Section 556

Water Distribution Systems

PART 1: General

1.1 *General Description of Work* – All potable water distribution systems which are to be extensions to the ECUA system shall be designed and constructed in accordance with these Standards. Potable water distribution systems include transmission and distribution mains, service lines, valves, fire hydrants, meters and other appurtenances. Water system materials, installation, and construction methods and procedures shall be in accordance with current ECUA Specifications. Technical Specifications for Water Transmission, Distribution and Service Lines are included in Section 2556 of this Manual.

1.1.1 *Minimum Requirements* – Design standards indicated herein shall be considered minimum requirements unless otherwise noted. The Design Standards outlined in this Manual are intended to provide an adequate supply of potable water to consumers, and fire protection at all times, at pressures and flows as required by the Florida Administrative Code – F.A.C. All proposed system expansions shall be compatible with the Water Master Plan as maintained and amended by ECUA.

1.1.2 *Deviations* – Deviations from these standards may be allowed by ECUA upon a finding by ECUA that, in accordance with sound engineering principles, the granting of the deviation will not result in an increase in the likelihood of a system failure or additional maintenance requirements. Proposed deviations shall be clearly noted on the Construction Plans and explained in an Engineering Report signed and sealed by the Engineer-of-Record and approved in writing by ECUA. Approval of proposed deviations from these Standards is at ECUA's sole discretion.

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PART 2: Other Standards

2.1 *General* – ECUA's Potable Water System Design Standards may differ from the requirements of other local, state and federal agencies having jurisdiction. The more stringent requirement, as determined by ECUA, shall apply.

PART 3: Water Distribution System Design Standards

3.1 *Flow Requirements* – In sizing extensions to the water distribution system, the minimum required design flow shall be the sum of the required fire flow plus two-thirds (2/3) of the required domestic flow.

3.1.1 *Required Domestic Flow* – Required flow for domestic use in residential areas shall be in accordance with sound engineering practice based upon the Design Engineer's knowledge of water demand characteristics for the specific development, but in no case shall the design be based upon flows less than those presented in the following table:

REQUIRED DOMESTIC WATER SUPPLY						
Max. No. Dwelling Units	Minimum Supply, GPM Dwelling Unit					
	Single Family Detached	Multi-Family		Mobile Homes		Retirement Single Family
		2 BDRM	1 BDRM	2 BDRM	1 BDRM	2 BDRM (MAX)
50	4.0	3.6	3.4	3.2	3.0	2.6
100	3.0	2.7	2.6	2.4	2.3	2.0
200	2.0	1.8	1.7	1.6	1.5	1.3
200+	1.5	1.4	1.3	1.2	1.1	1.0

Note: Multi-family, mobile home, or retirement units consisting of more than 2 bedrooms shall be considered as single-family detached.

3.1.2 *Required Commercial Flow* – The required flow for commercial, industrial or other nonresidential areas shall be as determined by the Engineer-of-Record and approved by the ECUA for each specific instance.

NOTE: Acceptable technical guidance for establishing required flow values may include, but is not necessarily limited to: a) Metcalf & Eddy "Wastewater Engineering", b) State of Florida Department of Health, Chapter 64E-6, c) Fixture Values as contained in the Florida Building Code, Plumbing, Appendix E. Historical consumption data as documented by utility billing records from approved comparable uses may also be accepted.

3.1.3 *Required Fire Flow* –

3.1.3.1 The minimum required design fire flow shall be 600 gpm with a minimum residual pressure of 20 psig.

3.1.3.2 ECUA will, on request, provide the designer with available system data. ECUA-provided data may be used for preliminary planning purposes only. Engineer-of-Record shall conduct flow testing, in the presence of ECUA Regional Services personnel to support final design.

3.2 *Water System Layout* –

3.2.1 *Grid System* – Where technically feasible and economically sensible, all mains shall be interconnected to form a grid or "looped" system. Six-inch mains shall be placed to form grids of 1,000 feet or less. In no case should 6-inch mains be installed such that there is more than 1,320 feet of line between grid interconnections unless authorized by the ECUA. Eight-inch mains shall form grids no greater than 4,000 feet x 8,000 feet. When larger grids are necessary, larger diameter pipes shall be used unless authorized by ECUA for water quality considerations. Four-inch mains may also be used to form localized grid interconnections where appropriate.

3.2.2 *Subdivision Layout* – A development designed for more than 25 single family dwellings shall have 2 or more connections to the existing distribution system

3.2.3 *Dead-Ends* – All mains shall be looped where possible. Where not possible, provisions shall be made (for example provision of easements) to facilitate future interconnections.

