



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
ENGINEERING DIRECTIVE**

Directive: ENG2005-01

Effective Date: July 1, 2006

SUBJECT: PRIVATE SERVICE LATERAL (HCS) DESIGN AND CONSTRUCTION REQUIREMENTS

STATEMENT OF PURPOSE

This directive addresses changes to the requirements for the design, construction, and replacement of private sewer laterals in the public right-of-way, sewer easement, or pursuant to an expressed or implied private property easement, after December 31, 2005. This Directive and the associated legislation do not change the private ownership status of the service lateral. The private service lateral will remain the responsibility of the property owner for which it services, from the point of connection at the public sewer line (including the connection itself) to the connected property.

This Directive is in response to revised Blue Stake regulations (A.R.S. 40-360.21 to 40-360.32). The changes address utility excavation concerns about not being able to locate private sewer laterals connected to the public sewer. The changes require the operator of a sewer system to acquire information on the location of private sewer laterals installed after December 31, 2005, and mark those laterals within the public right-of-way as part of a Blue Stake call.

GENERAL PROVISIONS

Private Sewer Lateral Construction

All new private sewer laterals connecting to a public sewer and all full replacements of existing private sewer laterals in the public right-of-way, sewer easement, or pursuant to an expressed or implied private property easement, installed after December 31, 2005, shall meet the following requirements:

1. The private sewer lateral shall be constructed with a private cleanout located within the private property, adjacent to the property line. The cleanout shall face downstream, and be installed per revised Standard Detail WWM 401. One of the following 3 options shall be followed when completing this installation:
 - a. Installations of cleanouts in subdivisions, where there is significant construction/grading activity that could impact the survival of a riser associated with a private cleanout at the property line, will be allowed to install the riser/cover/cap between 12" and 18" below the top of curb elevation when said cap is equipped with an approved electronic marking device under a plastic cover/cap at the time the lateral is installed. Note: This type of installation is prohibited should the riser be located beneath a paved surface when project is completed (e.g. driveway, sidewalk, etc.). In order to simplify potential future locating during construction, a wire should be tied to the riser and extended to the surface.

- b. Installations of cleanouts in subdivisions where there is significant construction/grading activity that could impact the survival of a riser associated with locating a private cleanout at the property line, may have the cast riser/valve box/cover installed at final grade when the private sewer lateral is connected to the building. In order to simplify potential future locating during construction, a wire should be tied to the riser and extended to the surface.
 - c. Installations of cleanouts for individual service (custom homes, single lot construction, etc.), shall occur when the extension is connected to the public sanitary sewer and be set at final grade with cast frame and cover.
2. The private sewer lateral shall be installed in a straight line from the connection at the public sewer to the private cleanout within the private property, and, using a standard layout, at 90 degrees to the public sewer where possible.
3. The private sewer lateral shall be installed with a ten (10) foot lateral extension from the cleanout, into the property, for the building sewer connection. Sand bedding is not required for this extension.
4. Magnetic locating tape shall be installed at least 18 inches below the final grade, and at least 18 inches above the sewer pipe, from the connection point at the public sewer to the private cleanout within the private property.
5. The private cleanout shall be installed within a Sewer Access Easement granted to PCWWM, or other suitable Public Utility Easement with expressed rights of access granted to PCWWM. Should a linear or curvilinear easement serving several properties be impractical, then the cleanout should be situated within a 10ft. x 10ft. Sewer Access Easement adjoining and contiguous with the public right of way, sewer easement, or an expressed or implied private property easement.
6. The cleanout, when completed, shall be used as either a visual (at grade) or electronic indicator (below grade) of the private service lateral. It shall be the responsibility of the property owner to maintain the private service lateral in an operational condition.
7. The private sewer cleanout, when installed at final grade, shall be installed with a metal cleanout cover to protect the cleanout cap and facilitate detection with a metal detector should it become buried.
8. The HCS curb stamp shall be placed in the curb, directly over the private sewer lateral, where a curb is constructed.

For all new sewer systems where a sewer design plan is generated, the following additional requirements shall be met:

1. The plan view shall show the distance from the downstream public manhole, for each private sewer lateral along the length of the public sewer.

