

## 1. POTABLE WATER DESIGN

There shall be no physical connection between an active Potable Water supply and an unapproved water supply, or any reclaimed water, Wastewater or storm water system, which would allow unsafe water to enter, or backflow into the active Potable Water system by direct pressure, vacuum, gravity or any other means. All Potable Water services shall be in compliance with all applicable cross connection control regulations. All brass in contact with Potable Water shall be "Lead Free".

Design standards for Potable Water mains (WM) are as follows (Raw water mains shall be designed and constructed to Potable Water main standards):

(a) Minimum Cover:

Design finished grade over WM shall be 36" minimum (30" is acceptable with DIP except for pipes under proposed/existing pavement in public rights-of-way) and 60" maximum. All Potable Water transmission mains within major thoroughfare rights of way shall have full plan and profiles shown. Pipes shall be designed to be as level as possible to avoid high points. Reduced minimum cover requires prior approval.

(b) Minimum Horizontal Separation (Wall to Wall):

- (1) 10' to buildings, exfiltration trenches, roof overhangs, canopies, walls, fountains, and other structures.
- (2) 10' to Wastewater lines (Min. 6' may be approved in special cases)
- (3) 10' to drainage pipes (Min. 3' may be approved in special cases).
- (4) 4' to power poles, light poles and other public utility lines
- (5) 3' to drainage structures and reclaimed water lines

(c) Vertical Separation:

- (1) 12" separation between all pipes should be maintained. A minimum of 6" vertical separation is acceptable, however, if it is not possible to maintain 12" and if the water main crosses over a storm or Wastewater gravity main. When there is no alternative to the water main passing under a storm or Wastewater main, and when the water main crosses over or under a reclaimed water main, or force main, a minimum of 12" vertical clearance shall be maintained.
- (2) WM shall cross over other pipes unless not feasible.

(d) Layout:

- (1) The Potable Water mains shall be looped unless otherwise not feasible. Multiple feed lines may be required at discretion of the Department. Permanent "Dead Ends" are not acceptable unless unavoidable. Dead Ends shall be equipped with a blow-off for flushing or automatic flushing devices to maintain water quality.
- (2) WM should be placed in ROWs or dedicated common tracts whenever possible. Placement

of WM on or adjacent to interior property lines or between structures is discouraged and will be approved only when unavoidable or when necessary for looping. Water mains shall not be placed in ditches, landscape buffers, wetlands, or storm water management areas unless specifically approved by the Department.

- (3) Details of connections to existing facilities must be shown. A reverse tap due to pre-existing conditions are acceptable only if approved by the Department (detail drawing required).
- (4) In order to facilitate Potable Water service for all properties within the service area, Potable Water mains shall be extended along the full length of all fronting boundaries of a property by the Developer/Owner requesting Potable Water service and may be required to be extended through the property if another is to be served in the future.
- (5) Loop Potable Water main to existing Potable Water mains or leave provisions for looping or extension whenever possible. The mains in such instances shall end with a valve and plug. Water mains 16" and larger shall end with a teed off fire hydrant, inline valve and plug. The valve shall be mechanically restrained. Approved permanent "Dead Ends" shall be terminate with automatic flushing devices.
- (6) Sample points as required by the Health Department must be shown on plans.

(e) Potable Water Main Material:

Pressure Class Rated or Special Thickness Class Rated Cement Lined Ductile Iron Pipe (DIP) or C-900 Class 150 DR 18 PVC pipe (Color: Blue) shall be allowed for WM 12" diameter or smaller. The lining for DIP shall be factory applied in accordance with the manufacturer's specifications and shall be warranted by the pipe manufacturers. Unless specific approval is granted, no water main shall be encased in concrete. Potable Water mains shall be marked with one continuous strip of 6" wide magnetic blue coded tape imprinted with two (2) inch high lettering reading "Caution - Potable Water Line Buried Below", and located approximately twelve (12) inches above the crown of the pipe. The wording shall occur every three (3) feet. Buried DIP smaller than 24" shall be painted with a 4" wide continuous blue line parallel to the axis of the pipe and that is located on top of pipe. Buried DIP 24" and larger shall have a 4" wide continuous blue line applied along each side of pipe as well as along the top of pipe. The coating shall be minimum 8 mils WFT, and minimum 3 mils DFT.

DIP shall be required in the following circumstances:

- (1) WM 16" in diameter or larger.
- (2) WM smaller than 6".
- (3) Within 10' of Wastewater/ storm/reclaimed water pipes for parallel installation.
- (4) Within 15' of structures, (near side of concrete footing), and top of bank of canals or lakes.
- (5) Crossings over Wastewater, reclaimed water and storm pipes with less than 12" separation with no joint within 10' of each other; crossings under any Wastewater, reclaimed water or storm pipe.

- (6) Jack and bores (mechanical joints with "Megalugs" or equal).
- (7) Potable Water mains for fire sprinkler system connections up to point of service.
- (8) Fire hydrant branches.
- (9) The right is reserved to mandate DIP in any instances of off-site or on-site construction where future damage to the line is possible due to location or circumstances, or in private property away from dedicated ROWs.
- (10) Flanged ductile iron pipe is required for exposed (not buried) installation.
- (11) Ductile iron pipe shall be polywrapped if buried closer than 10' to other underground iron/steel pipes if no other protection is provided.
- (12) Water main with less than 36" cover over pipe.
- (13) Where required for locations with substandard separations to other piping systems.

