

- To keep roots, grease and other obstructions out of sanitary sewer conveyance facilities.

The *Design Standards* are intended to provide specific and technical details that meet or exceed State and County regulations. These standards provide the minimum criteria for the design of Public Sewer conveyance facilities in Pima County. It is not intended that these standards be blindly applied in every application. There may be strong technical reasons why a particular standard is not appropriate for a given situation. In unique circumstances, creative engineering design, based on sound engineering principles, may meet the intent of the State and County regulations. Where necessary, either Special Approval or a design Variance, may be appropriate.

2.3 Variances

In some cases, strict compliance with the *Design Standards* may not be feasible and a Variance may be appropriate. In these cases, the Sanitary Engineering Manager of the Department may grant or deny a request for a Variance. It is the responsibility of the Sanitary Engineering Manager to administer, coordinate and execute the Variance process in coordination with the ~~Development Liaison group~~Department's plan reviewers.

A Variance may be considered either during the development of the construction documents or during the progress of construction, and limited to any of the following circumstances:

- Design slopes less than the standard minimums would eliminate the need for a pump station;
- A substitution for, or change in a standard material, results in the use of a material which can be clearly demonstrated to be of equal or superior quality;
- A strict adherence to standard specifications would be impractical or impossible because of an existing field conflict or other condition; or
- An emergency situation prohibits strict adherence to preliminary sewer layout requirements or standard specifications.

For other deviations from the *Design Standards* that do not fit any of these circumstances or for certain design concepts specified in the *Design Standards*, Special Approval shall be required and will be made by the Director or his/her delegate.

2.3.1 Requests for Design Variances

Requests for design Variances shall be submitted through the Development Liaison group for administrative processing. The Variance request shall be in a letter format and include the following elements:

- A reference to the specific standard(s) from which a Variance is being requested;

C. Conformance for Sealed Plans

The UC group will issue a Letter of Clearance to the project owner after the 100%-sealed plan submittal is reviewed and meets the following requirements:

- The plan submittal must be sealed by the Design Engineer;
- The submittal must be complete;
- The results of the review must indicate conformance with all applicable design and construction standards; and
- When a sewer modification plan is included with the submittal, the mylar cover sheet must be included for signature by the Department.

4.2 Graphical Requirements for Utility Coordination Plans

Public utility and public improvement projects can vary ~~tremendously~~ in size and scope; therefore, the types of plans included in a submittal can also vary. The following requirements are provided as guidance for plans when existing Public Sewers are located within the limits of proposed construction:

- Show the Department's utility coordination tracking number (e.g. UPC-20XX-XXX) on the cover sheet of the project plans (typically assigned by the UC group after the first submittal);
- Label each existing Public Sewer manhole and cleanout with the Department's unique manhole identification number and clearly indicate if it will remain undisturbed, modified, abandoned, etc.;
- Show and label existing service laterals (HCS/BCS) that were installed after December 31, 2005;
- Label existing Public Sewer lines and force mains with the Department's plan tracking number (e.g. G-20XX-XXX), pipe diameter, material and direction of flow;
- For each existing manhole and cleanout to be adjusted, show the existing and proposed rim elevations and clearly specify the sewer modifications required;
- Clearly label horizontal and vertical clearances of existing sewer with new public utility lines and structures to the nearest hundredth of a foot; and
- For non-typical designs, the Design Engineer should contact the UC supervisor to determine what pertinent information should be shown on the plans with existing Public Sewers.

The following subsections provide more detailed requirements for specific types of plans that may be included with the submittal.

4.2.1 Landscape, Planting and Irrigation Plans

In cases where existing Public Sewer lines are located in the vicinity of new landscape and planting areas, such as in roadway medians and shoulders, the plans should provide sufficient information to show design conformance with the

railroad jurisdiction. In any such case, Public Sewer lines shall be protected within a steel casing that meets or exceeds the requirements per S.D. RWRD-100.

