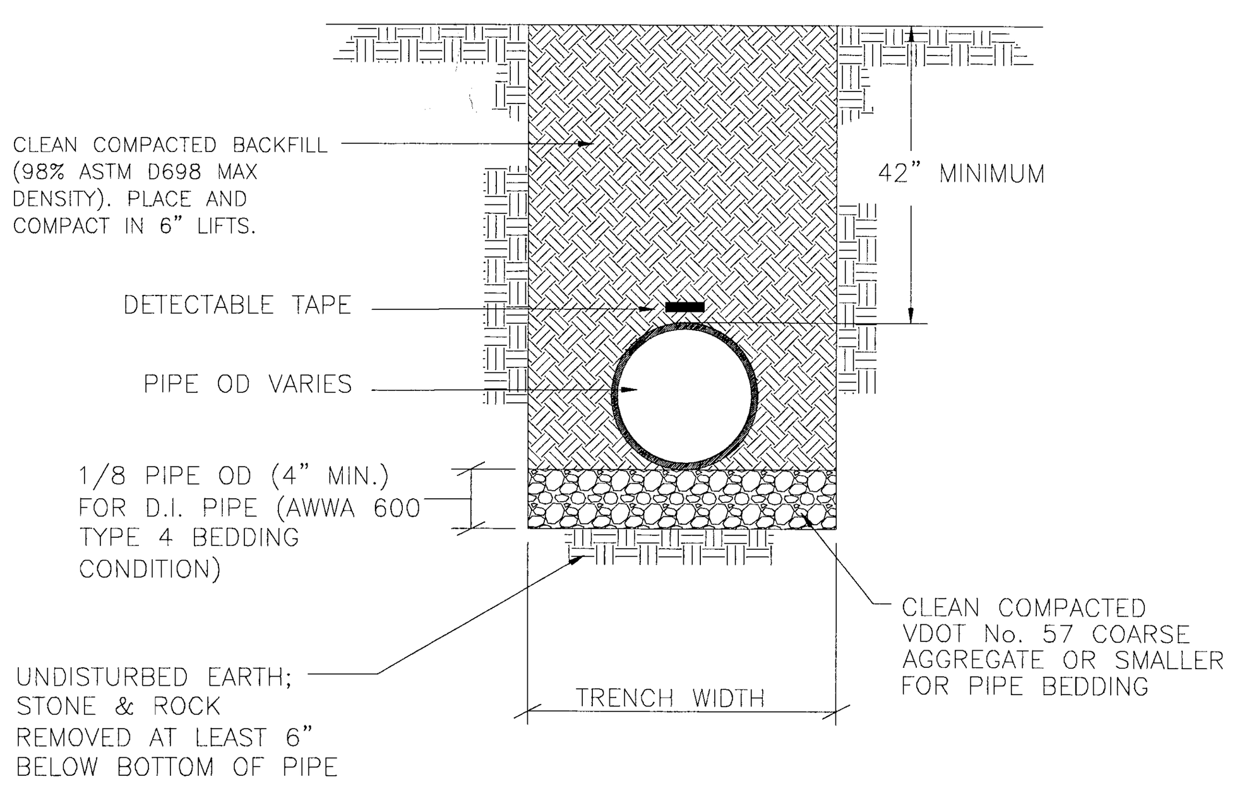
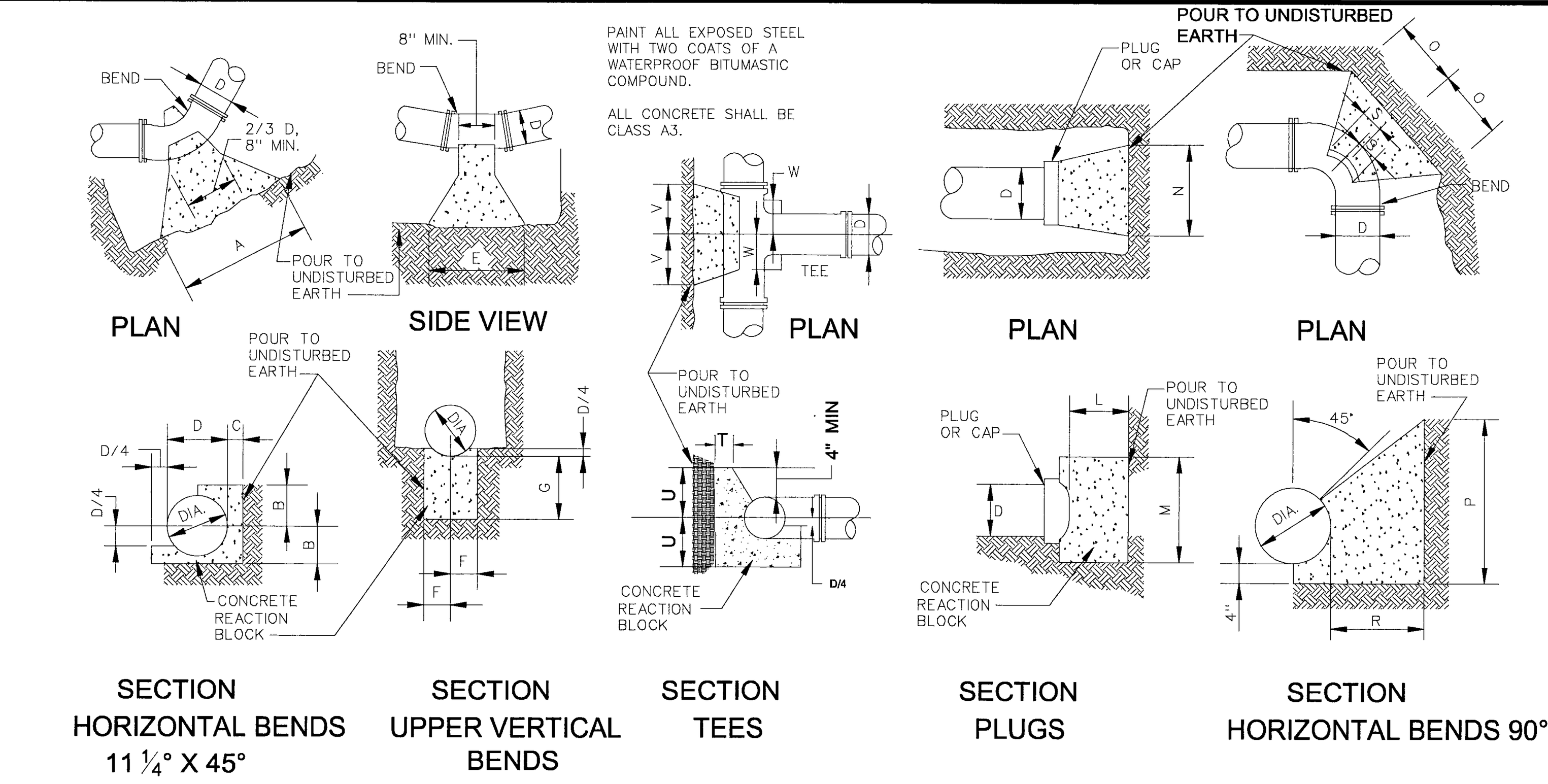


NOTES:

1. VDOT No. 1 OR No. 2 FOUNDATION STONE SHALL BE REQUIRED WHEN SOIL CONDITIONS ARE UNSUITABLE FOR BEARING NEW STRUCTURES OR PIPING.

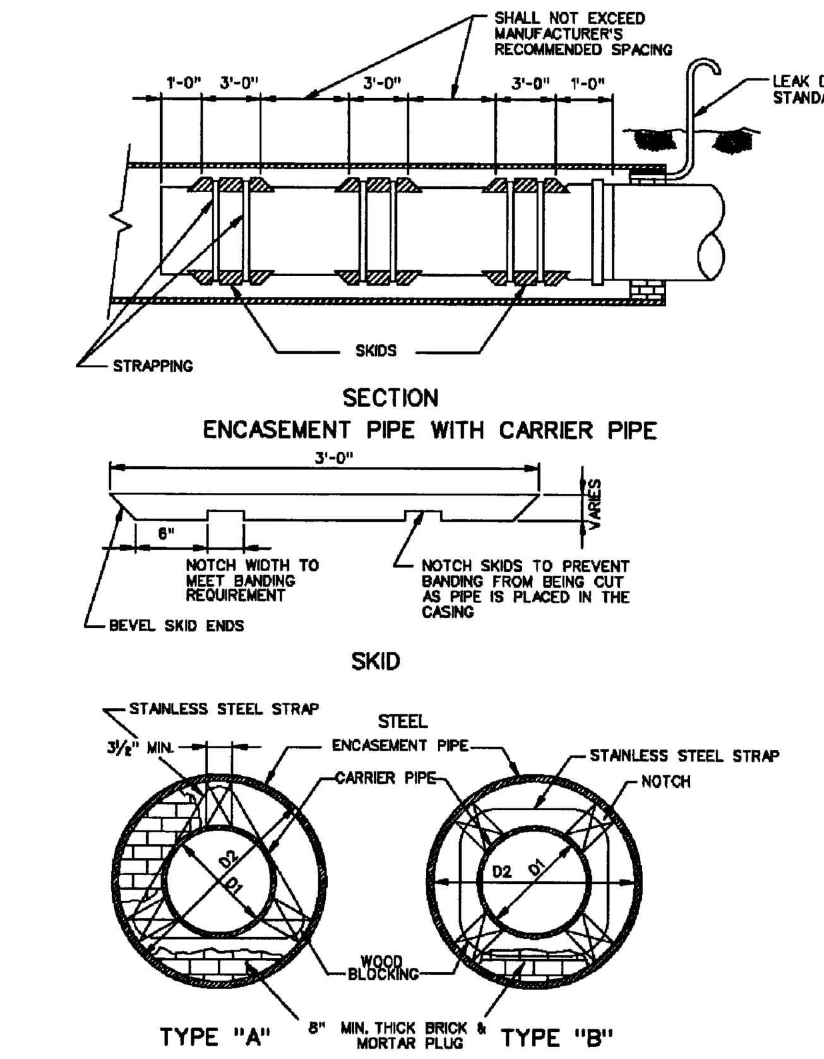
2. AN ADDITIONAL 1" DEPTH OF BEDDING MATERIAL WILL BE REQUIRED FOR EACH ADDITIONAL 2 FEET OF TRENCH DEPTH IN EXCESS OF 16 FEET UP TO A MAX. OF 12 INCHES.

DETAIL W–1 WATERLINE TRENCH
N.T.S.



DIA.	HORIZONTAL BENDS 11 1/4° A	B	C	22 1/2° A	B	C	45° A	B	C	UPPER VERTICAL BENDS 11 1/4° E	F	G	22 1/2° E	F	G	45° E	F	G	PLUGS L	M	N	HORIZONTAL BENDS 90° O	P	R	S	TEE BRANCH T	U	V	W
4"	.50	.58	.75	.75	.58	.75	1.25	.58	.75	.50	.58	.58	.75	.58	.58	1.25	.58	.58	.50	1.17	1.50	1.17	1.17	1.67	.42	.75	.67	.75	.50
6"	.50	.58	.75	.75	.58	.75	1.25	.58	.75	.50	.58	.58	.75	.58	.58	1.25	.58	.58	.50	1.17	1.50	1.17	1.17	1.67	.42	.75	.67	.75	.50
8"	.67	.67	.75	1.00	.67	.75	2.00	.67	.75	.67	.67	.58	1.00	.67	.67	2.08	.75	.83	.67	1.50	2.25	1.58	1.50	1.75	.50	.75	.83	1.00	.67
10"	.83	.75	.75	1.50	.75	.83	2.50	.75	.92	.83	.75	.67	1.50	.83	.67	2.08	.75	.83	.67	2.00	2.50	1.67	2.08	1.75	.50	.83	1.00	1.25	.67
12"	1.00	.83	.75	1.75	.92	.92	2.92	.92	1.17	1.00	.83	.67	1.75	.83	.67	2.50	.92	.92	.83	2.33	3.25	2.00	2.50	1.92	.58	1.00	1.25	1.42	.67
16"	1.33	1.00	.75	2.33	1.00	1.17	3.67	1.25	1.42	1.33	1.00	.75	2.25	.83	.75	3.33	1.25	1.25	1.00	2.92	4.17	2.08	3.00	2.17	.83	1.17	1.67	1.83	.83
20"	1.67	1.17	1.00	3.17	1.17	1.33	4.75	1.50	1.83	1.67	1.17	.83	3.00	1.17	1.00	4.17	1.50	1.50	1.33	3.75	5.17	3.50	3.83	2.83	1.00	1.33	2.08	2.25	1.17
24"	2.00	1.33	1.00	4.00	1.33	1.50	6.08	1.67	1.92	2.00	1.33	1.00	3.50	1.33	1.00	5.00	1.75	1.75	1.67	4.33	6.25	4.67	4.00	3.00	1.00	1.50	2.50	2.67	1.33
30"	2.50	1.50	1.08	5.00	1.58	1.75	7.95	2.00	3.08	2.50	1.58	1.08	4.17	1.58	1.08	6.25	2.25	2.25	2.00	5.42	7.42	5.75	5.00	3.83	1.17	1.75	3.08	3.92	1.83
36"	3.00	1.92	1.17	5.75	2.00	2.00	8.92	2.50	3.33	3.00	1.58	1.17	5.33	2.00	1.17	7.50	2.50	2.67	2.00	6.50	9.00	6.83	6.00	4.83	1.17	2.00	3.75	3.92	1.83

DETAIL W–2 TYPE "F" HORIZONTAL ANCHOR BLOCK
N.T.S.



