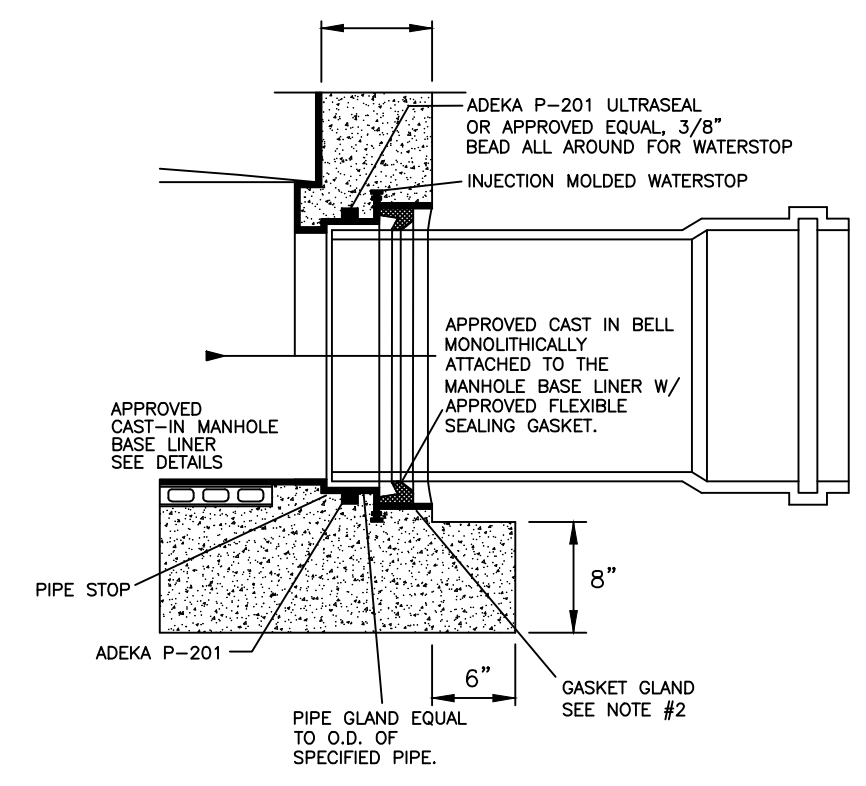


- NOTES:
1. CORED OPENING AND CHANNEL DIAMETER PER CHANNEL/BELL MANUFACTURER REQUIREMENTS. SIZES SHALL BE SPECIFIED ON SHOP DRAWING.
 2. ONLY AN APPROVED CHANNEL/BELL ASSEMBLY PROVIDED BY THE BASE LINER MANUFACTURER SHALL BE USED.
 3. CHANNEL/BELL ASSEMBLY MUST BE COMPLETELY GROUTED IN PLACE USING AN APPROVED CEMENT.
 4. UPON "SETTING" OF GROUT, THE NEW CHANNEL/BELL ASSEMBLY MUST BE JOINED TO THE EXISTING MANHOLE BASE LINER BY EITHER THERMO-PLASTIC WELDING OR FRP PATCH AS SPECIFIED BY BASE LINER MANUFACTURER.

FLOW CHANNEL/ PIPE CONNECTION TO EXISTING CAST-IN BASE LINER

34S



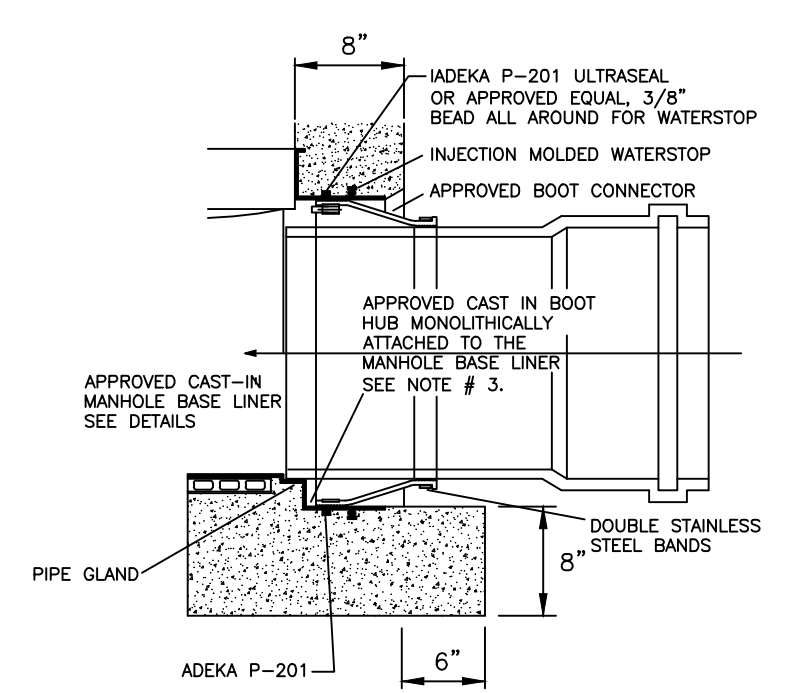
- INSTALLATION:
1. CLEAN BELL REMOVING ANY EXCESS CONCRETE SLURRY OR DIRT INSIDE BELL.
 2. INSTALL GASKET AS SHOWN.
 3. LUBRICATE PIPE SPOUT AND SLIDE INTO BELL AND GASKET UNTIL REACHING PIPE STOP.
 4. CHECK FOR WATERTIGHT CONNECTION. (VACUUM TESTING OR OTHER APPROVED METHOD).

