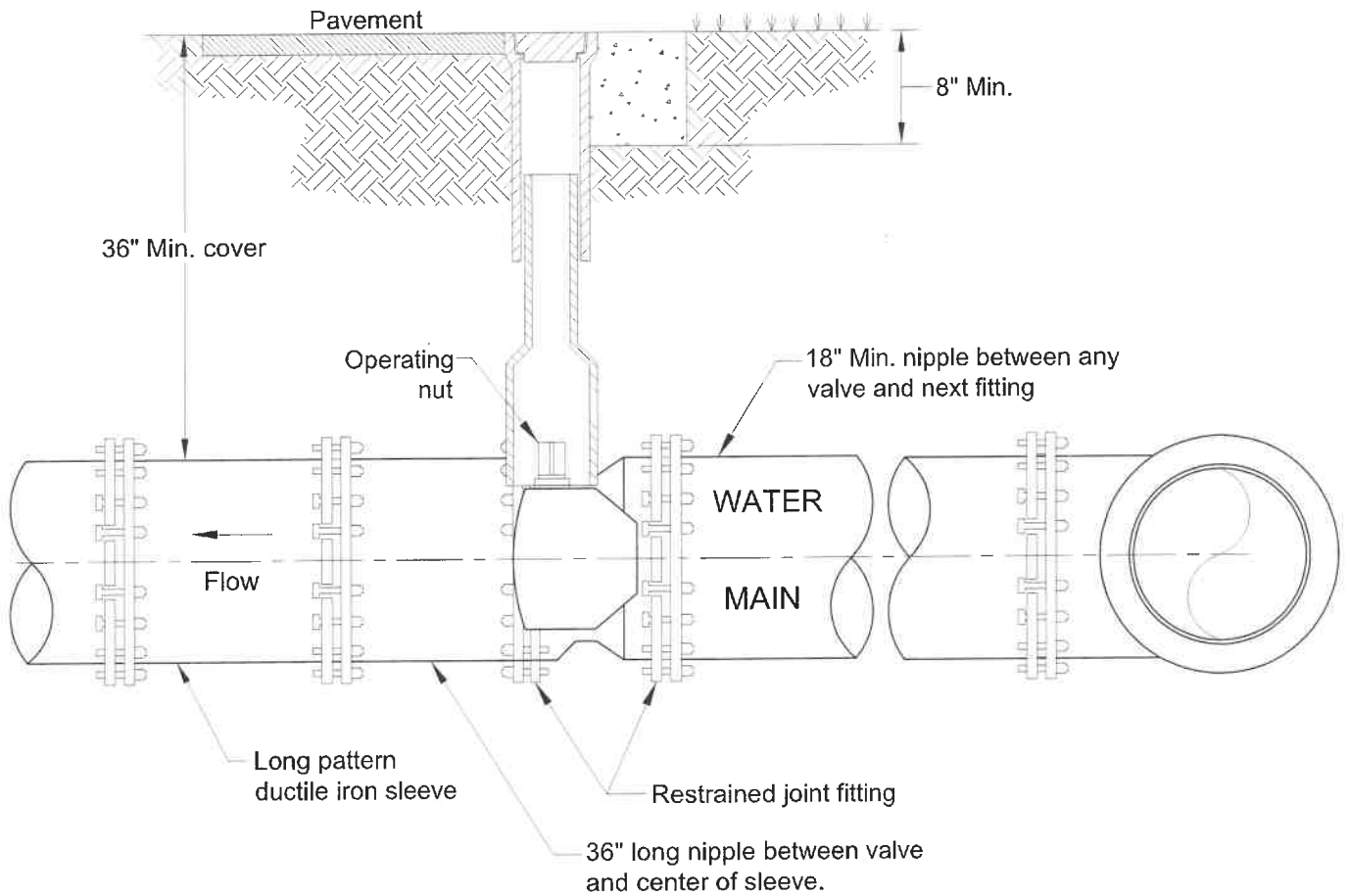


1. When top of operating nut is deeper than 36", a high strength steel extension will be required to bring operating nut to not more than 24" below finished grade. Extension bolts & nuts shall be 316 stainless steel. A steel centering plate welded to the extension is also required.
2. Valve boxes in pavement shall have covers & lids marked "WATER" or "SEWER", as appropriate.
3. All valve boxes shall be installed flush to finished grade.
4. A plumb ductile iron pipe or C-900 PVC riser shall be used if depth so requires, with approval.
5. In order to maintain adequate cover over valve nut, the following minimum cover over pipe are required:

GATE VALVE SIZE	MIN. COVER OVER PIPE
16"	48"
20"	54"
24"	60"
30"	72"
36"	84"

6. Valve boxes shall not be located in a sidewalk unless specifically approved by the city of west palm beach.

REVISED: FEB-2018	PRESSURE PIPE - VALVE BOX SETTING	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-1



1. See "VALVE BOX SETTING" Standard (P-1) for additional details.
2. All butterfly valves shall be installed with an in-line sleeve.
3. All joints shall be restrained.

