

EXHIBIT A

CRITERIA FOR THE SEPARATION OF WATER MAINS AND SANITARY SEWERS

Criteria adapted from State of California Department of Health Services "Criteria for the Separation of Water Mains and Sanitary Sewers" established April 5, 1983.

CRITERIA FOR THE SEPARATION OF WATER MAINS AND SANITARY SEWERS

A. PUBLIC HEALTH CONSIDERATIONS

Waterborne disease outbreaks attributed to the entry of sewage-contaminated groundwater into the distribution systems of public water supplies continue to be a problem in the United States. A community with its buried water mains in close proximity to sanitary sewers is vulnerable to waterborne disease outbreaks.

Sanitary sewers frequently leak and saturate the surrounding soil with sewage. This is caused primarily by structural failure of the sewer line, improperly constructed joints, and subsidence or upheaval of the soil encasing the conduit. A serious public health hazard exists when the water mains are depressurized and no pressure or negative pressures occur. The hazard is further compounded when, in the course of installing or repairing a water main, existing sewer lines are broken. Sewage spills into the excavation and, hence, enters into the water main itself. Additionally, if a water main fails in close proximity to a sewer line, the resultant failure may disturb the bedding of the sewer line and cause it to fail. In the event of an earthquake or manmade disaster, simultaneous failure of both conduits often occurs.

The water supplier is responsible for the quality of the water delivered to consumers and must take all practical steps to minimize the hazard of sewage contamination to the public water supply. Protection of the quality of the water in the public water system is best achieved by the barrier provided by the physical separation of the water mains and sewer lines.

B. BASIS SEPARATION STANDARDS

The "California Waterworks Standards" sets forth the minimum separation requirements for water mains and sewer lines. These standards, contained in Section 64630, Title 22, California Code of Regulations, specify:

Parallel Construction: The horizontal distance between pressure water mains and sewer lines shall be at least 10 feet.

Perpendicular Construction (Crossing): Pressure water mains shall be at least one foot above sanitary sewer lines where these lines must cross.

Separation distances specified in [c] shall be measured from the nearest edges the facilities.

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Common Trench: Water mains and sewer lines must not be installed in the same trench.

When water mains and sanitary sewers are not adequately separated the potential for contamination of the water supply increases. Therefore, when adequate physical separation cannot be attained increasing the structural integrity of both the pipe materials and joints should provide an increase in the factor of safety

C. EXCEPTIONS TO BASIC SEPARATION STANDARDS

Local conditions, such as available space, limited slope, existing structures, etc., may create a situation where there is no alternative but to install water mains or sewer lines at a distance less than that required by the Basic Separation Standards. In such cases, alternative construction criteria as specified in Section E should be followed, subject to the special provisions in Section D.

Water mains and sewers of 24 inches diameter or greater may create special hazards because of the large volumes of flow. Therefore, installation of water mains and sewer lines 24 inches diameter or larger should be reviewed and approved by the health agency prior to construction.

D. SPECIAL PROVISIONS

1. The Basic Separation Standards are applicable under normal conditions for sewage collection lines and water distribution mains. More stringent requirements may be necessary if conditions, such as, high groundwater exist.
2. Sewer lines shall not be installed within 25 feet horizontally of a low head (5 psi or less pressure) water main.
3. New water mains and sewers shall be pressure tested where the conduits are located ten feet apart or less.
4. In the installation of water mains or sewer lines, measures should be taken to prevent or minimize disturbances of the existing line. Disturbance of the supporting base of this line could eventually result in failure of this existing pipeline.
5. Special consideration shall be given to the selection of pipe materials if corrosive conditions are likely to exist. These conditions may be due to soil type and/or the nature of the fluid conveyed in the conduit, such as a septic sewage, which produces corrosive hydrogen sulfide.