ENCASEMENT PIPE I.D. (IN.)	STEEL ENCASEMENT PIPE MINIMUM THICKNESS COVER TO 15 FEET	COVER 15 FT. & OVER
12"	1/4"	↑
16"	1/4"	USE MIN. 5/16"
18"	1/4"	
24"	1/4"	↓
30"	3/8"	3/8"
36"	3/8"	3/8"
48"	7/16"	7/16"
54"	7/16"	7/16"
60"	7/16"	7/16"

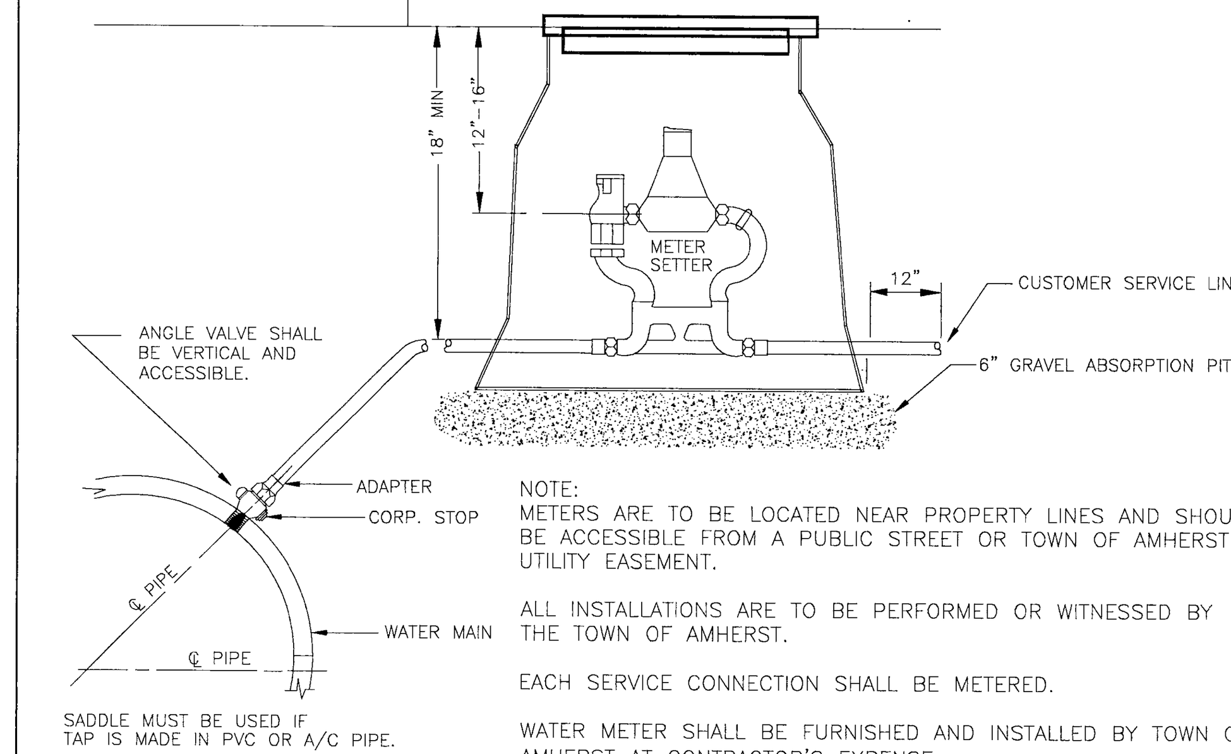
NOTES:

1. TIMBER SKIDS SHALL BE LOCUST, CYPRESS, PRESERVATIVE TREATED HARDWOOD, NEOPRENE, NYLON, PLASTIC OR OTHER MATERIAL OF HIGH ABRASION RESISTANCE AND A LOW FRICTION COEFFICIENT APPROVED BY THE ENGINEER. PRESERVATIVE FOR TIMBER SKIDS SHALL CONFORM TO SECTION 236 OF THE SPECIFICATIONS.
2. METAL STRAPS AND CLIPS HOLDING BLOCKING TO CARRIER PIPE SHALL BE STAINLESS STEEL WITH A MINIMUM CROSS SECTION OF 0.014 SQ. IN. STRAP SPACING SHALL BE A MINIMUM OF TWO (2) BANDS PER SKID LENGTH.
3. STEEL ENCASEMENT PIPE SHALL BE GRADE B AND SHALL CONFORM TO SECTION 232.02 (C)7 OF THE SPECIFICATIONS.
4. CARRIER PIPE SHALL BE PUSHED OR PULLED THROUGH THE ENCASEMENT PIPE SO THAT JOINTS ARE ALWAYS BEING COMPRESSED.
5. CARRIER PIPE SHALL BE WRAPPED WITH TAR PAPER AT MASONRY PLUG.
6. MASONRY PLUG SHALL BE WATERTIGHT.
7. ENCASEMENT PIPE SHALL BE BEDDED IN ACCORDANCE WITH STANDARD VDOT PB-1.

STEEL ENCASEMENT PIPE

DETAIL W–3 PIPE ENCASEMENT UNDER ROADWAY
N.T.S.

Water Service Bill of Materials	5/8" Setting	1" Setting	2" Setting
1. Service Saddle	Ford Style F202 double strap iron saddle with CC threads (for use on AC, C900 and CI mains)		
2. Corp Stop	3/4" Ford Type F1000 w/ CC tapered threads and PJ-CTS	1"Ford Type F1000-4 w/ CC threads and PJ-CTS	2" Ford Type FB400-7 w/ CC tapered threads x MIP
3. Service Pipe	3/4" Type "K" Copper	1" Type "K" Copper	2" Type "K" Copper
4. Branch Tee	Ford T444-334		
5. Meter Box	Carson-Brooks Model 2200-18 Body		
6. Meter Box Lid	Carson-Brooks Model 22008 Cast Iron Lid		
7. Copper Setter	Ford VHH71-12W-11-33	Ford VHH74-10W-44-44	Ford VBHH77-12B-11-77
8. Meter	5/8 x 1/2 Sensus SRII; dial must read in gallonsx10	1"x 1" Sensus SRII; dial must read in gallonsx10	2"x 2" Sensus SRII; dial must read in gallonsx10



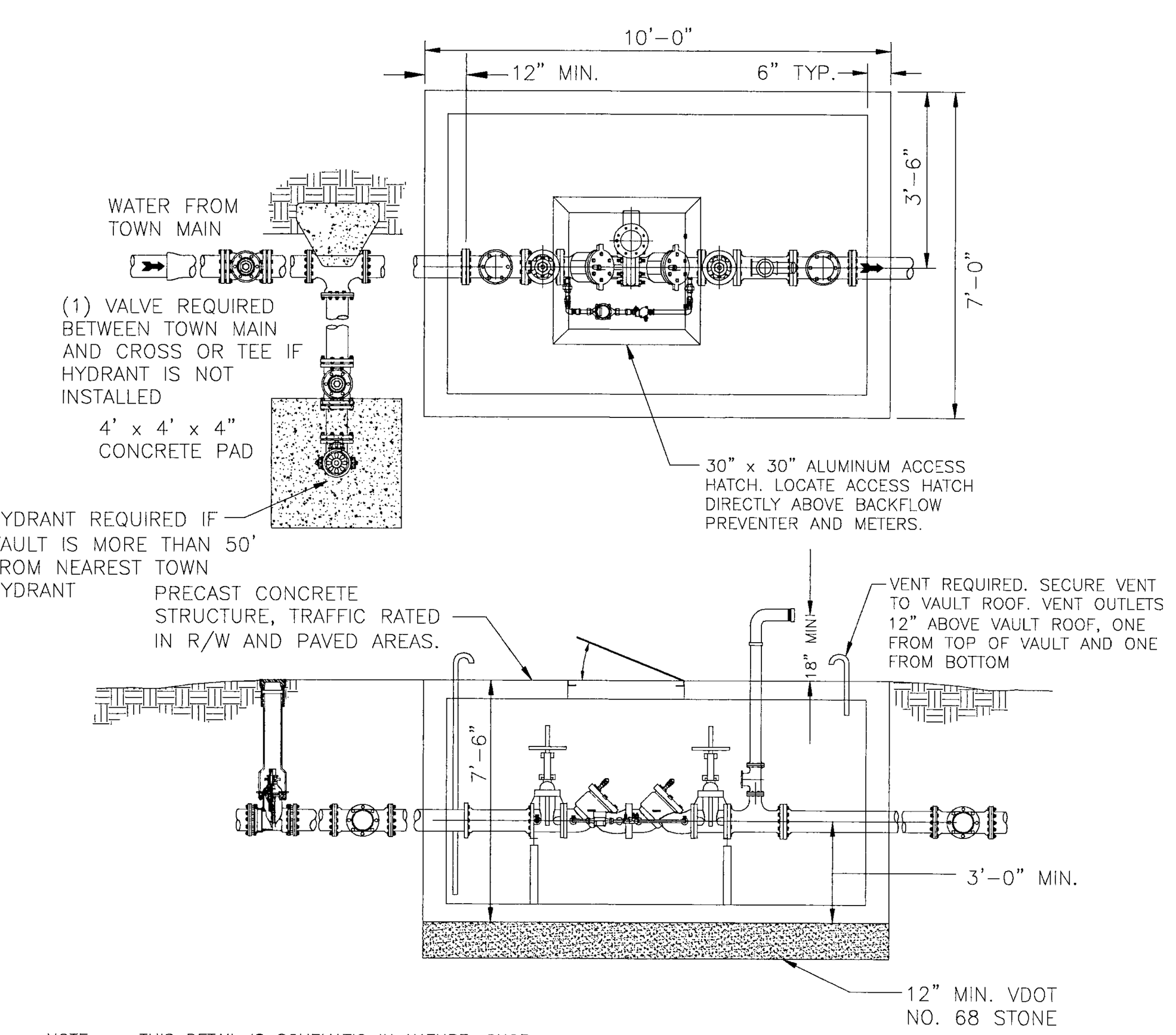
NOTE:
METERS ARE TO BE LOCATED NEAR PROPERTY LINES AND SHOULD BE ACCESSIBLE FROM A PUBLIC STREET OR TOWN OF AMHERST UTILITY EASEMENT.

ALL INSTALLATIONS ARE TO BE PERFORMED OR WITNESSED BY THE TOWN OF AMHERST.

EACH SERVICE CONNECTION SHALL BE METERED.

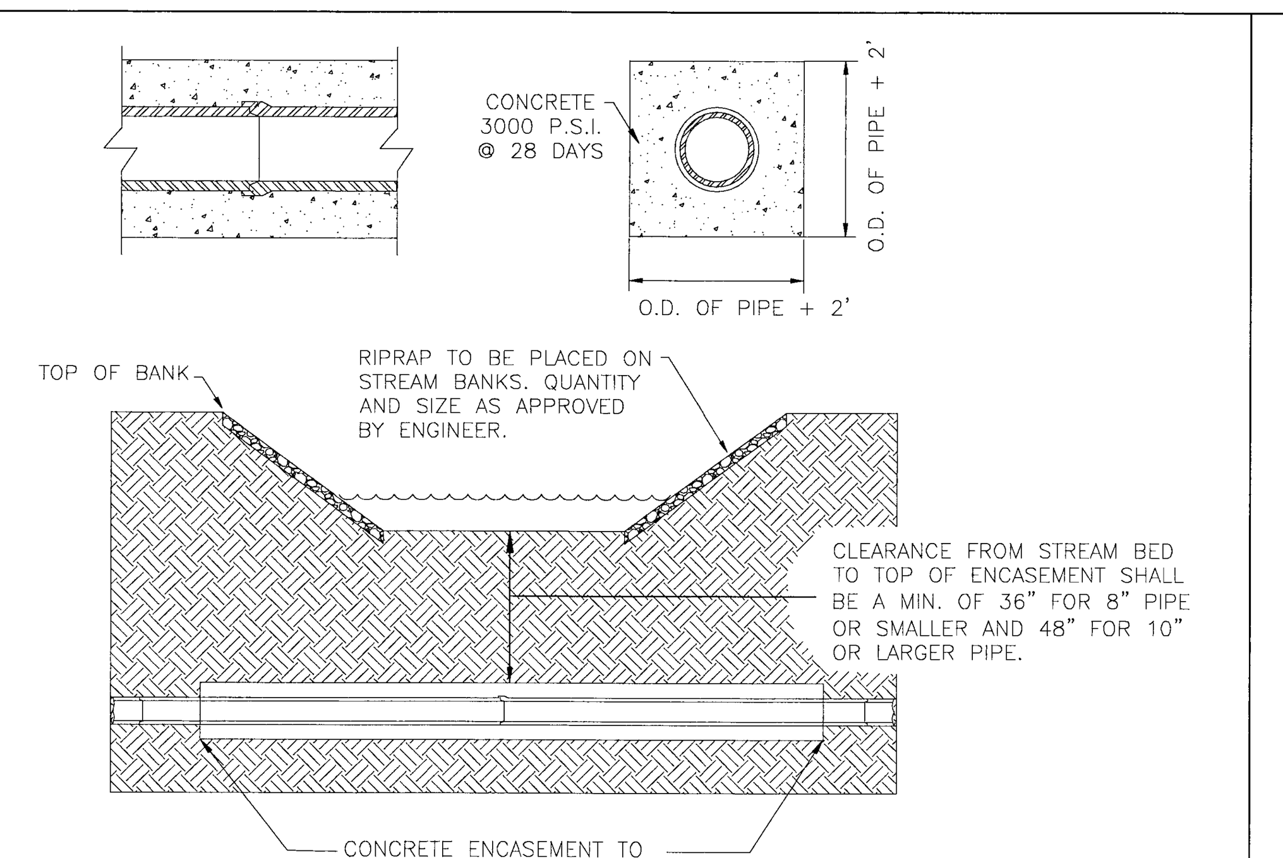
WATER METER SHALL BE FURNISHED AND INSTALLED BY TOWN OF AMHERST AT CONTRACTOR'S EXPENSE.

DETAIL W–4 METER & METER SETTING FOR SMALL METERS
N.T.S.



NOTE: THIS DETAIL IS SCHEMATIC IN NATURE. SHOP DRAWINGS SHALL BE REVIEWED AND APPROVED BY THE SITE PLAN PREPARER AND SUBMITTED TO THE TOWN OF AMHERST FOR REVIEW.

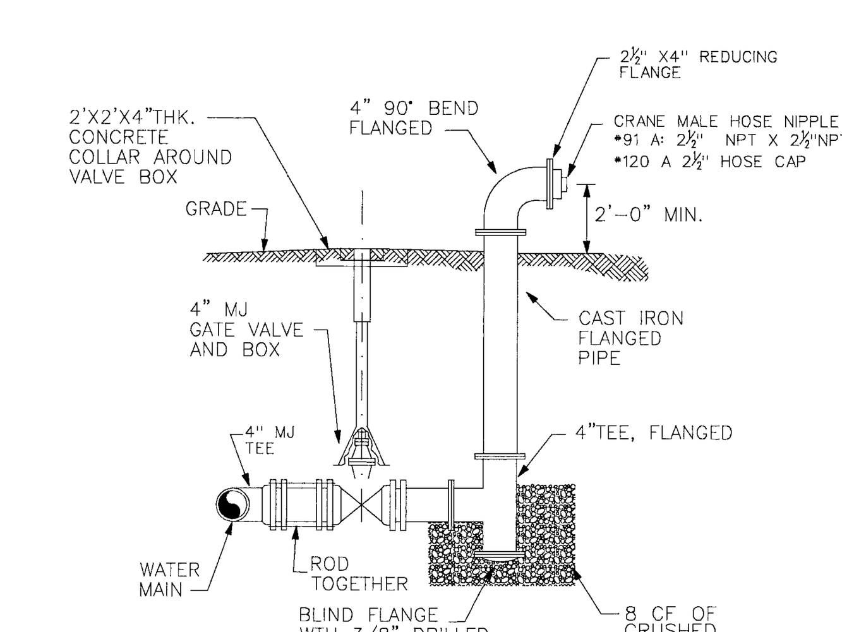
DETAIL W–5 FIRE VAULT DOUBLE CHECK VALVE
N.T.S.



