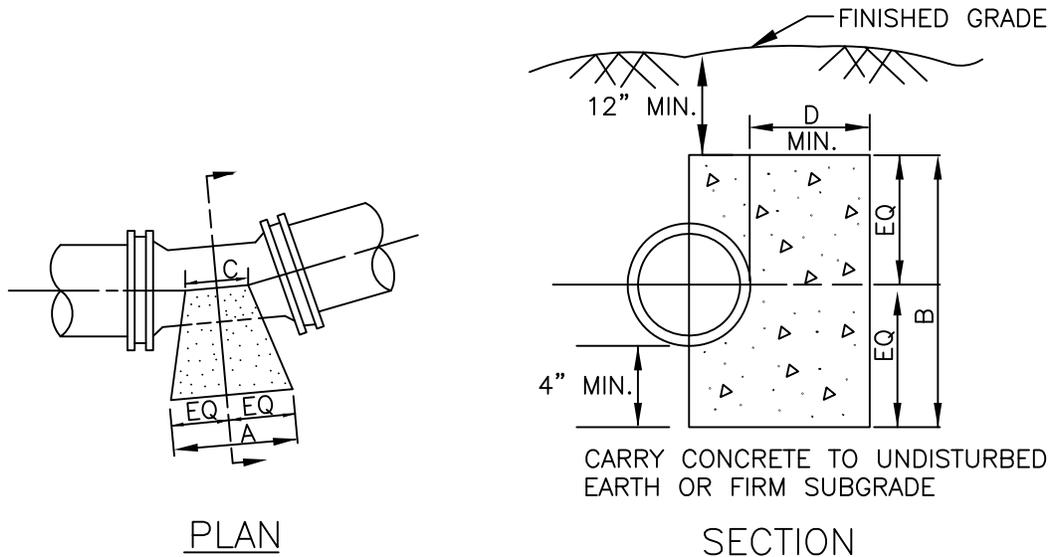


**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



PLAN

SECTION

PIPE SIZE	11-1/4° BEND				22-1/2° BEND				45° BEND				90° BEND			
	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
4"	6"	1'-0"	4"	6"	8"	1'-0"	6"	7"	1'-1"	1'-0"	6"	6"	1'-10"	1'-0"	6"	1'-0"
6"	8"	1'-2"	6"	7"	10"	1'-2"	6"	8"	1'-4"	1'-2"	6"	8"	2'-3"	1'-2"	6"	1'-6"
8"	8"	1'-4"	8"	7"	1'-4"	1'-4"	8"	8"	2'-0"	1'-4"	8"	9"	3'-3"	1'-4"	8"	1'-6"
10"	1'-1"	1'-6"	8"	8"	1'-7"	1'-6"	8"	10"	2'-6"	1'-6"	8"	10"	3'-9"	2'-0"	10"	1'-6"
12"	1'-4"	1'-8"	1'-0"	9"	2'-0"	1'-8"	1'-0"	1'-0"	3'-3"	1'-8"	1'-0"	1'-0"	5'-0"	2'-0"	10"	1'-6"
16"	1'-9"	2'-0"	1'-0"	9"	2'-6"	2'-0"	1'-0"	1'-3"	4'-3"	2'-6"	1'-0"	1'-3"	6'-0"	2'-6"	1'-4"	1'-9"
18"	1'-9"	2'-6"	1'-0"	10"	3'-3"	2'-6"	1'-0"	1'-6"	6'-0"	2'-6"	1'-0"	1'-4"	8'-0"	3'-4"	1'-8"	1'-9"
20"	1'-9"	2'-6"	1'-0"	10"	3'-3"	2'-6"	1'-0"	1'-6"	6'-0"	2'-6"	1'-0"	1'-4"	8'-0"	3'-4"	1'-8"	1'-9"
24"	2'-0"	3'-0"	1'-0"	1'-0"	3'-9"	3'-0"	1'-0"	1'-6"	7'-0"	3'-0"	1'-0"	1'-9"	9'-9"	4'-0"	2'-0"	2'-0"
30"	2'-6"	3'-6"	1'-4"	1'-2"	4'-0"	3'-6"	1'-4"	1'-9"	7'-6"	4'-0"	1'-4"	2'-3"	9'-9"	5'-0"	2'-6"	2'-6"

NOTES:

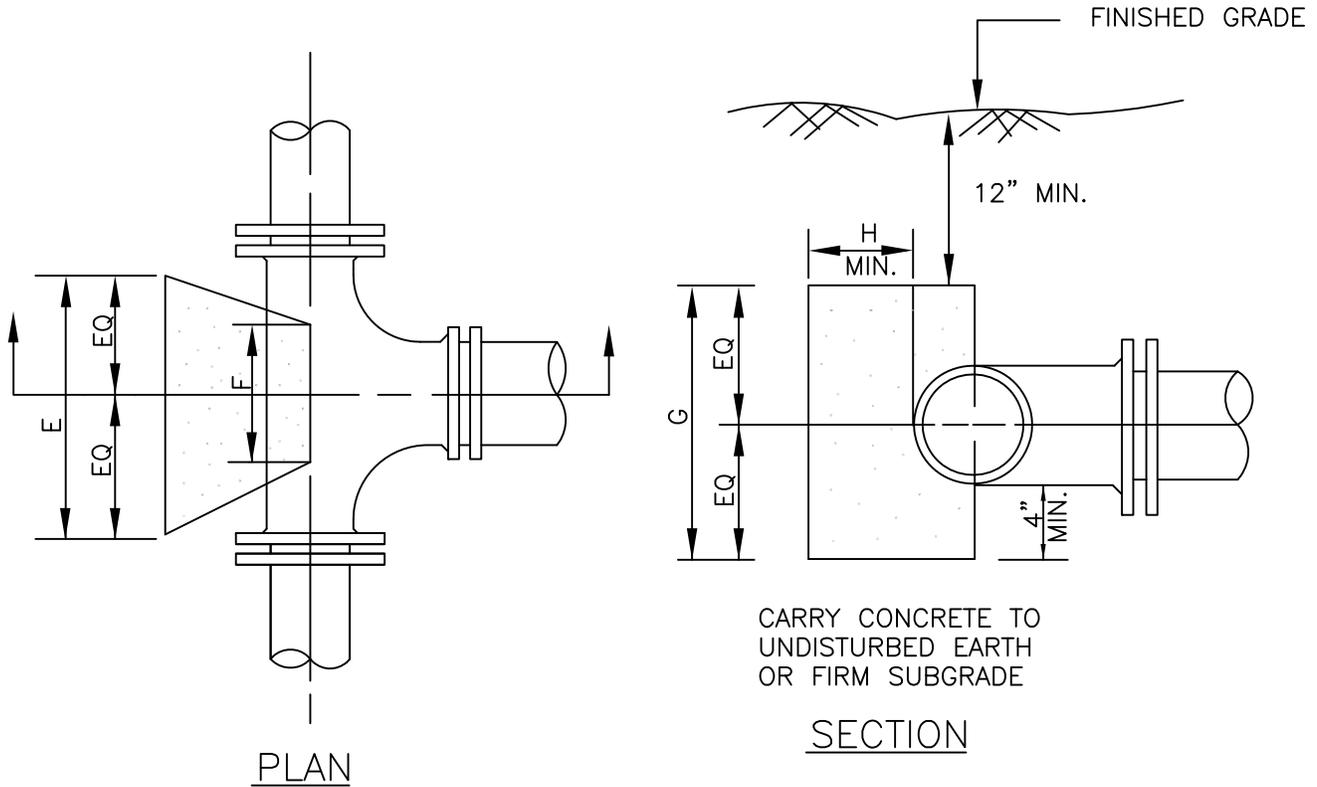
1. BLOCKING DIMENSIONS ARE SHOWN AT A MINIMUM.
2. BLOCKING DIMENSIONS ARE BASED ON A STATIC PRESSURE OF 150 PSI AND AN ALLOWABLE SOIL BEARING CAPACITY OF 2,000 PSF.
3. WHERE SOIL BEARING CAPACITY IS LESS THAN OR GREATER THAN 2,000 PSF, BLOCKING DESIGN CALCULATIONS ARE TO BE SHOWN ON THE PLANS.
4. FITTINGS TO BE WRAPPED IN 4 MIL POLYETHYLENE TO PROTECT NUTS AND BOLTS.

DATE MAY 2004  
REV JAN 2011

**BLOCKING DETAIL  
HORIZONTAL BENDS**

DETAIL  
**BLK-1**

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



BRANCH SIZE	E	F	G	H
4"	1'-0"	8"	1'-4"	6"
6"	1'-4"	1'-0"	1'-8"	8"
8"	1'-6"	1'-0"	2'-6"	9"
10"	2'-2"	1'-0"	2'-8"	10"
12"	2'-6"	1'-0"	3'-6"	1'-0"
16"	3'-4"	1'-4"	4'-8"	1'-2"
18"	4'-0"	2'-0"	6'-0"	1'-6"
20"	4'-0"	2'-0"	6'-0"	1'-6"
24"	5'-0"	2'-0"	6'-8"	1'-8"
30"	5'-6"	2'-6"	7'-0"	1'-10"

NOTE: SEE APPLICABLE NOTES AS SHOWN ON BLK-1

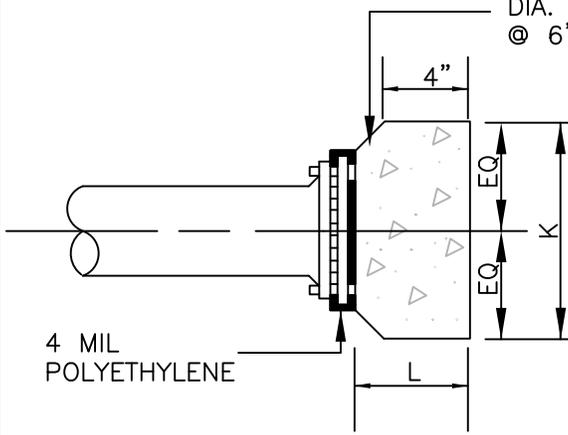
DATE MAY 2004  
REV JAN 2011

**BLOCKING DETAIL  
TEES**

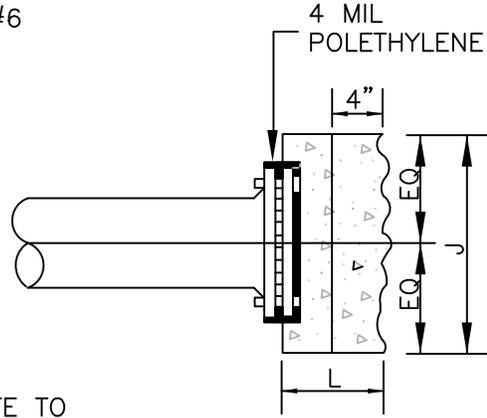
DETAIL  
**BLK-2**

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

REINFORCING FOR 16"  
DIA. & LARGER PIPE #6  
@ 6" E. W.



PLAN



ELEVATION

CARRY CONCRETE TO  
UNDISTURBED EARTH  
OR FIRM SUBGRADE

SIZE	J	K	L
4"	1'-0"	1'-0"	8"
6"	1'-6"	1'-6"	8"
8"	2'-6"	1'-6"	10"
10"	2'-8"	2'-2"	1'-0"
12"	3'-6"	2'-6"	1'-2"
16"	4'-8"	3'-4"	1'-4"
18"	6'-0"	4'-0"	1'-6"
20"	6'-0"	4'-0"	1'-6"
24"	6'-8"	5'-0"	1'-8"
30"	8'-0"	6'-8"	2'-0"

NOTE: SEE APPLICABLE  
NOTES AS SHOWN  
ON BLK-1

NOTE: BLOCKING BASED ON PRESSURE OF 150 P.S.I. AND  
ALLOWABLE SOIL BEARING CAPACITY OF 2000 P.S.F.  
CONCRETE TO BE 3000 P.S.I.

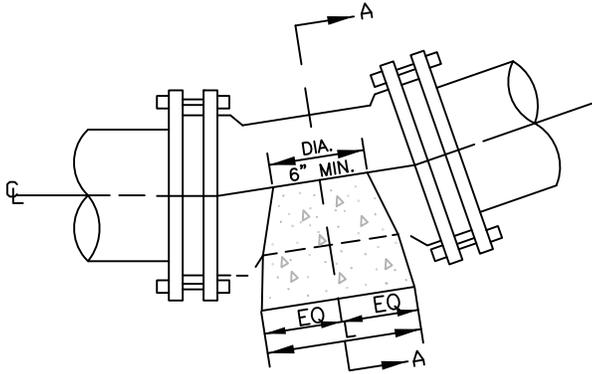
DATE MAY 2004  
REV JAN 2011

**BLOCKING DETAIL  
PLUGS, CAPS, AND HYDRANTS**

DETAIL  
**BLK-3**

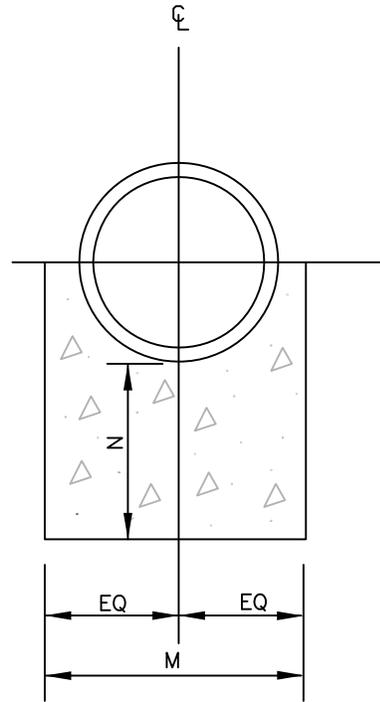
**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

NOTE: SEE APPLICABLE NOTES  
AS SHOWN ON BLK-1.



ELEVATION

CARRY CONCRETE TO  
UNDISTURBED EARTH  
OR FIRM SUBGRADE



SECTION A-A

PIPE SIZE	11-1/4° BEND			22-1/2° BEND			45° BEND		
	L	M	N	L	M	N	L	M	N
6"	6"	1'-2"	8"	10"	1'-2"	8"	1'-2"	1'-2"	8"
8"	8"	1'-4"	8"	11"	1'-4"	8"	1'-9"	1'-4"	8"
10"	8"	1'-6"	8"	1'-3"	1'-6"	9"	2'-5"	1'-6"	1'-0"
12"	8"	2'-0"	8"	1'-4"	2'-0"	9"	2'-8"	2'-0"	1'-2"
16"	1'-1"	2'-4"	9"	2'-1"	2'-4"	1'-0"	4'-0"	2'-4"	1'-6"
18"	1'-5"	2'-8"	10"	2'-9"	2'-8"	1'-2"	5'-6"	2'-8"	2'-0"
20"	1'-5"	2'-8"	10"	2'-9"	2'-8"	1'-2"	5'-6"	2'-8"	2'-0"
24"	1'-10"	3'-0"	1'-0"	3'-7"	3'-0"	1'-4"	6'-0"	3'-6"	2'-6"
30"	2'-0"	3'-6"	1'-2"	3'-11"	3'-6"	1'-6"	6'-6"	3'-10"	2'-9"

NOTE: BLOCKING BASED ON PRESSURE OF 150 PSI AND ALLOWABLE SOIL BEARING CAPACITY OF 2000 PSF. CONCRETE TO BE 3000 PSI.

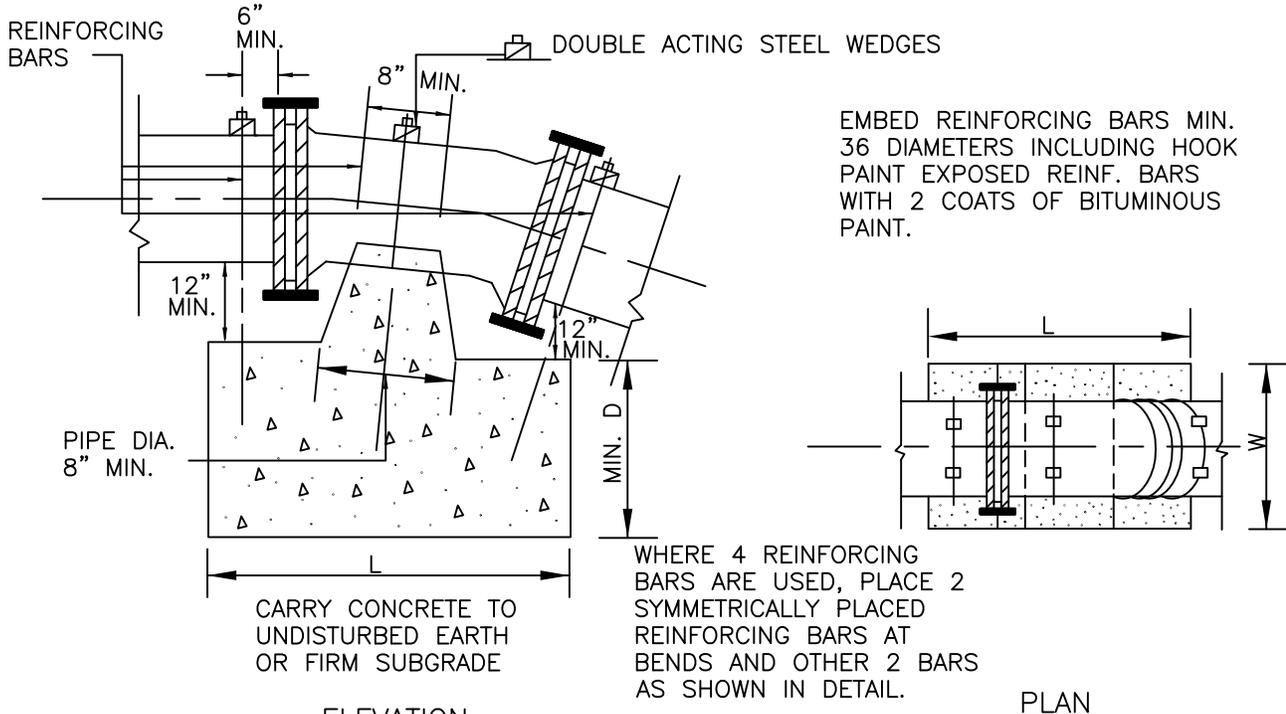
DATE MAY 2004  
REV JAN 2011

**BLOCKING DETAIL  
LOWER VERTICAL BENDS**

DETAIL  
**BLK-4**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

NOTE: SEE APPLICABLE NOTES  
AS SHOWN ON BLK-1



EMBED REINFORCING BARS MIN. 36 DIAMETERS INCLUDING HOOK  
PAINT EXPOSED REINF. BARS  
WITH 2 COATS OF BITUMINOUS PAINT.

WHERE 4 REINFORCING BARS ARE USED, PLACE 2 SYMMETRICALLY PLACED REINFORCING BARS AT BENDS AND OTHER 2 BARS AS SHOWN IN DETAIL.

PIPE SIZE	11-1/4° BEND				22-1/2° BEND				45° BEND			
	L	W	D	REINF. BAR # & SIZE	L	W	D	REINF. BAR # & SIZE	L	W	D	REINF. BAR # & SIZE
6"	2'-0"	2'-0"	1'-6"	3 # 7	2'-6"	2'-6"	2'-0"	3 # 7	3'-0"	3'-0"	2'-0"	3 # 7
8"	2'-0"	2'-0"	2'-0"	3 # 8	2'-9"	2'-9"	2'-3"	3 # 8	3'-6"	3'-6"	2'-6"	3 # 8
10"	2'-3"	2'-3"	2'-0"	3 # 8	3'-6"	3'-6"	2'-3"	3 # 8	4'-0"	4'-0"	2'-9"	4 # 8
12"	2'-6"	2'-6"	2'-3"	3 # 8	4'-0"	4'-0"	2'-6"	4 # 8	4'-6"	4'-6"	3'-0"	4 # 8
16"	3'-3"	3'-3"	2'-6"	3 # 8	4'-6"	4'-6"	3'-0"	4 # 8	6'-0"	6'-0"	3'-6"	4 # 10
18"	4'-0"	4'-0"	2'-6"	3 # 10	5'-6"	5'-6"	3'-6"	3 # 10	7'-6"	7'-6"	4'-0"	4 # 10
20"	4'-0"	4'-0"	2'-6"	3 # 10	5'-6"	5'-6"	3'-6"	3 # 10	7'-6"	7'-6"	4'-0"	4 # 10
24"	4'-6"	4'-6"	3'-0"	3 # 10	6'-0"	6'-0"	4'-0"	4 # 10	8'-6"	8'-6"	4'-6"	4 # 10

**NOTES:**

1. BLOCKING BASED ON PRESSURE OF 150 PSI AND ALLOWABLE SOIL BEARING CAPACITY OF 2,000 PSF. CONCRETE TO BE 3,000 PSI.
2. PIPES GREATER THAN 24", THE DESIGN ENGINEER TO SPECIFY RESTRAINT SYSTEM NECESSARY.

DATE MAY 2004  
REV JAN 2011

## BLOCKING DETAIL UPPER VERTICAL BENDS

DETAIL  
**BLK-5**

## HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

CARRIER PIPE DIA.	C A S I N G   P I P E				
	D I A M E T E R	M I N I M U M   W A L L   T H I C K N E S S			
		C R I T E R I A   W I T H I N R A I L R O A D   R I G H T   O F   W A Y		C R I T E R I A   W I T H I N V D O T   R I G H T   O F   W A Y	
		R.C.P. WITH PROTECTIVE COATING	STEEL WITH PROTECTIVE COATING	R.C.P.	STEEL
6"	16"	3.0"	0.281"	3.0"	0.250"
8"	20"	3.0"	0.375"	3.0"	0.250"
10"	20"	3.0"	0.375"	3.0"	0.250"
12"	24"	3.5"	0.375"	3.5"	0.250"
15"	24"	3.5"	0.375"	3.5"	0.250"
* 16"	30"	4.0"	0.500"	4.0"	0.375"
18"	30"	4.0"	0.500"	4.0"	0.375"
20"	30"	4.0"	0.500"	4.0"	0.375"
21"	30"	4.0"	0.500"	4.0"	0.375"
24"	36"	4.5"	0.563"	4.5"	0.375"
30"	42"	5.0"	0.625"	5.0"	0.500"
33"	42"	5.0"	0.625"	5.0"	0.500"
36"	48"	5.5"	0.688"	5.5"	0.500"
42"	54"	6.0"	0.781"	6.0"	0.500"

REINFORCED CONCRETE CASING PIPE SHALL BE ASTM C-76, CLASS III.  
STEEL CASING PIPE SHALL BE ASTM 139, GRADE B.

\* WHERE PIPE IS RESTRAINED, APPROVED RESTRAINED JOINT PIPE MAY BE USED IN A 24" CASING PIPE TO AVOID HAVING TO INSTALL A 30" CASING PIPE.

**NOTES:**

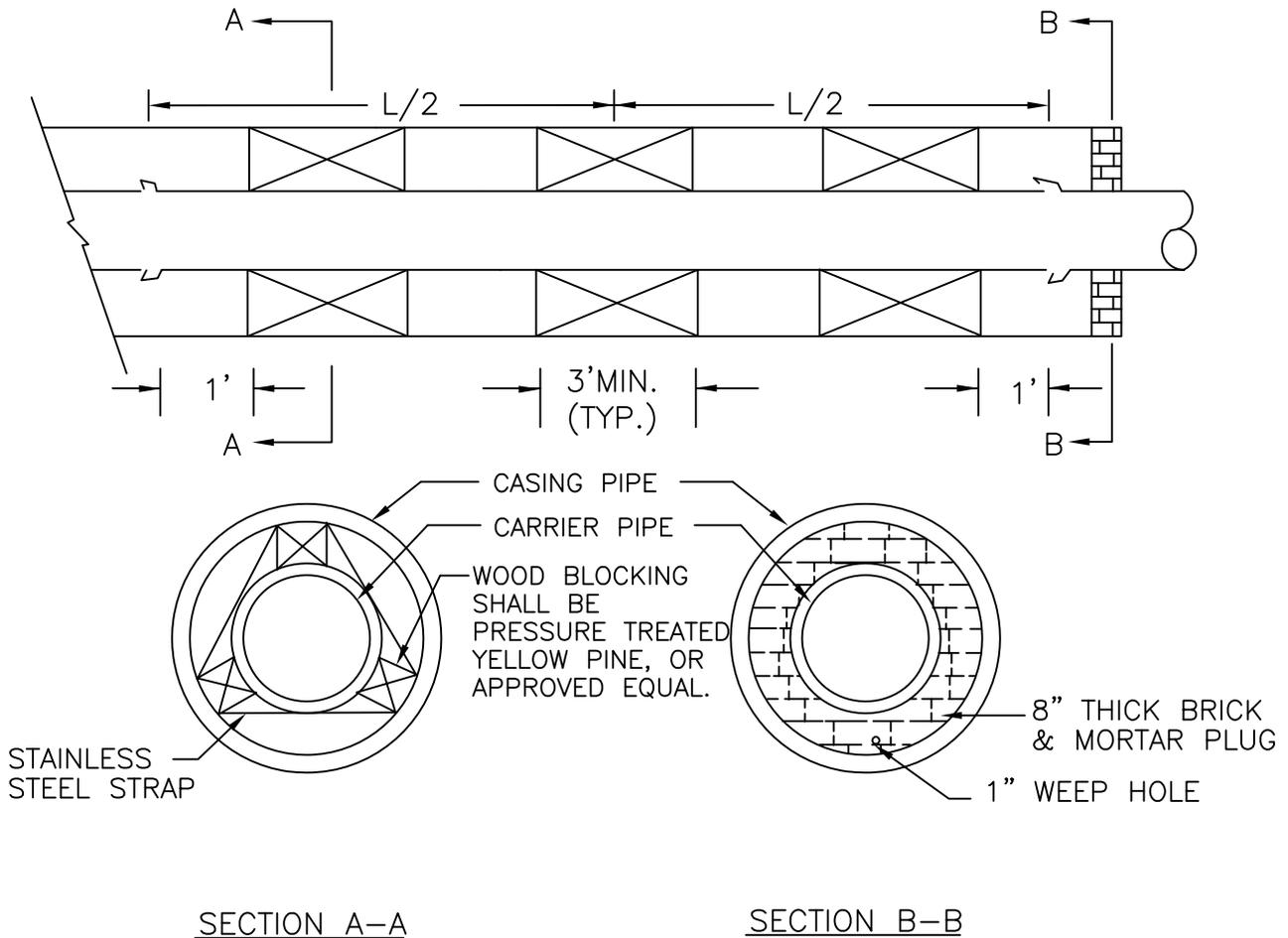
1. SLOPES THROUGH BORES SHALL NOT BE BASED ON MINIMUM GRADE UNLESS IT IS THE ONLY SLOPE AVAILABLE.
2. INCREASING THICKNESS OF CASING MUST BE CONSIDERED WHERE BORE LENGTHS EXCEED 125'.
3. WHEN USING STEEL CASING, A MINIMUM OF .3125" THICKNESS IS REQUIRED WHERE GROUND COVER OVER PIPE EXCEEDS 15'.
4. CONTRACTOR SHALL MAKE AN EFFORT TO BORE IN THE APPROPRIATE DIRECTION BASED ON EXISTING SOIL CONDITIONS. ENGINEER MUST SHOW LOCATION AND SIZE OF BORE PIT; AND LOCATION AND SIZE OF PERMANENT AND CONSTRUCTION EASEMENT.
5. WHERE RESTRAINING DEVICES ARE REQUIRED FOR THE CARRIER PIPE, THE CASING PIPE SIZE SHALL BE INCREASED AS NECESSARY.

DATE MAY 2004  
REV JAN 2011

### CASING PIPE REQUIREMENTS

DETAIL  
**CAS-1**

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



**NOTES:**

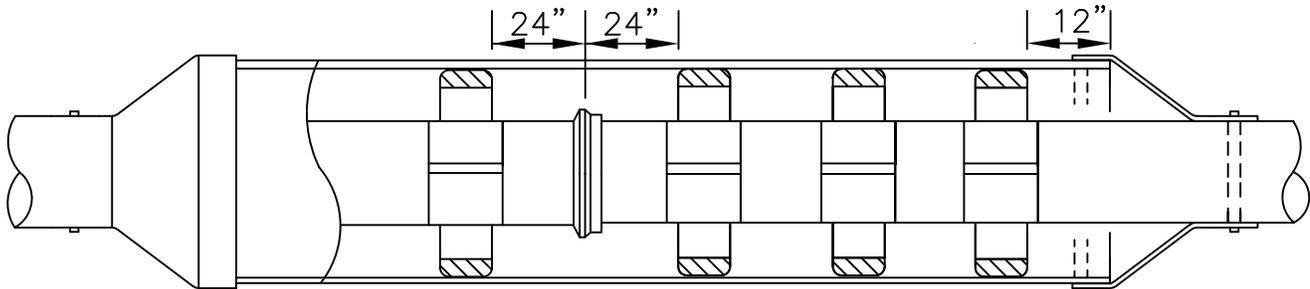
1. THREE POINT BLOCKING SHALL BE USED FOR D.I. PIPE.
2. CARRIER PIPE WITHIN BORES FOR SANITARY SEWER INSTALLATION SHALL BE DUCTILE IRON THICKNESS (CLASS 52) AND IS TO BE USED FROM MANHOLE TO MANHOLE.
3. FOR NORMAL METHOD OF INSTALLATION SEE DETAIL CAS-3. THIS METHOD (CAS-2) MAY ONLY BE UTILIZED WITH PERMISSION OF INSPECTOR.

DATE MAY 2004  
REV JAN 2011

**ALTERNATE CASING DETAIL  
SEWER**

DETAIL  
**CAS-2**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



CASING DETAIL NOTES:

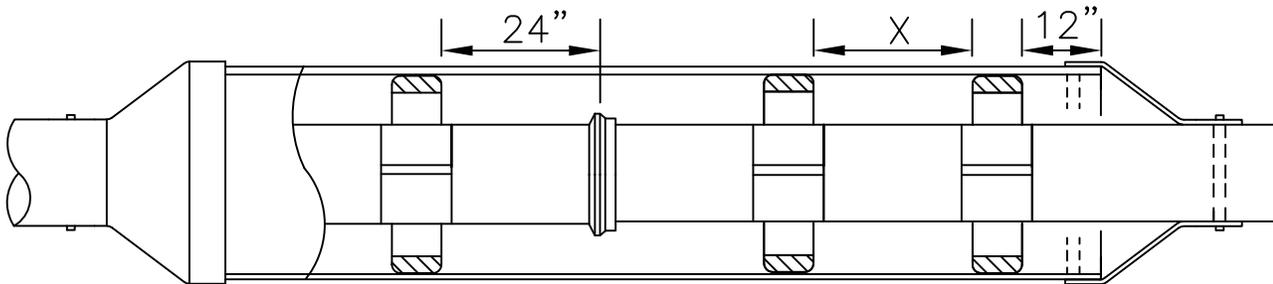
1. CASING SPACERS FOR GRAVITY SEWER LINES MAY BE USED ONLY WHEN THE SLOPE OF THE FINISHED WELDED CASING PIPE HAS BEEN COMPLETED AND CHECKED AND IS EQUAL TO THE SLOPE OF THE CARRIER PIPE.
2. THREE CASING SPACERS SHALL BE ATTACHED TO EACH JOINT OF CARRIER PIPE WITH ONE AT THE CENTER AND ONE NOT MORE THAN 24" FROM EACH END.
3. ONE CASING SPACER SHALL BE LOCATED NOT MORE THAN 12" FROM EACH END OF THE CASING PIPE.
4. CARRIER PIPE SHALL BE POSITIONED AND RESTRAINED WITHIN CASING TO COMPLY WITH GRADE REQUIREMENTS BY AN APPROVED CASING SPACER.
5. STEEL CASING SHALL HAVE A MINIMUM YIELD STRENGTH OF 35,000 PSI AND CORROSION PROTECTION.
6. LINES TO BE ENCASED UNDER STATE ROADS/RAILROADS WILL COMPLY WITH COUNTY AND ANY APPLICABLE VDOT/AMERICAN RAILROAD ENGINEERING SPECIFICATIONS, WHICHEVER IS MORE STRINGENT.
7. WHEN INSTALLING CARRIER PIPE, CONTRACTOR SHALL PUSH SO THAT PIPE JOINTS ARE ALWAYS BEING COMPRESSED.
8. REINFORCED CONCRETE CASING PIPE SHALL BE ASTM C-76, CLASS III. STEEL CASING PIPE SHALL BE ASTM-139, GRADE B.
9. CARRIER PIPE WITHIN BORES FOR SANITARY SEWER INSTALLATION SHALL BE DUCTILE IRON THICKNESS (CLASS 52) AND IS TO BE USED FROM MANHOLE TO MANHOLE.
10. CASING PIPE SHALL BE SEALED BY USE OF WRAPAROUND END SEALS OR WRAP ENDS OF CARRIER PIPE WITH TAR PAPER AND INSTALL 4" THICK BRICK AND MORTAR PLUG IN THE ANNULAR SPACE WITH A 1" WEEP HOLE.

DATE MAY 2004  
REV JAN 2011

CASING DETAIL  
METHOD FOR GRAVITY SEWER LINES

DETAIL  
CAS-3

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



CASING DETAIL NOTES:

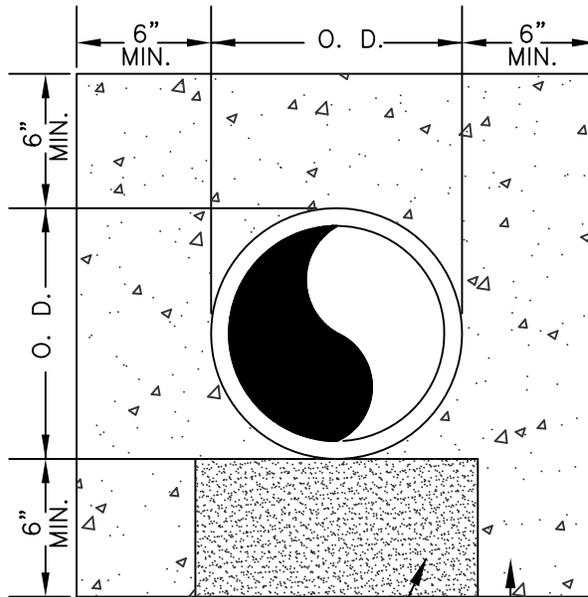
1. CARRIER PIPE SHALL BE CENTERED WITHIN CASING BY AN APPROVED CASING SPACER.
2. CASING PIPE SHALL BE SEALED BY USE OF WRAPAROUND END SEALS OR WRAP ENDS OF CARRIER PIPE WITH TAR PAPER AND INSTALL 4" THICK BRICK AND MORTAR PLUG IN THE ANNULAR SPACE WITH A 1" WEEP HOLE.
3. THREE CASING SPACERS SHALL BE ATTACHED TO EACH JOINT OF CARRIER PIPE WITH ONE AT THE CENTER AND ONE NOT MORE THAN 24" FROM EACH END.
4. ONE CASING SPACER SHALL BE LOCATED NOT MORE THAN 12" FROM EACH END OF CASING PIPE.
5. VALVES OR OTHER CONTROL/MAINTENANCE EQUIPMENT ATTACHED TO WATERLINE/SEWER FORCE MAINS SHALL BE LOCATED A MINIMUM FOUR PIPE LENGTHS FROM THE END OF THE CASING, OR AS APPROVED BY THE COUNTY.
6. STEEL CASING SHALL HAVE A MINIMUM YIELD STRENGTH OF 35,000 PSI AND CORROSION PROTECTION.
7. LINES TO BE ENCASED UNDER STATE ROADS/RAILROADS WILL COMPLY WITH COUNTY AND ANY APPLICABLE VDOT/AMERICAN RAILROAD ENGINEERING SPECIFICATIONS WHICHEVER IS MORE STRINGENT.
8. WHEN INSTALLING CARRIER PIPE, CONTRACTOR SHALL PUSH SO THAT PIPE JOINTS ARE ALWAYS BEING COMPRESSED.
9. REINFORCED CONCRETE CASING PIPE SHALL BE ASTM C-76, CLASS III STEEL CASING PIPE SHALL BE ASTM-139, GRADE B.
10. ALL WATERLINES AND FORCE MAINS IN CASING SHALL BE A MINIMUM OF THICKNESS CLASS 52 DIP WITH M.J. BELLS AND AN APPROVED JOINT RESTRAINT DEVICE AT EACH M.J. CONNECTION. MINIMUM 3 JOINTS OUTSIDE EACH END OF CASING SHALL BE M.J. DUCTILE IRON WITH RESTRAINED JOINTS.
11. ALL FORCE MAINS SHALL HAVE RESTRAINED JOINTS WITHIN THE CASING.

DATE MAY 2004  
REV JAN 2011

CASING DETAIL FOR  
WATERLINES & SEWER FORCE MAINS

DETAIL  
CAS-4

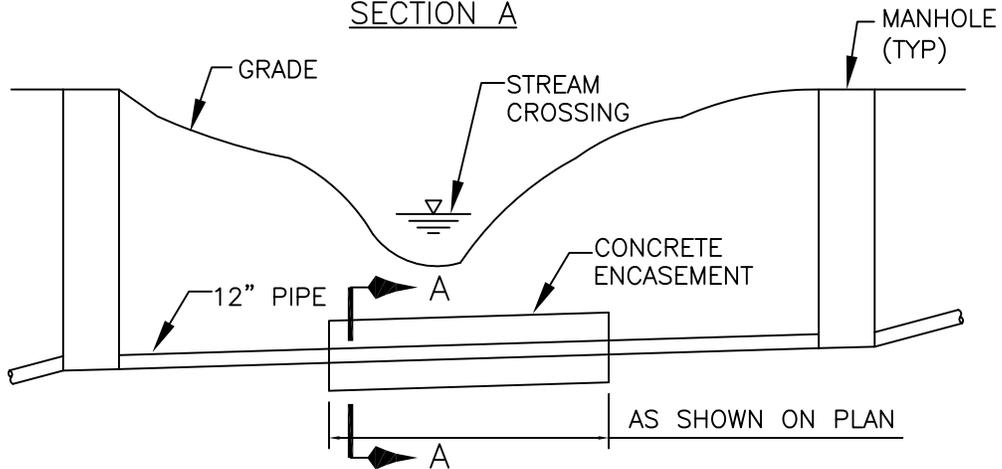
**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



SOLID CONCRETE BLOCK OR CEMENT  
OR CLAY BRICK SUPPORT (MINIMUM  
OF ONE PER PIPE LENGTH)

3000# CONCRETE

SECTION A



TYPICAL PROFILE

**NOTES:**

1. ALL CONCRETE ENCASEMENTS MUST BE FORMED AND INSPECTED BY DPU INSPECTOR PRIOR TO PLACING CONCRETE AND BACKFILLING.
2. AT STREAM CROSSINGS, ENCASEMENT SHALL EXTEND A MINIMUM OF TEN FEET (10') ON EITHER SIDE OF THE CROSSING.
3. PIPE TO BE DUCTILE IRON (CLASS 52) MANHOLE TO MANHOLE.
4. NOT ALLOWED ON WATER LINE PROJECTS.
5. REQUIRED DIP WHEN ENCASED PER SECTION 1.2.9

DATE MAY 2004  
REV JAN 2011

**PIPE ENCASEMENT DETAIL**

DETAIL  
**CAS-5**



# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

## GENERAL UTILITY NOTES:

1. ALL WATER AND SEWER CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE STANDARDS AND REQUIREMENTS OF THE HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES. THE COUNTY'S WATER AND SANITARY SEWER STANDARDS ARE INCORPORATED BY REFERENCE.
2. THE CONTRACTOR SHALL CONTACT THE HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES INSPECTION DIVISION TO SCHEDULE A PRE-CONSTRUCTION CONFERENCE AT LEAST 48 HOURS PRIOR TO BEGINNING ANY CONSTRUCTION ACTIVITY ON WATER OR SEWER IMPROVEMENTS.
3. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL REQUIRED PERMITS FOR THE WORK.
4. A PERMIT FROM THE VIRGINIA DEPARTMENT OF TRANSPORTATION IS REQUIRED FOR ALL WORK WITHIN A PUBLIC ROAD RIGHT-OF-WAY. WITHIN THE LIMITS OF THE TOWN OF ASHLAND THE TOWN ISSUES THIS PERMIT FOR ALL ROADS EXCEPT I-95.
5. WATERLINES 12" AND SMALLER SHALL BE DUCTILE IRON PIPE MEETING THE REQUIREMENTS OF AWWA C151 THICKNESS CLASS 52 OR PVC PIPE MEETING THE REQUIREMENTS OF AWWA C900; CLASS 150.
6. METER BOX LIDS SHALL HAVE A 1-3/4" DIAMETER HOLE LOCATED IN ITS CENTER. THE HOLE SHALL EITHER BE CAST IN PLACE AT THE FOUNDRY OR AFTER CASTING BE RETROFITTED VIA A PLASMA ARC TORCH.
7. THE LOCATION OF EXISTING UTILITIES ACROSS OR ALONG THE ROUTE OF THE PROPOSED WORK IS NOT NECESSARILY SHOWN ON THE PLANS, AND WHEN SHOWN, IS ONLY APPROXIMATELY CORRECT. THE CONTRACTOR SHALL, ON HIS OWN INITIATIVE, LOCATE ALL EXISTING UNDERGROUND LINES, FACILITIES AND STRUCTURES AS REQUIRED. THE CONTRACTOR IS RESPONSIBLE FOR REPAIRING ANY UNDERGROUND LINES, FACILITIES AND STRUCTURES DAMAGED BY HIS ACTIVITIES.
8. CONTRACTOR SHALL CALL "MISS-UTILITY" AT (800)552-7001 PRIOR TO THE START OF CONSTRUCTION.
9. NO STRUCTURES OR TREES SHALL BE PERMITTED IN UTILITY EASEMENTS.
10. FINAL ACCEPTANCE OF WORK BY THE HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES SHALL NOT BE MADE UNTIL ALL WORK SHOWN ON THE APPROVED PLANS IS COMPLETED.
11. TWO SETS OF PRINTS AND ONE ELECTRONIC COPY OF THE AS-BUILT DRAWINGS MUST BE SUBMITTED TO THE DEPARTMENT OF PUBLIC UTILITIES PRIOR TO TENTATIVE ACCEPTANCE OF THE WORK BY THE COUNTY.
12. WATER CONNECTIONS SHALL NOT BE BACKFILLED PRIOR TO APPROVAL BY THE HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES.
13. ALL WATERLINES SHALL HAVE A MINIMUM OF 3.5 FEET OF COVER.
14. TESTING NOTES:  
PRESSURE:  
LEAKAGE SHALL NOT EXCEED THE MAXIMUM ALLOWABLE LEAKAGE SPECIFIED IN AWWA C600. MINIMUM TEST PRESSURE SHALL BE 150 PSI.  
BACTERIOLOGICAL:  
TWO SAMPLES FOR BACTERIOLOGICAL SAMPLING SHALL BE COLLECTED AT LEAST 24 HOURS APART. IF CONTAMINATION IS INDICATED, THEN THE DISINFECTION PROCEDURE AND TESTING SHALL BE REPEATED UNTIL SATISFACTORY RESULTS ARE OBTAINED.
15. THE CHLORINE IN HEAVILY CHLORINATED WATER FLUSHED FROM MAINS NEEDS TO BE NEUTRALIZED BEFORE DISCHARGE. CONTRACTORS MUST PROVIDE EQUIPMENT FOR NEUTRALIZING HEAVILY CHLORINATED WATER FLUSHED FROM MAINS DURING CONSTRUCTION PRIOR TO DISCHARGING THE WATER.
- 16A. RESTRAINED JOINT PIPE AND FITTINGS SHALL BE UTILIZED AT ALL WATER LINE STUB-OUTS AND DEAD ENDS FOR A MINIMUM OF 90 FT OR BACK TO THE FAR SIDE OF THE NEAREST VALVE, TEE, OR CROSS, WHICHEVER IS SHORTER, UNLESS ANOTHER DISTANCE IS SPECIFICALLY CALLED OUT ON THE PLANS.
- 16B. IT SHOULD BE ASSUMED THAT EVERY FITTING WILL BE REQUIRED TO HAVE RESTRAINED JOINTS UNLESS OTHERWISE NOTED ON THE PLANS. WHERE CONDITIONS ALLOW OR WARRANT, CONCRETE THRUST BLOCKING MAY BE USED AS A SUBSTITUTE FOR RESTRAINED JOINTS OR MAY BE REQUIRED IN ADDITION TO THE RESTRAINT SYSTEM AS DECIDED BY THE DPU INSPECTOR.
17. MONITORING MANHOLES SHALL BE INSTALLED ON ALL SEWER LATERALS WHERE NON-DOMESTIC OR STRONG WASTE WILL POTENTIALLY BE DISCHARGED TO THE PUBLIC SEWER SYSTEM. IF MONITORING MANHOLES ARE NOT PROVIDED WITH THE INITIAL CONSTRUCTION, THE DEPARTMENT OF PUBLIC UTILITIES MAY REQUIRE THAT THE OWNER ADD A MONITORING MANHOLE, AT THE OWNERS COST, SHOULD THE USE OF THE FACILITY CHANGE, SHOULD THE CHARACTERISTICS OF THE WASTE DISCHARGED BE CHANGED, SHOULD REGULATIONS CHANGE, OR SHOULD THE DEPARTMENT DETERMINE FOR ANY REASON WHAT SO EVER, IN ITS SOLE JUDGEMENT, THAT A MONITORING MANHOLE IS NECESSARY TO PROTECT THE CENTRAL SEWER SYSTEM OR TREATMENT FACILITIES.
18. SEWER LATERALS SHALL BE NO MORE THAN 8 FEET DEEP AT THE EASEMENT OR PROPERTY LINE UNLESS OTHERWISE SPECIFICALLY SHOWN DEEPER THAN 8 FEET ON THE APPROVED PLANS.