REVISED: FEB-2018	PRESSURE PIPE - BUTTERFLY VALVE SETTING	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-2

MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED

SOURCE: THRUST RESTRAINT DESIGN FOR DUCTILE IRON PIPE, DIPRA 6TH EDITION, 2006

FITTING TYPE	PIPE SIZE (Ø)														
	4"	6"	8"	10"	12"	14"	16"	18"	20"	24"	30"	36"	42"	60"	
HORIZ. 90° BEND	18	25	33	39	46	52	58	63	69	80	94	107	119	147	
HORIZ. 45° BEND	8	11	14	16	19	22	24	26	29	33	39	45	50	61	
HORIZ. 22.5° BEND	4	5	7	8	9	11	12	13	14	16	19	22	24	30	
HORIZ. 11.25° BEND	2	3	4	4	5	6	6	7	7	8	10	11	12	15	
90° VERT. OFFSET BEND	UPPER BEND	31	44	58	69	81	92	103	114	124	145	173	200	224	281
	LOWER BEND	18	25	33	39	46	52	58	63	69	80	94	107	119	147
45° VERT. OFFSET BEND	UPPER BEND	13	19	24	29	34	38	43	47	52	60	72	83	93	117
	LOWER BEND	8	11	14	16	19	22	24	24	29	33	39	45	50	61
22.5° VERT. OFFSET BEND	UPPER BEND	7	9	12	14	16	19	21	23	25	29	35	40	45	56
	LOWER BEND	4	5	7	8	9	11	12	13	14	16	19	22	24	30
11.25° VERT. OFFSET BEND	UPPER BEND	4	5	6	7	8	10	11	12	13	15	18	20	23	28
	LOWER BEND	2	3	4	4	5	6	6	7	7	8	10	11	12	15
TEE (BRANCH RESTRAINT) (MIN. PIPE LENGTH ALONG TEE RUN = 5)	4" x Ø	28	-	-	-	-	-	-	-	-	-	-	-	-	-
	6" x Ø	26	40	-	-	-	-	-	-	-	-	-	-	-	-
	8" x Ø	24	39	54	-	-	-	-	-	-	-	-	-	-	-
	10" x Ø	22	38	53	65	-	-	-	-	-	-	-	-	-	-
	12" x Ø	20	36	52	64	77	-	-	-	-	-	-	-	-	-
	14" x Ø	18	35	50	63	76	88	-	-	-	-	-	-	-	-
	16" x Ø	16	33	49	62	75	87	99	-	-	-	-	-	-	-
	18" x Ø	13	32	48	61	75	87	99	110	-	-	-	-	-	-
	20" x Ø	11	30	47	60	74	84	98	109	120	-	-	-	-	-
	24" x Ø	6	26	44	58	72	85	97	108	119	141	-	-	-	-
	30" x Ø	1	21	40	55	69	82	95	106	118	140	169	-	-	-
	36" x Ø	1	15	35	51	66	80	92	104	116	138	168	196	-	-
	42" x Ø	1	8	30	47	63	77	90	102	114	137	167	195	219	-
60" x Ø	1	1	14	34	52	68	82	95	108	132	163	192	217	277	
REDUCER (LARGER PIPE RESTRAINT)	6" x Ø	23	-	-	-	-	-	-	-	-	-	-	-	-	-
	8" x Ø	41	24	-	-	-	-	-	-	-	-	-	-	-	-
	10" x Ø	56	42	23	-	-	-	-	-	-	-	-	-	-	-
	12" x Ø	70	59	43	24	-	-	-	-	-	-	-	-	-	-
	14" x Ø	83	73	60	44	24	-	-	-	-	-	-	-	-	-
	16" x Ø	95	87	75	61	44	24	-	-	-	-	-	-	-	-
	18" x Ø	107	100	89	77	62	44	24	-	-	-	-	-	-	-
	20" x Ø	118	112	103	92	78	62	44	23	-	-	-	-	-	-
	24" x Ø	140	135	127	118	107	94	79	63	44	-	-	-	-	-
	30" x Ø	170	165	160	153	144	134	122	109	95	61	-	-	-	-
36" x Ø	197	194	189	183	176	168	159	148	137	109	61	-	-	-	
42" x Ø	221	219	215	210	204	198	190	181	171	149	108	58	-	-	
60" x Ø	280	278	275	272	269	264	259	253	247	232	206	173	135	-	
PLUG / IN-LINE VALVE	31	44	58	69	81	92	103	114	124	145	173	200	224	281	

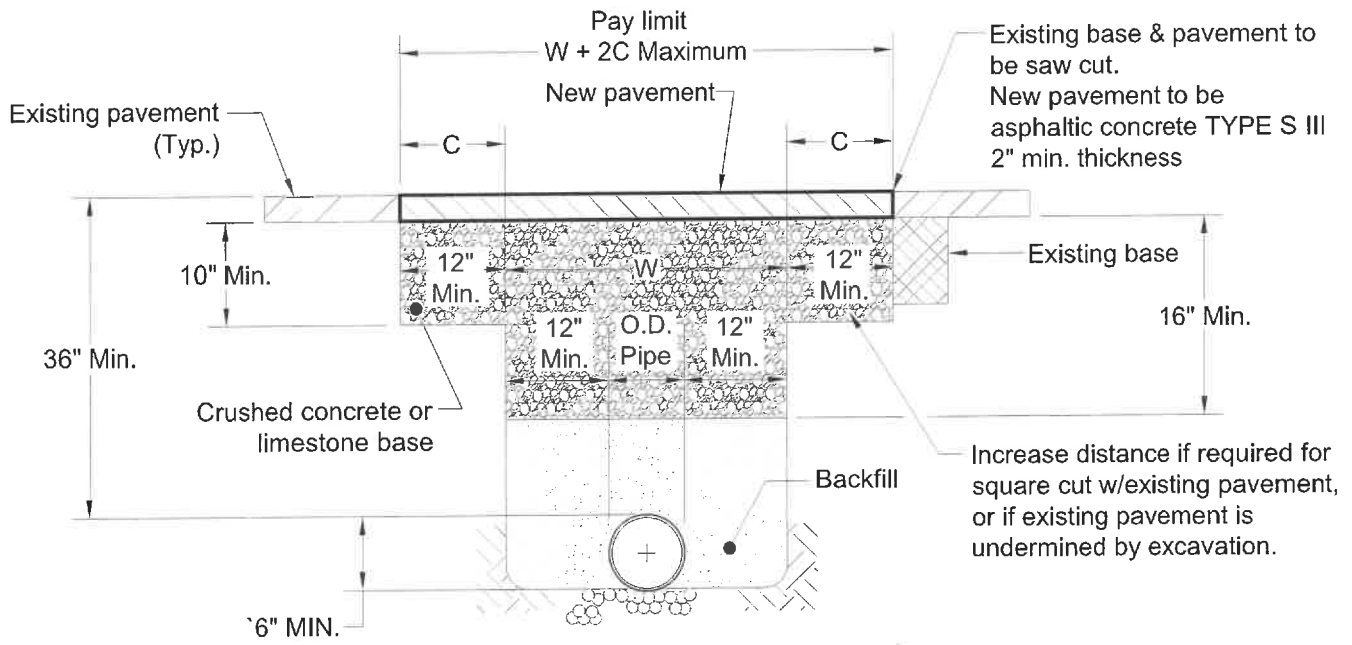
NOTES:

1. THE DATA IN THE ABOVE TABLE ARE BASED UPON THE FOLLOWING INSTALLATION CONDITIONS:

SOIL TYPE: SAND DEPTH OF BURY: 3 FEET
 TRENCH TYPE: 2 TEST PRESSURE: 150 PSI
 SAFETY FACTOR: 1.5
 MINIMUM PIPE LENGTH ALONG TEE RUN: 5 FEET

2. THE RESTRAINED PIPE LENGTHS APPLY TO DUCTILE IRON PIPE ONLY.
3. RESTRAINED PIPE LENGTHS APPLY TO PIPE ON BOTH SIDES OF VALVES AND FITTINGS.
4. MULTIPLY PIPE LENGTH BY 1.4 FOR POLYETHYLENE ENCASED PIPE.
5. ALL JOINTS BETWEEN UPPER AND LOWER BENDS SHALL BE RESTRAINED.
6. DESIGN ENGINEER IS RESPONSIBLE TO PROPERLY SIZE THE RESTRAINT PIPE LENGTHS FOR THE PROJECT.
7. MINIMUM NUMBER OF JOINTS TO BE RESTRAINED SHALL BE MINIMUM LENGTH AS LISTED ABOVE PLUS ONE FULL LENGTH.