DO NOT LUBRICATE THE GASKET OR THE BELL

- NOTES:
1. MANHOLE SHOP DRAWINGS SHALL IDENTIFY THE TYPE OF MANHOLE/PIPE CONNECTION.
 2. ONLY THE POLYISOPRENE GASKET SUPPLIED BY THE BELL MANUFACTURER SHALL BE USED IN COMPRESSION TYPE BELLS.
 3. BOOT HUB VARIES ACCORDING TO GASKET MANUFACTURER'S SPECIFICATION FOR SPECIFIC PIPE SIZE AND TYPE.
 4. MANHOLE SHOP DRAWINGS MUST IDENTIFY THE PIPE SIZE, TYPE, GASKET TYPE AND HOLE SIZE.

PIPE TO MANHOLE CONNECTION DETAIL TYPE "A" (GASKET)

35S



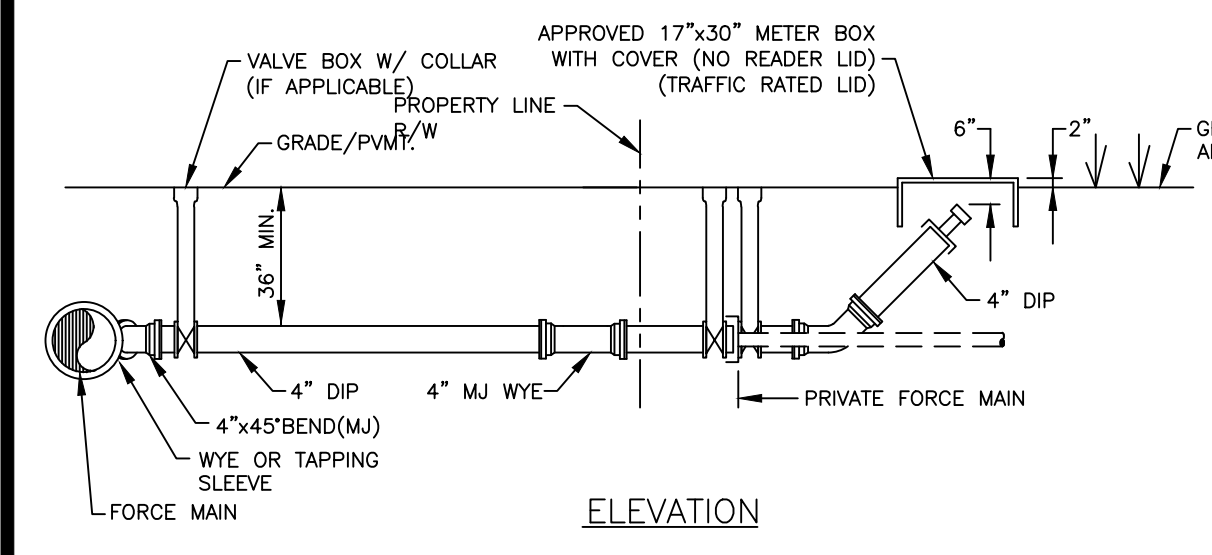
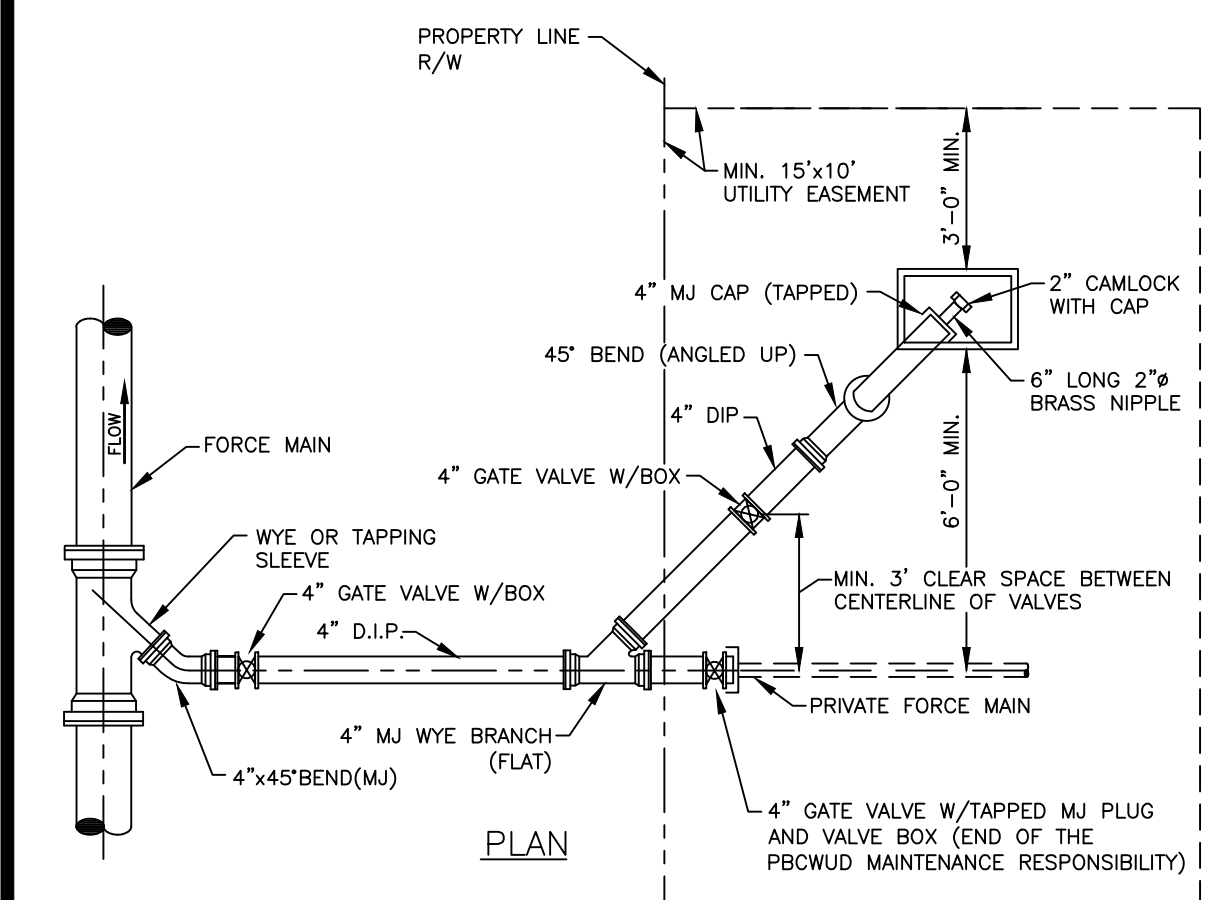
- INSTALLATION:
1. CLEAN BOOT HUB REMOVING ANY EXCESS CONCRETE SLURRY OR DIRT INSIDE BELL.
 2. INSTALL RUBBER BOOT CONNECTOR (PER MANUFACTURER'S INSTRUCTIONS). WEDGE STYLE EXPANDER BOLTS MUST BE ALIGNED WITH THE "TOP" OF BOOT HUB ACCESS NOTCH.
 3. PRE-MITER PIPE END AS REQUIRED TO PREDETERMINED PIPE DEFLECTION ANGLE. MERELY "DE-RIBB" PIPE END - DO NOT CHAMFER OR BEVEL PIPE END.
 4. LUBRICATE SPOUT, GREASE PIPE MITER, SLIDE INTO RUBBER BOOT CONNECTOR; "HONEY" PIPE TO BASE LINER CHANNEL END; DEFLECT PIPE AS REQUIRED. INSPECT MANHOLE BASE INTERIOR FOR CHANNEL/PIPE INVERT ALIGNMENT AND SEAL. TIGHTEN RUBBER BOOT CLAMP (PER MANUFACTURER'S INSTRUCTIONS).