DATE MAY 2004  
REV JAN 2011

## STANDARD SEWER AND WATER NOTES

DETAIL  
**DES-2**  
SHT. 1 OF 2

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

**GENERAL UTILITY NOTES:**

19. WHENEVER CONNECTING A SEWER LATERAL TO AN EXISTING MANHOLE, CORE DRILLING AND A FLEXIBLE PIPE-TO-MANHOLE CONNECTOR SHALL BE USED. THE CONNECTOR SHALL BE KOR-N-SEAL ASSEMBLY OR APPROVED EQUAL. THE CONNECTOR SHALL BE INSTALLED IN STRICT ACCORDANCE WITH THE MANUFACTURERS SPECIFICATIONS.
20. WHENEVER CONNECTING A SEWER LATERAL TO AN EXISTING SEWER LINE, THE CONTRACTOR MUST USE A MECHANICAL HOLE CUTTER WHEN TAPPING THE EXISTING SEWER LINE AND AN APPROVED SADDLE OR INSERTA-TEE OR KOR-N-TEE SHALL BE USED.
21. THE CONTRACTOR SHALL SCHEDULE AND COORDINATE THE SHUT-OFF OF EXISTING WATER LINES AND ANY CORRESPONDING SERVICE INTERRUPTIONS WITH HANOVER COUNTY DPU AND ALL AFFECTED CUSTOMERS AT LEAST 48 HOURS PRIOR TO THE SCHEDULED ACTIVITY. THE CONTRACTOR IS TO NOTIFY ALL AFFECTED CUSTOMERS IN WRITING. THE CONTRACTOR SHALL MAKE PROVISIONS TO PROVIDE REASONABLE ACCOMMODATIONS TO AFFECTED CUSTOMERS AND SHALL TAKE ALL NECESSARY STEPS TO MINIMIZE THE LENGTH OF THE SERVICE INTERRUPTION. IN CASES WHERE SPECIAL OPERATIONAL ISSUES ARISE AS A RESULT OF THE PROPOSED WORK, DPU RESERVES THE RIGHT TO DELAY OR POSTPONE THE WORK SO NOT TO JEOPARDIZE THE INTEGRITY OF ITS UTILITY SYSTEM OR SERVICE TO CUSTOMERS.
22. ALL SANITARY SEWERS CONSTRUCTED IN FILL SHALL BE OF DUCTILE IRON SEWER PIPE (CLASS 52 MINIMUM) WITH MANHOLES FOUNDED ON ORIGINAL GROUND UNLESS A LICENSED GEOTECHNICAL ENGINEER FURNISHES A WRITTEN CERTIFICATION THAT THE FILL HAS BEEN SUFFICIENTLY COMPACTED SO THAT SETTLEMENT OF THE SANITARY SEWER MAIN AND/OR MANHOLE WILL NOT OCCUR.
23. ALL WATER MAINS CONSTRUCTED IN FILL SHALL BE DUCTILE IRON PIPE WITH RESTRAINED JOINTS UNLESS A LICENSED GEOTECHNICAL ENGINEER FURNISHES A WRITTEN CERTIFICATION THAT THE FILL HAS BEEN SUFFICIENTLY COMPACTED SO THAT SETTLEMENT OF THE WATER MAIN WILL NOT OCCUR.
24. ALL SEWER SERVICE CONNECTIONS SHALL BE TERMINATED AT THE PROPERTY LINE W/ AN APPROVED WATER TIGHT PLUG AND MARKED WITH A 2" X 4" BOARD, PAINTED GREEN, INSTALLED PLUMB FROM BOTTOM OF 6" PLUG TO 2 FEET ABOVE GROUND. CLEANOUT ASSEMBLY IS TO BE INSTALLED BY THE BUILDING PLUMBER PER SEW-11.
25. VALVE BOXES NOT LOCATED IN PAVEMENT OR CONCRETE SHALL HAVE A 2 FOOT SQUARE BY 4" THICK CONCRETE PAD POURED AROUND THEM PER DETAIL WAT-5 AND SECTION 2.4.3.1.C.2.
26. WATER METERS OR OTHER WATER UTILITY APPURTENANCES SHALL NOT BE LOCATED IN DRIVEWAYS, SIDEWALKS, OR OTHER PAVED AREAS IN SUBDIVISION OR TOWNHOUSE DEVELOPMENTS WITHOUT THE PRIOR APPROVAL OF THE DEPARTMENT OF PUBLIC UTILITIES.

DATE MAY 2004  
REV JAN 2011

**STANDARD SEWER AND WATER NOTES**

DETAIL  
**DES-2**  
SHT. 2 OF 2

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

## SEQUENCE OF CONSTRUCTION, TESTING, AND FLUSHING OF NEW WATERLINE

1. LAY NEW WATERLINES AND APPURTENANCES – CONSTRUCTION SHOULD BEGIN IN THE PROXIMITY OF EXISTING WATERLINES TO FACILITATE FUTURE INSTALLATION OF THE DOUBLE CHECK WITH GATE VALVE AND TESTING CORPORATION STOP ASSEMBLY (I.E. JUMPER) AND TIE-IN. CONNECTION TO ANY EXISTING WATERLINE IS NOT ALLOWED UNTIL CONTRACTOR IS READY TO TEST NEW WATERLINES PRIOR TO PLACING THEM IN SERVICE UNLESS JUMPER IS A CERTIFIED BACKFLOW PREVENTER. COORDINATE ACCEPTABLE “BACKFLOW” ASSEMBLY (PER DETAIL WAT-13) WITH DPU INSPECTOR PRIOR TO COMMENCING WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL LABOR AND EQUIPMENT REQUIRED FOR FLUSHING, DECHLORINATION, EROSION PREVENTION, AND REPAIR OF ANY DAMAGE CAUSED BY ANY AND ALL WATERLINE FLUSHING PRIOR TO ISSUANCE OF TENTATIVE ACCEPTANCE BY HANOVER DPU.
2. INITIAL FLUSH – INITIAL FLUSHING OF NEW WATERLINE(S), INCLUDING ALL HYDRANTS AND DEAD-END WATERLINE(S), MAY COMMENCE AFTER JUMPER HAS BEEN INSTALLED AND CONNECTION TO THE EXISTING WATERLINE IS COMPLETE. A SAFE AND STABLE DISCHARGE THAT ALLOWS THE USE OF A PITOT GAUGE FOR FLOW MEASUREMENT MUST BE PROVIDED. DPU PERSONNEL WILL VERIFY THAT INITIAL FLUSHING IS PROPERLY PERFORMED AND ALL AIR AND DEBRIS HAVE BEEN REMOVED FROM THE NEW WATERLINE. ALL WATERLINES SHALL BE INITIALLY FLUSHED AT A MINIMUM RATE OF 2.5 FEET PER SECOND (FPS) AND FOR THE DURATION NECESSARY TO PROVIDE A MINIMUM OF 2 COMPLETE WATER TURN-OVERS WITHIN THE NEW WATERLINE(S). THE FOLLOWING TABLE IS PROVIDED AS A GUIDELINE FOR ACHIEVING THE REQUIRED 2.5 FPS VELOCITY AND WATER TURN-OVER RATES. INITIAL FLUSH REQUIREMENTS FOR PIPE DIAMETERS LARGER THAN 16” WILL BE DETERMINED ON A CASE-BY-CASE BASIS AS APPROVED BY DPU PERSONNEL.

MAIN SIZE	4”	6”	8”	12”	16”
FLOW (GPM)	98	220	400	900	1,500
GALLONS/FOOT	0.65	1.47	2.61	5.87	10.44

3. PRESSURE TEST – CONDUCT PRESSURE TEST CONSISTENT WITH HANOVER COUNTY DPU STANDARDS AND AS DIRECTED BY DPU INSPECTOR.
4. DISINFECTION – LIQUID SODIUM HYPOCHLORITE SHALL BE USED. USE OF CALCIUM HYPOCHLORITE GRANULES OR TABLETS IS PROHIBITED. THE DISINFECTION SOLUTION SHALL BE FED AT A CONTINUOUS RATE AND MIXED WITH THE WATER ENTERING THE PIPE FROM THE EXISTING SYSTEM SO THAT THE CHLORINE CONCENTRATION OF THE WATER AND DISINFECTION SOLUTION IN THE PIPE IS ELEVATED TO AND MAINTAINED AT A MINIMUM CONCENTRATION OF 50 MG/L AVAILABLE CHLORINE.
5. LOW FLOW FLUSHING – LOW FLOW FLUSHING SHALL NOT BEGIN UNTIL THE DISINFECTION SOLUTION HAS BEEN IN THE NEW WATERLINE FOR AT LEAST 24 HOURS AND A SATISFACTORY CHLORINE RESIDUAL HAS BEEN VERIFIED BY DPU PERSONNEL. LOW FLOW FLUSHING IS A LOW VELOCITY FLUSH OF APPROXIMATELY 1 FPS AND SHALL BE MAINTAINED LONG ENOUGH FOR THE DISINFECTION SOLUTION TO BE ENTIRELY REMOVED FROM THE NEW WATERLINE AND THE NORMAL DISTRIBUTION SYSTEM CHLORINE CONCENTRATION IS OBSERVED. LOW FLOW FLUSHING SHALL NOT END UNTIL THE WATER IS VISIBLY CLEAR. DPU PERSONNEL WILL VERIFY THAT LOW FLOW FLUSHING IS PROPERLY PERFORMED.
6. BACTERIOLOGICAL TESTING – BACTERIOLOGICAL TESTING SHALL BE COMPLETED NO EARLIER THAN TWO WEEKS PRIOR TO THE SCHEDULED ISSUANCE OF TENTATIVE ACCEPTANCE. BACTERIOLOGICAL TEST SAMPLING SHALL BE CONDUCTED IN THE PRESENCE OF DPU PERSONNEL. AT LEAST TWO SAMPLES SHALL BE COLLECTED AND TESTED BY A STATE OF VIRGINIA CERTIFIED LABORATORY. THE TWO SAMPLES SHALL BE COLLECTED AT LEAST 24 HOURS APART AT PIPE INTERVALS DETERMINED BY THE INSPECTOR (NOT EXCEEDING 1,200 FEET APART AND AT THE END OF ALL BRANCH LINES AND CUL-DE-SACS). THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE EXPENSE AND COORDINATION OF THE SAMPLE COLLECTION AND TESTING. TWO CONSECUTIVE NEGATIVE TESTS FOR COLIFORM FROM ALL THE SAMPLE LOCATIONS SHALL CONSTITUTE ADEQUATE DISINFECTION OF THE NEW WATERLINE(S). ORIGINALS OF ALL APPLICABLE DOCUMENTATION AND TEST RESULTS MUST BE PROVIDED TO DPU INSPECTOR PRIOR TO ISSUANCE OF TENTATIVE ACCEPTANCE AND PROCEEDING TO STEP #7.
7. REMOVAL OF THE JUMPER AND FINAL FLUSH – ONCE DPU APPROVAL HAS BEEN GRANTED, THE CONTRACTOR MAY REMOVE THE JUMPER AND PERFORM NEEDED FLUSHING ON THE NEW WATERLINE TO REMOVE ANY REMAINING AIR AND DEBRIS. DPU PERSONNEL WILL FLUSH EXISTING COUNTY WATERLINES AS NECESSARY AND VERIFY THAT CONTRACTOR'S FLUSHING OF THE NEW WATERLINE(S) IS ADEQUATE.

DATE JAN 2011

STANDARD SEWER AND WATER NOTES

DETAIL  
**DES-3**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

OPTION 1: IF GRADE ADJUSTMENT IS NOT REQUIRED:

- A. THE CONNECTOR PIPE SHALL BE DUCTILE IRON PIPE.
- B. IF ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE RESTRAINED WITH APPROVED JOINT RESTRAINT DEVICE THRUST BLOCKING BEHIND HYDRANT NOT REQUIRED.

OPTION 2: IF GRADE ADJUSTMENT IS REQUIRED:

- A. THE CONNECTOR PIPE SHALL BE OF THE OFFSET DESIGN SO THAT THE FIRE HYDRANT CAN BE ADJUSTED TO ENSURE PLACEMENT AT THE PROPER GRADE. WHEN THE CONNECTOR PIPE IS THE OFFSET DESIGN IT SHALL HAVE AN ANCHORING FEATURE AT BOTH ENDS SO THAT WHEN USED WITH M.J. SPLIT GLANDS A RESTRAINED JOINT IS PROVIDED.

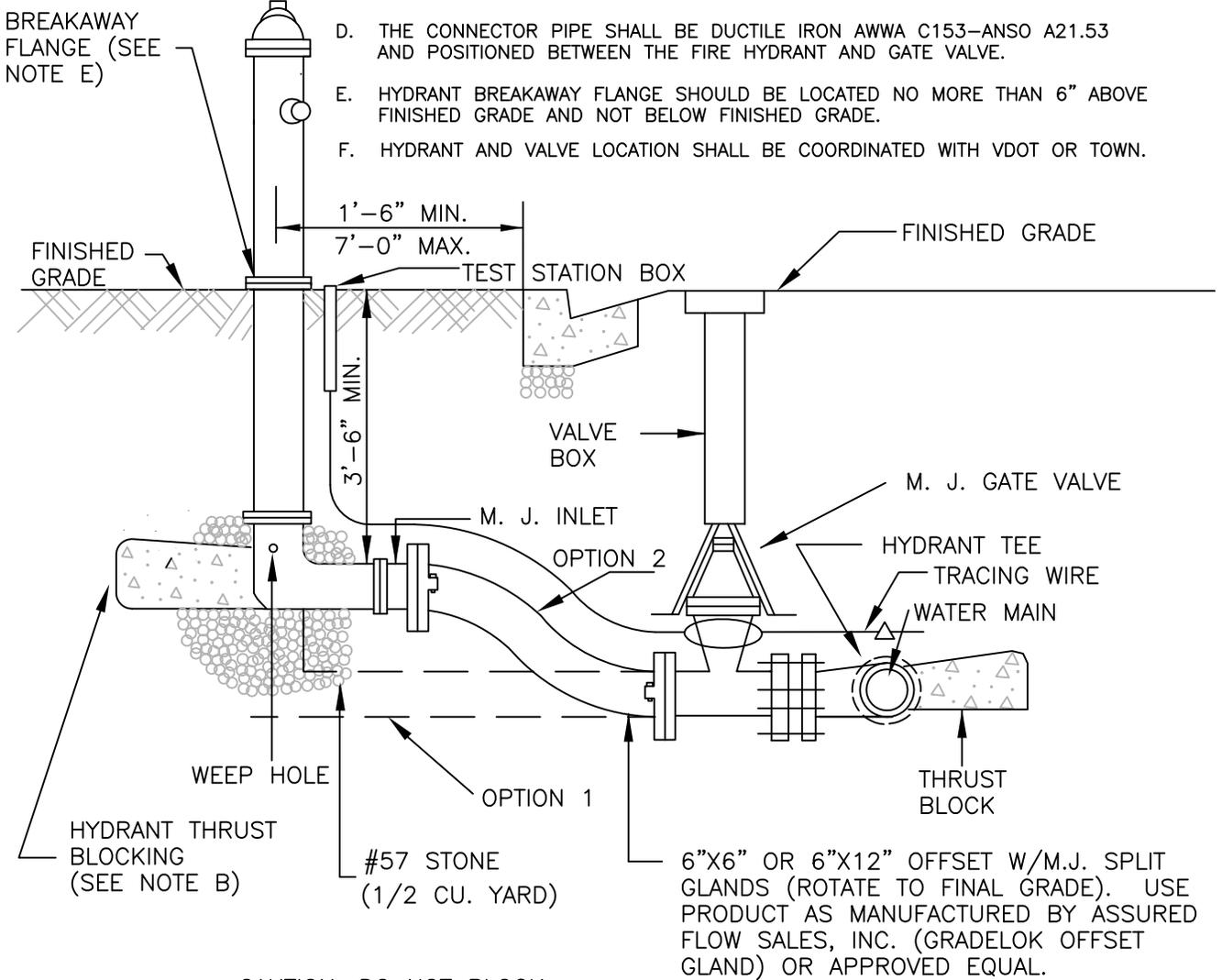
- B. ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE TO BE RESTRAINED WITH APPROVED JOINT RESTRAINT DEVICE.

- C. THE CONNECTOR PIPE SHALL BE CEMENT LINED IN ACCORDANCE WITH AWWA C110-ANSI A214.

- D. THE CONNECTOR PIPE SHALL BE DUCTILE IRON AWWA C153-ANSI A21.53 AND POSITIONED BETWEEN THE FIRE HYDRANT AND GATE VALVE.

- E. HYDRANT BREAKAWAY FLANGE SHOULD BE LOCATED NO MORE THAN 6" ABOVE FINISHED GRADE AND NOT BELOW FINISHED GRADE.

- F. HYDRANT AND VALVE LOCATION SHALL BE COORDINATED WITH VDOT OR TOWN.



**CAUTION:** DO NOT BLOCK WEEP HOLE WITH CONCRETE, PLACE STONE OVER WEEP HOLE AREA.

\* NOTE: WHEN A HYDRANT TEE IS USED, RESTRAINED JOINT NOT NEEDED TO RESTRAIN VALVE TO TEE.

DATE MAY 2004  
REV JAN 2011

## TYPICAL FIRE HYDRANT DETAIL

DETAIL  
**FIR-1**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

OPTION 1: IF GRADE ADJUSTMENT IS NOT REQUIRED:

- A. CONNECTOR PIPE MUST BE DUCTILE IRON PIPE.
- B. IF ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE RESTRAINED WITH APPROVED JOINT RESTRAINT DEVICE THRUST BLOCKING BEHIND HYDRANT NOT REQUIRED.

OPTION 2: IF GRADE ADJUSTMENT IS REQUIRED:

- A. THE CONNECTOR PIPE SHALL BE OF THE OFFSET DESIGN SO THAT THE FIRE HYDRANT CAN BE ADJUSTED TO ENSURE PLACEMENT AT THE PROPER GRADE. WHEN THE CONNECTOR PIPE IS THE OFFSET DESIGN IT SHALL HAVE AN ANCHORING FEATURE AT BOTH ENDS SO THAT WHEN USED WITH M.J. SPLIT GLANDS A RESTRAINED JOINT IS PROVIDED.

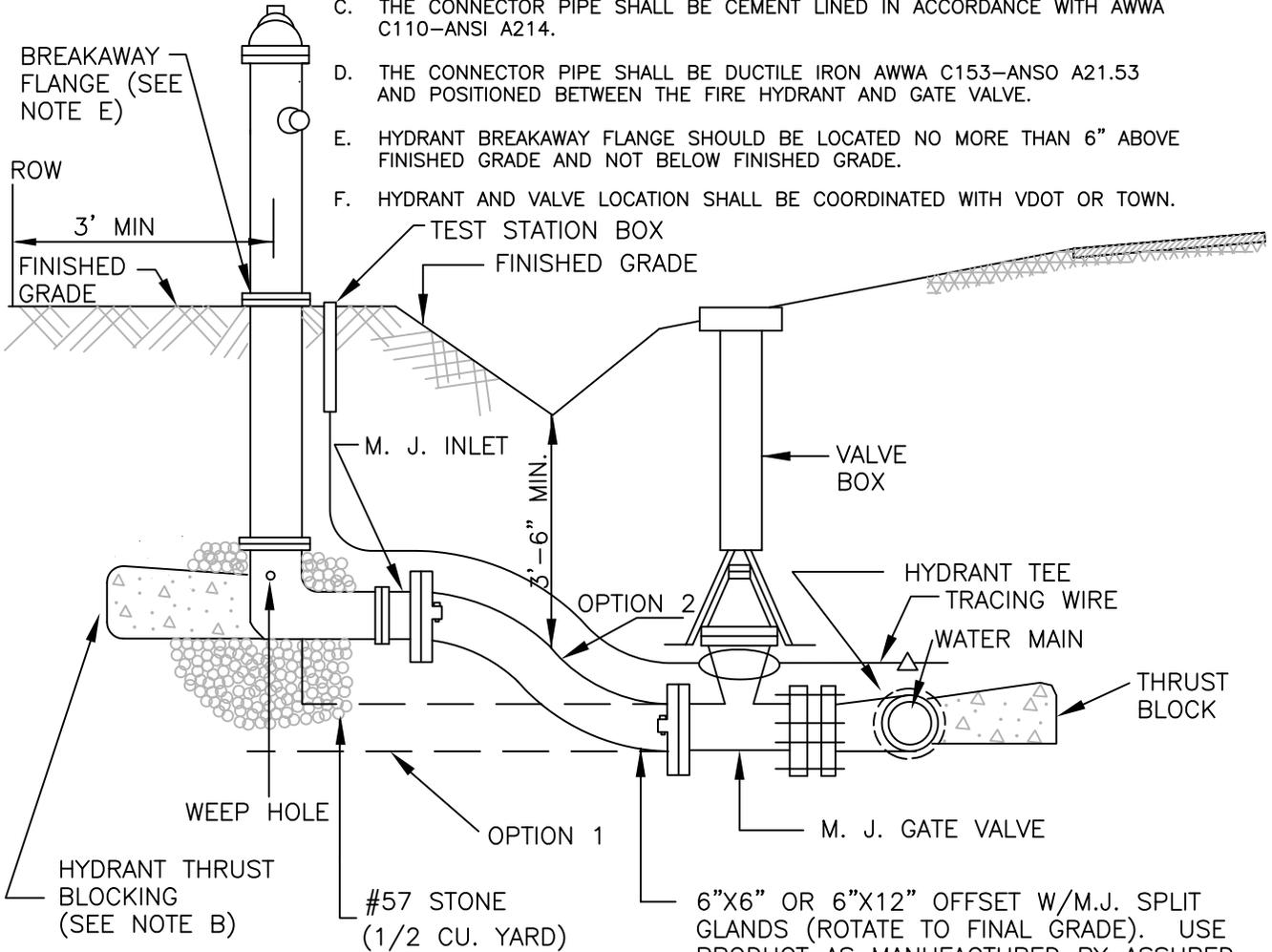
- B. ALL JOINTS FROM HYDRANT TEE TO HYDRANT ARE TO BE RESTRAINED WITH APPROVED JOINT RESTRAINT DEVICE.

- C. THE CONNECTOR PIPE SHALL BE CEMENT LINED IN ACCORDANCE WITH AWWA C110-ANSI A214.

- D. THE CONNECTOR PIPE SHALL BE DUCTILE IRON AWWA C153-ANSO A21.53 AND POSITIONED BETWEEN THE FIRE HYDRANT AND GATE VALVE.

- E. HYDRANT BREAKAWAY FLANGE SHOULD BE LOCATED NO MORE THAN 6" ABOVE FINISHED GRADE AND NOT BELOW FINISHED GRADE.

- F. HYDRANT AND VALVE LOCATION SHALL BE COORDINATED WITH VDOT OR TOWN.



6"X6" OR 6"X12" OFFSET W/M.J. SPLIT GLANDS (ROTATE TO FINAL GRADE). USE PRODUCT AS MANUFACTURED BY ASSURED FLOW SALES, INC. (GRADELOK OFFSET GLAND) OR APPROVED EQUAL.

**CAUTION:** DO NOT BLOCK WEEP HOLE WITH CONCRETE, PLACE STONE OVER WEEP HOLE AREA.

\* NOTE: WHEN A HYDRANT TEE IS USED, RESTRAINED JOINT NOT NEEDED TO RESTRAIN VALVE TO TEE.

DATE MAY 2004  
REV JAN 2011

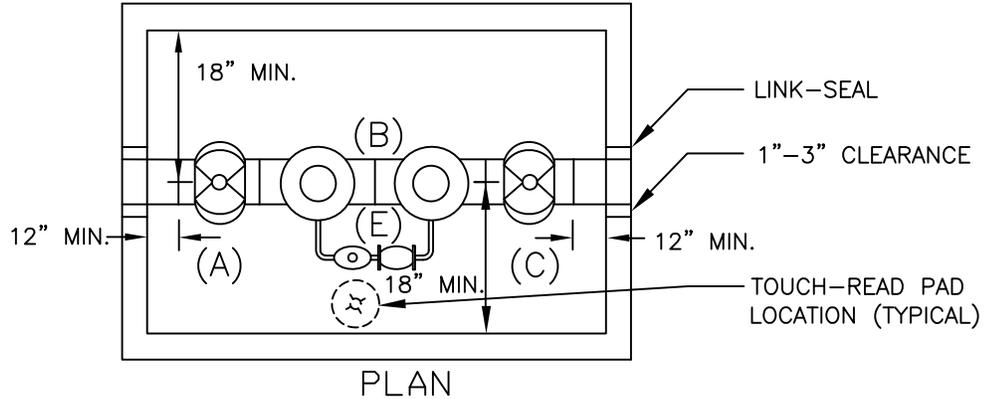
**TYPICAL FIRE HYDRANT DETAIL**

DETAIL  
**FIR-2**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

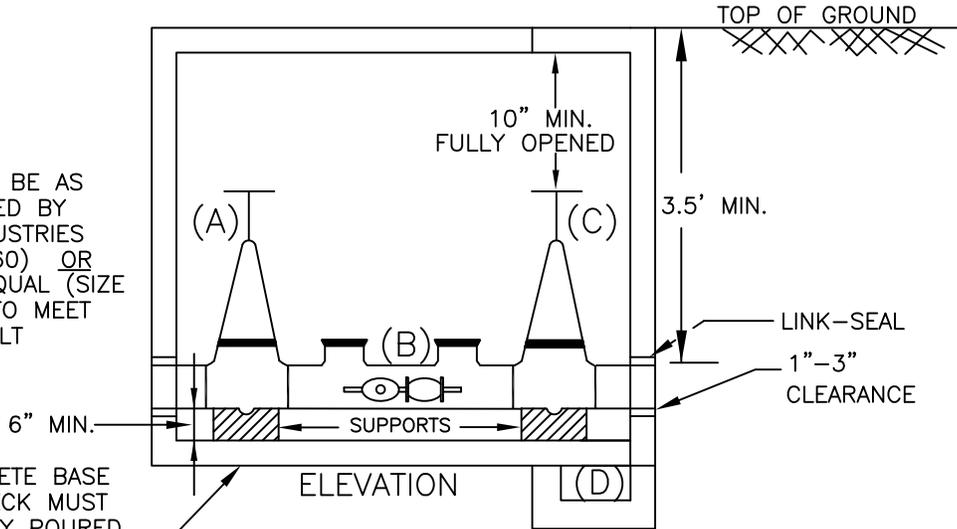
**NOTES:**

1. DOUBLE CHECK DEVICE SHALL BE INSTALLED IN A BOX AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. DOUBLE DETECTOR CHECK ASSEMBLY MUST BE U.L. LISTED OR F.M. APPROVED AND APPROVED BY HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES.



- |   |   |
|---|---|
| <p>(A) OUTSIDE STEM AND YOKE GATE VALVE<br/>         (B) DOUBLE DETECTOR CHECK VALVE ASSEMBLY<br/>         (C) OUTSIDE STEM AND YOKE GATE VALVE</p> | <p>(D) SUMP PUMP WHERE WATER TABLE IS A PROBLEM OR GRAVITY DRAIN WHERE WATER TABLE IS NOT<br/>         (E) BY-PASS LOW FLOW METER WITH ISOLATION VALVES, AND BACKFLOW PREVENTER. METER TO BE PURCHASED FROM THE COUNTY.</p> |
|---|---|

VAULT SHALL BE AS MANUFACTURED BY CARSON-INDUSTRIES (MODEL #3660) OR APPROVED EQUAL (SIZE NECESSARY TO MEET MINIMUM VAULT STANDARDS).



BOX WITH CONCRETE BASE AND DOUBLE CHECK MUST BE SUPPORTED BY POURED IN PLACE CONCRETE PIPE SADDLES OR METAL PIPE STANDS [COATED WITH RUST RETARDANT] COATING.

NOTE: ISOLATION VALVES ON LOW-FLOW BYPASS SHALL BE 1/4 TURN BALL VALVES WITH SINGLE LEVER HANDLE. GATE VALVES WITH HANDWHEEL ACTUATOR ARE STRICTLY PROHIBITED.

DATE MAY 2004  
REV JAN 2011

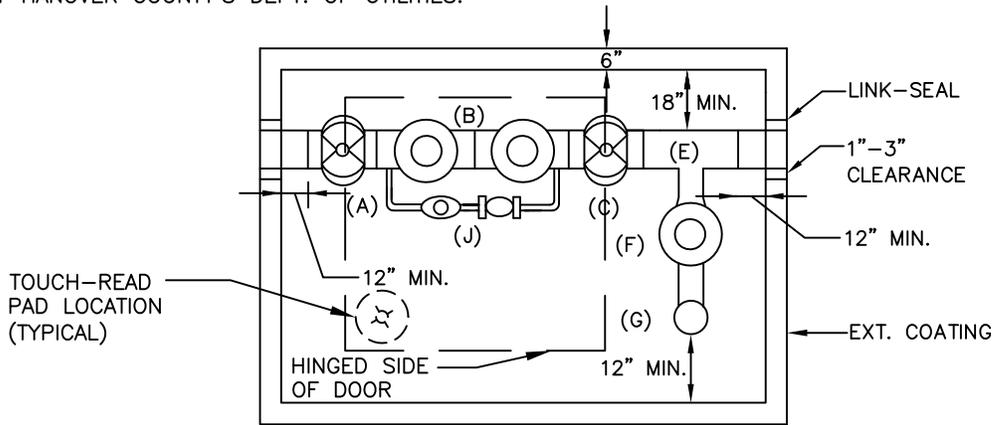
## 2" OR SMALLER DOUBLE DETECTOR CHECK ASSEMBLY AND VAULT

DETAIL  
FIR-3

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

**NOTES:**

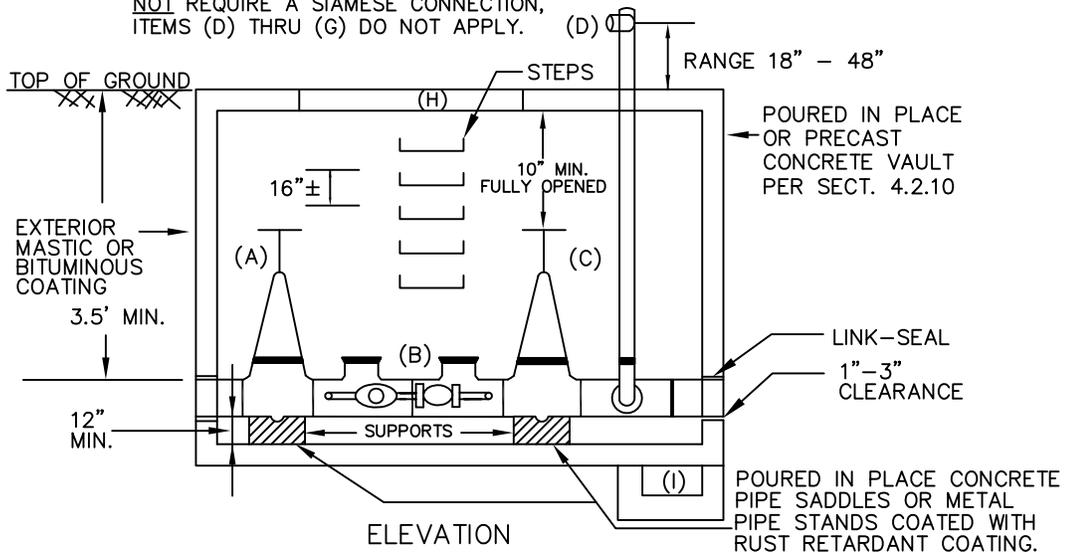
1. DOUBLE CHECK DEVICE SHALL BE INSTALLED IN A BOX AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. DOUBLE DETECTOR CHECK ASSEMBLY MUST BE U.L. LISTED OR F.M. APPROVED AND APPROVED BY HANOVER COUNTY'S DEPT. OF UTILITIES.



PLAN

- (A) OUTSIDE STEM AND YOKE GATE VALVE
- (B) DOUBLE DETECTOR CHECK VALVE ASSEMBLY
- (C) OUTSIDE STEM AND YOKE GATE VALVE
- \* (D) 2 1/2" THREADED N.S.T. SIAMESE CONNECTION FOR FIRE DEPARTMENT W/AUTOMATIC BALL DRIP
- \* (E) REQUIRED (MAIN LINE SIZE) " X 4" TEE
- \* (F) 4" CHECK VALVE
- \* (G) 4" - 90° BEND
- (H) JD-2AL 4' X 4' BILCO DOOR, OR AS MANUFACTURED BY VA. SPRINKLER COMPANY, OR APPROVED EQUAL.
- (I) SUMP WHERE WATER TABLE IS A PROBLEM OR GRAVITY DRAIN WHERE WATER TABLE IS NOT A PROBLEM.
- (J) BY-PASS LINE WITH LOW-FLOW METER, ISOLATION VALVE, BACKFLOW PREVENTER. METER TO BE PURCHASED FROM THE COUNTY.

\*WHERE A 3" OR LARGER FIRE LINE DOES NOT REQUIRE A SIAMESE CONNECTION, ITEMS (D) THRU (G) DO NOT APPLY.



ELEVATION

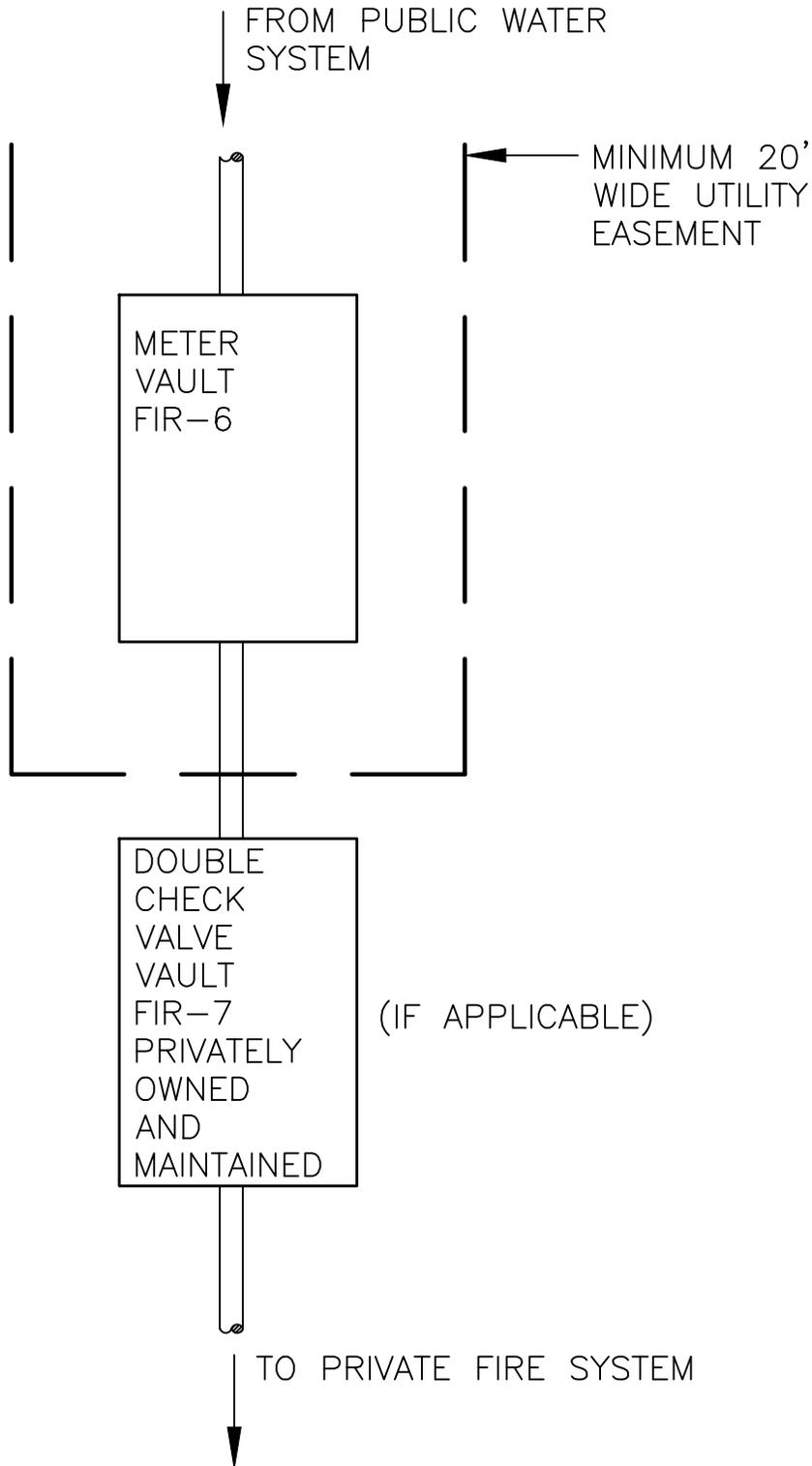
NOTE: ISOLATION VALVES ON LOW-FLOW BYPASS SHALL BE 1/4 TURN BALL VALVES WITH SINGLE LEVER HANDLE. GATE VALVES WITH HANDWHEEL ACTUATOR ARE STRICTLY PROHIBITED.

DATE MAY 2004  
REV JAN 2011

## 3" OR LARGER DOUBLE DETECTOR CHECK ASSEMBLY AND VAULT

DETAIL  
FIR-4

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



DATE MAY 2004  
REV JAN 2011

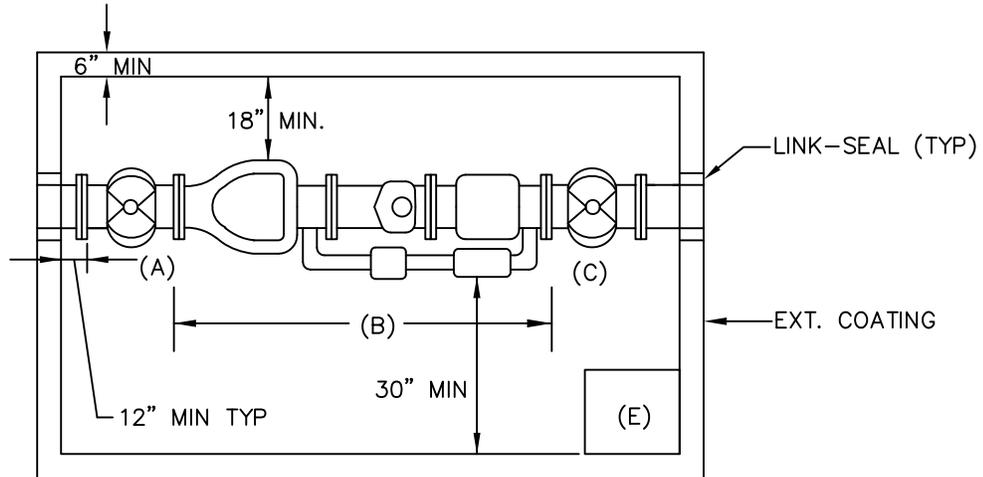
PRIVATE CENTRAL FIRE SYSTEM  
PLAN VIEW - 1 OF 3

DETAIL  
FIR-5

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

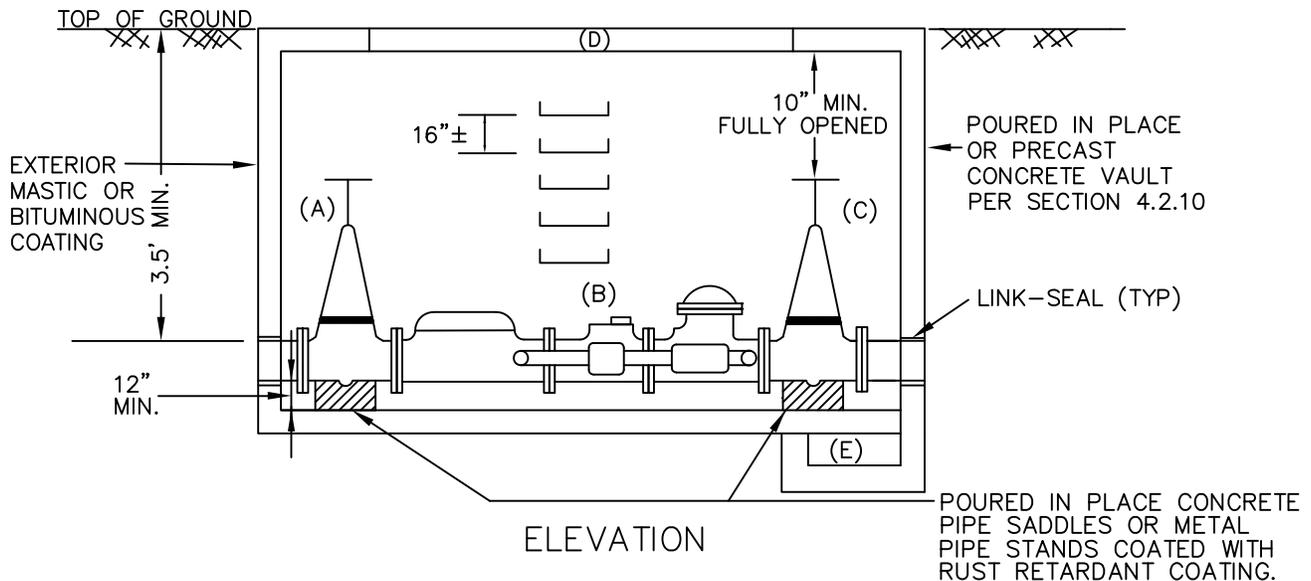
**NOTES:**

1. FIRE METER SHALL BE INSTALLED IN A VAULT AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING VAULT IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. FIRE METER MUST BE U.L. LISTED OR F.M. APPROVED AND APPROVED BY HANOVER COUNTY'S DEPT. OF UTILITIES.



