBED SOIL'S DENSITY PRIOR TO PLACING OF CAP.
- * REFER TO UTILITY TRENCH SECTION REPAIR DETAILS FOR BACKFILL AND SURFACE REPAIR REQUIREMENTS.

CITY OF SAN ANGELO

CONCRETE CAP
OVER EXISTING WATER MAINS W-CC-W

FIRE HYDRANT INSTALLATION



NOTES

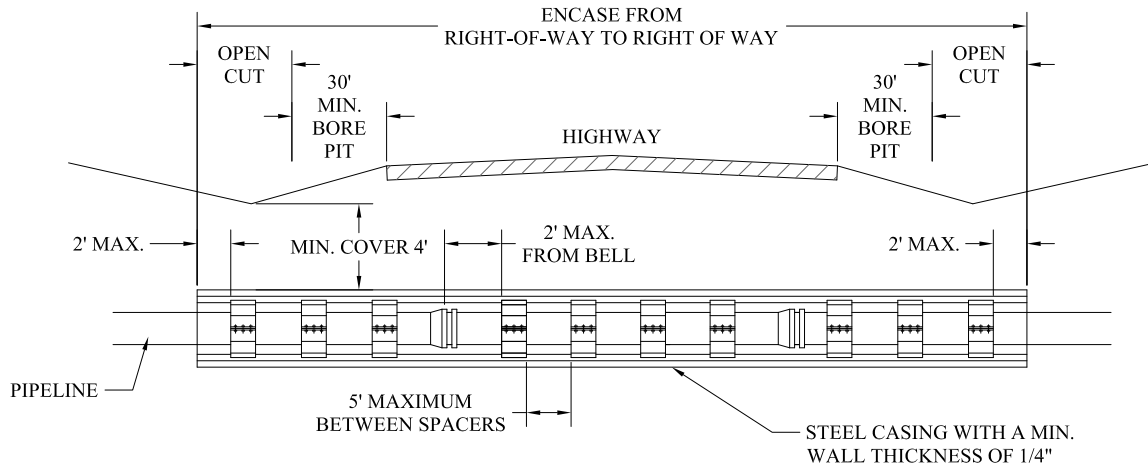
1. CONCRETE BLOCKING TO BE POURED TO UNDISTURBED SOIL.
2. PUMPER NOZZLE CAP TO BE NOT LESS THAN 12" NOR MORE THAN 48" BEHIND CURB.
3. WRAP ALL VALVES & FITTINGS WITH 3 MIL. POLYETHYLENE SHEET PLASTIC.
4. FIRE HYDRANT SHALL BE PAINTED YELLOW, SHERWIN WILLIAMS B-54Y17 OR 617087 OR EQUAL.
5. ANY ASPHALT OR CONCRETE REMOVAL REQUIRED FOR INSTALLATION SHALL BE PAID AT THE UNIT PRICES IN THE UTILITY TRENCH REPAIR CONTRACT.

CITY OF SAN ANGELO

FIRE HYDRANT
INSTALLATION

W-FHI

HIGHWAY CROSSING



NOTES

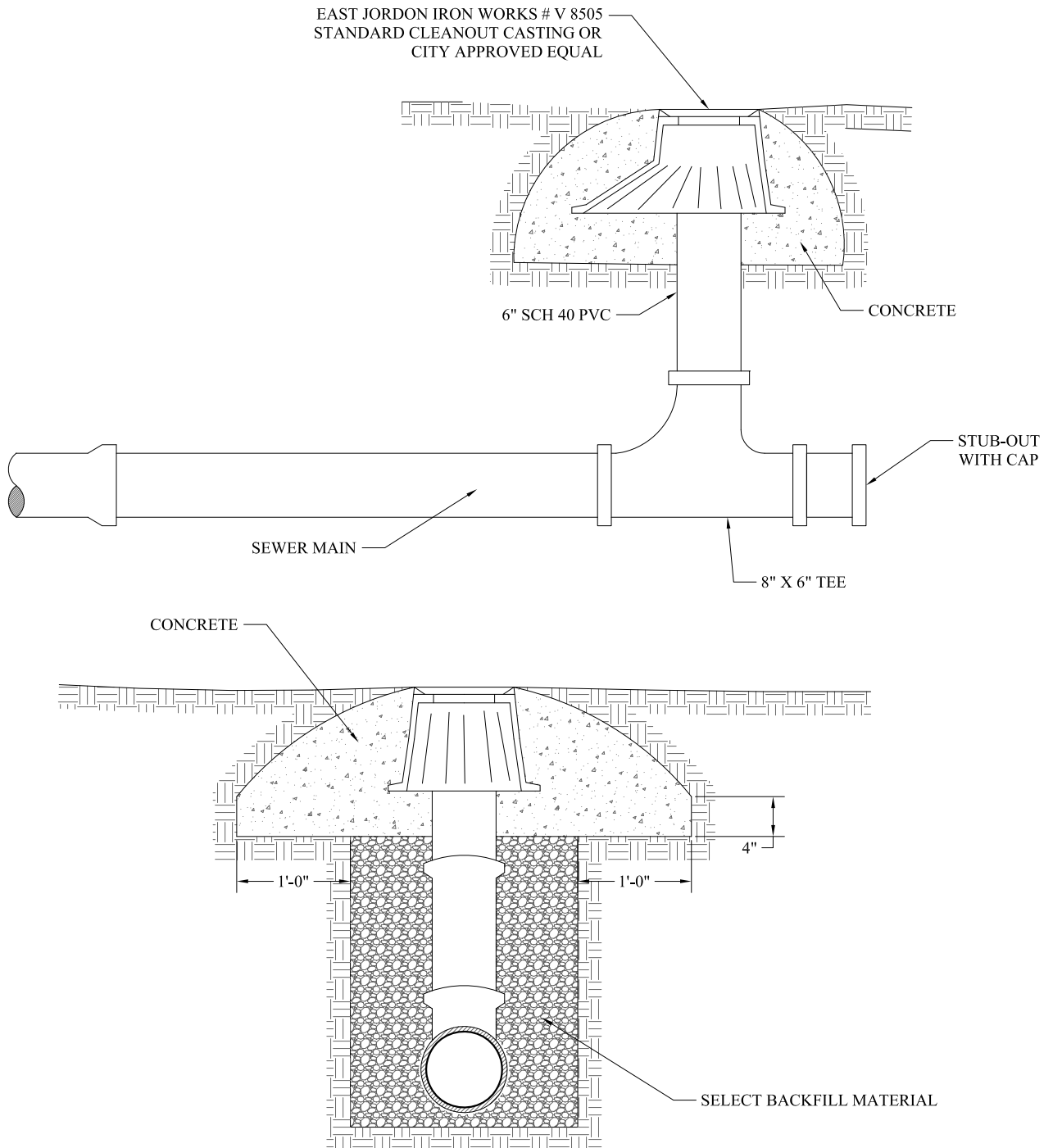
1. ALL HIGHWAY CROSSINGS SHALL BE MADE BY BORING OR TUNNELING. ENCASEMENT PIPE SHALL EXTEND FROM ROW TO ROW. BORE PITS SHALL BE A MINIMUM OF 30' FROM THE EDGE OF PAVEMENT.
2. GROUT AROUND CASING ALL OVER CUTTING IN EXCESS OF 1".
3. CASING SPACERS SHALL BE SPACED A MAXIMUM OF 2' FROM EACH END OF JOINT AND NOT MORE THAN 5' BETWEEN SPACERS. CASING SPACERS SHALL BE APS POLYETHYLENE OR OWNER APPROVED EQUAL.
4. GROUT EACH END OF ENCASEMENT A MINIMUM OF 2'.
5. GROUT SHALL HAVE A MINIMUM STRENGTH OF 1,800 P.S.I. IN 28 DAYS WITH A SLUMP OF 10" OR GREATER.
6. BORING PIT SHALL BE CONFINED TO THE WORK EASEMENT.
7. BORE PITS SHALL BE LOCATED AT THE SPECIFIED END OF ENCASEMENT PIPE AND SHALL BE CONSTRUCTED IN SUCH A MANNER AS TO NOT INTERFERE WITH HIGHWAY STRUCTURAL INTEGRITY & ADEQUATE CLEARANCE FOR SAFE TRAFFIC OPERATIONS. IF NECESSARY, SHORING SHALL BE USED.
8. LINES AND GRADES ARE CRITICAL AND SHALL BE MAINTAINED.
9. RESTORE HIGHWAY RIGHT-OF-WAY TO ORIGINAL OR BETTER CONDITION IN ACCORDANCE WITH TXDOT PERMIT REQUIREMENTS.