REVISED: FEB-2018	PRESSURE PIPE - DESIGN TABLE FOR THRUST RESTRAINT	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-3

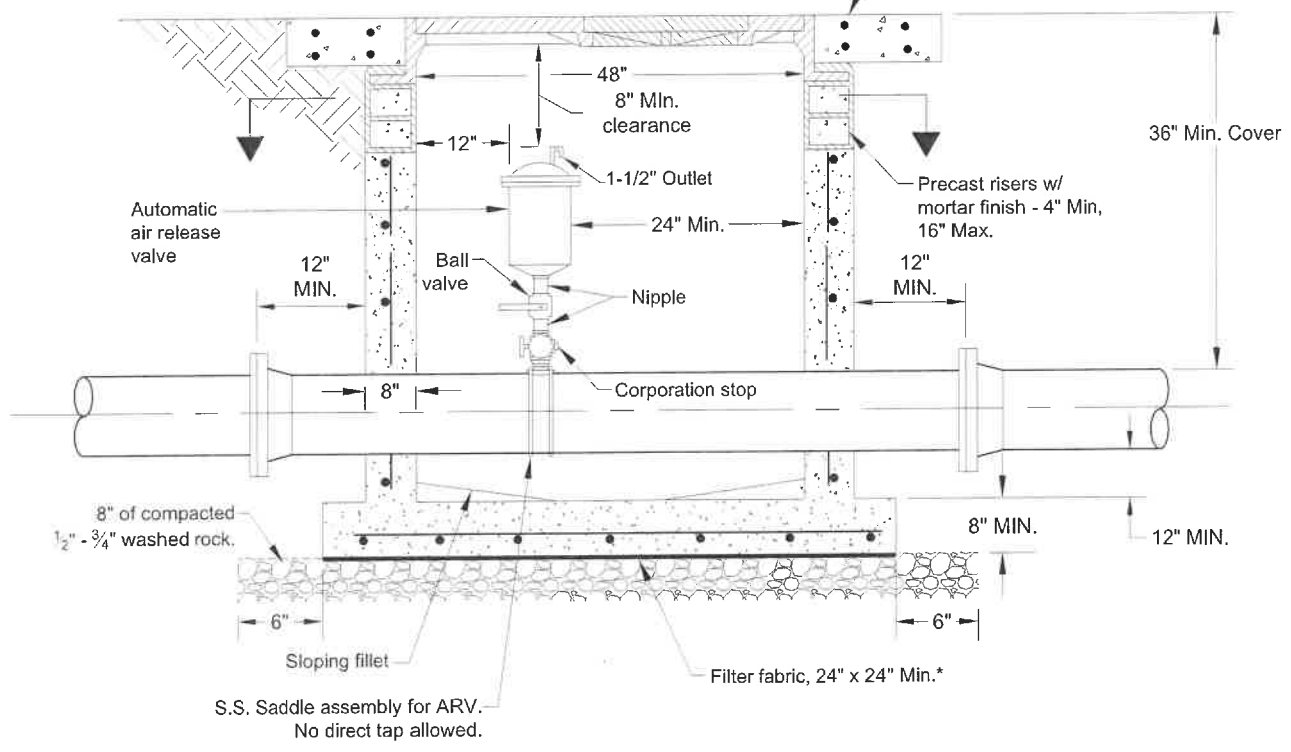
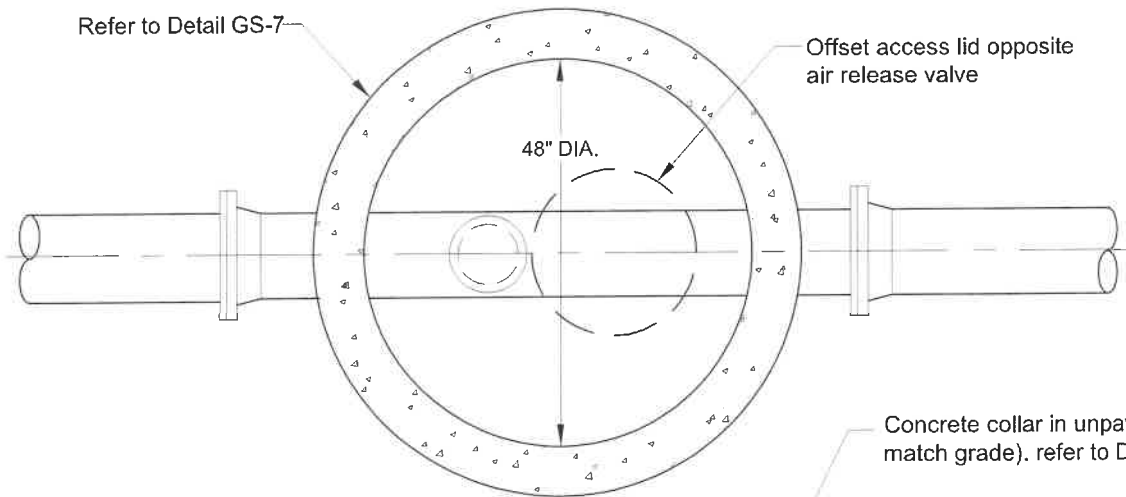
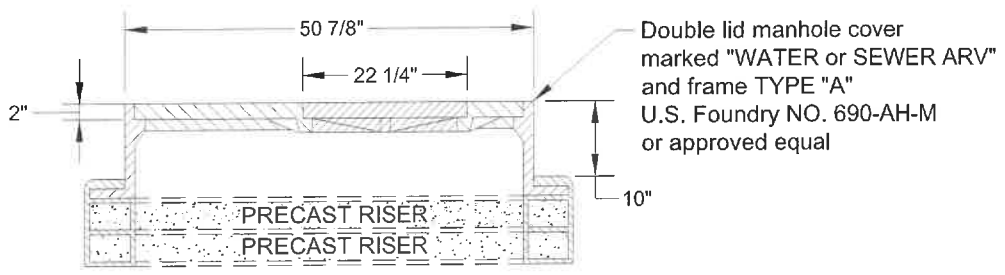


W = O.D. OF PIPE + 12" MIN. AT BOTH SIDES OF PIPE.

C = VARIES W/SOIL TYPE (PER GEOTECHNICAL REPORT).

1. Final Restoration - The road shall be milled/resurfaced 1" minimum depth for full lane width of the travel lane(s) encroached by the trench area, including a transition area of 50 ft on each side of the trench.
2. All pavement sections to be constructed per City of West Palm Beach Standard Detail GC-5. Option to be designated by the City Engineer or his/her designee.
3. Bedding shall consist of in-situ material or washed and graded limerock $\frac{3}{8}$ " - $\frac{7}{8}$ " sizing. Unsuitable in-situ materials such as muck, debris and larger rocks shall be removed.
4. Contractor shall provide adequate compacted fill beneath the haunches of the pipe using mechanical tamps suitable for this purpose. This compaction applies to the material placed beneath the haunches of the pipe and above any bedding required.
5. The contractor shall obtain a well-compacted bed and fill along the sides of the pipe and to a point indicating the baserock material.
6. Backfill compaction within R.O.W. shall be minimum 98% of maximum density pursuant to ASTM D1557. Backfill not in R.O.W. shall be minimum 95% of maximum density pursuant to ASTM D1557. Lifts shall be 12" maximum. density reports shall be provided to City prior to installation of asphalt.
7. Re-striping must be thermoplastic and match existing striping or as directed by the City Engineer or his/her designee.
8. For roads not under City of West Palm Beach jurisdiction, the appropriate road authority standards shall take precedence over the City standards. Refer to FDOT, Palm Beach County or Town of Palm Beach standards, as appropriate.
9. Install tracing or locating wires on top of PVC pipes for future locating purposes.