PLAN

- (A) OUTSIDE STEM AND YOKE GATE VALVE
- (B) SENSUS FIRELINE METER ASSEMBLY WITH TOUCH READ (FM-720 OR FM-721)
- (C) OUTSIDE STEM AND YOKE GATE VALVE
- (D) JD-2AL 4' x 4' BILCO DOOR, OR AS MANUFACTURED BY VA. SPRINKLER COMPANY, OR APPROVED EQUAL.
- (E) SUMP PUMP OR GRAVITY DRAIN REQUIRED.



ELEVATION

DATE MAY 2004  
REV JAN 2011

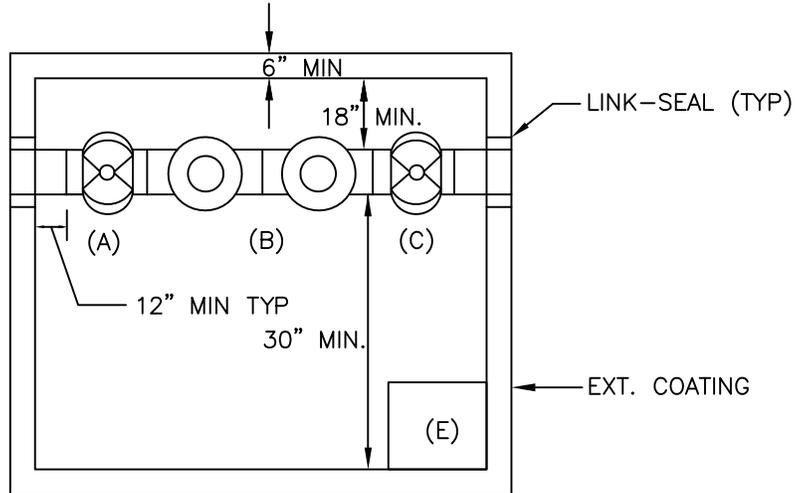
**PRIVATE CENTRAL FIRE SYSTEM  
FIRE METER ASSEMBLY & VAULT - 2 OF 3**

DETAIL  
**FIR-6**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

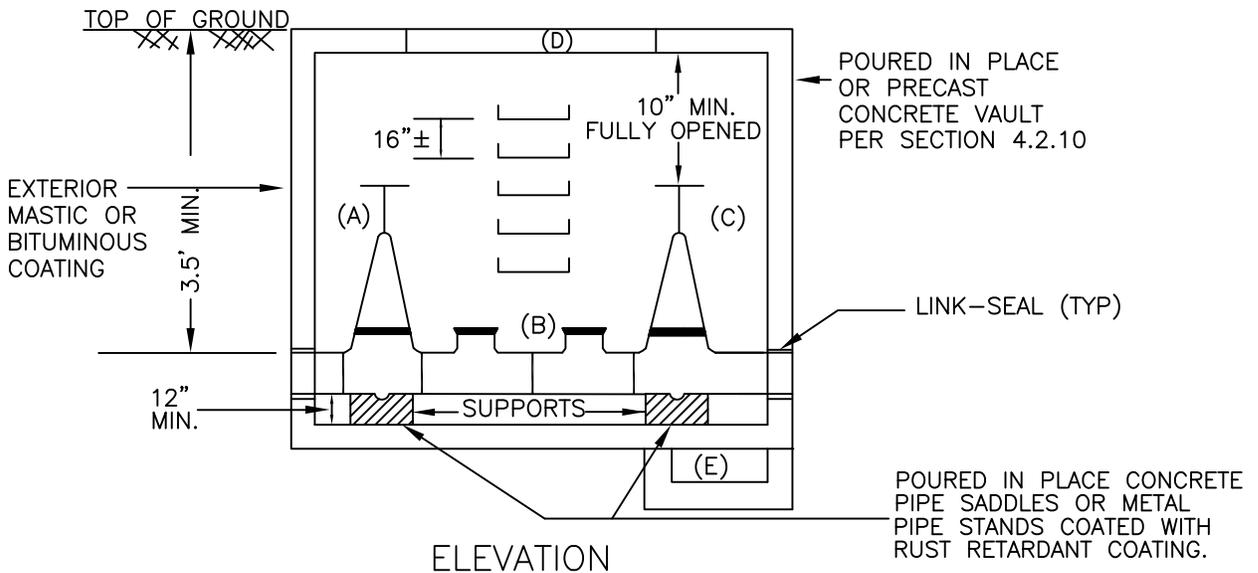
**NOTES:**

1. DOUBLE CHECK DEVICE SHALL BE INSTALLED IN A BOX AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
2. DOUBLE DETECTOR CHECK ASSEMBLY MUST BE U.L. LISTED OR F.M. APPROVED AND APPROVED BY HANOVER COUNTY'S DEPT. OF UTILITIES.



PLAN

- (A) OUTSIDE STEM AND YOKE GATE VALVE
- (B) DOUBLE CHECK VALVE ASSEMBLY
- (C) OUTSIDE STEM AND YOKE GATE VALVE
- (D) JD-2AL 4' x 4' BILCO DOOR, OR AS MANUFACTURED BY VA. SPRINKLER COMPANY, OR APPROVED EQUAL.
- (E) SUMP PUMP OR GRAVITY DRAIN REQUIRED.



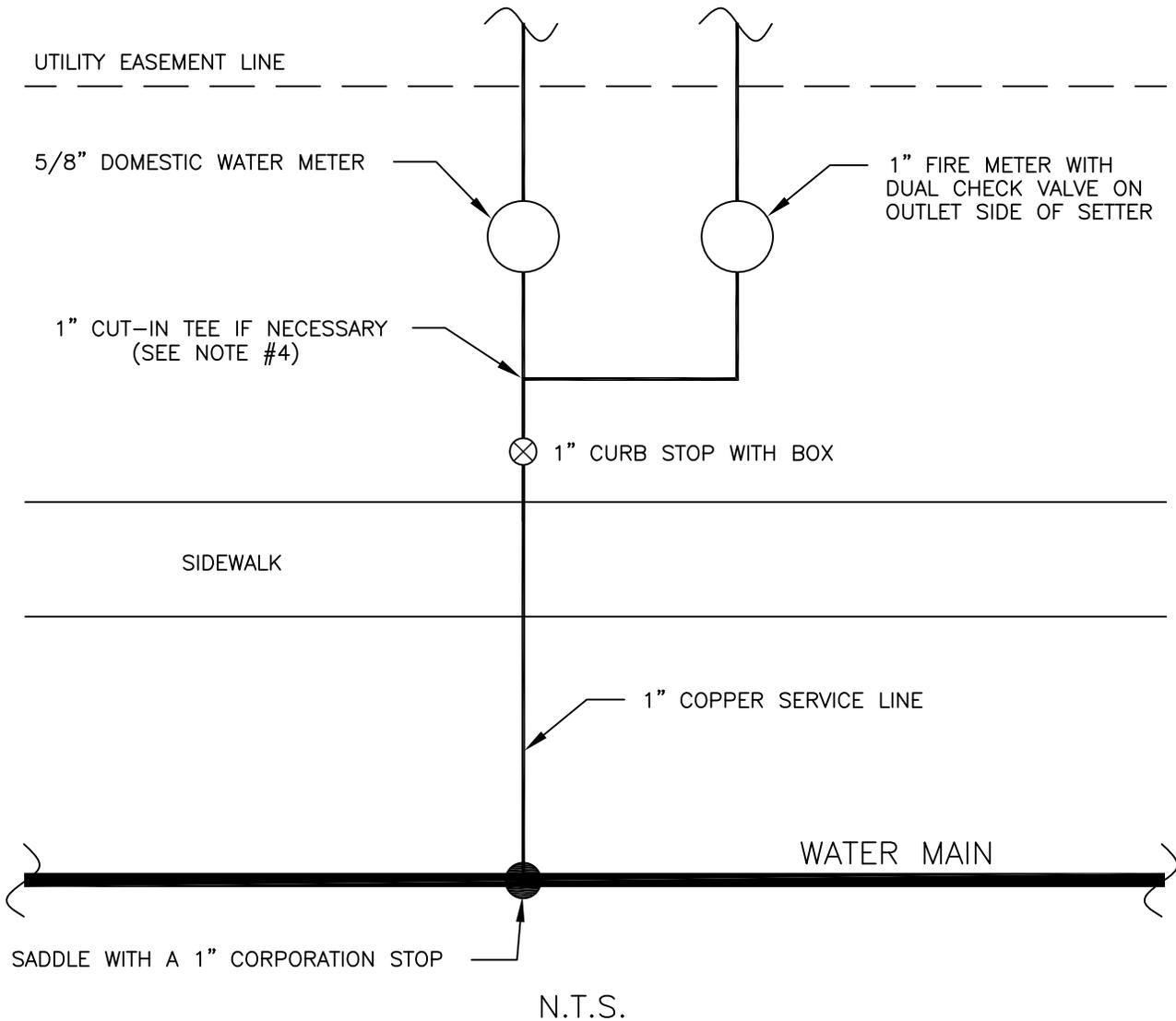
ELEVATION

DATE MAY 2004  
REV JAN 2011

**SYSTEM INTERCONNECTION 3" OR LARGER  
DOUBLE CHECK ASSEMBLY & VAULT - 3 OF 3**

DETAIL  
**FIR-7**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



**NOTES:**

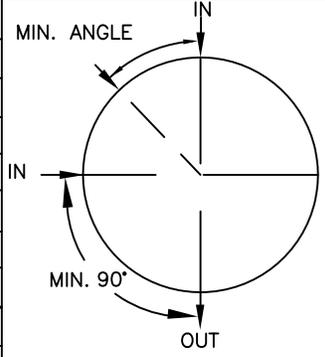
1. USE OF THIS ARRANGEMENT IS LIMITED TO A CASE-BY-CASE BASIS AND REQUIRES DPU APPROVAL. NORMAL RESIDENTIAL WATER SERVICES ARE TO BE PER MET-1.
2. ALL ITEMS ARE TO BE PER HANOVER DPU STANDARDS UNLESS SPECIFICALLY NOTED OTHERWISE.
3. CURB STOP IS TO HAVE COMPRESSION JOINT WITH GRIPPER RING (300 PSI WORKING PRESSURE CONNECTION ON INLET SIDE TO ASSURE VALVE REMAINS IN PLACE DURING USE. PROPOSED TEE IS TO BE COMPRESSION JOINT WITH GRIPPER RING (300 PSI WORKING PRESSURE) AS MANUFACTURED BY FORD, CAMBRIDGE, OR APPROVED EQUAL.
4. TEE IS TO BE CUT IN ONLY IF DWELLINGS IS TO BE FITTED WITH A SPRINKLER SYSTEM.

DATE JAN 2011	<b>TYP. SINGLE FAMILY RESIDENTIAL FIRE LINE SYSTEM WITH DOMESTIC SERVICE LINE</b>	DETAIL <b>FIR-8</b>
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# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

## PIPE SIZE

		PIPE SIZE														
		8	10	12	15	18	21	24	27	30	33	36	42	48	54	
48" MH	8	38°	40°													
	10	40°	43°													
	12	43°	45°	48°												
	15	47°	49°	51°	55°											
	18	55°	57°	59°	63°	71°										
	21	59°	61°	64°	67°	76°	80°									
	24	63°	65°	68°	71°	80°	84°	88°								
60" MH	12	34°	36°	38°	41°											
	15	37°	39°	41°	44°											
	18	44°	46°	48°	51°	57°										
	21	47°	49°	51°	54°	61°	64°									
	24	51°	53°	54°	57°	64°	67°	71°								
	27	54°	56°	58°	61°	67°	71°	74°	77°							
	30	57°	59°	61°	64°	71°	74°	77°	81°	84°						
72" MH	33	61°	63°	64°	67°	74°	77°	81°	84°	87°	90°					
	15				37°	42°										
	18				42°	48°										
	21				45°	50°	53°									
	24				48°	53°	56°	59°								
	27				50°	56°	59°	62°	64°							
	30				53°	59°	62°	64°	67°	70°						
	33				56°	62°	64°	67°	70°	73°	76°					
84" MH	36				59°	64°	67°	70°	73°	76°	78°	81°	87°			
	18					41°	43°									
	21					43°	46°									
	24					46°	48°	50°								
	27					48°	50°	53°	55°							
	30					50°	53°	55°	58°	60°						
	33					53°	55°	58°	60°	62°	65°					
	36					55°	58°	60°	62°	65°	67°	70°				
	42					60°	62°	65°	67°	70°	72°	74°	79°			
96" MH	48					65°	67°	70°	72°	74°	77°	79°	84°	89°		
	54								67°	69°	71°	73°	78°	82°	86°	



THICK-WALL OR NON-FLOAT PIPE MUST BE CALCULATED.  
 \* D=PIPE DIAMETER  
 W=PIPE WALL THICKNESS  
 PIPE 18" AND OVER IS ASSUMED TO BE CONCRETE.

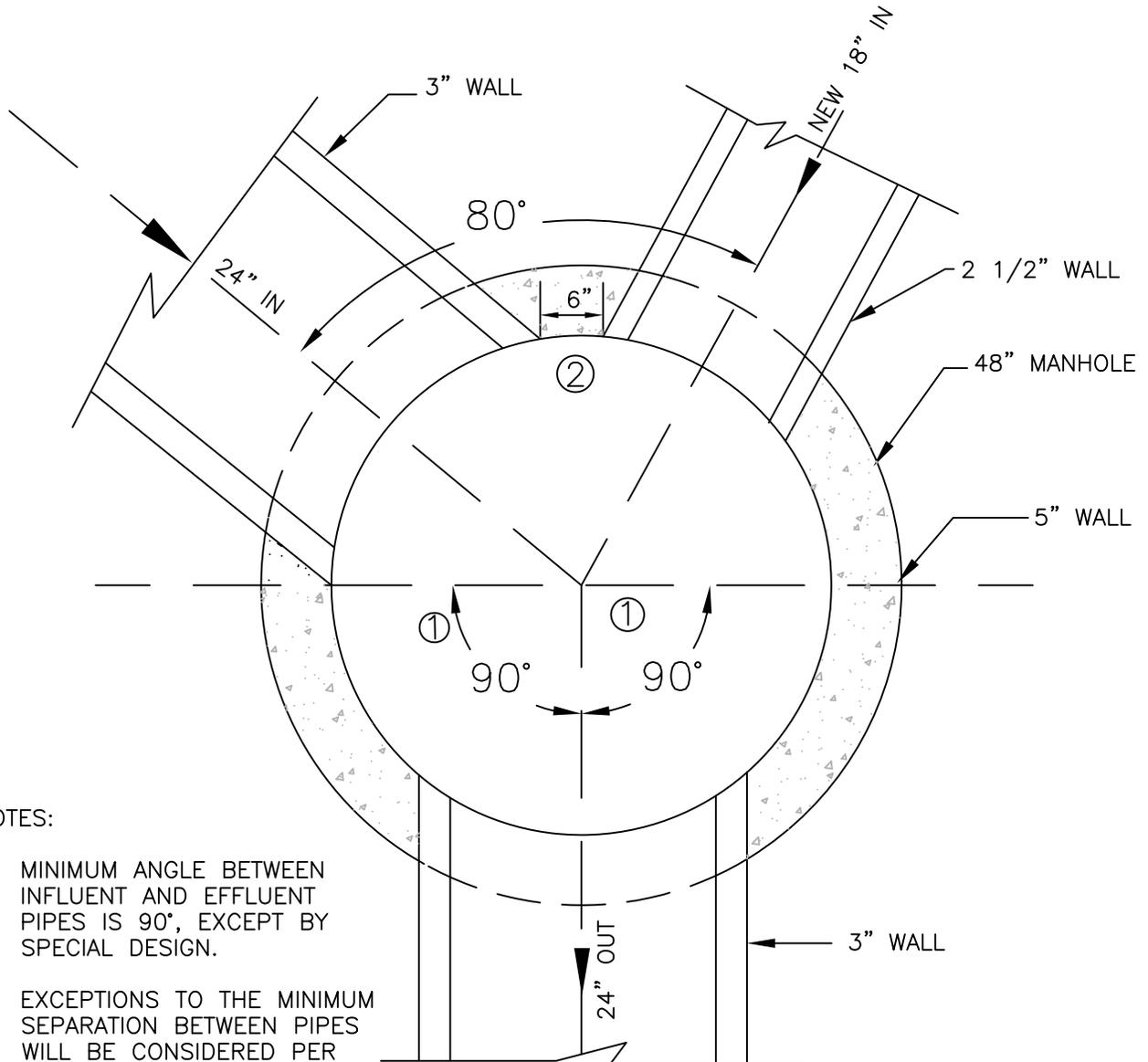
② 42" PIPE WILL BE ALLOWED IN 72" MH WHERE THE CALCULATION ALLOWS IT. FOR EXAMPLE, STRAIGHT THRU OR MIN. ANGLE OVER 92° FOR TWO 42" PIPES.

MINIMUM ANGLE FOR COMBINATIONS NOT GIVEN MAY BE DERIVED BY:

$$\frac{*D1 + \frac{D2}{2} + (7+W1+W2)}{2} \times 360$$

7" MH DIA.

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

1. MINIMUM ANGLE BETWEEN INFLUENT AND EFFLUENT PIPES IS 90°, EXCEPT BY SPECIAL DESIGN.
2. EXCEPTIONS TO THE MINIMUM SEPARATION BETWEEN PIPES WILL BE CONSIDERED PER EACH, BY SPECIAL DESIGN.

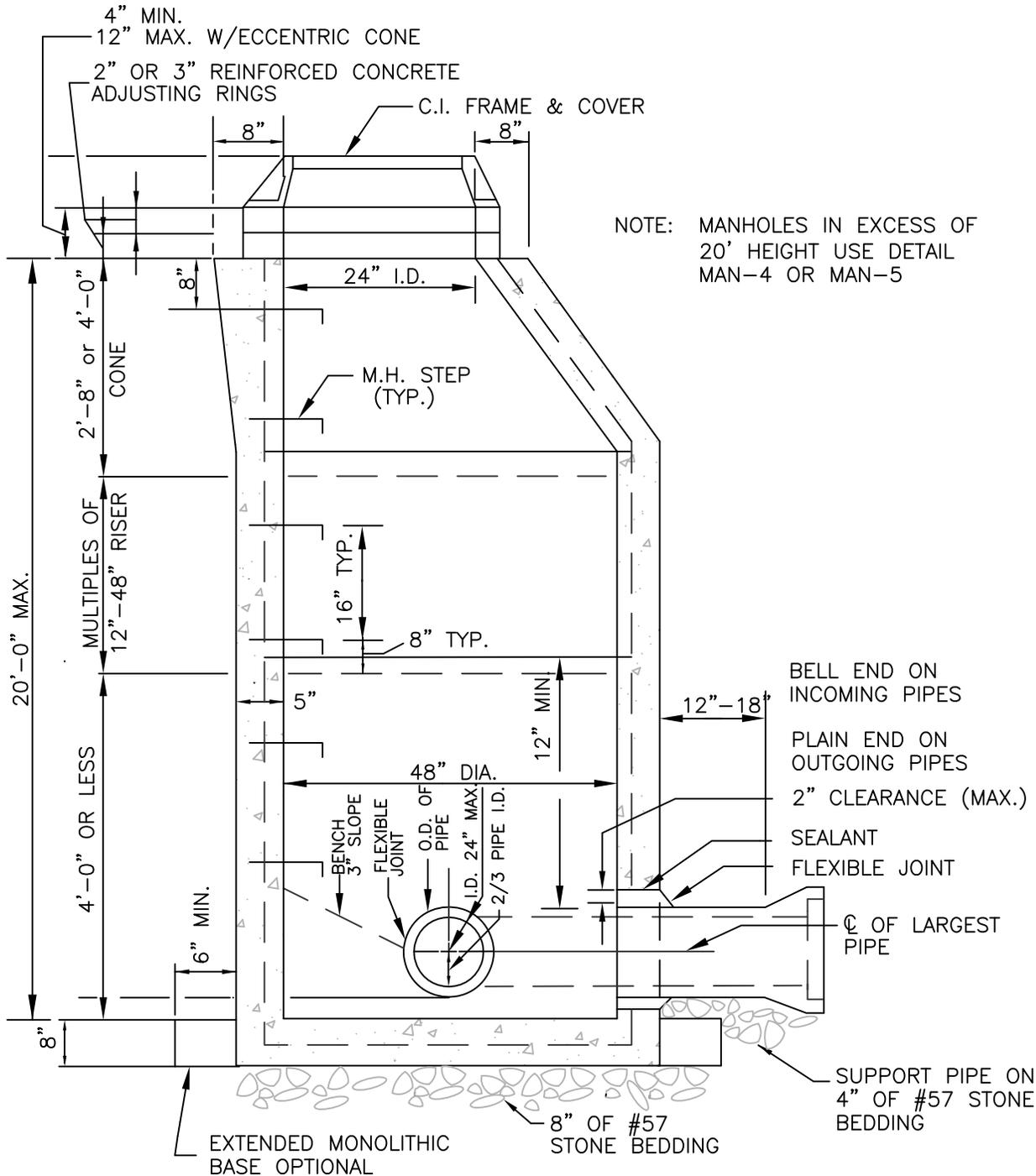
EXAMPLE: 48" MANHOLE, EXISTING 24" IN, EXISTING 24" OUT, NEW 18" IN, ALL CONCRETE. MAN-1 TABLE INDICATES A MINIMUM ANGLE OF 80° BETWEEN THE EXISTING 24" (IN) AND THE NEW 18" (IN), RESULTING IN APPROXIMATE 6" OF INTERIOR MANHOLE WALL REMAINING BETWEEN THE 2 PIPES.

DATE MAY 2004  
REV JAN 2011

MANHOLE SIZING AND MINIMUM ANGLE  
TABLE

DETAIL  
MAN-1  
SHT. 2 OF 2

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

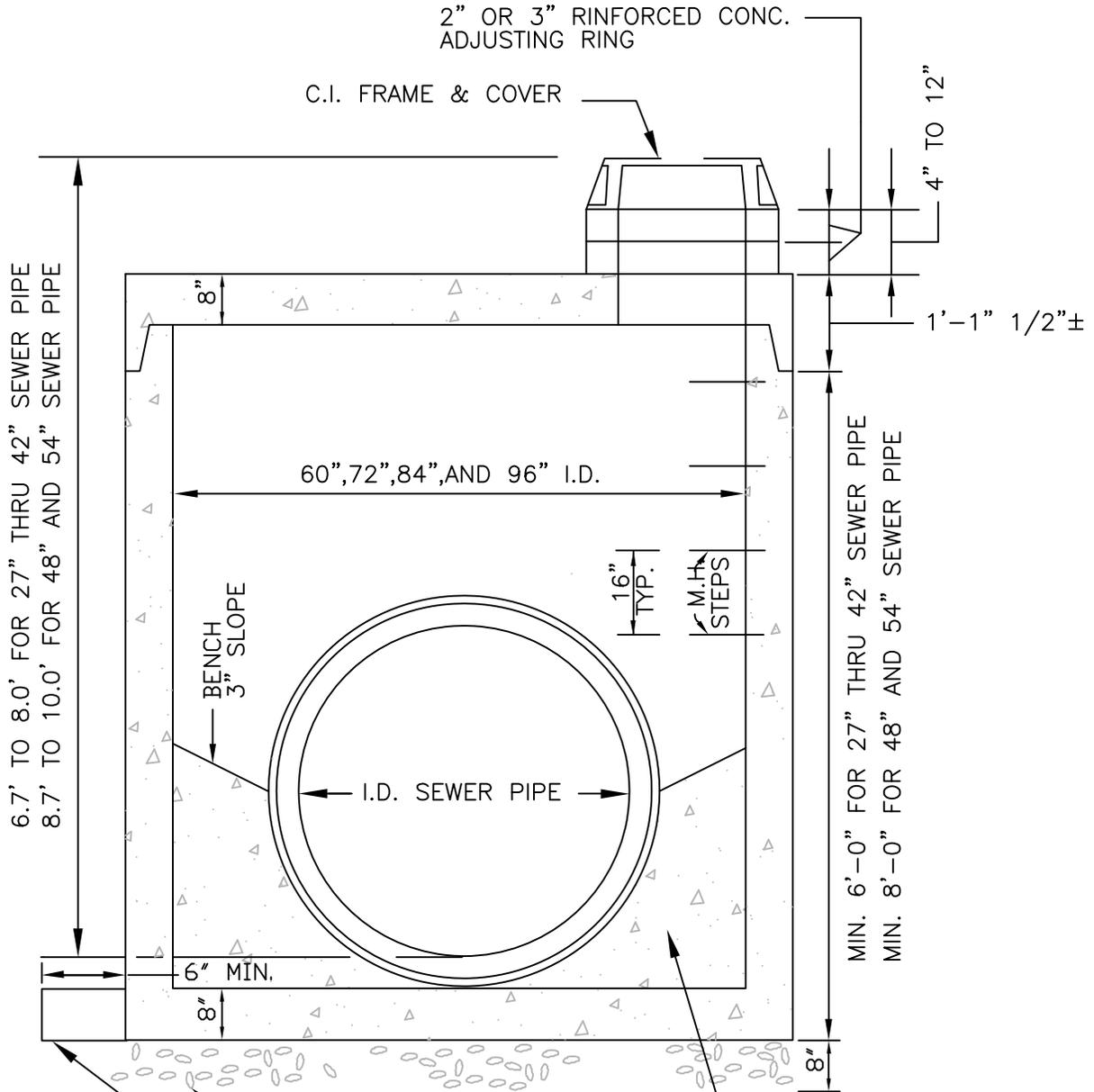


NOTE: MANHOLES IN EXCESS OF 20' HEIGHT USE DETAIL MAN-4 OR MAN-5

NOTE: BENCH MAY BE CONC. OR BRICK AND MORTAR. USE TYPE II SULFATE RESISTANT CEMENT FOR ALL MANHOLE BENCH CONSTRUCTION.

NOTE: STONE BEDDING SHALL EXTEND TO THE OUTER BOUNDARY OF ALL UNDISTURBED AREAS SURROUNDING THE MANHOLE.

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



#57 STONE BEDDING

BRICK AND MORTAR OR 3000# CONCRETE. USE TYPE II SULFATE RESISTANT CEMENT FOR ALL MANHOLE BENCH CONSTRUCTION

EXTENDED MONOLITHIC BASE OPTIONAL

MANHOLE CONSTRUCTION SHALL CONFORM TO ASTM C-478

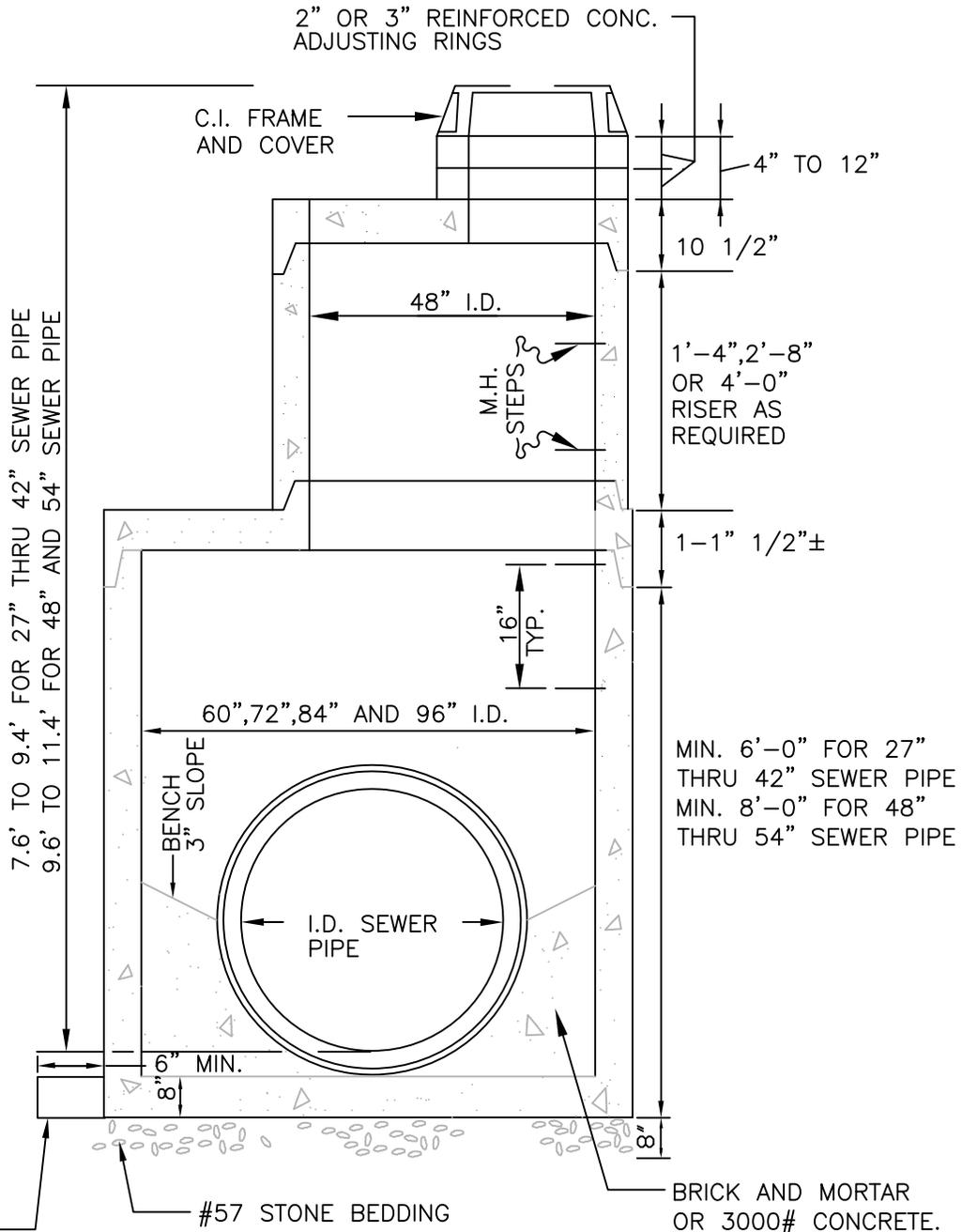
NOTE: WHERE STUBS ARE PROVIDED FOR FUTURE CONNECTIONS BENCH SHALL BE SO FORMED.

DATE MAY 2004  
REV JAN 2011

60", 72", 84" & 96" I.D. MANHOLE - I

DETAIL  
MAN-3

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



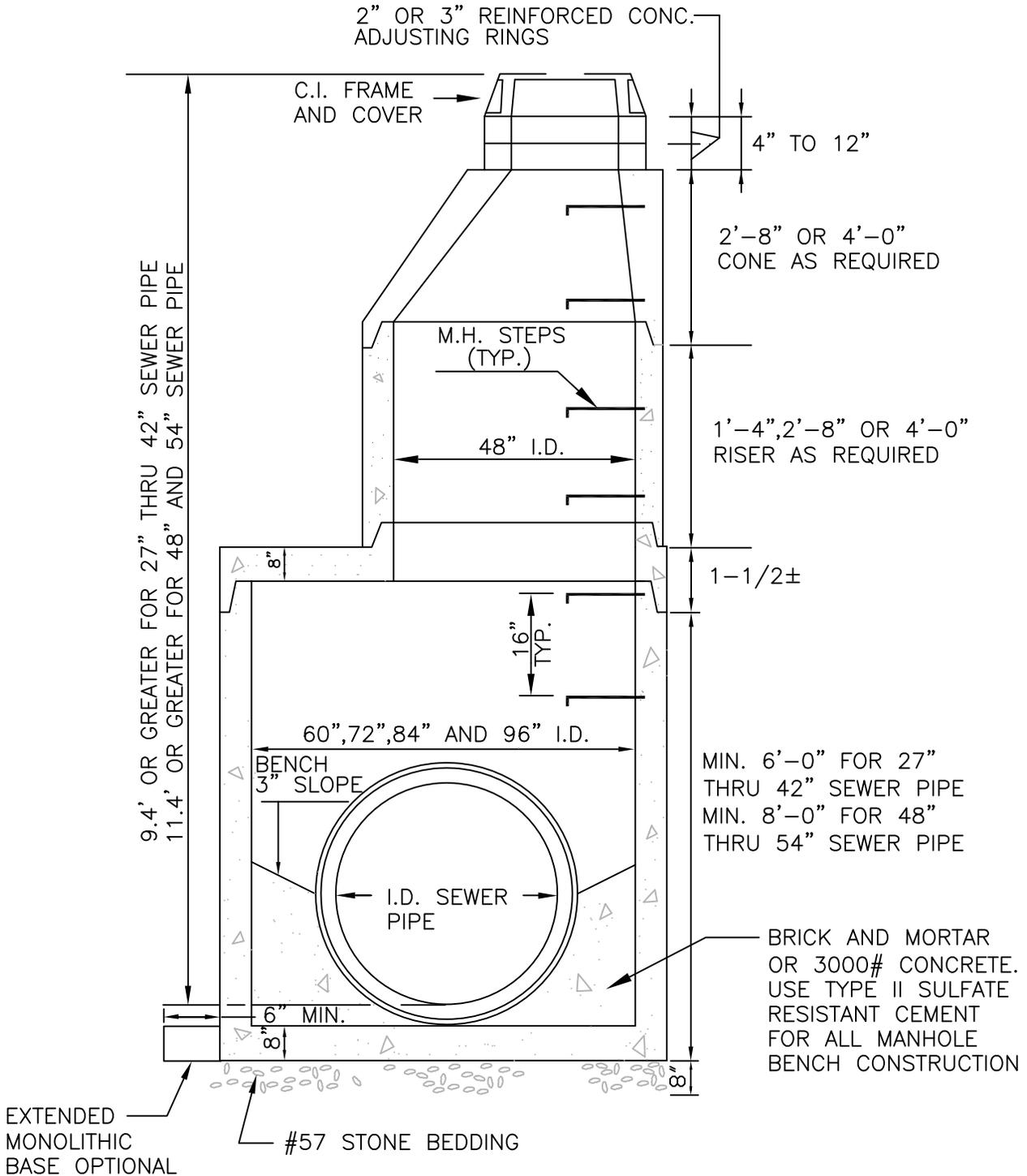
NOTE: WHERE STUBS ARE PROVIDED FOR FUTURE CONNECTIONS BENCH SHALL BE SO FORMED.

DATE MAY 2004  
REV JAN 2011

60", 72", 84" & 96" I.D. MANHOLE - II

DETAIL  
MAN-4

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTE: WHERE STUBS ARE PROVIDED FOR FUTURE CONNECTIONS BENCH SHALL BE SO FORMED.

DATE MAY 2004  
REV JAN 2011

STANDARD PRECAST CONCRETE  
MANHOLE III 60", 72", 84" & 96" I.D.

DETAIL  
MAN-5

THIS DETAIL REMOVED FROM  
STANDARDS IN 2004

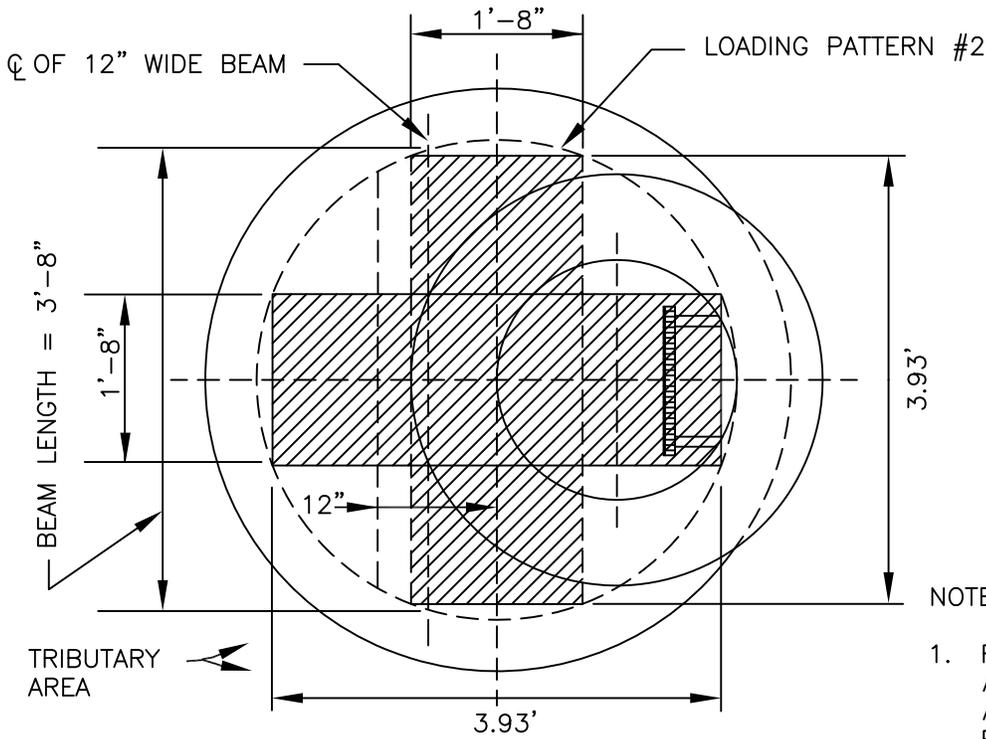
DATE  
MAY 2004

HANOVER  
DPU

THIS DETAIL REMOVED FROM  
STANDARDS IN 2004

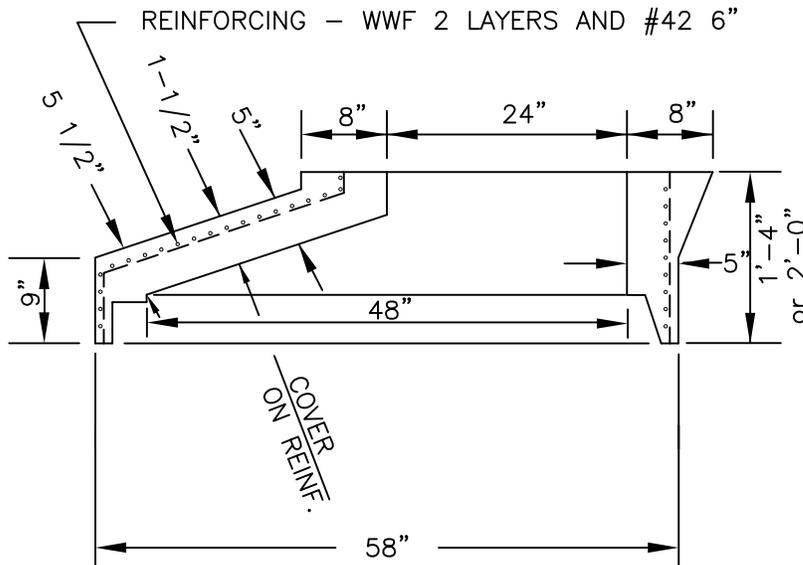
DRWG. NO.  
MAN-6

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

1. REINFORCING TO MEET ASTM A-185 FOR MESH AND ASTM A-615 FOR REBARS.
2. MANHOLE MEETS ALL REQUIREMENTS OF ASTM C-478.
3. CONCRETE IS 4,000 PSI COMPRESSIVE STRENGTH MINIMUM.

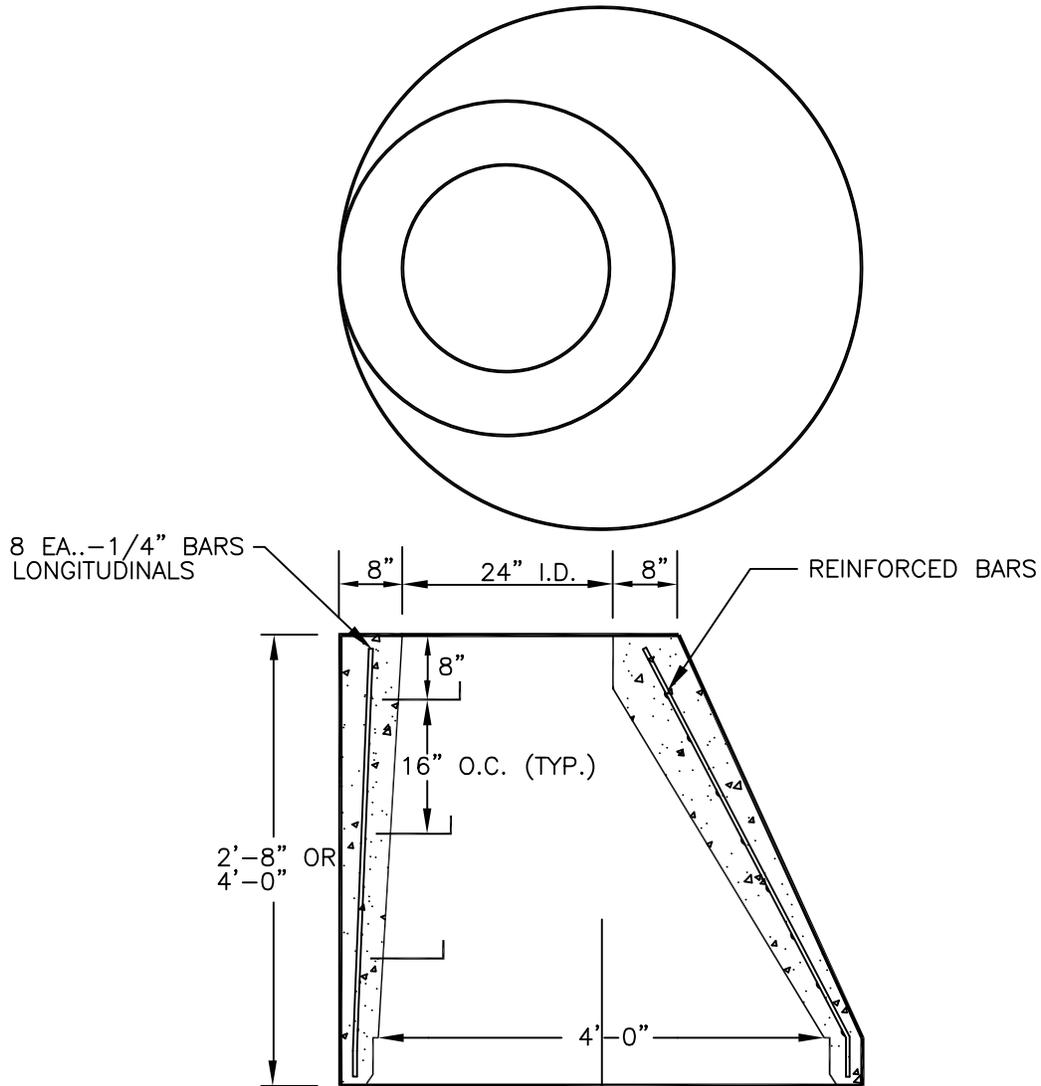


DATE MAY 2004  
REV JAN 2011

1'-4" or 2'-0" CONE (TYPE 1)

DETAIL  
MAN-7

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

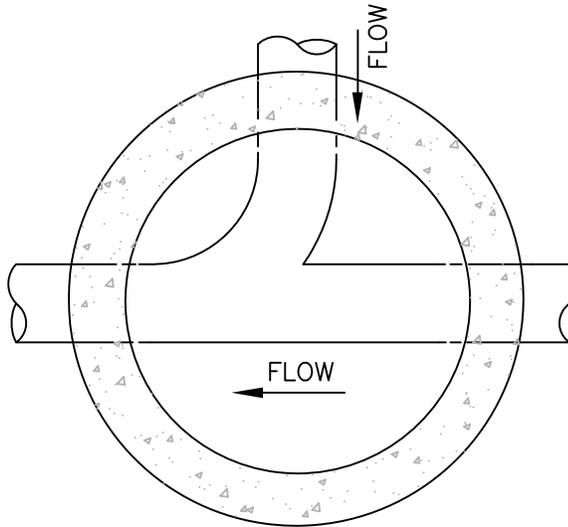
1. CONE SHALL MEET REQUIREMENTS OF ASTM C478. O-RING GASKET JOINTS MEET REQUIREMENTS OF ASTM C443.
2. CONCRETE SHALL MEET OR EXCEED THE TEST 4,000 PSI MINIMUM COMPRESSIVE 28 DAY STRENGTH.
3. APPROVED STEPS SHALL BE EQUAL, SPACED @ 16 INCHES O.C.
4. REINFORCING SHALL BE A MINIMUM .12 IN. <sup>2</sup>/FT. (MINIMUM OF 8 EACH - 1/4" BARS ON BACK FACE; & MINIMUM OF 4 EACH - #3 BARS ON FRONT FACE AND W3.4 [5 GAL.] WIRING.)