NOTES:

1. CONCRETE TO BE 3000 PSI.
2. ENCASEMENT TO BE USED ONLY WHEN SPECIFIED ON DRAWINGS.
3. CARRIER PIPE SHALL BE DUCTILE IRON PIPE.
4. FILTER FABRIC TO BE PLACED UNDER RIPRAP AND KEYED INTO EMBANKMENT.
5. JOINTS ARE TO BE FLEXIBLE AND WATERTIGHT.
6. PER 12VAC5–590–1180 OF THE VIRGINIA ADMINISTRATIVE CODE, VALVES SHALL BE PROVIDED AT BOTH ENDS OF THE WATER CROSSING SO THAT THE SECTION CAN BE ISOLATED FOR TESTS OR REPAIR. PERMANENT TAPS SHALL BE MADE FOR TESTING AND LOCATING LEAKS. THESE VALVES AND TAPS SHALL BE EASILY ACCESSIBLE AND NOT SUBJECT TO FLOODING.

DETAIL W–6 WATER LINE CROSSING BENEATH STREAM BED
N.T.S.

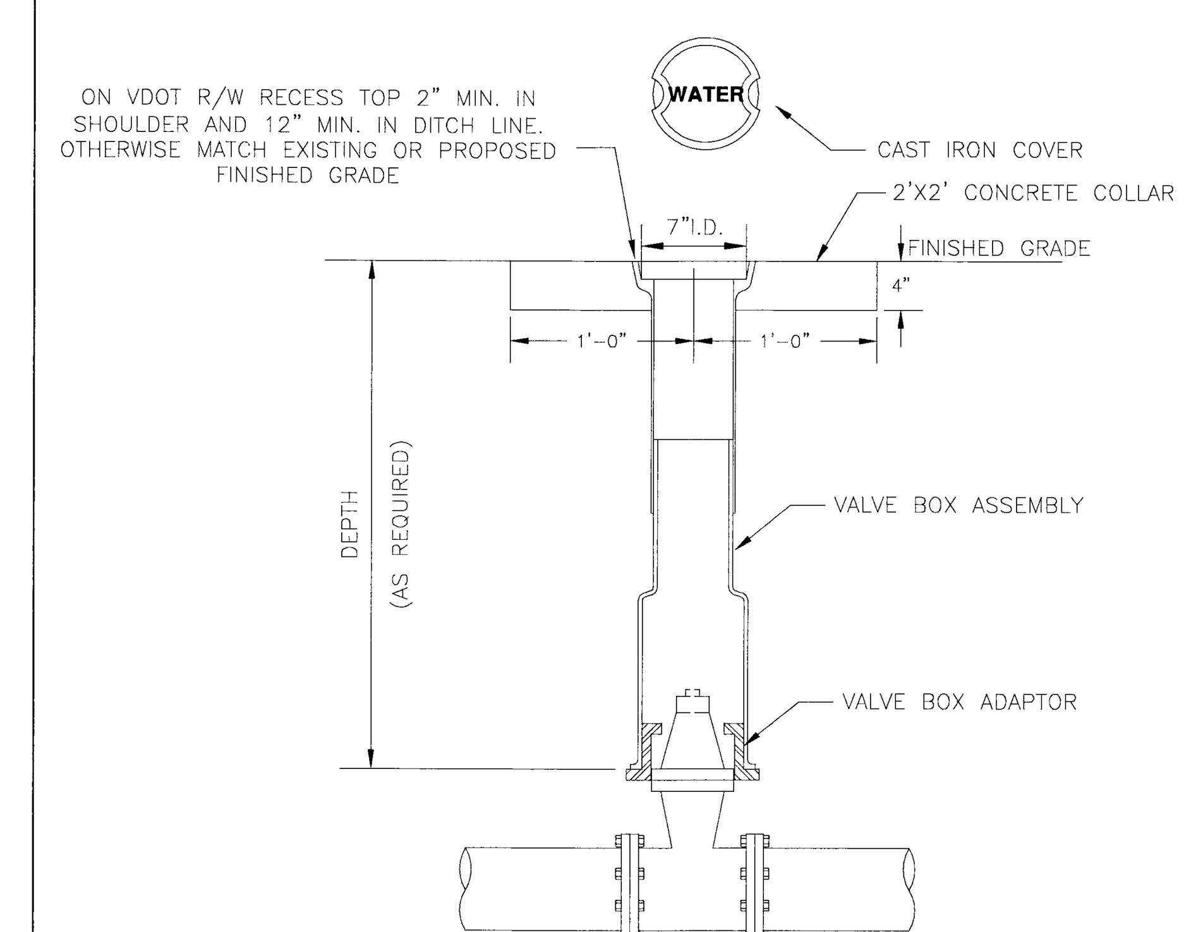


NOTE:

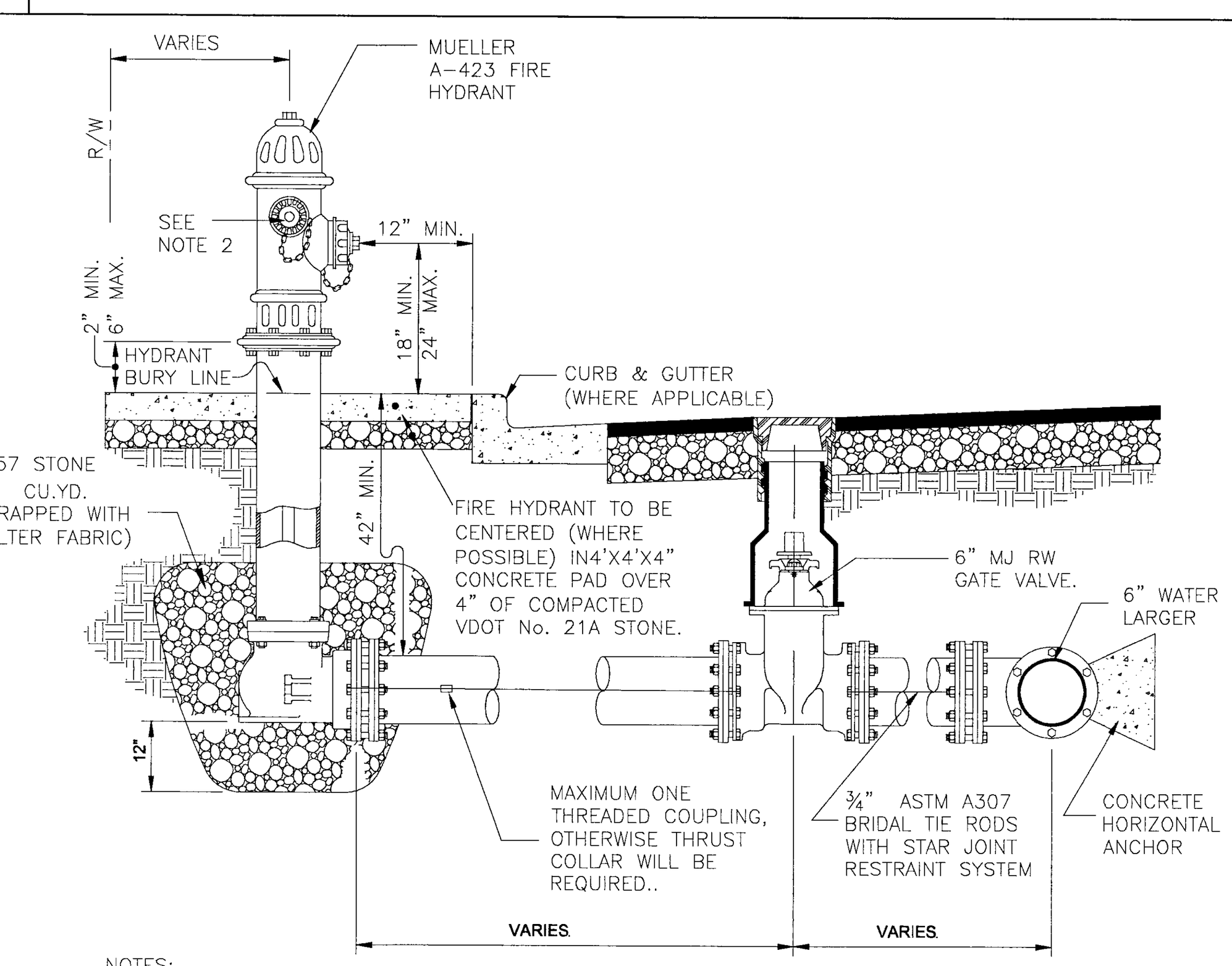
1. ALL FITTINGS SHALL BE COVERED WITH PLASTIC WRAP.

2. DRAINAGE CAPABILITY MUST BE AFFORDED WEEPHOLES. BLOW–OFF ASSEMBLY SHALL NOT BE LOCATED WITHIN A HIGH GROUNDWATER TABLE AREA.

DETAIL W–7 BLOW–OFF ASSEMBLY
N.T.S.



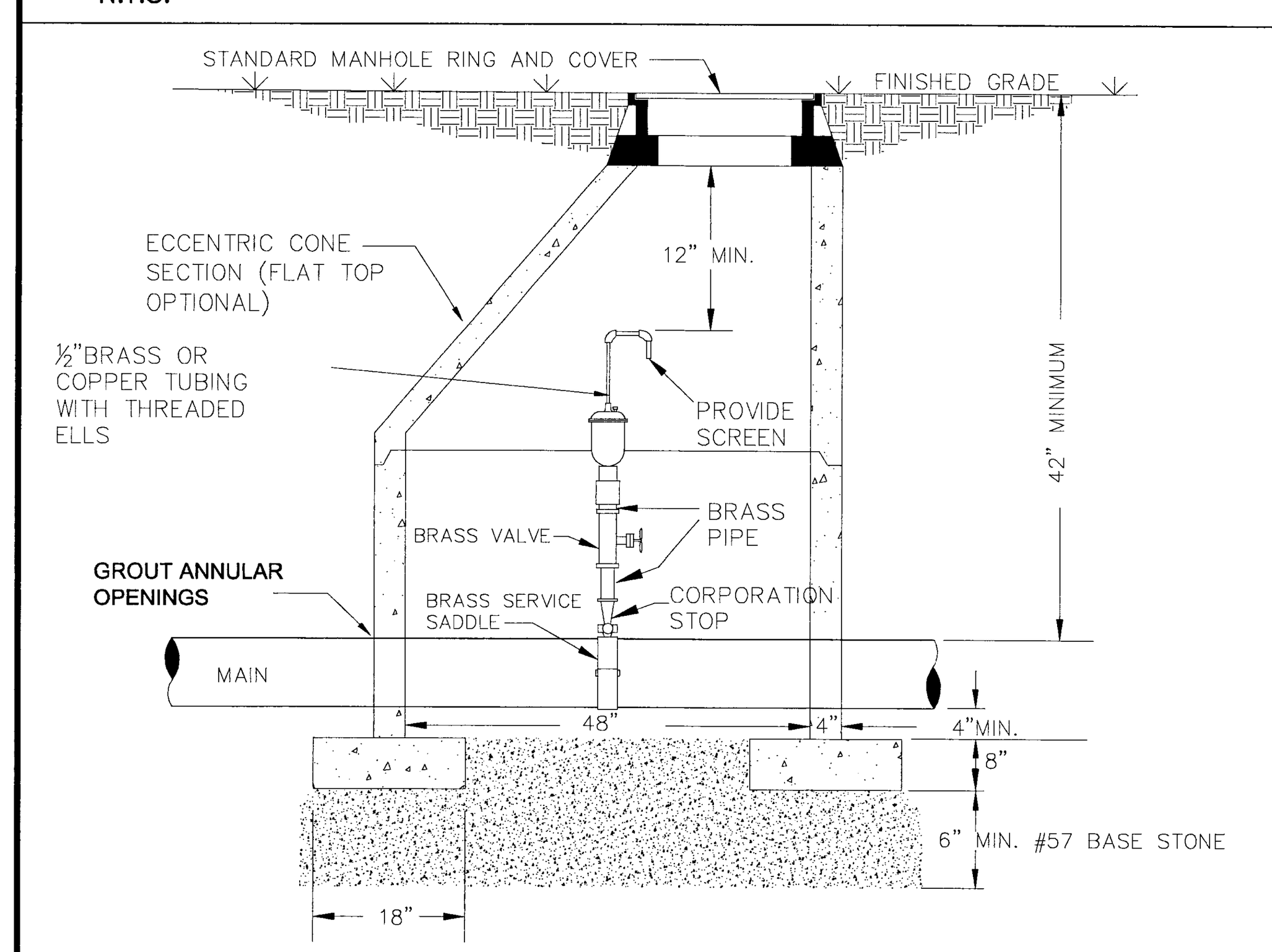
DETAIL W–8 VALVE BOX
N.T.S.



NOTES:

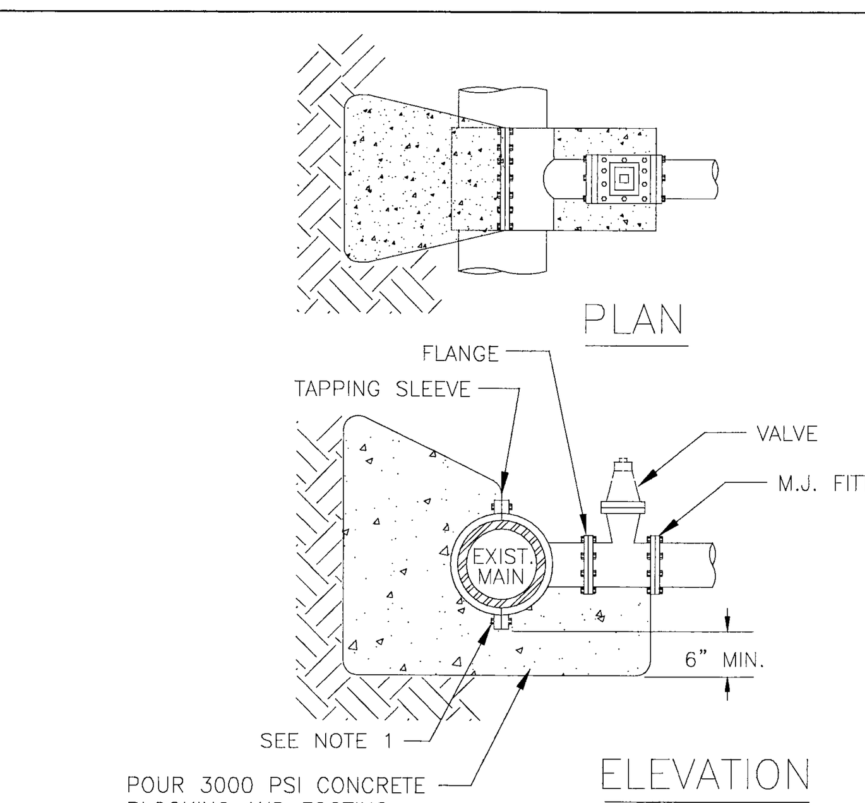
1. HYDRANTS TO BE PLACED WITH PUMPER NOZZLE FACING THE STREET OR AS OTHERWISE DIRECTED.
2. WHEN VALVE BOX IS PLACED OUTSIDE OF PAVEMENT, PROVIDE PRECAST SHOULDER SLAB.
3. WHEN FIRE HYDRANTS ARE INSTALLED WHERE ROADWAY HAS A DRAINAGE DITCH AND NO CURB & GUTTER, MINIMUM COVER SHALL BE 24" FROM THE BOTTOM OF DITCH.
4. WHERE HYDRANT IS SET BEHIND GUARDRAIL, CENTERLINE OF PUMPER NOZZLE TO BE A MINIMUM OF 12" AND A MAXIMUM OF 18" ABOVE TOP OF GUARDRAIL.
5. WHERE HYDRANT IS LOCATED IN A HIGH GROUNDWATER AREA, WEEPHOLE SHALL BE PLUGGED.
6. UNI–FLANG RETAINER (MEGALUG) RETAINER SYSTEM (FORD MODEL UFR1400–DA–x–U STYLE OR APPROVED EQUIVALENT) MAY BE USED INSTEAD OF TIE ROD RESTRAINT SYSTEM.