2. The As Built plans shall depict any changes to the design in regard to the location or layout of the private sewer lateral(s). The As Built documentation shall comply with the Pima County As Built Ordinance 13.20.030 Section E, and any subsequent Directives.
3. The As Built plans shall include a tabular report providing the X and Y State Plane coordinates at the riser and the distance to the downstream manhole. (Note: This information may be provided on a single summary sheet)

For all new, or fully replaced, private sewer laterals where a sewer design plan is not generated, a Private Sewer Lateral Connection Form documenting the final, constructed location shall be submitted. The documentation shall contain the following information:

1. A drawing of the lateral location with cleanout reference distances from property corners, public sewer manholes, or any other references needed for an accurate re-location.
2. The distance from the connection to both the upstream and downstream public manholes.
3. The distance of the lateral to one property corner.
4. An attached survey plan providing the X and Y State Plane coordinates at the cleanout riser, on the private sewer lateral. Note: For an existing, single-family residence re-connection, a survey plan will be waived.

Utility Plans Containing Private Sewer Laterals

Utility construction plans shall identify all existing private sewer laterals installed after December 31, 2005, within the construction area, for the purpose of design and construction documentation.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage. Pima County Wastewater Management Department is a member of the Arizona Blue Stake Center, and is responsible for Blue Stake requests regarding the sewers under its authority.

PROCEDURE

The design, construction, and full replacement of private sewer laterals shall follow the provisions as described in PCWWM Sewer Design Standards, Specifications, Details, and Directives. Standard Detail WWM 401 has been modified to identify the new private sewer lateral requirements. Standard Detail WWM A-3 has been modified to clarify that private sewer laterals installed after December 31, 2005, are now required to be Blue-Staked. The revised Standard Details are incorporated in this Directive.

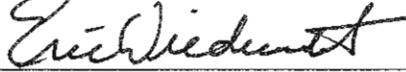
Revised Standard Detail WWM 401: House Connection Sewer (Private Sewer Lateral)
Revised Standard Detail WWM A-3: Gravity or Pressure Sewer (page 8 of 12)

Inspection of the cleanout shall be done at the time of construction of the sewer lateral, and not when the lateral is connected to the house.

PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND



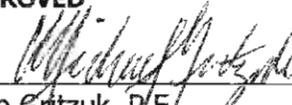
Eric Wieduwilt, P.E.
Chief Engineer- Engineering Division