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3.2.4 *Future Interconnections* – Provisions for future connecting mains shall be made by extending construction of all water mains to the exterior boundaries of the development wherever future connections to adjacent properties are anticipated or are required to form a looped system.

3.3 *Water Line Sizing* – Distribution mains shall be of sufficient size to furnish the required flow at pressures and velocities as herein provided. Mains shall be located to provide service to each unit within a development and to form a looped network as provided above.

3.3.1 *Required Pressure* – Extensions to the water system shall be designed such that the water pressure at all points in the distribution system shall not be less than 40 psi with no fire hydrant in use. Water pressure in the main at ground level shall not be less than 20 pounds per square inch under all conditions, inclusive of fire flows.

NOTE: When the water pressure exceeds 80 psi, there shall be installed and maintained by the customer, on the property side of the water meter, an approved pressure regulator in conformance with applicable state and local codes.

3.3.2 *Standard Sizes* – Distribution mains used shall have nominal diameters of 2, 3, 4, 6, 8, 12 and 16 inches.

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3.3.3 *Minimum Main Size* – Minimum distribution main diameter shall be 4 inches in single family residential areas where fire hydrants are not required, and 6 inches in all other areas. For cul-de-sacs, 3-inch water mains may be used when serving no more than 10 residences. 2-inch water mains may be used around cul-de-sacs serving 4 or less residences. Fittings shall be used as necessary for installation of the pipe around the cul-de-sac.

3.3.4 *Velocity* – Velocities of water for the non-fire flow conditions in the distribution mains shall not exceed 6 feet per second. The velocity under any flow condition shall not exceed 15 fps.

Approximate Capacities and Head Loss of Pipes @ Maximum Design Velocity (Non-Fire Flow Conditions)			
Size	**Flow (gpm) at 6 fps**	**Head Loss C900 Pipe (c=130) ft./1000ft**	**Head Loss C900 Pipe (c=130) psi/1000ft**
4"	235	39	17
6"	530	22	10
8"	950	15	6.5
12"	2100	10	4
16"	3700	7	3

3.4 *Water Line Placement* –

3.4.1 *Location* – All mains to be accepted by ECUA shall be installed only in public rights-of-way, utility easements, or on land owned by ECUA.

3.4.2 *Alignment* – Water mains shall be designed to be parallel to the adjoining pavement and/or right-of-way line to the extent practical. In order to keep the main within its desired

alignment within the right-of-way or easement, may be required. Standard fittings are available as 11 ¼-degree, 22 ½-degree or 45-degree bends.

If unavoidable, pipe deflections shall adhere to the Manufacturer's recommendations.

3.4.3 *Depth* –

3.4.3.1 *General* – Water lines shall be designed to provide a minimum of 30 inches or a maximum of 36 inches of cover below the proposed finished grade. Deviations from the required minimum or maximum cover may be allowed where conditions require, subject to prior approval of ECUA.

3.4.3.2 *Roadway Crossings* – When crossing roadways, refer to the following guidelines:

3.4.3.2.1 Water line installation in public rights-of-way shall conform to all applicable requirements of the governing agency responsible for the maintenance and operation of the roadway.

3.4.3.2.2 In cases where open-trench construction of roadway crossings is allowed, water lines may be installed as ductile iron or with steel casing in accordance with ECUA's Technical Specifications.

3.4.3.2.3 In cases where open trench construction of roadway crossings is not allowed, water lines shall be installed in a casing in accordance with Section 2310-"Jack and Bore" of ECUA's Technical Specifications. In circumstances where conditions warrant, valves may be required on both sides of the casing.

3.4.3.3 *Water Crossings* – When crossing water, refer to the following guidelines:

3.4.3.3.1 Water line installation involving construction under or across waters of the state shall conform to all applicable requirements of the governing agency, or agencies, having jurisdiction for such activities.

3.4.3.3.2 Where open trenching is permitted, waterline shall be constructed using ductile iron river crossing pipe (or other approved equal) at a depth not less than 36 inches below the bottom surface of the crossing. The ductile iron pipe shall extend at least 20 feet beyond either side of the maximum width of the crossing, and no less than to the jurisdictional line of state waters. Valves shall be placed on each side beyond the jurisdictional line defining the boundaries of the waters of the state.