DETAIL W–9 TYPICAL FIRE HYDRANT CONNECTION
N.T.S.



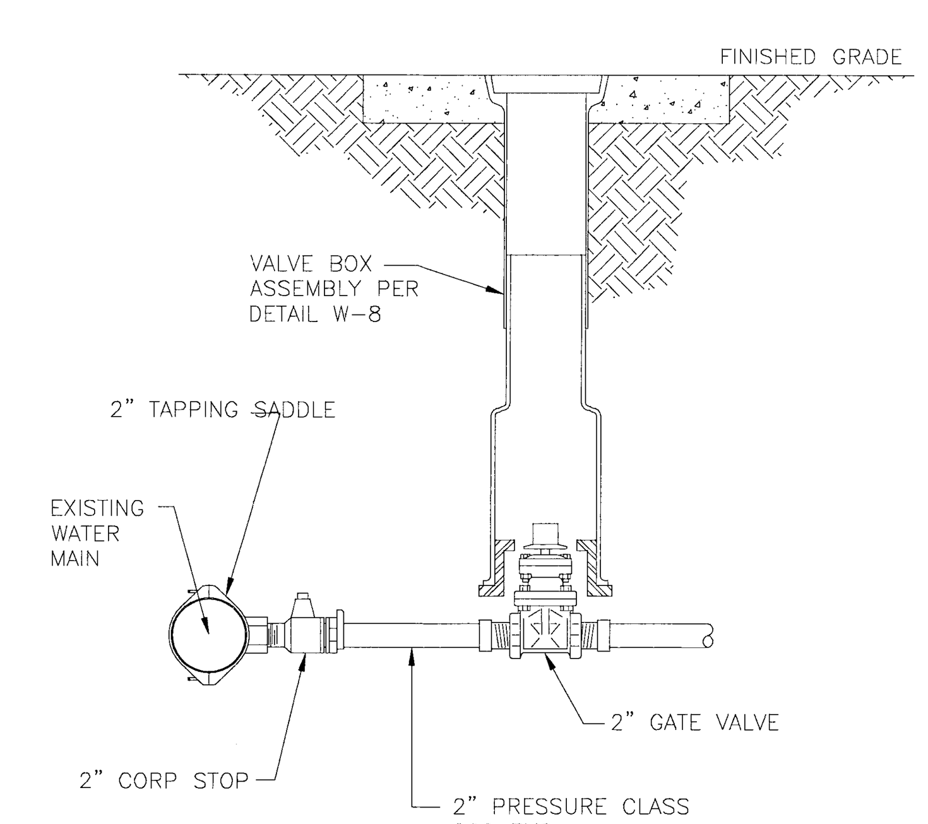
NOTES:
1. ALL JOINTS TO BE T&G WITH PREFORMED BUTYL RUBBER (MASTIC) OR O–RING GASKET.
2. PRECAST DOGHOUSE CONCRETE MANHOLE BASE IS TO BE INSTALLED ON PRECAST CONCRETE BASE OR POURED CONCRETE FOOTING.
2. AUTOMATIC AIR & VACCUUM RELEASE VALVE MODEL TO BE AS PER ITEM 2.7.4.1 ON DWG. DET–W2.

DETAIL W–10 AUTOMATIC AIR RELEASE VALVE
N.T.S.



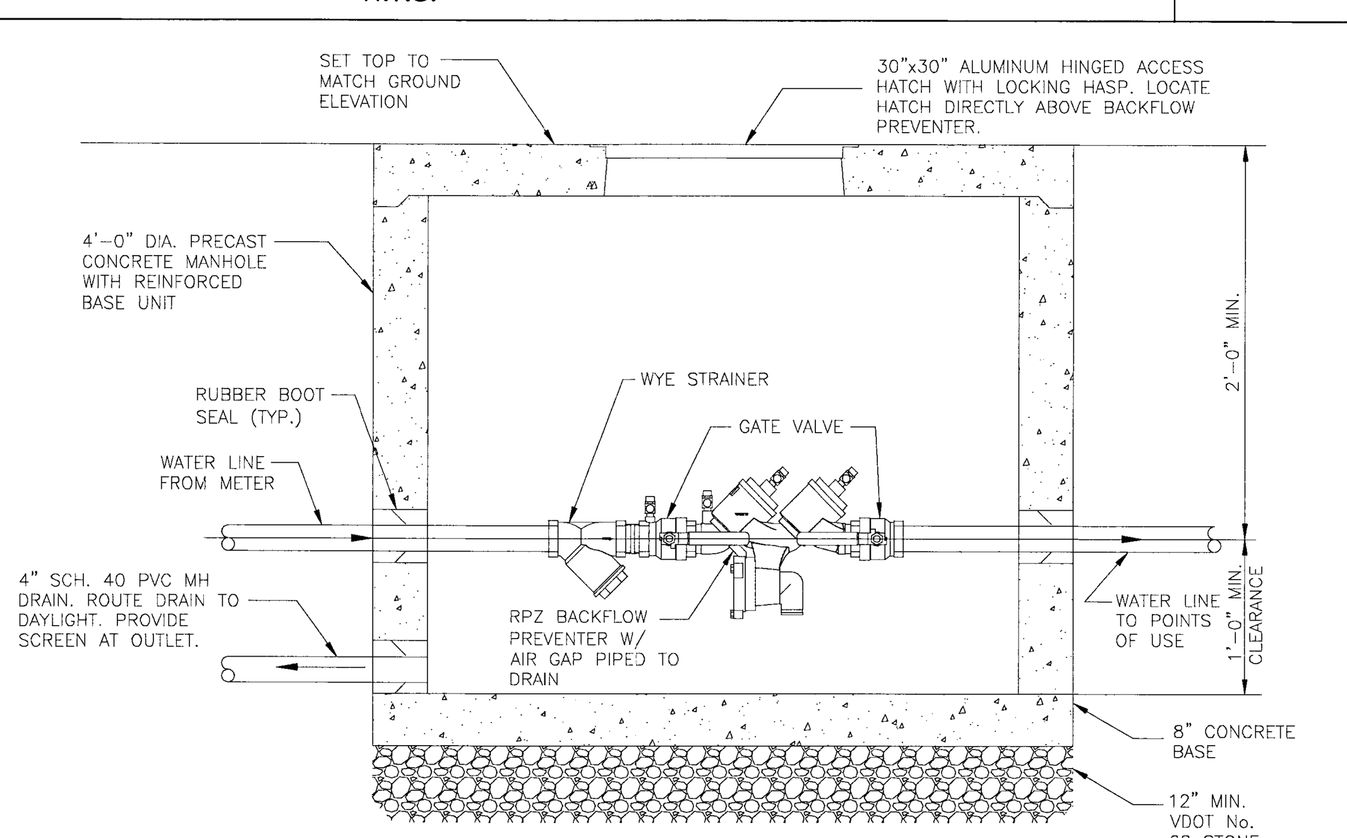
NOTES:
1. CONCRETE SHALL NOT CONTACT BOLTS OR ENDS OF MECHANICAL JOINT FITTINGS. (WRAP IN PLASTIC)
2. SEE TYPE "F" (HORIZONTAL) ANCHOR BLOCK DETAIL FOR AREA OF CONCRETE REQUIRED.
3. TAPPING SLEEVE SHALL BE A MINIMUM OF 4' FROM NEAREST PIPE JOINT.

DETAIL W–11 TAPPING SLEEVE & VALVE 6–INCH WATER LINES AND LARGER
N.T.S.



NOTES:
1. TAPPING SADDLE SHALL BE A MINIMUM OF 4' FROM NEAREST PIPE JOINT.

DETAIL W–11A TAPPING SADDLE & VALVE 2–INCH WATER LINES
N.T.S.



NOTES:

1. SEE ITEM 2.11 ON DWG. DET–W2 FOR APPROVED REDUCED PRESSURE ZONE (RPZ) BACKFLOW PREVENTER MODELS.
2. RPZ BACKFLOW PREVENTERS LOCATED IN AREAS SUBJECT TO FLOODING SHALL BE INSTALLED ABOVE GROUND IN HEATED, INSULATED ENCLOSURES.
3. INSTALLATION OF THE BACKFLOW PREVENTER SHALL COMPLY WITH THE TOWN OF AMHERST CROSS CONNECTION CONTROL ORDINANCE (SECTION 17–14 OF THE TOWN CODE) AS WELL AS THE LATEST EDITION OF THE VIRGINIA DEPARTMENT OF HEALTH WATERWORKS REGULATIONS.
4. MAINTENANCE AN ANNUAL TESTING OF THE BACKFLOW PREVENTER SHALL BE THE RESPONSIBILITY OF THE PROPERTY OWNER, NOT THE TOWN OF AMHERST.

DETAIL W–12 RPZ BACK FLOW PREVENTER ASSEMBLY (3/4" – 2")
N.T.S.

GENERAL NOTES:

1. ALL MATERIALS SHALL BE NEW, BEST QUALITY AND IN ACCORDANCE WITH APPROPRIATE AWWA SPECIFICATIONS AND MEET OR EXCEED CURRENT VDOT ROAD AND BRIDGE SPECIFICATIONS WHERE INSTALLATION IS WITHIN VDOT R/W.
2. ALL VALVES SHALL BE MJ RW TYPE UNLESS OTHERWISE SPECIFIED.
3. THE DEVELOPER/OWNER SHALL INCLUDE THE FOLLOWING MASTER NOTES ON THE MAIN SITE PLAN SUBMITTED TO THE TOWN FOR REVIEW:
   A. THE TOWN OF AMHERST ADMINISTERS BUSINESS LICENSE AND ZONING ORDINANCE PROGRAMS (434–946–7885). AMHERST COUNTY ADMINISTERS LAND DISTURBANCE (EROSION AND SEDIMENT CONTROL) AND BUILDING CODE PROGRAMS (434–946–9302). PERMITS FOR WORK IN THE PUBLIC STREET RIGHT OF WAY ARE ADMINISTERED BY VDOT (434–856–8293).
   B. ALL WATER AND SEWER IMPROVEMENT PROJECTS, WHETHER IN CONNECTION WITH A SUBDIVISION, A COMMERCIAL DEVELOPMENT (I.E. SITE PLANS) OR TOA–FUNDED MAINTENANCE WORK AND CAPITAL PROJECTS, SHALL BE CONSTRUCTED ACCORDING TO TOWN OF AMHERST SPECIFICATIONS.
   C. ALL MATERIALS SHALL BE APPROVED BY THE TOWN MANAGER OR HIS AUTHORIZED REPRESENTATIVE BEFORE INSTALLATION.
   D. THE TOWN SHALL PROVIDE AND SET WATER METERS. DEVELOPER SHALL FURNISH AND INSTALL ALL OTHER MATERIALS, INCLUDING METER BOXES, METER YOKES. FIRE HYDRANTS, MANHOLES. AND CLEANOUTS ACCORDING TO TOWN OF AMHERST SPECIFICATIONS.
   E. THE CONTRACTOR SHALL MAINTAIN A SET OF APPROVED PLANS ON THE JOB SITE AT ALL TIMES DURING THE CONSTRUCTION.
   F. CALL MISS UTILITY AT 811 BEFORE DIGGING TO HAVE UNDERGROUND UTILITIES MARKED.
4. ALL APPROVED PLANS SHALL BE SIGNED BY DEVELOPER/OWNER AND TOWN MANAGER PRIOR TO APPROVAL AND CONSTRUCTION.
5. ALL TESTING SHALL BE PAID FOR BY THE DEVELOPER, WITNESSED BY THE TOWN OF AMHERST AT ITS DISCRETION AND CERTIFIED BY A LICENSED PROFESSIONAL ENGINEER.
6. THE CONTRACTOR SHALL RESTORE THE DISTURBED AREAS (I.E., BACKFILL, COMPACT, FERTILIZE/SEED/STRAW AND PATCH PAVEMENT) TO ORIGINAL CONDITION OR BETTER.
7. AS–BUILT DRAWINGS CERTIFIED BY A LICENSED PROFESSIONAL ENGINEER SHALL BE PROVIDED TO THE TOWN PRIOR TO RELEASE OF ANY SURETY BOND.

NO.	REVISION	BY	DATE

NO.	REVISION	BY	DATE

COMMONWEALTH OF VIRGINIA
[illegible]
JACK F. HOBBS
Lic. No. 21877
PROFESSIONAL ENGINEER

TOWN OF AMHERST
INCORPORATED 1910

DESIGNED BY:	PROJECT: TOWN OF AMHERST, VIRGINIA			REVISION SET –
DRAWN BY:				DRAWING NUMBER: DET–1
REVIEWED BY:	TITLE: STANDARD WATER DETAILS			
WWA NUMBER: 204232.04	FILE NAME: DET–W1.dwg	DISCIPLINE: CIVIL	SCALE: H: V: AS NOTED	DATE: 3–23–12	SHEET NUMBER: 1 OF 2

M:\204232.00\DET–W1.dwg

1. GENERAL

1.1 PROJECT CONDITIONS: SEPARATION OF WATER LINES AND SANITARY SEWERS.

1.1.1 FOLLOW VDH STANDARDS FOR SEPARATION OF WATER MAINS AND SEWER LINES.

1.1.2 PARALLEL INSTALLATION

1.1.2.1 NORMAL CONDITIONS: WATER LINES SHALL BE CONSTRUCTED AT LEAST 10 FEET HORIZONTALLY FROM A SEWER OR SEWER MANHOLE WHENEVER POSSIBLE, THE DISTANCE SHALL BE MEASURED EDGE-TO-EDGE.

1.1.2.2 UNUSUAL CONDITIONS: WHEN LOCAL CONDITIONS PREVENT A HORIZONTAL SEPARATION OF AT LEAST 10 FEET, THE WATER LINE MAY BE LAID CLOSER TO A SEWER OR SEWER MANHOLE PROVIDED THAT:

1.1.2.3 THE BOTTOM OF THE WATER LINE IS AT LEAST 18 INCHES ABOVE THE TOP OF THE SEWER.

1.1.2.3.1 WHERE THIS VERTICAL SEPARATION CANNOT BE OBTAINED, THE SEWER SHALL BE CONSTRUCTED OF AWWA APPROVED WATER PIPE PRESSURE-TESTED IN PLACE TO 50 PSI WITHOUT LEAKAGE PRIOR TO BACKFILLING. THE SEWER MANHOLE SHALL BE OF WATERTIGHT CONSTRUCTION AND TESTED IN PLACE.