CITY OF SAN ANGELO

HIGHWAY CROSSING

W-HWY-BORE

STANDARD CLEANOUT

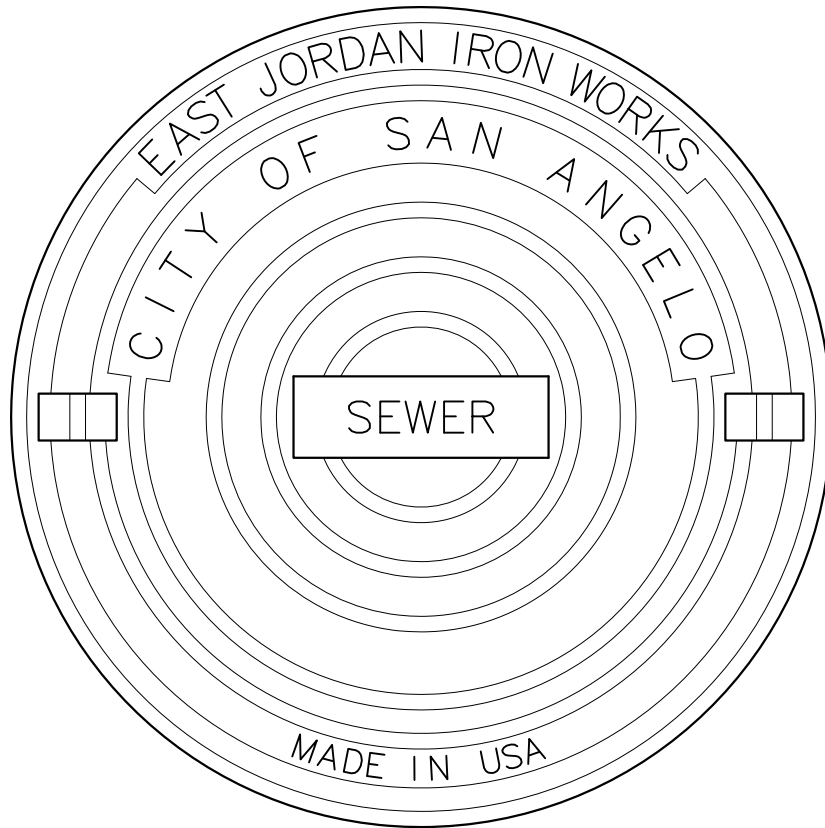


CITY OF SAN ANGELO

STANDARD CLEANOUT

W-SA-CO

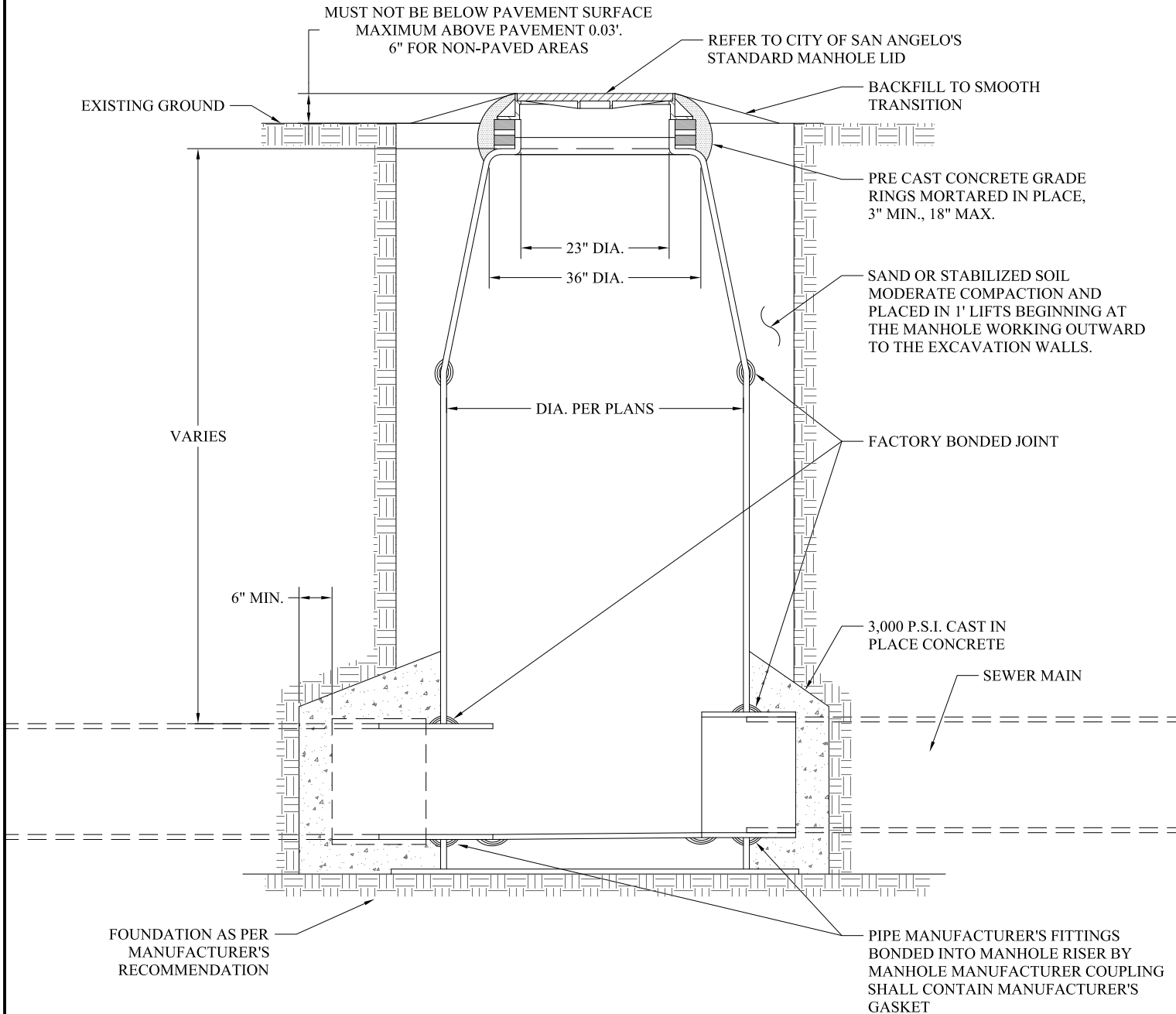
SANITARY SEWER STANDARD MANHOLE LID



NOTES:

1. MANHOLE LID & RING SHALL BE EAST JORDAN IRON WORKS (EJIW) V-1177 (24") OR APPROVED EQUAL WITH THE ABOVE DETAILS.
2. WATER TIGHT LID & RING SHALL BE EJIW V-1342 (24") OR APPROVED EQUAL WITH THE ABOVE DETAILS.
3. MANHOLE LID AND RING SHALL BE MACHINE FITTED WITH TWO (2) PICK BAR SLOTS.
4. MANHOLE RING AND COVER SHALL BE CAST IRON, MEETING THE LATEST REVISION OF ASTM A-48 CLASS 30 WITH A HIGHWAY LOAD RATING OF H-20.

MANHOLE - TYPE A



NOTES

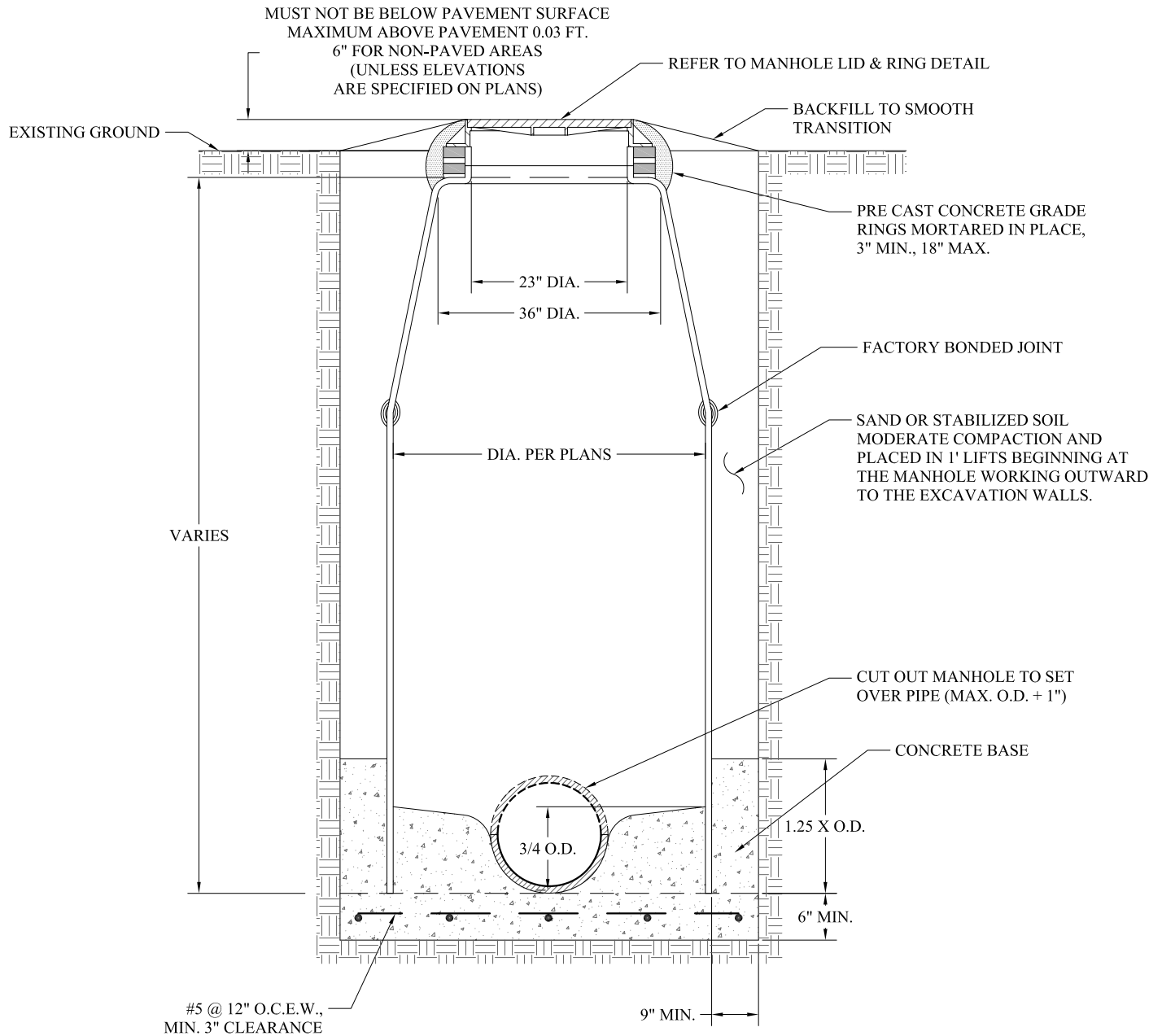
1. CONCRETE SHALL BE PLACED A MINIMUM OF 6" BEYOND ALL CONNECTIONS.
2. ALL INLETS AND OUTLETS SHALL BE BONDED INTO THE MANHOLE RISER BY THE MANUFACTURER.
3. CONTRACTOR SHALL VERIFY MANHOLE DEPTHS, INLET AND OUTLET ELEVATIONS.
4. MANHOLE FLOOR SHALL BE FACTORY INSTALLED INTEGRAL FIBERGLASS BENCH AND INVERT AREA. CONCRETE IS NOT ALLOWED.