3.4.3.3.3 Water lines installed under crossings where open trenching is not permitted shall be installed per Section 2300-"Horizontal Directional Drilling" of ECUA's Technical Specifications.

3.4.3.3.4 In circumstances where conditions do not allow trenchless installation, and an existing or proposed bridge crosses the waterway at the same location as the proposed water line, provision may be made to attach the water line to the bridge structure. Prior consent must be obtained from the agency responsible for the maintenance and operation of the bridge. Design of

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pipe restraints for the bridge attachment shall allow for limited movement of the pipe as a result of expansion and contraction.

3.4.3.3.5 Valves are to be installed on both sides of all water crossings.

3.4.3.4 *Railroad Crossings* – When crossing railroads, refer to the following guidelines:

3.4.3.4.1 Water line installation involving construction under railroads shall conform to all applicable requirements of the governing agency, or agencies, having jurisdiction for such activities.

3.4.3.4.2 Railroad crossings of any length shall be installed in a casing in accordance with Section 2310-"Jack and Bore" of ECUA's Technical Specifications, or in accordance with any special requirements of the railroad company, whichever is more strict.

3.4.3.5 *Other Crossings* – Refer to the following guidelines for other crossings:

3.4.3.5.1 Water lines that must be installed under existing obstructions, such as pipes or conduits, shall maintain a vertical separation of at least 6 inches. In cases where a minimum separation of at least 6 inches cannot be maintained, or in any case where there is a potential threat to the integrity of the water line as a result of an existing obstruction, the pipe shall be installed in a steel casing in accordance with Section 2310-"Jack and Bore" of ECUA's Technical Specifications. Alternatively, Ductile Iron pipe may be used. These special provisions shall extend at least 10 feet on either side of the pipe or obstruction being crossed.

3.4.3.5.2 Water lines installed within easements shall be constructed with Ductile Iron pipe through the entire length of the easement. Valves shall be installed at both ends of the line, unless otherwise approved by ECUA.

3.4.4 *Separation of Potable Water Lines From Sanitary Sewer Lines* – For the purpose of this section, the phrase "water mains" shall mean mains, including treatment plant process piping, conveying either raw, partially treated, or finished drinking water; fire hydrant leads; and service lines that are under the control of a public water system and that have an inside diameter of three inches or greater.

3.4.4.1 *Horizontal Separation* – Refer to the following guidelines regarding horizontal separation between underground water mains and sanitary or storm sewers, wastewater or storm water force mains, reclaimed water pipelines, and on-site sewage treatment and disposal systems:

3.4.4.1.1 New or relocated, underground water mains shall be laid to provide a horizontal distance of at least three feet between the outside of the water main and the outside of any existing or proposed storm sewer, or storm water force main.

3.4.4.1.2 New or relocated, underground water mains shall be laid to provide a horizontal distance of at least three feet, and preferably ten feet, between the outside of the water main and the outside of any existing or proposed vacuum-type sanitary sewer.

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3.4.4.1.3 New or relocated, underground water mains shall be laid to provide a horizontal distance of at least six feet, and preferably ten feet, between the outside of the water main and the outside of any existing or proposed gravity- or pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water. The minimum horizontal separation distance between water mains and gravity-type sanitary sewers shall be reduced to three feet where the bottom of the water main is laid at least six inches above the top of the sewer.

3.4.4.1.4 New or relocated, underground water mains shall be laid to provide a horizontal distance of at least ten feet between the outside of the water main and all parts of any existing or proposed "on-site sewage treatment and disposal system".

3.4.4.2 *Vertical Separation* – Refer to the following guidelines regarding vertical separation between underground water mains and sanitary or storm sewers, wastewater or storm water force mains, and reclaimed water pipelines:

3.4.4.2.1 New or relocated, underground water mains crossing any existing or proposed gravity- or vacuum-type sanitary sewer or storm sewer shall be laid so the outside of the water main is at least six inches, and preferably 12 inches, above or at least 12 inches below the outside of the other pipeline. However, it is preferable to lay the water main above the other pipeline.

3.4.4.2.2 New or relocated, underground water mains crossing any existing or proposed pressure-type sanitary sewer, wastewater or storm water force main, or pipeline conveying reclaimed water shall be laid so the outside of the water main is at least 12 inches above or below the outside of the other pipeline. However, it is preferable to lay the water main above the other pipeline.