DO NOT LUBRICATE THE GASKET OR THE BELL

- NOTES:
1. MANHOLE SHOP DRAWINGS SHALL IDENTIFY THE TYPE OF MANHOLE/PIPE CONNECTION.
 2. ONLY THE POLYISOPRENE GASKET SUPPLIED BY THE BELL MANUFACTURER SHALL BE USED IN COMPRESSION TYPE BELLS.
 3. BOOT HUB VARIES ACCORDING TO GASKET MANUFACTURER'S SPECIFICATION FOR SPECIFIC PIPE SIZE AND TYPE.
 4. MANHOLE SHOP DRAWINGS MUST IDENTIFY THE PIPE SIZE, TYPE, GASKET TYPE AND HOLE SIZE.

PIPE TO MANHOLE CONNECTION TYPE "B" (BOOT)

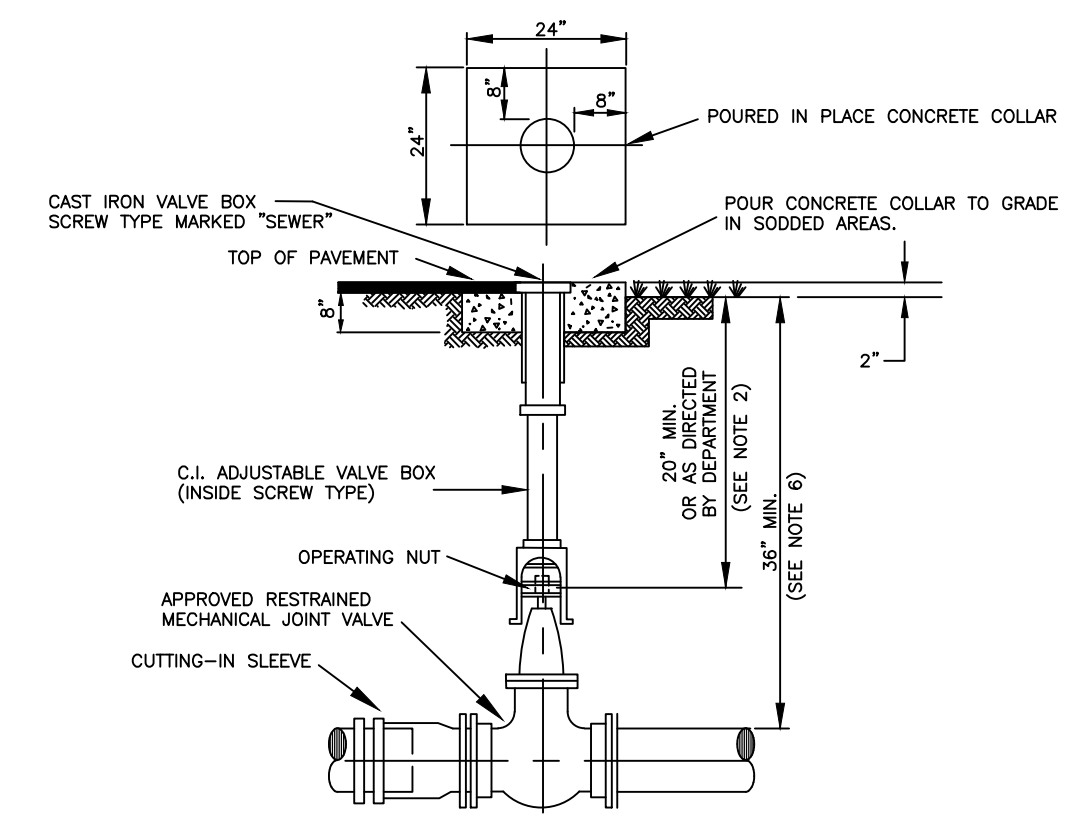
36S



- NOTE:
1. THE FLUSHING CONNECTION SHALL BE LOCATED IN GRASS AREA.
 2. ALL 4" PIPES SHALL BE RESTRAINED.