(f) Potable Water Main Size:

The WM shall be sized by the developer's engineer as required. The Department's Master Planning may require a greater diameter. An over sizing credit as defined in **Chapter 3** may apply. Use the "Friction Coefficient Factor"  $C=120$  for flow calculations and a peak instantaneous flow velocity of 3 feet per second to determine applicable credits.

The minimum size of WM shall be 6". Four-inch (4") mains may be proposed for non-fire hydrant lines serving cul-de-sacs where additional development will not occur. The engineer may be required to demonstrate the adequacy of such sizing. In cases where the completion of gaps in the Potable Water systems to meet flow requirements of the development is necessary, the developer shall construct the required improvements. Delivered flows shall meet peak domestic requirements as mandated by State DEP plus fire flow as mandated by the Fire Marshall. Domestic average flows shall be based on 270 gpd per Equivalent Residential Connection. The residual pressure under these conditions shall not be less than 20 psi. Potable Water Main sizes shall conform to the latest Department Potable Water Master Plan.

(g) Valves and Appurtenances:

- (1) Valves - Valving of all systems shall be designed to facilitate the isolation of each section of pipeline between intersections of the grid system. Generally, the number of valves at an intersection shall be one less than the number of pipes forming the intersection.

All valves shall have mechanical joint or flanged ends and be of resilient seat design with right hand closed operation; valves 12" or greater shall be butterfly valves unless another type of valve is approved in writing by the Department. Butterfly valves larger than 16" shall have worm gears. Valves shall be certified for buried service if applicable. Valves 24" and smaller shall be rated min. 150 psi. Larger valves shall be rated min. 200 psi.

Inline valves shall be installed for mains 16" and smaller near each side of a canal crossing and/or major road crossing.

In-line valves shall generally be installed at intervals no greater than 1,000 feet on

transmission mains, at intervals of no greater than 700 LF on main distribution loops and feeders, and on all primary branches connected to these lines. In high-density areas, valves shall be installed as necessary to minimize the number of persons affected by a break. In all instances, effectiveness of placement shall be primary criteria in determining valve location. Valves placed in curbs will not be accepted. When located in traffic areas, valves shall be placed in center of traffic lanes. All valves require lids and must be marked "water". All valves shall be numerically identified on construction drawings.

Clearance of 18" or one pipe diameter, whichever is greater, shall be maintained between all fittings (bells, valves, saddles, flanges, etc).

- (2) Air Release Valves - Air release valves shall be installed at all canal crossings and at high points. Air release valves shall be sized per manufacturer's recommendations.
- (3) All fittings, bends, crosses and caps shall have mechanical joint or flanged ends unless an approved flexible joint restraint system is used.

(h) Thrust Restraint:

- (1) All bends, tees, crosses, reducers, valves and dead ends shall be restrained through an approved means of mechanical or approved flexible joint restraint. Thrust blocks consisting of poured-in-place concrete having a minimum compressive strength of 2,500 psi after 28 days cure may be utilized only with prior approval for connections to existing un-restrained piping. Any line terminated as a construction phase that is a known future extension, shall have a plugged valve placed at the end, and restrained with approved mechanical or flexible joint restraint.
- (2) An adequate number of pipe lengths shall be restrained using approved mechanical joint restraints (MJ pipe), flexible joint restraints (DIP push-on joint pipe) or pressure pipe bell restraints (PVC or DIP push-on joint pipe) to handle 150 psi working pressure and 250 psi surge pressure. Pipes larger than 24" shall be restrained and pressure tested to 200 psi. If the restraint pipe length on a design deviates from the standard length listed herein in the restrained pipe lengths shall be designed by a Registered Engineer based upon the soil conditions and shall be shown on the design drawings and record drawings.
- (3) If flexible joint restraints are utilized, the following requirements must be met:
  - The installation of flexible joint restraints must be witnessed by a Construction Coordinator.
  - A copy of the material invoice must be available on the job site for review to confirm the shipment of restraining gaskets, etc.
- (4) PVC/DI pipe transitioning from HDPE pipe shall be restrained as a minimum to "in-line valve" condition.

**MIN. LENGTH OF PIPE (FEET) TO BE RESTRAINED**

(SOURCES: EBAA IRON RESTRAINT LENGTH CALCULATION PROGRAM FOR PVC PIPE, RELEASE 3.1, AND DIPRA THRUST RESTRAINT FOR DUCTILE IRON PIPE, RELEASE 3.2)