DATE MAY 2004

STANDARD ECCENTRIC CONE

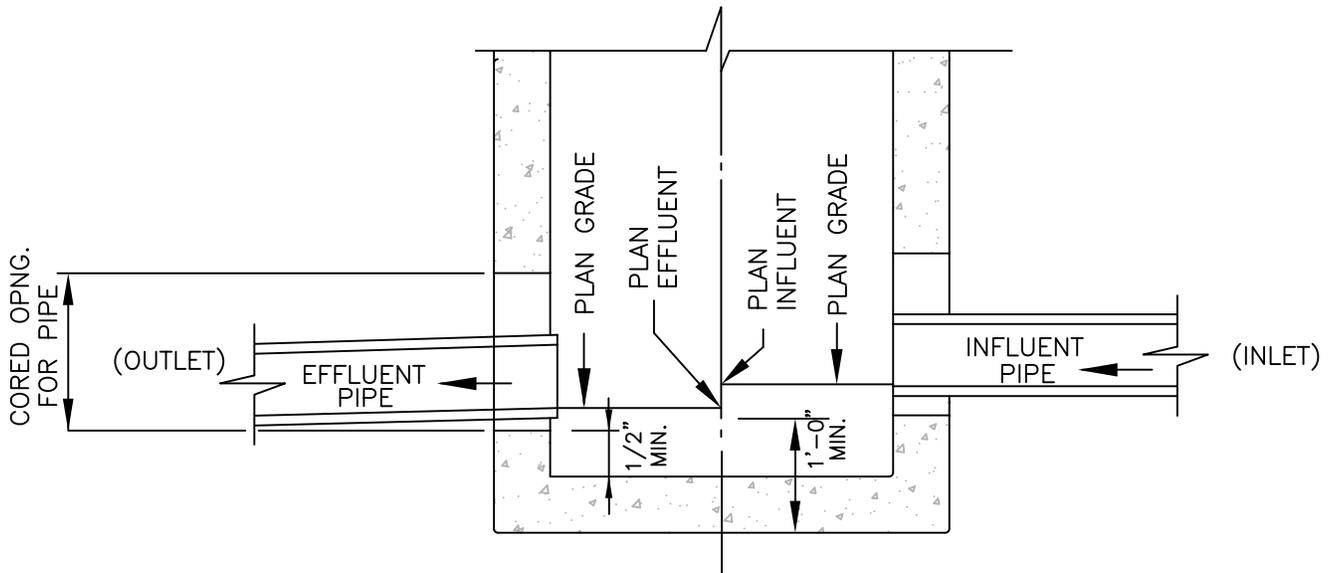
DETAIL  
MAN-8

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN INVERT

NOTE: THE EFFLUENT ELEVATION SHOWN AT A MANHOLE IS ESTABLISHED FROM THE INFLUENT ELEVATION OF THE MANHOLE IMMEDIATELY DOWNSTREAM. ELEVATIONS SHOWN APPLY AT THE  $\text{C}$  OF MANHOLES & ARE BASED ON THE HORIZONTAL DISTANCE,  $\text{C}$  TO  $\text{C}$  M.H. USING PERCENT OF GRADE INDICATED.



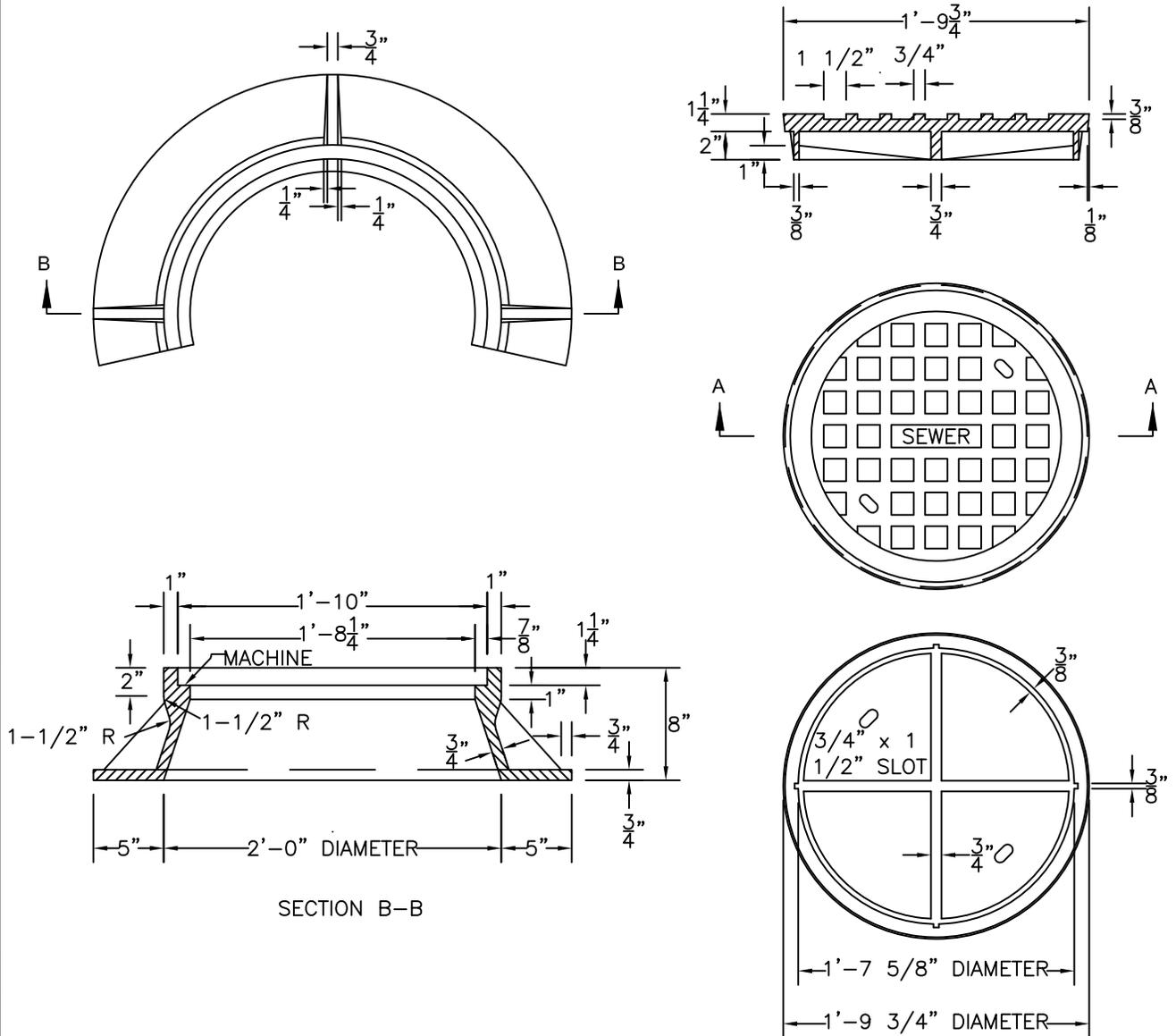
DATE MAY 2004

STANDARD INVERT DETAILS

DETAIL  
MAN-9



HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



SECTION B-B

NOTES:

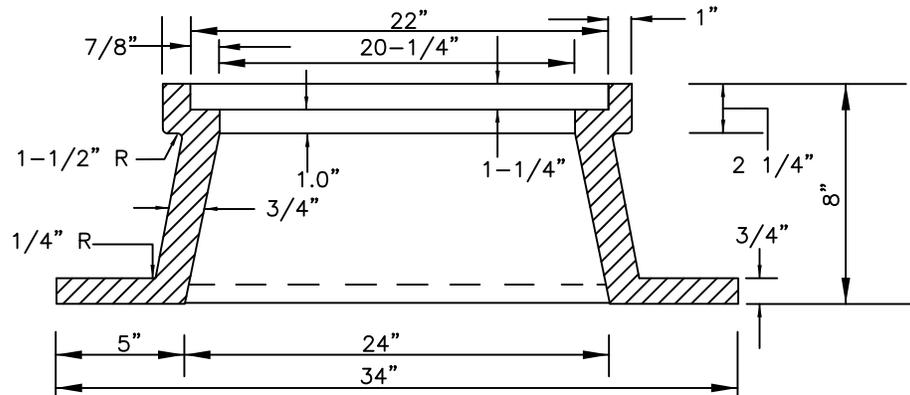
1. THE LETTERS ARE TO BE CAST IN THE DEPRESSION IN THE TOP OF COVER, 1" WIDE RAISED 3/8" HIGH AS SHOWN.
2. ON COVERS FOR WATER FACILITIES THE WORD "WATER" IS TO BE CAST IN THE TOP RATHER THAN "SEWER".
3. APPROXIMATE WEIGHT, CAST IRON; FRAME 239 + 12 LBS, COVER 137 + 7 LBS.
4. MANHOLE FRAMES LOCATED ABOVE GRADE SHALL BE ATTACHED TO MANHOLE BY USE OF TWO 1/2" STAINLESS STEEL ANCHOR BOLTS, WEDGE ANCHORS, OR STUD ANCHORS WITH STAINLESS STEEL WASHER AND NUT LOCATED ON OPPOSITE SIDES OF MANHOLE FRAME. HOLES IN MANHOLE FRAME SHALL BE NEATLY DRILLED TO ALIGN WITH ANCHORS.
5. SEALANT FOR MANHOLE FRAMES SHALL BE ONE-COMPONENT POLYURETHANE OR BITUMASTIC MATERIAL PER SECTION 3.2.2.G.

DATE MAY 2004  
REV JAN 2011

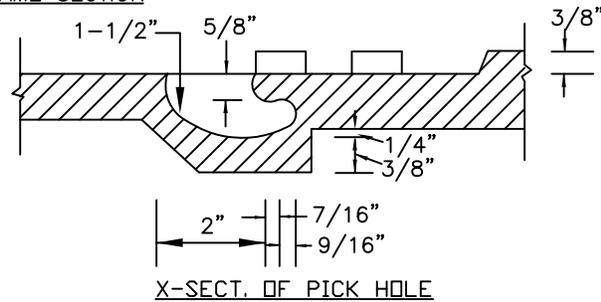
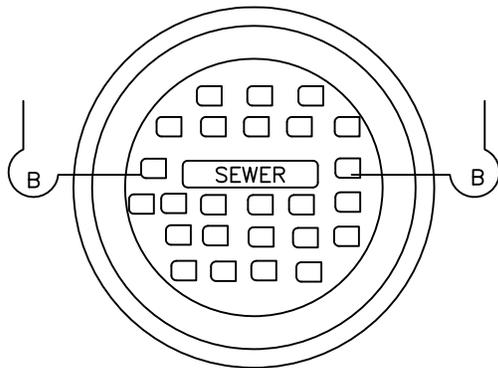
STANDARD MANHOLE FRAME & COVER

DETAIL  
MAN-11

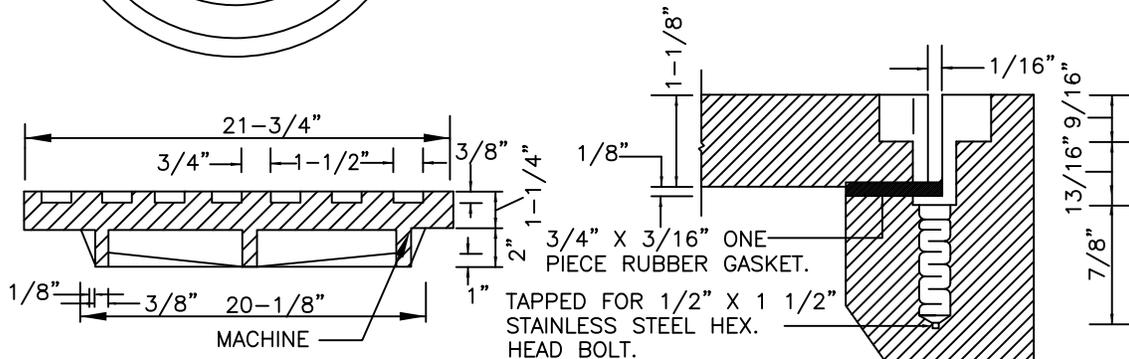
HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



FRAME SECTION



X-SECT. OF PICK HOLE



SECT. B-B

X-SECT. OF BOLT

NOTE:

1. INSTALL (4) FOUR 1/2" X 1-1/2" STAINLESS STEEL 3/4" HEXAGONAL HEAD BOLTS AT 90 DEGREES. COUNTERBORE THE COVER SO THAT THE HEAD OF THE BOLT IS FLUSH OR JUST BELOW THE TOP OF THE COVER. PENTAGON HEAD BOLTS ARE OPTIONAL FOR WATERTIGHT OR VANDAL RESISTANT INSTALLATIONS.
2. MANHOLE FRAMES LOCATED ABOVE GRADE SHALL BE ATTACHED TO MANHOLE BY USE OF FOUR 1/2" STAINLESS STEEL ANCHOR BOLTS, WEDGE ANCHORS, OR STUD ANCHORS WITH STAINLESS STEEL WASHER AND NUT LOCATED ON OPPOSITE SIDES OF MANHOLE FRAME. HOLES IN MANHOLE FRAME SHALL BE NEATLY DRILLED TO ALIGN WITH ANCHORS.
3. SEALANT FOR MANHOLE FRAMES SHALL BE ONE-COMPONENT POLYURETHANE OR BITUMASTIC MATERIAL PER SECTION 3.2.2.G.
4. INSTALLATION OF A CRETEX OR APPROVED EQUAL MANHOLE CHIMNEY SEAL REQUIRED ON ALL WATERTIGHT FRAME AND COVER INSTALLATIONS.

DATE MAY 2004  
REV JAN 2011

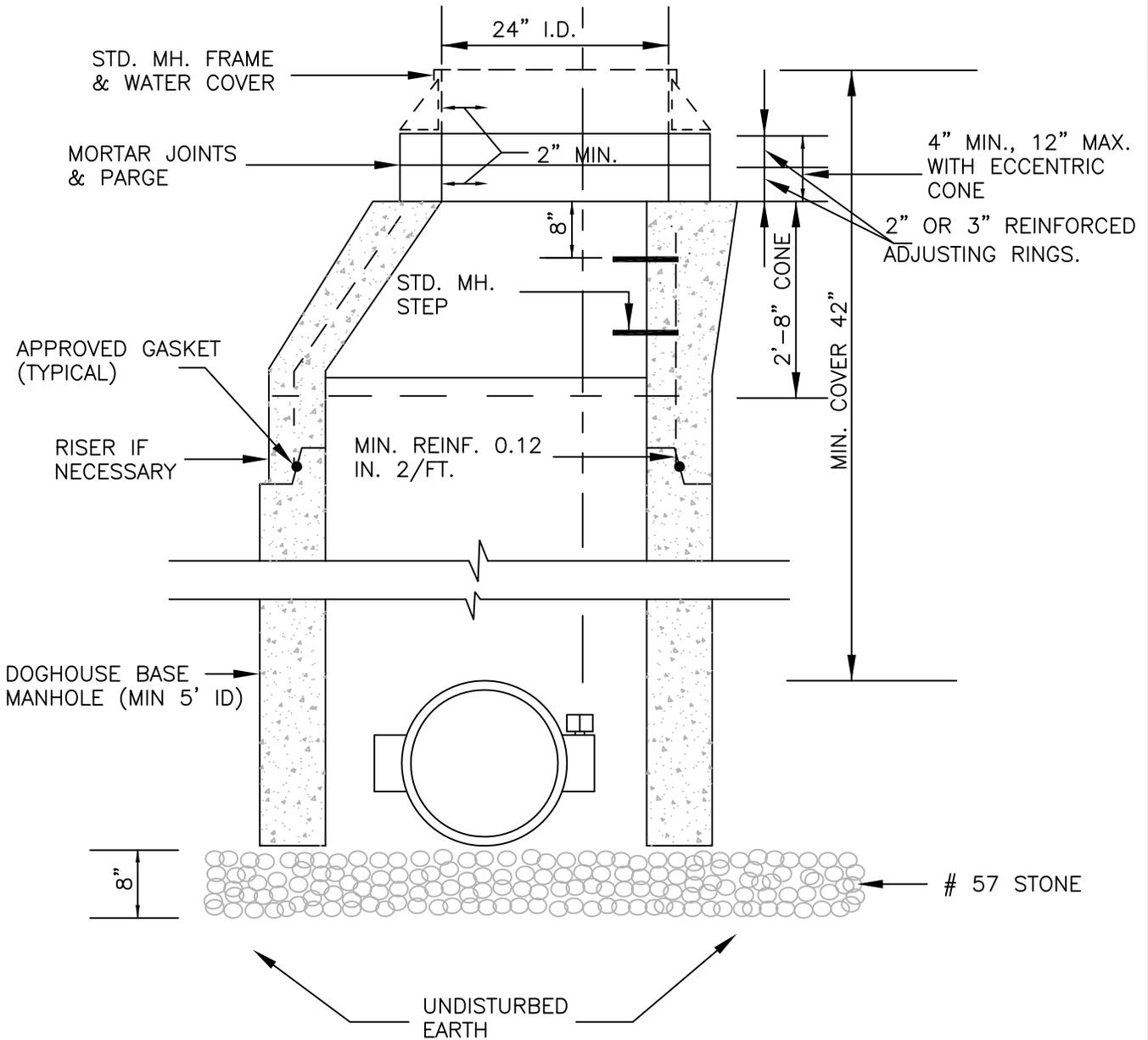
WATERTIGHT MANHOLE  
FRAME & COVER

DETAIL  
MAN-12

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

NOTE: MANHOLE IS REQUIRED WHEN VALVE IS LOCATED UNDER PAVEMENT.  
USE STANDARD VALVE BOX OVER OPERATING NUT FOR OTHER INSTALLATIONS.

A VERTICAL LINE EXTENDING FROM THE VALVE OPERATING NUT SHALL COME NO CLOSER THAN 12" FROM THE EDGE OF THE OPENING.

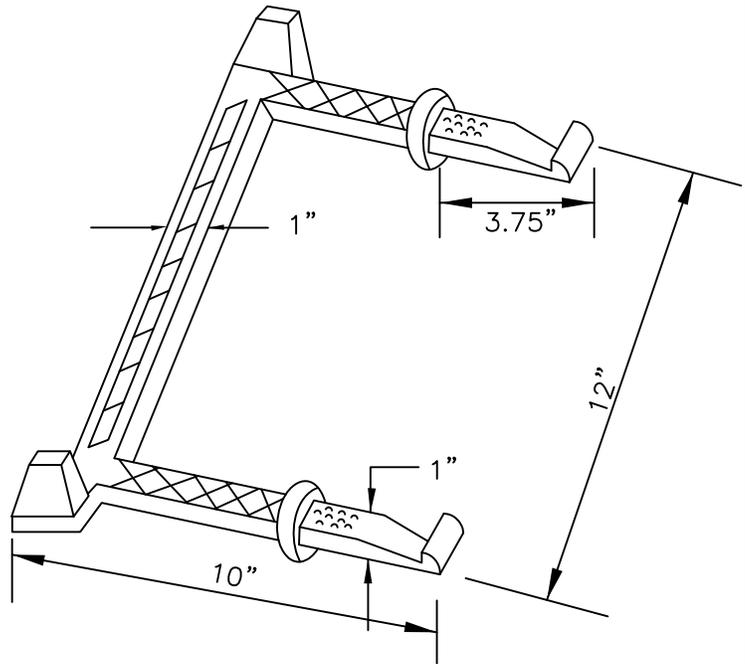
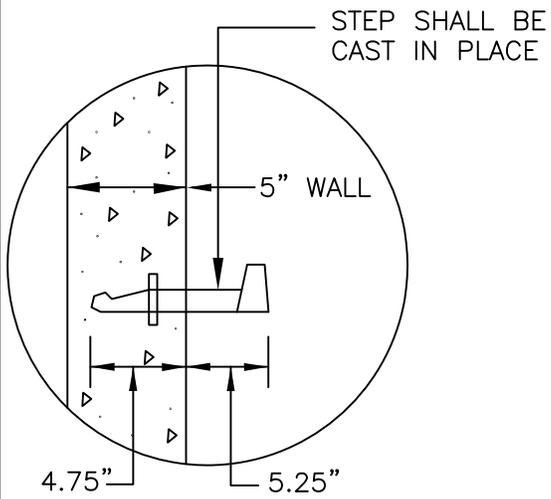


DATE MAY 2004  
REV JAN 2011

## STANDARD BUTTERFLY VALVE MANHOLE (16" AND LARGER)

DETAIL  
MAN-13

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



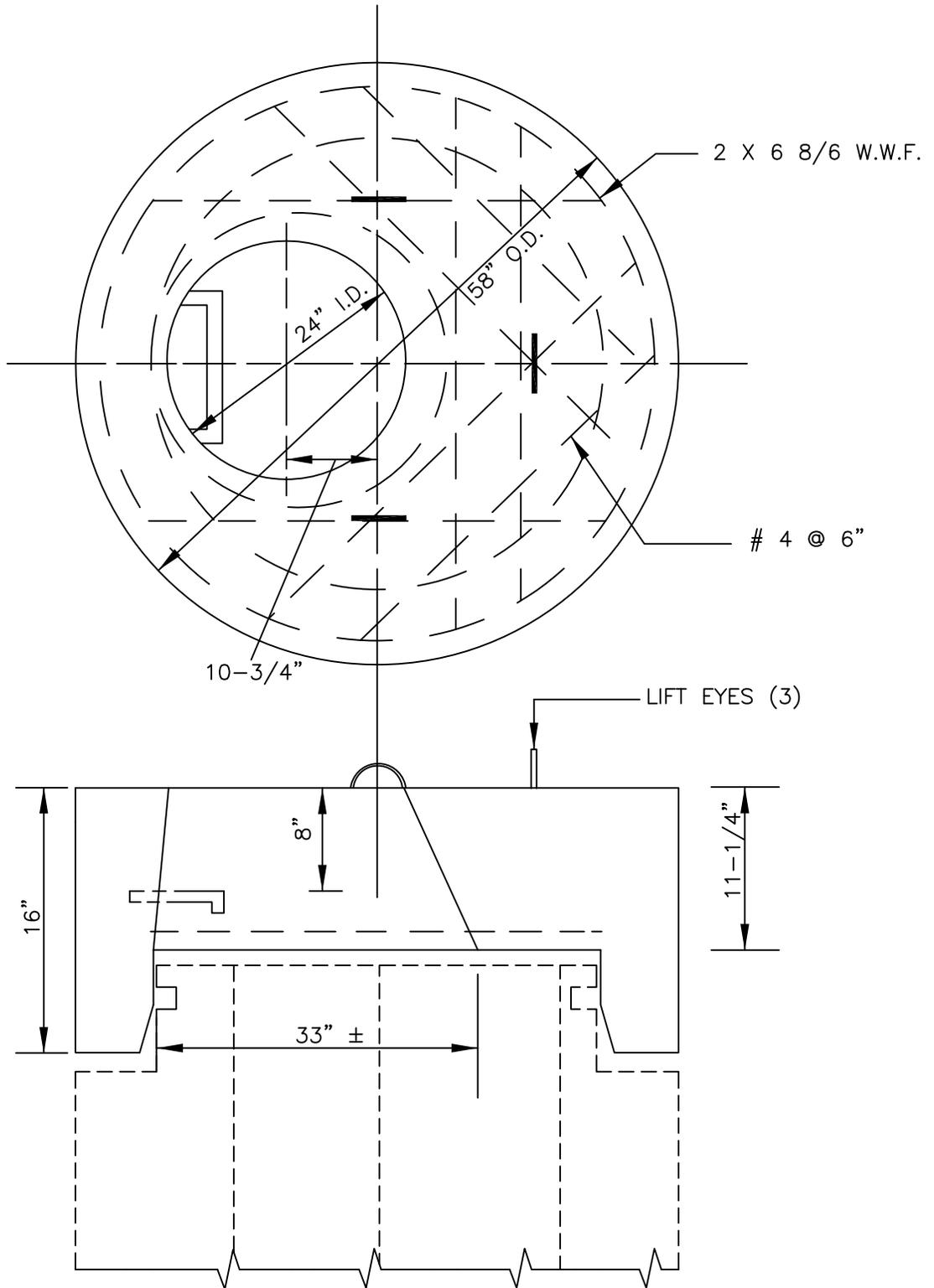
NOTE: STEP SHALL BE MADE WITH 1/2" STEEL REINFORCING BAR ENCAPSULATED IN POLYPROPYLENE PLASTIC.

DATE MAY 2004  
REV JAN 2011

TYPICAL MANHOLE STEP

DETAIL  
MAN-14

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

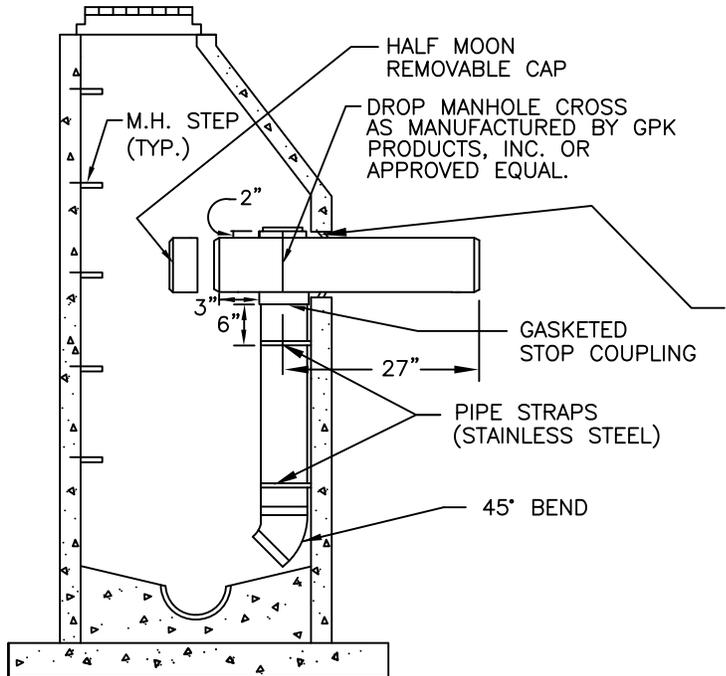


DATE MAY 2004

1' - 4" FLAT TOP CONE  
(TYPE 2)

DETAIL  
MAN-15

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



**NOTES:**

1. ONLY ONE PER EXISTING 48" DIAMETER MANHOLE.
  2. WHEN PROPOSING WITH NEW CONSTRUCTION A 60" DIAMETER MANHOLE SHALL BE USED.
  3. MANHOLE CONE SHALL BE POSITIONED SO THAT ACCESS TO THE DROPSTICK IS MAXIMIZED.
- USE FLEXIBLE RUBBER BOOT OR APPROVED PVC MANHOLE ADAPTOR AS MANUFACTURED BY GPK PRODUCTS, INC. OR APPROVED EQUAL IN CORE OPENING.

**NOTES:**

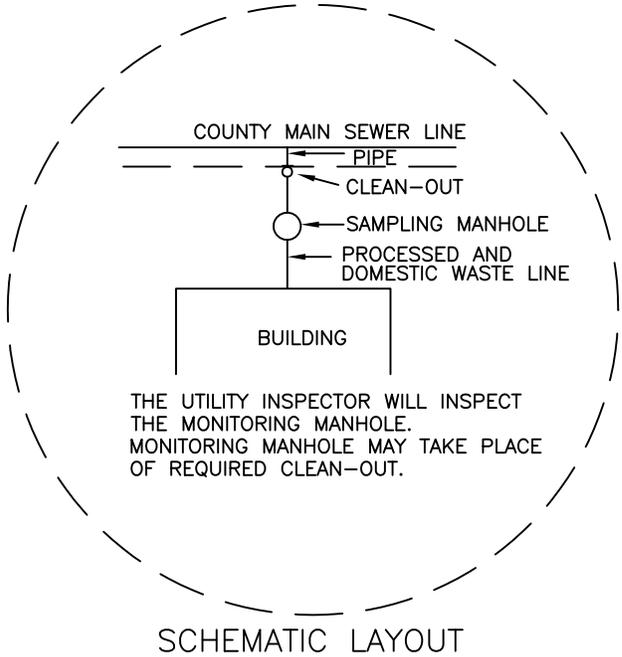
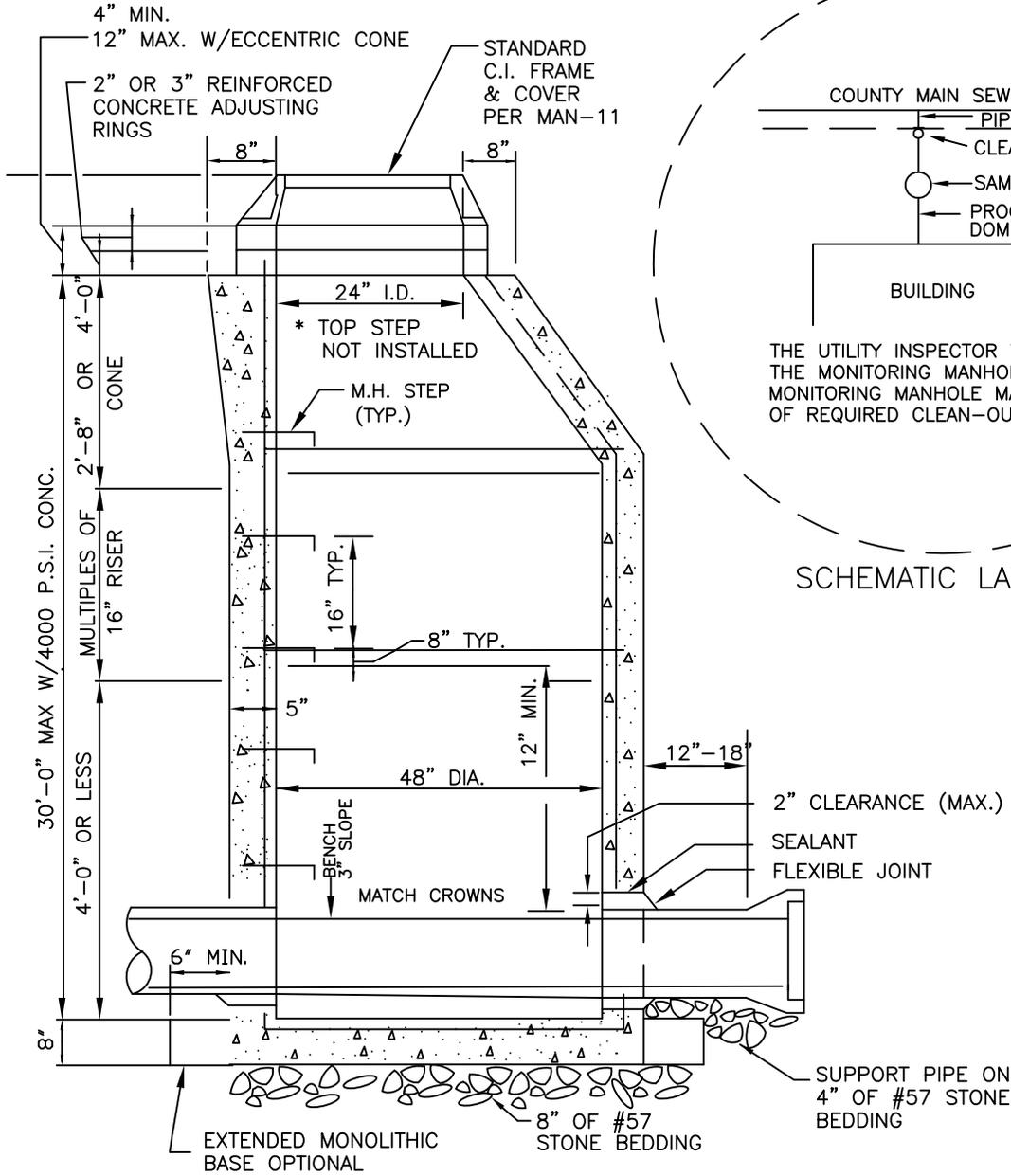
1. ALL THRU PIPE SHALL BE FITTED WITH AN SDR 35 P.V.C. REMOVABLE CAP WHICH SHALL BE HELD IN PLACE BY THE INTERFERENCE (FRICTION) FIT BETWEEN THE PIPE AND CAP.
2. ALL CAPS SHALL BE SECURED TO THE DROP FITTING WITH TWO (2) FEET OF GALVANIZED CHAIN SECURED WITH TWO STEEL MACHINE SCREWS, NUTS AND WASHERS.
3. CHAMFER ON ALL PIPE SIZES TO BE AT A 15 DEGREE ANGLE.
4. HEIGHT OF VERTICAL STACK WILL BE DETERMINED BY ENGINEER, BUT WILL NOT BE LESS THAN TWO FEET.
5. DROP STACK TO BE 6" OR 8" SDR 35 P.V.C. PIPE CONNECTED TO DROP FITTING WITH STANDARD GASKETED JOINT.
6. VERTICAL STACK WILL BE STRAPPED TO MANHOLE AT PIPE JOINTS. STRAPS SHALL BE MADE OF STAINLESS STEEL OR APPROVED MATERIAL NON-CORROSIVE TO SEWER GASES.
7. SHAPE INVERT AS NEEDED TO PROVIDE SMOOTH TRANSITION FROM DROP CONNECTION DISCHARGE POINT TO SPRING LINE OF MANHOLE INVERT. USE TYPE II SULFATE RESISTANT CEMENT.
8. ELBOW AT BOTTOM OF THE STACK WILL BE A 45 DEGREE BEND POSITIONED IN THE DIRECTION OF THE FLOW IN MANHOLE WITH BENCH CONSTRUCTED TO CONFORM TO MANHOLE BENCH.
9. MANHOLE OPENING TO BE CORED AS REQUIRED PER THE LATEST COUNTY WATER AND SEWER SPECIFICATIONS.
10. DROP STACK SHALL NOT BE INSTALLED WITHIN 60 DEGREES OF THE ACCESS STEPS.
11. INSIDE DROP CONNECTIONS MAY BE USED AS AN ALTERNATIVE TO EXTERIOR DROP CONNECTIONS UNDER SPECIAL CIRCUMSTANCES, IE. BAD SOILS, HIGH WATER TABLE, UTILITY CONFLICTS, AND EXCESSIVE DEPTHS.

DATE MAY 2004  
REV JAN 2011

**STANDARD INSIDE DROP CONNECTION**

DETAIL  
**MAN-16**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



**NOTES:**

1. BENCH MAY BE CONC. OR BRICK AND MORTAR. USE TYPE II SULFATE RESISTANT MORTAR.
2. MINIMUM DEPTH FROM THE BENCH TO THE TOP OF THE CONE SHALL BE 4' UNLESS OTHERWISE APPROVED.
3. STONE BEDDING SHALL EXTEND TO THE OUTER BOUNDARY OF ALL UNDISTURBED AREAS SURROUNDING THE MANHOLE.

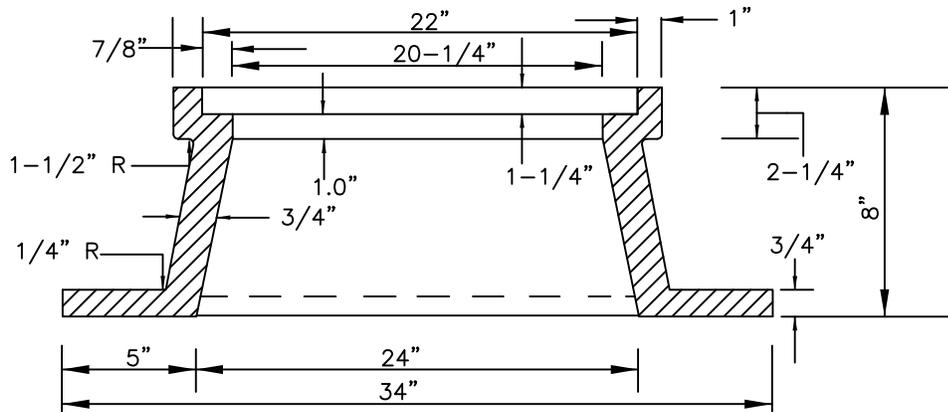
DATE MAY 2004  
REV JAN 2011

## MONITORING MANHOLE

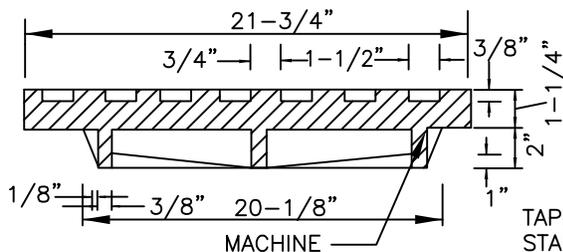
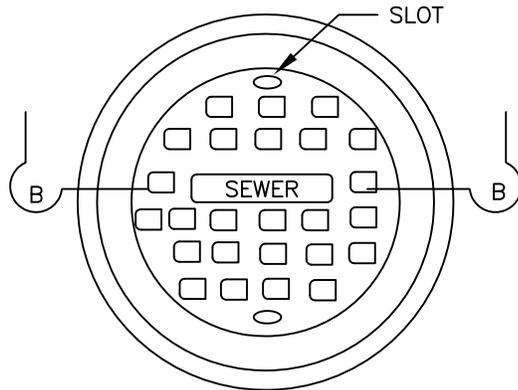
DETAIL  
MAN-17A



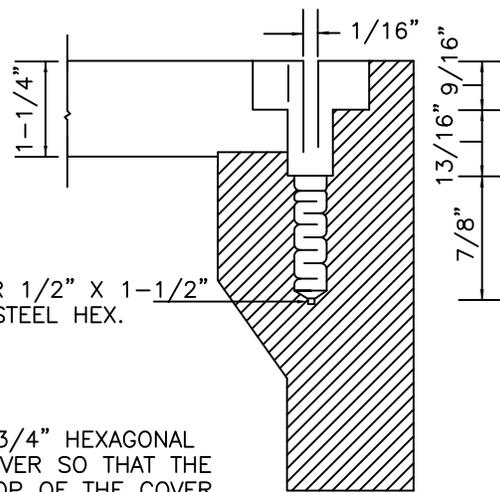
HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



FRAME SECTION



SECT. B-B



X-SECT. OF BOLT

TAPPED FOR 1/2" X 1-1/2"  
STAINLESS STEEL HEX.  
HEAD BOLT.

NOTES:

1. INSTALL (4) FOUR 1/2" X 1-1/2" STAINLESS STEEL 3/4" HEXAGONAL HEAD BOLTS AT 90 DEGREES. COUNTERBORE THE COVER SO THAT THE HEAD OF THE BOLT IS FLUSH OR JUST BELOW THE TOP OF THE COVER. PENTAGON HEAD BOLTS ARE OPTIONAL.
2. MANHOLE FRAMES LOCATED ABOVE GRADE SHALL BE ATTACHED TO MANHOLE BY USE OF TWO 1/2" STAINLESS STEEL ANCHOR BOLTS, WEDGE ANCHORS, OR STUD ANCHORS WITH STAINLESS STEEL WASHER AND NUT LOCATED ON OPPOSITE SIDES OF MANHOLE FRAME. HOLES IN MANHOLE FRAME SHALL BE NEATLY DRILLED TO ALIGN WITH ANCHORS.
3. SEALANT FOR MANHOLE FRAMES SHALL BE ONE-COMPONENT POLYURETHANE OR BITUMASTIC MATERIAL PER SECTION 3.2.2.G.

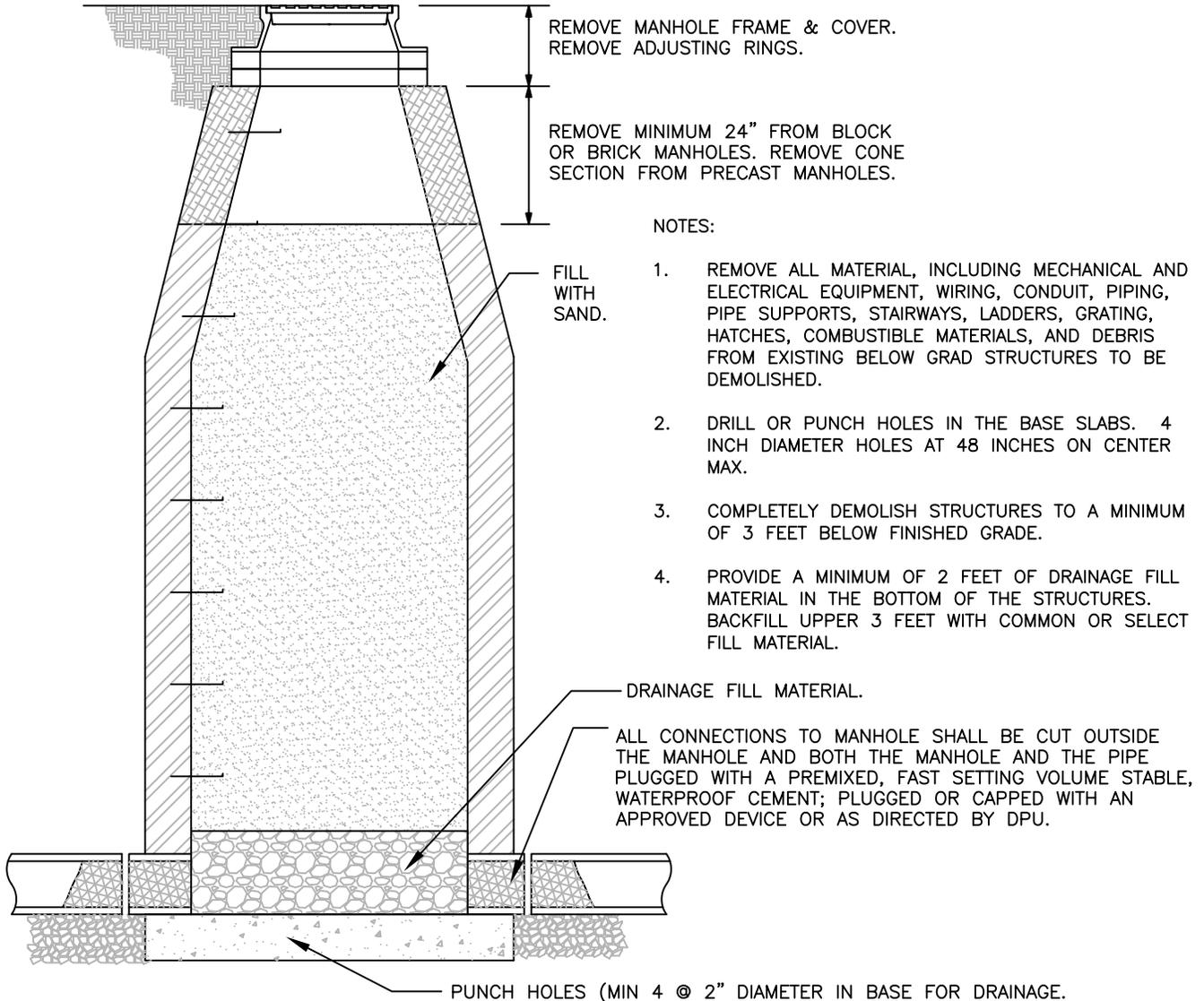
DATE MAY 2004  
REV JAN 2011

VANDAL PROOF MANHOLE FRAME &  
COVER

DETAIL  
MAN-18

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

WHERE MANHOLE IS LOCATED IN PAVEMENT, PAVEMENT WILL BE RESTORED IN ACCORDANCE WITH TOA OR VDOT STANDARDS. FOR MANHOLES NOT LOCATED IN PAVEMENT, AREA WILL BE GRADED AND RESTORED SIMILAR TO SURROUNDING CONDITIONS.