3.4.4.2.3 At the utility crossings described in paragraphs "a" and "b" above, one full length of water main pipe shall be centered above or below the other pipeline so the water main joints will be as far as possible from the other pipeline. Alternatively, at such crossings, the pipes shall be arranged so that all water main joints are at least three feet from all joints in vacuum-type sanitary sewers, storm sewers, storm water force mains and at least six feet from all joints in gravity- or pressure-type sanitary sewers, wastewater force mains, or pipelines conveying reclaimed water.

3.4.4.3 *Water Main and Manhole Separation* – Refer to the following guidelines regarding separation between water mains and sanitary or storm sewer manholes:

3.4.4.3.1 No water main shall pass through, or come into contact with, any part of a sanitary sewer manhole.

3.4.4.3.2 Water mains shall not be constructed or altered to pass through, or come into contact with, any part of a storm sewer manhole or inlet structure. Where it is not technically feasible or economically sensible to comply with this requirement (i.e., where there is a conflict in the routing of a water main and a storm sewer and where alternative routing of the water main or the

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storm sewer is not technically feasible or is not economically sensible), the ECUA may allow exceptions to this requirement (i.e., ECUA may allow construction of conflict manholes), but such exception shall be subject to written authorization from the Florida Department of Environmental Protection (FDEP). It shall be the responsibility of the Design Engineer to secure such authorization from the FDEP. The Design Engineer shall prepare and submit a preliminary design report to the FDEP including the following information:

3.4.4.3.2.1 Technical or economic justification for each conflict manhole.

3.4.4.3.2.2 A statement identifying the party responsible for maintaining each conflict manhole.

3.4.4.3.2.3 Assurance of compliance with the design and construction requirements in sub-subparagraphs (a) through (d) below.

3.4.4.3.2.3.1 Each water main passing through a conflict manhole shall have a flexible, watertight joint on each side of the manhole to accommodate differential settling between the main and the manhole.

3.4.4.3.2.3.2 Within each conflict manhole, the water main passing through the manhole shall be installed in a watertight casing pipe having high impact strength (i.e., having an impact strength at least equal to that of 0.25-inch-thick ductile iron pipe).

3.4.4.3.2.3.3 Each conflict manhole shall have an access opening, and shall be sized to allow for easy cleaning of the manhole.

3.4.4.3.2.3.4 Gratings shall be installed at all storm sewer inlets upstream of each conflict manhole to prevent large objects from entering the manhole.

3.4.4.4 *Other Separation Guidelines* – Refer to the following guidelines regarding separation between fire hydrant drains and sanitary or storm sewers, wastewater or storm water force mains, reclaimed water pipelines, and on-site sewage treatment and disposal systems.

3.4.4.4.1 New or relocated fire hydrants with underground drains shall be located so that the drains are at least three feet from any existing or proposed storm sewer, or storm water force main, and preferably ten feet, from any existing or proposed vacuum-type sanitary sewer; at least six feet, and preferably ten feet, from any existing or proposed gravity- or pressure-type sanitary sewer, wastewater force main, or pipeline conveying reclaimed water; and at least ten feet from any existing or proposed “on-site sewage treatment and disposal system.

3.4.4.5 *Exceptions* – Where it is not technically feasible or economically sensible to comply with the requirements in subsection “1” or “2” above, ECUA may allow exceptions to these requirements upon the condition that technical or economic justification for each exception is provided and that alternative construction

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features ensure similar level of reliability and public health protection. Acceptable alternative construction features include the following:

3.4.4.5.1 Where an underground water main is being laid less than the required minimum horizontal distance from another pipeline and where an underground water main is crossing another pipeline and joints in the water main are being located less than the required minimum distance from joints in the other pipeline:

3.4.4.5.1.1 Use of pressure-rated pipe conforming to the American Water Works Association standards incorporated into Rule 62-555.330, F.A.C., for the other pipeline if it is a gravity- or vacuum-type pipeline;

3.4.4.5.1.2 Use of welded, fused, or otherwise restrained joints for either the water main or the other pipeline; or

3.4.4.5.1.3 Use of watertight casing pipe for either the water main or the other pipeline.

3.4.4.5.2 Where an underground water main is being laid less than three feet horizontally from another pipeline and where an underground water main is crossing another pipeline and is being laid less than the required minimum vertical distance from the other pipeline:

3.4.4.5.2.1 Use of pipe, or casing pipe, having high impact strength (i.e., having an impact strength at least equal to that of 1/4-inch-thick ductile iron pipe); and

3.4.4.5.2.2 Use of pipe, or casing pipe, having high impact strength (i.e., having an impact strength at least equal to that of 1/4-inch-thick ductile iron pipe) for the other pipeline if it is new and is conveying wastewater or reclaimed water.