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6. Sewer Force Mains

- a. Sewer force mains shall not be installed within ten feet (horizontally) of a water main.
- b. When a sewer force main must cross a water line, the crossing should be as close as practical to the perpendicular. The sewer force main should be at least one foot below the water line.
- c. When a new sewer force main crosses under an existing water main, all portions of the sewer force main within ten feet (horizontally) of the water main shall be enclosed in a continuous sleeve.
- d. When a new water main crosses over an existing sewer force main, the water main shall be constructed of pipe materials with a minimum rated working pressure of 200 psi or equivalent pressure rating.

E. ALTERNATE CRITERIA FOR CONSTRUCTION

The construction criteria for sewer lines or water mains where the Basic Separation Standards cannot be attained are shown in Figures 1 and 2. There are two situations encountered:

Case 1 - New sewer line - new or existing water main.

Case 2 - New water main - existing sewer line.

For Case 1, the alternate construction criteria apply to the sewer line.

For Case 2, the alternate construction criteria may apply to either or both water main and sewer line.

The construction criteria should apply to the house laterals that cross above a pressure water main but not to those house laterals that cross below a pressure water main.

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Case 1: New Sewer Being Installed

Zone Special Construction Required for Sewer

- A. Sewer lines parallel to water mains shall not be permitted in this zone without approval from the responsible health agency and water supplier.
- B. A sewer line placed parallel to a water line shall be constructed of:
 - 1. Extra strength vitrified clay pipe with compression joints.
 - 2. Class 4000, Type 11, asbestos-cement pipe with rubber gasket joints.
 - 3. Plastic sewer pipe with rubber ring joints (per ASTM D3034) or equivalent.
 - 4. Cast or ductile iron pipe with compression joints.
 - 5. Reinforced concrete pressure pipe with compression joints (per AWWA C302-74).

A sewer line crossing a water main shall be constructed of:

- 1. Ductile iron pipe with hot dip bituminous coating and mechanical joints.
- 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent centered over the pipe being crossed.
- 3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered over the pipe being crossed.
- 4. Any sewer pipe within a continuous sleeve.

A sewer line crossing a water main shall be constructed of:

- 1. A continuous section of ductile iron pipe with hot dip bituminous coating.
- 2. A continuous section of Class 200 (DR 14 per AWWA C900) plastic pipe or equivalent centered on the pipe being crossed.
- 3. A continuous section of reinforced concrete pressure pipe (per AWWA C302-74) centered on the pipe being crossed.
- 4. Any sewer pipe within a continuous sleeve.
- 5. Any sewer pipe separated by a ten-foot by ten-foot, four-inch thick reinforced concrete slab.

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Case 2: New Water Mains Being Stalled

Zone Special Construction Required for Water Main

- A. No water mains parallel to sewers shall be constructed without approval from the health agency.
- B. If the sewer paralleling the water main does not meet the Case 1, Zone B, requirements, the water main shall be constructed of:
 - 1. Ductile iron pipe with hot dip bituminous coating.
 - 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 - 3. Class 200, Type 11, asbestos-cement pressure pipe.
 - 4. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 - 5. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79- or C303-70).
- C. If the sewer crossing the water main does not meet the Case 1, Zone C, requirements, the water main shall have no joints in Zone C and be constructed of:
 - 1. Ductile iron pipe with hot dip bituminous coating.
 - 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 - 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 - 4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).
- D. If the sewer crossing the water main does not meet the requirements for Zone D, Case 1, the water main shall have no joints within four feet from either side of the sewer and shall be constructed of:
 - 1. Ductile iron pipe with hot dip bituminous coating.
 - 2. Dipped and wrapped one-fourth-inch-thick welded steel pipe.
 - 3. Class 200 pressure rated plastic water pipe (DR 14 per AWWA C900) or equivalent.
 - 4. Reinforced concrete pressure pipe, steel cylinder type, per AWWA (C300-74 or C301-79 or C303-70).

**See Standard Construction
Detail NC-23**