CONCUR



Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

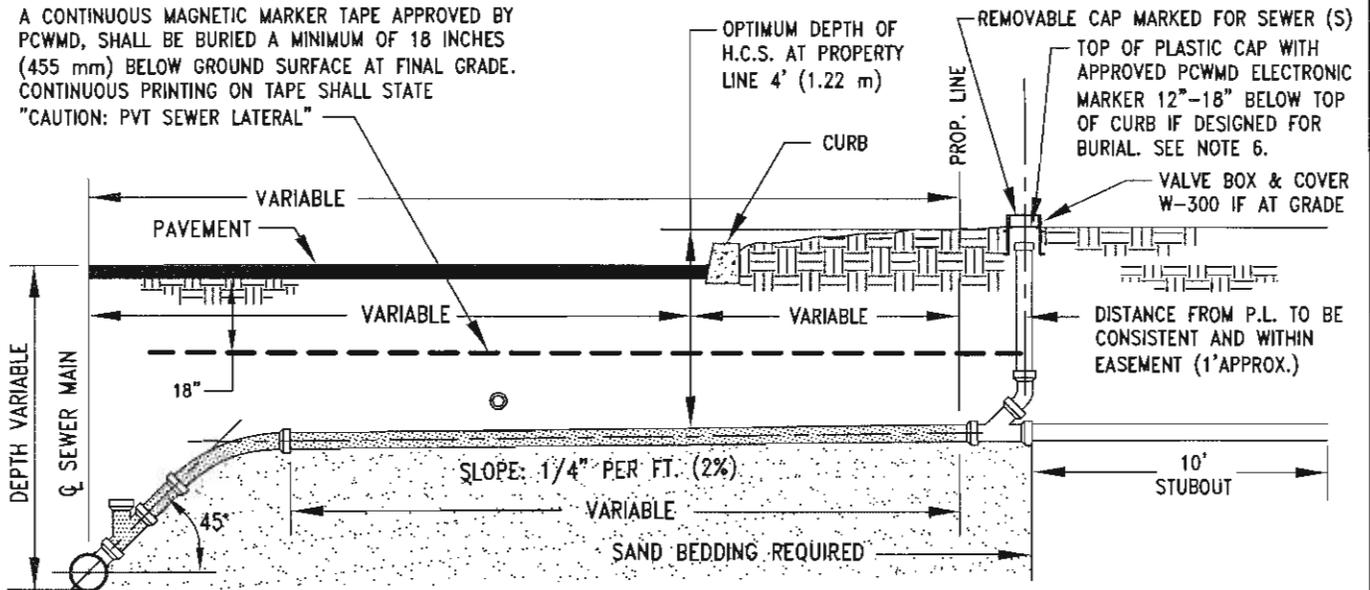
APPROVED



Mike Gritzuk, P.E.
Director

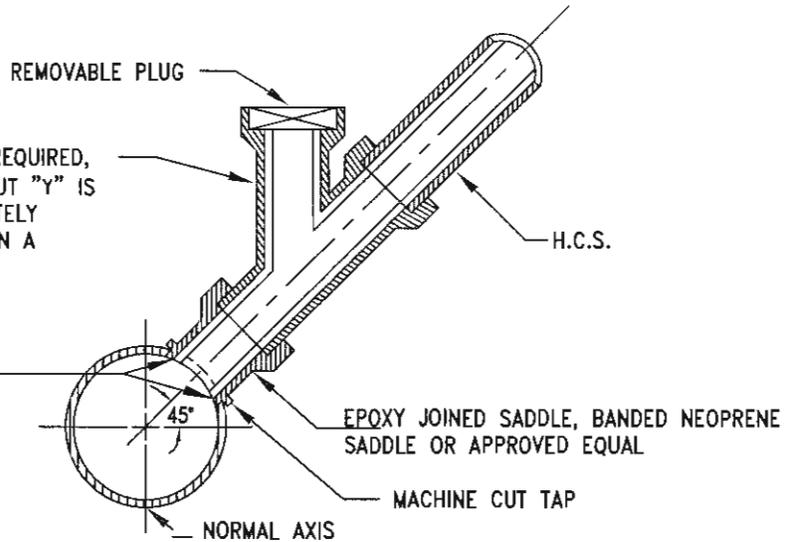
Date: 7/6/06

A CONTINUOUS MAGNETIC MARKER TAPE APPROVED BY PCWMD, SHALL BE BURIED A MINIMUM OF 18 INCHES (455 mm) BELOW GROUND SURFACE AT FINAL GRADE. CONTINUOUS PRINTING ON TAPE SHALL STATE "CAUTION: PVT SEWER LATERAL"



IF PRESSURE TESTING IS REQUIRED, THEN A TESTING CLEANOUT "Y" IS TO BE INSTALLED IMMEDIATELY OUTSIDE THE SADDLE WHEN A SEWER IS TAPPED

NO PORTION OF THE TAPPING SADDLE SHALL PROTRUDE INTO THE INTERNAL DIAMETER OF THE PUBLIC MAIN



NOTES:

1. WHERE MINIMUM DEPTHS AND CLEARANCES CAN NOT BE MAINTAINED, A SPECIAL H.C.S. DESIGN WILL BE REQUIRED (WWM 404).
2. H.C.S. CONNECTIONS INTO SEWER MAINS 12" (300 mm) AND LARGER ARE NOT PERMITTED WITHOUT THE WRITTEN APPROVAL OF PCWMD.
3. FOR H.C.S.'S GREATER THAN 4" (100 mm) IN DIAMETER, THE APPROVAL OF PCWMD. - AS TO THE TYPE & LOCATION OF THE CONNECTION - SHALL BE ACQUIRED IN ADVANCE.
4. THE OWNERSHIP AND MAINTENANCE OF THE ENTIRE H.C.S. - FROM THE OUTSIDE SURFACE OF THE MAINLINE SEWER PIPE (OR MANHOLE) INCLUDING THE CONNECTION, TO THE CONNECTED PLUMBING FIXTURES WITHIN THE BUILDING - SHALL BE THE RESPONSIBILITY OF THE CONNECTEE.
5. ALL CONNECTIONS TO PUBLIC SEWERS SHALL BE MADE WITH "Y" FITTINGS OR BY MACHINE CUT TAP. WHEN A TAP IS MADE, A MACHINE CUT TAP SHALL BE MADE.
6. INSTALL RAISED 4" THREADED PLUG IN CLEANOUT INCORPORATING 3M MODEL 1414 ELECTRONIC DISC MARKER. GREEN IN COLOR. LOCATOR PLUG TO BE GPK PRODUCTS MODEL #228-004 DM OR APPROVED EQUAL.

