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## **Section 710 Non-potable Water System Design Standards**

### **710.1 Purpose**

This document provides procedures and guidelines for the preparation of plans and specifications for construction of urban non-potable water facilities for the City of Beaverton. Adherence to these procedures and guidelines will reduce the time required for processing the plans. These guidelines do not include, but may reference, additional conditions that may be promulgated by all other pertinent ordinances, codes, and official policy set forth by the City of Beaverton Water Department or other departments of the City of Beaverton or other government agencies. These guidelines establish minimum acceptable design criteria. More stringent requirements may be imposed by the City Engineer based on specific project conditions.

Wherever the approval, discretion or opinion of the City Engineer, or any other City staff, is called for herein, the project applicant shall submit a written request for the same. Design exception requests must clearly identify the unusual circumstance that would warrant an exemption or waiver from the standards or specifications. The project applicant shall be responsible for providing any calculations or studies needed to support the proposal and for resolving specific design problems with the appropriate agencies, departments or divisions. Any final decision by City staff may be appealed pursuant to the City Code.

### **710.2 Requirements for Improvements and Subdivision Maps**

- A. Provide a detailed utility plan showing onsite and offsite public and private Non-Potable water systems, including mains, services, valves, and all other required appurtenances, and their connections to existing City maintained non-potable water facilities. Show the location, type, and diameter of public and private non-potable water mains, along with proposed system valves and service lateral placement.
- B. Onsite non-potable water facilities shall be clearly denoted in accordance with this document.
- C. Annotate the local agency information sheet of the Subdivision Map with any information that is needed to notify property owners of requirements for connection to the City water system. These include, but are not limited to:
  - 1. Payment of fees prior to issuance of Building Permits,
  - 2. Lots requiring pressure regulating valves or booster pumps,
  - 3. Backflow protection,
  - 4. Public access requirements, such as gates or access roads.

The appropriate information may be obtained from the City of Beaverton Public Works Water Operations.

### **710.3 Non-potable Water Mains – General**

- A. Under no circumstances will cross-connection between the potable water system and the non-potable water system be allowed.
- B. Public non-potable water mains may not be designed outside the street right-of-way without written approval from the City Engineer.

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- C. In general, publicly maintained non-potable water facilities will be designed only where they serve multiple ownership lots and where appropriate access for maintenance can be provided.
- D. Non-potable water mains installed at a slope of 15% or greater shall be designed with restrained joints. The Design Engineer shall provide adequate drainage measures to protect the trench from erosion.
- E. Non-potable water mains installed outside of any roadway, called "cross-country mains," shall have suitable access for Water Operations personnel and equipment. In general, cross-country mains must be isolated with valves in the public right-of-way and must be identified with purple locating posts (Carsonite 492 CW-112 or approved equal) at approximate 500-foot intervals, at any angle point, and at the entrance to an easement. Stakes should have vandal-proof metal bottoms. Access requirements as established in the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management* may be imposed on a project based on site conditions.
- F. For purposes of leak detection and maintenance access, no reinforced concrete may be designed over publicly maintained non-potable water facilities. Un-reinforced concrete will be allowed under special circumstances such as crosswalks.
- G. Extent of non-potable water main improvements will be as follows:
1. Any off-site non-potable water main improvements needed to serve the project must be shown on the improvement plans.
  2. In general, non-potable water mains shall be designed at least across one half of the property frontage or to the last service connection, whichever is greater; or
  3. Where the project is required to provide new street improvements over the non-potable water main alignment and the non-potable water main will serve properties beyond the project limits, the non-potable water main must be designed to cross the full property frontage or to the limits of the street improvements, whichever is greater.
- H. Streets with potable water, non-potable water, and sewer mains must be at least 25 feet wide, face-of-curb to face-of-curb. Streets with non-potable water and either sewer or potable water must be at least 20 feet wide, face-of-curb to face-of-curb.
- I. Restrained Joints
1. For pipes with diameters 12-inch and greater in areas where the system pressure is 90 psi or greater, restrained joints shall be used, in addition to concrete thrust blocking and harnesses, at horizontal and vertical bends, and at radial curves. Restrained joints shall also be used on piping on either side of a restrained and/or blocked bend to provide restraint utilizing soil friction. A rational method, such as the DIPRA design program, will be utilized to determine restrained lengths.
  2. For pipes with diameters 16-inch and greater, regardless of area pressure, restrained joints shall be used, in addition to concrete thrust blocking and harnesses, at horizontal and vertical bends, and at radial curves. Restrained joints shall also be used on piping on either side of a restrained and/or blocked bend to provide restraint utilizing soil friction. A rational method, such as the DIPRA design program, will be utilized to determine restrained lengths.
  3. For pipes with diameters 10-inch and smaller, restrained joints alone shall be used, where practical, at horizontal and vertical bends, and at radial curves. Restrained joints shall also be used

on piping on either side of a restrained and/or blocked bend to provide restraint utilizing soil friction. A rational method, such as the DIPRA design program, will be utilized to determine restrained lengths.