1.1.3 CROSSING

1.1.3.1 NORMAL CONDITIONS: WATER LINES CROSSING OVER SEWERS SHALL BE LAID TO PROVIDE A SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE WATER LINE AND THE TOP OF THE SEWER WHENEVER POSSIBLE.

1.1.3.1.1 UNUSUAL CONDITIONS: WHEN LOCAL CONDITIONS PREVENT A VERTICAL SEPARATION DESCRIBED IN CROSSING, NORMAL CONDITIONS, PARAGRAPH ABOVE, THE FOLLOWING CONSTRUCTION SHALL BE USED.

1.1.3.1.2 SEWERS PASSING OVER OR UNDER WATER LINES SHALL BE CONSTRUCTED OF THE MATERIALS DESCRIBED IN PARALLEL INSTALLATION, UNUSUAL CONDITIONS, AS SPECIFIED ABOVE.

1.1.3.1.3 WATER LINES PASSING UNDER SEWERS SHALL, IN ADDITION, BE PROTECTED BY PROVIDING:

A VERTICAL SEPARATION OF AT LEAST 18 INCHES BETWEEN THE BOTTOM OF THE SEWER AND THE TOP OF THE WATER LINE,

ADEQUATE STRUCTURAL SUPPORT FOR THE SEWERS TO PREVENT EXCESSIVE DEFLECTION OF THE JOINTS AND SETTLING ON AND BREAKING WATER LINE,

THAT THE LENGTH OF THE WATER LINE BE CENTERED AT THE POINT OF THE CROSSING SO THAT JOINTS SHALL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.

1.1.4 SANITARY SEWERS OR SEWER MANHOLES: NO WATER PIPES SHALL PASS THROUGH OR COME IN CONTACT WITH ANY PART OF A SEWER OR SEWER MANHOLE.

1.2 SUBMITTALS: PROVIDE THE FOLLOWING SHOP DRAWING SUBMITTALS AS ONE COMPLETE PACKAGE, APPROVED AND SIGNED BY THE DEVELOPER'S ENGINEER, FOR APPROVAL BY THE TOWN MANAGER. A TOTAL OF FOUR (4) COPIES OF THE COMPLETE SHOP DRAWING PACKAGE SHALL BE SUBMITTED FOR APPROVAL; ONE (1) REVIEWED COPY WILL BE RETURNED TO THE DEVELOPER/CONTRACTOR.:

1.2.1 PIPE AND FITTINGS: CATALOG CUTS AND CERTIFICATES OF COMPLIANCE FOR PIPE, FITTINGS, LININGS, AND MATERIALS FOR APPROVAL. CERTIFICATES SHALL STATE THAT MATERIALS FURNISHED COMPLY WITH THE STANDARDS SPECIFIED IN THIS SECTION.

1.2.2 PIPE RESTRAINT DEVICES

1.2.3 VALVES: CATALOG CUTS AND CERTIFICATES OF COMPLIANCE FOR VALVES.

1.2.4 AIR RELEASE VALVES

1.2.5 CASING SPACERS/END SEALS

1.2.6 FIRE HYDRANTS

1.2.7 VALVE AND METER BOXES

1.2.8 PRECAST CONCRETE MANHOLE AND VAULT DETAILS

1.2.9 MANHOLE STEPS

1.2.10 PIPE TO MANHOLE CONNECTION DETAILS

1.2.11 WATER PIPING FIELD TEST CERTIFICATION REPORTS

1.2.12 BACTERIOLOGICAL TEST REPORTS (SUBMIT TO TOWN)

1.3 THE CONTRACTOR SHALL PHYSICALLY VERIFY THE LOCATION AND ELEVATION OF THE EXISTING UTILITIES, WHETHER INDICATED OR NOT, PRIOR TO STARTING CONSTRUCTION. **THE CONTRACTOR SHALL CONTACT MISS UTILITY (TELEPHONE: 811) AND RESPECTIVE UTILITY OWNERS FOR EXACT LOCATIONS PRIOR TO ANY EXCAVATION NEAR UTILITIES.**

1.4 CONSTRUCTION ACTIVITIES WHICH INVOLVE THE TEMPORARY INTERRUPTION OF ESSENTIAL SERVICES OR TRAFFIC PATTERNS SHALL BE SCHEDULED IN CONSULTATION WITH THE TOWN OF AMHERST AND VDOT OR THEIR REPRESENTATIVES, SHALL NOT BE OF LONGER DURATION THAN ESSENTIAL TO ACCOMPLISH THE PURPOSE FOR SUCH INTERRUPTIONS, AND SHALL BE COORDINATED TO GIVE THE TOWN OF AMHERST THE ABILITY TO MAINTAIN WATER SERVICE. THE CONTRACTOR SHALL COORDINATE ANY INTERRUPTION OF WATER SERVICE WITH THE TOWN AT LEAST 1 WEEK IN ADVANCE OF SUCH WORK. UPDATED CONSTRUCTION SCHEDULES SHALL BE SUBMITTED TO THE TOWN EACH WEEK TO COORDINATE UPCOMING CONSTRUCTION ACTIVITIES.

2. PRODUCTS

2.1 PIPING APPLICATION: **WATER MAIN PIPING SHALL BE 2-INCH, 6-INCH, 8-INCH, 10-INCH, OR 12-INCH IN DIAMETER UNLESS OTHERWISE APPROVED BY THE TOWN OF AMHERST.**

2.1.1 THE FOLLOWING PIPING SYSTEMS, 6-12 INCHES IN DIAMETER, SHALL BE CONSTRUCTED OF PRESSURE CLASS 350 DUCTILE IRON PIPE UNLESS OTHERWISE INDICATED:

2.1.1.1 BELOW GRADE WATER MAIN PIPING. PIPE RESTRAINT SHALL BE PROVIDED AS SPECIFIED HEREIN UNLESS OTHERWISE INDICATED.

2.1.1.2 BELOW GRADE WATER PIPING NOT OTHERWISE SPECIFIED

2.1.2 THE FOLLOWING PIPING SYSTEMS, 6 INCHES AND LARGER IN DIAMETER, SHALL BE CONSTRUCTED OF RESTRAINED JOINT PRESSURE CLASS 350 DUCTILE IRON PIPE. ALL PIPE JOINTS FOR THESE SECTIONS OF PIPING SHALL BE RESTRAINED:

2.1.2.1 BELOW GRADE WATER MAIN PIPING AT ROAD CROSSINGS AND STREAM CROSSINGS

2.1.2.2 BELOW GRADE PIPING BENEATH STRUCTURES

2.1.2.3 BELOW GRADE PIPING NOT OTHERWISE SPECIFIED

2.1.3 THE FOLLOWING PIPING SYSTEMS, 6 INCHES AND LARGER IN DIAMETER, SHALL BE CONSTRUCTED OF FLANGED JOINT SPECIAL THICKNESS CLASS 53 DUCTILE IRON PIPE UNLESS OTHERWISE INDICATED:

2.1.3.1 ABOVE GRADE PIPING AT BLOWOFF ASSEMBLIES

2.1.3.2 ABOVE GRADE PIPING NOT OTHERWISE SPECIFIED

2.1.4 THE FOLLOWING PIPING SYSTEMS, 2 INCHES IN DIAMETER, SHALL BE CONSTRUCTED OF RESTRAINED JOINT PRESSURE CLASS 200 ASTM D2241 POLYVINYL CHLORIDE (PVC) PIPE UNLESS OTHERWISE INDICATED:

2.1.4.1 BELOW GRADE WATER MAIN PIPING

2.1.5 THE FOLLOWING PIPING SYSTEMS, SMALLER THAN 2 INCHES IN DIAMETER, SHALL BE CONSTRUCTED OF ASTM B 88 TYPE K FLEXIBLE COPPER PIPE UNLESS OTHERWISE INDICATED:

2.1.5.1 PIPING INSIDE AIR RELEASE VALVE MANHOLES. FITTINGS SHALL MEET THE REQUIREMENTS SPECIFIED IN PARAGRAPHS 2.2.3.1 AND 2.2.3.2.

2.1.5.2 BELOW GRADE WATER SERVICE LATERAL PIPING

2.1.5.3 BELOW GRADE WATER PIPING NOT OTHERWISE SPECIFIED

2.1.6 THE MINIMUM SIZE PIPE FOR WATER DISTRIBUTION SHALL BE SIX INCHES IN DIAMETER EXCEPT THAT TWO INCH PIPE MAY BE USED WHEN THE RUN IS LESS THAN 300 FEET AND FUTURE USES ARE NOT A STRONG CONSIDERATION. OTHER DEPARTURES MAY BE JUSTIFIED BY A HYDRAULIC ANALYSIS THAT CONSIDERS FUTURE WATER USES IN SPECIAL CIRCUMSTANCES. THE MINIMUM SIZE OF PIPE WHERE FIRE HYDRANTS OR OTHER FIRE CONNECTIONS ARE TO BE PROVIDED OR REQUIRED SHALL BE SIX INCHES IN DIAMETER. WATER MAINS NOT SIZED TO CARRY FIRE FLOWS SHALL NOT BE CONNECTED TO FIRE HYDRANTS.

2.1.7 ACCESSORIES: PROVIDE FLANGES, JOINT RESTRAINTS, CONNECTING PIECES, TRANSITION GLANDS, TRANSITION SLEEVES, TAPPING SADDLES, AND OTHER ADAPTERS AS REQUIRED FOR COMPLETE AND OPERABLE PIPING SYSTEMS FOR THE SERVICE INDICATED. PROVIDE RESTRAINED JOINTS WHERE INDICATED ON THE DRAWINGS AND AS SPECIFIED IN THIS SECTION.

2.2 PIPE

2.2.1 DUCTILE IRON PIPE

2.2.1.1 DUCTILE IRON PIPE SHALL BE PRESSURE CLASS 350 UNLESS OTHERWISE INDICATED AND SHALL MEET REQUIREMENTS OF ANSI/AWWA C150 AND C151. FLANGED PIPE SHALL BE SPECIAL THICKNESS CLASS 53 UNLESS OTHERWISE INDICATED AND SHALL MEET REQUIREMENTS OF ANSI/AWWA C115.

2.2.1.2 FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 AND C153 WITH PRESSURE RATING NOT LESS THAN THAT OF THE PIPE.

2.2.1.3 PROVIDE MECHANICAL JOINTS OR PUSH-ON JOINTS FOR UNDERGROUND PIPING. JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

2.2.1.4 MECHANICAL JOINT RETAINER GLANDS SHALL BE ASTM A536 DUCTILE IRON AND SHALL BE MANUFACTURED BY EBAA IRON, INC, OR APPROVED EQUAL BY AMERICAN CAST IRON PIPE COMPANY, FORD METER BOX COMPANY, OR ROMAC INDUSTRIES, INC.

2.2.1.5 RESTRAINED JOINTS SHALL BE "FLEX-RING" AS MANUFACTURED BY AMERICAN CAST IRON PIPE COMPANY, "TR FLEX" AS MANUFACTURED BY U.S. PIPE AND FOUNDRY COMPANY, "SNAP-LOK" AS MANUFACTURED BY GRIFFIN PIPE PRODUCTS COMPANY, OR APPROVED EQUAL. JOINTING MATERIALS SHALL MEET REQUIREMENTS OF ANSI/AWWA C111.

2.2.1.6 PUSH-ON JOINT AND RUBBER GASKET SHALL MEET REQUIREMENTS OF ANSI/AWWA C111. RESTRAINED PUSH-ON JOINTS MAY BE USED WHERE RESTRAINED JOINTS ARE REQUIRED.

2.2.1.7 PROVIDE FLANGED JOINTS FOR ALL ABOVEGROUND PIPING AND AS INDICATED ON THE DRAWINGS. FLANGES SHALL MEET REQUIREMENTS OF CLASS 125 ANSI B16.1.

2.2.1.8 FLANGED JOINT GASKETS SHALL BE FULL FACE, MADE OF RUBBER, AND SHALL MEET REQUIREMENTS OF ANSI/AWWA C111/A21.11.

2.2.1.9 CEMENT MORTAR LINING WITH BITUMINOUS SEAL COAT FOR DUCTILE IRON PIPE AND CAST IRON FITTINGS SHALL MEET REQUIREMENTS OF ANSI/AWWA C104. CEMENT MORTAR LINING SHALL BE STANDARD THICKNESS.

2.2.1.10 EXTERIOR, BITUMINOUS COATING SHALL MEET REQUIREMENTS OF ANSI/AWWA C110, C115, C151, AND C153, AS APPLICABLE.

2.2.2 POLYVINYL CHLORIDE (PVC) PRESSURE PIPING

2.2.2.1 POLYVINYL CHLORIDE (PVC) PRESSURE PIPING, 2 INCHES IN DIAMETER, SHALL MEET REQUIREMENTS OF ASTM D 2241 AND CSA B 137.3. FITTINGS SHALL MEET REQUIREMENTS OF CSA B 137.2. PIPE AND FITTINGS SHALL BE SDR 21, PRESSURE CLASS 200. PIPE CONNECTION SHALL BE PLAIN END AND RUBBER GASKETED BELL END, MEETING REQUIREMENTS OF ASTM D 3139. PIPE SHALL CONFORM TO IRON PIPE SIZE (IPS) OUTSIDE DIMENSION.

2.2.2.2 RESTRAINING DEVICES FOR PIPE FITTINGS SHALL BE UNI-FLANGE SERIES 1300 BY FORD METER BOX COMPANY, INC., OR APPROVED EQUAL BY EBAA IRON, INC., OR ROMAC INDUSTRIES, INC. RESTRAINING DEVICES FOR PIPE JOINTS SHALL BE UNI-FLANGE SERIES 1390 BY FORD METER BOX COMPANY, INC., OR APPROVED EQUAL BY EBAA IRON, INC., OR ROMAC INDUSTRIES, INC.

2.2.3 COPPER TUBING

2.2.3.1 COPPER TUBING AND ASSOCIATED FITTINGS SHALL BE ASTM B 88, TYPE K FLEXIBLE.

2.2.3.2 BRASS FITTINGS SHALL BE COMPRESSION JOINT BY FORD METER BOX COMPANY, INC.

2.3 CONCRETE FOR THRUST BLOCKS AND BULKHEAD ANCHORS SHALL BE CLASS A3 AS SPECIFIED IN SECTION 217 OF THE VDOT ROAD AND BRIDGE SPECIFICATIONS. THRUST BLOCKS AND ANCHORS SHALL BE IN ACCORDANCE WITH THE STANDARD DETAIL, BEARING ON UNDISTURBED EARTH. THE PIPING SYSTEM SHALL NOT BE PRESSURE TESTED FOR 14 DAYS AFTER THRUST BLOCKS ARE POURED.

2.4 PIPE LABELING

2.4.1 DETECTABLE TAPE SHALL BE PROVIDED FOR ALL BELOW GRADE PIPING SYSTEMS AND SHALL HAVE A METALLIC CORE PROTECTED BY A PLASTIC JACKET. THE TAPE SHALL BE CONTINUOUSLY MARKED INDICATING THAT A WATER MAIN IS BURIED BENEATH THE TAPE.