3.4.5 *Pipe Restraints* - All water line fittings and appurtenances shall be restrained. Joint restraints shall be provided in accordance with ECUA Detail D-62. See Section 2556-"Water Distribution Systems", Paragraph 2.4.1.6 for further information.

3.5 *Appurtenances* –

3.5.1 *Valves* – In-line valves shall be spaced such that no more than 1,000 feet of pipe would be out of service with valves shut, and shall be located on every branch line, with at least one valve on the main line at the junction. The valve may be located on the opposite side of the street from the fittings, except in cases where a tapping sleeve and valve is used. ECUA may require the installation of air release valves on distribution mains. Valves shall be installed in accordance with ECUA Standard Details and Specification 2556-"Water Distribution Systems."

3.5.2 *Fire Hydrants* –

3.5.2.1 Fire hydrants shall be on a 6-inch or larger main, and no more than 1,000 feet apart along rights-of-way or approved easements. Fire hydrants shall be located

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at intersections when practical, otherwise as close as practical to common property lines.

3.5.2.2 Fire hydrants shall be located in single family residential areas so that not more than 600 feet of fire hose, as laid along a public right-of-way, will be required to reach any proposed house.

3.5.2.3 Fire hydrants shall be located in multi-family residential or commercial areas, so that no more than 500 feet of hose, as laid across unobstructed terrain, will be required to reach the most remote part of any proposed building.

3.5.2.4 Fire hydrants may also be installed on private land supplied by a private dedicated fire line of at least 6 inches diameter, and protected with an appropriate detector-check assembly located at the property line. Operation and maintenance of hydrants on private property (excluding those in ECUA approved easements) is solely the responsibility of the private maintenance entity.

3.5.3 *Flushing Hydrants* –

3.5.3.1 Flushing hydrants shall be located within a right-of-way or easement near lot/property corners such that their location and use will not be hampered by improvements (driveways, fences, shrubbery).

3.5.3.2 All dead-end lines 4 inches and smaller shall have at least a 2-inch post hydrant assembly.

3.5.3.3 All dead-end lines 6 inches and larger shall have a standard fire hydrant with valve. See ECUA Standard Detail D-50.

3.5.4 *Backflow Preventers* – See Section 3.7 “Cross Connection Control and Backflow Prevention”

3.5.5 *Double Check Detector Assemblies* – An appropriate double check detector assembly shall be required in any private fire line.

3.5.6 *Meters* – Residential and commercial boxes for meters up to 1 ½ inches in size are typically provided by ECUA. Residential and commercial water meters are typically provided by ECUA for all sizes. For water meters 2 inches and larger, the developer is required to install the meter vault in accordance with ECUA Standard Detail D-44 or D-45 as applicable.

3.6 *Service Lines* –

3.6.1 *Potable Water Services* –

3.6.1.1 *General* – Line size must be selected with due consideration for length, peak demand, elevation and pressure loss, including loss across backflow preventer, for the anticipated end use(s). A water meter of the size requested by the customer will be supplied and installed by the ECUA at each connection point. The meter size should be shown on the plans for all commercial developments. Refer to the table below for tubing size.

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All residential meters shall be installed in boxes immediately adjacent to the property line in the public right-of-way or easement and readily accessible to ECUA meter readers. Meter boxes shall not be located in driveways or where they might be obstructed by landscaping or other structures, or closer than six feet to the sanitary sewer service lateral.

In cases where there is insufficient space to locate a commercial meter box in the right-of-way, an easement of sufficient size to access, operate and maintain the meter, box and bypass lines shall be provided.

For water meters 2-inches or greater, a meter vault shall be installed. The meter vault is to be installed on private property. An easement of sufficient size shall be granted to provide access, to operate and maintain the meter, vault and bypass lines.

Recommended Tubing Size For Water Services				
Size of Meter	**Max. Flow (gpm)**	**Max. Pressure Loss (psi)**	**Max. Length of Tubing For Size Indicated**	
			1"	**2"**
5/8"	20	10	92	2679
1"	50	10	17	492
1-1/2"	100	10	-	136
2"	160	10	-	57

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Any water service serving two or more buildings shall be designed, reviewed and permitted as a distribution system.

3.6.1.2 *Residential* – Water service installation in accordance with ECUA Standard Detail D-40 shall be provided for individual service lines to each lot within all residential developments.