4. Restrained joints shall be mechanical joint ductile iron in accordance with the applicable requirements of the AWWA C111 and AWWA C153 of latest revision, or an approved bell harness restraint, and shall be compatible with the type and pressure class of pipe used.
- J. Non-potable water mains shall not be designed with laterals for fire hydrants, wharf heads, or other appurtenances that would allow non-potable water to be used for other than approved uses unless approved by the City Engineer.
- K. Non-potable water mains shall not be designed with temporary connections unless approved by the City Engineer. When permitted, temporary connections shall be designed in accordance with this document.
- L. Thrust Blocks
1. Regardless of restrained joint installations, thrust blocks shall be installed behind all tees, when connecting to existing mains, where existing restraints are not in place or are unknown, and anywhere where restrained joints alone are insufficient or not practical.
  2. When used, thrust blocks shall be constructed in accordance with applicable Chapter 6, City Water design standards.
- M. A combination of thrust blocking and restrained joints may be required in unique situations, not already specified herein, and/or as required by the City.

#### 710.4 Materials

- A. Labeling
1. Buried pipes and service laterals used for non-potable water shall be clearly identified by using purple pipe with continuous wording "NON-POTABLE WATER – DO NOT DRINK" printed on opposite sides of the pipe. Where purple pipe cannot be used, the pipes shall be installed with warning tape.
  2. The plastic warning tape shall be prepared with black or white printing on a purple field having the words, "NON-POTABLE WATER - DO NOT DRINK". The overall width shall be a minimum of 3 inches.
  3. Warning tapes shall be installed directly on the top of the pipe longitudinally and shall be centered. The warning tape shall be installed continuous for the entire length of the pipe and shall be fastened to each pipe length by plastic tape banded around the pipe with fasteners no more than 5 feet apart. Taping attached to the sections of pipe before installation in the trench shall have flaps sufficient for continuous coverage.
  4. All above grade non-potable water pipe and service laterals must be labeled with the words "NON-POTABLE WATER – DO NOT DRINK" and color-coded purple to differentiate non-potable water pipelines from potable and other water pipelines. If purple identification tape is used to label the pipe and/or color code the pipe, the tape must be adhesive, permanent, and resistant to environmental conditions. Purple bands may also be painted around the circumference of the pipe at 10-foot intervals. Purple PVC pipe is not acceptable for color coding in exposed environments because the color will fade in the sunlight.

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5. Tracer wire in accordance with City Water Specifications except that it shall be purple in color. Tracer Wire shall be laid on top of and along entire length of all new buried pipes and tubing, and shall be extended to the surface at all valve locations, blow offs and meter boxes sufficiently for locator equipment to be attached.
- B. Non-potable water service laterals 2-inch diameter and smaller shall be purple high-density polyethylene (HDPE) tubing produced from PE4710 virgin HDPE or purple polyethylene coated type “K” copper tubing unless otherwise directed.
- C. Non-potable Water Mains: 4-inch to 12-inch Diameter
1. Gasketed joint or fusible polyvinyl chloride (PVC) pipe, Pressure Class 235 DR18 minimum, per AWWA Standard C900.
  2. Ductile iron pipe (DIP) fittings, Pressure Class 350, per AWWA Standard C151.
  3. Where normal static mainline pressure exceeds 100 psi, pipe shall be either PVC Pressure Class 305 DR 14 or DIP Pressure Class 350, and fittings shall be rated for 250 psi minimum.
  4. Ductile Iron Pipe (DIP) shall be used within delineated fault zones and shall extend to 100 feet outside each side of the delineated fault boundaries with approved valves installed at the ends for isolation.
- D. Non-potable Water Mains: 16-inch and 18-inch Diameter
1. Gasketed joint or fusible polyvinyl chloride (PVC) pipe, Pressure Class 165 DR 25 minimum, per AWWA Standard C900 or DIP Pressure Class 350.
  2. Ductile iron pipe (DIP) fittings, Pressure Class 250 minimum, per AWWA Standards C110, C111 & C153.
  3. Where normal static mainline pressure exceeds 100 psi, pipe and fittings shall be rated for 200 psi minimum.
  4. Ductile Iron Pipe (DIP) shall be used within delineated fault zones and extend to 100 feet outside each side of the delineated fault boundaries.
- E. Non-potable Water Mains: 20-inch Diameter and Larger
1. Gasketed joint or fusible polyvinyl chloride (PVC) pipe, Pressure Class 165 minimum, per AWWA Standard C900.
  2. Tape-wrapped Steel Pipe per AWWA Standard C200, design pressure of 150 psi minimum.
  3. Ductile iron pipe (DIP) and fittings, Pressure Class 250 minimum, per AWWA Standard C151.
  4. Ductile Iron Pipe (DIP) shall be used within delineated fault zones and extend to 100 feet outside each side of the delineated fault boundaries with approved isolation valves installed at both ends.