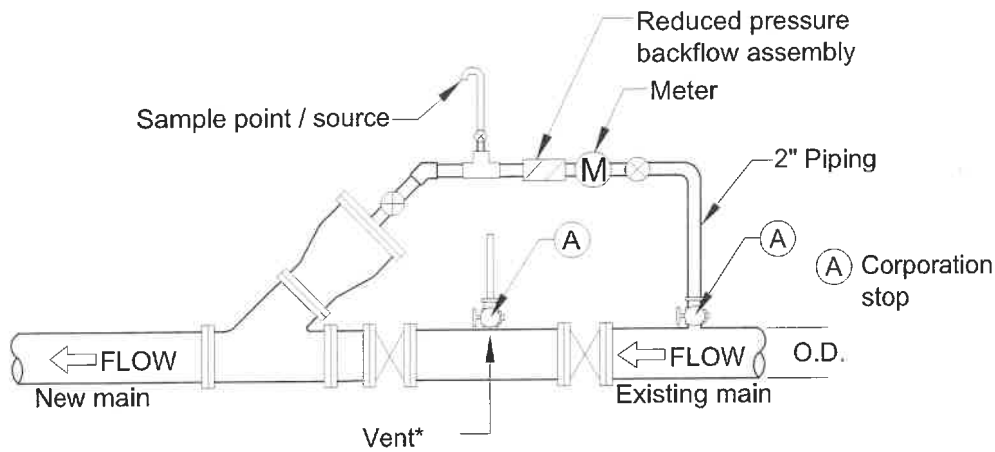
REVISED: FEB-2018	PRESSURE PIPE - TRENCH-BACKFILL-PAVEMENT RESTORATION	STANDARD DETAIL
ISSUED: 2017	CITY OF WEST PALM BEACH	P-4



REVISED: FEB-2018	PRESSURE PIPE - AIR RELEASE VALVE AND VAULT	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-5

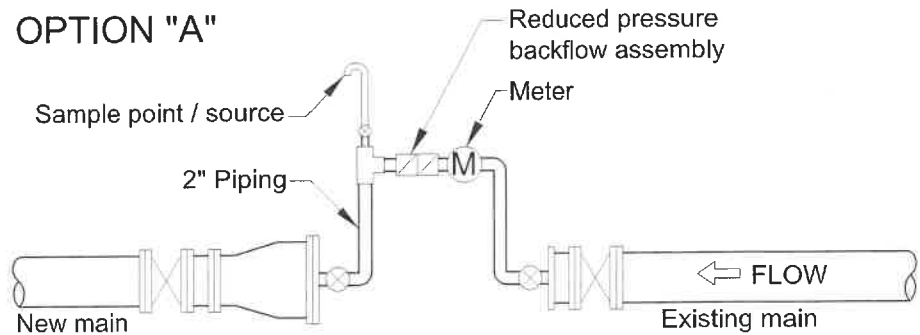
1. Concrete used for vaults, manholes, and risers shall have an ultimate compressive strength at 28 days of 4000 P.S.I. Cement shall be TYPE II Portland.
2. Vault shall be precast or poured in place concrete in accordance with ASTM C478.
3. Air release valve shall be type and size appropriate for service intended.
4. All openings shall be sealed with waterproof non-shrink mortar.
5. Coatings on interior & exterior of manholes and vaults shall be in accordance with City of West Palm Beach approved materials list, and applied in two different colored coats.
6. Reinforced concrete collar required when manhole or vault is outside pavement.
7. No weep holes shall be allowed in vaults for force main & water main ARV'S.
8. For vault to be constructed over existing pipe, see "DOG HOUSE MANHOLE" Standards, DETAIL GS-7.
9. ARV'S shall be installed at high point of water main/force main. Contractor shall adjust location in field as required for installation to be at high point.
10. ARV'S shall be installed with S.S.Saddle Assembly. Direct tap is not acceptable.

REVISED: FEB-2018	PRESSURE PIPE - AIR RELEASE VALVE AND VAULT NOTES	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-5.1



*(VENT SHALL NOT BE USED AS SAMPLING POINT)

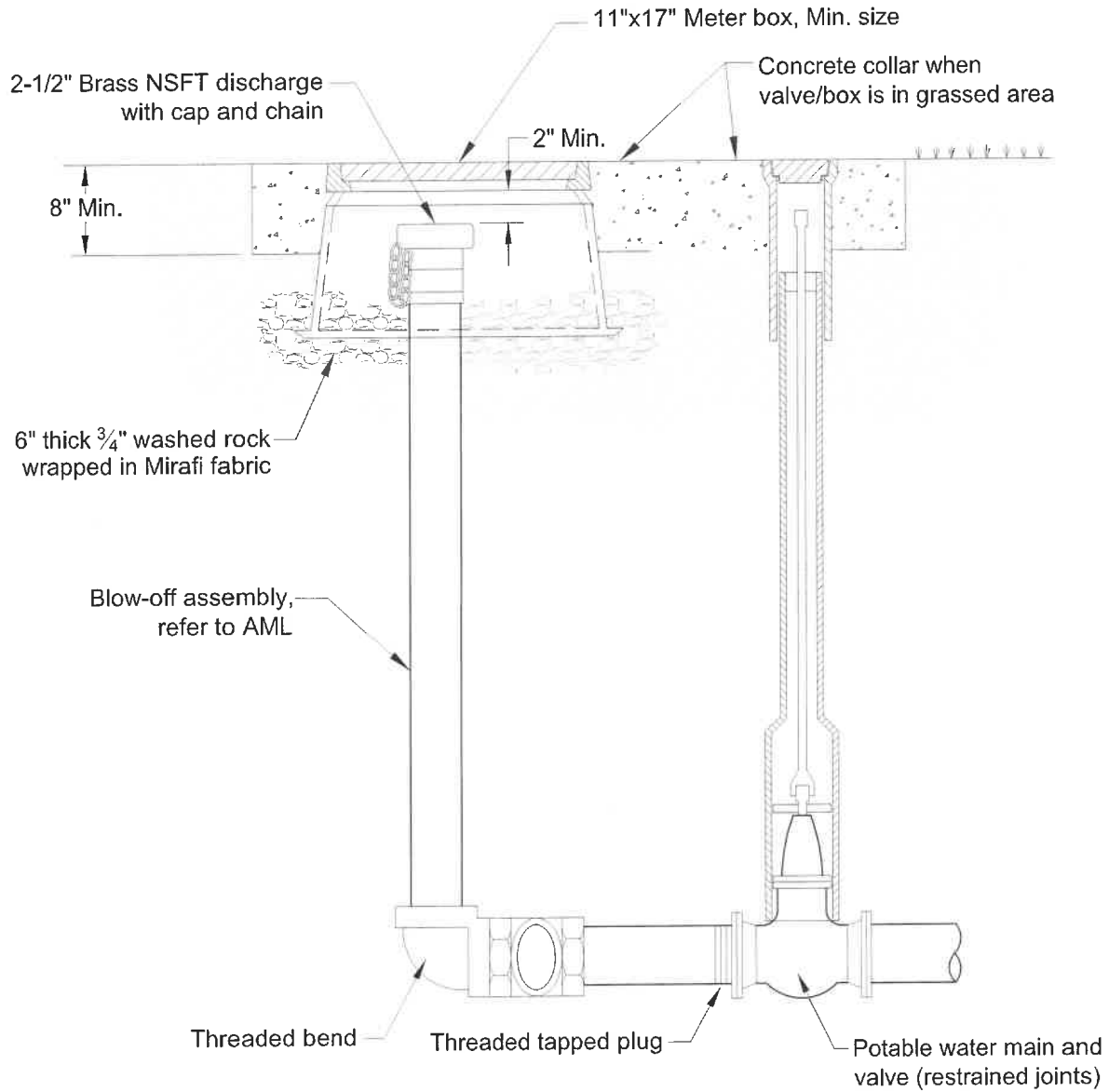
OPTION "A"