FITTING TYPE		PIPE SIZE								200psi			
		4"	6"	8"	10"	12"	16"	20"	24"	30"	36"	42"	48"
90° HORIZ. BEND		14	20	25	30	35	45	54	62	98	112	124	135
45° HORIZ. BEND		6	8	11	13	15	19	22	26	41	46	51	56
22.5° HORIZ. BEND		3	4	5	6	7	9	11	12	19	22	25	27
11.25° HORIZ. BEND		1	2	3	3	4	4	5	6	10	11	12	13
90° VERT. OFFSET	UPPER BEND	29	41	53	64	74	95	115	134	214	246	276	304
	LOWER BEND	7	10	13	16	19	25	30	35	57	66	74	83
45° VERT. OFFSET	UPPER BEND	12	19	24	29	34	39	48	56	89	102	114	126
	LOWER BEND	3	4	6	7	8	10	12	15	23	27	31	34
22.5° VERT. OFFSET	UPPER BEND	6	9	12	14	17	19	23	27	43	49	55	60
	LOWER BEND	1	2	4	4	4	5	6	7	11	13	15	16
11.25° VERT. OFFSET	UPPER BEND	3	4	6	7	8	9	11	13	21	24	27	30
	LOWER BEND	1	1	1	2	2	2	3	3	6	6	7	8
PLUG (DEAD END)		32	45	59	70	83	107	129	151	214	246	276	304
IN-LINE VALVE		32	45	45	45	45	55	65	80	110	125	140	155
TEE (BRANCH RESTRAINT)	4"X Ø	23	-	-	-	-	-	-	-	-	-	-	-
	6"X Ø	21	35	-	-	-	-	-	-	-	-	-	-
	8"X Ø	18	34	47	-	-	-	-	-	-	-	-	-
	10"X Ø	16	32	46	58	-	-	-	-	-	-	-	-
	12"X Ø	13	30	44	57	69	-	-	-	-	-	-	-
	16"X Ø	7	26	41	55	67	90	-	-	-	-	-	-
	20"X Ø	1	21	38	52	65	88	109	-	-	-	-	-
	24"X Ø	1	16	34	49	62	86	108	129	-	-	-	-
	30"X Ø	1	8	28	44	58	83	106	127	208	-	-	-
	36"X Ø	1	1	22	39	54	80	103	124	206	240	-	-
	42"X Ø	1	1	15	33	49	77	100	122	205	239	270	-
48"X Ø	1	1	7	27	44	73	97	120	203	238	269	298	
REDUCER (LARGER PIPE RESTRAINT)	6"X Ø	23	-	-	-	-	-	-	-	-	-	-	-
	8"X Ø	38	25	-	-	-	-	-	-	-	-	-	-
	10"X Ø	57	43	24	-	-	-	-	-	-	-	-	-
	12"X Ø	72	60	44	41	-	-	-	-	-	-	-	-
	16"X Ø	99	90	78	75	45	-	-	-	-	-	-	-
	20"X Ø	123	116	107	105	81	45	-	-	-	-	-	-
	24"X Ø	146	140	132	131	111	82	45	-	-	-	-	-
200psi	30"X Ø	209	204	197	188	177	153	116	75	-	-	-	-
	36"X Ø	243	236	233	226	217	196	168	135	74	-	-	-
	42"X Ø	273	270	265	259	252	234	211	183	133	72	-	-
	48"X Ø	301	298	294	289	283	268	249	226	183	131	71	-

**NOTES:**

- THE DATA IN THE ABOVE TABLE ARE BASED UPON THE FOLLOWING INSTALLATION CONDITIONS:  
 SOIL TYPE-SAND                      TEST PRESSURE-150 PSI/200 PSI                      DEPTH OF BURY-3'  
 TRENCH TYPE-3                      SAFETY FACTOR- 1.5                      VERTICAL OFFSET-3'  
 MINIMUM PIPE LENGTH ALONG TEE RUN-5'
- THE RESTRAINED PIPE LENGTHS APPLY TO DUCTILE IRON AND PVC PIPE.
- ALL JOINTS BETWEEN UPPER AND LOWER BENDS SHALL BE RESTRAINED.
- RESTRAINED PIPE LENGTHS APPLY TO PIPE ON BOTH SIDES OF VALVES AND FITTINGS.
- MULTIPLY PIPE LENGTH BY 1.4 FOR POLYETHYLENE ENCASED PIPE.
- RESTRAINED PIPE LENGTHS EQUAL TO AN "INLINE VALVE" CONDITION ARE REQUIRED AT EACH END OF A TRANSITION FROM HDPE PIPE TO OTHER PIPE MATERIALS.
- DESIGN ENGINEER IS RESPONSIBLE TO PROPERLY SIZE THE RESTRAINT PIPE LENGTHS FOR THE PROJECTS.

**Notes:**

- The data in the above table are based upon the following installation conditions:

Soil Type – Sand

Test Pressure – 150 psi up to 24", 200 psi for pipes larger than 24".

Depth of Bury – 3'

Trench Type – 3

Safety Factor – 1.5

Vertical Off-Set – 3'

Minimum pipe length along tee run – 5'

- The restrained pipe lengths apply to PVC pipe and DIP without polyethylene encasement.
- All joints between upper and lower bends shall be restrained.
- Restrained pipe lengths apply to pipe on both sides of valves and fittings.

The above table shall serve as a general design and construction guide only. It is the Engineer's responsibility to justify and document any deviations from the pipe lengths specified in the above table.

i. Fire Hydrants and Fire Sprinkler Systems:

The appropriate Fire Marshall has final jurisdiction on fire flow requirements, on hydrant locations and fire sprinkler system requirements. A Fire Marshall approved plan is required with each first plan submission and with any revision that relocates a hydrant or a fire line connection. An approved above ground Double Check Detector Valve Assembly (DCDA) or Reduced Pressure Principle Detector Assembly (RPDA) shall be installed prior to Service Activation on all dedicated fire lines.

- (1) Fire Hydrants - Fire hydrants shall be provided in all Potable Water distribution systems and shall have a 5-1/4" main valve. Each hydrant shall be equipped with approved locking caps (with chains). The caps must be installed prior to water system certification. Fire hydrants shall be spaced such that the radius of protection will not be more than 300', or as approved by the Fire Marshall. For new developments, water distribution system shall be capable of delivering a minimum fire flow of 1,000 gallons per minute for residential areas, and 1500 gpm for non-residential areas (or a higher flow as required by the Fire Marshall), with a residual pressure of not less than 20 psi. Multiple fire hydrants with looped mains and/or larger main sizes may be required to provide adequate level of fire protection for projects with higher flow demand. Flow tests shall be performed to verify the specified fire flow demand prior to final DEP certification.