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## 710.5 Connection to an Existing Public Non-Potable Water Main

- A. Under no circumstances will cross-connection between the potable water system and the non-potable water system be allowed.
- B. Indicate a "hot tap" for connection of non-potable water service laterals 2-inch in diameter and smaller.
- C. Indicate connection of pipes 4-inch - 12-inch in diameter with a hot tap or a cut-in tee in conformance with the provisions of Chapter 6, Water System.
- D. Tie-ins to the existing City non-potable water system must be inspected by a City Water Operations representative and the improvement plans must be so annotated.
- E. Size-on-size taps are allowed up to 8-inch diameter mains.
- F. In most major streets, or where the street surface is less than five years old, installation methods other than open cutting may be required. The City Engineer, as appropriate, will determine the requirements based on the condition of the existing street.

## 710.6 Alignment

### 710.6.1 Horizontal

- 1. Except for crossings, a minimum horizontal distance of 4 feet clear shall be maintained between potable water mains and the non-potable water mains and service laterals. If the horizontal distance specified is not feasible, the Designer shall provide an alternate design to the City Engineer and demonstrate that the alternate will provide at least the same level of protection to public health. In no case is horizontal separation of less than 10 feet or construction in the same trench as potable facilities allowed.
- 2. The minimum horizontal separation from storm drains, gas, electrical, telephone and communications lines shall be 4 feet clear except at crossings.
- 3. Non-potable water mains shall be designed a minimum of 5 feet from all structures, such as manholes or drop inlets.
- 4. Non-potable water mains shall be designed a minimum of 3 feet clear from the lip of gutter and 5 feet clear from the edge of easements.
- 5. In the event that it is not possible to maintain the required separations and relative positions between non-potable water mains and service laterals, potable water lines and sanitary sewer lines, a special design shall be required and approved by the City Engineer.
- 6. Non-potable water main crossings over or under other underground facilities will be designed as close to 90 degrees to the facility as possible. If the other utility is a potable water main the minimum angle for a crossing shall be 45 degrees.
- 7. Non-potable water mains shall be designed with service laterals perpendicular to the main.

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## 710.6.2 Vertical

1. Non-potable water mains shall be designed with the ability to generally drain to blow offs. Consult with the City of Beaverton, Water Operations staff for specific design requirements.
2. Provide a minimum of 6-inch vertical separation from storm drains or other underground utilities such as telephone, communication, gas, or electrical conduit.
3. Pothole and survey utilities or other structures critical to vertical alignment.
4. Where it is necessary to lower or raise either the non-potable water main or the existing potable water main because of a vertical conflict, the main that is smaller shall be chosen for the deviation; however, the deviation shall be such that the potable water main is placed above the non-potable water main. If the non-potable water main must go over an existing potable water main the Designer shall submit the proposed “alternative” design to the City Engineer for review and approval.
5. Non-potable water mains over or under other utilities shall be in accordance with the City Design Manual Chapter 6 – Water.

## 710.7 Main Sizing Criteria

- A. Non-potable water mains will be sized in accordance with the City’s planned areas to be served by the non-potable water system. Variation from the system design will require approval from the City Engineer.
- B. Non-potable water mains will be sized based on a peaking factor of 10 applied to the annual average demand rate, and a maximum velocity of 5 feet per second.
- C. Non-potable water mains shall be 4-inch diameter minimum.

## 710.8 Minimum Main/Lateral Cover

- A. Depth of cover is defined as the distance from the top of the pipe to the final finished grade measured directly over the pipe. Minimum depth of cover shall be as follows:
  1. Service laterals shall have minimum cover as shown on City Standard Details.
  2. Mains of 4-inch, 6-inch and 8-inch diameter shall have 36 inches of minimum cover.
  3. Mains of 12-inch diameter shall have 42 inches of minimum cover.
  4. Mains of 16-inch diameter or larger shall have 48 inches of minimum cover.
- B. When within 10 feet of separation from a potable water main, the depth of the non-potable water pipe shall provide for 1 foot of vertical separation with the non-potable water main beneath the potable water main.
- C. Where minimum cover is less than standard or greater than 8 feet, approval by the City Engineer is required. Show mains with nonstandard cover in profile on the Improvement Plans or Encroachment Permit applications. Where cover is less than the Standard, higher class pipe, ductile iron pipe, and use of controlled density fill may be required.