2.5 STEEL CASING PIPE FOR BORING OR JACKING UNDER HIGHWAYS, RAILROADS, OR STREAMS SHALL MEET REQUIREMENTS OF ASTM A 139, GRADE B. NOMINAL PIPE DIAMETER AND WALL THICKNESS SHALL BE AS INDICATED ON THE DRAWINGS. NO PROTECTIVE COATING OR LINING, NOR HYDROSTATIC TESTING WILL BE REQUIRED.

2.6 CASING SPACERS/END SEALS

2.6.1 CASING SPACERS SHALL BE BOLT-ON STYLE WITH A TWO-PIECE SHELL MADE FROM T-304 STAINLESS STEEL OF A MINIMUM 14-GAUGE THICKNESS. THE SHELL SHALL BE LINED WITH A RIBBED PVC EXTRUSION WITH A RETAINING SECTION THAT OVERLAPS THE EDGE OF THE SHELL AND PREVENTS SLIPPAGE. BEARING SURFACES (RUNNERS) MADE FROM UHMW POLYMER WITH A STATIC COEFFICIENT OF FRICTION OF 0.11-0.13 SHALL BE ATTACHED TO SUPPORT STRUCTURES (RISERS) AT APPROPRIATE POSITIONS TO PROPERLY SUPPORT THE CARRIER WITHIN THE CASING AND TO EASE INSTALLATION. CASING SPACERS SHALL BE MODEL S12G-2 BY PIPELINE SEAL AND INSULATOR, INC, 6525 GOFORTH STREET, HOUSTON, TEXAS 77021, TELEPHONE NUMBER: (800) 423-2410, OR APPROVED EQUAL.

2.6.2 END SEALS SHALL BE MODEL C AS MANUFACTURED BY PIPELINE SEAL AND INSULATOR, INC., OR APPROVED EQUAL.

2.7 VALVES

2.7.1 GATE VALVES

2.7.1.1 NONRISING STEM GATE VALVES 3 INCHES AND LARGER SHALL MEET REQUIREMENTS OF AWWA C500 "AWWA STANDARD FOR GATE VALVES FOR WATER AND SEWERAGE SYSTEMS," OR VALVES 3 INCHES THROUGH 12 INCHES SHALL MEET REQUIREMENTS OF AWWA C509 "AWWA STANDARD FOR RESILIENT SEATED GATE VALVES FOR WATER AND SEWERAGE SERVICE." WORKING PRESSURE SHALL BE AT LEAST 200 PSI FOR VALVE SIZES 3 THROUGH 12 INCHES, AT LEAST 150 PSI FOR VALVE SIZES GREATER THAN 12 INCHES, OR AT THE PRESSURE RATING SPECIFIED FOR ADJACENT PIPING, WHICHEVER IS GREATER. VALVE ENDS SHALL BE COMPATIBLE WITH PIPING SYSTEMS IN WHICH VALVES ARE INSTALLED. VALVE SHALL BE CAST IRON BODY, BRONZE MOUNTED. VALVES SHALL HAVE O-RING SEALS AND SHALL OPEN COUNTERCLOCKWISE. ASBESTOS PACKING WILL NOT BE ACCEPTABLE.

2.7.1.2 VALVES LISTED ABOVE SHALL BE MANUFACTURED BY KENNEDY VALVE MANUFACTURING COMPANY, INC., OR AMERICAN FLOW CONTROL.

2.7.1.3 2-INCH GATE VALVES SHALL BE NONRISING STEM, CAST IRON BODY, TAPERED SEAT, RESILIENT WEDGE CONSTRUCTION, WITH THREADED ENDS AND 2-INCH OPERATING NUT. WORKING PRESSURE SHALL BE AT LEAST 200 PSI. VALVES SHALL BE MANUFACTURED BY WATTS REGULATOR, OR APPROVED EQUAL.

2.7.2 TAPPING SLEEVES AND VALVES

2.7.2.1 TAPPING SLEEVES SHALL MEET REQUIREMENTS OF ANSI/AWWA C110 FOR PRESSURE RATING OF PIPING. SLEEVES SHALL BE CONSTRUCTED IN TWO SECTIONS AND SHALL BE MECHANICAL JOINT TYPE WITH FLANGED OUTLET. THE TAPPING SLEEVE SHALL BE FOR THE SIZE AND TYPE OF PIPING SHOWN ON THE DRAWINGS AND SPECIFIED HEREIN. TAPPING SLEEVES SHALL BE FORD METER BOX COMPANY "FAST," ROMAC INDUSTRIES, INC. "SST," MUELLER COMPANY "H30" OR "H304," OR APPROVED EQUAL.

2.7.2.2 TAPPING VALVES SHALL MEET REQUIREMENTS OF GATE VALVES SPECIFIED IN THIS SECTION, EXCEPT THAT SEAT OPENING SHALL BE LARGER THAN NOMINAL SIZE AND VALVE OUTLET END SHALL BE MECHANICAL JOINT.

2.7.3.3 TAPPING SADDLES FOR 2-INCH WATER LINE CONNECTIONS SHALL BE MANUFACTURED BY MUELLER COMPANY, FORD METER BOX COMPANY, OR ROMAC INDUSTRIES, INC.

2.7.3 BALL VALVES: BALL VALVES SHALL BE CLASS 150, MEETING REQUIREMENTS OF ANSI B16.34. VALVES SHALL HAVE ANSI CARBON STEEL BODIES AND BALLS. VALVES SHALL HAVE STAINLESS STEEL STEMS AND TRIM, AND VITON OR TEFLON SEATS, BODY SEALS, AND STEM SEALS. VALVES SHALL BE LEVER OPERATED. VALVES SHALL BE MANUFACTURED BY VELAN VALVE CORPORATION, CONBRACO INDUSTRIES, INC., ITT-GRINNELL, WORCHESTER, INC., OR APPROVED EQUAL.

2.7.4 AIR RELEASE VALVES

2.7.4.1 AIR RELEASE VALVES SHALL BE APCO MODEL 145C COMBINATION AIR VALVES AS MANUFACTURED BY VALVE AND PRIMER CORPORATION, 1420 SOUTH WRIGHT BLVD., SCHAUMBURG, ILLINOIS 60193 OR APPROVED EQUAL BY CLA-VAL COMPANY. VALVES SHALL HAVE THE FOLLOWING DIMENSIONS:

INLET DIAMETER: 2-INCH NPT
OUTLET DIAMETER: 2-INCH NPT
LARGE ORIFICE DIAMETER: 2-INCH
SMALL ORIFICE DIAMETER: 3/32-INCH

2.7.4.2 VALVES SHALL HAVE ASTM A126 GRADE B CAST IRON BODY, COVER, AND LEVER FRAME, ASTM B124 BRONZE PLUG, BUNA-N NEEDLE AND SEAT, AND ASTM A240 STAINLESS STEEL FLOAT.

2.8 CORPORATION STOPS SHALL BE ONE-PIECE BRONZE BODY WITH INTEGRAL WRENCH FLATS, CC INLET TAPER THREADS, O-RING SEALED, BALANCED PRESSURE, PLUG TYPE VALVE, HAVING A ROUND, FULL OPEN UNOBSTRUCTED FLOW WAY, AND MEETING REQUIREMENTS OF AWWA C800, "UNDERGROUND SERVICE LINE VALVES AND FITTINGS." CORPORATION STOPS SHALL BE MANUFACTURED BY FORD METER BOX COMPANY AS INIDCATED ON STANDARD WATER DETAIL W-4, OR APPROVED EQUAL BY A.Y. MCDONALD.

2.9 WATER METERS, METER BOXES, AND SERVICE LATERAL ACCESSORIES SHALL BE AS INDICATED ON THE TOWN OF AMHERST STANDARD WATER DETAIL W-4.

2.10 VALVE BOXES SHALL BE ADJUSTABLE CAST IRON VALVE BOXES OF THE TWO-PIECE SCREW-TYPE. BASE SHALL BE PROPER TYPE AND SIZE FOR THE VALVE WITH WHICH IT IS USED. VALVE BOXES SHALL BE MANUFACTURED BY MUELLER COMPANY, DEWEY BROTHERS, TYLER, OR BINGHAM-TAYLOR.

2.11 BACKFLOW PREVENTERS

2.11.1 FIRE VAULT BACKFLOW PREVENTERS SHALL BE PROVIDED WITH NSF 61 LISTED-FDA APPROVED EPOXY COATED CAST IRON CHECK VALVE BODIES WITH REPLACEABLE BRONZE SEATS AND STAINLESS STEEL RELIEF VALVE SEAT, EPOXY COATED Y-STRAINER, NON-RISING STEM RESILIENT SEATED GATE VALVES, AND BACKFLOW PREVENTER TEST KIT. RELIEF VALVE SHALL BE EQUIPPED WITH AIR GAP. BACKFLOW PREVENTERS SHALL BE SUITABLE FOR 175-PSI SUPPLY PRESSURE AND MEET AWWA C511 REQUIREMENTS. FIRE VAULT BACKFLOW PREVENTERS SHALL BE DOUBLE DETECTOR CHECK TYPE, MANUFACTURED BY WATTS REGULATOR, OR APPROVED EQUAL.

2.11.2 BACKFLOW PREVENTERS FOR LAWN SPRINKLER SYSTEMS SHALL BE BRONZE BODY CONSTRUCTION, CELCON CHECK SEATS, STAINLESS STEEL RELIEF VALVE SEATS AND SHAFTS, RUBBER CHECK VALVE AND RELIEF VALVE ASSEMBLIES, BRONZE STRAINER AND TEST COCKS, AND QUARTER-TURN, FULL PORT RESILIENT SEAT BALL VALVES. RELIEF VALVE SHALL BE EQUIPPED WITH 1-INCH AIR GAP. BACKFLOW PREVENTERS SHALL BE SUITABLE FOR 175-PSI SUPPLY PRESSURE AND MEET REQUIREMENTS OF AWWA C511. LAWN SPRINKLER SYSTEM BACKFLOW PREVENTERS SHALL BE WATTS SERIES 909-QT-S REDUCED PRESSURE ZONE TYPE, MANUFACTURED BY WATTS REGULATOR, OR APPROVED EQUAL.

2.12 FIRE HYDRANTS SHALL BE THE SAFETY FLANGE, BREAKAWAY TOP TYPE, MEETING REQUIREMENTS OF AWWA C502, "AWWA STANDARD FOR DRY-BARREL FIRE HYDRANTS." HYDRANTS SHALL HAVE A BARREL DIAMETER OF NO SMALLER THAN 7 INCHES, A HYDRANT VALVE DIAMETER NO SMALLER THAN 5¼ INCHES, AND SHALL BE EQUIPPED WITH TWO 2½-INCH HOSE NOZZLES AND ONE 4½-INCH PUMPER CONNECTION. HOSE AND PUMPER OUTLET THREADS SHALL MATCH LOCAL FIRE DEPARTMENT EQUIPMENT. FIRE HYDRANTS SHALL BE MUELLER MODEL A-423.

2.13 MANHOLES

2.13.1 PRECAST REINFORCED CONCRETE MANHOLE SECTION

2.13.1.1 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS SHALL MEET REQUIREMENTS OF ASTM C 478. SECTION ENDS SHALL HAVE GASKET GROOVE PROVIDED DURING MANUFACTURING PROCESS. GASKETS FOR SECTION JOINTS SHALL MEET REQUIREMENTS OF ASTM C 443. JOINTS MAY ALSO BE SEALED WITH FLEXIBLE BUTYL RESIN SEALANT MEETING THE REQUIREMENTS OF ASTMC443 OR ASTMC990 WHICH SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS. TOP SECTIONS FOR ALL MANHOLES SHALL BE DESIGNED TO WITHSTAND HS-20 TRAFFIC LOADING.

2.13.1.2 MANHOLE FRAMES AND COVERS SHALL BE ROADWAY TYPE WITH DEEP SOCKET COVERS. MACHINE FRAMES AND COVERS TO PREVENT RATTLING. FRAMES SHALL BE PROVIDED WITH HOLES FOR BOLTING IT DOWN TO MANHOLE RISER SECTION. PROVIDE COVER WITH TWO ¾-INCH DIAMETER HOLES FOR VENTILATION. CASTINGS SHALL BE GRAY IRON MEETING REQUIREMENTS OF ASTM A 48, CLASS 30, AND HAVE 24-INCH DIAMETER CLEAR OPENINGS SUCH AS NEENAH FOUNDRY COMPANY TYPE R-1642 WITH TYPE "C" COVER OR APPROVED EQUAL BY U.S. FOUNDRY OR EAST JORDAN IRON WORKS. THE FRAME AND COVER SHALL WEIGH AT LEAST 277 POUNDS.

2.13.1.3 MANHOLE FRAMES SHALL BE ANCHORED TO THE TOP OF THE MANHOLE RISER SECTIONS WITH ¾-INCH EXPANSION BOLTS. TWO PASSES OF "CONSEAL" BITUMASTIC SEALANT IN 1-INCH ROPE FORM SHALL BE USED TO PROVIDE WATERTIGHT SEAL BETWEEN FRAME AND MANHOLE RISER SECTION. CLEAN MANHOLE RISER AND FRAME THOROUGHLY PRIOR TO INSTALLATION.

2.13.1.4 MANHOLE STEPS SHALL BE "SUREFOOT" STEP CONSTRUCTED OF A NO. 4 STEEL REINFORCING ROD ENCASED IN CORROSION-RESISTANT RUBBER BY OLIVER TIRE & RUBBER COMPANY OR APPROVED EQUAL.

2.14 PRECAST REINFORCED CONCRETE VALVE VAULTS

2.14.1 VALVE VAULTS SHALL BE MANUFACTURED BY ROTONDO PRECAST, 5115 MASSAPONAX CHURCH ROAD, FREDERICKSBURG, VIRGINIA 22407, THE CLEAR FLOW COMPANY, 1321 NORTH DELPHINE AVENUE, WAYNESBORO, VIRGINIA 22980, OR APPROVED EQUAL. VAULTS SHALL MEET REQUIREMENTS OF ASTM C 890 AND ASTM C 913. TOP SECTIONS FOR ALL VALVE VAULTS SHALL BE DESIGNED TO WITHSTAND HS-20 TRAFFIC LOADING. VAULTS SHALL BE MANUFACTURED AS INDICATED ON THE DRAWINGS AND SHALL BE WATERTIGHT. PROVIDE WALL SLEEVES, ALUMINUM ACCESS HATCHES, ALUMINUM ACCESS LADDER, VENTS, AND OTHER APPURTENANCES AS SPECIFIED HEREIN AND INDICATED ON THE DRAWINGS TO ENSURE COMPLETE ASSEMBLY.