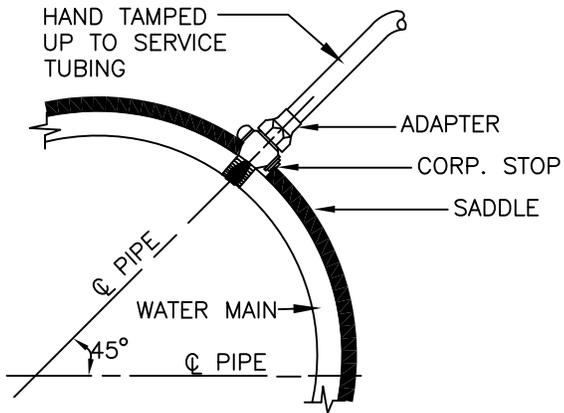
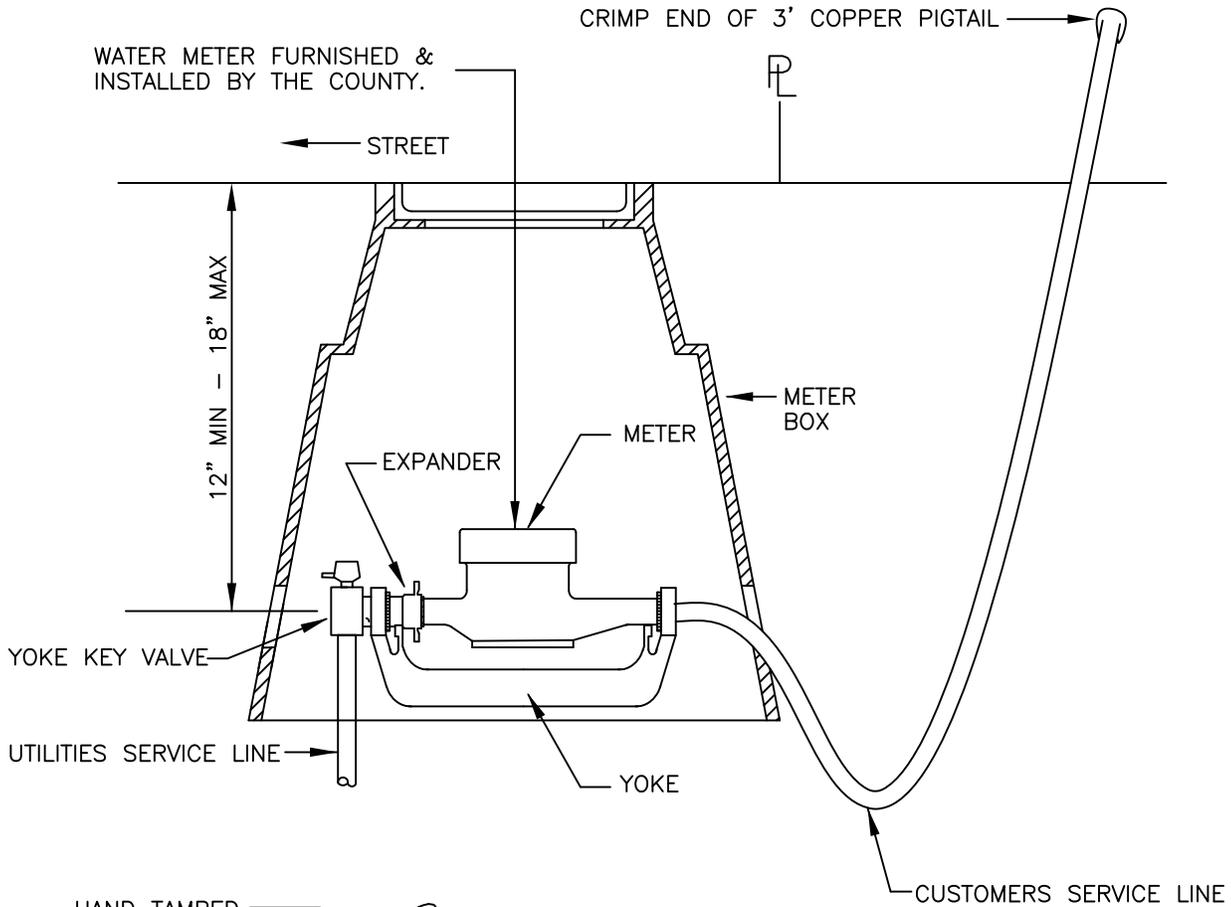


DATE JAN 2011

## ABANDONMENT OF MANHOLES

DETAIL  
MAN-19

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



SADDLE MUST BE USED FOR ALL TAPS.

ENLARGED VIEW

**NOTES:**

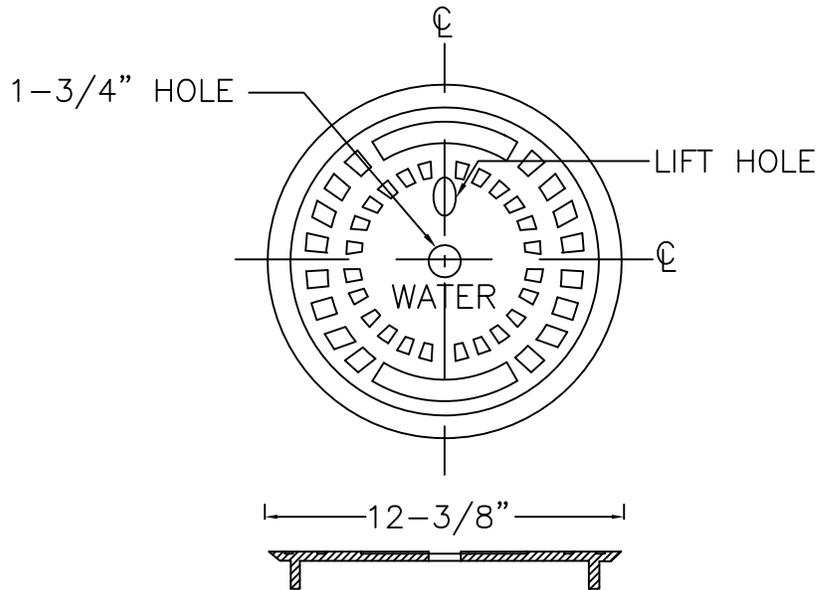
1. YOKE SHALL BE CENTERED IN METER BOX.
2. METER BOX SHOULD BE LOCATED 1' INSIDE OF ROW OR EASEMENT LINE. METER BOX MAY BE MOVED A REASONABLE DISTANCE INSIDE ROW OR EASEMENT LINE IN ORDER TO INSTALL ON REASONABLY LEVEL GROUND.
3. SERVICES SHALL BE INSTALLED PRIOR TO TESTING.
4. YOKES SHALL BE FORD 500 SERIES OR APPROVED EQUAL.
5. EXPANDERS SHALL BE FORD EC23 (5/8"), EC4 (1") OR APPROVED EQUAL.
6. TOP OF METER BOX SHALL BE 1/2" TO 1" ABOVE YARD GRADE OR FLUSH WITH PAVEMENT.

DATE MAY 2004  
REV JAN 2011

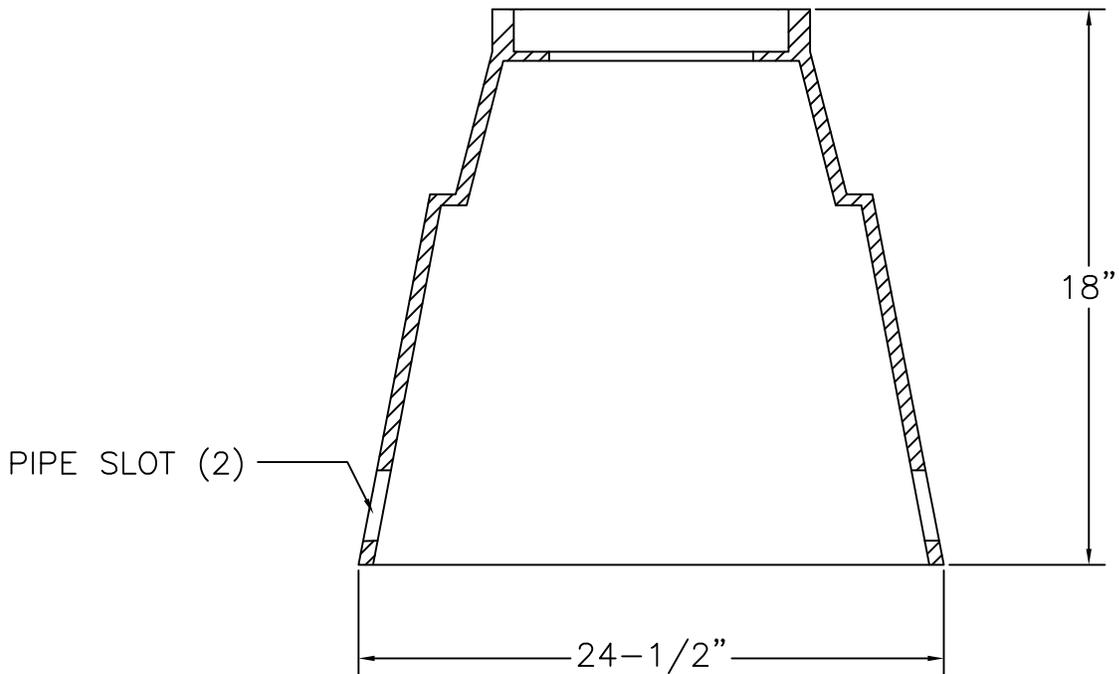
**TYPICAL WATER METER CONNECTION FOR  
3/4" & 1" SERVICES (5/8" AND 1" METERS)**

DETAIL  
**MET-1**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTE: COVER LID MUST BE CAST IRON.

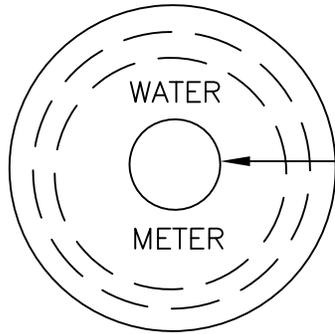


DATE MAY 2004

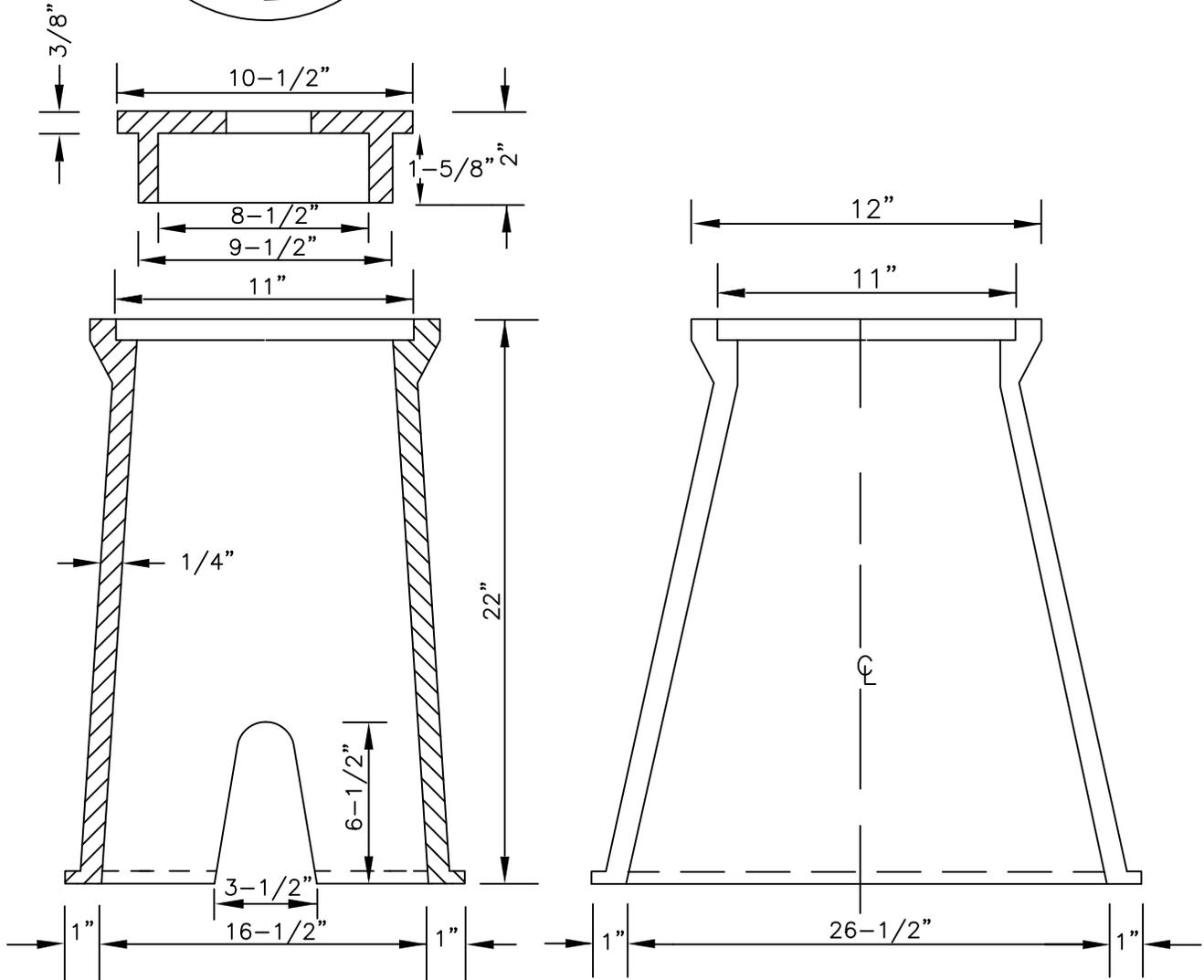
PLASTIC METER BOX  
(5/8" AND 1" METERS)

DETAIL  
MET-2

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



1-3/4" HOLE

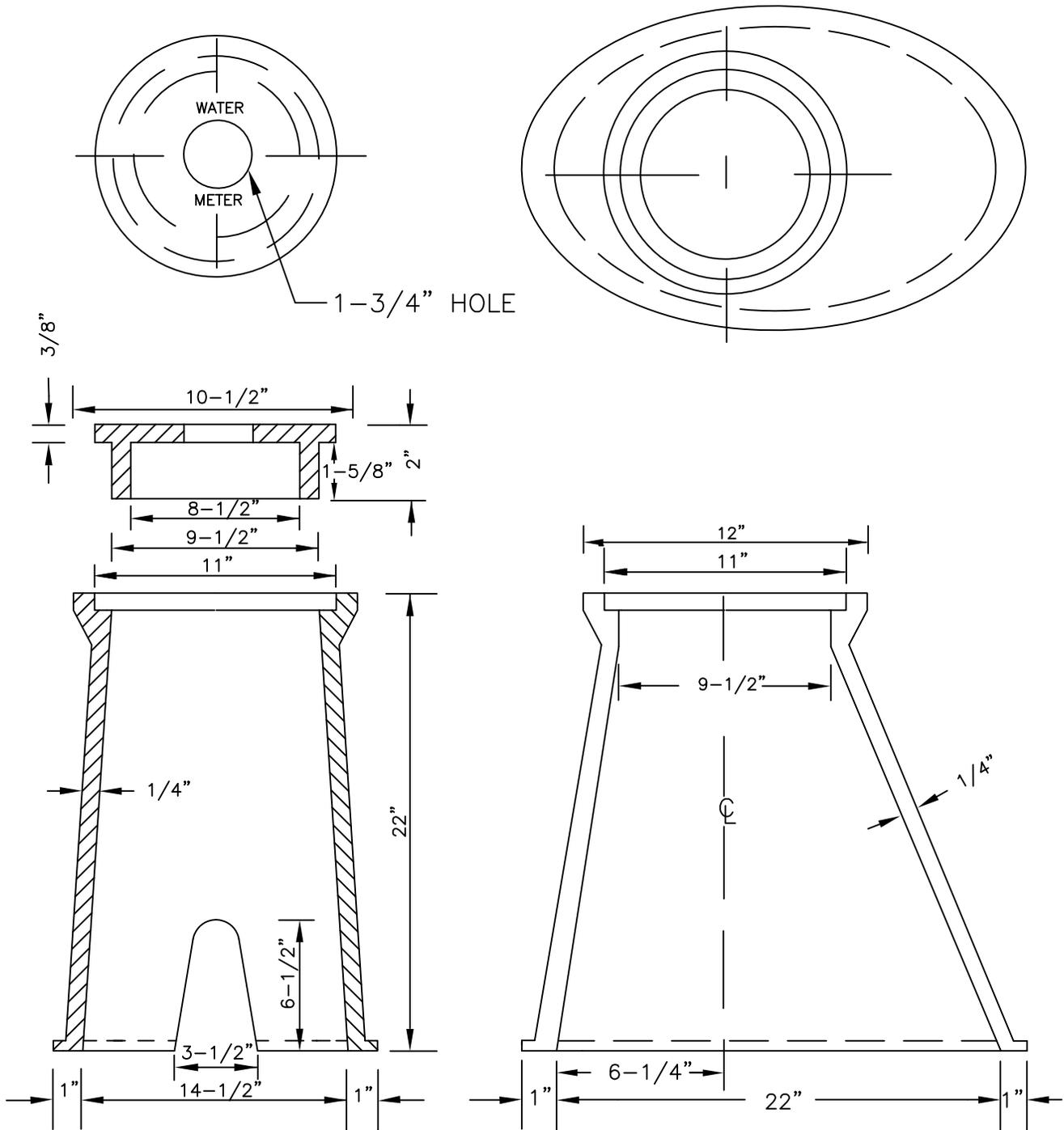


DATE MAY 2004

CAST IRON METER BOX (TYPE 1)  
(FOR 1" METERS)

DETAIL  
MET-3

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



DATE MAY 2004

CAST IRON METER BOX (TYPE 2)  
(5/8" METERS)

DETAIL  
MET-4

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

THIS DETAIL REMOVED  
FROM STANDARDS IN 2011

DATE MAY 2004

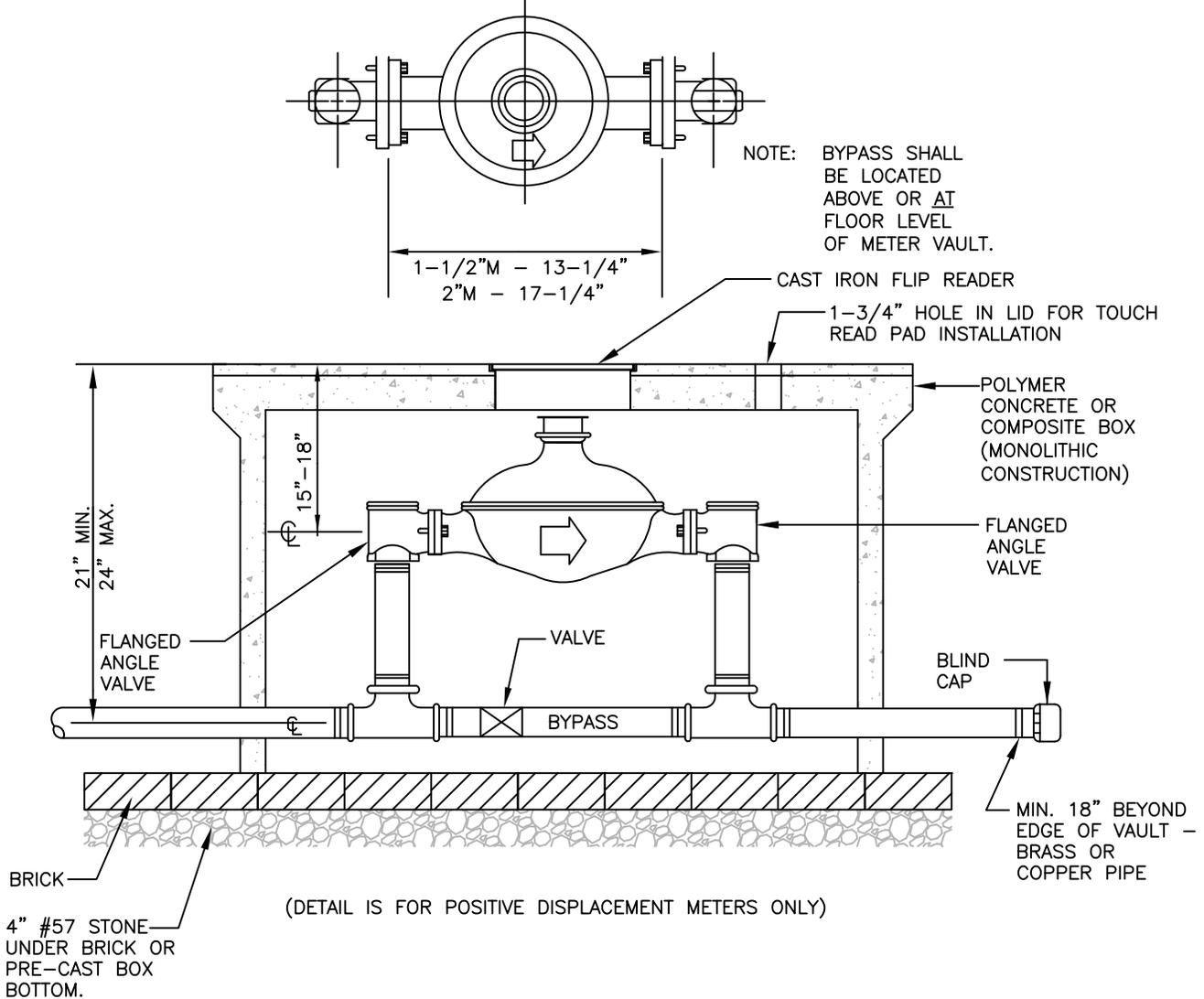
THIS DETAIL REMOVED FROM  
STANDARDS IN 2011

DETAIL  
MET-5

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

**NOTES:**

1. ALL 1-1/2" AND 2" METERS SHALL BE TIED TO THE MAIN PER MET-11B.
2. WATER SERVICE LATERALS FOR 1-1/2" AND 2" SERVICES WILL BE TYPE-K HARD COPPER. CONNECTIONS FOR 1-1/2" AND 2" SERVICES WILL BE APPROVED COMPRESSION FITTINGS.
3. METER BOX TO BE AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
4. METER BOXES TO BE PER SECTION 4.2.17.C.
  - a. TOUCH READ TO BE INSTALLED IN BOX TOP NOT FLIP READER.
  - b. BOX TO HAVE MOUSE HOLES FOR SERVICE LINE ENTRY AND EXIT. SEAL RESIDUAL OPENING AS DIRECTED BY DPU INSPECTOR.
  - c. IF BOTTOM PROVIDED IN PRECAST BOX, DRAINAGE HOLES TO BE INSTALLED AS DIRECTED BY INSPECTOR.

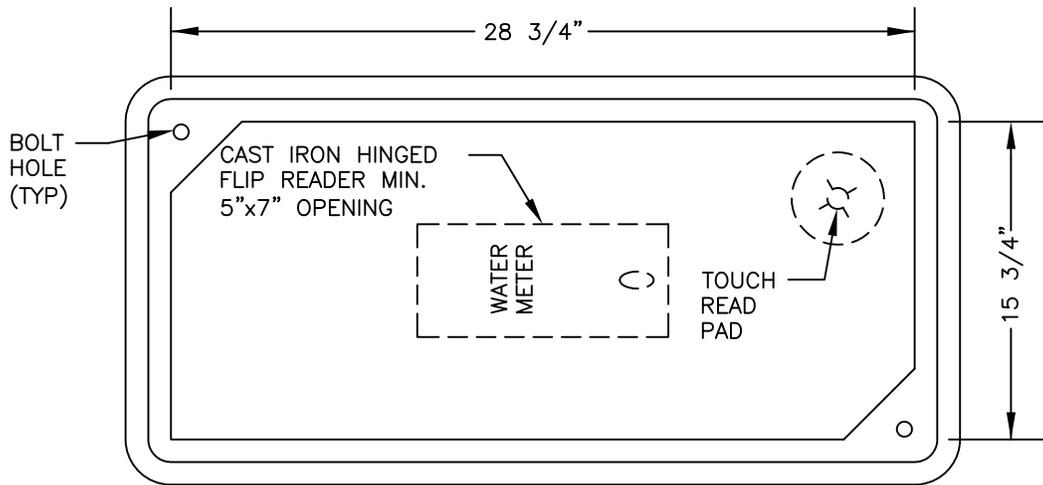


DATE MAY 2004  
REV JAN 2011

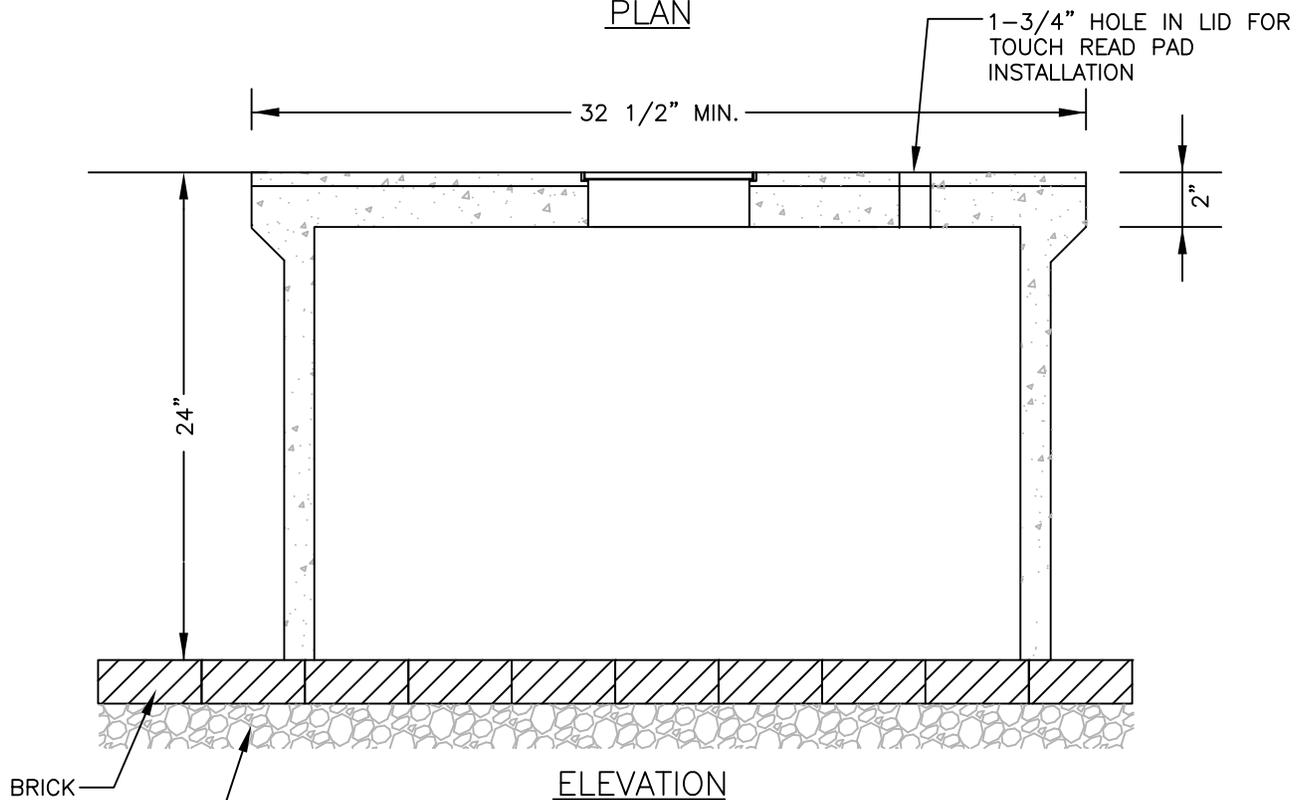
## 1-1/2" OR 2" METER SETTING

DETAIL  
**MET-6**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN



4" #57 STONE UNDER BRICK OR PRE-CAST BOX BOTTOM.

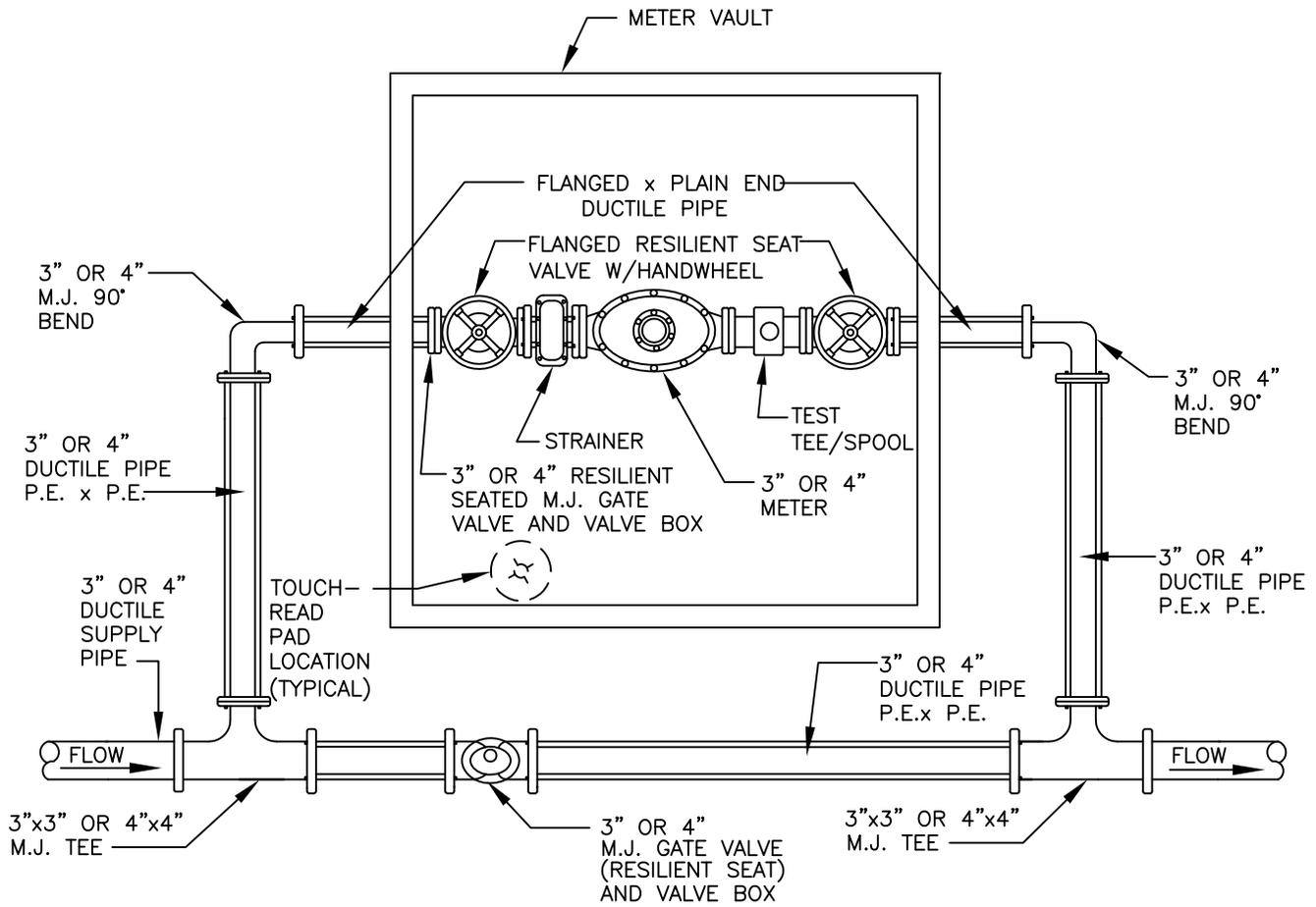
NOTE: MONOLITHIC CONSTRUCTION POLYMER CONCRETE OR COMPOSITE BOX WITH SEPARATE LID. BOX MAY HAVE BOTTOM AS PART OF CAST STRUCTURE. BOX WITHOUT BOTTOM AND BRICK BASE SHOWN ABOVE. BOX TO BE PER SECTION 4.2.17.C.

DATE MAY 2004  
REV JAN 2011

1-1/2" & 2" METER BOX

DETAIL  
MET-7

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN VIEW

NOTES:

1. THE CONTRACTOR SHALL NOT INSTALL THE PIPING UNTIL THE METER AND ASSOCIATED APPURTENANCES HAVE BEEN PURCHASED FROM THE UTILITIES DEPARTMENT AND ARE ON THE PROJECT, SO THAT THE CORRECT LENGTH OF PIPE IS INSTALLED ACCORDING TO THIS DETAILED CONFIGURATION. STRAINER, METER AND TEST TEE ARE PROVIDED BY THE COUNTY.
2. CONTRACTOR IS REQUIRED TO COORDINATE WITH THE UTILITY DEPARTMENT OPERATION CENTER, THE PICK UP OF A COUNTY APPROVED METER. ALL CONNECTION FEES AND/OR OTHER APPLICABLE CHARGES OR FEES MUST BE PAID PRIOR TO PICKING UP THE WATER METER, TEST TEE AND STRAINER FROM THE UTILITIES DEPARTMENT.
3. 3" OR 4" APPROVED JOINT RESTRAINT DEVICES ARE REQUIRED ON ALL MECHANICAL JOINT (M.J.) CONNECTIONS. ALL FITTINGS SHALL BE MECHANICAL JOINT.
4. ALL FITTINGS INSIDE OF THE VAULT SHALL BE FLANGED.
5. NO CHECK VALVE OR PRV IS ALLOWED ON THE INLET SIDE OF THE METER.
6. FOR DETAILS OF VAULT, SEE MET-10.

DATE MAY 2004  
REV JAN 2011

3" OR 4" METER SETTING

DETAIL  
MET-8

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

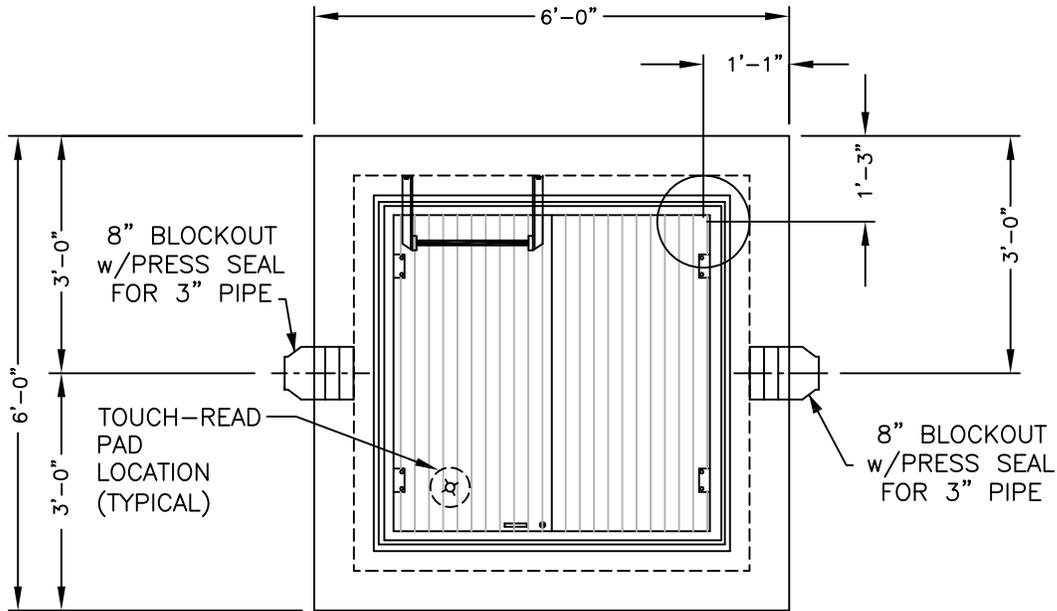
THIS DETAIL REMOVED FROM  
STANDARDS IN 2011

DATE MAY 2004

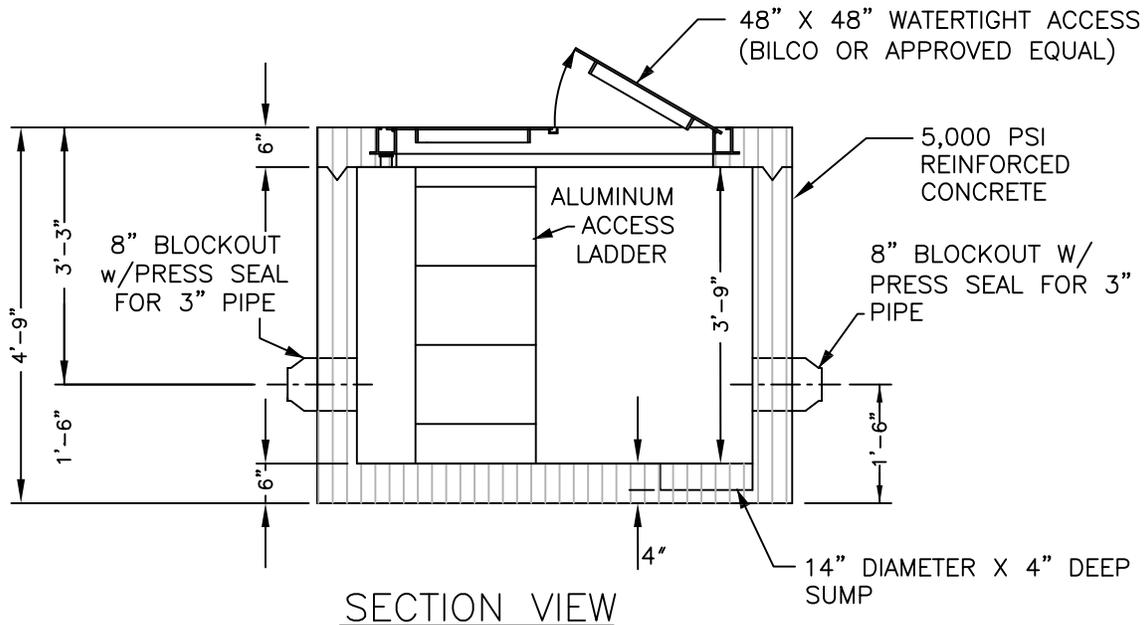
THIS DETAIL REMOVED FROM  
STANDARDS IN 2011

DETAIL  
MET-9

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN VIEW



SECTION VIEW

NOTES:

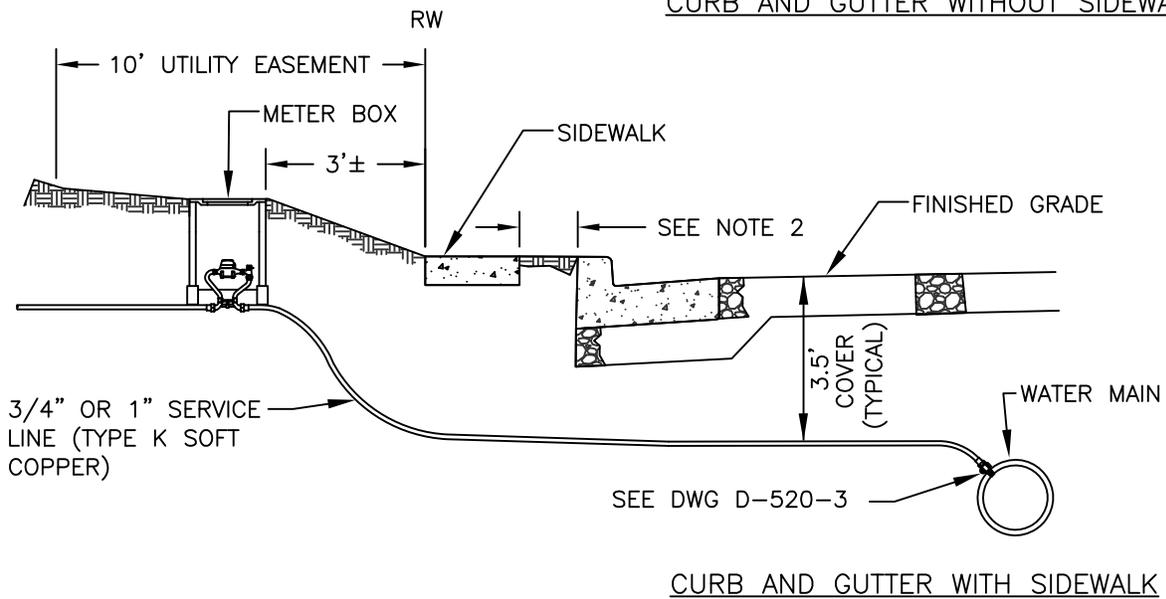
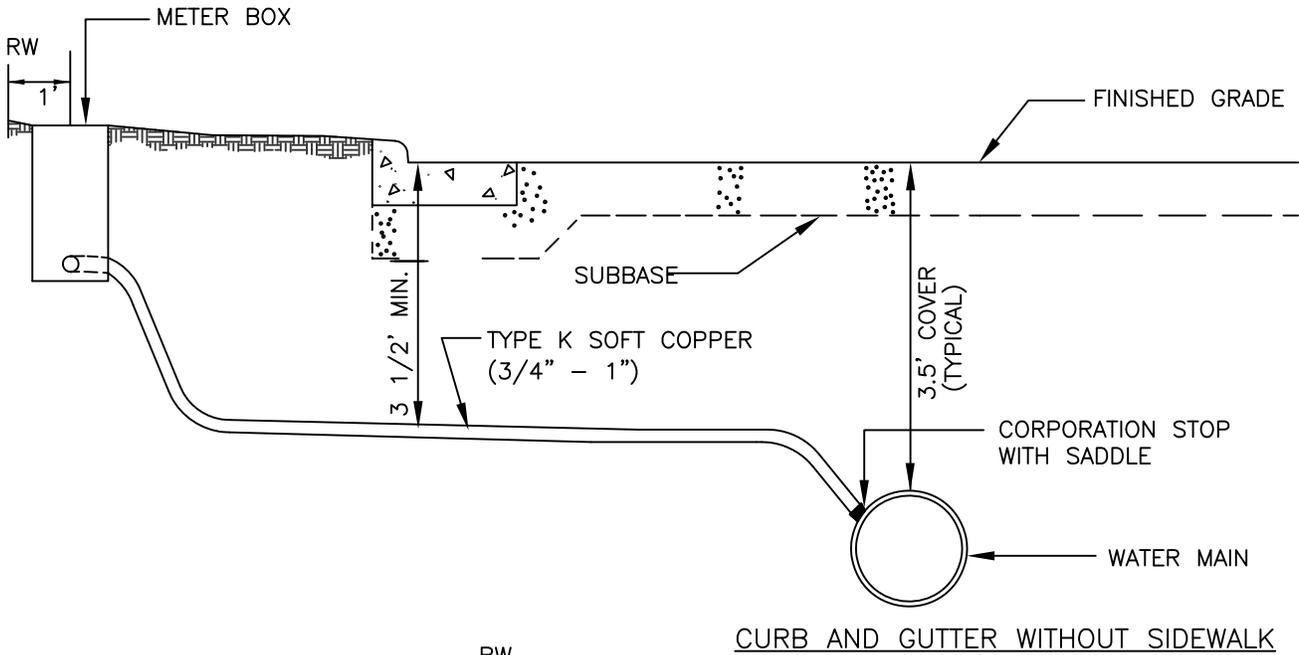
1. CLEAR FLOW VAULT SHIPPED ASSEMBLED WEIGHING APPROX. 12,000 LBS.
2. METER VAULT TO BE AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING VAULT IN AREAS SUBJECT TO VEHICULAR TRAFFIC.