CITY OF SAN ANGELO

MANHOLE - TYPE A

W-SA-MH-A

MANHOLE - TYPE B



NOTES

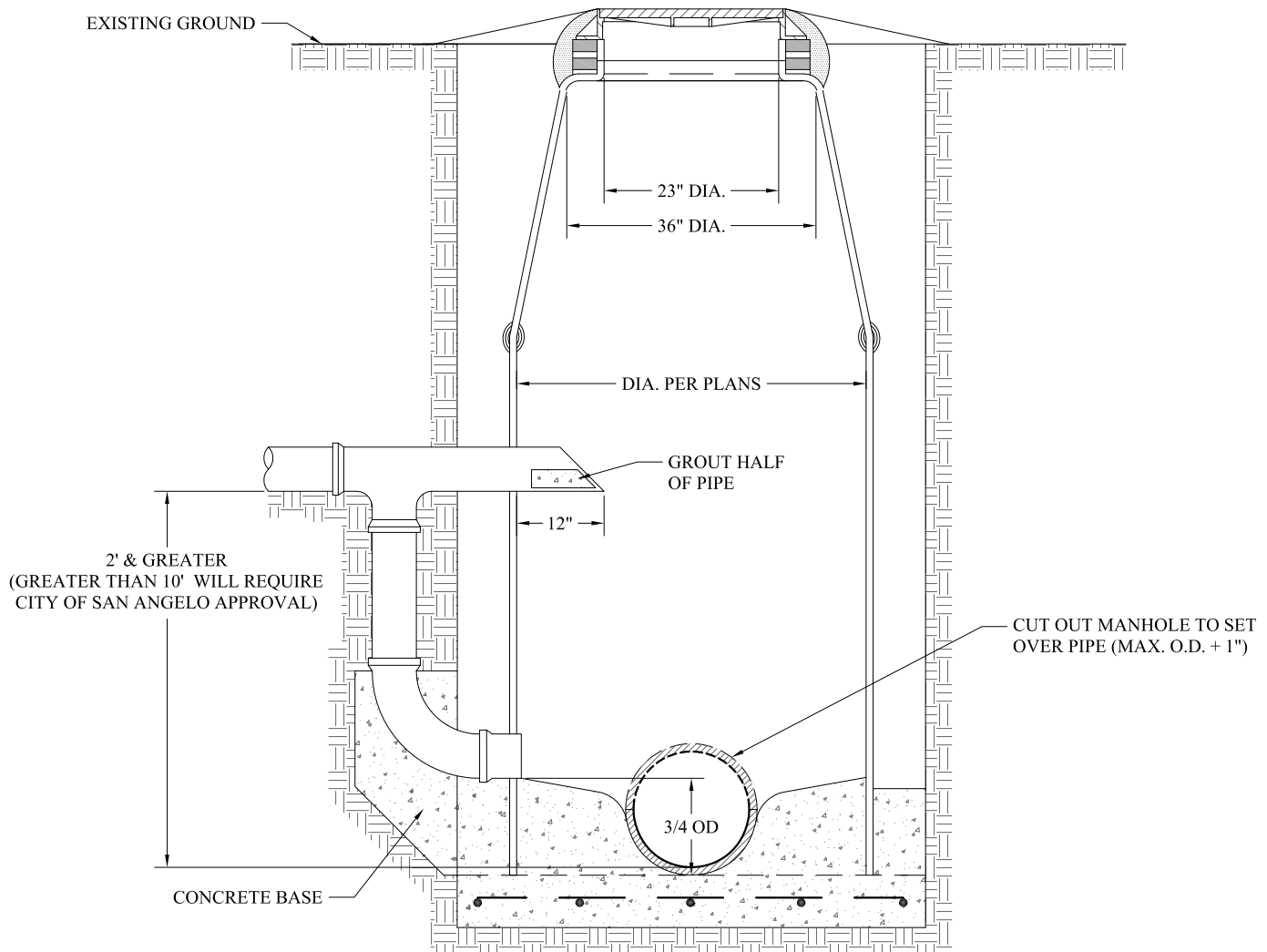
1. CONCRETE BASE TO BE POURED IN PLACE IN TRENCH.
2. MANHOLE CUTOUT TO BE MADE AT TIME OF INSTALLATION.
3. MANHOLE TO BE INSTALLED BY INSERTING INTO WET CONCRETE BASE.
4. FLOW LINE INVERT MAY BE CHANNEL FORMED IN CONCRETE FLOOR OR PIPE SECTION WITH TOP CUT OUT.
5. SEAL CONCRETE TO PIPE WITH ELASTOMERIC GASKET SEAL.
6. CONTRACTOR SHALL VERIFY MANHOLE DEPTHS, INLET AND OUTLET ELEVATIONS.
7. CONCRETE SHALL BE PLACED A MINIMUM OF 6" BEYOND ALL CONNECTIONS.
8. CONTRACTOR SHALL VERIFY MANHOLE DEPTHS, INLET AND OUTLET ELEVATIONS.

CITY OF SAN ANGELO

MANHOLE - TYPE B

W-SA-MH-B

DROP MANHOLE



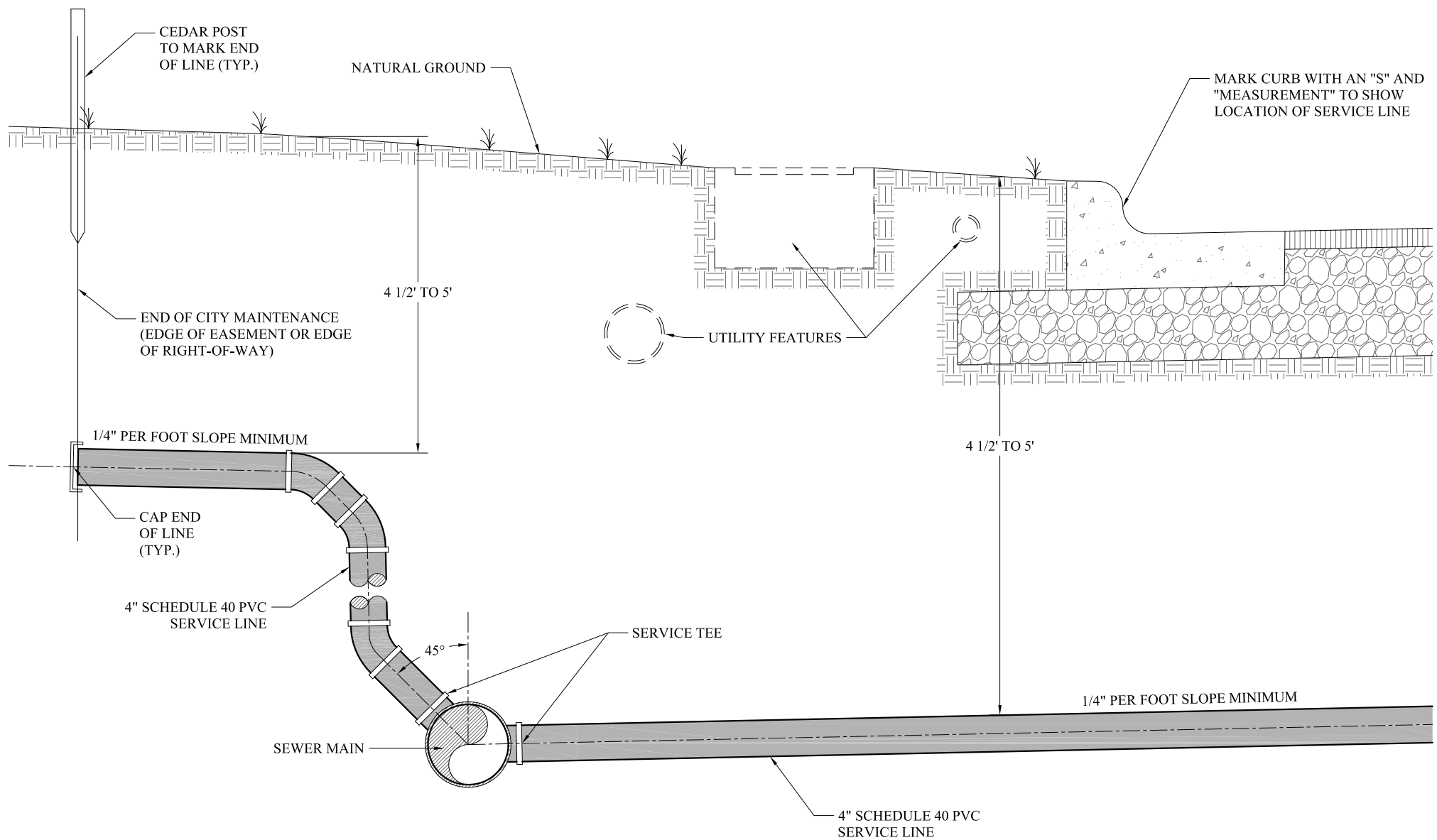
NOTES

1. CONSTRUCTION OF THE DROP MANHOLE IS IDENTICAL WITH THE STANDARD MANHOLE A AND B IN EVERY RESPECT EXCEPT THE METHOD OF ENTRANCE OF THE SEWAGE FROM THE LATERALS. THIS ENTRANCE SHALL BE CONSTRUCTED AS SHOWN ABOVE.
2. WHEN ENTERING AN EXISTING MANHOLE WITH A NEW LINE AND THE DIFFERENCE IN ELEVATION OF THE TWO INVERTS EXCEEDS 2' THE METHOD OF ENTRANCE SHALL BE AS ABOVE.
3. REFER TO SANITARY SEWER STANDARD MANHOLE LID DETAIL.
4. BACKFILL SHALL BE COMPACTED IN 6" HORIZONTAL LAYERS MINIMUM DENSITY 95% MODIFIED PROCTOR.

CITY OF SAN ANGELO

DROP MANHOLE

W-SA-MH-D



NOTES:

1. SEWER SERVICE LINE: 4" MINIMUM SIZE, SCHEDULE 40 PVC.
2. SERVICE LINE PIPE TO BE STANDARD 20' JOINTS, UNLESS TOTAL LENGTH OF SERVICE LINE IS LESS THAN 10', OR UNLESS APPROVED OTHERWISE BY THE CITY.
3. ALL JOINTS SHALL BE GLUED.
4. WHERE BENDS ARE NEEDED, MAXIMUM DEGREE ALLOWABLE SHALL BE 45°