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## 710.9 Non-potable Water Valving

### A. Valves - General

1. A minimum of two (2) mainline valves are required for “T” intersections.
2. A minimum of three (3) mainline valves are required for cross intersections.
3. Any non-potable water main that does not have a lateral connection will have valves at approximately 500-foot intervals.
4. Non-potable water main valves must be located outside of concrete areas whenever possible to facilitate repairs.
5. Cross-country mains must be isolated with valves in the public right-of-way and must be identified with locating posts at 500-foot intervals, at any angle point and at the entrances to easements.
6. All valves must be tagged with a non-potable water identification tag with the words “WARNING – NON-POTABLE WATER – NOT FOR DRINKING” on one side and “AVISO – NO ES PARA BEBER” on the other. Identification tags shall be permanent plastic tags affixed to the valve designed to withstand exposure to weather, sunlight, and immersion.

### B. Gate Valves

1. Gate valves shall comply with City Design Manual Section 640.
2. Gate valves shall be ductile iron and shall conform to AWWA Standards C509 and C515 of the latest revision and shall be the resilient seat type with non-rising stem opening counter clockwise with O ring stem seal and suitable ends for connecting to the type of pipe or fitting used.
3. The working pressure rating of the gate valves shall meet or exceed the pressure rating of the pipe.
4. External bolts and nuts shall be 304 stainless.

### C. Butterfly Valves

1. Butterfly valves shall comply with City Design Manual Section 640.
2. Butterfly valves shall be flanged or mechanical joint type only and shall conform to AWWA Standard C504 of the latest revision and shall be the rubber seat type.
3. Valve discs shall rotate 90 degrees from the full open position to the tight shut position.
4. The valve seat shall provide a tight shut off at a pressure differential of 150 psi upstream and 0 psi downstream in either direction.
5. The valve operator shall be the traveling nut type.
6. Valve shall open with a counter-clockwise rotation of the operating nut.
7. External bolts and nuts shall be 304 Stainless.



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- D. Valve Boxes
1. Valve boxes shall be taken from the City approved products list.
  2. Valve stem riser shall be SDR 35 purple PVC pipe.
  3. Valve boxes shall be purple and have a warning label permanently molded into the cover. Warning labels shall be constructed of a weatherproof material with the warning permanently stamped or molded into the label and having the words, "NON-POTABLE WATER - DO NOT DRINK".

### 710.10 Service Laterals and Meters for Irrigation Service

- A. Under no circumstances will cross-connection between the potable water system and the non-potable water system be allowed.
- B. All service meters must be tagged with a non-potable water identification tag with the words "WARNING – NON-POTABLE WATER – NOT FOR DRINKING" on one side and "AVISO– NO ES PARA BEBER" on the other. Identification tags shall be permanent plastic tags affixed to the valve designed to withstand exposure to weather, sunlight, and immersion.
- C. Conditioned developments will be provided City non-potable water service via meters located at the frontage of a public street.
- D. The City may allow meters to be located on private street frontages and/or within public utility easements if the City Water Operations staff evaluation concludes that it is reasonable under the circumstances. However, meters must be readily accessible.
- E. Design meter boxes out of traveled ways and a minimum of 10 feet from street trees whenever possible. Meter boxes shall be purple and have a warning label permanently molded into or affixed onto the cover with rivets, bolts, etc. Warning labels shall be constructed of a weatherproof material with the warning permanently stamped or molded into the label and having the words, "NON-POTABLE WATER - DO NOT DRINK".
- F. Base any required hydraulic calculations for the water meter and service lateral sizes on criteria from AWWA Manual M22 and submit to the City Engineer for approval. Service laterals shall be 1"-inch diameter, minimum.
- G. The maximum velocity in non-potable water service laterals from the main to the meter is 15 feet per second.
- H. Meter manifolds other than those shown in various City Standard Plans will be detailed on the plans and approved by Water Operations staff.
- I. Multi-Family Residential (3 or more units)
1. See City Design Manual Chapter 6, Section 660.1.1 for irrigation meter requirements for any landscaped or common areas.
  2. All meters must be within public right-of-way or easements and multiple meters will be clustered where possible.
- J. Mobile Home Parks