5.1.11 Washes and Stormwater Detention/Retention Basins

A. Washes

The placement of Public Sewers within or along a wash or wash environment shall be avoided unless Special Approval is obtained from the Director or his/her delegate, on a case-by-case basis. This restriction shall also apply to crossing a wash outside of a Right-of-Way. In cases where crossing a wash cannot be avoided, the sewer alignment should be located perpendicular to the direction of flow within the wash. Diagonal crossings have a greater potential for exposure, and should be avoided.

When Special Approval is obtained for crossing a wash, the design of the Public Sewer line shall meet the following criteria:

- Provide a minimum cover 4 feet per Subsection 5.1.7;
- Place the sewer line at a depth of at least 2 feet below the ~~Total Maximum~~ Predicted Scour Depth per the *Design Standards*, Appendix A, Subsection IV; and
- The sewer line material shall be ductile iron and extend a minimum of 10 feet beyond the Lateral Migration Setback limits per the *Design Standards*, Appendix A, Subsection V.

In cases where the minimum cover and or minimum depth of two feet below the Maximum Predicted Scour Depth cannot be met, Special Approval by the Director or his/her delegate shall also be required for the design of Scour mitigation measures such as pile-supported sewer lines per S.S.D. RWRD-101 or alternative measures per the *Design Standards*, Appendix A, Subsection VI and S.S.D. RWRD-113.

The calculations for ~~Total Maximum Predicted~~ Scour Depth per the *Design Standards*, Appendix A, Subsection IV shall be included with the Sewer Plan submittal. If mitigation ~~design~~ measures for Scour protection are required, a Design Report for these design measures shall be included with the Sewer Plan submittal.

B. Stormwater Detention/Retention Basins

Public Sewer lines should not be located beneath stormwater basins and all reasonable design options must be exercised to avoid such locations.

5.1.12 Abandonment of Sewer Lines

Wherever possible, reaches of existing sewer pipe that are to be abandoned shall be completely removed. When the removal of sewer pipe is not feasible, it shall be abandoned-in-place per the *Standard Specifications and Details*, Subsection 3.2.3(H).

5.2 Manholes and Appurtenances

5.2.1 Placement of Manholes

Wherever possible, manholes should be located within the paved area of a Right-of-Way or within a Public Sewer easement. Manholes should be located along the centerline of paved streets or centered within a multi-use or driving lane. However, manhole location shall not interfere with street monumentation. The placement of manholes in the wheel path of vehicles shall be avoided. The placement of manholes in sidewalks, crosswalks, bike trails, wash crossings, back or side yards, behind walls, curbs or gutters shall also be avoided.

A manhole shall be provided at any of the following locations along the sewer alignment:

- A change in slope;
- A horizontal bend (horizontal deflection angles greater than zero);
- A change in pipe size;
- ~~A change in pipe material (excluding DIP replacements and repairs);~~
- Where two or more incoming Public Sewer lines connect;
- A terminal end;
- The connection of an HCS/BCS that is 6 inches in diameter or larger; and
- For Public Sewer lines, 15 inches in diameter or larger, the connection of any size HCS/BCS or private sewer shall be avoided unless Special Approval is obtained from the Director or his/her delegate, on a case-by-case basis.

5.2.2 Spacing of Manholes

Pursuant to AAC R18-9-E301(D)(3)(a), the maximum spacing between manholes is summarized in Table 5.2:

**Table 5.2
Manhole Spacing Requirements**

Pipe Diameter (inches)	Maximum Manhole Spacing (feet)
8 to less than 18	500
18 to less than 36	600
36 to less than 60	800
60 and greater	1,300

Extending the reach length beyond maximum manhole spacing requirements to avoid a potentially high erosion area shall also require prior approval by ADEQ/PDEQ per AAC R18-9-E301(D)(2)(c)(iv).

