

**CITY OF TUCSON, WATER DEPARTMENT  
DESIGN STANDARD NO. 8-09  
WATER SYSTEM MODIFICATIONS DESIGN STANDARDS**

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**WATER SYSTEM MODIFICATIONS DESIGN STANDARDS**

**8-09.1.0 General**

**8-09.2.0 Design Requirements, Water System Modifications**

**8-09.0.0 WATER SYSTEM MODIFICATIONS DESIGN STANDARDS**

**8-09.1.0 General**

1.1 Purpose

This section describes the design standards and requirements for public water system modifications projects.

1.2 Definitions

Section 8-18 contains a list of definitions, abbreviations, and acronyms. The following definitions are unique to this section.

- A. "Modification" means the reconstruction redesign of City of Tucson water pipeline system facilities with new materials to resolve water conflicts with construction of Public Agency roadway projects.
- B. "Public Agency project" means any project performing work to replace or maintain public infrastructures. That includes roadways, storm drains, sewer, sidewalks, pole and underground duct structures for traffic and lighting, street overlays, landscaping and other work that could impact City of Tucson water system pipeline facilities.
- C. "Water conflict" means that a construction conflicts exists between an existing water pipeline and the proposed facilities being constructed by the Public Agency project.
- D. "Direct water conflict" means that the existing water pipeline facility must be reconstructed to relocate to a different location in order to avoid physical contact or to provide physical space for a facility being constructed by the Public Agency project.
- E. "Proximity water conflict" means that the existing water pipeline facility must be reconstructed to relocate to a different location in order to provide adequate space between a facility being constructed by the Public Agency project and the subject water facility.

Other construction conditions that are considered a proximity conflict include any construction that exposes any pipe bedding materials, any construction damaging concrete thrust blocking, and, any pole foundations located within five feet of a water pipeline.

- F. "Minimum construction working space" over a water pipe shall be defined as two feet, measured in the vertical direction from the bottom

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of all excavation for roadway sub grades and all trenches to the top of all existing water pipeline facilities.

1.3 Applicability

All water system modifications shall adhere to Intergovernmental Agreements or other agreements between agencies. In the absence of any Intergovernmental Agreements or other agreement, the provisions of these standards shall apply.

The requirements listed herein are in addition to all other standards.

Water system modifications involve the following types of water conflicts:

A. Direct Water Conflicts

Reconstruction of existing water pipeline facilities is required if proposed Public Agency project will have direct construction contact with the existing water pipeline facility.

B. Proximity Water Conflicts

1. Reconstruction of existing water pipeline facilities is required if the Public Agency project has facilities that have less than two feet vertical working cover over the water pipelines.
2. Reconstruction of existing water pipeline facilities is required if there is less than five feet minimum horizontal distance from the outside of the water pipeline and the outside wall of any pole foundation for electric or traffic facilities.
3. Reconstruction of existing water pipeline facilities is required if any proposed trenches that parallel existing water pipelines will expose the bedding materials of subject water facilities.
4. Reconstruction of existing water pipelines is required if proposed trenches weaken any trench support of concrete thrust blocking.

**8-09.2.0 Design Requirements, Water System Modifications**

These requirements are in addition to those found in Section 8-08.

2.1 General Responsibilities

A. Public Agency

1. Projects for Public Agency shall include contract provisions to have the project work scope include the design and construction of the necessary water system modifications. Project coordination with Tucson Water requires project plan submittals for Tucson Water comments on project plans and acceptance of water system modifications plans.

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2. Public Agency project alignments shall be considered to minimize the amount of modifications to water mains, transmission mains, and appurtenances.

**B. Project Designer**

1. Identify all water conflicts within the construction scope of the Public Agency project by reviewing alignments of proposed structures of the Public Agency project facilities and existing water pipeline facilities consisting of water mains and water transmission mains and appurtenances.
2. Prepare the plans for water system modifications to resolve water conflicts and construction of Public Agency project improvements.
3. Make plan submittal to appropriate staff at Tucson Water and coordinate any changes required.

**C. Tucson Water**

1. Tucson Water shall provide written plan review comments including identification of discrepancies according to Section 8-05.
2. Tucson Water may contact and request written confirmation from the responsible governmental agency that proper consideration was given during development of conceptual alignments for the subject roadway/drainage facilities.

**2.2 Scope of Design**

**A. Design Work**

The design work shall include, but not be limited to, all work for research, development, and production of a concise set of biddable project documents for water system modifications. Tucson Water acceptance is required for water system modifications on a Public Agency project.

**B. Pipeline Work**

All pipeline design for water system modifications shall be subject to review by Tucson Water. Acceptable pipeline designs shown on the water system modifications plan shall be sealed by the Designer and submitted to Tucson Water for signature.

**C. Facilities and New Components**

The design work shall identify the new water facilities to be reconstructed and shall specify all water pipeline components that are needed to replace the conflicting water facilities. Tucson Water will advise the Designer of any needs to upsize the pipe diameters or changes to configuration of the water system.