1. See City Design Manual Chapter 6 for common area irrigation meter requirements.
- K. Mixed residential and commercial uses must have separate meters.
- L. Irrigation
1. Provide separate irrigation meters for landscaped areas of all commercial uses.
  2. Provide separate irrigation meters for common areas of all condominium, town home, apartment complexes, and mobile home parks.
  3. Provide reduced pressure backflow devices for all irrigation services. Backflow devices must be specified on the irrigation plan and must conform to City Standard Details and current Approved Products List.
  4. Sizing of irrigation meters will be determined by Water Operations staff after reviewing the landscape plans. Irrigation meter size will be determined by the maximum flow required at the meter and will be based on AWWA criteria for meter sizing. Water demand purchased will be based on the estimated gallons required to maintain the planned landscape in a healthy condition for our climate. Along with landscape and irrigation plans, the applicant must submit the planned square footage of planted areas and categories of plants to be used as selected from the following:
    - a. High water use plants: turf, annuals, and container plants;
    - b. Moderate water use plants: ornamental trees, shrubs ground covers, and perennials primarily irrigated by sprinklers. (Note that there may be some use of drip or bubblers in this category but not a predominance.)
    - c. Low water use plants: drought tolerant plants recognized as having a plant factor of 0.3 or less and irrigated primarily through drip emitters.

### 710.11 Backflow Devices

- A. Backflow Prevention shall be in accordance with the City’s Design Manual Chapter and shall be required for the following applications:

APPLICATION	TYPE OF DEVICE
Buildings with Non-potable Water for approved Dual Plumb uses	RP*
Irrigation Systems w/ Booster Systems	RP*
Irrigation System w/Chemical Feed	RP*
Irrigation System w/Non-potable Water impoundments on-site	RP*
Irrigation System w/Supplemental Water from the Potable Water System	RP*
*RP = Reduced Pressure Zone Assembly	

- B. All backflow devices must be tagged with a non-potable water identification tag with the words “WARNING – NON-POTABLE WATER – NOT FOR DRINKING” on one side and “AVISO – NO ES PARA BEBER” on the other. Identification tags shall be permanent plastic tags affixed to the valve designed to withstand exposure to weather, sunlight, and immersion.

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## 710.12 Pressure

- A. Pressure
  - 1. Pressure Criteria
    - a. Operating pressure under peak hour demand shall not be less than 40 psi.
    - b. The maximum allowable static pressure is 100 psi.
  - 2. Pressure Regulation
    - a. Install pressure reducing valve installations where required by City to meet operating and static pressure standards.
    - b. All pressure reducing valves must be tagged with a non-potable water identification tag with the words “WARNING – NON-POTABLE WATER – NOT FOR DRINKING” on one side and “AVISO – NO ES PARA BEBER” on the other. Identification tags shall be permanent plastic tags affixed to the valve designed to withstand exposure to weather, sunlight, and immersion.

## 710.13 Specialty Valves and Water Sampling Stations

- A. Water sampling stations are required to provide representative sampling where indicated in the City’s Design Manual Chapter 6. The above grade cabinet must have a warning label affixed onto it with rivets, bolts, etc. Warning labels shall be constructed of a weatherproof material with the warning permanently stamped or molded into the label and having the words, "NON-POTABLE WATER - DO NOT DRINK".
- B. Air release and vacuum relief valves are required at substantial high points in the system such as hilltops, bridge crossings, and the upper end of dead legs. Air valves may be located below grade with above grade vent piping and drain to the sanitary sewer.
- C. Blowoffs shall be installed at substantial low points to facilitate draining of the system and shall be located within 150 feet of a sanitary sewer manhole. Local low points, such as utility crossings, will not require blowoffs. Blowoffs shall be in accordance with City’s Standard Drawings.
- D. All manual control valves, electrical control valves, pressure reducing valves shall be installed below grade in a valve box. Air release valves can be vented below grade.
- E. All specialty valves and water sampling stations must be tagged with a non-potable water identification tag with the words “WARNING – NON-POTABLE WATER – NOT FOR DRINKING” on one side and “AVISO – NO ES PARA BEBER” on the other. Identification tags shall be permanent plastic tags affixed to the valve designed to withstand exposure to weather, sunlight, and immersion.

## 710.14 Special Conditions for Delineated Fault Zones

- A. Fault zones must be identified on improvement plans.
- B. Ductile iron pipe shall be indicated on the improvement plans in delineated fault zones and extend to 100 feet outside each side of the delineated fault boundaries with isolation valves shown on both ends.