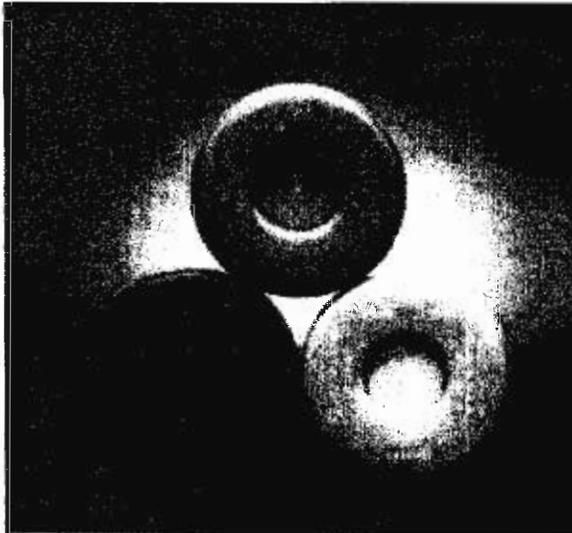
ISSUED:		STANDARD DETAIL HOUSE CONNECTION SEWER (H.C.S.)		DETAIL NO.
8/92				WWM 401
REVISED:				SHEET 1 OF 1
6/06				

3M

ScotchMark™

Electronic Marker System

Disc Marker for gas, water and wastewater applications



1

All ScotchMark markers, including the disc marker, use compatible technology. This means the same frequency marker locator can be used to locate any of the markers for a particular utility service.

The ScotchMark System is accurate even in congested areas. The locator is not affected by metal conduit or pipe, metallic conductors, fences, AC power, or other electronic markers. Use of the ScotchMark Locator and markers requires only a few minutes of training.

The ScotchMark Disc Marker is the most dependable way to mark:

- hand holes
- valve boxes
- meter boxes
- access boxes

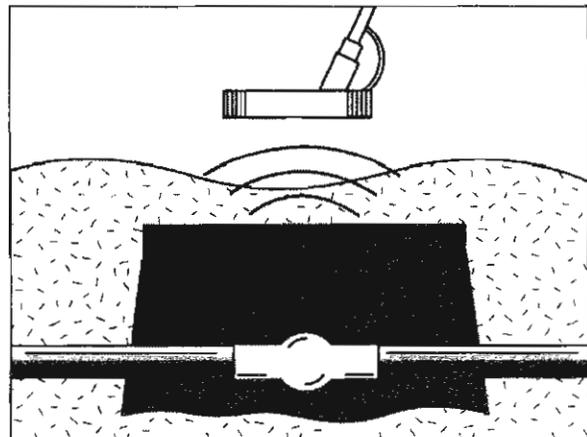
Built for durability

The ScotchMark disc marker is a passive antenna encased in a water-resistant polyethylene shell which is impervious to minerals, chemicals and temperature extremes normally found in underground plant environments.

Find your underground facilities the first time

The ScotchMark™ 4" Disc Marker provides an easy, accurate method of locating flush-mounted facilities, which become covered by backfill. Facilities are also easily located through other obstructions, such as snow or overgrown vegetation. ScotchMark electronic marking eliminates wasted time and money spent on searching for "lost" facilities.

The disk marker is four inches in diameter and is easily affixed to the underside of non-metallic lids or covers over flush mounted facilities. It is not intended for direct burial in the soil. When the facility becomes covered or hidden from sight, it is easily located using a ScotchMark Electronic Marker Locator. The disc marker has a vertical range of up to five feet from the locator. The locator transmits a signal to the marker. The marker reflects the signal back to the locator, and its exact location is indicated with both a visual reading and a tone. The locator consists of a compact electronics package and a lightweight hand-held probe.