CONNECTION OF PRIVATE FORCE MAIN UNDER 4" IN DIAMETER

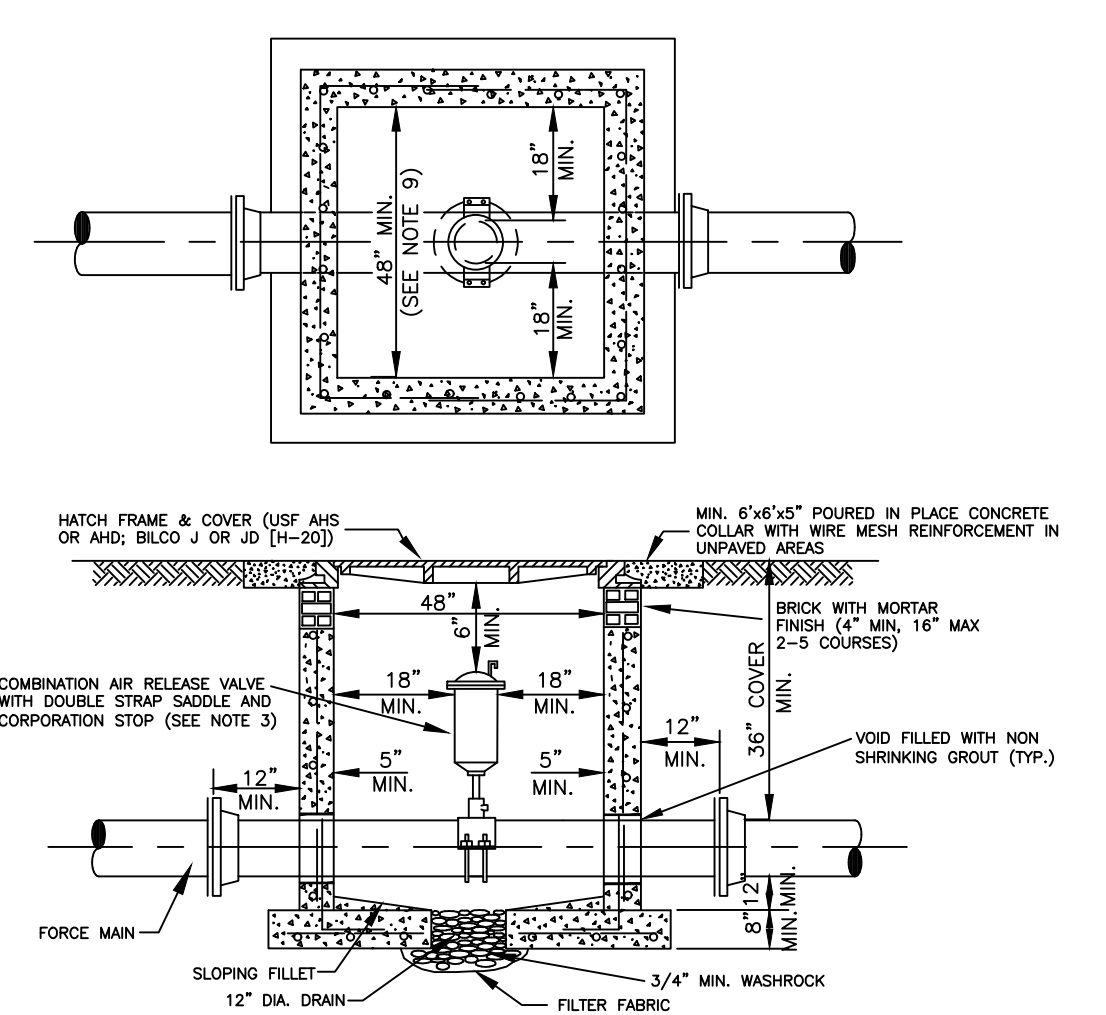
37S



- NOTES:
1. CONCRETE COLLAR IS NOT REQUIRED IN PAVED AREAS IF PAVEMENT SURFACE IS FINISHED PRIOR TO CONDITIONAL FINAL INSPECTION.
 2. WHEN OPERATING NUT IS DEEPER THAN 36" A ONE PIECE EXTENSION WILL BE REQUIRED TO BRING OPERATING NUT 20"-30" BELOW FINISHED GRADE. EXTENSION BOLTS & NUTS ARE TO BE STAINLESS STEEL. A HIGH STRENGTH STEEL CENTERING PLATE, WELDED TO THE EXTENSION, IS ALSO REQUIRED.
 3. VALVE BOXES SHALL HAVE COVERS MARKED "SEWER".
 4. EXTENSION VALVE BOX TO BE D.I.P. OR C-900 PVC DR 18 (COLOR: GREEN).
 5. A CUT-IN INSTALLATION SHALL REQUIRE MECHANICAL JOINT THROUGHOUT ASSEMBLY.
 6. IN ORDER TO MAINTAIN ADEQUATE COVER OVER VALVE NUT, THE FOLLOWING MINIMUM COVERS OVER PIPE ARE REQUIRED:
- | GATE VALVE SIZE | MIN. COVER OVER PIPE |
|-----------------|----------------------|
| 18" | 54" |
| 20" | 60" |
| 24" | 72" |
| 30" | 84" |
| 36" | 84" |
7. PIPE SHALL BE RESTRAINED ON BOTH SIDES OF THE VALVE AS REQUIRED.
 8. VALVES IN ROADWAYS SHALL BE LOCATED OUTSIDE OF WHEEL PATHS WHENEVER POSSIBLE.