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### 710.15 Easements

- A. An easement must be provided over any public non-potable water system when it is installed outside a public right-of-way.
- B. The easement will be the same width as a Public water Easement, See Chapter 1, section 130 – Easements. A shared easement that contains another facility, such as sewer, storm drain, or other utility shall be 20' wide minimum. The easement will be dedicated as a "Public Recycled Water Easement" if it contains non-potable water only. It will be dedicated as a "Public Utilities Easement" if it contains other facilities as well.
- C. Easements must be configured to encompass all publicly maintained appurtenances, such as service laterals and meters and will be generally centered over the facility. Separate access easements may be required depending on site conditions. When non-potable water mains are to be installed along a property line the easement will be wholly contained on one parcel.
- D. All property restrictions placed as a result of dedication of easements will be so noted on the Subdivision Map, or on the Easement Deed if the easement is not dedicated as part of a subdivision. Required notes are:
  - 1. No structures may encroach on, above or below the surface of the ground in any public non-potable water easement. This includes footing of foundations or eaves from the roof of any adjacent structure, pools, ponds, or outbuildings on slabs or foundations. Decks, sheds, or other structures that may be easily removed for maintenance of the water system may be allowed at the discretion of the City Engineer.
  - 2. No trees may be planted in a public non-potable water easement without first obtaining approval of the City Engineer. Trees may be allowed to the extent that damage to the water system does not occur from root intrusion and adequate access can be provided for maintenance and repair vehicles.

### 710.16 Abandonment of Non-potable Water Mains and Services

- A. Any existing non-potable water mains and service laterals that will not be used must be abandoned and must be shown on the Improvement Plans with appropriate notation.
- B. For all abandoned non-potable water services up to and including 2 inches, annotate to remove the valve and saddle and install a full circle clamp on main under inspection by authorized City personnel.
- C. For all tees, the tee, valve and concrete thrust block must be removed and the main repaired with approved pipe and couplings, and so noted on the Improvement Plans.
- D. Valve boxes and riser pipes for abandoned valves must be removed and so noted on the Improvement Plans.
- E. Abandoned mains and valves located within any street structural section or within any new trench must be shown on the Improvement Plans to be removed.
- F. Show all 12-inch diameter and larger non-potable water mains to be abandoned within the public right-of-way as removed or broken every 50 feet and filled with an approved flowable fill material.

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## 710.17 Non-potable Water Pumping Stations

- A. Pumps and Piping
  - 1. Pumps
    - a. Vertical turbine pumps shall be installed in stainless steel suction cans. The size and depth of the suction can as well as the location of the suction piping connection shall be in accordance with Hydraulic Institute standards.
    - b. The pumps shall not exceed 1800 revolutions per minute operating speed and shall be provided with mechanical seals.
    - c. Pump motors shall be 480 VAC, 3-phase, with 1.15 service factor. Motors shall be open drip-proof or have water-proof enclosures.
  - 2. Piping
    - a. Pond intake piping shall be stainless steel, including intake screen.
    - b. Pump isolation valves are required on the suction and on the discharge piping.
    - c. Isolation valves shall be resilient seat gate valves.
    - d. Provide rubber flapper check valves on the pump discharge piping at a minimum.
    - e. No piping other than drain piping connection to pump cans shall be buried beneath the floor. Below grade piping shall be in pipe trenches with aluminum grating covering the trench.
    - f. Each pump station shall be plumbed to have sodium hypochlorite injection capability.
- B. Electrical Design & Emergency Power
  - 1. Electrical Equipment (single feed)
    - a. A minimum of one pump shall be driven by an adjustable speed drive (VFD).
  - 2. The other pump motors shall have reduced voltage solid-state starters.
- C. Surge Control
  - 1. Hydrodynamic transient analyses shall be performed for each pump station to determine necessary surge control measures.
- D. Instrumentation & Controls (I & C)
  - 1. Supervisory Control And Data Acquisition (SCADA)
    - a. The new system shall integrate with the City's existing system, which utilizes spread spectrum radio telemetry to a centralized server.

- b. Pumps normally shall be controlled by downstream reservoir levels.
- c. Redundant communication paths between the pump station and the downstream reservoir are required.
- d. An electromagnetic flow meter shall be provided within the pump station.

E. Redundancy Requirements

1. Capacity

The pump station shall be designed such that it can meet design capacity with the largest pump out of service at the specified design capacity.

2. Electrical Redundancy

- a. No redundancy is required for electrical switch gear, motor control centers, or adjustable speed drives.
- b. Standby generators are not required, but the pump station shall have a transfer switch and receptacle of a type that would allow a direct connection of a City portable generator to the pump station.

F. Auxiliary System Redundancy (HVAC)

- 1. Auxiliary systems can be constructed without redundant equipment.
- 2. All pumps stations shall be provided with heaters.
- 3. Ventilation shall be as required to keep the interior temperature within the allowable temperature range of electronic equipment housed within the building.

G. Site Requirements

1. Architectural

- a. The pumps and electrical equipment, including switch gear, motor control centers, and control panels shall be housed in masonry buildings.
- b. The floor of the building shall be a minimum of 6 inches above the surrounding exterior grade.
- c. Skylights shall be provided in the roof above the pumps for removal and installation of pumps.