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D. Water System Modifications

All pipeline alignments for water system modifications within the work scope of a Public Agency project shall be located to avoid construction conflicts with project improvements and any water pipelines and utilities. The Designer shall obtain acceptance from the governmental agency having right of way authority for all pipeline alignments. The construction of water system modifications shall use all new materials to reconstruct water mains and water transmission mains and appurtenances.

2.3 Location of New Water Pipelines

This subsection contains the following major topics:

- General
- Horizontal Alignments of New Pipelines
- Vertical Alignments of New Pipelines
- Depth of New Pipelines
- Location of Water Appurtenances
- Water Services Location
- Utility Separation
- Design of New Pipelines and Appurtenances

A. General

1. New pipelines within the construction scope of the Public Agency project shall comply with the following as minimum requirements for determining the most economical and acceptable pipeline alignments (horizontal and vertical). The following paragraphs are minimum requirements and must be collectively evaluated as part of the determination of the pipeline alignments.
2. The designer shall make all efforts to design the pipe alignments to minimize or avoid pipe alignments that place a horizontal diagonal pipe alignment across a street intersection.
3. In all cases, new pipeline shall be located within right of way.

B. Horizontal Alignments of New Pipelines

1. New pipelines alignments shall be located to avoid construction conflicts with project underground improvements and any water pipelines and utilities to remain.
2. New pipelines in new pavement located next to new curb shall be located no closer than four feet to new curb and shall be located to place water valve boxes outside of the vehicular wheel track.
3. New pipelines located outside of pavement or back of curb and next to a pole foundation shall be placed no closer than five feet, from outside wall of new pipe to outside wall of any pole foundation for traffic or street lighting facilities.

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4. New pipelines in new pavement or outside new pavement located parallel to existing water lines shall be no closer than five feet, from outside wall of new pipe to outside wall of existing pipe. This minimum five feet shall be increased as required to handle these conditions, varying sandy and silty soil site conditions and any differences in elevation between pipe inverts when new pipe is installed at lower invert elevations. In all situations the new pipe alignments that horizontally parallel existing waterlines alignments must provide sufficient horizontal spacing between the new and existing water line facility as to avoid any exposure of bedding materials when trenching for new waterline.
5. New pipelines to replace existing pipeline may be installed in the same alignments as existing water mains provided that sufficient looped pipelines are in place to minimize interruption of service.

**C. Vertical Alignments of New Pipelines**

1. New pipeline alignments shall be located to avoid construction conflicts with Public Agency project underground improvements and any water pipelines and utilities to remain.
2. The minimum vertical separation at a crossing between new pipelines and existing utility lines shall be twelve inches.
3. The minimum vertical separation at a crossing between new pipelines and storm drain facilities shall be as follows:
  - a. Crossing over storm drain facility. The minimum vertical separation shall be twenty-four inches measured from the top of the storm drain structure and the top of the new pipeline.
  - b. Crossing under a storm drain facility. The minimum vertical separation shall be thirty-six inches measured from the bottom of the trench floor and the top of the new pipeline.

**D. Depth of New Pipelines**

1. General
  - a. Sufficient trench backfill cover over the top of pipelines is necessary to give protection against transmittal of excessive external live loading onto the installed pipe and to provide anchorage for normal sections of straight pipe.
  - b. In all cases the cover depth shall be identified to mean the vertical distance measurement from the top of the pipe to the point identified as the terminus elevation point final grade. Increased amount of cover may be allowed if required to provide additional protection against transmittal of excessive external live loading onto the installed pipe.

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- c. Final grade for the project roadways shall be defined as the top surface elevation of the finished pavements including curb cuts or undisturbed pavement scheduled to remain.

2. Trench Minimum Backfill

For trench minimum backfill covers, all new pipelines shall be installed to maintain a minimum cover of thirty-six inches from the bottom of any excavation or scarification during all project construction periods prior to completion of project final grades. The depth of cover to the top of the pipe shall not be less than three feet, unless adequate structural protection is provided and justified by the design engineer, and approved by Tucson Water.

E. Water Services Location

Locate all water meters within project right of way and out of new pavement as follows: (See also Section 8-08.)

- 1. Where room permits between new curb and sidewalks locate behind new curbs at an minimum of eight inches set back distance from the back of curb to the face of the meter box lid.
- 2. Where placing in new sidewalks locate at an acceptable location within the new sidewalk and provide a detail showing provisions for meter box to incorporate concrete collar. When installing meter boxes in new sidewalks, provide a detail showing provisions for the meter box to incorporate a concrete collar. Placement and location of meter boxes in a sidewalk shall be consistent with standard specs and details.
- 3. The work to change location of the water meter will be identified as either a water meter relocation service line adjustment (requires partial replacement of service line) or water meter relocation service line renewal (requires full replacement of service line including new service connection on water main).

F. Utility Separation

All pipeline design alignments shall comply with separation requirements for utilities in accordance with this Section and any conflicting requirements shall be resolved by using the more restrictive requirement.