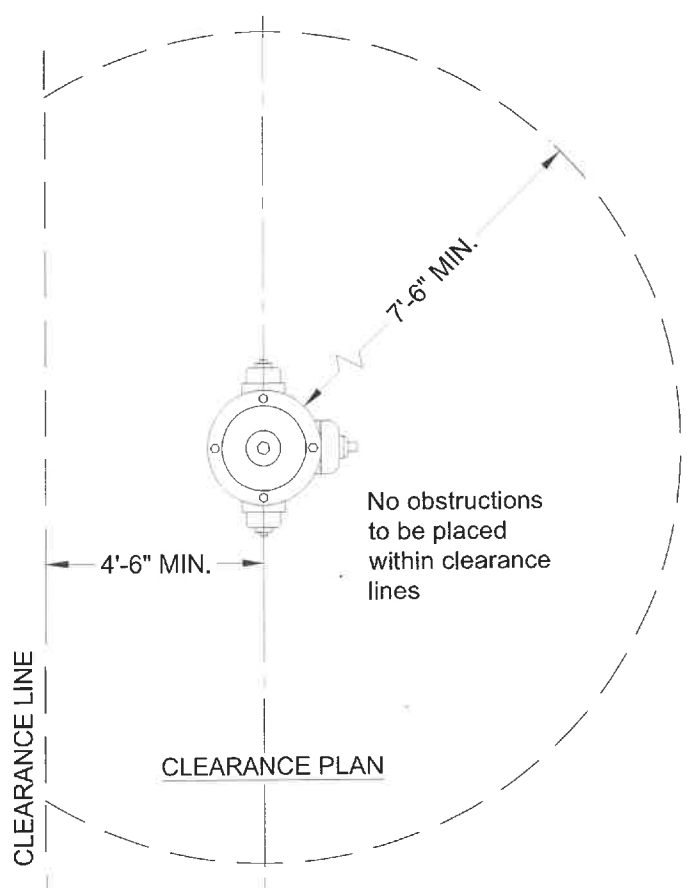
OPTION "B"

1. Except as indicated below for short lengths, each section of pipeline shall be thoroughly cleaned with one polyurethane foam pig. Contractor shall submit a pigging plan as part of the shop drawing submittal.
2. A City representative shall be present at the time of insertion and exit of the pigs. Lines shall be pigged and/or flushed until the water runs clear and is approved by the City representative. The City shall be given 48 hours minimum notice prior to pigging or flushing.
3. On short lengths of pipeline (100' max.) cleaning may be accomplished by flushing with water at a minimum velocity of 2.5 feet per second. Water required for testing and cleaning shall be supplied by the City at the contractor's expense. Water shall be from a potable source satisfactory to the City and shall be sampled as part of the sampling program.
4. Reducer to be new main size plus 2" larger.
5. Wye to be plugged and restrained at the end of pigging.
6. At the end of the project, all corporations to be removed and corporation plugs to be installed.
7. Sample point to be located after backflow preventer.
8. All materials, pipe and fittings to be in accordance with the City's AML.
9. Install reducer with pig inside. Only one pig will be allowed to be run through the main at a time. Pipe shall be pigged min. twice. pipe extension cap may be required.
10. All backflow prevention assemblies must be approved by the foundation for cross connection control and hydraulic research, University of Southern California.

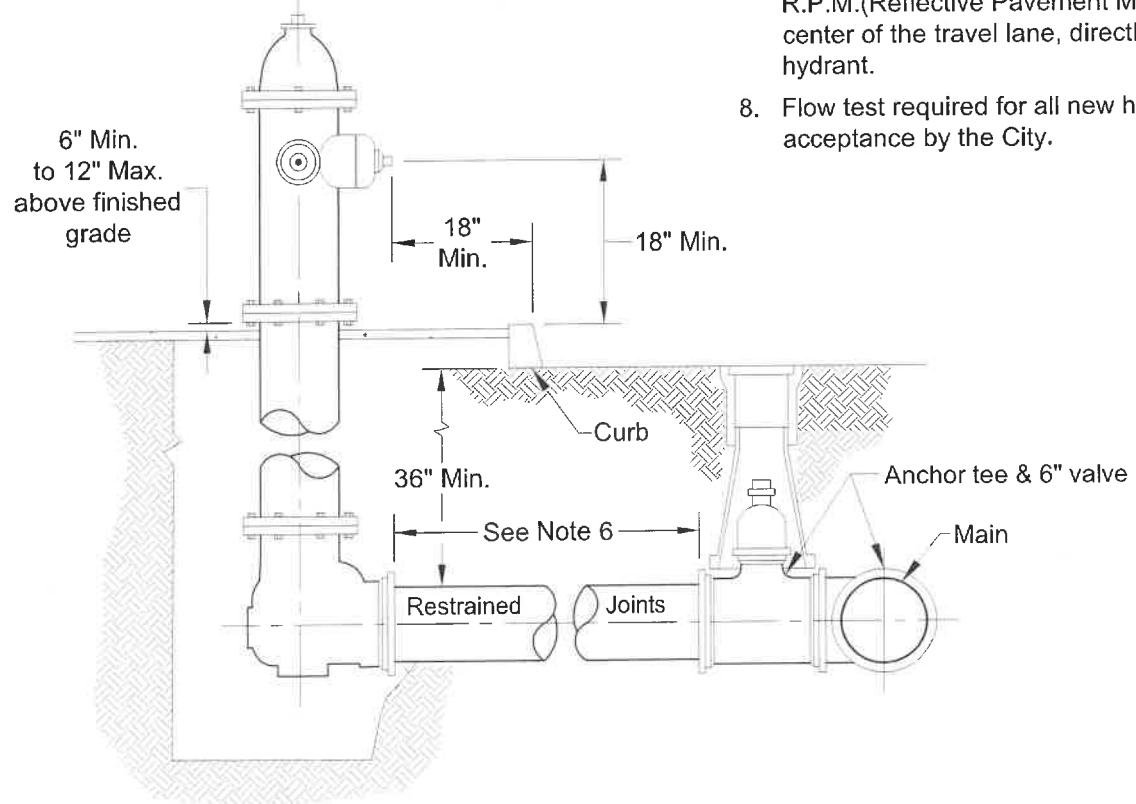
REVISED: NOV-2018	PRESSURE PIPE - PIGGING PROCEDURE	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-6