2. Visual Impacts/Restrictions

- a. Building sites will be subject to City Design Review Board.
- b. Roofing materials shall match existing roofing materials in the area.
- c. Pump station shall be fenced.

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- i. Wrought iron decorative fence in urban settings.
      - ii. Others may be cyclone with or without slats.
    - d. Entrance gates shall be provided.
      - i. Gate(s) shall be either rolling or double leaf swinging gates.
      - ii. Type of locks shall be determined based on type of fencing and gates selected.
  3. City/County Noise Limits

In the City or in urban settings the pumps shall be housed in a building to mitigate noise and conform to the requirements of the City's noise ordinance.
  4. Parking/Paving
    - a. Paved areas shall be of sufficient size and located to allow crane access for pump removal.
    - b. There shall be adequate paved area to turn around a pickup truck within the fenced area.
  5. Security/Utilities/Lighting
    - a. There shall be covers on locks to prevent the cutting of the locks.
    - b. Ladder protectors shall be required wherever ladders are in exterior locations.
    - c. Type of yard lighting control may be manual, by photocell or on a timer.
    - d. Motion detector lights may be required.
    - e. Security cameras may be required.
    - f. Electric service shall be underground in urban areas but may be overhead in rural areas.
    - g. Intrusion alarms may be required.
  6. Landscaping shall be required and shall be designed and installed per the City's Development Code.

### 710.18 Non-potable Water Storage Facilities Criteria

- A. Hydraulic Considerations
    1. Hydraulic Modeling shall determine capacity sizes for operational storage capacity only.
    2. Emergency Storage Capacity and fire storage capacity shall not be included in the sizing of the non-potable water storage facilities.
    3. The High Water Elevation and Hydraulic Grade Line shall be determined by hydraulic analysis.
    4. Tank connections shall be to the distribution system and "float" off system.
  - B. Siting Criteria
- City of Beaverton Engineering Design Manual
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- Chapter 7 – Non-potable Water

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1. Hydraulic Modeling shall determine site locations and shall be coordinated with proposed distribution system piping alignments and location of major demands.
  2. Evaluate Alternate Sites based on the following siting criteria.
    - a. Proximity to Distribution System and Sanitary Sewer
    - b. Hydraulic Effectiveness
    - c. Power Availability
    - d. Geotechnical Feasibility
    - e. Property Ownership and Land Acquisition
    - f. Construction Cost
    - g. Access Requirements
    - h. Surrounding Land Uses
    - i. Overflow Constraints
    - j. Environmental Constraints
      - i. Biological Resources
      - ii. Cultural Resources
      - iii. Geology and Soils
      - iv. Noise
      - v. Land Use Planning
    - k. k. Noise Impacts
    - l. l. Visual Impacts
    - m. m. Permitting Requirements
- C. Right-of-Way Needs and Land Acquisition
1. Tank Sites shall be evaluated based on tank capacities developed during hydraulic evaluation.
  2. Land Acquisition and easements required will be determined and included in the evaluation at each site.
  3. Construction Easements may be required and will be evaluated on a case by case basis.
- D. Tank Materials



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1. Seismic/Structural design shall be in accordance with the Oregon Structural Specialty Code, seismic design category D.
  2. Welded steel tanks are required to be consistent with existing City water storage facilities. AWWA Standard D-100 shall be used to design welded steel tanks.
  3. Footings shall be designed by an Engineer specializing in structural design, and shall be concrete ring wall footings unless local geotechnical conditions and final dimensions dictate otherwise. The tank shell shall be anchored to the ring wall footing unless this requirement is proven to be unwarranted for a specific installation.
  4. Coatings for steel tanks shall comply with City tank coating standards.
- E. City will consider need for corrosion protection on a case-by-case basis.
- F. On-Site Piping
1. Inlet/Outlet piping for non-potable water shall be a single pipeline from the distribution system and shall enter the tank through the floor plate. To address seismic issues, piping connected to the tank will be adequately designed to accommodate differential settlement.
  2. Pipeline Size will be determined by the final hydraulic analysis.
  3. Valves
    - a. Normally, a control valve or an altitude valve will not be provided.
  4. Floor Drains shall be provided.
  5. Overflow Pipe
    - a. An overflow pipe will be provided with an air gap to eliminate potential back pressure on the overflow pipe.
    - b. The overflow pipe shall be sized for maximum flows into the tank.
    - c. The tank overflow piping and shell nozzle shall be welded steel pipe.
    - d. Overflow shall have an air-break and drain by gravity pipeline to the nearest sewer, with lateral sized to limit flows based on capacity of receiving sewer main. The City Engineer may waive this requirement at his/her discretion.
- G. Site Requirements
1. Environmental/Geotechnical investigations shall be conducted after the initial reconnaissance of each selected tank site.
  2. Visual Impacts/Restrictions shall be considered.
  3. Fencing
    - a. Storage tanks shall be fenced.