DATE MAY 2004  
REV JAN 2011

VAULT DETAIL FOR  
3" AND 4" WATER METERS

DETAIL  
MET-10

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

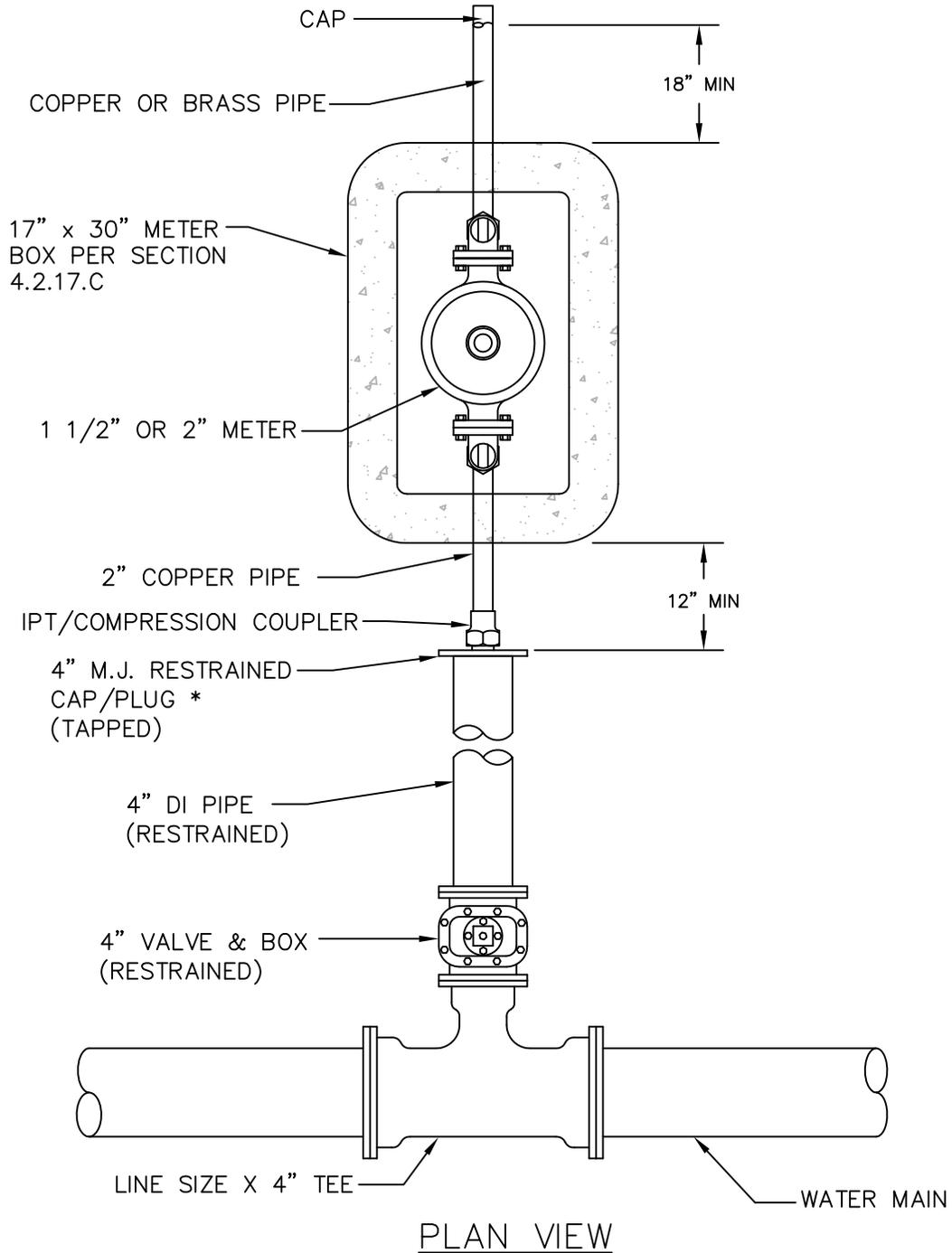
1. SADDLE MUST BE USED.
2. WATER METER MAY BE INSTALLED BETWEEN CURB AND SIDEWALK IF THE DISTANCE IS 3' OR MORE.
3. IF RIGHT OF WAY HAS A DITCH VERSUS CURB AND GUTTER, METER BOX IS TO BE LOCATED ON THE PROPERTY SIDE OF THE DITCH IN A LEVEL AREA. SERVICE LINE TO BE 3.5' BELOW THE INVERT OF THE DITCH.

DATE JAN 2011

**WATER SERVICE INSTALLATION DETAIL  
FOR 5/8" OR 1" METERS**

DETAIL  
MET-11A

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



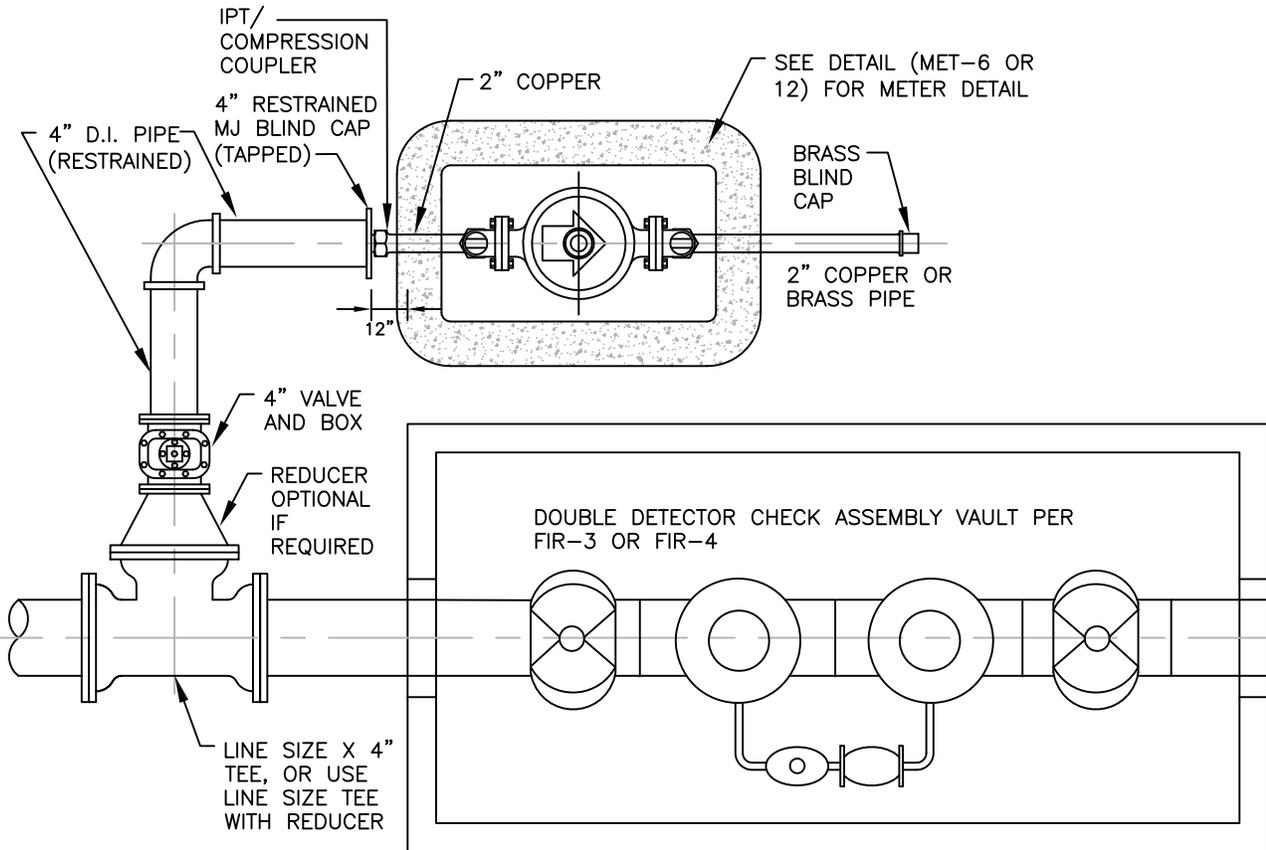
\* CAP/PLUG TO BE LOCATED AT LEAST 12" PAST THE EDGE/BACK OF THE IMPROVED HARD SURFACE; I.E. PAVEMENT, CURBING, SIDEWALK, ETC.

DATE JAN 2011

**WATER SERVICE INSTALLATION DETAIL  
FOR 1-1/2" AND 2" METERS**

DETAIL  
MET-11B

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



NOTE: PIGGY BACK WATER AND DOUBLE DETECTOR CHECK MAIN SERVICE LINE SHALL HAVE A VALVE LOCATED AT THE MAIN ADJACENT TO ITS TEE.

DATE JAN 2011

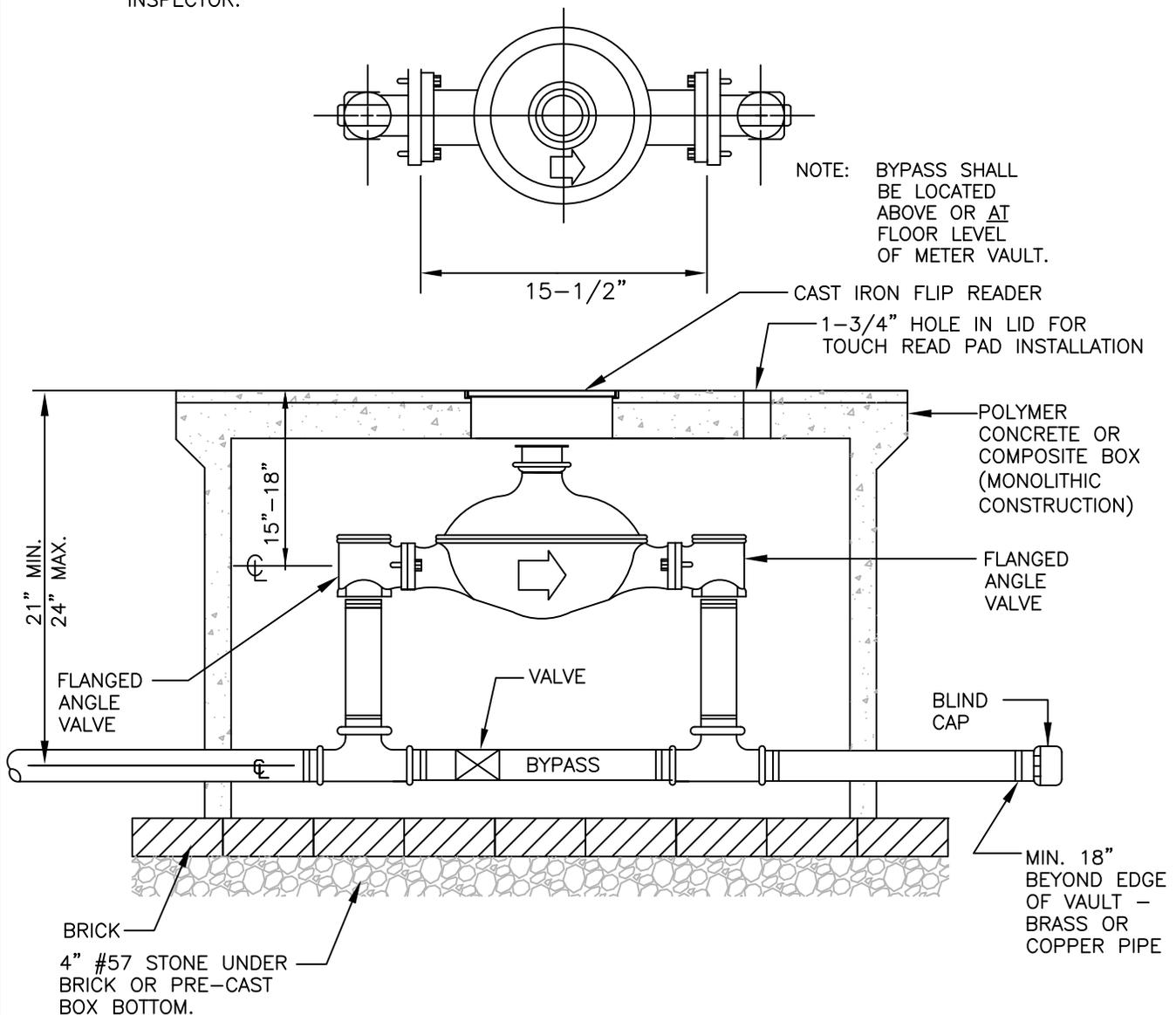
**1-1/2" OR 2" METER 4", 6", OR 8"  
DETECTOR SETTING**

DETAIL  
MET-11C

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

**NOTES:**

1. ALL 2" METERS SHALL BE TIED TO THE MAIN PER MET-11B.
2. WATER SERVICE LATERALS FOR 2" SERVICES WILL BE TYPE-K HARD COPPER. CONNECTIONS FOR 2" SERVICES WILL BE APPROVED COMPRESSION FITTINGS.
3. METER BOX TO BE AS NEAR TO THE WATER MAIN AS POSSIBLE WITHOUT PLACING BOX IN AREAS SUBJECT TO VEHICULAR TRAFFIC.
4. METER BOXES TO BE PER SECTION 4.2.17.C.
  - a. TOUCH READ TO BE INSTALLED IN BOX TOP NOT FLIP READER.
  - b. BOX TO HAVE MOUSE HOLES FOR SERVICE LINE ENTRY AND EXIT. SEAL RESIDUAL OPENING AS DIRECTED BY DPU INSPECTOR.
  - c. IF BOTTOM PROVIDED IN PRECAST BOX, DRAINAGE HOLES TO BE INSTALLED AS DIRECTED BY INSPECTOR.

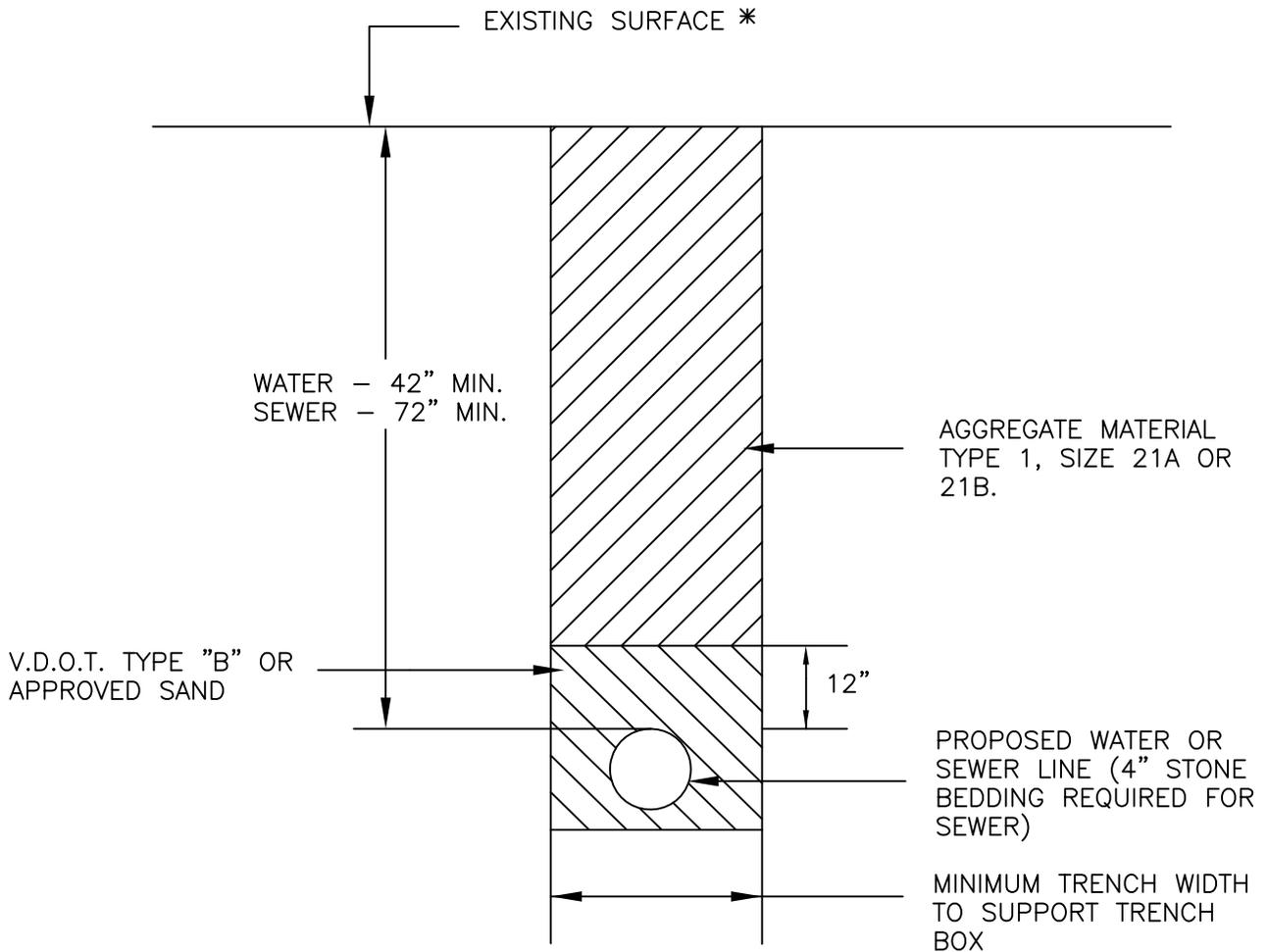


DATE MAY 2004  
REV JAN 2011

## 2" COMPOUND METER SETTING

DRWG. NO.  
**MET-12**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



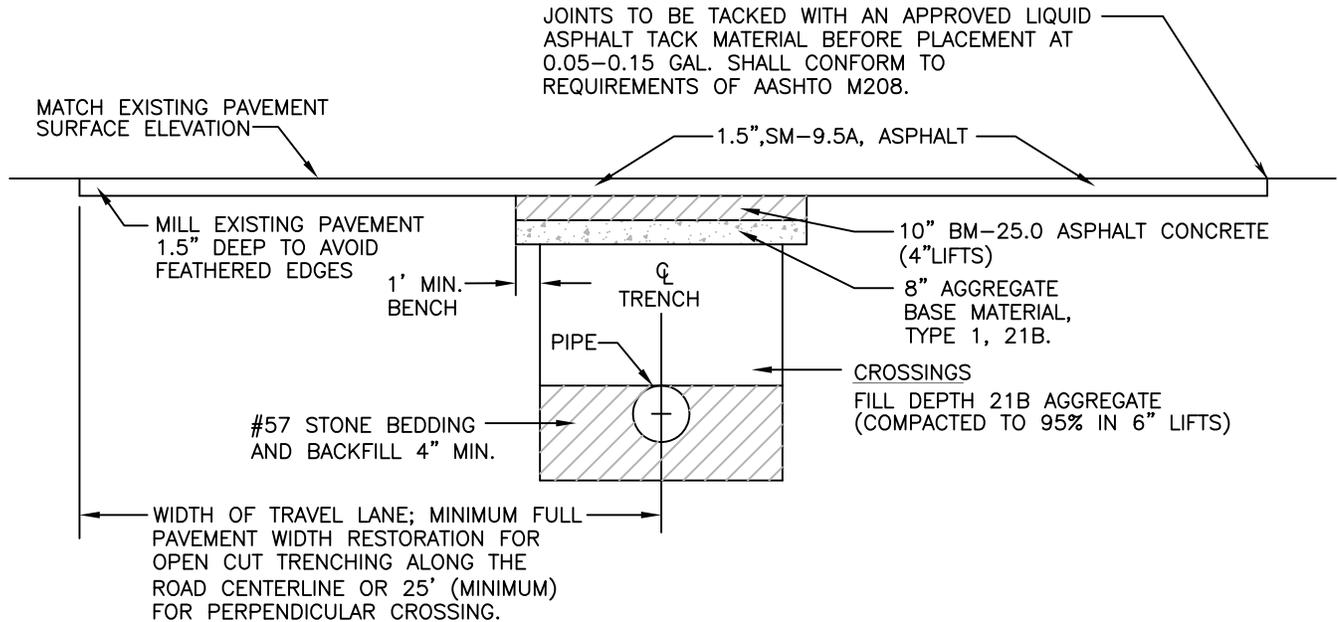
\* NOTE: CAPPING DONE ON SHOULDERS, GRAVEL AND DIRT ROADS.

DATE MAY 2004

TYPICAL SECTION FOR REPAIR OF "PRIMARY" ROADWAY SHOULDERS OR OTHER UNPAVED TRAVELED AREAS FOR WATER & SEWER LINE CROSSINGS

DETAIL  
PAV-1

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



**NOTES:**

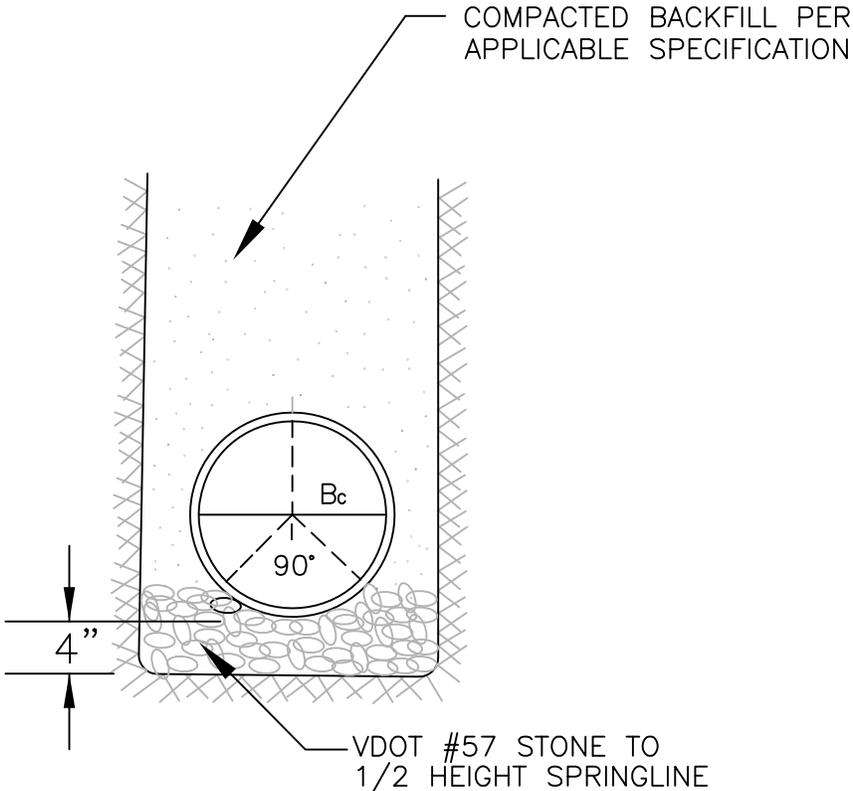
1. ALL BACKFILL AND COMPACTING SHALL BE IN ACCORDANCE WITH CURRENT VDOT STANDARDS AND SPECIFICATIONS.
2. WHENEVER THE PAVEMENT IS PERMITTED TO BE CUT, NOT OVER ONE-HALF OF THE ROADWAY SHALL BE DISTURBED AT ONE TIME. THE FIRST OPENING SHALL BE COMPLETELY RESTORED TO SATISFACTORY, TRAVELABLE CONDITION BEFORE THE SECOND HALF CAN BE OPENED.
3. IF THE OPEN CUT AREA IS GREATER THAN 16 SQ. FT. THEN THE PERMITTEE SHALL MILL AND RESURFACE ALL (ASPHALT) CONCRETE ROADWAY AND RESURFACE ALL OTHER ROADWAY WITH LIKE MATERIAL THAT IS EXISTING FOR A DISTANCE OF 25 FEET ON EACH SIDE OF THE DISTURBED AREA FROM EDGE-OF-PAVEMENT TO EDGE-OF-PAVEMENT OR AS INDICATED ON THE APPROVED PLANS.
4. A GEOTECHNICAL ENGINEER SHALL ASCERTAIN THE CAUSE AND CERTIFY THE METHOD FOR ALL PAVEMENT STRUCTURE FAILURES AND BE PRESENT DURING BACKFILL OPERATIONS TO CERTIFY THE AGGREGATE HAS BEEN INSTALLED AT (95%) COMPACTION RATE. WHERE THE PAVEMENT IS DISTURBED OR DEEMED WEAKENED IN ITS ENTIRETY OR SUCH PORTIONS OF IT AS DEEMED DESIRABLE BY VDOT SHALL BE RESTORED OR REPLACED IN A MANNER WHICH IS SATISFACTORY TO VDOT'S RESIDENT ENGINEER OR HIS/HER REPRESENTATIVE.
5. ALL PAVEMENT MARKINGS DAMAGED OR DESTROYED BY TRENCH EXCAVATION ACTIVITY SHALL BE REPLACED BY THE PERMITTEE IN ACCORDANCE WITH CURRENT VDOT STANDARDS & SPECIFICATIONS.

DATE MAY 2004  
REV JAN 2011

TYPICAL SECTION FOR REPAIR OF OPEN CUT AFTER PLACEMENT OF  
SEWER IN SURFACE TREATED ROAD WHERE A BASE (EXCEPT  
CONCRETE OR PLANT MIX) IS PRESENT

DETAIL  
**PAV-2**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



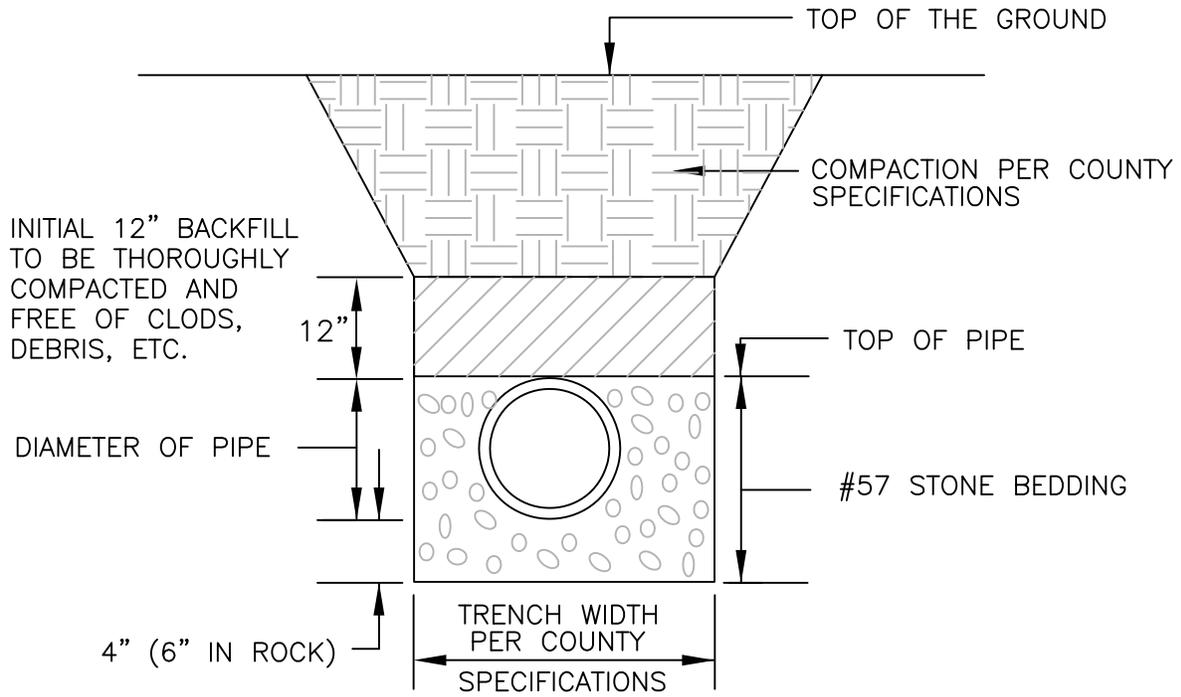
TYPICAL PIPE BEDDING FOR DUCTILE IRON PIPE

DATE MAY 2004  
REV JAN 2011

BEDDING FOR DIP SEWER PIPE

DETAIL  
SEW-1

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTE: FOR DEPTHS IN EXCESS OF 14 FEET, STONE TO EXTEND TO 12" ABOVE PIPE.,

NOTE: CONTRACTOR MUST INSURE THE STONE IS PROPERLY COMPACTED, ESPECIALLY UNDER THE HAUNCHES OF THE PIPE.

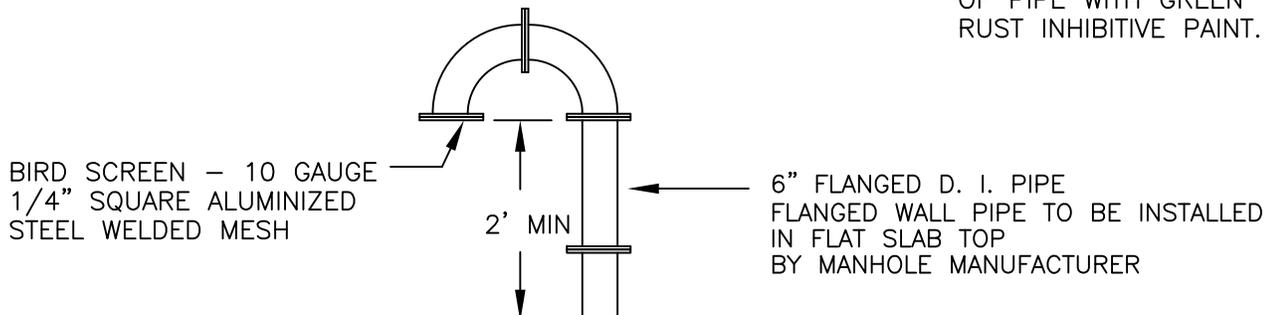
DATE MAY 2004

BEDDING AND BACKFILL DETAIL FOR  
PLASTIC SEWER PIPE

DETAIL  
SEW-2

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

NOTE: PAINT EXPOSED PORTION  
OF PIPE WITH GREEN  
RUST INHIBITIVE PAINT.



NOTE: WHERE MANHOLE  
IS LOCATED IN FLOOD  
PLAIN, AIR VENT SHALL  
BE SET AT LEAST 12"  
ABOVE 100 YEAR FLOOD  
ELEVATION OR BE EQUIPPED  
WITH BACKWATER VALVE.

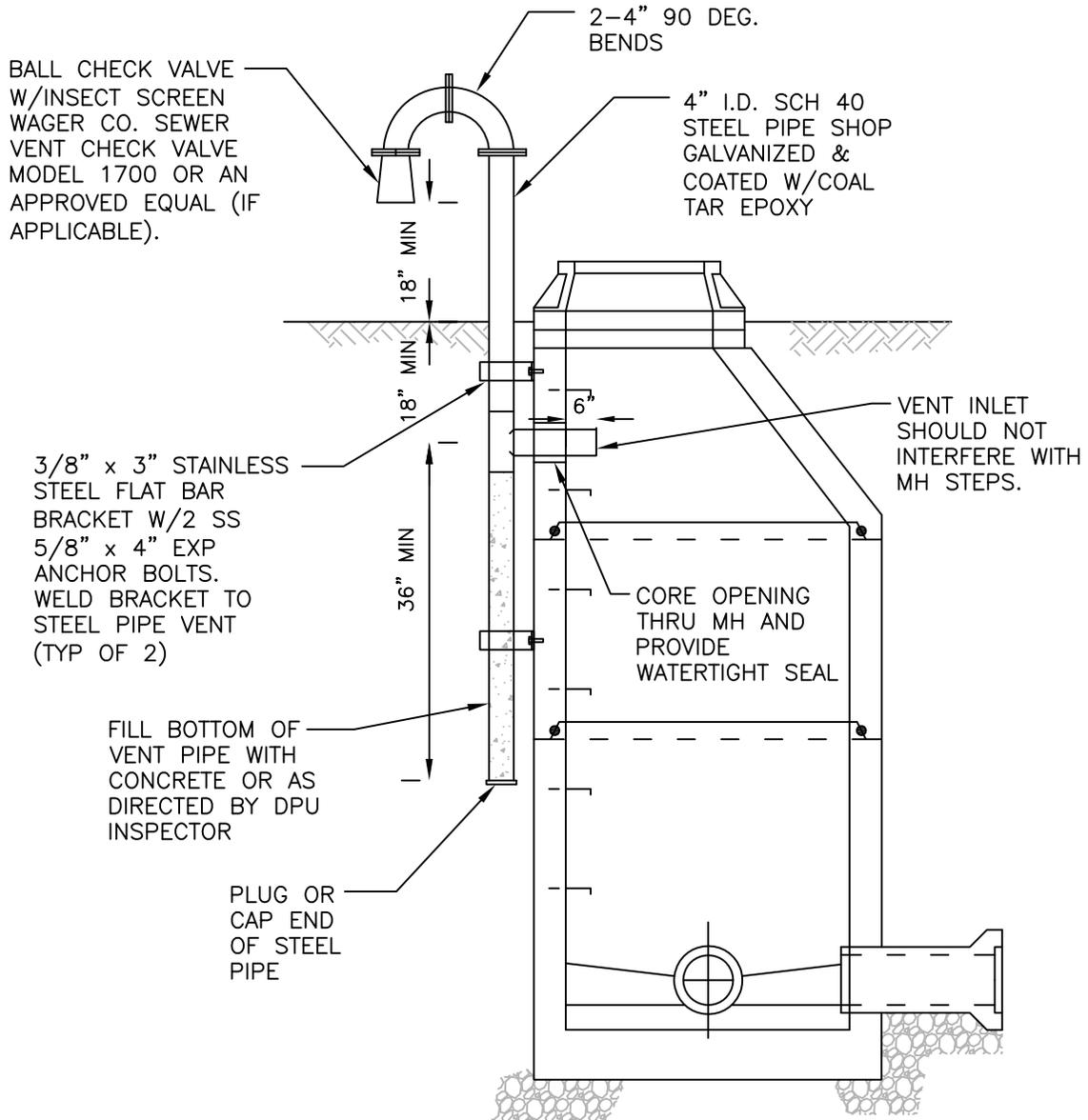
SECTION

DATE MAY 2004  
REV JAN 2011

AIR VENT

DETAIL  
**SEW-3**  
SHT. 1 OF 2

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



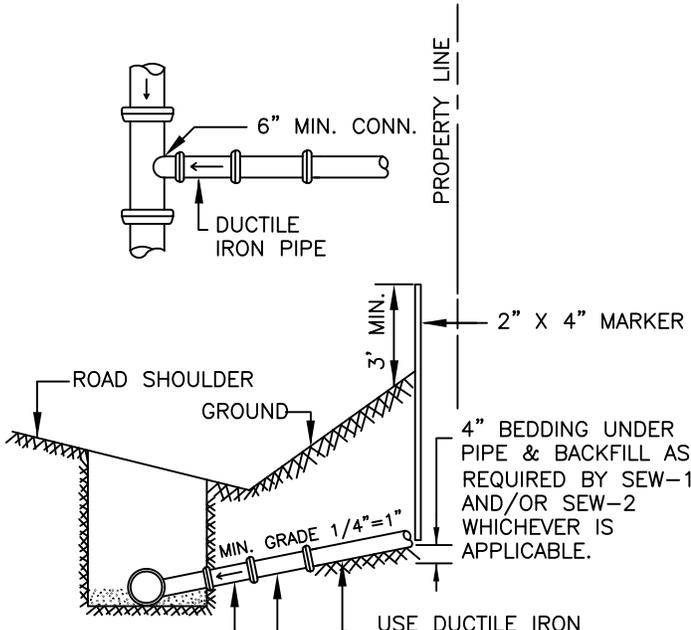
NOTE: WHERE MANHOLE IS LOCATED IN FLOODPLAIN, AIR VENT SHALL BE SET AT LEAST 12" ABOVE 100 YEAR FLOOD ELEVATION OR EQUIPPED WITH BACKWATER VALVE PER 4.3.13.

DATE JAN 2011

SEWER MANHOLE VENT

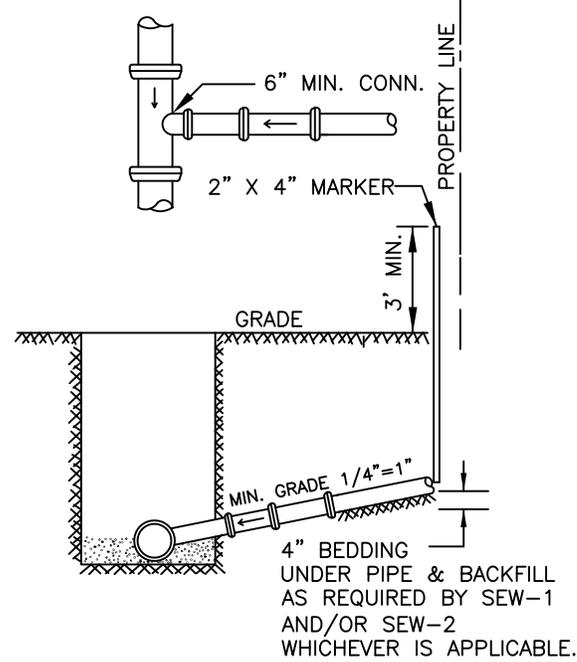
DETAIL  
SEW-3  
SHT. 2 OF 2

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

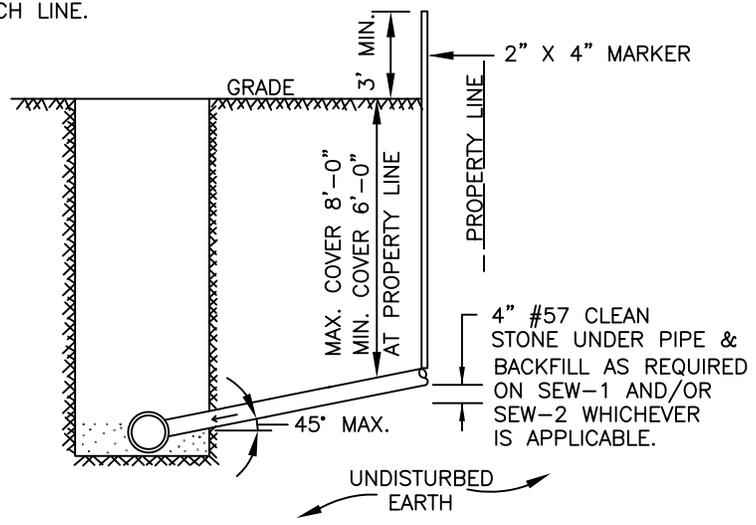


DITCH CROSSING

USE DUCTILE IRON PIPE IF LESS THAN 3.5' COVER AT DITCH LINE AND CONC. CAP (3000 PSI CONCRETE) WHERE LESS THAN 2' OF COVER AT DITCH LINE.



STD. HOUSE CONNECTION



DEEP HOUSE CONNECTION

**NOTE:**

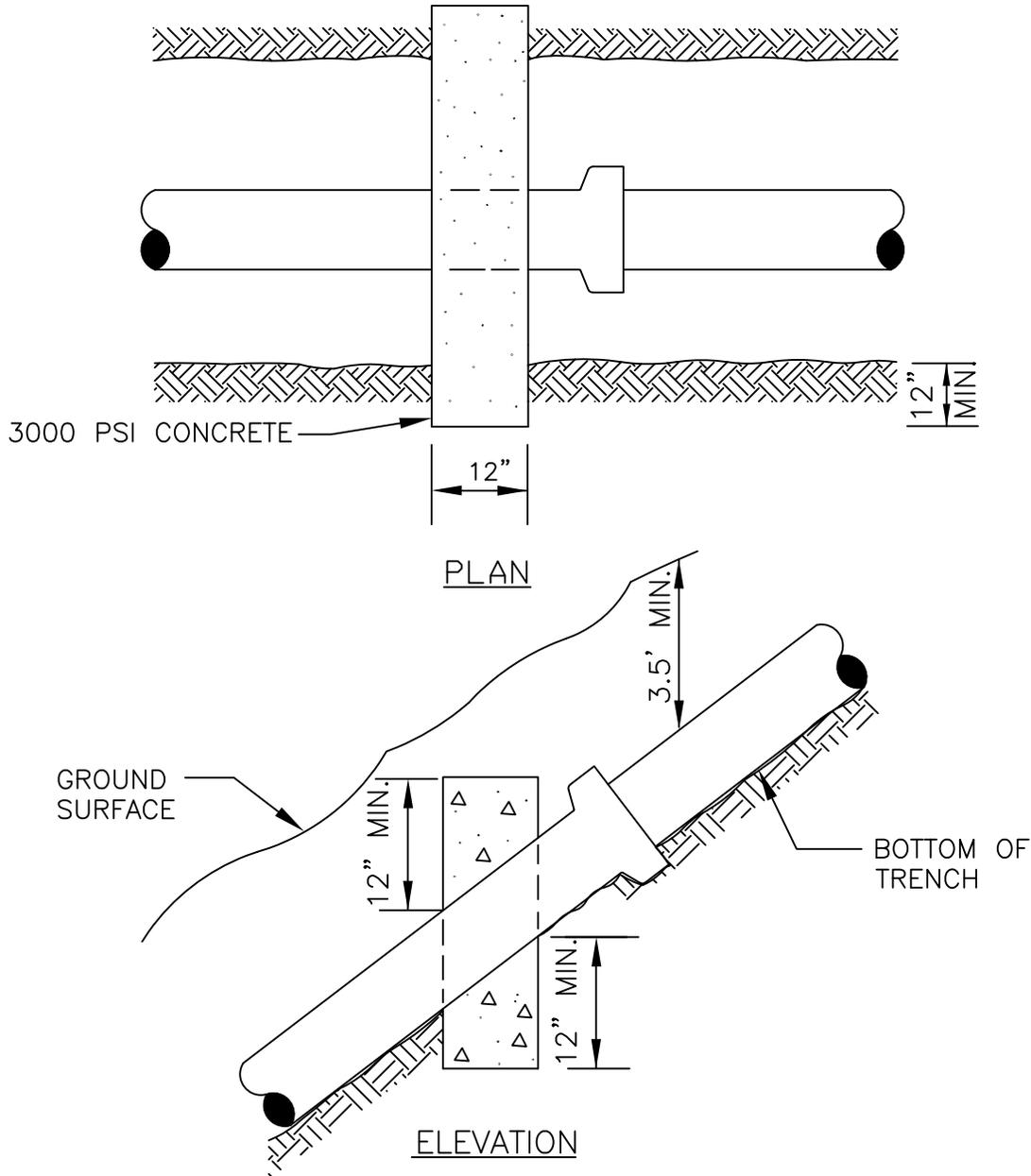
1. HOUSE CONNECTION SHALL BE LAID AT AN ANGLE NOT GREATER THAN 45° FROM HORIZONTAL.
2. WHERE MAIN LINE DEPTH IS GREATER THAN 12', CONTRACTOR SHALL LAY CONNECTION AS SHOWN PROVIDED THE ELEVATION OF CONNECTION AT THE PROPERTY LINE IS SUCH THAT THE LOT IS SERVED PROPERLY.
3. CLEANOUT IS TO BE PROVIDED BY PLUMBER AT PROPERTY OR EASEMENT LINE.