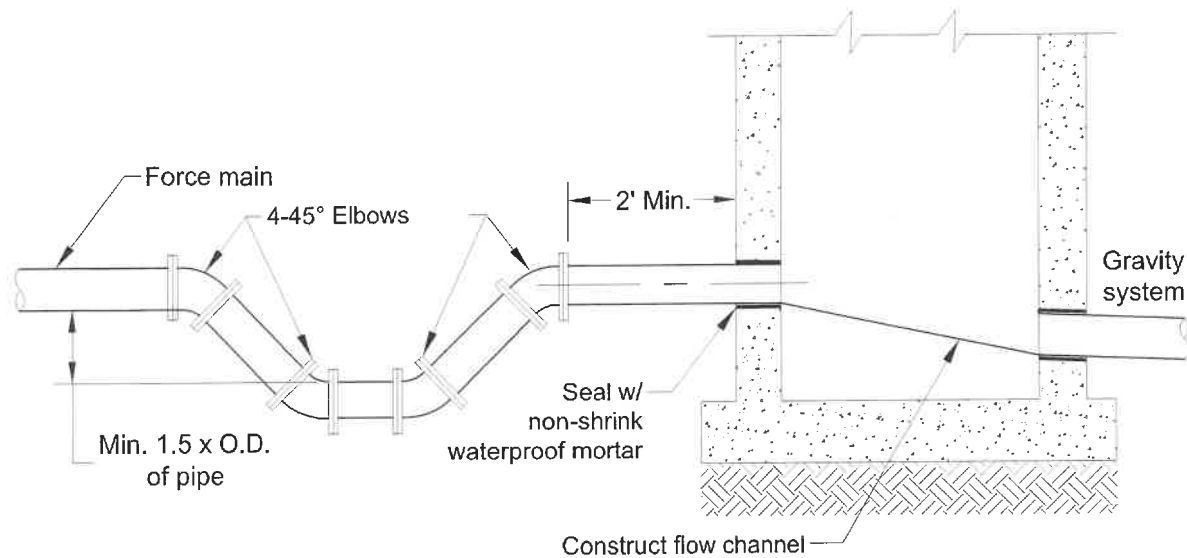
REVISED: FEB-2018	PRESSURE PIPE - 2" TERMINAL BLOW-OFF	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-7



1. All hydrants to be manufactured to City of West Palm Beach specifications, including iron weather cap, per W.P.B. AML.
2. Bonnet shall be painted with reflective coating. All other parts above breakway flange shall be painted silver. Any other parts below breakway flange shall be painted black. All paint materials to be as specified on approved materials list.
3. For projects within F.D.O.T. & Palm Beach County R/W: Hydrants to be located in dedicated easements outside of R/W.
4. All joints including bell and spigot shall be restrained.
5. See "VALVE BOX SETTING" Standard for additional details.
6. If distance between fire hydrant and anchor tee exceeds 30 ft., add a second valve 4 ft. from hydrant. No fittings permitted between hydrant valve and hydrant base elbow.
7. Install an F.D.O.T. approved Blue R.P.M.(Reflective Pavement Marker) in the center of the travel lane, directly in front of hydrant.
8. Flow test required for all new hydrants prior to acceptance by the City.

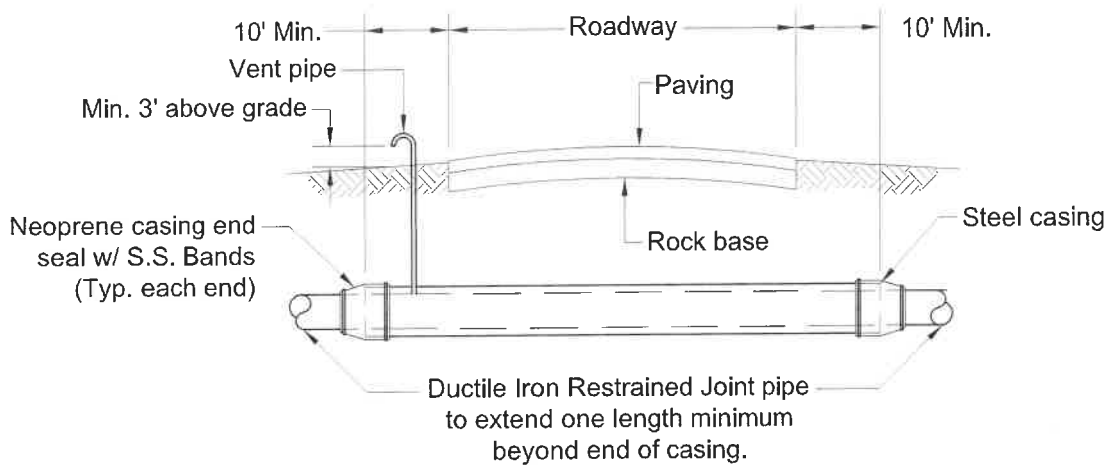


REVISED: FEB-2018	PRESSURE PIPE - FIRE HYDRANT CONNECTION	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-8

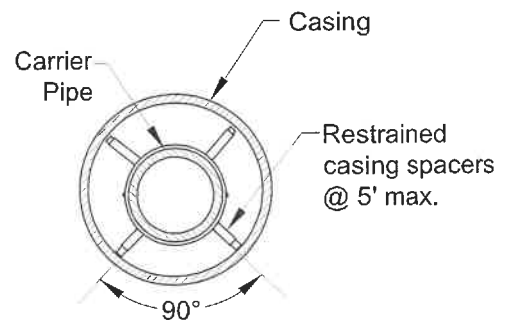


1. Force main to enter manhole at $180^{\circ} \pm 10^{\circ}$ from gravity outflow.
2. The invert level of force main at point of entry shall be no less than $2 \frac{1}{2}$ ".
3. Entry into existing manholes shall be by coring only.
4. Trap to be installed prior to drop into manhole and, if possible, shall be located outside of paved areas.
5. Flow channel required to gravity system from force main. refer to DETAIL GS-3.
6. If force main is to discharge into an existing manhole, then the contractor shall replace or rehabilitate manhole as required by the City.
7. Refer to DETAIL GS-4 for inside drop manhole requirements.