3.6.1.3 *Commercial* – Service Connections to industrial or commercial lots may be omitted if the service size cannot be predetermined, provided approval is obtained. Provisions shall be made so that it is not necessary to cut the public roadway to install the service in the future.

Master meters are required for shopping centers, malls and similar developments. Exceptions may be made when a beneficial part of the Distribution System runs through the development within an ECUA approved easement.

A master meter is required for a wholesale customer, where water is to be distributed to individual units through private lines.

Master meters shall be used for apartment, condominium and other such complexes. ECUA does not accept water and sewer facilities, located outside of the right-of-way which serve Condominium projects subject to the exceptions as described in the document entitled “ECUA Requirements for Acceptance of Potable Water and Sanitary Sewer Mains and Facilities in Condominium Projects”. (See Appendix A).

3.6.2 *Fire Service Lines –*

3.6.2.1 Fire service lines may be installed at the customer's expense, provided that there is adequate existing capacity. Verification of capacity shall be the sole responsibility of the Customer and his design professional.

3.6.2.2 An approved backflow preventer shall be installed by the customer at his expense immediately adjacent to the property line. (See Section 3.7 below.)

3.6.2.3 All fire line services shall be pressure-tested and chlorinated up to the backflow preventer in the same manner as other line extensions.

3.6.3 *Irrigation Service Lines* – Provision shall be made for separate irrigation services and meters to be installed at customer's expense, if required. These should adhere to the requirements for potable water services, per paragraph 3.6.1.

3.7 *Cross Connection Control and Backflow Prevention* – Backflow prevention assemblies shall be installed, in accordance with requirements contained in ECUA's Code, Chapter 5, "Cross Connection Control" and ECUA's Cross Connection Control Program, by the owner/developer, to protect the water distribution system from potential contamination.

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3.7.1 *Water Services Requiring Backflow Prevention Assemblies –*

3.7.1.1 *Single Family Residences* – A Backflow Prevention Assembly is required for certain types of residential services. These services are dedicated irrigation services, dedicated fire suppression services and in situations where there is an auxiliary water source on the property.

3.7.1.2 Commercial and Multi-Family – A Backflow Prevention Assembly is required on every commercial and multi-family service.

3.7.2 *Types of Backflow Prevention Assemblies Required* – The type of backflow prevention assembly required for each individual establishment will be based on the degree of hazard involved. ECUA shall make the final decision based on the proposed land use activities. Refer to ECUA Code, Chapter 5, "Cross-Connection Control" and ECUA's Cross Connection Control Program. All assemblies must be approved for use in potable water service by one or more of the following: NSF, ANSI, ASSE, and UL.

3.7.2.1 *Backflow Prevention Assembly Types –*

3.7.2.1.1 Air-Gap Separation Backflow Prevention Assembly will be used in any high risk installation, but is acceptable in all situations described in this section.

3.7.2.1.2 Reduced Pressure Principle Backflow Prevention Assembly will be used in any moderate to high-risk installation.

3.7.2.1.3 Double Check Valve Backflow Prevention Assembly will be used in any moderate-risk installation, which will include most private fire lines, and private hydrants.

3.7.2.1.4 Pressure Vacuum Breaker Backflow Prevention Assembly will be used for irrigation systems only.

3.7.2.2 *Additional Requirements* –

3.7.2.2.1 The type of backflow prevention assembly shall be shown on the Construction Plans.

3.7.2.2.2 An unmetered water line with a backflow prevention assembly may also be required to have a low flow detector meter.

3.7.3 *Bypass* – Any piping arrangement that bypasses the backflow prevention assembly is strictly prohibited.

3.7.4 *Location* –

3.7.4.1 All backflow prevention assemblies are to be located immediately after the meter or immediately inside the property line at the right-of-way line, and shall be readily accessible for inspection and visible from the public right-of-way.

3.7.4.2 Any deviation from 3.7.4.1 above must be individually approved by the ECUA in writing.

3.7.4.3 The location of the backflow prevention assembly is to be shown on the Construction Plans for all developments with the exception of single family dwellings.

3.7.5 *Inspection and Testing* – Inspection and testing of the backflow prevention assembly is the responsibility of the owner. Upon the completion of the initial installation of the backflow prevention assembly, the assembly shall be tested. Additional tests are required biennially for Single Family and annually for Commercial/Multi-Family. All backflow assembly tests shall be conducted by a certified backflow prevention tester and the test results submitted to ECUA's Cross Connection Control Division.

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