2.14.2 CONCRETE/REINFORCING STEEL REQUIREMENTS: PROVIDE AN AIR CONTENT OF 6%, ±2% AND A MINIMUM WALL THICKNESS OF 6 INCHES. ASTM A 615 REINFORCING BARS, ASTM A 497 WELDED WIRE FABRIC, ASTM C 443 GASKETS FOR JOINT CONNECTIONS. VAULTS SHALL BE MANUFACTURED WITH CALCAREOUS AGGREGATE SO THAT THE FINISHED PRODUCT SHALL HAVE AN AZ FACTOR EQUAL TO 90. SLEEVES THROUGH CONCRETE OR MASONRY WALLS OR SLABS SHALL BE CAST IRON OR SCHEDULE 40 STEEL. PROVIDE SLEEVES THROUGH WALLS, FLOORS, AND CEILINGS FOR ALL PIPE PENETRATIONS EXCEPT WHERE WALL PIPES ARE INDICATED.

2.15 PIPE TO SLEEVE SEALANT SHALL BE GROUTING COMPOUND. GROUTING COMPOUND SHALL BE AS MANUFACTURED BY 3M COMPANY OR BE AN EQUIVALENT PRODUCT HAVING TENSILE STRENGTH OF 80 PSI AND ELONGATION PROPERTY OF 700% IN ACCORDANCE WITH ASTM D 3574 TEST E, AND LINEAR DIMENSION CHANGE SHALL NOT EXCEED 18% WHEN SUBJECT TO WET AND DRY CYCLES IN ACCORDANCE WITH ASTM D 756, PROCEDURE G AND ASTM D 1042.

2.16 MECHANICAL TYPE PIPE TO WALL SLEEVE SEALS: MECHANICAL TYPE PIPE TO WALL SLEEVE SEALS SHALL BE "LINK-SEAL" PIPE TO WALL CLOSURES MANUFACTURED BY THUNDERLINE CORPORATION, WAYNE, MICHIGAN. SEALS SHALL BE MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO FILL ANNULAR SPACE BETWEEN PIPE AND WALL OPENING AND SHALL PROVIDE WATERTIGHT SEAL BETWEEN PIPE AND WALL OPENING.

3. EXECUTION

3.1 PIPE LAYING

3.1.1 TAKE ALL PRECAUTIONS NECESSARY TO INSURE THAT PIPE, VALVES, FITTINGS, AND OTHER ACCESSORIES ARE NOT DAMAGED IN UNLOADING, HANDLING, AND PLACING IN TRENCH. EXAMINE EACH PIECE OF MATERIAL JUST PRIOR TO INSTALLATION TO DETERMINE THAT NO DAMAGE HAS OCCURRED. REMOVE ANY DAMAGED MATERIAL FROM THE SITE AND REPLACE WITH UNDAMAGED MATERIAL.

3.1.2 EXERCISE CARE TO KEEP FOREIGN MATERIAL AND DIRT FROM ENTERING PIPE DURING STORAGE, HANDLING, AND PLACING IN TRENCH. CLOSE ENDS OF IN-PLACE PIPE AT THE END OF ANY WORK PERIOD TO PRECLUDE THE ENTRY OF ANIMALS AND FOREIGN MATERIAL.

3.1.3 BEDDING OF PIPE SHALL BE AS DETAILED ON THE DRAWINGS.

3.1.4 DO NOT LAY PIPE WHEN TRENCH BOTTOM IS MUDDY OR FROZEN, OR HAS STANDING WATER.

3.1.5 USE ONLY THOSE TOOLS SPECIFICALLY INTENDED FOR CUTTING THE SIZE AND MATERIAL AND TYPE PIPE INVOLVED. MAKE CUT TO PREVENT DAMAGE TO PIPE OR LINING AND TO LEAVE A SMOOTH END AT RIGHT ANGLES TO THE AXIS OF THE PIPE.

3.2 LAY WATER MAIN PIPING WITH BELL ENDS FACING THE DIRECTION OF LAYING. WHERE GRADE IS 10 PERCENT OR GREATER, PIPE SHALL BE LAID UPHILL WITH BELL ENDS UPGRADE. LAY WATER MAIN PIPING WITH A MINIMUM COVER OF 36 INCHES UNLESS OTHERWISE INDICATED.

3.3 JOIN MECHANICAL JOINT PIPE AS FOLLOWS:

3.3.1 THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER FROM THE JOINT. PAINT THE BELL AND THE SPIGOT WITH SOAP SOLUTION. SLIP CAST-IRON GLAND ON SPIGOT END WITH LIP EXTENSION OF GLAND TOWARD END OF PIPE. PAINT RUBBER GASKET WITH OR DIP INTO SOAP SOLUTION AND PLACE ON SPIGOT END WITH THICK EDGE TOWARD GLAND.

3.3.2 PUSH THE SPIGOT END FORWARD TO SEAT IN THE BELL. THEN CAREFULLY PRESS THE GASKET INTO THE BELL SO THAT IT IS LOCATED EVENLY AROUND THE JOINT. MOVE THE GLAND INTO POSITION, INSERT BOLTS, AND SCREW NUTS UP FINGER TIGHT. THEN TIGHTEN ALL NUTS TO TORQUE LISTED BELOW.

BOLTS SIZE – INCHES	TORQUE FEET – POUNDS
?	40-60
¾	60-90
1	70-100
1¼	90-120

3.3.3 TIGHTEN NUTS ON ALTERNATE SIDES OF THE GLAND UNTIL PRESSURE ON THE GLAND IS EQUALLY DISTRIBUTED.

3.3.4 PERMISSIBLE DEFLECTION OF MECHANICAL JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

3.4 JOIN PUSH-ON JOINT PIPE AS FOLLOWS:

3.4.1 THOROUGHLY CLEAN INSIDE OF THE BELL AND 8 INCHES OF THE OUTSIDE OF THE SPIGOT END OF THE JOINING PIPE TO REMOVE OIL, GRIT, EXCESS COATING, AND OTHER FOREIGN MATTER. FLEX RUBBER GASKET AND INSERT IN THE GASKET RECESS OF THE BELL SOCKET. APPLY A THIN FILM OF GASKET LUBRICANT SUPPLIED BY PIPE MANUFACTURER TO EITHER THE GASKET OR THE SPIGOT END OF THE JOINING PIPE.

3.4.2 START SPIGOT END OF PIPE INTO SOCKET WITH CARE. THE JOINT SHALL THEN BE COMPLETED BY FORCING THE PLAIN END TO THE BOTTOM OF THE SOCKET WITH A FORKED TOOL OR JACK TYPE DEVICE. FIELD CUT PIPE SHALL HAVE THE END FILED TO MATCH THE MANUFACTURED SPIGOT END.

3.4.3 JOIN RESTRAINED PUSH-ON JOINTS ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

3.4.4 PERMISSIBLE DEFLECTION OF PUSH-ON JOINT PIPE SHALL NOT BE GREATER THAN LISTED IN AWWA C600.

3.4.5 PERMISSIBLE DEFLECTION IN RESTRAINED PUSH-ON JOINT PIPE SHALL BE AS RECOMMENDED IN WRITING BY THE MANUFACTURER.

3.5 JOIN POLYVINYL CHLORIDE (PVC) PIPE USING RUBBER RING GASKETS IN BELL JOINTS AS RECOMMENDED IN WRITING BY THE MANUFACTURER.

3.6 WELDED, SOLDERED, OR BRAZED JOINTS BETWEEN SECTIONS OF COPPER PIPE AND BETWEEN PIPE AND FITTINGS SHALL BE IN COMPLIANCE WITH ANSI B31.1. MAKE JOINTS IN PIPING SYSTEM TIGHT AND LEAKPROOF AGAINST THE DESIGN PRESSURE. PEENING OF WELDED JOINTS TO CORRECT LEAKS WILL NOT BE PERMITTED. BRAZED OR SOLDERED JOINTS THAT LEAK SHALL BE DISASSEMBLED, CLEANED, AND MADE AGAIN.

3.7 INSTALL DETECTABLE TAPE IN TRENCH ABOVE ALL PIPE PER THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.

3.8 SET VALVES AND VALVE BOXES AS FOLLOWS:

3.8.1 EQUIP ALL UNDERGROUND VALVE OPERATORS WITH VALVE BOXES. SET BOX IN ALIGNMENT WITH VALVE STEM CENTERED ON VALVE NUT. SET VALVE BOX TO PREVENT TRANSMITTING SHOCK OR STRESS TO THE VALVE. SET BOX COVER FLUSH WITH THE FINISHED GROUND SURFACE OR PAVEMENT.

3.9 INSTALLATION OF TAPPING SLEEVES AND TAPPING VALVES

3.9.1 ALL TAPPING SLEEVES SHALL BE SET TO AVOID INTERFERENCE WITH EXISTING PIPE JOINTS.

3.9.2 ALL TAPPING SLEEVES, TAPPING VALVES, AND TAPPING SADDLES SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN INSTRUCTIONS.

3.9.3 AFTER ALL TAPPING SLEEVES/SADDLES AND VALVES HAVE BEEN SET IN PLACE, A 150-PSI PRESSURE TEST SHALL BE PERFORMED TO INSURE THAT THERE ARE NO LEAKS AROUND THE SLEEVE/SADDLE OR THROUGH THE VALVE PRIOR TO TAPPING. ALL LEAKAGE SHALL BE CORRECTED.

3.9.4 ACTUAL TAPS SHALL BE MADE IN THE PRESENCE OF THE TOWN'S REPRESENTATIVE. THE TOWN SHALL BE GIVEN A MINIMUM OF 48 HOURS NOTICE BEFORE TAPPING OPERATIONS COMMENCE.

3.10 FOR BURIED PRESSURE PIPING, PROVIDE REACTION ANCHORS OF CONCRETE BLOCKING, RETAINER GLAND TYPE DEVICES, RESTRAINING DEVICES, OR RESTRAINED JOINT TYPE PIPE AT ALL CHANGES IN DIRECTION OF PRESSURE PIPING, AT DEAD ENDS, AND AS SHOWN ON THE DRAWINGS.

3.10.1 CONCRETE REACTION ANCHORS SHALL BEAR AGAINST UNDISTURBED EARTH AND SHALL BE OF THE SIZE AND SHAPE SHOWN ON STANDARD WATER DETAIL W-2.

3.10.2 RESTRAIN ALL JOINTS WITH RETAINER GLANDS/DEVICES IN ACCORDANCE WITH THE WRITTEN RECOMMENDATIONS OF THE RETAINER GLAND/DEVICE MANUFACTURER. ALL PIPE JOINTS SHALL BE RESTRAINED WITH RETAINER GLANDS/DEVICES A MINIMUM OF 60 FEET EACH SIDE OF A FITTING OR VALVE.

3.10.3 WHERE RETAINER GLANDS/DEVICES ARE USED, EXTREME CARE SHALL BE TAKEN SO THAT EACH SET SCREW IS TIGHTENED AS RECOMMENDED BY THE MANUFACTURER BEFORE THE PIPE IS BACKFILLED AND TESTED.

3.11 INSTALL WATER SERVICE LATERALS, WATER METERS, AIR RELEASE VALVES, MANHOLES, FIRE HYDRANTS, AND BLOWOFF ASSEMBLIES AS INDICATED ON THE TOWN OF AMHERST STANDARD WATER DETAIL DRAWINGS. INSTALL BACKFLOW PREVENTERS IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.

3.12 LOCATE FIRE HYDRANTS AT SUCH A DISTANCE FROM THE CURB OR EDGE OF PAVEMENT TO PROVIDE READY ACCESS AND MINIMIZE THE POSSIBILITY OF DAMAGE FROM VEHICLES. MAXIMUM HORIZONTAL SEPARATION BETWEEN FIRE HYDRANT AND BUILDING SHALL BE 500 FEET. LOCATE FIRE HYDRANTS IN DRY, STABLE AREAS OUTSIDE OF HIGH GROUNDWATER TABLES TO PREVENT POTENTIAL CROSS CONNECTION. ORIENT THE HYDRANT SO THAT THE PUMPER NOZZLE FACES THE ROAD. SET HYDRANT PLUMB AND WITH THE BURY LINE ON THE HYDRANT AT GRADE. PROVIDE ANCHORAGE AND AT LEAST 7 CUBIC FEET OF CRUSHED STONE UNDER THE BASE TO ALLOW DRAINAGE FROM THE HYDRANT DRAIN VALVE, AS INDICATED ON THE DRAWINGS.

3.13 INSTALL COMBINATION AIR VALVES AT LOCATIONS INDICATED ON THE DRAWINGS AND AT ALL HIGH POINTS ON PRESSURE PIPING IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS. INSTALL GATE VALVE BETWEEN PIPING AND AIR VALVE. USE TAP, TAPPING SADDLE, TEE, OR OTHER FITTINGS AS REQUIRED FOR COMPLETE AND OPERABLE INSTALLATION.

3.14 CONSTRUCT MANHOLES USING PRECAST REINFORCED CONCRETE MANHOLE SECTIONS EXCEPT AS OTHERWISE NOTED. INSTALL MANHOLE FRAMES AND COVERS AND MANHOLE STEPS USING MATERIALS SPECIFIED UNDER PRODUCTS.

3.15 INSTALL PRECAST CONCRETE VALVE VAULTS IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS. PROVIDE A 12-INCH LAYER OF CLEAN VDOT NO. 68 COARSE AGGREGATE FILL BENEATH EACH VAULT.

3.16 CONSTRUCT CONCRETE CAP OR CRADLE IN ACCORDANCE WITH THE LATEST EDITION OF THE VDOT ROAD AND BRIDGE STANDARDS AT LOCATIONS WHERE THE VERTICAL SEPARATION BETWEEN THE NEW WATER MAIN PIPING AND ADJACENT UTILITIES IS LESS THAN 6 INCHES.

3.17 ENCASE WATER MAIN PIPING CROSSING UNDER HIGHWAYS IN A LARGER PIPE OR CONDUIT CALLED A CASING PIPE. THE CASING PIPE SHALL BE OF THE DIAMETER AND WALL THICKNESS INDICATED ON THE DRAWINGS. JOINING OF STEEL CASING PIPE SHALL MEET REQUIREMENTS OF AWWA C206 "STANDARD FOR FIELD WELDING OF STEEL WATER PIPE JOINTS." INSTALL CASING PIPE BY JACKING OR BORING.

3.17.1 INSTALLATION UNDER HIGHWAYS SHALL MEET REQUIREMENTS OF VDOT ROAD AND BRIDGE SPECIFICATIONS. PROVIDE END SEALS ON CASING PIPE ENDS TO PROTECT AGAINST FOREIGN MATTER. NOTIFY VDOT PRIOR TO BEGINNING WORK.

3.17.2 THE CONTRACTOR SHALL DETERMINE FOR HIMSELF THE EXISTING CONDITIONS BOTH ABOVE AND BELOW GROUND AND SHALL PHYSICALLY VERIFY THE LOCATION AND ELEVATION OF THE EXISTING UTILITIES, WHETHER INDICATED OR NOT, PRIOR TO INSTALLATION. **THE CONTRACTOR SHALL CONTACT MISS UTILITY AND RESPECTIVE UTILITY OWNERS FOR EXACT LOCATIONS PRIOR TO ANY CASING INSTALLATION NEAR UTILITIES.** THE CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLING THE CASING PIPE AND THE CARRIER PIPE TO THE REQUIRED LINES AND GRADES.