Fire hydrant branches (from main to hydrant) shall not be less than 6" ID and be as short as possible to minimize any potential for a Potable Water main with no flow. Each branch shall be restrained and provided with a gate valve. Hydrants shall be located minimum five feet from edge of road pavement with raised curbing and no less than three (3') feet from driveways with the pumper discharge nozzle facing the roadway. Hydrants shall be located so as to minimize their vulnerability to traffic. Bollards shall be shown on the design plans

and installed where required. Bollards are not allowed within “Clear Zones” in thoroughfare plan roads. On transmission mains, fire hydrants shall be spaced as required by the Fire Marshall and to serve as sample points for bacteriological testing.

Fire hydrants shall be placed in an accessible, unobstructed location with 7.5' clearance in all directions. Fire hydrants shall be numerically identified on construction drawings. New private fire hydrants are not allowed and all new fire hydrants shall be owned and maintained by the Department. Existing privately owned dedicated fire hydrant lines shall be separated from Department owned water mains by a privately owned DCDA.

(2) Fire Sprinkler System Connections –

Residential fire sprinkler systems (NFPA type 13d). There shall be no separate service connection to the potable water system. The sprinkler system shall be connected to the domestic water service line on the customer side of the water meter. A minimum 1” water service line and a minimum 1” meter are required to assure adequate flow rate. As a minimum, an in-line check valve is required at the Point of Connection of the fire line into the domestic service line to prevent backflow. It is the property owner’s responsibility to obtain any necessary permits and certifications for the fire sprinkler system.

NFPA type 13r fire sprinkler systems. Fire sprinkler system branches shall be minimum 4” ductile iron pipe up to Point of Service. Closed dedicated fire sprinkler connections shall require as minimum backflow prevention device a double check detector assembly (DCDA). Sprinkler systems with pressure/storage tanks, booster pumps, chemical additive injection systems, and/or auxiliary water supply connections shall require reduced pressure principle detector assembly. Pressure testing and inspection of the Department’s water distribution system shall be performed as a minimum up to the valve designated as the Point of Service (see Standard Detail). The Department shall perform the initial testing and certification of the backflow prevention assembly prior to Service Activation. All subsequent tests and certifications are the responsibility of the Property Owner. There shall be no pipe joints or any service connections between the point of fire service valve and first 90 degrees bend leading up to the backflow prevention assembly. The design shall minimize any potential for Potable Water main with no flow.

The design and construction of privately owned fire lines shall conform to the applicable Fire Marshall standards pertaining to dedicated fire sprinkler systems (i.e., the installation of tamper switches and post indicator valves may be required).

(j) Potable Water Service Lines and Taps:

Potable Water service taps on the main shall be spaced at a minimum distance of 18" apart or greater, as shown on details. All PVC service lines shall be Schedule 40 PVC with Schedule 80 fittings. Polyethylene services shall be PE 3408/3608 CTS DR9 blue or blue striped. Services shall be installed in accordance with the construction details of this manual and shall have corporation stops. 1½” corporation stops and double strap saddles shall be required for 5/8" X 3/4" and 1" meters. 2" corporation stops and double strap saddles shall be required for 1-1/2"

and 2" meters. The threaded area of a corporation stop shall be spiral wrapped with two wraps of Teflon tape. The corporation stop shall not be bottomed out (1-3 threads remain showing).

A valve box shall be installed over all 2" corporation stops. Compression (pack joint) style adapters shall be used for transition from brass valves and fitting to PVC pipes.

No PVC male/female adapters shall be used. Services shall not exceed 100' to the meter. Services crossing under parking tracts shall have their meters placed prior to the crossing so that the Department is not responsible for these lines.

In developments where the property line is not clearly defined (condominiums and commercial), the meter shall be placed in a readily accessible location. Service lines under driveways and roadways shall be encased in minimum three (3) inch casing (black iron, PVC Schedule 40 or HDPE Pipe). Service taps under driveways and roadways shall be avoided whenever possible.

For water meter installations within nonexclusive utility easement paralleling a road right-of-way, the control valve shall be located a maximum of 18" from the right-of-way line and the meter box shall not extend into the easement by more than 48" from the right-of-way line.

Private services shall not cross Potable Water mains unless specifically identified on plans and approved by the Department. The Developer shall coordinate the installation of private service lines with location of meters to deliver Potable Water to the correct multi-family dwelling unit or bay and shall identify each to the Department. The water meter location shall match the site plan layout to eliminate service line crossings.

Wet Taps equal or larger than one half the pipe's diameter require a restrained ductile iron mechanical joint tapping sleeve. No size on size taps is permitted.

(k) Potable Water Meter Installation:

General requirement - Construction plans shall include a typical meter installation detail for each size meter to be installed. Service line and meter sizes must be shown on the plans. Dual metering of a single building service (i.e., two 1" meters instead of one 2" meter) shall not be permitted. The proper sizing of meters and service lines is the responsibility of the developer's engineer. Meters will be available in the following sizes only: 5/8" X 3/4", 1", 1-1/2", 2", 3", 4" and larger sizes as necessary. Meter boxes for 4" and smaller meters are standard. A bypass will be required for meters 1-1/2" and larger (see details). A project consisting of multiple services shall use the same pipe material for all services (where applicable). Service pipe material shall be identified on record drawing.

All applicable Service Initiation Fees must be paid to the Department prior to meter installation, and all meters will be installed by the Department. All service piping, valves, lids, boxes and required backflow prevention assemblies/devices must be built in accordance to these standards prior to meter installation. Generally, the Department will not install services for meters 3" and larger.