The vertical range of the Disc Marker is four feet from the locator probe. 2
The marker is shown permanently affixed to the underside of a hand hole or meter box lid. ScotchMark™ Disc Markers are designed for use with plastic or concrete lids.

ScotchMark™ Electronic Marker System

Features	Benefits
Accurate even in congested areas	Helps eliminate mislocates
Underground marker	Able to identify underground facilities for years to come, regardless of topographic changes
Durable	Long-lasting passive antenna encased in waterproof shell helps identify underground facilities for years to come
Frequency- and color-coded	Helps identify specific utility
Easy to use	Minimal training

Physical Specifications

Size	4" D x 1.38" T	(10.2 cm x 0.97 cm)
Weight	Each: 1.4 oz (39.7 g)	Per Carton: 5 lb. (2.3 kg)
Packaging		50 markers/carton
Range		5' (1.5 m) from locator probe
Shell		high-density polyethylene

Color-coded for each utility to APWA standards (gas-yellow, water-blue, wastewater-green)

Environmental Specifications

Operating temperature	-22° to 150°F	(-30° to 66°C)
Storage temperature	-40° to 167°F	(-40° to 75°C)

The ScotchMark™ family of products

Other ScotchMark Markers are available for a variety of applications. These include:

- Full-range marker – applicable to depths of eight feet (2.44 m). Also acts as a digging shield
- Mid-range marker – applicable to depths of six feet (1.8 m). Marker spokes help stabilize marker's position after placement for accurate locating
- Near-surface marker – designed for applications of up to two feet (0.61 m) from marker to locator probe. Installs

- easily in street surfaces for marking flush-mount facilities prior to repaving.
- 4" ball marker – applicable to depths of five feet (1.5m). A unique self-leveling feature allows the marker to be in the correct position for accurate locating.

All ScotchMark markers are color-coded to APWA standards and tuned to a specific frequency for each utility, minimizing the chance of accidentally locating other utilities' buried markers.

Ordering information

To order, contact the 3M order department at the toll-free number below and specify part number from the following chart:

APWA Color Code	Gas	Water	Wastewater
	Yellow	Blue	Green
Disc Marker	1415-XR	1413-XR	1414-XR

Phone: 800-722-6721 or 512-984-1038
 Fax: 800-828-9329 or 512-984-2210

Important Notice

WARRANTY AND REMEDY This product will conform to 3M published specifications and be free from defects in materials and workmanship for a period of one year from the date of purchase. In addition, 3M provides the following Conditional Lifetime Warranty for its Electronic Marker Products. When installed in accordance with 3M's installation instructions, 3M warrants 3M™ Electronic markers for the lifetime of the product, to be free from defects in material and manufacture, provided the Electronic Markers are located with 3M™ Dynatel™ Test and Measurement instruments or Scotchmark EMS Electronic Marker locators or other brand locators that may be designated by 3M in writing.

This warranty does not extend to Electronic markers that have been subjected to misuse or improper applications or that have been repaired or altered by others. 3M MAKES NO OTHER WARRANTY INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. If the Marker is found to be defective within the stated warranty period, your exclusive remedy shall be, at 3M's option, to repair or replace the Marker or refund the purchase price. 3M will not be liable for any special, incidental, or consequential damages arising from use of this 3M product, regardless of the legal theory asserted.



Corrosion Protection Department

6801 River Place Blvd.
 Austin, TX 78726-9000
<http://www.3M.com/corrosion>

♻️
 40% Pre-consumer waste paper
 10% Post-consumer waste paper

Litho in USA

© 3M IPC 1999 80-5111-8029-2



Construction of Private Sewer Lateral Cleanouts

MEMORANDUM of UNDERSTANDING

Pima County Wastewater Management Department

TO: PIMA COUNTY WASTEWATER MANAGEMENT: FIELD
ENGINEERING

FROM:

Developer of Project, Project Name & Project Number

Builder of Part or All Project, Project Name & Project Number

This Memorandum of Understanding, for obligations regarding private sewer lateral (HCS) cleanout installation, documents that both parties involved with the construction of public and private sewers, within a development, acknowledge and accept mutual responsibility for the successful installation of the HCS cleanout in full compliance with the standards and specifications of Pima County Wastewater Management (PCWMD), specifically Directive ENG2005-01.