TYPICAL FORCE MAIN GATE VALVE SETTING AND CUT-IN DETAIL

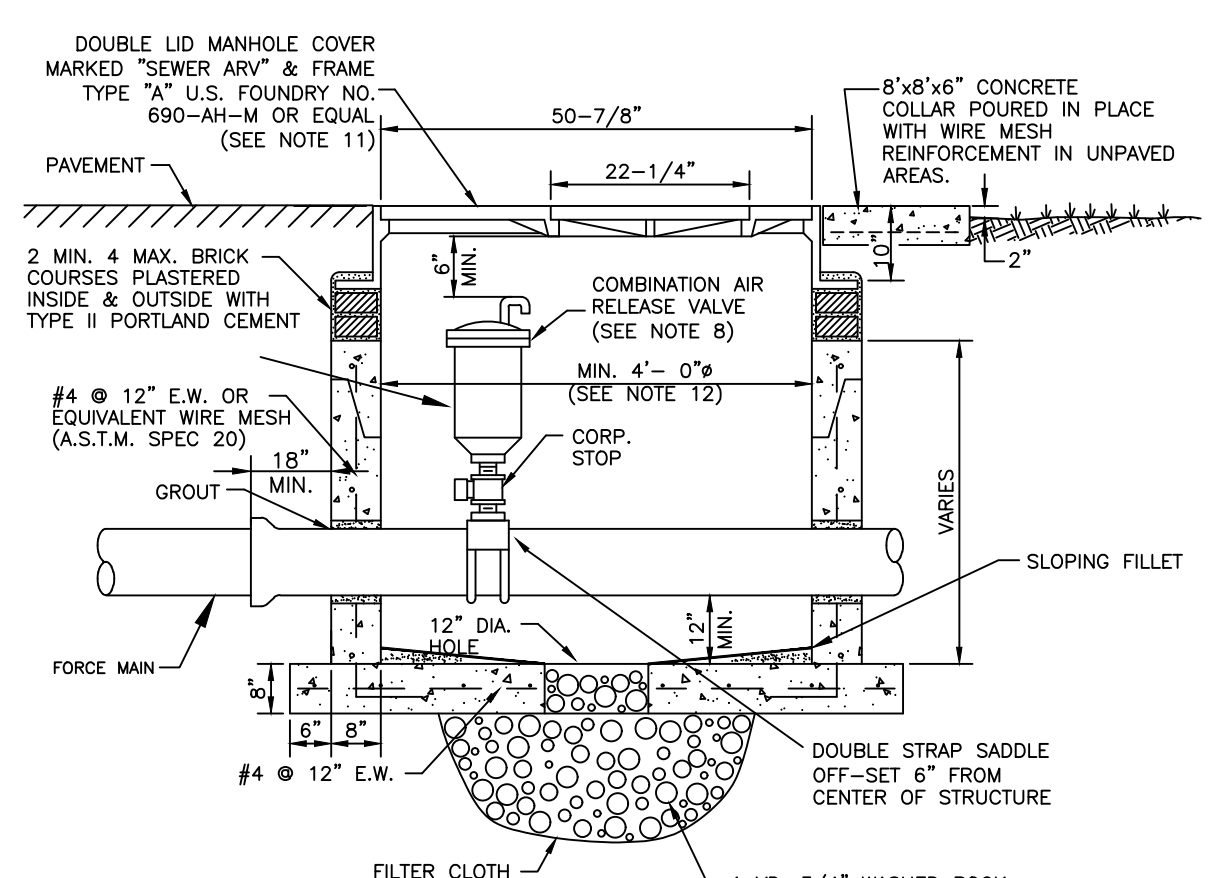
38S



- NOTES:
1. 4000 P.S.I. TYPE II CONCRETE.
 2. VAULT SHALL BE PRECAST WITH STEEL REINFORCING. SHOP DRAWING IS REQUIRED TO BE APPROVED BY THE DEPARTMENT PRIOR TO VAULT CONSTRUCTION AND/OR INSTALLATION.
 3. COMBINATION AIR RELEASE VALVE (ARV) SHALL BE TYPE AND SIZE APPROPRIATE FOR SERVICE INTENDED, ALTHOUGH A 2" MINIMUM SIZED ARV IS REQUIRED ON FORCE MAIN INSTALLATIONS.
 4. ALL OPENINGS SHALL BE SEALED WITH WATERPROOF NON-SHRINKING GROUT.
 5. ALTERNATE VAULT AND COVER DESIGN MAY BE USED PROVIDED ALTERNATE VAULT AND/OR COVER SHOP DRAWINGS WERE SUBMITTED AND APPROVED BY THE DEPARTMENT PRIOR TO THE VAULT AND/OR COVER BEING INSTALLED.
 6. COAT INSIDE WITH AN APPROVED CORROSION BARRIER SYSTEM.
 7. DUCTILE IRON PIPE IS REQUIRED THROUGH THE VAULT. NO PIPE JOINTS WITHIN THE VAULT.
 8. THREADED AREAS OF CORPORATION STOP SHALL BE SPIRAL WRAPPED WITH TWO WRAPS OF TEFLON TAPE.
 9. LARGER VAULTS WILL BE REQUIRED FOR PIPES LARGER THAN 12"
- | PIPE SIZE | MIN. VAULT SIZE |
|-----------|-----------------|
| 16"-24" | 4'W x 5'L |
| 30"-42" | 4'W x 6'L |

FORCE MAIN AIR RELEASE VALVE AND MANHOLE OUTSIDE OF R/W, NON-TRAFFIC VAULT

39S



- NOTES:
1. PRECAST 4000 P.S.I. TYPE II CONCRETE STRUCTURE. SHOP DRAWING IS REQUIRED TO BE APPROVED BY THE DEPARTMENT.
 2. ALL OPENINGS SHALL BE SEALED WITH A WATERPROOF NON-SHRINKING GROUT.
 3. LIFT HOLES ARE PERMITTED.
 4. ALL PIPE HOLES SHALL BE PRECAST.
 5. MANHOLE FABRICATION SHALL BE IN ACCORDANCE WITH A.S.T.M. C-478 LATEST STANDARD.
 6. COAT INSIDE WITH AN APPROVED PROTECTIVE CORROSION BARRIER SYSTEM.
 7. CONCRETE COLLAR REQUIRED WHEN MANHOLE IS OUTSIDE OF PAVEMENT, SEE DETAIL.
 8. COMBINATION AIR RELEASE VALVE (ARV) SHALL BE TYPE AND SIZE APPROPRIATE FOR SERVICE INTENDED, ALTHOUGH A 2" MINIMUM SIZED ARV IS REQUIRED ON FORCE MAIN INSTALLATIONS.
 9. DUCTILE IRON PIPE IS REQUIRED THROUGH THE MANHOLE. NO PIPE JOINTS INSIDE THE MANHOLE.
 10. THREADED AREAS OF CORPORATION STOP SHALL BE SPIRAL WRAPPED WITH TWO WRAPS OF TEFLON TAPE.
 11. FORCE MAINS 12" AND SMALLER, AN ALTERNATE VAULT AND COVER DESIGN MAY BE USED PROVIDED ALTERNATE VAULT AND/OR COVER SHOP DRAWINGS WERE SUBMITTED AND APPROVED BY THE DEPARTMENT PRIOR TO THE VAULT AND/OR COVER BEING INSTALLED.
 12. LARGER MANHOLES WILL BE REQUIRED FOR PIPES LARGER THAN 12"
- | PIPE SIZE | MIN. MANHOLE DIAMETER |
|-----------|-----------------------|
| 16"-24" | 60" |
| 30"-42" | 72" |