The number of metered connections shall match the number of connections reserved. The meter location and layout shall be determined prior to plan approval. Commercial establishments with Grease Traps, Oil/Grease Interceptors and/or Sand/Oil Interceptors shall be individually metered through the Department.

Consideration shall be given to the plumbing system in master metered projects, so water and sewer service can be provided individually in the future, if so desired or required.

(l) Water meter boxes:

- All meter boxes and lids shall display the manufacturer's name.
- All meter boxes shall display the date of manufacture.
- Traffic rated boxes and lids are required for all boxes in hardscaped area.
- Meter box lids to be "RF" compatible.

Location requirement - Meters shall generally be set in grass area generally at or near a common property line unless shown otherwise on approved plans.

Meter boxes for "zero lot line" properties shall be set in grass area as close as possible to a common property line. An installation detail shall be added to each plan sheet.

When no alternative is available, a meter will be allowed in paved area and:

- Top of box shall be flush with surface located outside of drainage flow lines (i.e., dry surface area).
- Meter box shall be placed out of a common traffic area. Bollards may be required under certain conditions.
- Meter box and lid shall meet the requirements of Tier 15 minimum load rating (ANSI) for incidental traffic.
- A 12" thick compacted rock base (3/4" washed rock) shall be required under the meter box to prevent settlement. The base shall extend minimum 12" beyond the perimeter of the meter box.

Locations for meter boxes and control valves shall be selected to be accessible and provide the "minimum unobstructed space" shown on applicable details. Meter boxes shall be installed in grass areas whenever possible and shall not be installed in pedestrian walkways, driveways or inaccessible areas:

- Minimum 12" horizontal separation is required between front edge of electrical transformer pad or its projection and back edge of water meter box.
- The Developer and/or his representative shall be responsible for coordination of locations of services.
- Meter/service will not be installed/activated until:

- (1) Driveway, sidewalk and/or form boards for same are in place.
  - (2) A Wastewater lateral connection inspection was conducted.
  - (3) "Minimum unobstructed space" is provided as shown on applicable details.
  - (4) The required backflow prevention assembly/device is installed and has passed the initial testing (if applicable).
  - (5) A signoff from the applicable Building Department has been obtained for a residential fire line (NFPA Type 13d).
- Minimum 5' horizontal separation is required between Potable Water service line and Wastewater lateral.
  - **Please note:** that minimum 1" meters are required for services with NFPA Type 13d residential fire lines.
- (m) Meters shall not be placed in areas that can be fenced, such as backyards, under any circumstances. Double boxes shall be used whenever possible for 5/8" X 3/4" meters with 3/4" fittings on or as close as possible to a common property line.

In cases where Potable Water, Reclaimed Water and Wastewater lines have been constructed and a developer replatted the development or relocated structures, the Department shall require that services which cannot be reasonably adjusted, be removed and plugged at the main.

If the number of services removed is excessive, the entire line may be required to be replaced. A reasonable adjustment is considered to be less than 3 feet laterally. Any adjustments/reconstruction shall be regarded as having to meet all new construction requirements.

(n) Backflow Prevention Assemblies/Devices for Potable Water Services:

Backflow Prevention Assemblies/Devices shall be provided on all projects for prevention and control of cross-connections. All nonresidential services, services for buildings with more than three stories, and residential services with 1-1/2" meters or larger shall have a Reduced Pressure Principle Backflow Prevention Assembly. Residential Dual Check Valves (rdc) are required as a minimum for all new residential Potable Water meters 1" and smaller and for existing residential Potable Water services with master metered reclaimed water service. All Potable Water services with individually metered reclaimed water service shall have a Reduced Pressure Principle Backflow Prevention Assembly. There shall be no service connection between the Backflow Prevention Assembly/Device and meter assembly.

All applicable Backflow Prevention Assemblies/Devices must be installed by the Developer/Customer prior to Potable Water meter installation. The installation of the assembly/device must follow the manufacturer's guidelines. The assembly/device must be easily accessible and have a minimum of 3' clear space around it. The assembly/device shall be located as close as possible to the Point of Service. Except for water services for Department facilities, the testable Reduced Pressure Principle Backflow Prevention Assembly will remain the property of the Customer, who shall also be responsible for installation, operation, maintenance, and testing of the assembly following Service Activation. Multiple parallel installed backflow prevention devices shall be designed for potable water connections where

service continuity is of utmost importance (for example: schools, treatment plants, etc). For additional information about application and acceptable Backflow Prevention Assemblies/Devices see Chapter 7 of the Department's Uniform Policies and Procedures Manual and Section 4.3 herein. In cases where a Reduced Pressure Principle Assembly or Double Check Valve Detector Assembly type backflow preventer is required, the Department shall perform the initial testing of the assembly and certify the installation for compliance.

## 2. POTABLE WATER MAIN CONSTRUCTION

- (a) Installation: Installation of Potable Water pipe and associated fittings shall be in accordance with current AWWA and NSF standards and manufacturers' requirements for their particular products. All non-DIP mains shall have a minimum of 36" clear cover to finished grade unless specifically approved otherwise, subject to pipe material limitation, with the pipe installed as level as possible.

Approved pipe joint restraint shall be required at each fitting involving a change of direction and as specified in plan details. The contractor shall be responsible to ensure that all safety requirements are met with respect to construction.