CITY OF SAN ANGELO

SEWER SERVICE LINE

W-SA-SL-1

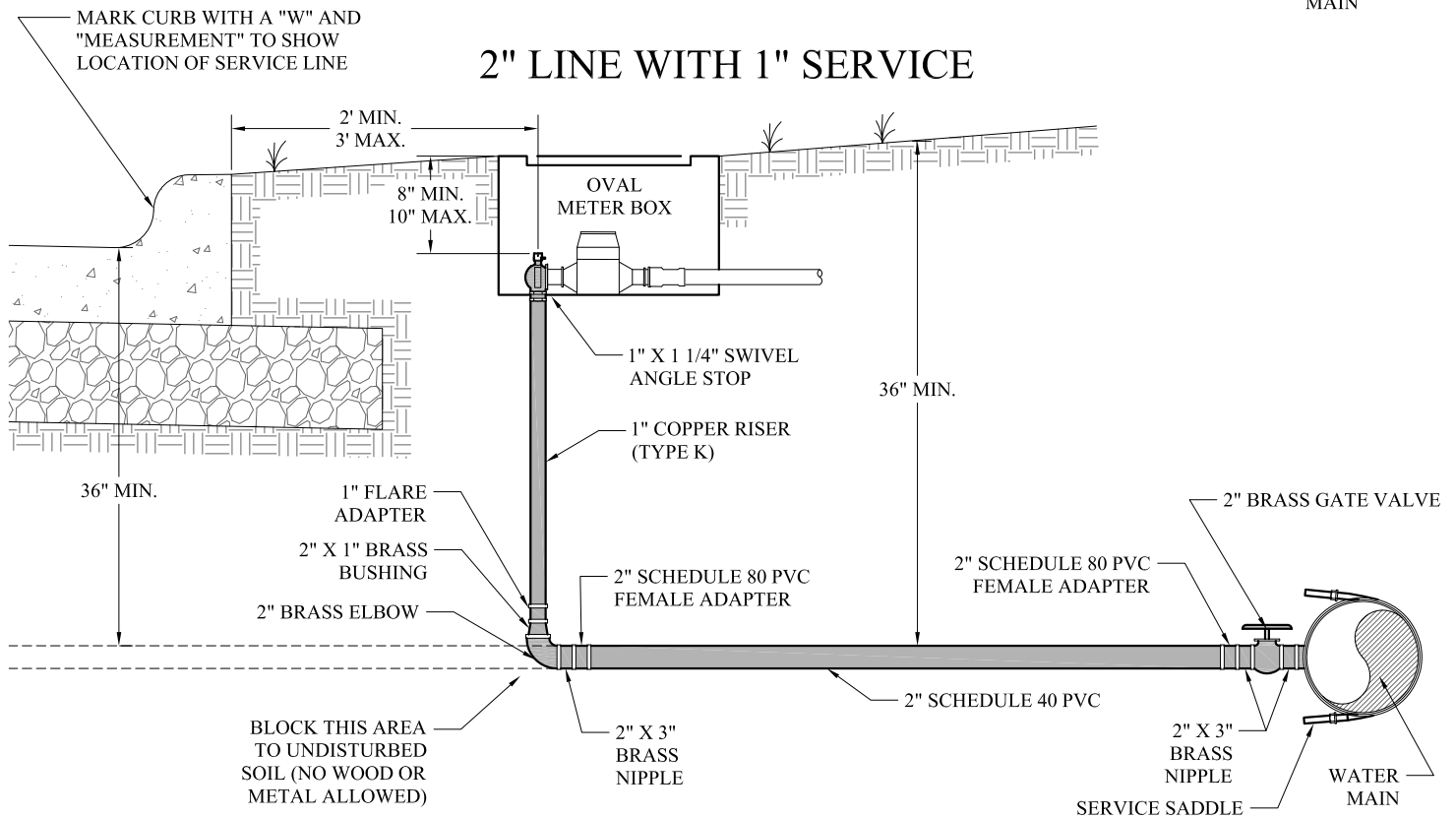
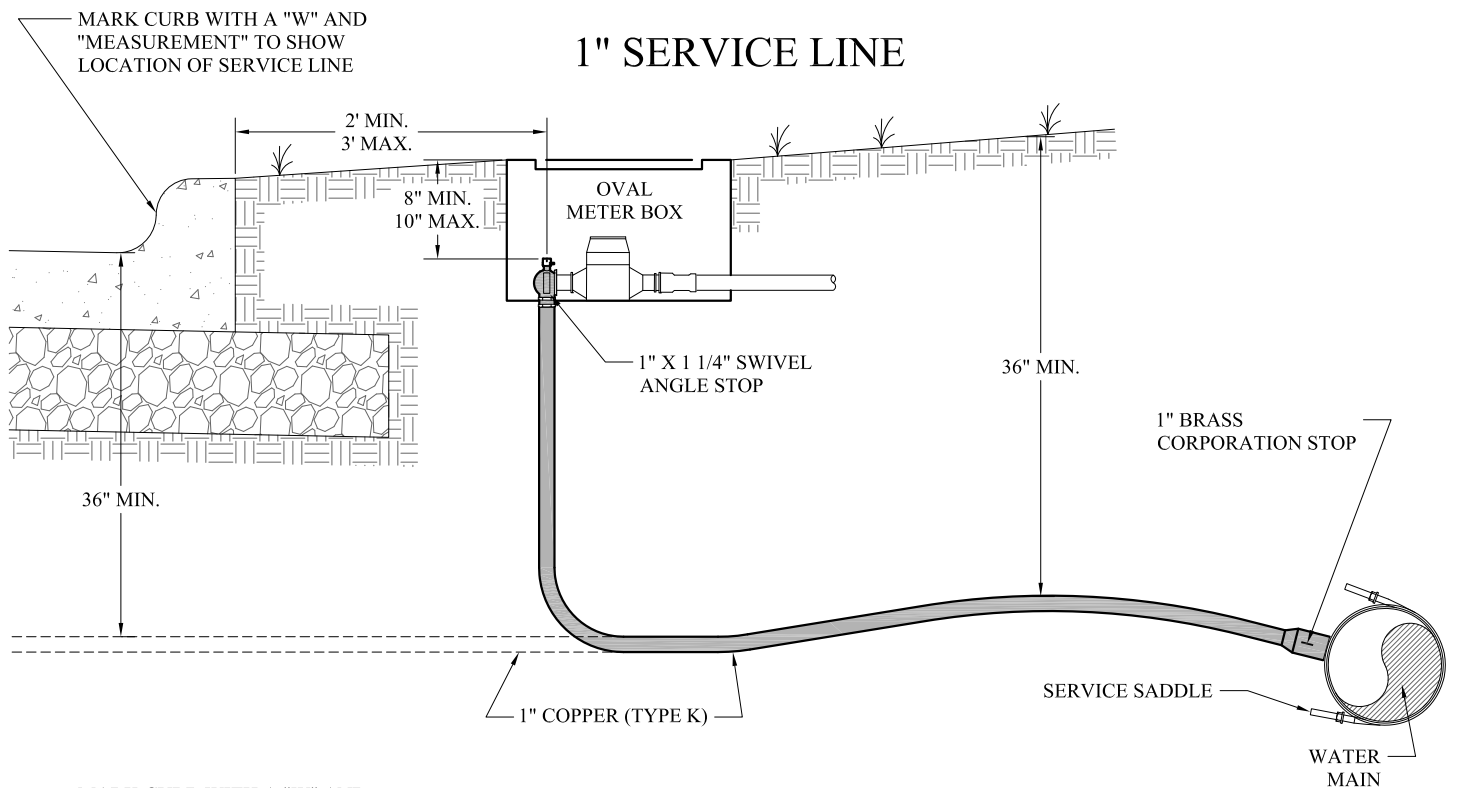
SEWER PIPE SLOPES

SIZE OF PIPE (INCHES)	MINIMUM SLOPE (%)	MAXIMUM SLOPE (%)
6	0.50	12.35
8	0.33	8.40
10	0.25	6.23
12	0.20	4.88
15	0.15	3.62
18	0.11	2.83
21	0.09	2.30
24	0.08	1.93
27	0.06	1.65
30	0.055	1.43
33	0.05	1.26
36	0.045	1.12
39	0.04	1.01
>39	*	*
* FOR PIPES LARGER THAN 39 INCHES IN DIAMETER, THE SLOPE IS DETERMINED BY MANNING'S FORMULA TO MAINTAIN A VELOCITY GREATER THAN 2.0 FEET PER SECOND AND LESS THAN 10.0 FEET PER SECOND WHEN FLOWING FULL.		

CITY OF SAN ANGELO

SEWER PIPE SLOPES

W-SA-SLOPE



NOTES

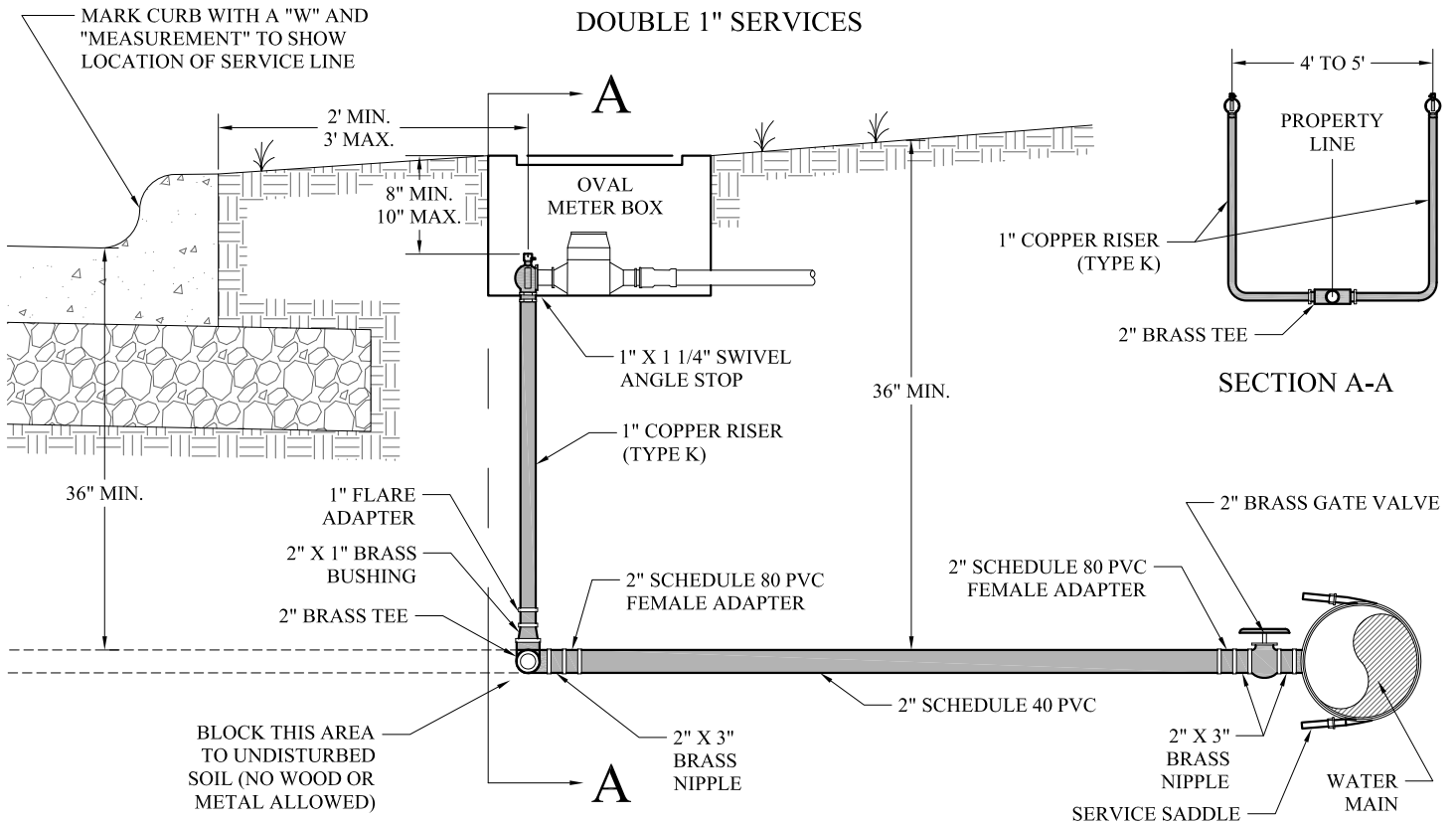
1. REFER TO CITY OF SAN ANGELO WATER UTILITIES MATERIAL SPECIFICATIONS FOR ACCEPTABLE WATER AND SEWER MANUFACTURERS.
2. ALL CONNECTIONS TO COPPER TUBING SHALL BE FLARED FITTINGS.
3. ALL PVC FITTINGS SHALL BE SCHEDULE 80.
4. NO RING JOINT CONNECTIONS ON 2" SCHEDULE 40 PVC SERVICE LINES, ALL JOINTS SHALL BE GLUED OR THREADED AS SHOWN.
5. ANY BUSHINGS REQUIRED SHALL BE BRASS WITH NEOPRENE GASKET.