REVISED: FEB-2018	PRESSURE PIPE - FORCE MAIN AT MANHOLE	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-9



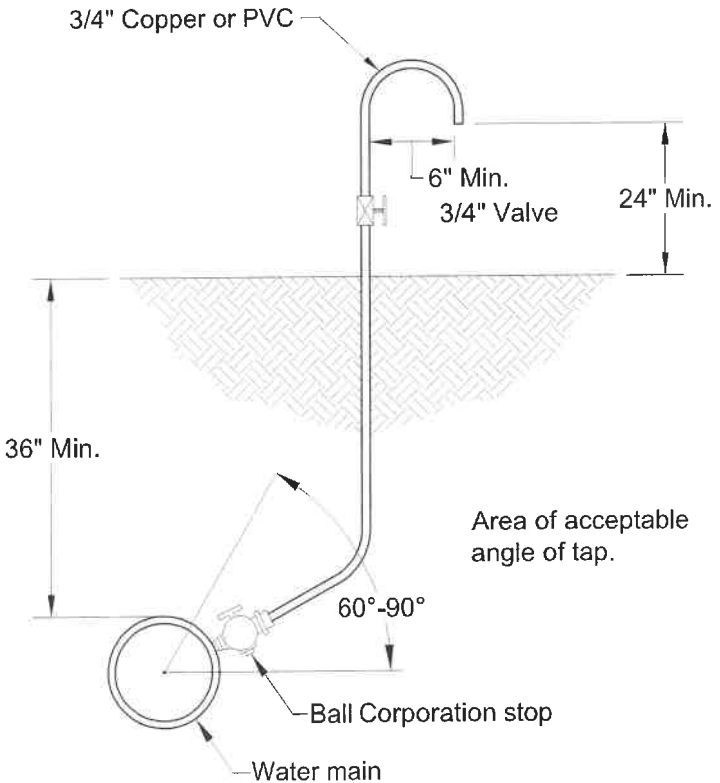
CARRIER PIPE SIZE	STEEL CASING	MIN. WALL THICKNESS	VENT PIPE SIZE
4"	12"	.188	2"
6"	14"	.250	2"
8"	16"	.250	2"
10"	18"	.250	2"
12"	20"	.250	3"
14"	24"	.250	3"
16"	24"	.250	3"
18"	30"	.250	4"
20"	30"	.250	4"
24"	36"	.250	4"
30"	42"	.312	4"
36"	48"	.375	4"
42"	60"	.500	4"
48"	72"	.500	4"



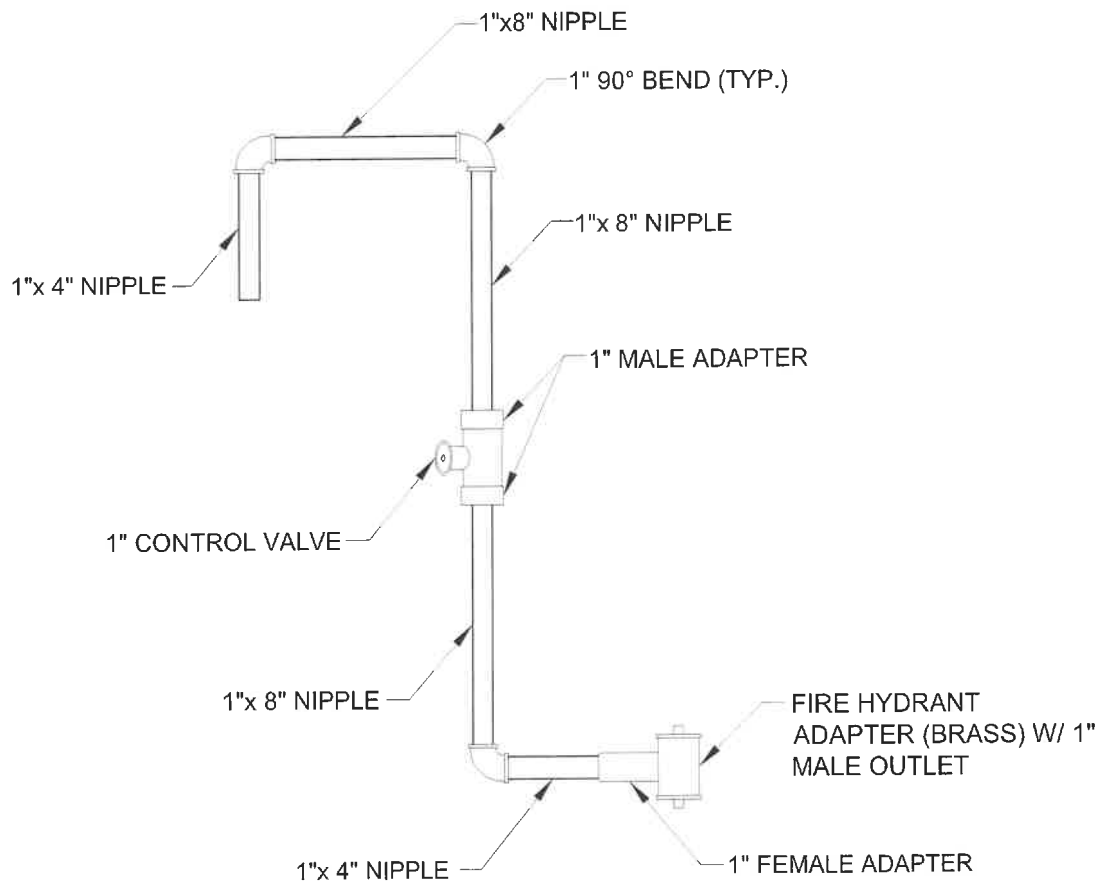
1. Pipe casing shall be in accordance with current ASTM Specification A139 and be protected by a black bitumastic coating for protection against corrosion.
2. Wall thickness shall be as noted in table above unless superceded by more stringent F.D.O.T. Standards, or Railroad Standards applying to those installations.
3. Ends shall be sealed with approved pressure resistant fittings. no grout.

REVISED: FEB-2018	PRESSURE PIPE - PIPE CASING	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-10

After satisfactory bacteriological testing, remove the tubing, corporation and plug the main with corporation plugs.