Changes in pipe alignment may be accomplished using appropriate fittings or through pipe deflection. Pipe deflection at the joint is allowed with ductile iron pipe and with specially designed PVC pipes. **(See Approved Material List).**

The deflection shall not exceed 75% of the Manufacturer's recommended maximum joint deflection. No deflection at the joint is allowed for PVC pipe unless allowed by the pipe manufacturer. If joint deflection is not allowed, PVC pipe curvature shall be accomplished by installing appropriate bends. All pipes shall be laid in trenches having a dry and stable bottom. Backfill shall be free of boulders and debris. Pipe shall be fully supported along its entire length. Sharp or rocky material encountered in the base shall be replaced with proper bedding. Pipe shall be laid on line and grade as designed.

Fire hydrants shall be installed with the center of the pumper nozzle approximately 18" above finished grade. Hydrants shall not be placed in sidewalks or traffic areas. It will be the responsibility of the developer to move hydrants placed in an unacceptable location and provide protection from traffic damage if necessary, upon the Department's request. Concrete collars are required for hydrants in unpaved areas. Fire hydrants must be ordered red in color. Fire hydrants must be clean and have a glossy red finish when accepted by the utility. If painting is required all oil, grease, dirt, salts and other contaminants must be removed. Two coats of approved paint to be applied by brush per manufacturer's specification for a DFT of at least 4 mils per coat.

All valves shall be placed according to plans unless relocation is approved by the Department. Valves shall not be placed in curbs or gutters or in designated parking spaces and shall be accessible at all times. As-built drawings shall reflect the actual location of all mains, hydrants, services, mechanically restrained pipe and valves. All taps must be at least 18" from a fitting or bell. Potable Water mains shall not be laid in fuel contaminated areas.

All road crossings, pavement cuttings and restoration shall be in accordance with the requirements of the particular authority governing the area.

(b) Connection to Existing System:

All connections to existing Potable Water mains shall be made under the direct supervision of the Department. Valves on existing Potable Water mains shall be operated by the Department personnel or under direct supervision of the Department. The contractor shall confirm the compliance of the existing facilities with the Standards and, modify the facilities, if required, at no cost to the Department, prior to connection. The added restraint must be designed by the Project Engineer subject to approval by the Department. Tapping sleeve and valve shall be pressure tested prior to tapping. Insertion valves or temporary line stops may be required in order to eliminate service interruptions.

If service must be cut off to existing Customers, the Department must have minimum seven (7) days notice to make necessary notifications. The contractor or developer may be required to assist in notifications. In this event, contractor shall be ready to proceed with as much material preassembled as possible at the site to minimize the length of service interruption. The Department will postpone a service cut-off if the contractor is not ready to proceed on schedule. Such connections may have to be made at night to minimize effects. No Customer should be without service for more than two (2) hours. Local chlorination will be required for all pipe and fittings used to complete connections with existing potable water main.

(c) Cleaning and Flushing:

Foreign material shall be kept out of pipe or cleaned from pipe prior to installation. The ends of pipe installed during one day shall be capped at the end of each day with pipe plugs to prevent contamination. Upon completion of installation and initial disinfection the mains shall be flushed with potable water and the water disposed of without creating a nuisance. Bypass piping is required for filling and initial disinfection. The existing potable water main valve shall remain closed during the filling and initial disinfection. Bypass piping shall include a minimum of two (2) single check valves. A tee with pressure gauge shall allow for chlorine injection during filling and disinfection. A metering injection pump shall be used to ensure a minimum of 50 ppm chlorine level. After the pipe is disinfected, the existing valve and the tie-in valve in the potable water main shall be cracked open to allow for flushing. A Department Inspector shall witness the filling and flushing through the main pipe.

(d) Testing:

- (1) Bacteriological Testing. New water mains shall be bacteriologically tested prior to pressure testing unless “alternate” testing sequence is approved by the Department. The “alternate” testing procedure allows for pressure testing ahead of bacteriological testing, and requires double valving with a pressure gauge installed between the valves.

All new Potable Water mains shall be tested for bacteriological acceptability by a certified laboratory and pressure tested using Potable Water. Sample points are required. Fire hydrants shall be used as sample points whenever possible. Bacteriological testing is generally required for any work involving a connection to the potable water system. Bacteriological testing is required in order to certify the newly installed Potable Water main to the Health Unit. The test results must be certified by the Department within 30 days of sampling. Only “construction meters” (hydrant meters) may be installed with “construction only release” from the Health Unit. The water through construction meters shall be considered non-potable and shall not be used for drinking or consumption purposes.

“Construction water” may be used for non-potable applications such as temporary irrigation, testing of internal plumbing systems, flushing toilets in model homes, construction trailers and/or sales trailers. The Developer shall post “Non-Potable Water – Do Not Drink” signs at all water outlets served with construction water.

- (2) Pressure Testing. New water mains shall be pressure tested after the “construction water release” is received, record drawings, and fire flow tests are approved by the Department. The road rock/base and “tack coat” shall be installed prior to pressure testing of water mains within road rights-of-way. Potable water shall be supplied to the main and pumped to 150 psi or 200 psi for pipes larger than 24”.

The maximum length of line to be tested as one section will be 2,500 feet. HDPE pipe segments shall be pressure tested separately from other pipe material (**see Section 4.4.3{g} for details**). The test shall be performed as determined in the current AWWA specification subject to specifications as listed below. The standard test duration is two (2) hours. The maximum quantity of make-up water that must be supplied into the tested pipe to maintain pressure within 5 psi of the specified test pressure shall not exceed 50% of the applicable AWWA C-600 Standard. The make-up water for pressure testing shall consist of ½ ounce of 5% sodium hypochloride per one gallon of Potable Water. If the pressure test fails, or if the water main pressure drops below 20 psi after the initial bacteriological tests were conducted, the bacteriological tests must be repeated before a request for “full release” certification is issued to the Health Unit.