CITY OF SAN ANGELO

1" SERVICE LINES

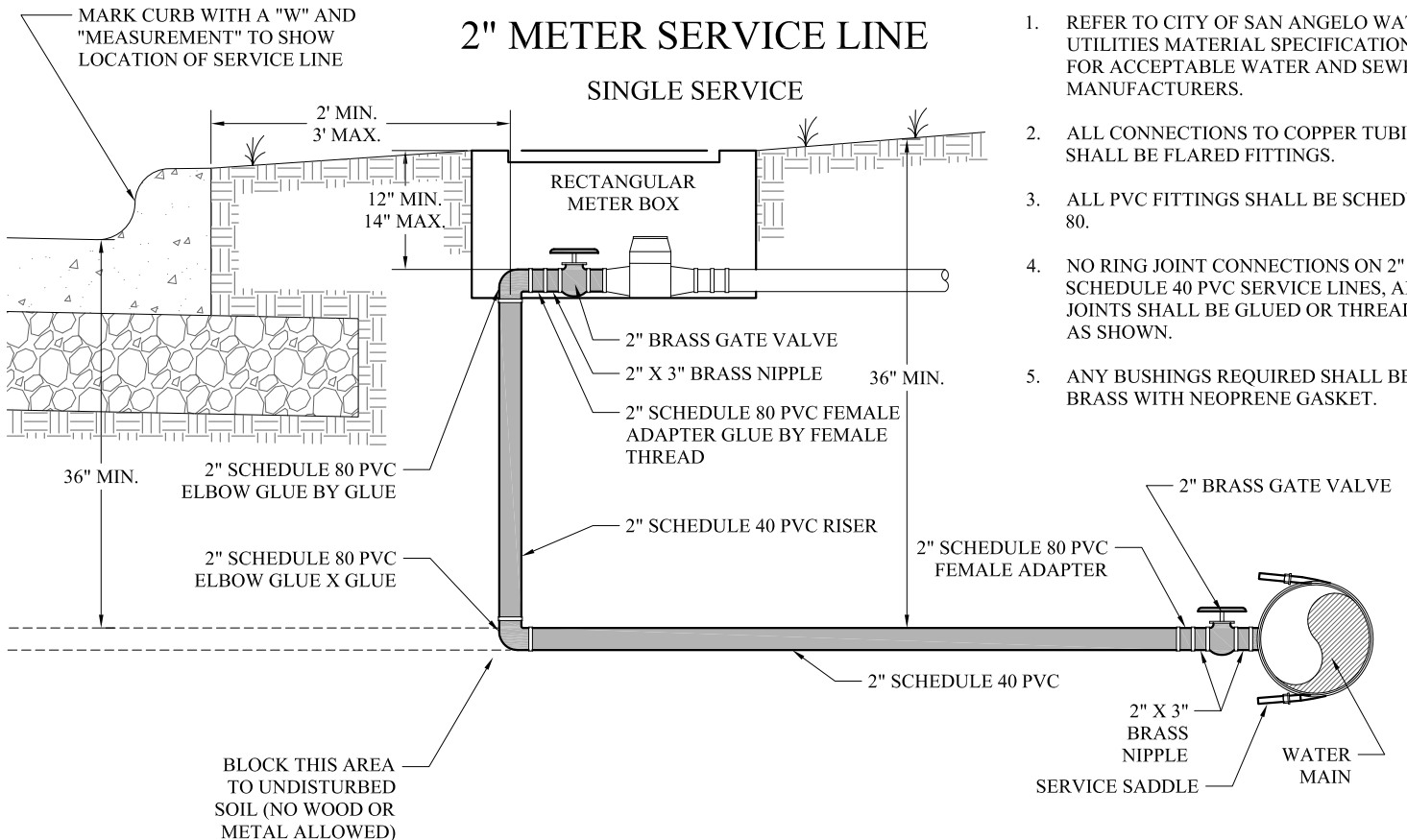
2" SERVICE LINE

DOUBLE 1" SERVICES



2" METER SERVICE LINE

SINGLE SERVICE



NOTES

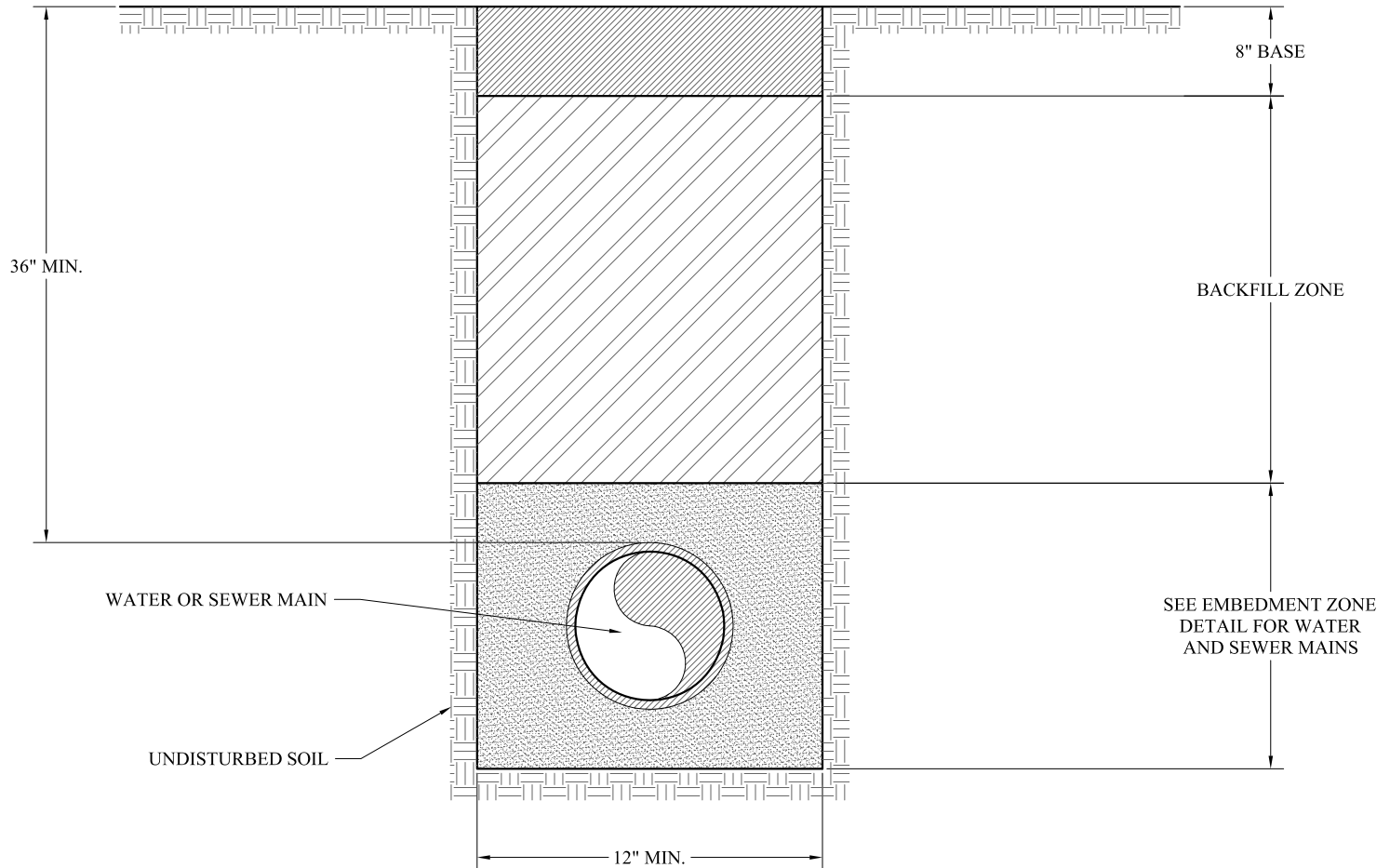
1. REFER TO CITY OF SAN ANGELO WATER UTILITIES MATERIAL SPECIFICATIONS FOR ACCEPTABLE WATER AND SEWER MANUFACTURERS.
2. ALL CONNECTIONS TO COPPER TUBING SHALL BE FLARED FITTINGS.
3. ALL PVC FITTINGS SHALL BE SCHEDULE 80.
4. NO RING JOINT CONNECTIONS ON 2" SCHEDULE 40 PVC SERVICE LINES, ALL JOINTS SHALL BE GLUED OR THREADED AS SHOWN.
5. ANY BUSHINGS REQUIRED SHALL BE BRASS WITH NEOPRENE GASKET.