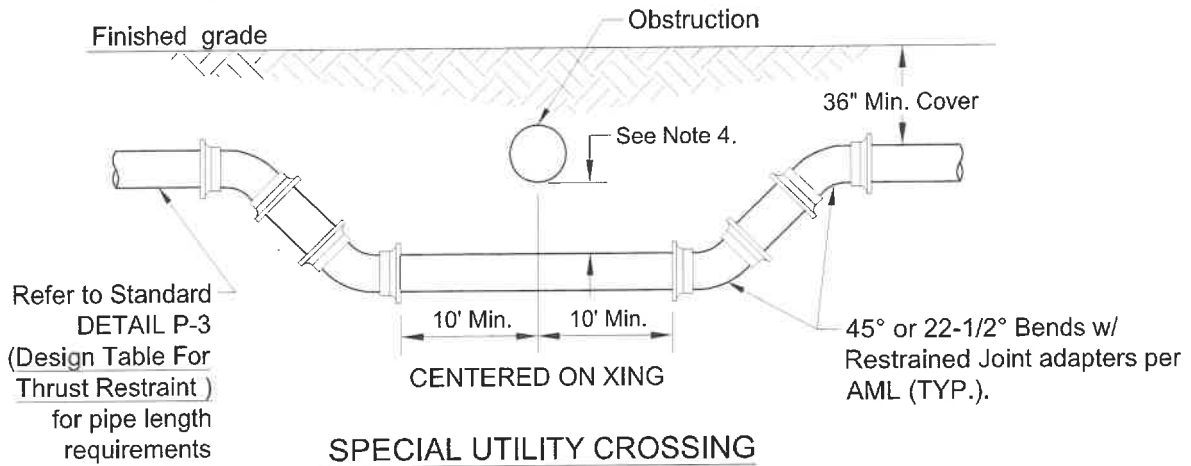
REVISED: FEB-2018	PRESSURE PIPE - SAMPLING POINT	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-11



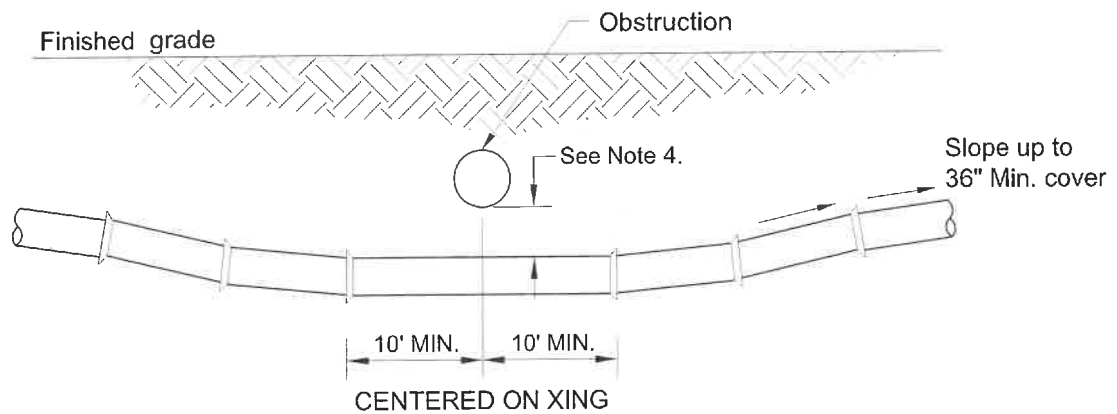
NOTES:

1. USE HYDRANT WRENCH ONLY
2. ALL PIPES AND FITTINGS SCHEDULE 40 PVC (PIPE COLOR: WHITE)

REVISED: FEB-2018	PRESSURE PIPE - FIRE HYDRANT SAMPLING POINT	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-11.1



SPECIAL UTILITY CROSSING
FITTING TYPE
 N.T.S.



SPECIAL UTILITY CROSSING
DEFLECTION TYPE
 N.T.S.

1. The deflection type crossing shall be used wherever possible. Only under specific orders by the engineer shall the fitting type crossing be allowed.
2. Construct deflection crossing using 75% of manufacturer's maximum joint deflection.
3. All mechanical joints shall be restrained per City standards.
4. Unless shown otherwise, 12" min. clearance will be required for water and sewer main crossings. 6" min. clearance will be required for other type of utilities crossings. (as measured (O.D. TO O.D.)

REVISED: FEB-2018	PRESSURE PIPE - UTILITY CONFLICT CROSSING	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-12

1. ALL OPENINGS IN MANHOLES & STRUCTURES SHALL BE SEALED WITH WATERPROOF NON-SHRINK MORTAR, EXCEPT AS OTHERWISE INDICATED IN THE PLANS OR SPECIFICATIONS.
2. ALL VALVE BOXES, MANHOLE FRAMES AND COVERS ARE TO BE FLUSH WITH PROPOSED FINISHED GRADES OF WALKS, PAVEMENTS, SWALES, ETC. THEY SHALL HAVE CONCRETE PADS POURED IN UNPAVED AREAS IN ACCORDANCE WITH VALVE, AIR RELEASE & MANHOLE SETTING DETAILS.
3. PRESSURE AND LEAKAGE TESTS SHALL BE CONDUCTED IN THE PRESENCE OF THE OR AN APPOINTED REPRESENTATIVE. CONTRACTOR WILL PROVIDE ALL NECESSARY APPARATUS INCLUDING PUMP, MEASURING DEVICE, PIPING CONNECTIONS, FITTINGS AND THE NECESSARY LABOR TO CONDUCT THE TEST. THE TEST SHALL BE A MINIMUM 2 HOUR DURATION. DURING THE TEST, THE PIPE BEING TESTED SHALL BE MAINTAINED AT A PRESSURE OF NOT LESS THAN 150 psi FOR WATER MAINS AND 100 psi FOR FORCE MAINS. THERE SHALL NOT BE A LOSS OR GAIN OF MORE THAN 5 psi DURING THE TEST. FOR WATER MAIN, LEAKAGE IS DEFINED AS THE QUANTITY OF WATER ADDED TO THE PIPE AFTER THE TESTING PERIOD. NO PIPE INSTALLATION WILL BE ACCEPTED IF THE LEAKAGE EXCEEDS THE QUANTITIES SPECIFIED IN AWWA C-600 SECTION 5.2 AS FOLLOWS:

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

WHERE:

- L = TESTING ALLOWANCE (MAKEUP WATER) IN GALLONS PER HOUR
- S = LENGTH OF PIPE TESTED, IN FEET
- D = NOMINAL DIAMETER OF THE PIPE, IN INCHES
- P = AVERAGE REST PRESSURE DURING THE HYDROSTATIC TEST, IN POUNDS PER SQUARE INCH (GAUGE)

4. NO LEAKAGE IS ALLOWED FOR FORCE MAIN.
5. CONTRACTOR SHALL SUBMIT TO THE ENGINEER THE PROPOSED TESTING PATTERN TO FOLLOW. THIS SHALL BE SUBMITTED FOR APPROVAL BY THE ENGINEER TO THE CITY PRIOR TO TESTING. UNLESS APPROVED BY THE ENGINEER, THE CONTRACTOR SHALL NOT TEST MORE THAN 1,500' OF PIPE IN A SINGLE TEST, AND ALL SERVICES MUST BE INSTALLED.
6. THE CITY OF WEST PALM BEACH SHALL BE GIVEN A MINIMUM OF 48 HOURS NOTICE TO ENABLE THE UTILITY DEPARTMENT'S REPRESENTATIVE TO BE PRESENT FOR OBSERVATIONS.
7. PRESSURE AND LEAKAGE TEST SHALL BE CONDUCTED AFTER BACKFILL AND TRENCH RESTORATION.

REVISED: FEB-2018	GENERAL NOTES - APPLICABLE TO PRESSURE PIPE SYSTEMS	STANDARD DETAIL
ISSUED: 2016	CITY OF WEST PALM BEACH	P-13