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- G. Warning signs that provide the Department's 24-hour emergency phone number shall be placed in a location that is visible from the security gate.
- H. The grading design for the site shall ensure that ponding will not occur within the yard. Driveways and drivable areas for equipment access shall be stabilized per Subsection 7.7.1 at a minimum.
- I. Lighting shall be provided for the yard and the control panels. Light shields for pole-mounted lights should be provided to minimize light pollution to adjacent homes. Electrical power outlets (110 Volt/20 Amp GFCI) shall be provided no greater than 50-feet away from the wet well and pipe manifold. Manual switches for yard lighting shall be provided within a secure panel at the entrance gate and at the control panel.
- J. ~~If a standby generator is required, a~~ A minimum clearance of 4 feet shall be provided on all sides of standby generators.
- K. A 1.5-inch potable water service shall be provided into the pump station site for the following fixtures:
- A 1.5-inch flushing hydrant, located no greater than 20-feet from the wet well and preferably within the concrete slab for the manifold piping; and
 - If chemical odor control facilities are used, an emergency eyewash and shower unit.
- L. A primary backflow prevention assembly shall be installed at the service line entering the site in accordance with the water purveyor's requirements. A secondary backflow prevention assembly shall also be installed for the emergency eyewash and shower unit.
- M. Landscaping requirements for the areas outside of the yard shall conform to the local land-use or HOA codes and consider a low-maintenance and drought-tolerant design.
- N. As a result of the U.S. Department of Homeland Security having classified pump stations as "critical infrastructure", heightened security measures shall be provided. Due to the sensitive nature of site security, specific design requirements are excluded from this document. Each project must be evaluated on a case-by-case basis and specific security requirements will be established at that time by the Department. For additional information relative to pump station security requirements, the Design Engineer should contact the Sanitary Engineering Manager.
- O. Depending on the site location, offsite radio repeater towers may be required for the Department's SCADA system. The property for the repeater towers must be procured for the Department prior to final Acceptance of the pump station.

6.5 Pumps

6.5.1 General Requirements

- A. Pump stations shall use duplex submersible wastewater pumps with each pump sized to handle the design flow. Refer to the Department's List of Approved Products for the recommended pump manufacturers. Pumps shall be equipped with three phase 480-volt electric motors. The pumps shall operate at a constant drive speed no greater than 1,780 rpm unless otherwise Approved. The use of Variable-Frequency Drive (VFD) pumping systems shall be avoided unless Special Approval is obtained from the Director or his/her delegate, on a case-by-case basis.
- B. The selected pumps shall be in the manufacturer's preferred operating range. This range and the system curve shall be indicated on the pump curve. The pumps shall be as close as possible to the best efficiency point of the pump curve, using the lowest horsepower motor that can be found to perform the required pumping rate.
- C. As part of the project, a third (spare) pump and two original equipment manufacturer (OEM) pump rebuilt kits shall be provided and delivered to the Department's Conveyance Division.

6.5.2 Additional Features

- A. The pump removal system shall use Type 316 stainless steel guide rails. Pumps shall be equipped with a sliding guide bracket that allows for installation and removal without entering the wet well. This bracket shall align the pump discharge with the discharge connection elbow for a watertight seal. The discharge connection elbow shall be attached to and supported by the floor of the wet well, and bear all static and dynamic forces from the pumps. The pumps shall not bear any direct load on the guide rails or the floor of the wet well.
- B. The pump connection to the discharge connection elbow shall be accomplished by employing a simple downward motion without rotation of the pump or removal of bolts, nuts or other fasteners.
- C. Each pump shall be attached to a lifting chain suspended from a hook located near the opening of the hatch. The chain shall be attached to the pump with a shackle.

6.6 Wet Wells

6.6.1 General Requirements

- A. Wet wells should be rectangular in shape and constructed of pre-cast concrete sections per the *Standard Specifications and Details*, Subsection 3.3.3(B)(iii) or cast-in-place concrete per the *Standard Specifications and Details*, Subsection 3.3.3(B)(v).
- B. The interior of the wet well shall have an Approved interior corrosion protection. Refer to the Department's List of Approved Products for the recommended coating and lining manufacturers.