CITY OF SAN ANGELO

2" SERVICE LINES

UTILITY TRENCH SECTION

UNPAVED STREETS, ALLEYS & DRIVEWAYS



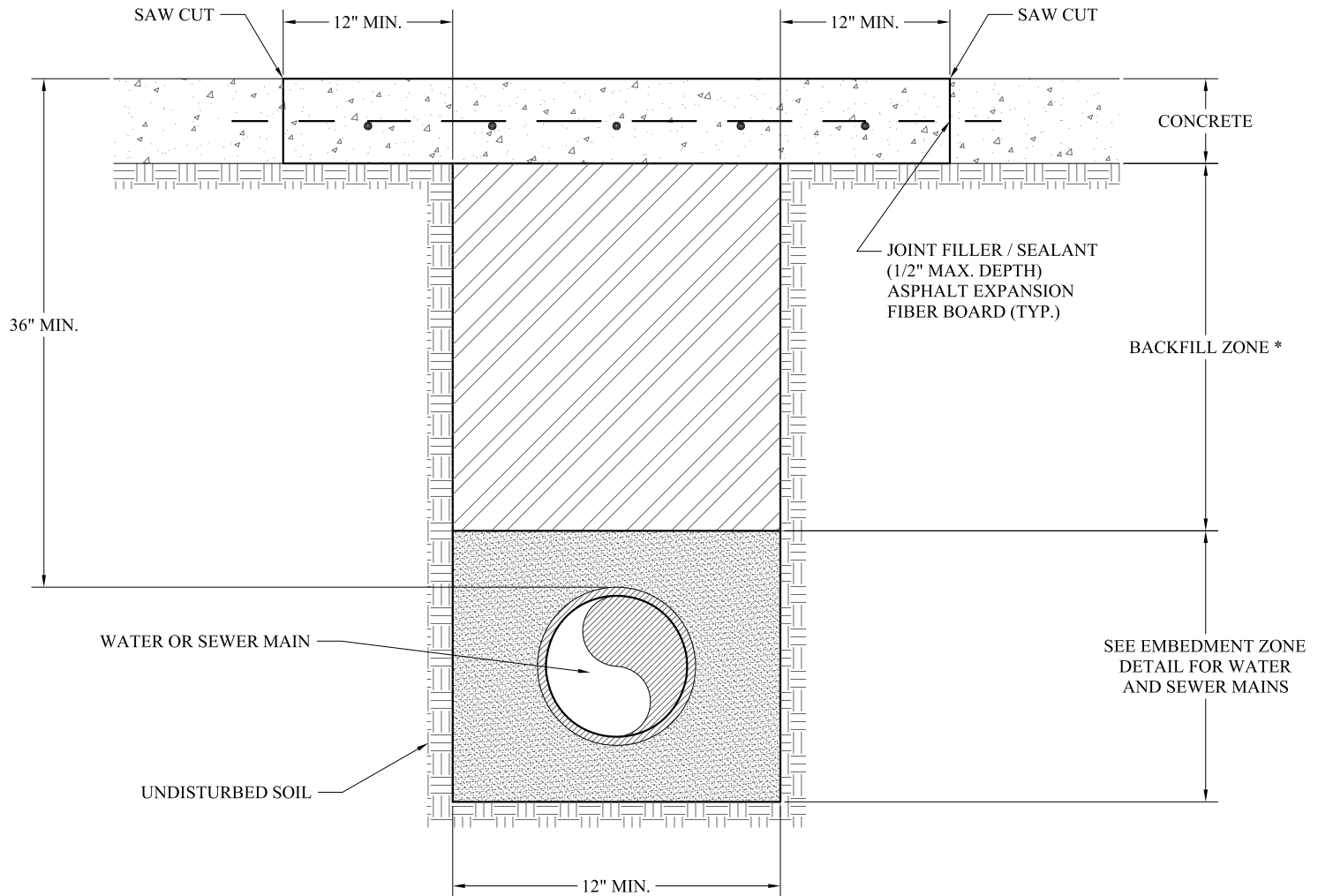
- BASE:** FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS. THICKNESS PER CITY OF SAN ANGELO STANDARD STREET SPECIFICATIONS COMPACTED IN 6" LAYERS. MINIMUM DENSITY 95% MODIFIED PROCTOR.
- BACKFILL ZONE:** WHERE PULVERIZED OR GRANULAR MATERIAL IS AVAILABLE FROM EXCAVATION WHICH IS FREE OF SHARP EDGED STONES, OR STONES LARGER THAN 3" IN DIAMETER, CLAY, ORGANIC MATTER, OR OTHER UNSUITABLE SUBSTANCES, HAS A $PI \leq 20$ AND $LL \leq 40$, AND MEETS THE APPROVAL OF THE CITY. SUCH MATERIAL MAY BE USED FOR BACKFILL MATERIAL AS INSTRUCTED BY THE OWNER.

CITY OF SAN ANGELO

UTILITY TRENCH SECTION UNPAVED STREETS,
ALLEYS AND DRIVEWAYS W-UTR-USA

UTILITY TRENCH SECTION

RIGID PAVEMENT



NOTES:

CONCRETE:

CLASS P, 3500 P.S.I. COMPRESSIVE; 555 P.S.I., FLEXURAL. BEND EXISTING REBAR INTO CENTER OF NEW CONCRETE. REPLACE AS NECESSARY WITH #4 REBAR ON 12" CENTERS EACH WAY AND DOWEL IN #4 REBAR 9" DEEP WITH 24" LAP SPLICE AND MUST BE ALLOWED TO CURE FOR A PERIOD OF NOT LESS THAN 72 HOURS, OR CLASS P, 3500 P.S.I. WITH 36 POUNDS OF NOVAMESH 850 PER CUBIC YARD WITH #4 REBAR DOWELS 9" DEEP AND 9" INTO THE TRENCH ON 18" CENTERS AND MUST BE ALLOWED TO CURE FOR A PERIOD OF NOT LESS THAN 24 HOURS.

BACKFILL ZONE :

FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS COMPACTED IN 6" HORIZONTAL LAYERS. MINIMUM DENSITY 95% MODIFIED PROCTOR. (UNLESS APPROVED OTHERWISE IN WRITING).

IF BASE PLUS BACKFILL ZONE DEPTH EXCEEDS 24", REMAINING BACKFILL ZONE (TO TOP OF EMBEDMENT ZONE) CAN CONSIST OF A PULVERIZED OR GRANULAR MATERIAL OBTAINED FROM TRENCH EXCAVATION, IF THE MATERIAL IS FREE OF SHARP EDGE STONES LARGER THAN 3" DIAMETER, CLAY, ORGANIC MATTER OR OTHER UNSUITABLE SUBSTANCES, HAS A $PI \leq 20$ AND $LL \leq 40$ AND MEETS APPROVAL OF THE CITY. ALL BACKFILLED MATERIAL SHALL BE COMPACTED TO A MINIMUM OF 95% MODIFIED PROCTOR, COMPACTED IN 6" HORIZONTAL LAYERS AT OR NEAR OPTIMUM MOISTURE CONTENT.

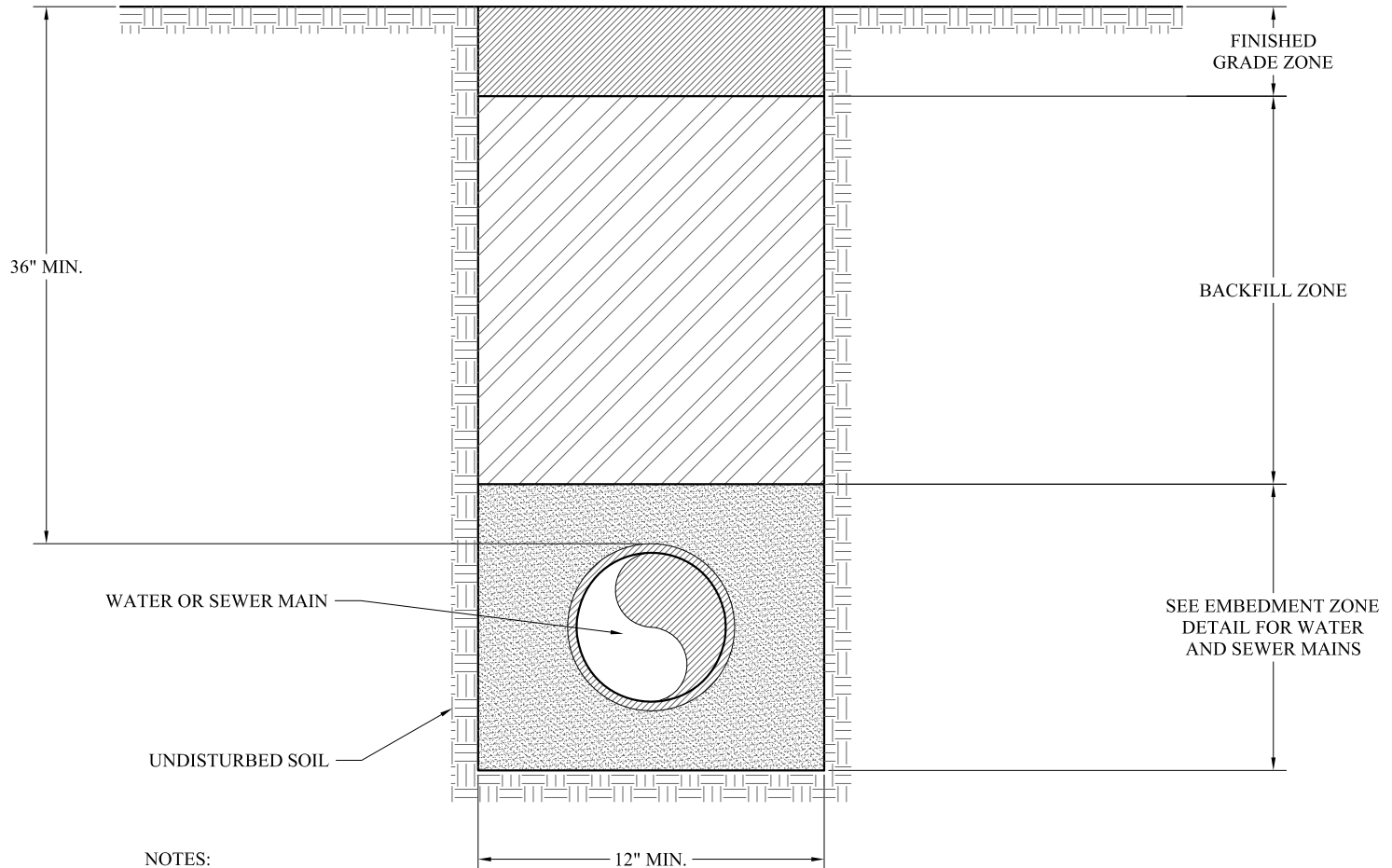
CITY OF SAN ANGELO

UTILITY TRENCH SECTION
RIGID PAVEMENT

W-UTR-RIG

UTILITY TRENCH SECTION

OTHER UNPAVED AREAS



NOTES:

BACKFILL ZONE:

OPTION #1: WHERE PULVERIZED OR GRANULAR MATERIAL IS AVAILABLE FROM EXCAVATION WHICH IS FREE OF SHARP EDGED STONES, OR STONES LARGER THAN 3" IN DIAMETER, CLAY, ORGANIC MATTER, OR OTHER UNSUITABLE SUBSTANCES, HAS A $PI \leq 20$ AND $LL \leq 40$, AND MEETS THE APPROVAL OF THE CITY SUCH MATERIAL MAY BE USED FOR BACKFILL MATERIAL AS INSTRUCTED BY THE OWNER. BACKFILL SHALL BE COMPACTED TO DENSITIES EQUAL TO OR GREATER THAN THAT OF SURROUNDING SOIL.