DATE MAY 2004  
REV JAN 2011

## HOUSE CONNECTION DETAILS

DETAIL  
**SEW-4**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

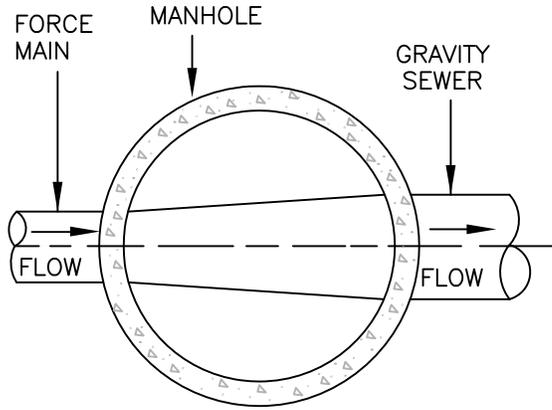
1. CONCRETE TO BE POURED AGAINST UNDISTURBED EARTH.
2. SPACING OF ANCHORS:  
 SLOPES: 20%–30% – EVERY 2 LENGTHS OF PIPE  
 31%–50% – EVERY 1 1/2 LENGTHS OF PIPE  
 OVER 50% – EVERY LENGTH OF PIPE

DATE MAY 2004  
REV JAN 2011

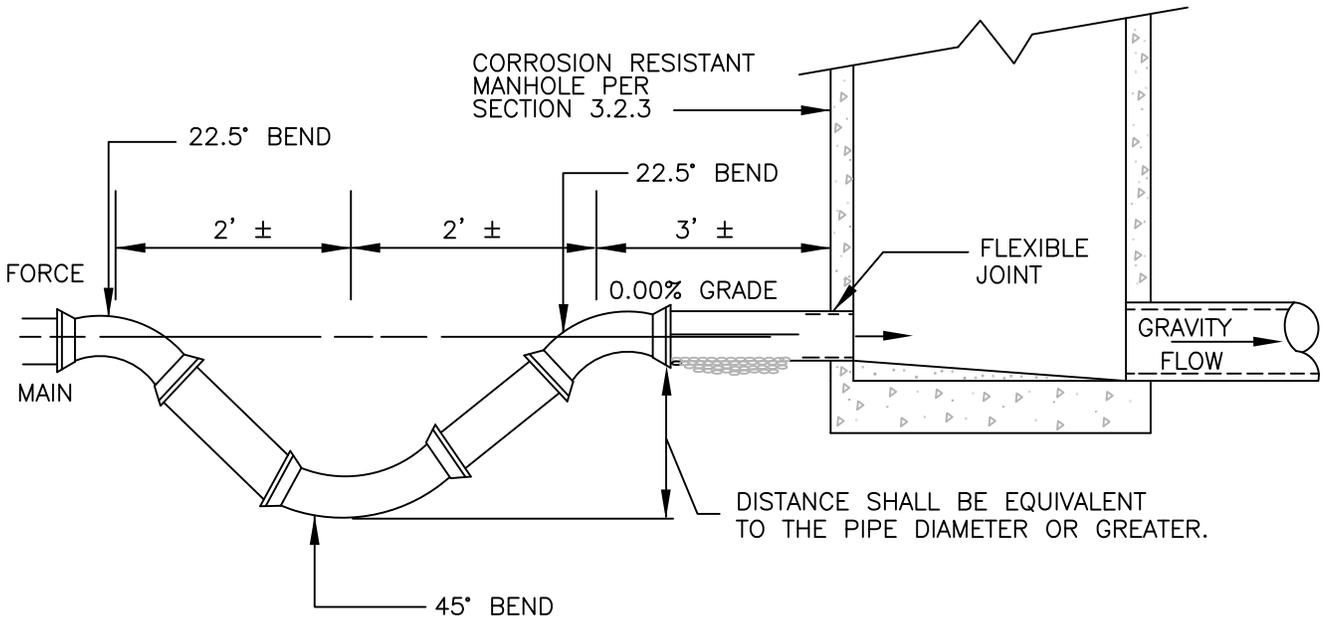
SEWER ANCHORAGE IN SLOPES  
GREATER THAN 20%

DETAIL  
SEW-5

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN



SECTION

NOTE: THIS DETAIL SHALL NOT BE UTILIZED IF THE TERMINAL MANHOLE IS THE FIRST HIGH POINT ON THE FORCE MAIN AND ACTS AS AN AIR RELEASE FOR THE FORCE MAIN. IN THIS CASE, POSITIVE GRADE SHALL BE MAINTAINED TO THE MANHOLE. IF POSSIBLE, THE FIRST 22.5 DEGREE BEND (FURTHEST FROM MANHOLE) SHOULD BE ELIMINATED AND THE REMAINDER OF THE DETAIL UTILIZED.

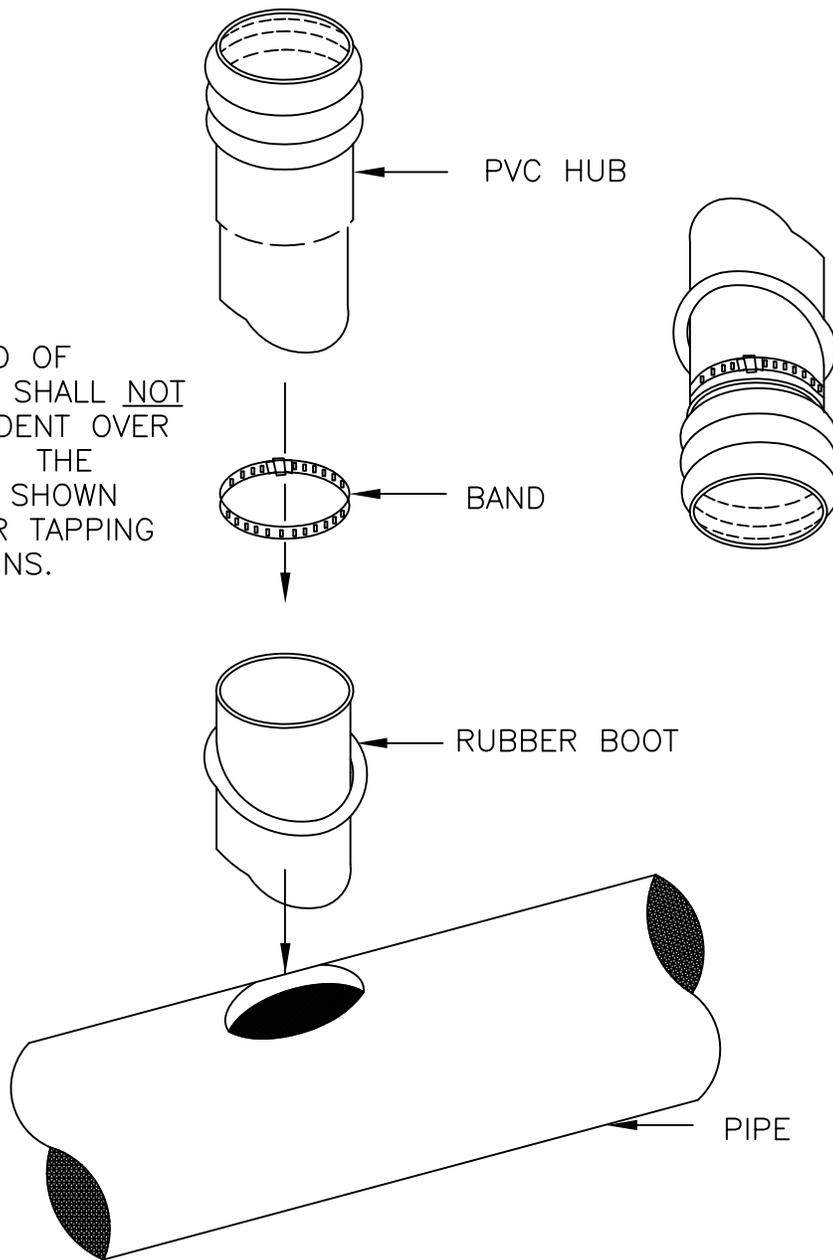
DATE MAY 2004  
REV JAN 2011

FORCE MAIN DISCHARGE

DETAIL  
SEW-6

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

NOTE: THIS METHOD OF CONNECTION SHALL NOT TAKE PRECEDENT OVER USING TEES. THE APPLICATION SHOWN HERE IS FOR TAPPING EXISTING MAINS.



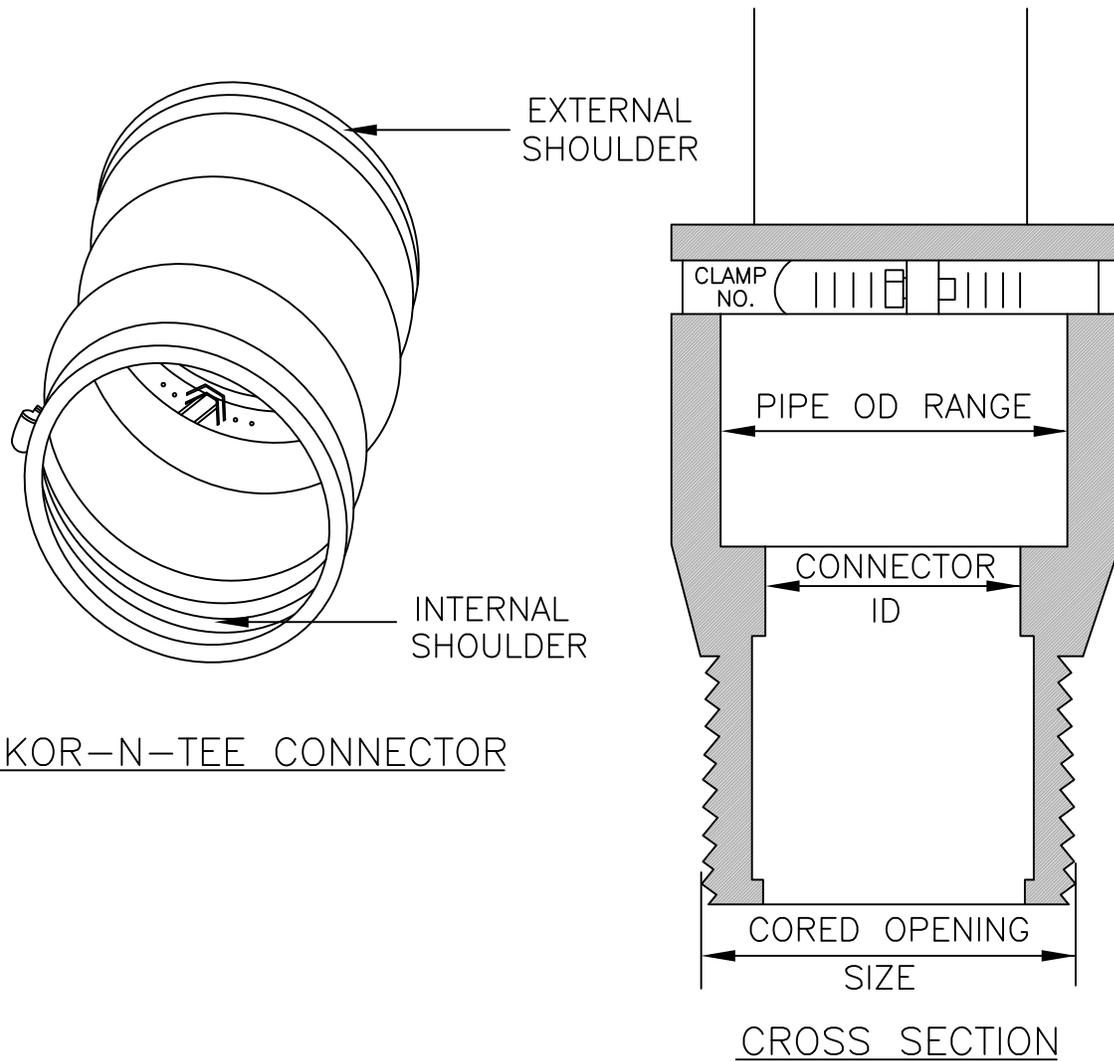
NOTE: INSERT-A-TEE CAN BE CONNECTED TO PVC, PERMA-LOC, SPIROLITE, SLIP LINER, DUCTILE IRON, THIN WALL MAIN LINES, CONCRETE (MAINLINES AND MANHOLES), CLAY, ALL THICK WALLED MAIN LINES. IT IS A THREE PIECE CONNECTION THAT IS COMPRESSION-FIT INTO THE CORED WALL OF THE MAIN LINE. IT CONSISTS OF SIDE SERVICES OF 4" THROUGH 12" AND FITS ALL MAIN LINE DIAMETER.

DATE MAY 2004

INSERTA TEE

DETAIL  
SEW-7

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



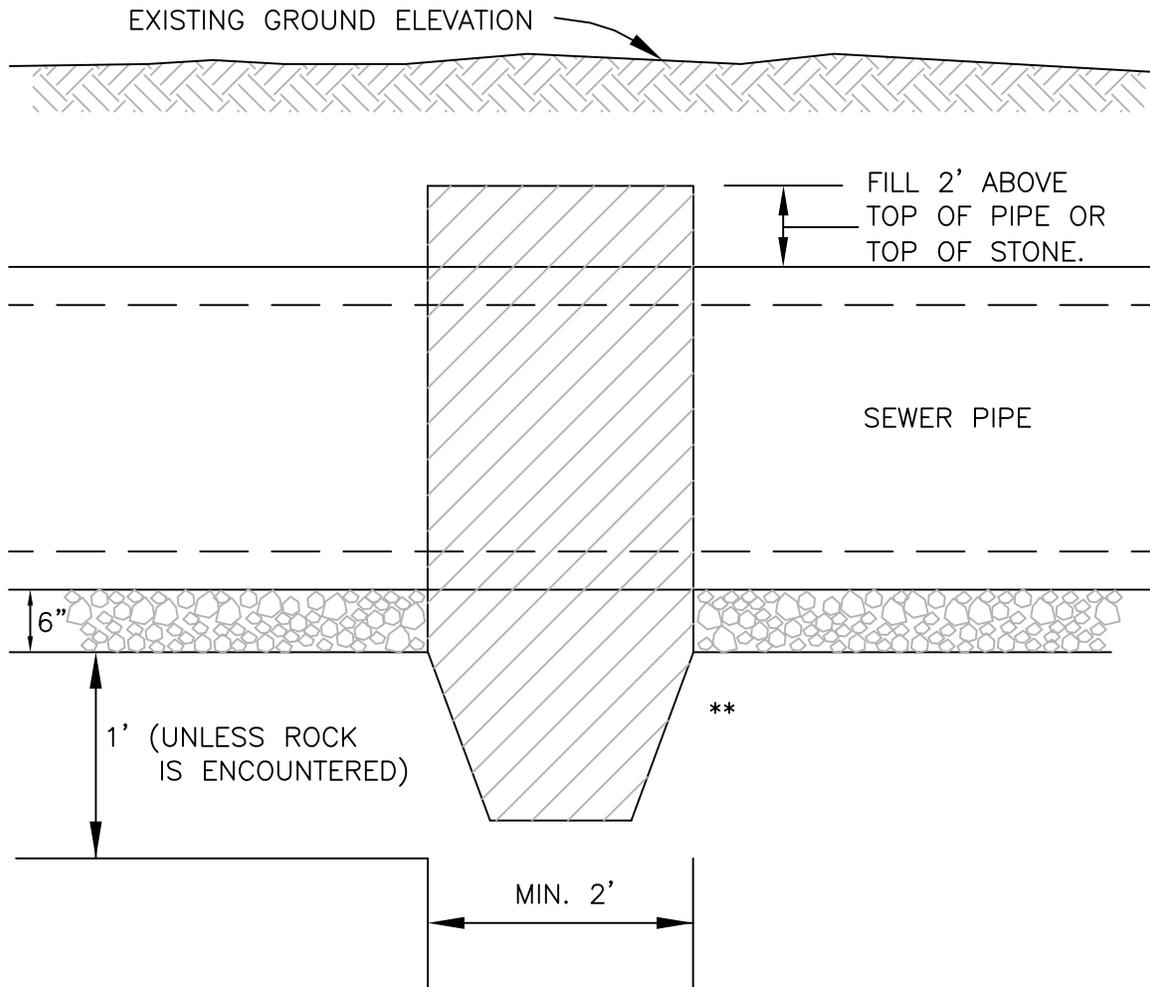
NOTE: IT CAN BE USED FOR INCOMING PIPE SIZES 3.5" O.D. TO 9.875" O.D. THE EXTERNAL SHOULDER PREVENTS THE CONNECTOR FROM PROTRUDING INTO THE TRUNK OR MAIN LINE. THE INTERNAL SHOULDER IN THE CONNECTOR PREVENTS THE INCOMING PIPE OR LATERAL FROM BEING PUSHED THROUGH THE KOR-N-TEE CONNECTOR AND PROTRUDING INTO THE TRUNK OR MAIN LINE. IT MAKES A PERMANENT CONNECTION FOR ALL MATERIALS INCLUDING PVC, FIBERGLASS, ETC.

DATE MAY 2004

**KOR-N-TEE**

DETAIL  
**SEW-8**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



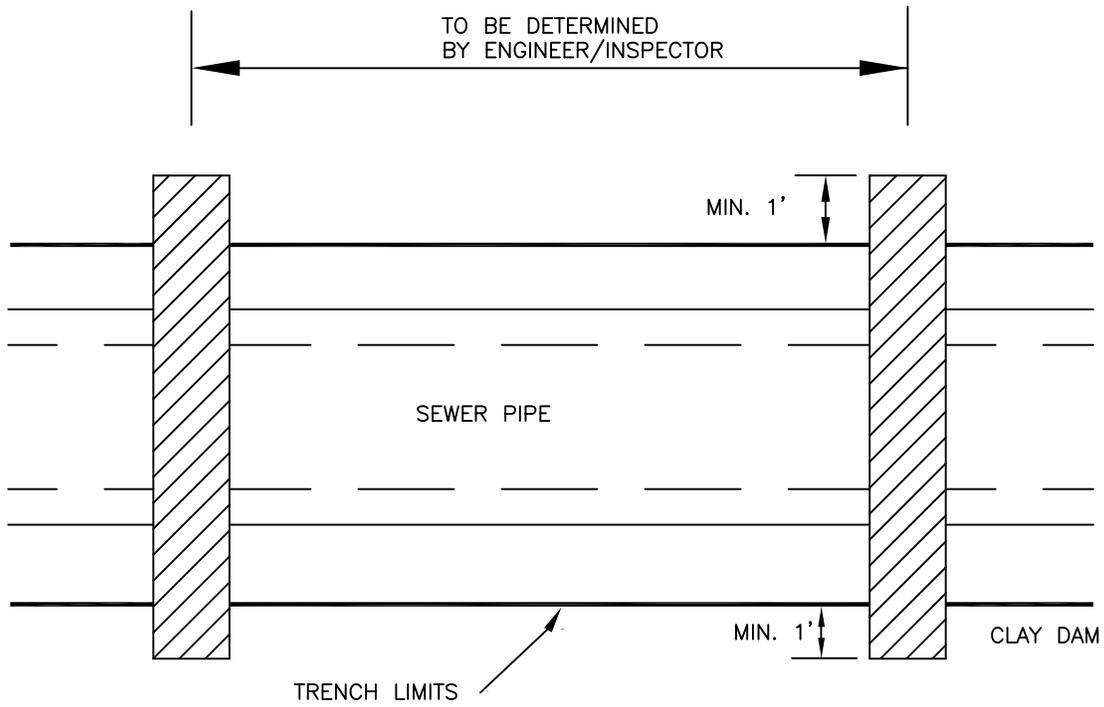
\*\* CLAY DAM (MIN. IMPERVIOUSNESS= $10^{-3}$  CM/SEC)  
\*ALTERNATE MATERIALS INCLUDE SOIL MIXED  
WITH CEMENT AND CONCRETE.  
(MATERIALS TO BE APPROVED BY ENGINEER  
PRIOR TO PLACING.)

DATE MAY 2004

CLAY DAM DETAIL

DETAIL  
SEW-9  
SHT. 1 OF 2

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



DATE MAY 2004

CLAY DAM DETAIL  
PLAN VIEW

DETAIL  
**SEW-9**  
SHT. 2 OF 2

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

MINIMUM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS									
DEPTH (FT)	DIAMETER, (IN.)								
	30	33	36	42	48	54	60	66	72
	TIME, (SEC.)								
8	11	12	14	17	20	23	26	29	33
10	14	15	18	21	25	29	33	36	41
12	17	18	21	25	30	35	39	43	49
14	20	21	25	30	35	41	46	51	57
16	22	24	30	34	40	46	52	58	67
18	25	27	32	38	45	52	59	65	73
20	28	30	35	42	50	53	65	72	81
22	31	33	39	46	55	64	72	79	89
24	33	36	42	51	59	64	78	87	97
26	36	39	46	55	64	75	85	94	105
28	39	42	49	59	69	81	91	101	113
30	42	45	53	63	74	87	98	108	121

NOTES:

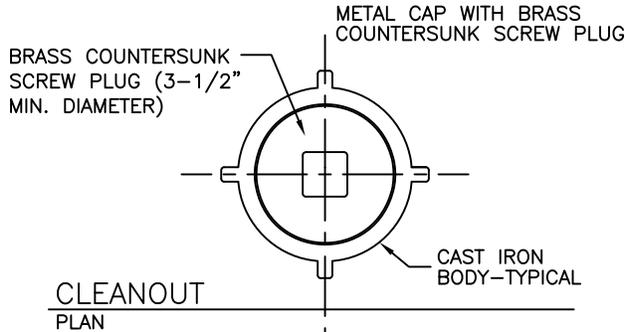
1. THE TEST HEAD SHALL BE PLACED AT THE TOP OF THE MANHOLE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
2. A VACUUM OF 10 IN. OF MERCURY SHALL BE DRAWN ON THE MANHOLE, THE VALVE ON THE VACUUM LINE OF THE TEST HEAD CLOSED, AND THE THE VACUUM PUMP SHUT OFF. THE TIME SHALL BE MEASURED FOR THE VACUUM TO DROP TO 9 IN. OF MERCURY.
3. THE MANHOLE SHALL PASS IF THE TIME FOR THE VACUUM READING TO DROP FROM 10 IN. OF MERCURY TO 9 IN. OF MERCURY MEETS OR EXCEEDS THE VALUES INDICATED IN TABLE 1.
4. IF THE MANHOLE FAILS THE INITIAL TEST, NECESSARY REPAIRS SHALL BE MADE BY AN APPROVED METHOD. THE MANHOLE SHALL THEN BE RETESTED UNTIL A SATISFACTORY TEST IS OBTAINED.

DATE MAY 2004

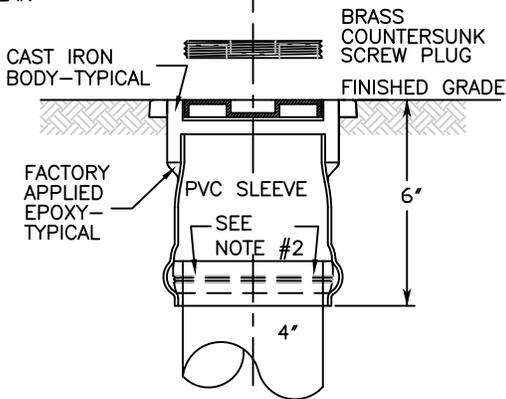
**VACUUM TEST (ASTM C 1244)  
FOR CONCRETE SEWER MANHOLES**

DETAIL  
**SEW-10**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



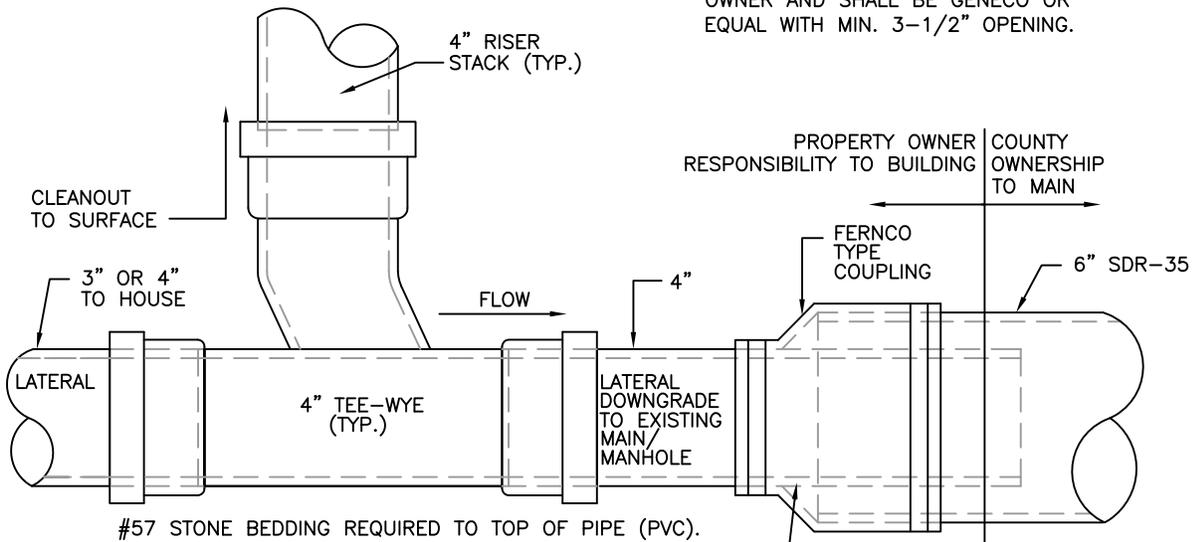
CLEANOUT  
PLAN



CLEANOUT  
ELEVATION

NOTES:

1. CLEANOUTS TO BE INSTALLED EVERY 100' AND AT EVERY 90° BEND OR AS SPECIFIED BY LATEST PLUMBING CODES.
2. CLEANOUT TOP MAY BE GASKETED OR GLUED CONNECTION TO THE STACK. EITHER METHOD MUST BE WATER TIGHT.
3. PIPING BEYOND CLEANOUT TO BE INSTALLED PER LATEST PLUMBING CODES.
4. CLEANOUT OWNED BY PROPERTY OWNER AND SHALL BE GENECO OR EQUAL WITH MIN. 3-1/2" OPENING.



ELEVATION

PROPERTY OWNER RESPONSIBILITY TO BUILDING      COUNTY OWNERSHIP TO MAIN

FERNCO TYPE COUPLING      6" SDR-35

FLOW →

4"      4" TEE-WYE (TYP.)      LATERAL DOWNGRADE TO EXISTING MAIN/MANHOLE

#57 STONE BEDDING REQUIRED TO TOP OF PIPE (PVC).

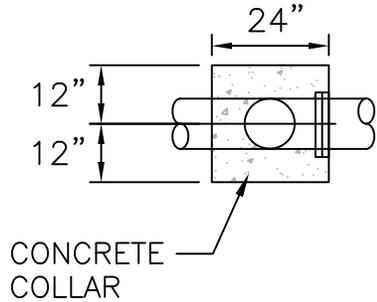
INSERT A 4" PIPE INTO A 6" PIPE 12"-18" AND SEAL USING A FERNCO COUPLING

DATE JAN 2011

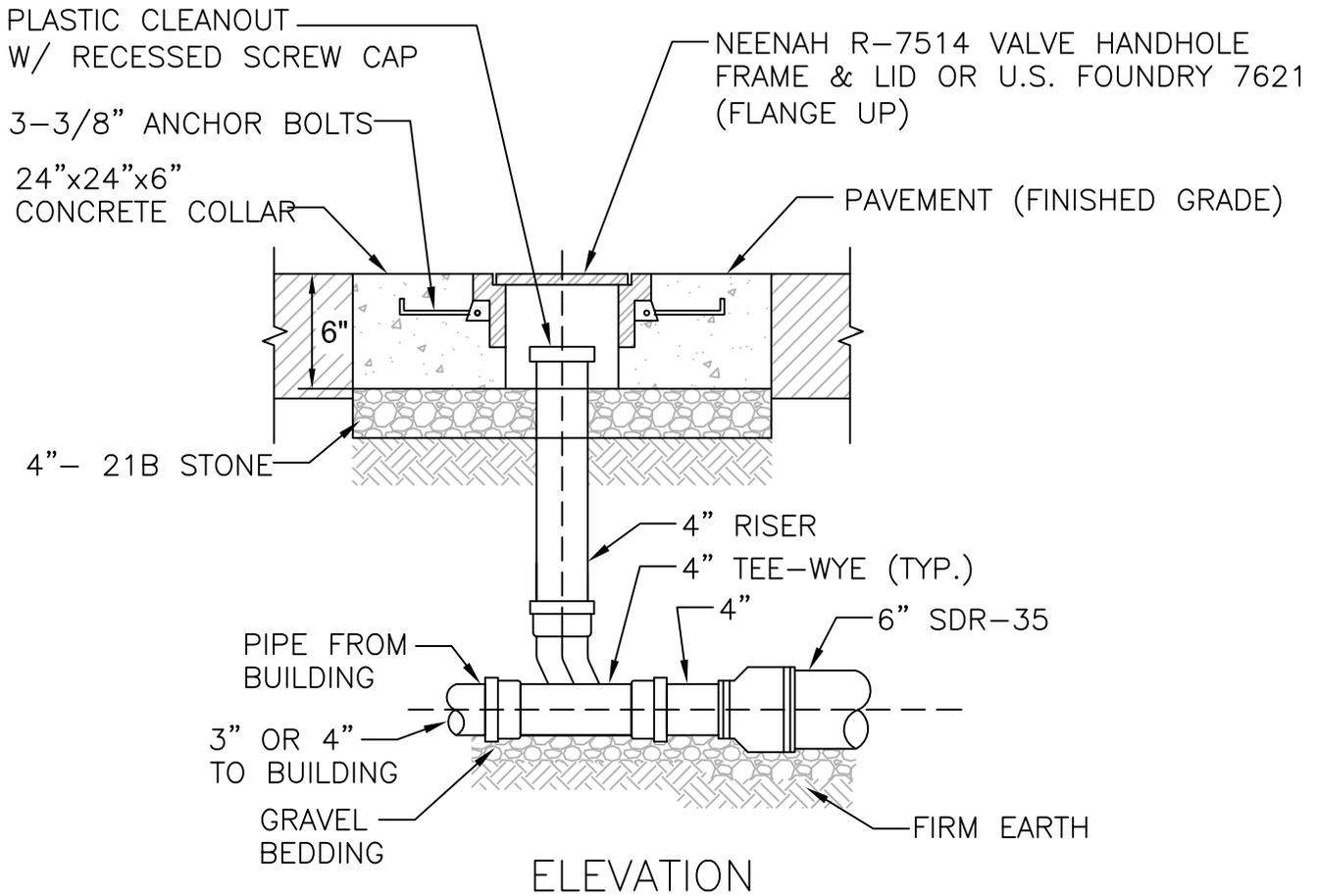
PROPERTY / EASEMENT  
LINE CLEANOUT DETAIL

DETAIL  
**SEW-11**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



PLAN



NOTE: 45° BEND AND WYE MAY BE ALLOWED FOR CLEANOUTS NOT LOCATED AT PROPERTY LINE OR EDGE OF EASEMENT, AS APPROVED BY BUILDING OFFICIAL.

DATE JAN 2011

**SANITARY SEWER CLEANOUT  
(TRAFFIC RATED)**

DETAIL  
**SEW-12**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES

WASTEWATER SYSTEMS 48" AND LARGER

<u>PIPE DIAMETER</u>	<u>ALLOWABLE INFILTRATION/EXFILTRATION (GAL./HOUR/100 FT.) (QT./MIN./100 FT.)</u>	
48"	1.894	0.1263
54"	2.131	0.1421
60"	2.367	0.1578
66"	2.604	0.1736
72"	2.841	0.1894
84"	3.314	0.2209

DATE MAY 2004

**ALLOWABLE INFILTRATION/EXFILTRATION  
BASED ON 50 GAL./IN. DIA./MILE/24 HRS.**

DETAIL  
TST-1

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP  
FOR SIZE AND LENGTH OF PIPE INDICATED  
PRESSURE DROP FROM 3.5 PSIF TO 2.5 PSIG\*

PIPE DIAMETER (IN.)	MINIMUM TIME (MIN: SEC)	TIME FOR LENGTH (L) (SEC)	SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)							
			100 FT.	150 FT.	200 FT.	250 FT.	300 FT.	350 FT.	400 FT.	450 FT.
6	5:40	.854 L	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	1.520 L	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	2.374 L	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	3.418 L	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	5.342 L	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	7.692 L	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	10.470 L	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:40	13.674 L	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
27	25:30	17.306 L	28:51	43:16	57:41	72:07	86:32	100:57	115:22	129:48
30	28:20	21.366 L	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15
33	31:10	25.852 L	43:05	64:38	86:10	107:43	129:16	150:43	172:21	193:53
36	34:00	30.768 L	51:17	76:55	102:34	128:12	153:50	179:29	205:07	230:46
42	45:21	41.883 L	69:48	104:47	139:37	174:31	209:25	244:19	279:13	314:07

\* THE 3.5 PSIG TEST PRESSURE SHALL BE INCREASED BY ADDING THE AVERAGE VERTICAL HEIGHT IN FEET OF GROUND WATER ABOVE THE SEWER PIPE INVERT, DIVIDED BY 2.31 BUT THE MAXIMUM STARTING TEST PRESSURE SHALL NOT EXCEED 9 PSIG.

DATE MAY 2004

**PVC PIPE AIR TEST TABLE  
BASED ON FORMULAS FROM UNI-B-6-90**

DETAIL  
TST-2

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

MINIMUM TEST TIME TWO HOURS

WATER LINE TEST BASED ON 150 PSI	
SIZE	MAX. ALLOWABLE LEAKAGE
3/4"	.0124 (GAL/2 HRS)/100 L.F.
1"	.0166 (GAL/2 HRS)/100 L.F.
1-1/2"	.0248 (GAL/2 HRS)/100 L.F.
2"	.0331 (GAL/2 HRS)/100 L.F.
3"	.0497 (GAL/2 HRS)/100 L.F.
4"	.0662 (GAL/2 HRS)/100 L.F.
6"	.0993 (GAL/2 HRS)/100 L.F.
8"	.1324 (GAL/2 HRS)/100 L.F.
12"	.1986 (GAL/2 HRS)/100 L.F.

WATER LINE TEST BASED ON 150 PSI	
SIZE	MAX. ALLOWABLE LEAKAGE
16"	.2648 (GAL/2 HRS)/100 L.F.
20"	.3310 (GAL/2 HRS)/100 L.F.
24"	.3972 (GAL/2 HRS)/100 L.F.
30"	.4965 (GAL/2 HRS)/100 L.F.
36"	.5958 (GAL/2 HRS)/100 L.F.
42"	.6951 (GAL/2 HRS)/100 L.F.
48"	.7944 (GAL/2 HRS)/100 L.F.
54"	.8937 (GAL/2 HRS)/100 L.F.

MAXIMUM ALLOWABLE LEAKAGE FOR THE WATER MAIN WILL BE CALCULATED USING THE FOLLOWING FORMULA:

$$L = \frac{DS\sqrt{P}}{148,000}$$

WHERE:

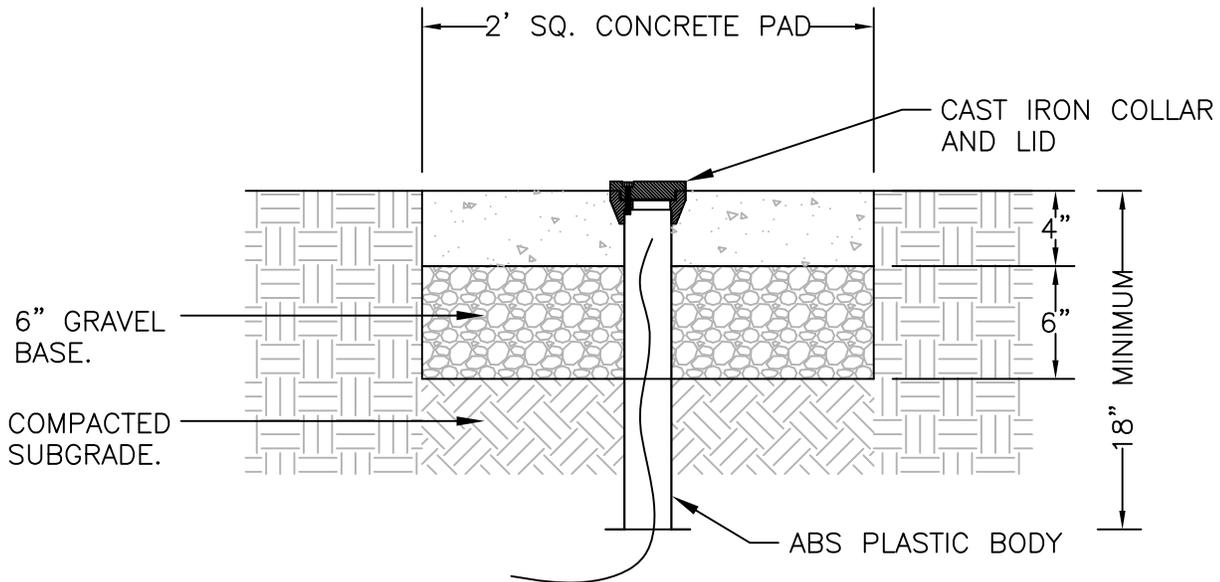
- L = MAXIMUM ALLOWABLE LEAKAGE, GALLONS/HOUR
- S = LENGTH OF PIPE IN TEST SECTION, IN FEET
- D = NOMINAL DIAMETER OF TESTED PIPE, IN INCHES
- P = TEST PRESSURE, POUNDS PER SQUARE INCH 150 PSI OR 1 1/2 THE WORKING PRESSURE WHICHEVER IS GREATER MEASURED AT THE HIGH POINT OF THE TEST SYSTEM.

DATE MAY 2004  
REV JAN 2011

**ALLOWABLE LEAKAGE TABLE - WATERLINES**  
BASED ON FORMULAS FROM AWWA SPECIFICATIONS

DETAIL  
**TST-3**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



TYPICAL INSTALLATION FOR FORCEMAINS  
AND WATERLINES.

NOTES:

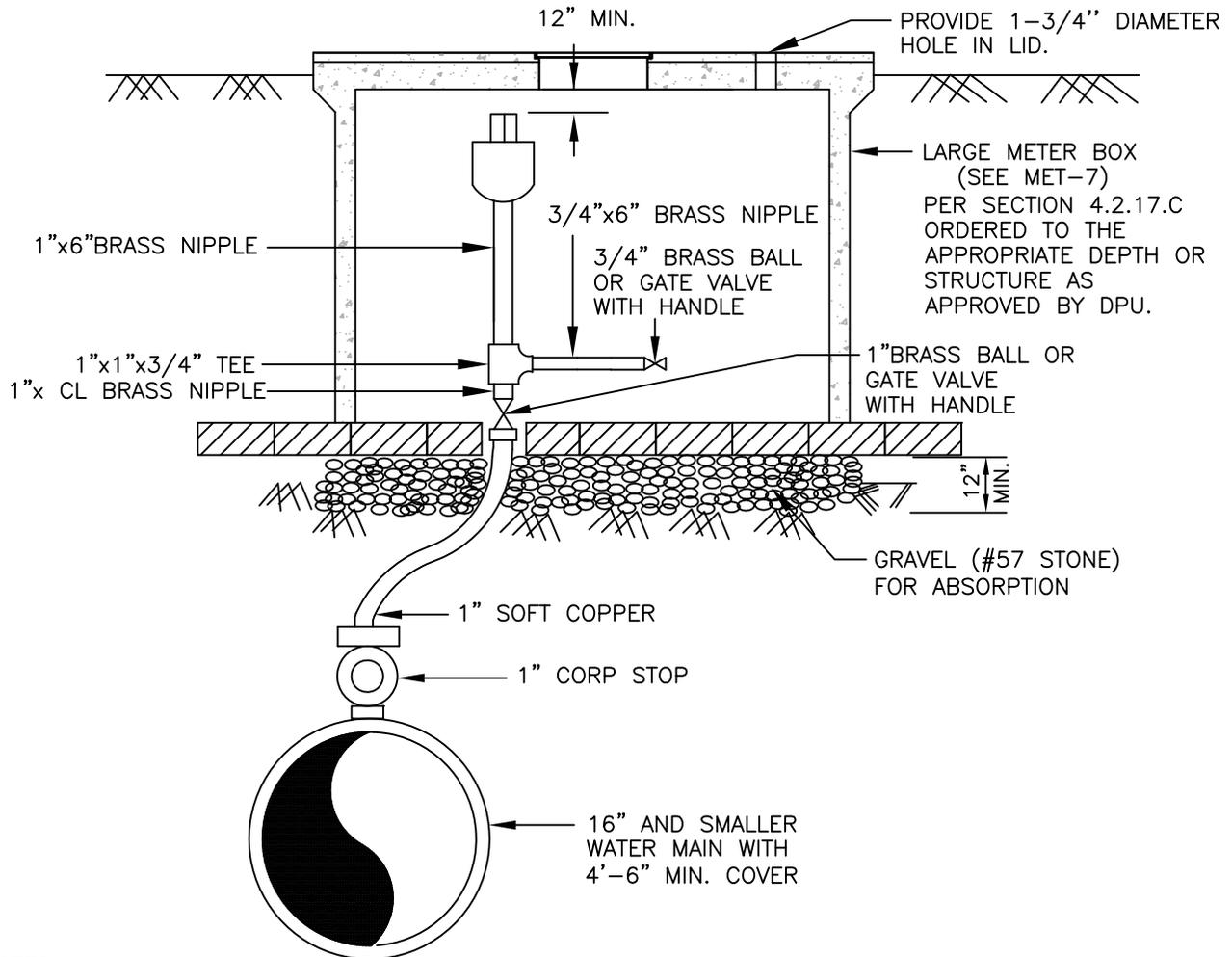
1. TEST BOX TO BE BINGHAM TAYLOR P-200 TEST WITH FLARED BOTTOM; 2-1/2" SIZE OR EQUAL.
2. CONCRETE FOR PAD TO BE 3000 PSI CONCRETE.
3. SEE SECTION 3.3.1 FOR FURTHER DETAILS ON MATERIALS TO BE USED.
4. ALL TEST STATIONS LOCATED OUTSIDE PUBLIC RIGHT OF WAY AND NOT ADJACENT TO OTHER ABOVE GROUND FACILITIES SHOULD HAVE A MARKER/WITNESS POST PROVIDED ADJACENT TO IT UNLESS OTHERWISE APPROVED BY DPU.
5. PRECAST REINFORCED CONCRETE RING 24" IN DIAMETER MAY BE USED IN LIEU OF 2' SQUARE PAD POURED IN PLACE.
6. TEST STATIONS ADJACENT TO FIRE HYDRANT DO NOT REQUIRE THE CONCRETE PAD/RING.