This document is a required submittal, prior to acceptance of the constructed sewer into the public system. This document also serves as notice to the homebuilder that they are required to install cleanouts, per PCWMD standards and specifications, where the following occurs:

1. All locations where the final installation of the HCS cleanout riser and surface cover have been passed on to the homebuilder, and
2. Where the location of the installed cleanout is situated under a paved surface (asphalt or concrete) and requires the cleanout to be raised to grade, and an approved cleanout cover installed.

We have read this Memorandum of Understanding and agree to take full responsibility for the installation of the HCS Cleanout in accordance with the standards and specifications of Pima County Wastewater Management. An attached form indicates all lots with buried HCS cleanouts and further identifies those with either cap sensors or only wire to locate.

Owner/Developer Principal

Date

Company

Home Builder Principal

Date

Company

Attach list of all lots containing buried cleanouts



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
ENGINEERING DIRECTIVE**

Directive: ENG2005-02

Effective Date: October 1, 2005

SUBJECT: MANHOLE WITH JOINT REINFORCEMENT – Standard Detail 223

STATEMENT OF PURPOSE

This Directive increases the number of joint reinforcement points from four (4) to six (6). The forces generated by floodwater on a manhole increase as more barrel sections are exposed. When more than three (3) barrel sections are exposed, the forces increase to the point where other factors must be taken into account. These factors may include local scour, manhole stability, forces on sewer pipes, and reduced loads on the barrel above the flood level. A registered structural engineer must now seal such a manhole design.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation that affect the collection, conveyance, treatment, and control of sanitary sewage.

GENERAL PROVISIONS

For a manhole located in a high erosion area, the requirements of Standard Detail 223 apply. Modifications to Standard Detail 223 through this Directive are:

1. Where three or fewer barrel sections are required, and the total depth is less than 12 feet, the required number of joint reinforcement points is increased from four (4) to six (6), located at 60 degree intervals around the circumference.
2. A manhole with more than three barrel sections, or greater than 12 feet deep, will require the submission and approval of a special manhole design, sealed by a registered structural engineer.
3. Prior approval by the Director is required when constructing a manhole in a high erosion area.
4. Extending the reach length beyond the State maximum distance, to avoid a high erosion area, shall have prior approval by Pima County Department of Environmental Quality.

PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards. The revised Standard Detail 223 is included in this Directive.