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- b. Wrought iron decorative fence in urban areas.
  - c. Others may be chain link with or without slats.
4. Gates
- a. Entrance gates shall be provided.
  - b. Gates shall be either rolling or double leaf swinging gates.
  - c. Types of locks shall be determined based on type of fencing and gates selected.
5. Paving/Parking
- a. Provide a 10-foot paved access road around the tank for maintenance and inspections. Alternate road materials may be considered if appropriate.
  - b. Provide adequate paved area to park and turn a truck around within the fence area.
6. Security/Utilities/Lighting
- a. There will be covers on locks to protect against cutting.
  - b. Ladder protectors and/or anti-climb assemblies will be required for exterior ladders.
  - c. Yard lighting controls will be selectable as manual, by photocell or timer.
  - d. Yard lighting shall take into consideration impacts on adjacent parcels.
  - e. Security cameras may be required.
  - f. Intrusion alarms shall be required, including on roof hatches.
  - g. Motion detector lights may be required.
7. Landscaping may be required and shall be designed and installed per the City's Development Code.
8. All site runoff will be collected and discharged to an appropriate location in accordance with CWS Erosion Control Standards.
- H. Instrumentation & Control
- 1. Remote Telemetry Unit (RTU) shall be provided to transmit signals and alarms from the tank site to the City's central Supervisory Control and Data Acquisition (SCADA) system.
  - 2. I/O shall include at a minimum, the following:
    - a. Tank water level
    - b. High water level alarm
    - c. Low water level alarm

- d. Roof hatch intrusion alarm.

I. Water Quality

1. Internal Tank Piping shall be designed to induce mixing and eliminate short-circuiting.
2. Mixing/Recirculation options shall be investigated at each tank to eliminate dead zones. Options include:
  - a. separate piping configuration
  - b. recirculation pumping
  - c. proprietary piping manifolds to induce better water circulation.
3. Sample Locations shall be evaluated based on:
  - a. inlet and outlet piping
  - b. the tank shell
4. Chlorine Injection facilities shall be considered based on:
  - a. the distribution system water quality
  - b. operational considerations

J. Appurtenances/Accessories

Generally, all tank appurtenances shall be per the latest revision of AWWA Standard D100 although minor alterations may be required or allowed by Beaverton Water.

The following appurtenances shall be provided at the tank:

1. Man-ways - there shall be two (2) standard shell man-ways located at opposite sides of the tank.
2. Roof Access Points - there shall be two (2) roof access points to the tank interior and for use during maintenance operations. The primary access shall be a hatch located directly over the interior ladder, the secondary access shall be located near the center vent on the opposite side of the primary. When allowed by the City Engineer, perimeter vents may be used as secondary access points.
3. Ladders
  - a. A stainless steel interior ladder with Saf-T-Climb assembly shall be located on the inside wall at the roof hatch.
  - b. An intermediate platform may be provided depending on the height of the tank.
4. Roof vent(s) shall be designed to minimize dust and debris entry into the tank. The number and size will be based on maximum inflows into the tank as determined during final design.

5. Level Gages
    - a. An exterior float-type level gage will be located at a convenient location for easy visual inspection from the access road.
    - b. A level transmitter will be located on the side wall at an appropriate distance from the ground for the level signal to the RTU.
  6. Water Sampling Assemblies shall be provided to enable sampling from one or more points within the tank similar the most recent potable water tanks constructed in the City.
- K. Electrical
7. Power shall be provided by PGE from local distribution grid. If access to the grid is not available, solar power will be considered.

#### 710.19 On-Site Design Standards

- A. Design requirements for on-site facilities shall be in accordance with this document.

### **Section 720 Non-potable Water System Standard Plans**

Non-potable (NP) water system standard plans shall be the same as the water distribution system standard plans except as noted in this manual. In no case shall the non-potable water system construction standards deviate from the City's Non-potable Water System Design Standards without prior approval from the City Engineer.

### **Section 730 Non-potable Water System Construction Standards Specifications**

Non-potable water system construction standards specifications shall be the same as the water system construction standard specifications except that in no case shall the non-potable water system deviate from the City's Non-potable Water System Design Standards without prior approval from the City Engineer.

### **Section 740 Non-potable Water System Engineer's List of Approved Items**

Non-potable water system Engineer's list of approved items shall be the same as for the water system except that in no case shall the non-potable water system deviate from the City's Non-potable Water System Design Standards without prior approval from the City Engineer.