- (3) Fire Hydrant Flow Testing. A flow test to verify the fire flow rates shall be provided by the Developer on all new fire hydrants prior to the project’s final HRS Certification and after “construction water only” clearance is obtained from the Health Department. The fire flow test shall generally be performed by the Fire Marshal. The Fire Marshall may accept test results for residential projects performed by a contractor when witnessed by a utility inspector. Only accurate, calibrated pressure gauges (0-100 psi) shall be used for testing.

The gauges must “zero out” at the end of the test. The flow tests shall be witnessed by the Department following the procedure as outlined below:

- (a) Make provisions for minimizing interruptions to traffic and for adequate drainage of water.
- (b) Locate the residual hydrant and do the following:
  - Flush the residual hydrant to eliminate sediment that may damage the gauge. (Always open and close hydrants SLOWLY to minimize water hammer).
  - Install the outlet-nozzle cap equipped with the pressure gauge on a hydrant nozzle. A “Defuser” shall be used to minimize damage to landscaping, etc.
  - Open the main valve slowly until the air is vented. Close the vent and open the main valve fully.
  - Read the gauge. This is the static pressure reading.
- (c) Conduct the flow test as follows:
  - Station one person at the residual hydrant and one person at each test hydrant.
  - Open each test hydrant SLOWLY until it is fully open. Open one hydrant at a time to avoid a pressure surge.
  - When the pressure at the residual hydrant is stabilized, the person at the residual hydrant signals the person stationed at the test hydrant to take the reading. The readings for residual pressure and flow rate readings of each flow hydrant must be taken simultaneously. The air should be exhausted from the flowing hydrant before the reading is taken.
  - Record the residual reading and the flow reading at each test hydrant. Then SLOWLY close the test hydrants one at a time.

For accurate test results, the pressure drop between the static and the residual pressures should be at least 10 psi. If the pressure drop is less than 10 psi, an additional test hydrant should be added to the test.

- (4) Plot the flow results in the field utilizing appropriate graph so that if the results appear in error, the test can be repeated immediately. Any inconsistencies in flows shall be verified and corrected (if necessary) prior to final water system certification.
- (5) The cumulative fire flow rate at 20 psi shall equal or exceed the minimum fire flow rate required by the Fire Marshall.
- (6) Backflow Prevention Assembly Testing: The Department shall perform the initial testing of the assemblies and certify the installation and operation for compliance prior to Service Activation.
- (e) Disinfection: All Potable Water mains shall be disinfected in accordance with AWWA standards and Palm Beach County Public Health Unit regulations. Samples will be taken from all sections of main and a clearance is required from the Health Department before the main can be put in service.

(f) Handling, Abandonment and Disposal of Asbestos/Cement (AC) Pipe:

- (1) AC pipe must be handled in accordance with applicable laws and regulations. Generally, all cutting and disposal of AC pipe must be performed by a Florida licensed Asbestos Abatement Contractor. The Department will make every reasonable effort to identify and quantify the location of known AC pipe prior to onset of work. If the Contractor during the course of work observes, uncovers, or otherwise becomes aware of the existence of any asbestos-cement pipe, pieces, or material at the site to which the Contractor or any subcontractor, supplier, or other person may be exposed, the Contractor shall immediately notify the Project Engineer and the Department.
- (2) On projects designed and/or constructed by the Department, the Contractor shall notify the County's Risk Management and Water Utilities Departments. The Risk Management Department shall promptly consult with the Project Engineer concerning such condition and determine the necessity of the County retaining special consultants or qualified experts. The contractor shall not perform any work near or in connection with the suspect material until receipt of special written instructions from the Risk Management Department. The Contractor will ensure that all subcontractors follow these procedures.
- (3) Abandonment – Grouting and/or abandonment in place is not permitted, unless otherwise authorized by the County, written approval is required. AC pipe to be abandoned in place shall be filled with grout. Abandoned A/C pipe is to be shown on the as-built drawings. The grout mix shall be:

<u>Type</u>	<u>Pounds</u>	<u>Cubic Feet</u>
Cement	340	1.73
Sand	2840	17.91
Stone	0	0
Water	374	6.00
Admix/Type B	13 oz.	
Air 170 + 5.0%	1.35	

The slump shall be 6" + 1 inch, Admix 1 shall meet ASTM C-494 type BD. Alternative mixes will be considered.

### 3. CONSTRUCTION USING HORIZONTAL DIRECTIONAL DRILLING (HDD)

(a) General

Potable Water design and construction standards (Section 1, 2, 4) shall apply unless noted otherwise. The Department reserves the right to disapprove a horizontal directional drilling installation if the conventional open trench or jack and bore type installation is preferred by the Department, because:

- Excessive number of high/low points
- Excessive depth of pipe is of concern
- A casing is required by the Department to protect the utility pipe

- Future service and main connections to the utility pipe will be negatively impacted by a horizontal directional drilling

(b) Pipe sizes, pipe material

The horizontal directional drilled utility main shall be manufactured approved restraint joint DIP, PVC AWWA C-900 DR14, 200 psi, NSF 61 (4"-12") or HDPE pipe (SDR 11).