OPTION #2: FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS COMPACTED IN 6" HORIZONTAL LAYERS TO MINIMUM DENSITY 95% MODIFIED PROCTOR.

FINISHED GRADE ZONE:

BACKFILL SHALL MATCH EXISTING GROUND CONDITIONS (SEE OPTIONS BELOW) OR AS DIRECTED BY THE OWNER. PAYMENT SHALL BE PER BID ITEMS.

OPTION A: UTILIZE BACKFILL ZONE MATERIAL FROM OPTION #1

OPTION B: 6" TOP SOIL.

OPTION C: 8" FLEXIBLE BASE

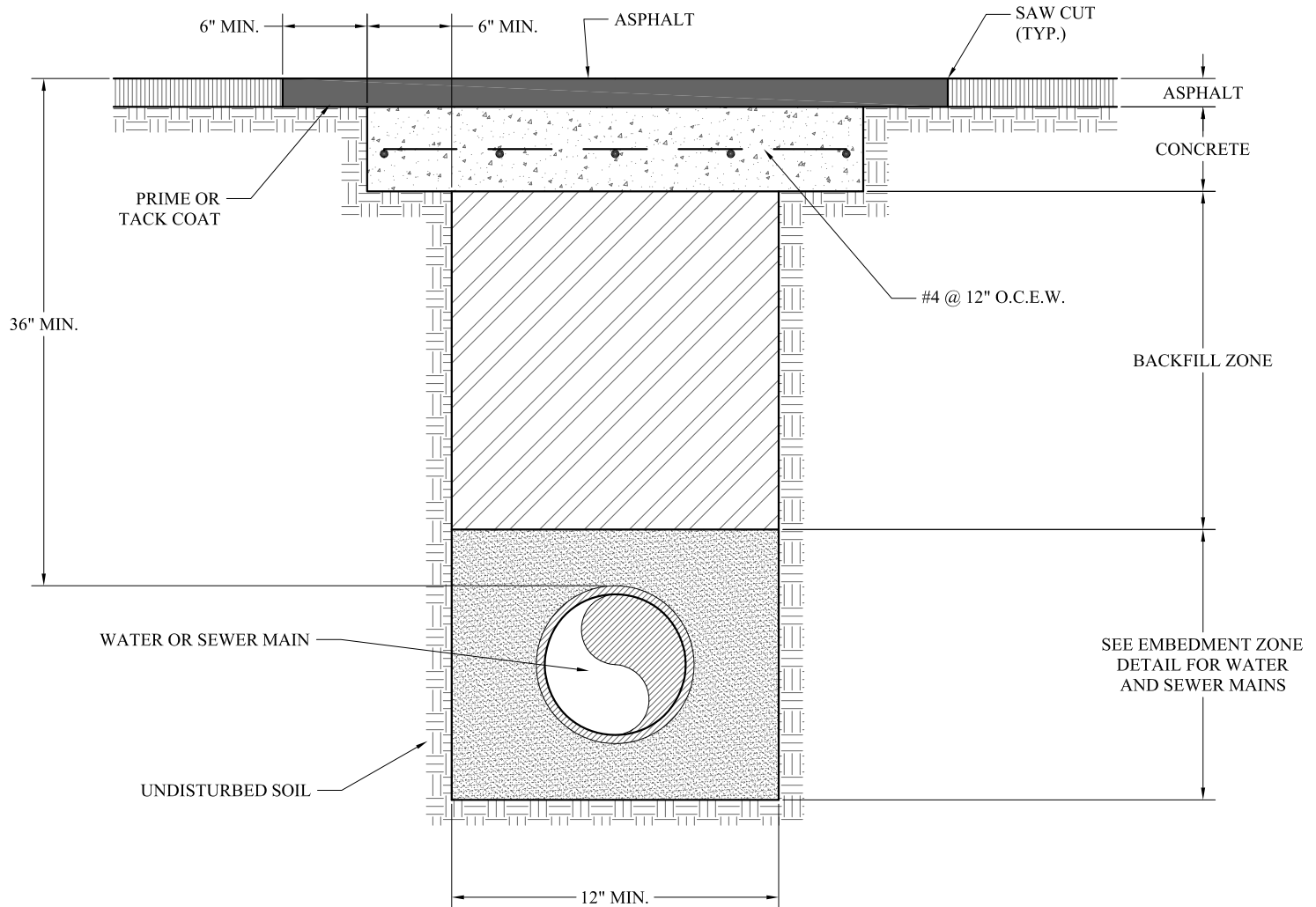
CITY OF SAN ANGELO

UTILITY TRENCH SECTION
OTHER UNPAVED AREAS

W-UTR-OUA

UTILITY TRENCH SECTION

CONCRETE CAP BELOW ASPHALT



- ASPHALT: 2" LAYER
TYPE D, TXDOT HOT MIX OR
TYPE D, TXDOT HOT MIX - COLD LAID
(MUST HAVE PRIOR CITY APPROVAL)
- PRIME COAT: TXDOT MC-30 ASPHALT AT THE RATE OF 0.25 TO 0.35
GALLON PER SQUARE YARD OF SURFACE
- TACK COAT: SHALL MEET THE REQUIREMENTS OF TXDOT ITEM 300
"ASPHALTS, OILS, AND EMULSIONS"
- CONCRETE: CLASS P, 3500 P.S.I., COMPRESSIVE; 555 P.S.I., FLEXURAL.
FOR CUTS OVER 2' WIDE, INSTALL #4 REBAR ON 12"
CENTERS EACH WAY.
- BACKFILL: FLEXIBLE BASE PER CITY OF SAN ANGELO
SPECIFICATIONS. COMPACTED IN 6" HORIZONTAL LAYERS
MINIMUM DENSITY 95% MODIFIED PROCTOR

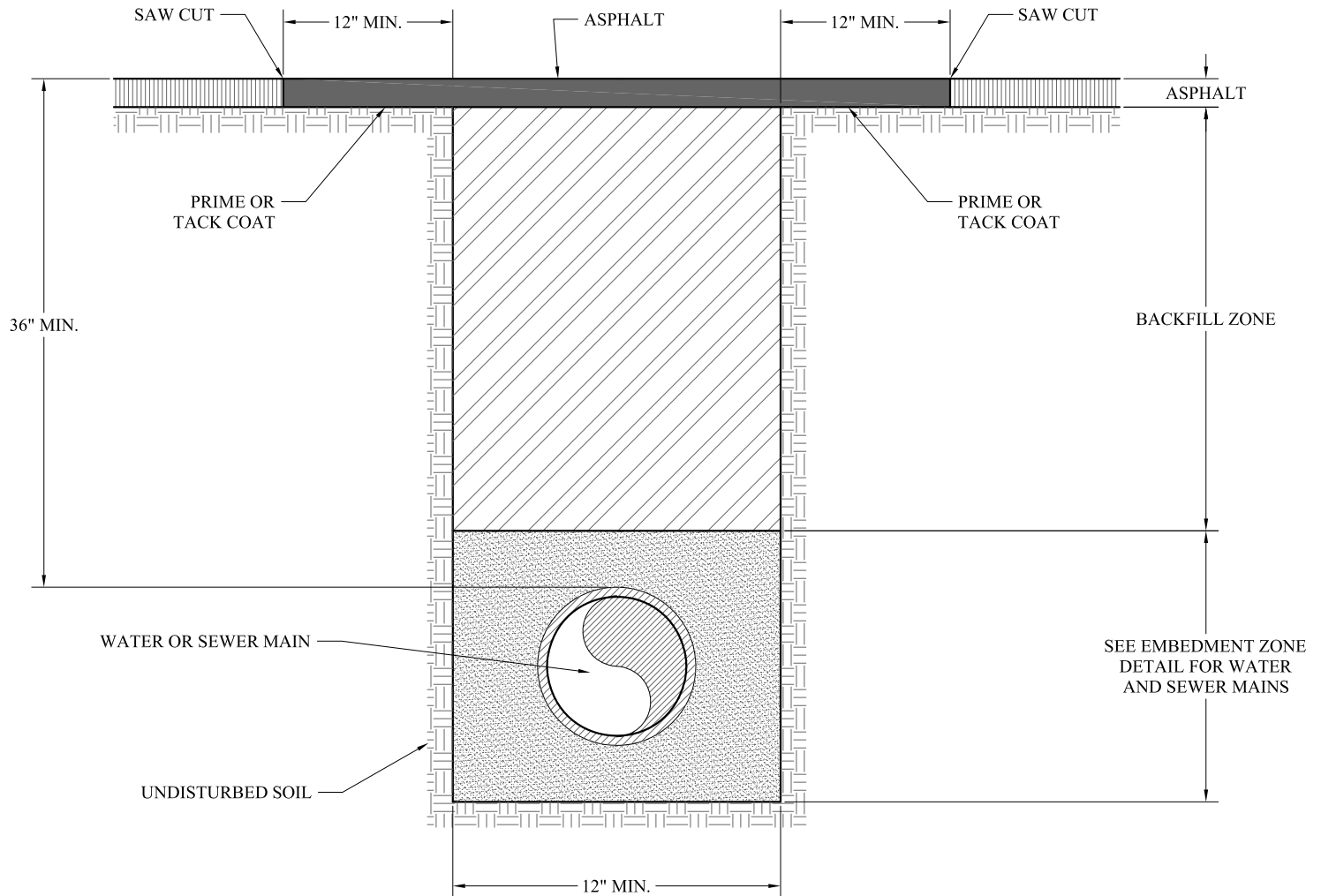
CITY OF SAN ANGELO

UTILITY TRENCH SECTION CONCRETE CAP
BELOW ASPHALT

W-UTR-CCBA

UTILITY TRENCH SECTION

ASPHALT PAVEMENT

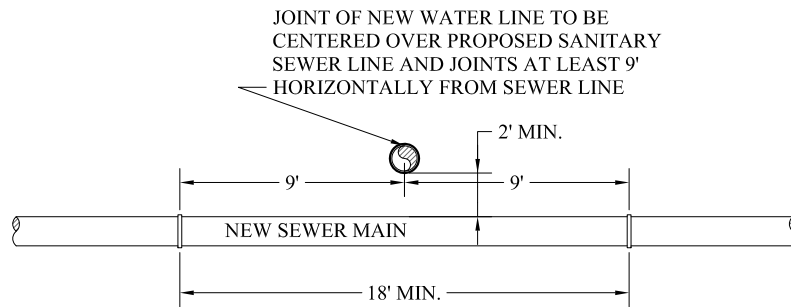


ASPHALT:	2" LAYER TYPE D, TxDOT HOT MIX OR TYPE D, TxDOT HOT MIX - COLD LAID (MUST HAVE PRIOR CITY APPROVAL)
PRIME COAT:	TxDOT MC-30 ASPHALT AT THE RATE OF 0.25 TO 0.35 GALLON PER SQUARE YARD OF SURFACE
TACK COAT:	SHALL MEET THE REQUIREMENTS OF TxDOT ITEM 300 "ASPHALTS, OILS, AND EMULSIONS".
BACKFILL ZONE:	FLEXIBLE BASE PER CITY OF SAN ANGELO SPECIFICATIONS COMPACTED IN 6" HORIZONTAL LAYERS. MINIMUM DENSITY 95% MODIFIED PROCTOR. (UNLESS NOTED OTHERWISE IN WRITING).