FORCE MAIN AIR RELEASE VALVE AND MANHOLE IN PAVED AREAS AND ROAD R/W

40S

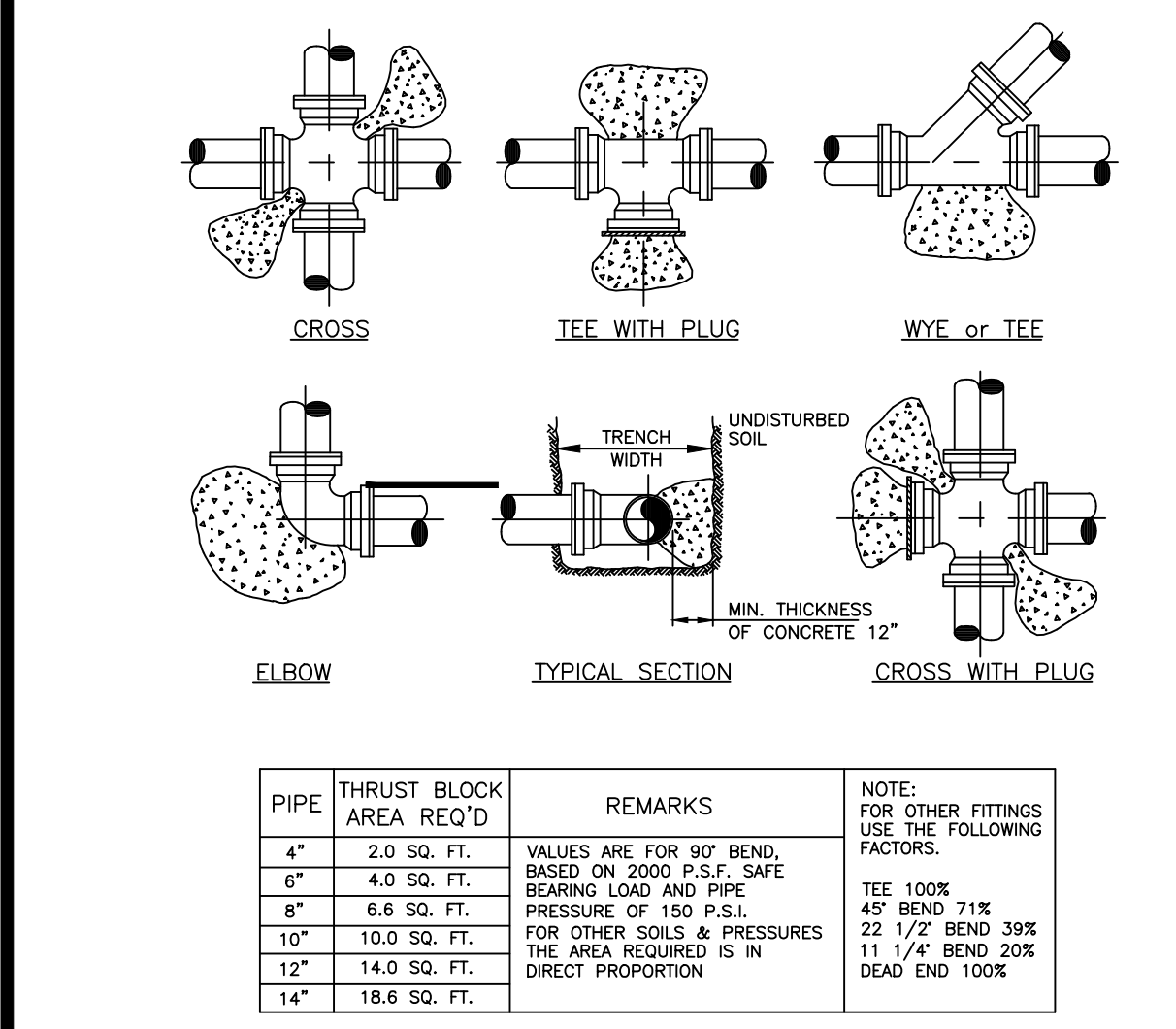
MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED
(SOURCES: EBAA IRON RESTRAINT LENGTH CALCULATION PROGRAM FOR PVC PIPE, RELEASE 3.1, AND DIPRA THRUST RESTRAINT FOR DUCTILE IRON PIPE, RELEASE 3.2)

FITTING TYPE	PIPE SIZE											
	4"	6"	8"	10"	12"	14"	16"	20"	24"	30"	36"	48"
90° HORIZ. BEND	14	20	25	30	35	45	54	62	73	84	93	101
45° HORIZ. BEND	6	8	11	13	15	19	22	26	30	35	38	42
22.5° HORIZ. BEND	3	4	5	6	7	9	11	12	15	17	18	20
11.25° HORIZ. BEND	1	2	3	3	4	4	5	6	7	8	9	10
90° VERT. OFFSET	29	41	53	64	74	95	115	134	160	185	207	228
45° VERT. OFFSET	7	10	13	16	19	25	30	35	42	49	56	62
22.5° VERT. OFFSET	3	4	6	7	8	10	12	15	18	20	23	26
11.25° VERT. OFFSET	1	1	1	2	2	3	3	4	5	5	6	6
PLUG (DEAD END)	32	45	59	70	83	107	129	151	160	185	207	228
IN-LINE VALVE	32	45	45	45	55	65	80	85	95	105	115	115
6\"/>												
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- NOTES:
1. THE DATA IN THE ABOVE TABLE ARE BASED UPON THE FOLLOWING INSTALLATION CONDITIONS: SOIL TYPE-SAND TEST PRESSURE-150 PSI TRENCH TYPE-TRENCH FACTOR-1.3 MINIMUM PIPE LENGTH ALONG TEE-5'
 2. THE RESTRAINED PIPE LENGTHS APPLY TO DUCTILE IRON AND PVC PIPE.
 3. ALL JOINTS BETWEEN UPPER AND LOWER BENDS SHALL BE RESTRAINED.
 4. RESTRAINED PIPE LENGTHS APPLY TO PIPE ON BOTH SIDES OF VALVES AND FITTINGS.
 5. MULTIPLY PIPE LENGTH BY 1.4 FOR POLYETHYLENE ENCASED PIPE.
 6. RESTRAINED PIPE LENGTHS EQUAL TO AN "IN-LINE VALVE" CONDITION ARE REQUIRED AT EACH END OF A TRANSITION FROM HOPE PIPE TO OTHER PIPE MATERIALS.
 7. DESIGN ENGINEER IS RESPONSIBLE FOR PROPER RESTRAINT PIPE LENGTH SIZING FOR THE PROJECT.