3.17.3 THE CARRIER PIPE SHALL BE CENTERED AND RESTRAINED WITHIN THE CASING PIPE BY THE USE OF CASING SPACERS. PLACEMENT INTERVALS FOR CASING SPACERS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S WRITTEN RECOMMENDATIONS.

3.18 USE SLEEVES WHERE PIPES, VALVES, STEM EXTENSIONS, OR EQUIPMENT PARTS PASS THROUGH CONCRETE OR MASONRY WALLS OR SLABS. SLEEVES SHALL BE OR SUFFICIENT SIZE TO ALLOW SEALING AROUND PIPES AND CLEARANCE FOR VALVE STEM OR EQUIPMENT. EXTEND VERTICAL SLEEVES THROUGH SLABS 1-INCH ABOVE TOP SURFACE.

3.18.1 USE CAST IRON OR STEEL SLEEVES WITH INTERMEDIATE COLLARS TO ANCHOR AND PROVIDE WATER STOPS ON SLEEVES THAT PASS THROUGH EXTERIOR WALLS BELOW GRADE. SEAL AROUND PIPES USING GROUTING COMPOUND OR "LINK-SEAL" PIPE TO WALL CLOSURES MANUFACTURED BY THUNDERLINE CORPORATION, WAYNE, MICHIGAN. SEALS SHALL BE MODULAR MECHANICAL TYPE, CONSISTING OF INTERLOCKING SYNTHETIC RUBBER LINKS SHAPED TO FILL ANNULAR SPACE BETWEEN PIPE AND WALL OPENING AND SHALL PROVIDE WATERTIGHT SEAL BETWEEN PIPE AND WALL OPENING. GROUTING COMPOUND SHALL BE MIXED AND PLACED IN ACCORDANCE WITH THE RECOMMENDATIONS OF THE MANUFACTURER. MECHANICAL PIPE TO WALL SEAL SHALL BE INSTALLED IN ACCORDANCE WITH THE WRITTEN RECOMMENDATIONS OF THE MANUFACTURER.

3.19 ACCEPTANCE TESTS

3.19.1 AFTER THE LINE HAS BEEN BACKFILLED AND AT LEAST 14 DAYS AFTER THE LAST CONCRETE REACTION ANCHOR HAS BEEN POURED, SUBJECT THE LINE OR ANY VALVED SECTION OF THE LINE TO A HYDROSTATIC PRESSURE TEST. FILL THE SYSTEM WITH WATER AT VELOCITY OF APPROXIMATELY 1 FOOT PER SECOND WHILE NECESSARY MEASURES ARE TAKEN TO ELIMINATE ALL AIR. AFTER THE SYSTEM HAS BEEN FILLED, RAISE THE PRESSURE BY PUMP TO 150 PSI, OR 1.5 TIMES THE WORKING PRESSURE, WHICHEVER IS GREATER. MEASURE PRESSURE AT THE LOW POINT ON THE SYSTEM COMPENSATING FOR GAGE ELEVATION. MAINTAIN THIS PRESSURE FOR 2 HOURS. IF PRESSURE CANNOT BE MAINTAINED, DETERMINE CAUSE, REPAIR, AND REPEAT THE TEST UNTIL SUCCESSFUL.

3.19.2 A LEAKAGE TEST SHALL BE CONDUCTED CONCURRENTLY WITH THE PRESSURE TEST. LEAKAGE SHALL BE DETERMINED WITH A CALIBRATED TEST METER FURNISHED BY THE CONTRACTOR. LEAKAGE WILL BE DEFINED AS THE QUANTITY OF WATER REQUIRED TO MAINTAIN A PRESSURE WITHIN 5 PSI OF THE SPECIFIED TEST PRESSURE, AFTER AIR HAS BEEN EXPELLED, AND THE PIPE FILLED WITH WATER. LEAKAGE SHALL NOT EXCEED THAT QUANTITY OBTAINED BY THE FORMULA BELOW. IF LEAKAGE EXCEEDS THAT DETERMINED BY THE FORMULA, FIND AND REPAIR THE LEAKS AND REPEAT THE TEST UNTIL SUCCESSFUL. THE LEAKAGE FORMULA SHALL BE AS FOLLOWS:

$$L = SD(\sqrt{P})/148{,}000$$

WHERE L = ALLOWABLE LEAKAGE IN GALLONS/HOUR
S = LENGTH OF PIPELINE TESTED IN FEET
D = NOMINAL DIAMETER OF THE PIPER IN INCHES
P = AVERAGE TEST PRESSURE DURING LEAKAGE TEST IN PSIG

3.19.3 ALL VISIBLE LEAKS SHALL BE REPAIRED REGARDLESS OF THE AMOUNT OF LEAKAGE.

3.20 DISINFECT AND TEST WATER MAINS AND ACCESSORIES IN ACCORDANCE WITH AWWA STANDARDS AND AS SPECIFIED HEREIN.

3.20.1 PRELIMINARY FLUSHING: THE MAIN SHALL BE FLUSHED PRIOR TO DISINFECTION, EXCEPT WHEN THE TABLET METHOD IS USED. FLUSHING SHALL BE AT A VELOCITY OF NOT LESS THAN 2.5 FEET PER SECOND. ADEQUATE PROVISIONS SHALL BE MADE FOR DRAINAGE OF FLUSHING WATER.

3.20.2 FORM OF CHLORINE FOR DISINFECTION

3.20.2.1 LIQUID CHLORINE SHALL BE USED ONLY WHEN SUITABLE EQUIPMENT IS AVAILABLE AND ONLY UNDER THE DIRECT SUPERVISION OF A PERSON FAMILIAR WITH THE PHYSIOLOGICAL, CHEMICAL, AND PHYSICAL PROPERTIES OF THIS ELEMENT AND WHO IS PROPERLY TRAINED AND EQUIPPED TO HANDLE ANY EMERGENCY THAT MAY ARISE. INTRODUCTION OF CHLORINE-GAS DIRECTLY FROM THE SUPPLY CYLINDER IS UNSAFE AND SHALL NOT BE PERMITTED.

3.20.2.2 CALCIUM HYPOCHLORITE CONTAINS 70% AVAILABLE CHLORINE BY WEIGHT. IT SHALL BE EITHER GRANULAR OR TABULAR IN FORM. THE TABLETS, SIX TO EIGHT TO THE OUNCE, ARE DESIGNED TO DISSOLVE SLOWLY IN WATER. A CHLORINE-WATER SOLUTION SHALL BE PREPARED BY DISSOLVING THE GRANULES OR TABLETS IN WATER IN THE PROPORTION REQUISITE FOR THE DESIRED CONCENTRATION.

3.20.2.3 SODIUM HYPOCHLORITE IS SUPPLIED IN STRENGTHS FROM 5.25% TO 16% AVAILABLE CHLORINE. THE CHLORINE-WATER SOLUTION SHALL BE PREPARED BY ADDING HYPOCHLORITE TO WATER.

3.20.2.4 APPLICATION: THE HYPOCHLORITE SOLUTIONS SHALL BE APPLIED TO THE WATER MAIN WITH A GASOLINE OR ELECTRICALLY POWERED CHEMICAL FEED PUMP DESIGNED FOR FEEDING CHLORINE SOLUTIONS. FOR SMALL APPLICATIONS, THE SOLUTIONS MAY BE FED WITH A HAND PUMP; FOR EXAMPLE, A HYDRAULIC TEST PUMP. FEED LINES SHALL BE OF SUCH MATERIAL AND STRENGTH AS TO WITHSTAND SAFELY THE MAXIMUM PRESSURES THAT MAY BE CREATED BY THE PUMPS. ALL CONNECTIONS SHALL BE CHECKED FOR TIGHTNESS BEFORE THE HYPOCHLORITE SOLUTION IS APPLIED TO THE MAIN.

3.20.3 METHODS OF CHLORINE APPLICATION

3.20.3.1 CONTINUOUS FEED METHOD: WATER FROM THE EXISTING DISTRIBUTION SYSTEM OR OTHER APPROVED SOURCES OF SUPPLY SHALL BE MADE TO FLOW AT A CONSTANT, MEASURED RATE INTO THE NEWLY LAID PIPELINE. THE WATER SHALL RECEIVE A DOSE OF CHLORINE, ALSO FED AT A CONSTANT, MEASURED RATE. THE TWO RATES SHALL BE PROPORTIONED SO THAT THE CHLORINE CONCENTRATION IN THE WATER IN THE PIPE IS MAINTAINED AT A MINIMUM OF 50 MG/L AVAILABLE CHLORINE. TO ASSURE THAT THIS CONCENTRATION IS MAINTAINED, THE CHLORINE SHALL BE MEASURED AT INTERVALS NOT EXCEEDING 1,200 FEET IN ACCORDANCE WITH THE PROCEDURES DESCRIBED IN THE CURRENT EDITION OF "STANDARD METHODS" AND AWWA M12 – "SIMPLIFIED PROCEDURES FOR WATER EXAMINATION." IN THE ABSENCE OF A METER, THE RATE MAY BE DETERMINED EITHER BY PLACING A PITOT GAGE AT THE DISCHARGE OR BY MEASURING THE TIME TO FILL A CONTAINER OF KNOWN VOLUME.

DURING THE APPLICATION OF THE CHLORINE, VALVES SHALL BE MANIPULATED TO PREVENT THE TREATMENT DOSAGE FROM FLOWING BACK INTO THE LINE SUPPLYING THE WATER. CHLORINE APPLICATION SHALL NOT CEASE UNTIL THE ENTIRE MAIN IS FILLED WITH THE CHLORINE SOLUTION. THE CHLORINATED WATER SHALL BE RETAINED IN THE MAIN FOR AT LEAST 24 HOURS, DURING WHICH TIME ALL VALVES AND HYDRANTS IN THE SECTION TREATED SHALL BE OPERATED IN ORDER TO DISINFECT THE APPURTENANCES. AT THE END OF THIS 24-HOUR PERIOD, THE TREATED WATER SHALL CONTAIN NO LESS THAN 25 MG/L CHLORINE THROUGHOUT THE LENGTH OF THE MAIN.

3.20.3.2 TABLET METHOD: USE ONLY WHEN ALLOWED BY THE ENGINEER. DO NOT USE THIS METHOD IF TRENCH WATER OR FOREIGN MATERIAL HAS ENTERED THE MAIN OR IF THE WATER IS BELOW 41°F (5°C). THIS METHOD MAY BE USED FOR MAINS UP TO 12 INCHES IN DIAMETER, AND WHERE THE TOTAL LENGTH OF THE MAIN IS LESS THAN 2,500 FEET.

PLACE TABLETS IN EACH SECTION OF PIPE AND ALSO IN HYDRANTS, HYDRANT BRANCHES, AND OTHER APPURTENANCES. ENOUGH TABLETS SHALL BE USED TO ENSURE THAT A CHLORINE CONCENTRATION OF 25 MG/L IS PROVIDED IN THE WATER. ATTACH TABLETS USING PERMATEX NO. 1 ADHESIVE OR OTHER APPROVED ADHESIVE, EXCEPT FOR THE TABLETS PLACED IN HYDRANTS AND IN THE JOINTS BETWEEN THE PIPE SECTIONS. TABLETS SHALL BE FREE OF ADHESIVE EXCEPT ON THE ONE BROAD SIDE TO BE ATTACHED. PLACE ALL TABLETS AT THE TOP OF THE MAIN. IF THE TABLETS ARE ATTACHED BEFORE THE PIPE SECTION IS PLACED IN THE TRENCH, MARK THE POSITION OF THE TABLET IN THE PIPE AND ASSURE THAT THE PIPE IS PLACED WITH THE TABLET AT THE TOP.

WHEN INSTALLATION IS COMPLETED, FILL THE MAIN WITH WATER AT A VELOCITY OF LESS THAN 1 FOOT PER SECOND. THE WATER SHALL REMAIN IN THE PIPE FOR AT LEAST 24 HOURS. OPERATE VALVES SO THAT THE STRONG CHLORINE SOLUTION WILL NOT FLOW BACK INTO THE LINE SUPPLYING THE WATER.

3.20.4 FINAL FLUSHING: AFTER THE APPLICABLE RETENTION PERIOD, THE HEAVILY CHLORINATED WATER SHALL BE FLUSHED FROM THE MAIN UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM, OR LESS THAN 1 MG/L. CHLORINE RESIDUAL DETERMINATION SHALL BE MADE TO ASCERTAIN THAT THE HEAVILY CHLORINATED WATER HAS BEEN REMOVED FROM THE PIPELINE. CONTRACTOR SHALL PROVIDE DECHLORINATION OF ALL FLUSHED WATER PRIOR TO DISCHARGE.

3.20.5 BACTERIOLOGIC TESTS

3.20.5.1 AFTER FINAL FLUSHING AND BEFORE THE WATER MAIN IS PLACED IN SERVICE, SAMPLES SHALL BE COLLECTED AND TESTED FOR BACTERIOLOGIC QUALITY AND SHALL SHOW THE ABSENCE OF COLIFORM ORGANISMS. AT LEAST TWO SAMPLES SHALL BE COLLECTED AT LEAST 24 HOURS APART AT INTERVALS NOT EXCEEDING 2,000 FEET, AND TESTED BY A STATE CERTIFIED LABORATORY AND RESULTS SUBMITTED TO THE TOWN.

3.20.5.2 SAMPLES FOR BACTERIOLOGICAL ANALYSIS SHALL BE COLLECTED IN STERILE BOTTLES TREATED WITH SODIUM THIOSULFATE. IF LABORATORY RESULTS INDICATE THE PRESENCE OF COLIFORM BACTERIA, THE SAMPLES ARE UNSATISFACTORY, AND DISINFECTION SHALL BE REPEATED UNTIL THE SAMPLES ARE SATISFACTORY.

3.20.5.3 A SAMPLING TAP CONSISTING OF A CORPORATION COCK WITH METAL PIPE SHALL BE INSTALLED WITHIN 2 FEET OF VALVES. THE CORPORATION STOP INLET SHALL BE MALE, 1-INCH IN SIZE, AND THE OUTLET SHALL HAVE 1-INCH I.P. THREADS AND A CAP.

3.20.6 CLEANING, DISINFECTION, AND TESTING WILL BE THE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR SHALL FURNISH THE WATER REQUIRED FOR THESE OPERATIONS AT HIS OWN COST AND EXPENSE. NO SEPARATE PAYMENT, OTHER THAN THAT INCLUDED IN THE CONTRACT LUMP SUM, WILL BE ALLOWED.

3.20.7 TESTING AND DISINFECTION OF THE COMPLETED SECTIONS SHALL NOT RELIEVE THE CONTRACTOR OF HIS RESPONSIBILITY TO REPAIR OR REPLACE ANY CRACKED OR DEFECTIVE PIPE. ALL WORK NECESSARY TO SECURE A TIGHT LINE SHALL BE DONE AT THE CONTRACTOR'S EXPENSE.

NO.	REVISION	BY	DATE	NO.	REVISION	BY	DATE

COMMONWEALTH OF VIRGINIA
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