If the directional-drilled pipe is to be used as a casing for a small diameter service line (up to 2" diameter), PVC DR18 or HDPE DR 17 pipes are acceptable. Pipe and system components shall be free from voids, cracks, inclusions, and other defects and shall be uniform in color throughout the installation.

(c) Design Requirements

The Engineer shall inquire with the Department about approval of a horizontal directional drilling procedure for a pipe installation. With the Department's concurrence, the Engineer shall submit a signed and sealed pilot bore plan for review and approval. The plan shall be submitted on a 24" x 36" sheet to a maximum 1"=20' horizontal and 1"=2' vertical scale (1"=10' horizontal, 1"=10' vertical scale preferred). The plan must show:

- Finished grade and surface improvements
- Locations of drill set-up
- Length of bore
- Deflection and radiuses of the pilot bore
- Field verified locations of existing utilities and underground structures
- Minimum horizontal and vertical clearances from underground structures, conduits, piping systems (the proposed clearances must exceed the Department's standards plus the guidance system accuracy tolerance)
- Pipe size and specifications (including restraining provisions against "pipe shrinkage")
- Proposed pilot bore pipe deflection limits shall not exceed 75% of the maximum deflection allowed by the pipe manufacturer
- The drill radius of the final HDD pipe shall be minimum 30 pipe diameters, not exceeding 80% of the max. bending radius as recommended by pipe manufacturer
- Limits of directional bore installation
- Limits of pressure testing
- Connection to existing utilities
- Rights-of-way limits, utility easements and temporary construction easements
- Minimum pipe joint restraints at each end of pipe material transition from HDPE pipe
- Tracer wires
- Isolation valves and/or transition fittings/adapters

(d) Preconstruction Meeting

Upon approval of the pilot drill plan by the Department and obtaining all necessary permits for the directional drilling, the Engineer shall schedule a preconstruction meeting with the Department. If

the construction requires any field welding/fusion of HDPE pipe and/or fittings, a Certificate of Completion of a pipe fitting manufacturer approved training program is required. The Engineer and the Contractors performing the utility work shall attend the meeting. The Licensed HDD Contractor shall provide references certifying minimum five (5) years HDD experience.

(e) Pilot Bore

The Engineer shall schedule the beginning of work with the Department a minimum of 3 days in advance. The drill path shall be accurately surveyed and plotted to create an “as-built” drawing (same scale as the pilot drill plan).

A high accuracy MGS (Magnetic Guidance System) shall be capable to provide vertical pipe data with a max.  $\pm 2\%$  deviation and horizontal pipe location data with max.  $\pm 2$  foot deviation. The data shall be collected at max. 25' intervals. Deviation of more than  $\pm 2$  feet vertically or horizontally from the approved pilot bore plan shall be reported immediately to the project engineer for evaluation. The Engineer shall evaluate the as-built data and confirm the compliance with the design parameters. Deviation beyond approved parameters (depths, deflection radius, separation to other utilities or structures) shall be brought to the attention of the Department.

The signed and sealed pilot bore “as-built” drawing shall be submitted to the Department for review and approval if the “as-built” location differs substantially from the design plan.

(f) Pull back of carrier pipe

Upon approval of the pilot bore location by the Department; the pullback operation of the required carrier pipe shall begin. The Contractor shall select the proper reamer type with the final hole opening to be a maximum of 1.5 times the outside diameter of the largest component system.

The open borehole shall be stabilized by means of bentonite drilling slurry. The slurry shall be contained at the entry or the exit side of the bore in pits or holding tanks.

The pipe sections shall be butt fused/joined together in accordance with the manufacturer's specifications. The ends of the pipe, gaskets and couplings shall be inspected for cleanliness. Chipped, scratched, scraped, cracked or excessive deformed pipe or couplings shall be rejected. Two approved APWA color coded HDD tracer wires shall be pulled along the sides of the product pipe, and extended to nearest valve boxes (coil min. 3' wire near the surface inside valve box).

The installation of the tracer wires is an essential part of the Horizontal Directional Drill process and the contractor shall use all reasonable means and methods to insure that the tracer wires are pulled without breakage. However, accidental tracer wire breakage shall not be a reason to require a repeat directional drill unless specifically required in the project specifications.

The pipe shall be elevated to the approximate angle of entry and supported by roller arms or equivalent. Any field welding/fusion of HDPE pipe and fittings may be performed only by personnel certified through a pipe/fitting manufacturer approved training program.

(g) Testing

Pipe installed using the HDD method shall be flushed and pressure tested using Potable Water. The pressure within the HDPE Pipe test section shall be raised to approx. 160 psi and then allowed to idle for approximately 3 hours in order to allow to stabilize. Additional make-up water/pressure shall be applied during the 3 hour stabilization period only to maintain a minimum 140 psi pressure.

The final phase of the pressure test shall involve applying make-up water/pressure to achieve a test pressure of 150 psi or higher (as required). The test section is then allowed to idle (no make-up water /pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to reestablish the test pressure. If the measured and added quantity of water is greater than the allowable amount, the pressure test fails. No leakage is acceptable.

Installed services, tees and stub-outs shall be pressure tested together with the main. Pressure test is not required if the installed pipe is intended to be used as a casing.

If the pipe successfully passed the pressure test, a connection to the existing pipe system may be performed. Bacteriological testing is required.

(h) As-Builts

Certified as-built drawings (signed and sealed by a licensed professional land surveyor or professional engineer full size paper copies, mylars and computer disk) must be submitted to the Department for review and approval prior to any final certification. The record drawings must be prepared in State Plane Coordinate System.