DATE MAY 2004  
REV JAN 2011

TEST STATION BOX

DETAIL  
TST-4

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

1. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO DESIGN THE PUBLIC WATER SYSTEM TO MINIMIZE THE NUMBER OF AIR RELEASE VALVES BY ELIMINATING HIGH POINTS WHERE REASONABLY FEASIBLE AND TO PROPERLY SIZE THE AIR RELEASE VALVE TAKING INTO CONSIDERATION ALL THE DESIGN FACTORS, AND KEEPING IN MIND THAT A 1" AIR RELEASE VALVE FOR 16" LINES IS DESIRABLE. ORIFICE SIZE SHALL BE NOTED ON PLANS.
2. ALL COPPER FITTINGS WILL BE COMPRESSION TYPE.
3. SADDLE MUST BE USED FOR TAP.
4. WHERE THE AIR RELEASE VALVE IS REMOTE FROM THE WATER LINE THERE MUST BE CONTINUOUS RISE IN THE COPPER SUPPLY LINE TO THE AIR RELEASE VALVE AND NO TRAP SHALL BE PERMITTED.
5. AIR RELEASE VALVE TO BE PLACED WHERE NOT SUBJECT TO FLOODING OR VEHICULAR TRAFFIC.
6. CONTRACTOR TO VERIFY DEPTH AND APPURTENANCES ARE APPROPRIATE PRIOR TO BEGINNING CONSTRUCTION.

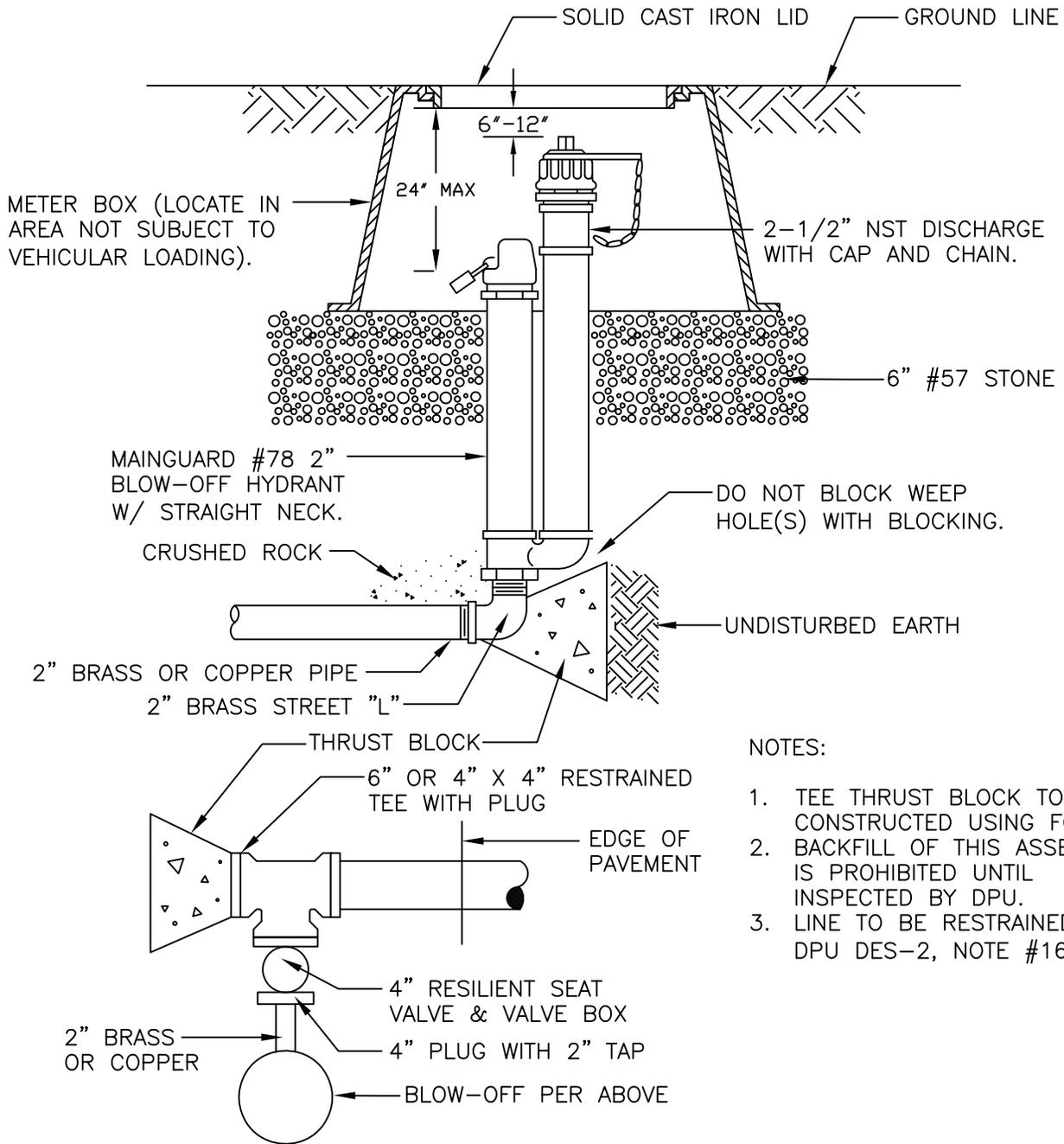
DATE MAY 2004  
REV JAN 2011

1" AIR RELEASE VALVE

DETAIL  
WAT-1



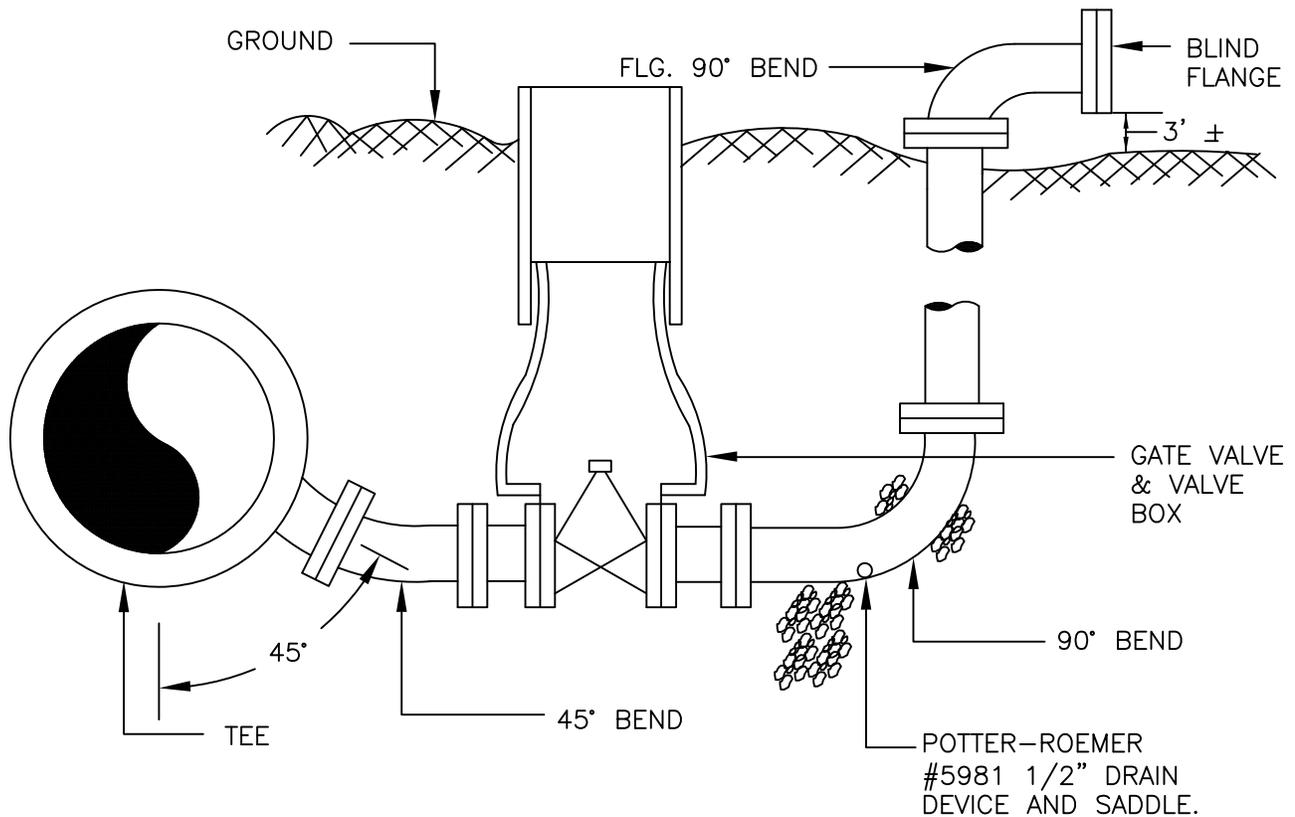
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- NOTES:
1. TEE THRUST BLOCK TO BE CONSTRUCTED USING FORMS.
  2. BACKFILL OF THIS ASSEMBLY IS PROHIBITED UNTIL INSPECTED BY DPU.
  3. LINE TO BE RESTRAINED BY DPU DES-2, NOTE #16.

TYPICAL PLAN VIEW OF INSTALLATION

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

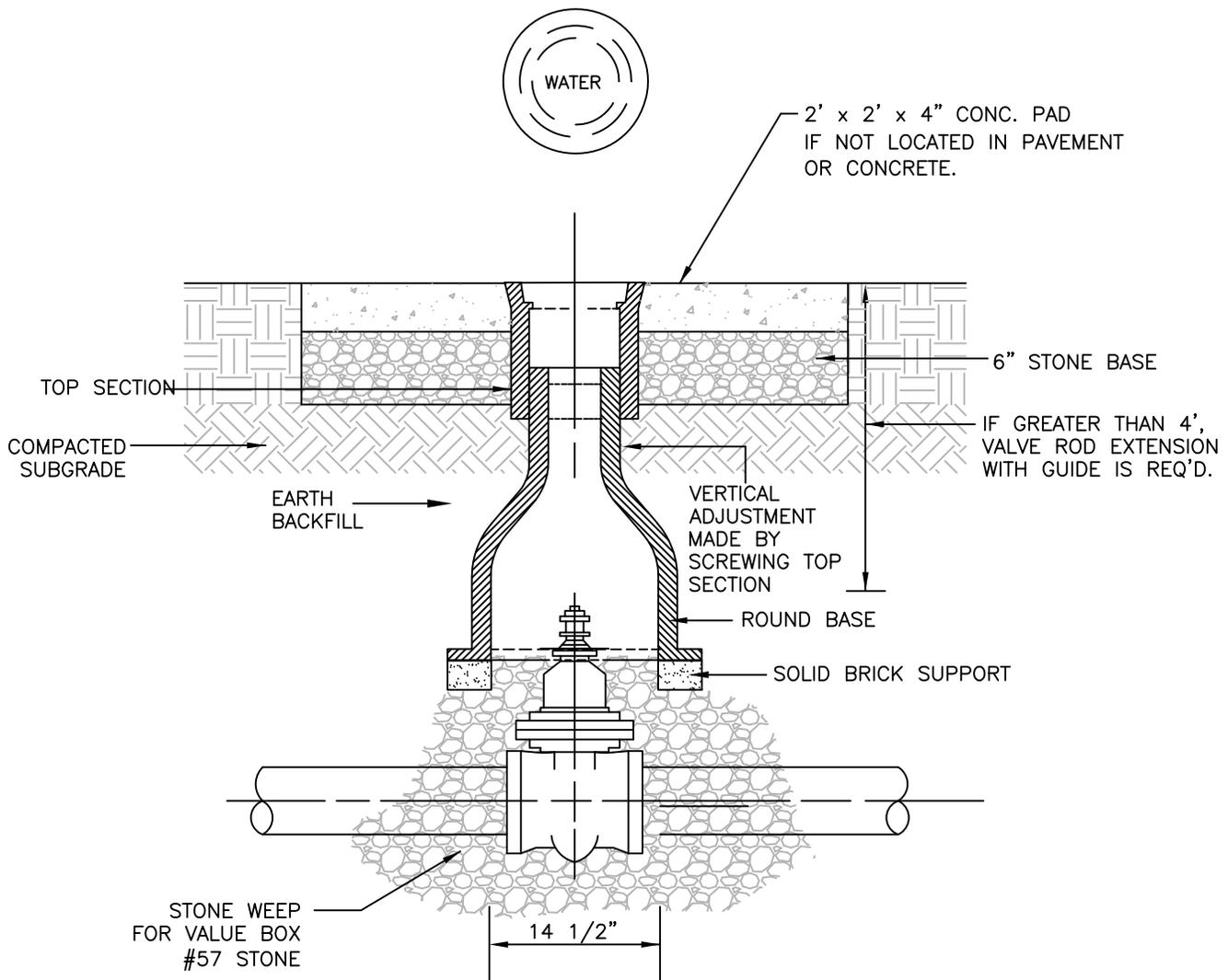
1. ALL PIPES AND FITTINGS SHALL BE FLANGED OR M.J. RESTRAINED JOINTS.
2. PROVIDE POTTER-ROEMER #5981 1/2" DRAIN DEVICE AND SADDLE TO DRAIN PIPE AND PREVENT FREEZING. DEVICE TO BE LOCATED AT LEAST 2 FEET BELOW GRADE. PROVIDE AT LEAST 1/2 CUBIC YARD OF #57 STONE BELOW DRAIN DEVICE.
3. THIS DETAIL SHALL BE UTILIZED ON 8" OR LARGER WATERLINES. MINIMUM SIZE BLOW-OFF SHALL BE 4" FOR UP TO 12" MAINS, 6" FOR 16" MAINS, AND 8" FOR 24" MAINS.
4. APPROPRIATE DISCHARGE FACILITY SHALL BE PROVIDED NEAR THE BLOW-OFF LOCATION, I.E. A RIP-RAP LINED POOL OR STORM STRUCTURE.

DATE MAY 2004  
REV JAN 2011

**TYPICAL 4" AND LARGER BLOW-OFF**  
(FOR WATERLINES 8" AND GREATER IN DIAMETER)

DETAIL  
**WAT-4**

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTES:

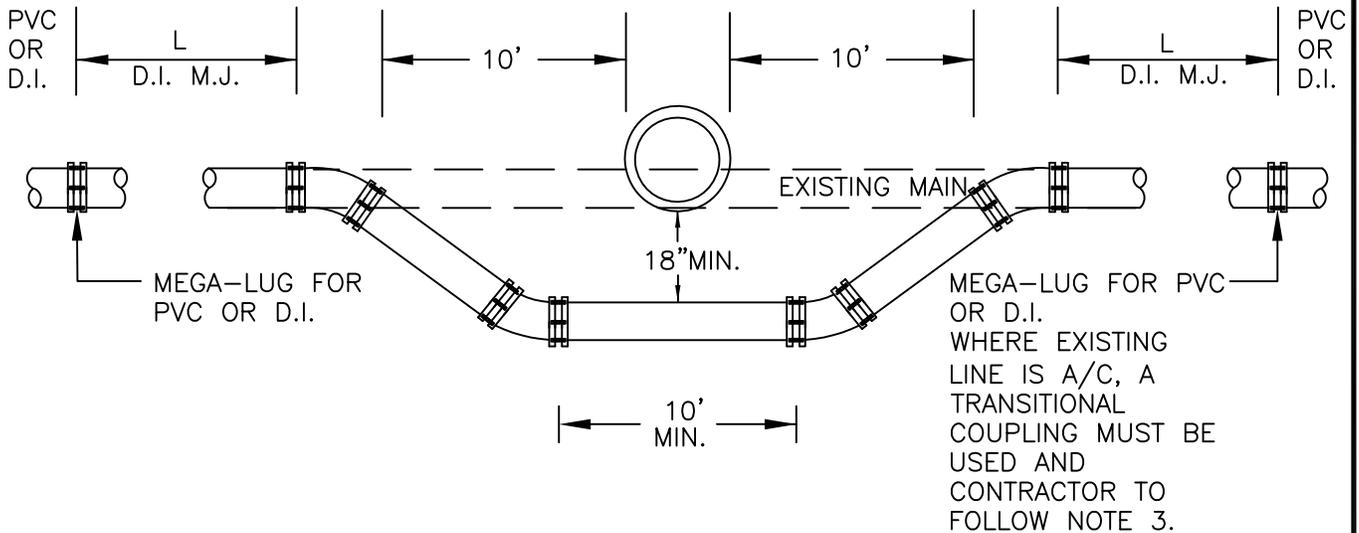
1. PRECAST REINFORCED CONCRETE RING 2' DIAMETER MAY BE USED IN LIEU OF THE 2' SQUARE Poured IN PLACE PAD.
2. USE STANDARD DESIGNED VALVE BOX OF THE APPROPRIATE LENGTH (HEIGHT) UTILIZING APPROVED MANUFACTURERS OF VALVE BOX APPURTENANCES.
3. IF EXCESSIVE DEPTH, A SECTION OF DUCTILE IRON PIPE WITH BELL END MAY BE USED NEAR THE VALVE AND THEN JOINED TO THE STANDARD ADJUSTABLE VALVE BOX. IF DEPTH TO VALVE OPERATING NUT EXCEEDS 4', THEN AN EXTENSION PER SECTION 3.1.4 AND DETAIL WAT-12 IS REQUIRED.

DATE MAY 2004  
REV JAN 2011

SMALL VALVE BOX

DETAIL  
WAT-5

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**



**NOTES:**

1. LOWERED SECTION TO BE OF DUCTILE IRON MECHANICAL JOINT PIPE WITH RESTRAINED JOINTS AT ANY INCLUDED JOINTS. THE ENGINEER SHALL CALCULATE LENGTH OF RESTRAINED SECTION.
2. THRUST BLOCKS FOR VERTICAL BENDS MAY BE DELETED WITH RESTRAINED JOINTS.
3. SUPPORT THE COUPLING WITH 4" X 4" SALT TREATED TIMBER DURING INSTALLATION. TIMBER SUPPORT TO BE LEFT IN PLACE AND MAY BE REQUIRED UNDER THE A/C PIPE AS DIRECTED BY THE DPU INSPECTOR.

DATE MAY 2004  
REV JAN 2011

**LOWERING WATER MAIN  
OR NEW INSTALLATION**

DETAIL  
**WAT-6**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

DISCHARGE TABLE FOR HYDRANTS.*+												
OUTLET PRESSURE MEASURED BY PITOT GAGE.												
FLOWING PRESSURE IN lb/in <sup>2</sup>	OUTLET DIAMETER IN INCHES											
	2-3/8	2-1/2	2-5/8	2-3/4	2-7/8	3	3-1/8	3-7/8	4	4-3/8	4-1/2	4-5/8
	U.S. GALLONS PER MINUTE											
1	150	170	180	200	220	240	260	400	430	510	540	580
2	210	240	260	290	310	340	370	570	610	720	770	810
3	260	290	320	350	380	420	450	700	740	890	940	990
4	300	340	370	410	440	480	530	810	860	1030	1090	1150
5	340	380	410	450	500	540	590	900	960	1150	1220	1290
6	370	410	450	500	540	590	640	990	1050	1260	1340	1410
7	400	440	490	540	590	640	690	1070	1140	1360	1440	1520
8	430	480	520	570	630	680	740	1140	1220	1450	1540	1620
9	450	500	550	610	670	730	790	1210	1290	1540	1640	1720
10	480	530	580	640	700	760	830	1280	1360	1630	1730	1820
11	500	560	610	670	730	800	870	1340	1430	1710	1810	1910
12	520	580	640	700	770	840	910	1400	1490	1780	1890	1990
13	550	610	670	730	800	870	950	1450	1550	1850	1960	2070
14	570	630	690	760	830	900	980	1510	1610	1920	2040	2150
15	590	650	720	790	860	940	1020	1560	1660	1990	2110	2220
16	610	670	740	810	890	970	1050	1620	1720	2060	2180	2300
17	620	690	760	840	910	1000	1080	1660	1770	2120	2240	2370
18	640	710	780	860	940	1030	1110	1710	1820	2180	2310	2440
19	660	730	810	890	960	1050	1140	1760	1870	2240	2370	2510
20	680	750	830	910	990	1080	1170	1800	1920	2290	2430	2570
22	710	790	870	950	1040	1130	1230	1890	2020	2400	2550	2700
24	740	820	910	1000	1090	1180	1290	1970	2110	2510	2660	2810
26	770	860	940	1040	1130	1230	1340	2050	2190	2620	2770	2930
28	800	890	980	1070	1170	1280	1390	2130	2280	2720	2880	3040
30	830	920	1010	1110	1210	1320	1430	2210	2350	2820	2980	3150
32	860	950	1050	1150	1260	1370	1480	2280	2430	2910	3080	3250
34	880	980	1080	1180	1290	1410	1530	2350	2510	3000	3170	3350
36	910	1010	1110	1220	1330	1450	1580	2420	2580	3080	3260	3440
38	930	1040	1140	1250	1370	1490	1620	2480	2650	3170	3350	3540
40	960	1060	1170	1290	1400	1530	1660	2550	2720	3250	3440	3630

\*COMPUTED WITH COEFFICIENT, C = 0.90, TO NEAREST 10 GALS. PER MIN.  
 +FROM NATL. BD. OF FIRE UNDERWRITERS.

EQUIPMENT FOR APPROXIMATING HYDRANT FLOWS (per R.C. Dennett, Engr. Natl. Bd. of Fire Underwriters):

THE EQUIPMENT NECESSARY CONSISTS OF EITHER A STANDARD PITOT TUBE OR A HYDRANT CAP TAPPED TO TAKE A PRESSURE GAGE. IF THE HYDRANTS USED AS A DISCHARGE POINT FOR FLUSHING HAS TWO OR MORE OUTLETS A PRESSURE GAGE ON ONE OUTLET WHILE ANOTHER OUTLET IS FLOWING WILL GIVE APPROXIMATELY THE SAME RESULTS AS THE USE OF A PITOT TUBE.

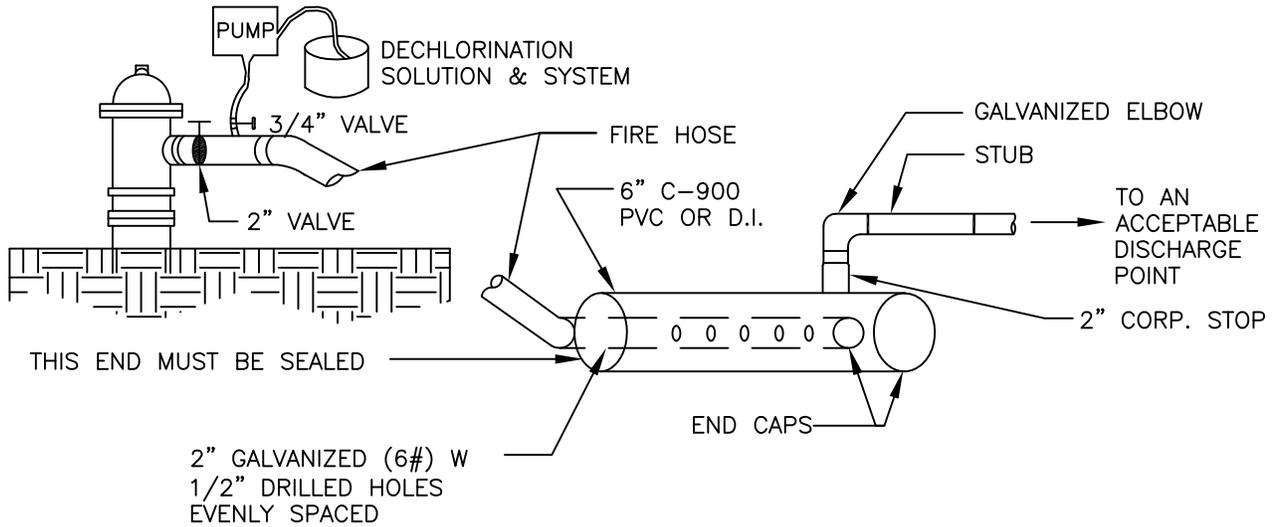
DATE MAY 2004

## DISCHARGE FLOW RATES FOR FLUSHING

DETAIL  
WAT-7

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

PUMP HAS TO HAVE CAPABILITY OF PUMPING WITH A GREATER PSI THAN THE PSI OF THE EXISTING SYSTEM.



**NOTES:**

1. ALL FITTINGS USED MUST BE RESISTANT TO DECHLORINATION CHEMICALS.
2. THE FIRE HOSE NEEDS TO BE DISCHARGED INTO AN AREA THAT WILL CAUSE NO ENVIRONMENTAL/EROSION PROBLEMS. THIS POINT WILL BE MONITORED TO MAKE SURE THAT THE DISCHARGING WATER IS DECHLORINATED.
3. THIS DETAIL IS A RECOMMENDED DESIGN CONCEPT. ALTERNATE METHOD(S) MAY BE SUBMITTED TO THE UTILITIES DEPARTMENT'S CONSTRUCTION SECTION FOR APPROVAL PRIOR TO SCHEDULED FLUSHING.

DATE MAY 2004  
REV JAN 2011

**NEUTRALIZATION STATION  
(DECHLORINATION)**

DETAIL  
**WAT-8**

**HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES**

PIPE MATERIAL TYPE AND SIZE	MAXIMUM DEFLECTION AT EACH JOINT	DEFLECTIONS (INCHES EACH JOINT) 19' LAYING LENGTH	RADIUS (MINIMUM)
DUCTILE IRON (PUSH-ON JOINT)			
6" TO 12"	2° 30'	9.5"	413'
14" TO 16"	2° 00'	7.5"	516'
18" +	1° 30'	5.5"	688'
DUCTILE IRON (MECHANICAL JOINT)			
6"	3° 30'	13.5"	291'
8" TO 12"	3° 00'	11.5"	344'
16"	2° 00'	7.5"	516'
24"	1° 30'	5.5"	688'

NOTE: ANY DEFLECTION NOT LISTED FOR IRON PIPE MAY BE DERIVED BY:

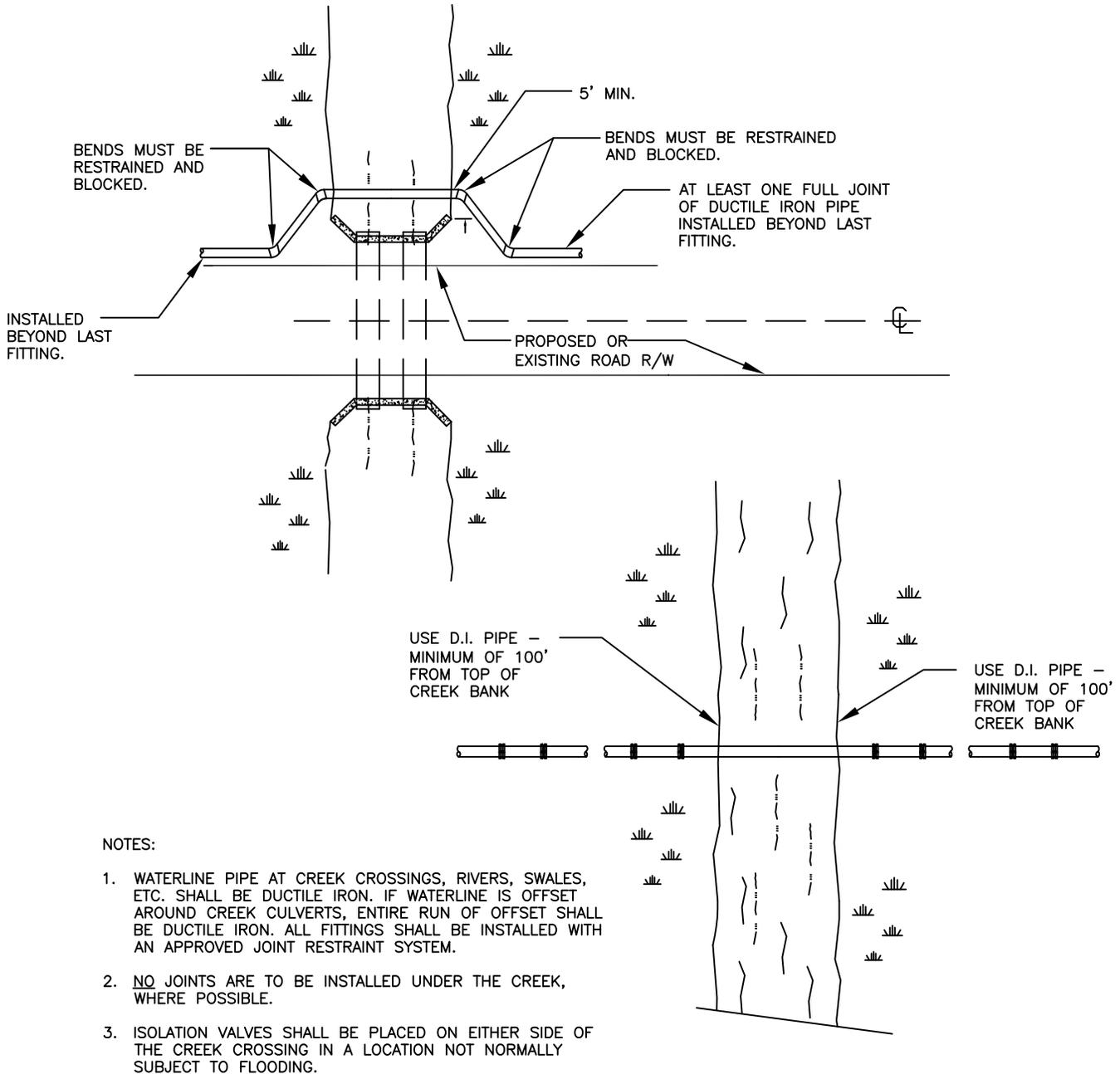
$$R = \frac{90^\circ}{1/2 \text{ MANUFACTURER'S MAX. JT. DEFLECTION}} \times \frac{18'' \times 2}{\pi} \quad \text{DEFLECTION} = \text{TAN JOINT DEFLECTION} \times 18' \times 12$$

DATE MAY 2004  
REV JAN 2011

**ALLOWABLE DEFLECTIONS  
FOR WATER PIPE**

DETAIL  
**WAT-9**

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



**NOTES:**

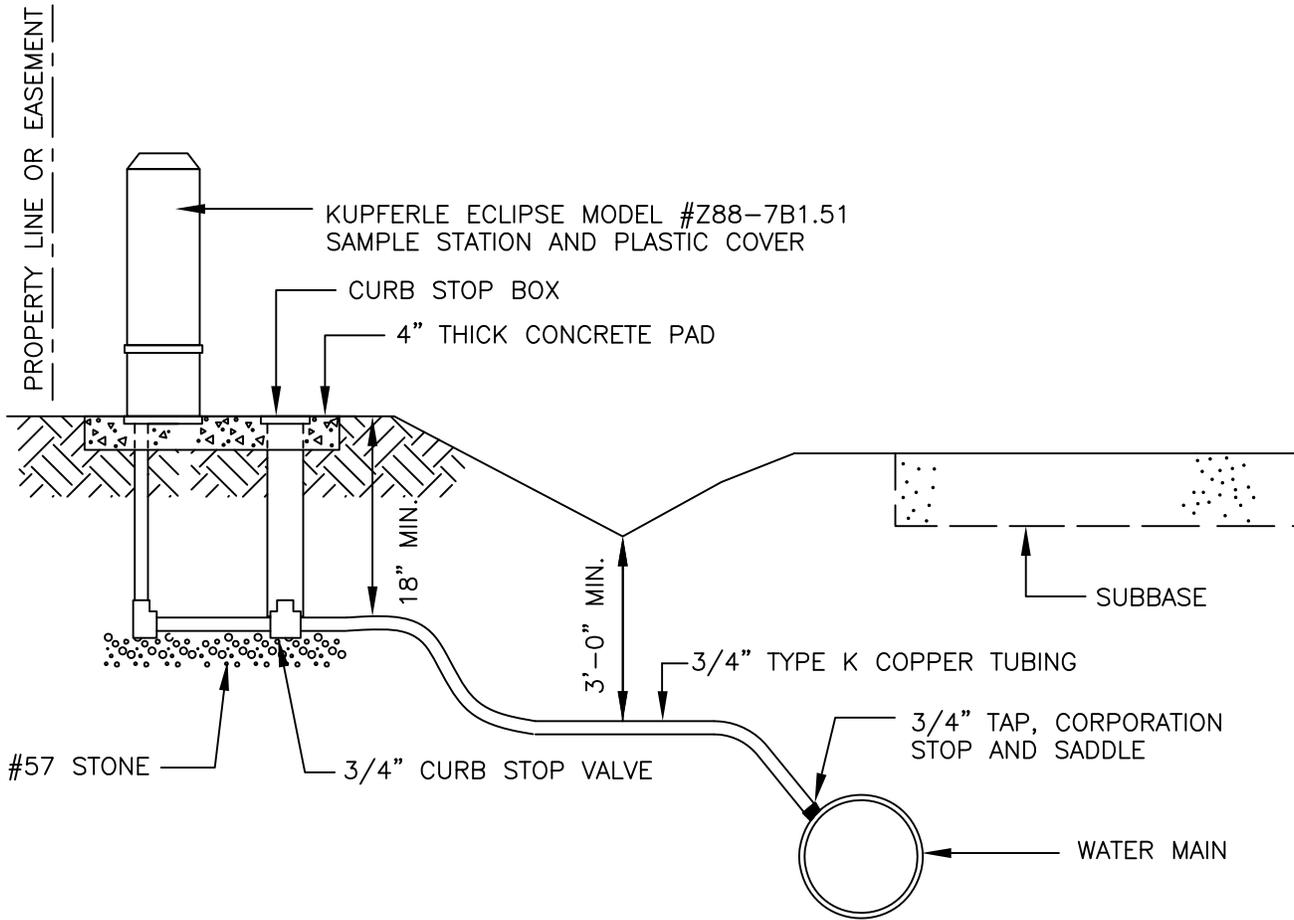
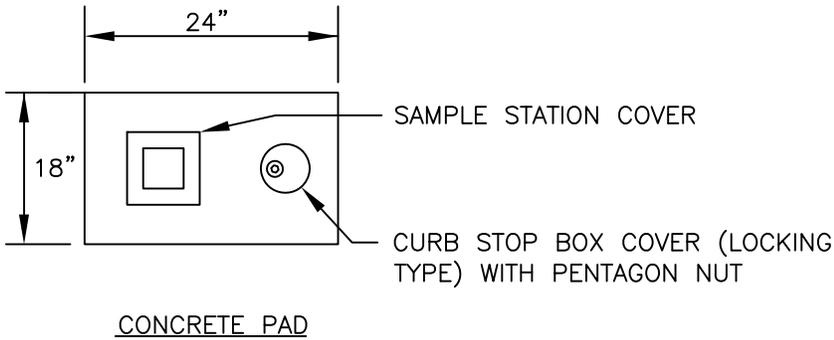
1. WATERLINE PIPE AT CREEK CROSSINGS, RIVERS, SWALES, ETC. SHALL BE DUCTILE IRON. IF WATERLINE IS OFFSET AROUND CREEK CULVERTS, ENTIRE RUN OF OFFSET SHALL BE DUCTILE IRON. ALL FITTINGS SHALL BE INSTALLED WITH AN APPROVED JOINT RESTRAINT SYSTEM.
2. NO JOINTS ARE TO BE INSTALLED UNDER THE CREEK, WHERE POSSIBLE.
3. ISOLATION VALVES SHALL BE PLACED ON EITHER SIDE OF THE CREEK CROSSING IN A LOCATION NOT NORMALLY SUBJECT TO FLOODING.

DATE MAY 2004  
REV JAN 2011

## TYPICAL WATERLINE CREEK CROSSINGS

DETAIL  
WAT-10

HANOVER COUNTY  
DEPARTMENT OF PUBLIC UTILITIES



NOTE: ALL FITTINGS SHALL BE AWWA APPROVED BRASS

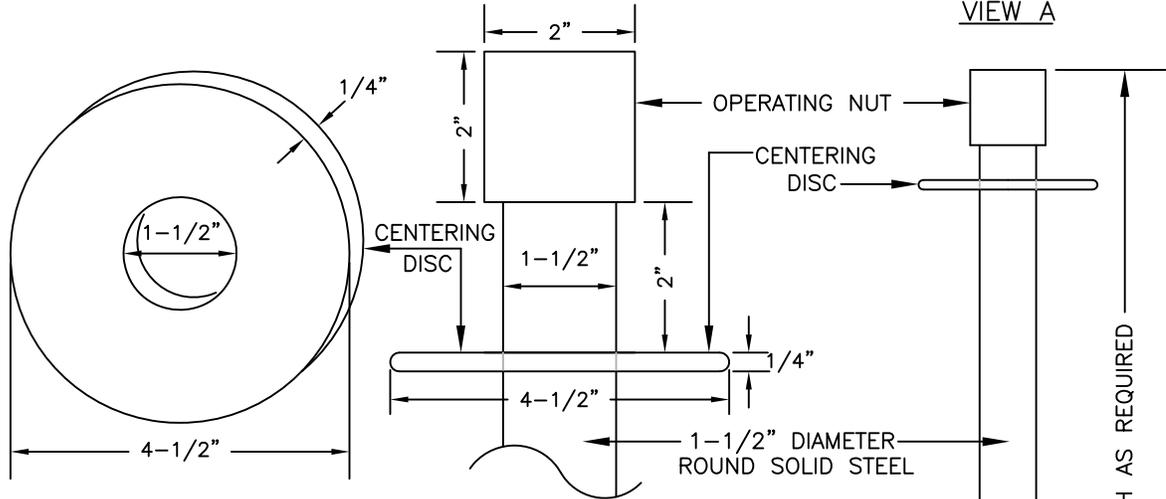
DATE MAY 2004  
REV JAN 2011

WATER QUALITY MONITORING  
STATION

DETAIL  
WAT-11

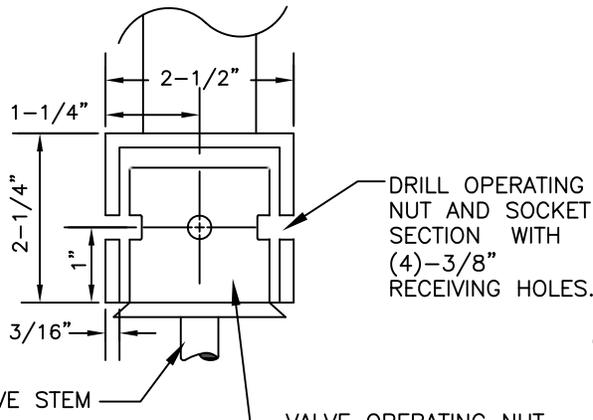
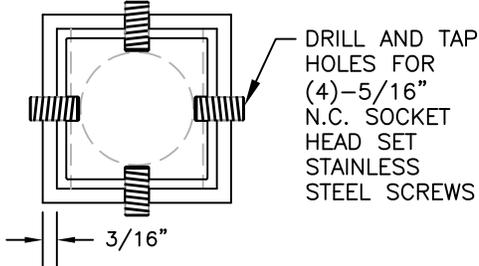
# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES

BLOW UP VIEW A



VIEW A

SOCKET SECTION  
BLOW UP VIEW B



VIEW B

**NOTES:**

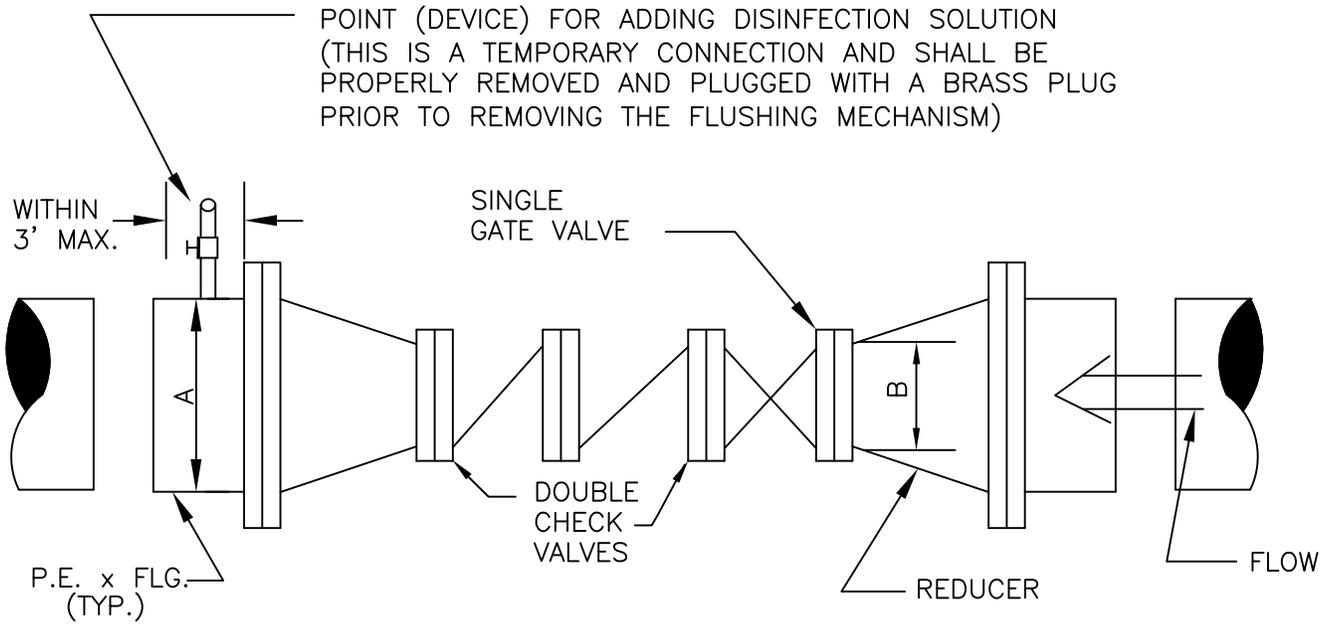
1. USE THIS DETAIL WHEN DISTANCE FROM TOP OF OPERATING NUT OF VALVE TO FINISH GRADE EXCEEDS 4'-0".
2. ALL STEEL, WELDED VALVE EXTENSIONS SHALL BE COATED WITH OIL-BASED ENAMEL OR OTHER RUST-PREVENTIVE COATING.
3. SPECIFIED LENGTH WILL BE TOTAL LENGTH OF ADJUSTMENT, MEASURED AS SHOWN.
4. THE 2" SQUARE OPERATING NUT ON TOP SHALL BE WELDED TO FORM A COMPLETE BOX WITH NO OPENINGS.
5. 2-1/2" SQUARE SOCKET ON BOTTOM SHALL BE TAPPED ON 4 SIDES FOR MINIMUM 5/16" N.C. SOCKET HEAD SET SCREWS AND SCREWS SHALL BE PROVIDED.
6. CENTER EXTENSION BAR SHALL BE 1-1/2" DIAMETER ROUND SOLID STEEL.
7. A 4-1/2" DIAMETER X 1/4" STEEL CENTERING DISC SHALL BE WELDED TO THE 1-1/2" STEEL ROD, POSITIONED 2" BELOW THE 2" SQUARE OPERATING NUT AS SHOWN.

DATE JAN 2011

## VALVE KEY EXTENSION

DETAIL  
WAT-12

# HANOVER COUNTY DEPARTMENT OF PUBLIC UTILITIES



A	B
6"	4"
8"	4"
12"	6"
16"	6"
20"	8"
24"	12"
30"	12"
36"	*

A = MAIN SIZE

B = CHECK VALVE AND  
GATE VALVE SIZE

\* = TO BE DESIGNED  
BY CONSULTANT.

NOTE: CONTRACTOR SHALL USE IN ACCORDANCE WITH FLUSHING SCHEDULE, SECTIONS 2.4.3.3 AND 2.4.3.4, AND DES-3.

DATE JAN 2011

**DOUBLE CHECK VALVE ASSEMBLY FOR  
ISOLATING NEW MAINS DURING TESTING**

DETAIL  
**WAT-13**