CITY OF SAN ANGELO

UTILITY TRENCH SECTION
ASPHALT PAVEMENT

W-UTR-ASP

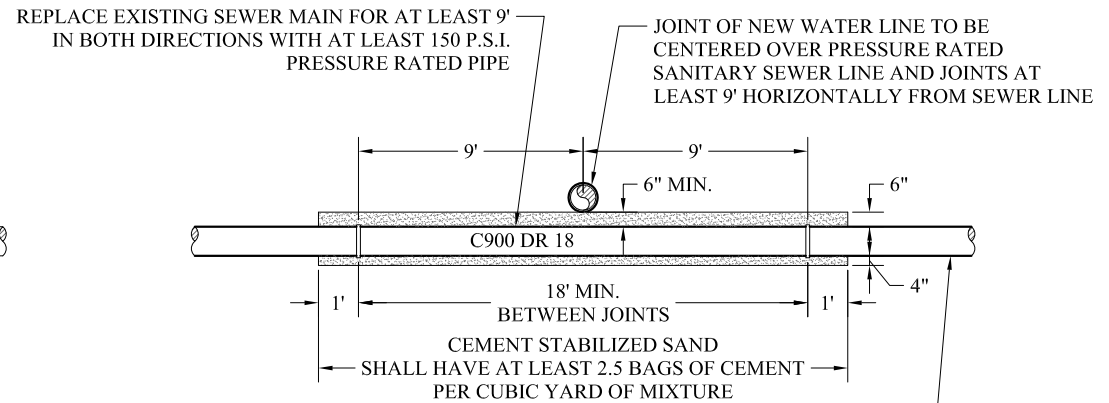


CONSTRUCTION SHALL BE IN ACCORDANCE WITH TCEQ CHAPTER 290, PUBLIC DRINKING WATER, SECTION 290.44(e)(4)(B)(i).

NOTE:
USE THIS INSTALLATION WHEN MIN. 2.0' VERTICAL SEPARATION BETWEEN WATER AND SEWER IS POSSIBLE.

CROSSING # 1

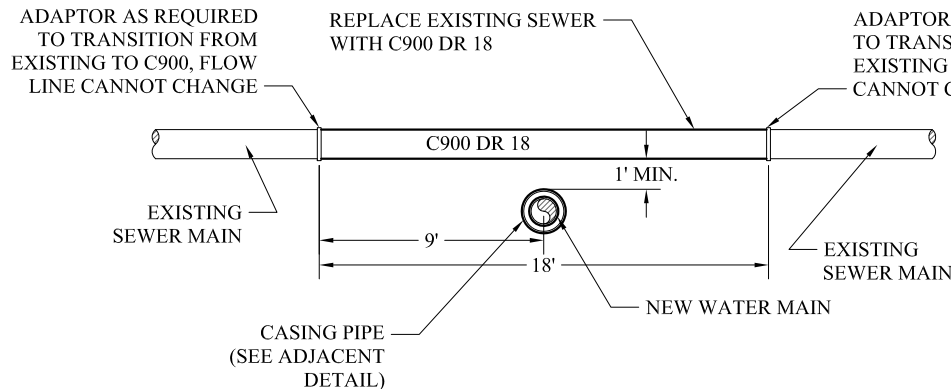
TYPICAL INSTALLATION OF NEW WATER LINE OVER NEW NON- PRESSURE RATED SANITARY SEWER LINE IN ACCORDANCE WITH TCEQ REGULATIONS



CONSTRUCTION SHALL BE IN ACCORDANCE WITH TCEQ CHAPTER 290, PUBLIC DRINKING WATER, SECTION 290.44(e)(4)(B)(v).

CROSSING # 2

TYPICAL INSTALLATION OF NEW WATER LINE OVER A PRESSURE RATED SANITARY SEWER LINE IN ACCORDANCE WITH TCEQ REGULATIONS

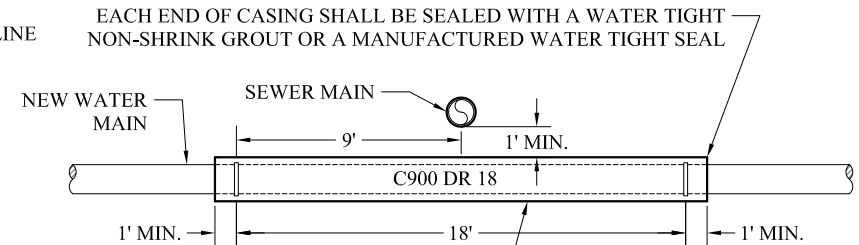


- NOTE:
1. IF STANDARD LENGTH OF PIPE IS LESS THAN 18', ADDITIONAL DETAILS WILL BE REQUIRED ALONG WITH COSA APPROVAL.
 2. IF A CROSSING NOT SHOWN HERE IS REQUIRED, CITY APPROVAL WILL BE REQUIRED PRIOR TO CONSTRUCTION.

NOTE:
USE THIS INSTALLATION WHEN WATER CROSSES UNDER A WASTEWATER MAIN OR LATERAL. BOTH WATER AND WASTEWATER MUST PASS A PRESSURE AND LEAKAGE TEST AS SPECIFIED IN AWWA C600 STANDARDS

CROSSING # 3

TYPICAL INSTALLATION OF NEW WATER LINE UNDER SANITARY SEWER LINE IN ACCORDANCE WITH TCEQ REGULATIONS



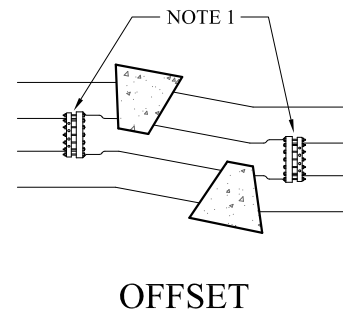
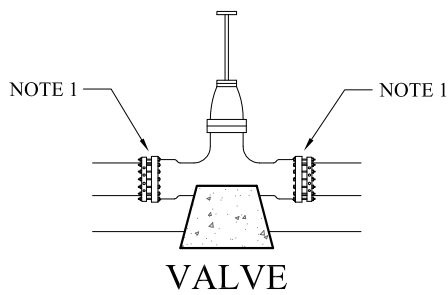
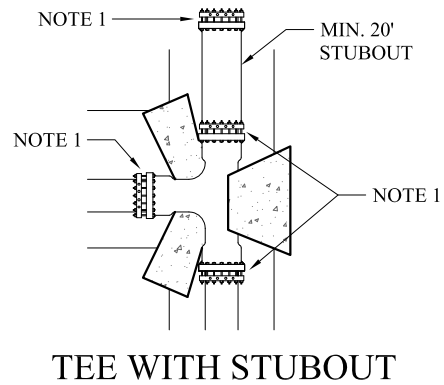
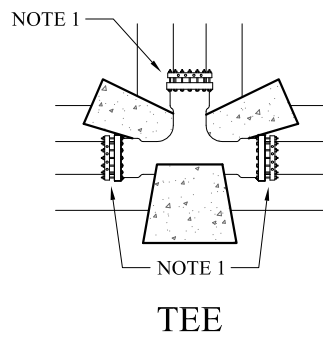
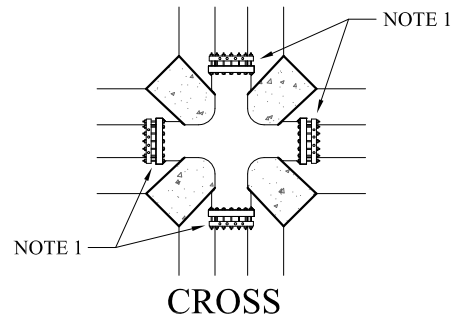
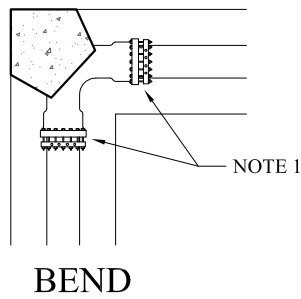
CASING PIPE TO BE DUCTILE IRON, STEEL PIPE, C900 PVC OR SDR 26 PVC WITH MECHANICAL OR WELDED JOINTS AS APPROPRIATE, TWO NOMINAL SIZES LARGER THAN THE WATER LINE. CASING PIPE A MINIMUM OF 18' TO ENCASE BOTH WATER LINE JOINTS. SPACERS PLACED AT 5' CENTERS.

WATER LINE SHALL BE ENCASED AS DESCRIBED IN TCEQ CHAPTER 290, PUBLIC DRINKING WATER, SECTION 290.44(e)(4)(B)(iv)(III).

CITY OF SAN ANGELO

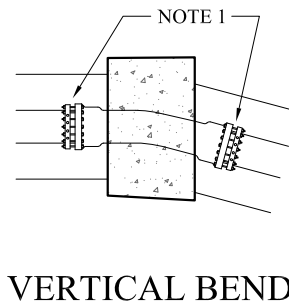
UTILITY CROSSING DETAILS
W-UTIL-XING

RETAINING GLAND, JOINT RESTRAINTS AND THRUST BLOCKING



NOTES:

1. ALL MECHANICAL JOINT CONNECTIONS ON BENDS SHALL BE EBBA IRON OR FORD "MEGA LUG" PIPE RESTRAINTS OR APPROVED EQUAL.
2. ALL CONCRETE TO BE 3,000 P.S.I. CONCRETE.



CITY OF SAN ANGELO

RETAINING GLAND, JOINT RESTRAINTS
AND THRUST BLOCKING

W-TB-1