MECHANICAL THRUST RESTRAINT MINIMUM PIPE LENGTHS (FORCE MAINS)

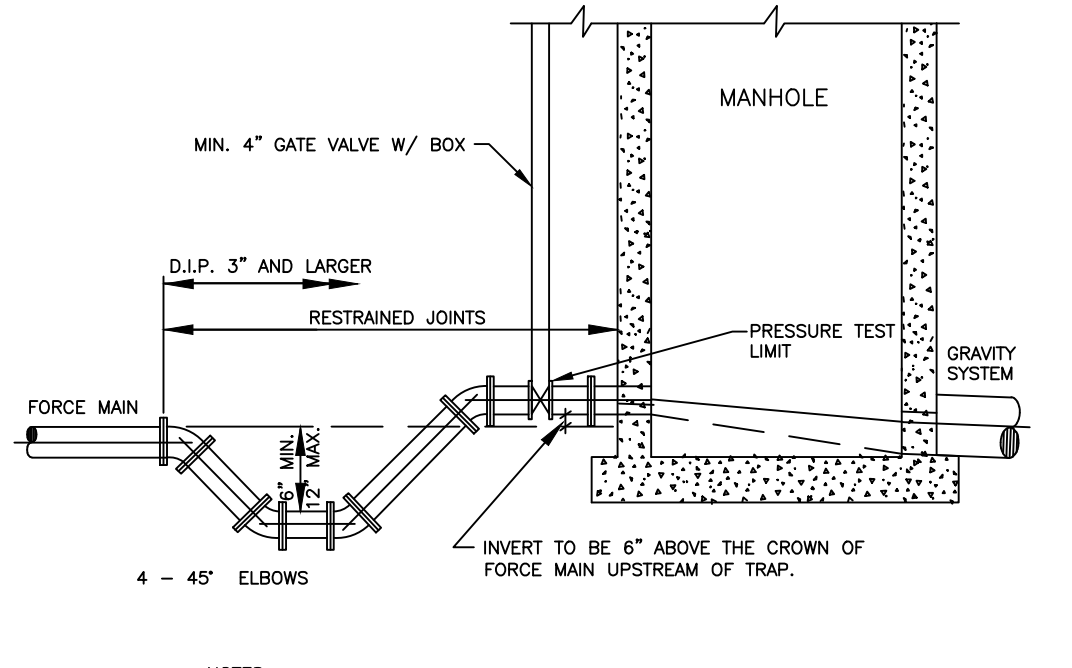
41S



- NOTES:
1. CONCRETE THRUST BLOCKS OR THRUST COLLARS MAY BE UTILIZED ONLY IF NECESSARY FOR CONNECTIONS TO AN EXISTING PIPING SYSTEM. OTHERWISE MECHANICAL RESTRAINTS SHALL BE USED. KEEP "T" BOLTS CLEAR OF CONCRETE, WRAPPED IN VISQUEEN FOR FUTURE ACCESS, WITH A MINIMUM OF 1" THICKNESS BETWEEN THE FITTING AND SOIL.
 2. BEFORE POURING CONCRETE, PLUGS SHALL BE WRAPPED WITH VISQUEEN AND A BOARD PLACED IN FRONT.
 3. CONCRETE SHALL BE 2500 P.S.I. MINIMUM.
 4. THE ENGINEER OF RECORD SHALL SUBMIT A THRUST BLOCK SIZE CALCULATION FOR TEE CONNECTIONS INTO UNRESTRAINED EXISTING MAINS LARGER THAN 14".
 5. THE ENGINEER OF RECORD SHALL SUBMIT A PIPE RESTRAINT DESIGN FOR IN-LINE EXTENSIONS OF AN EXISTING UNRESTRAINED MAIN IF MECHANICAL JOINT RESTRAINT CAN NOT BE INSTALLED ON THE EXISTING MAIN.

TYPICAL THRUST BLOCKS FOR PRESSURE PIPING

42S



- NOTES:
1. FORCE MAIN TO ENTER MANHOLE AS CLOSE AS POSSIBLE TO 180° TO GRAVITY OUTLET.
 2. THE INVERT LEVEL OF FORCE MAIN AT POINT OF ENTRY SHALL BE 6" ABOVE OUTFLOW INVERT OF MANHOLE.
 3. CORE ENTRY ONLY INTO EXISTING MANHOLES.
 4. TRAP TO BE LOCATED PRIOR TO DROP INTO MANHOLE AND OUTSIDE OF PAVED AREAS.
 5. USE TWO 45° ELBOWS PAST TRAP IF ELEVATION DROP IS REQUIRED TO ENTER MANHOLE.
 6. CAST-IN OR FIELD INSTALLED FLOW CHANNEL IS REQUIRED.
 7. MANHOLE WALL TO BE COATED WITH AN APPROVED SOLID THERMOPLASTIC CAST-IN CORROSION BARRIER SYSTEM.
 8. TRAP JOINTS TO BE RESTRAINED.

FORCE MAIN ENTERING MANHOLE WASTEWATER #5 STANDARD DETAILS

43S

CONSULTANT:

DESIGNED BY: _____ WUD _____

DRAWN BY: _____ M. BUCKNER _____ Palm Beach County

CHECKED BY: _____ J. LAMMERT _____ Water Utilities Department

APPROVED BY: _____ WUD _____ P.O. Box 16097 West Palm Beach, FL 33416-6097

IT'S THE LAW! CALL 48 HOURS BEFORE YOU DIG 1-800-432-4770 SUNSHINE STATE ONE CALL OF FLORIDA, INC. UTILITIES NOTIFICATION CENTER.

SHEET NUMBER 0 OF 0

SEAL

WUD PROJECT NO. 00-000

WUD PROJECT NAME

PALM BEACH COUNTY WATER UTILITIES DEPARTMENT P.O. BOX 16097 WEST PALM BEACH, FL 33416 (561)493-6000

NO.	DATE	REVISION / REMARKS
	JUNE 2019	GENERAL REVISION
	OCT 2021	GENERAL REVISION
	JAN 2023	GENERAL REVISION

BY: J.L. J.L. J.L.

STD DETAILS

Feb 27, 2023