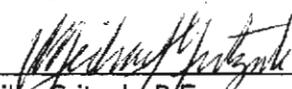
RECOMMEND


 Eric Wieduwilt, P.E.
 Chief Engineer- Engineering Division

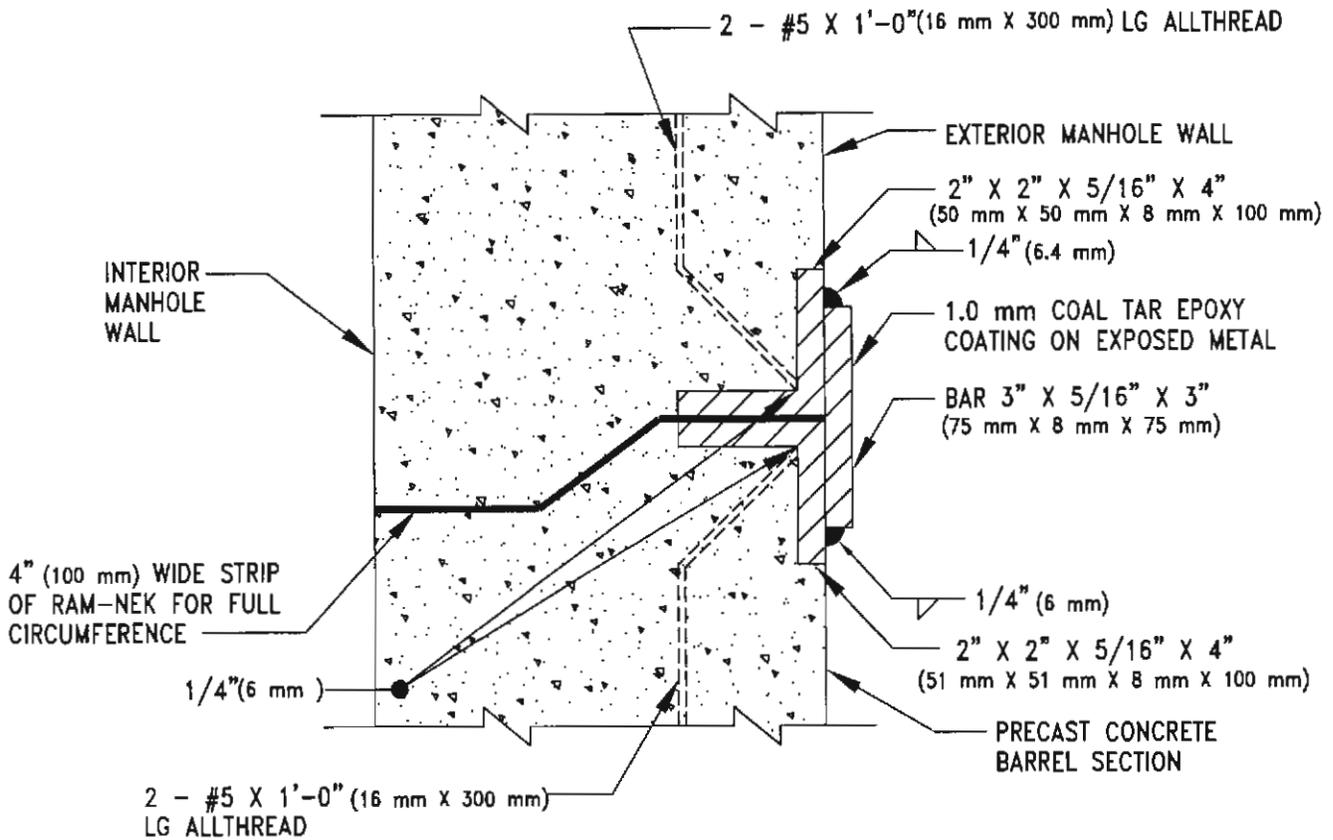
CONCUR


 Paul M. Bennett, P.E.
 Deputy Director- Planning/Engineering

APPROVED


 Mike Gritzuk, P.E.
 Director- Pima County Wastewater Management

Date: 09/13/05



NOTES:

1. PROVIDE POSITIVE JOINT REINFORCEMENT AT THE UPSTREAM WASH FACE AND AT 60° INTERVALS AROUND THE CIRCUMFERENCE OF THE MANHOLE FROM THE UPSTREAM FACE. JOINT REINFORCEMENT SHALL BE USED ON ALL MANHOLE SECTION-TO-SECTION, SECTION-TO-GRADE RINGS, AND GRADE RINGS-TO-GRADE RING JOINTS AS DETAILED. ALL SECTIONS SHALL BE SECURED. JOINT REINFORCEMENT SHALL BE USED TO SECURE THE BOTTOM MANHOLE SECTION TO THE MANHOLE BASE.
2. FIELD WELD THE JOINT REINFORCEMENT AS INDICATED ON THE EXTERIOR OF THE BARREL SECTION AND COAT ALL EXPOSED METAL WITH A 4 MIL (100 μm) COAL TAR EPOXY DRY FILM THICKNESS.
3. THE COSTS OF PROVIDING AND INSTALLING THE JOINT REINFORCEMENT SHALL BE CONSIDERED INCIDENTAL TO AND INCLUDED IN THE UNIT PRICE BID FOR THE MANHOLE.
4. ALL WELDS SHALL BE IMMEDIATELY QUENCHED WITH TEN WEIGHT (10W) MOTOR OIL AFTER EACH WELD IS COMPLETED.
5. THE ALLTHREAD SHALL BE 5/8" (16 mm), GRADE 2, NON-GALVANIZED, COARSE.
6. FOR MANHOLES WITH MORE THAN 3 BARREL SECTIONS OR MORE THAN 12 FEET DEEP WILL REQUIRE THE SUBMISSION AND APPROVAL OF A SPECIAL JOINT REINFORCING DESIGN BY A REGISTERED STRUCTURAL ENGINEER. MANHOLES WILL BE DESIGNED TO WITHSTAND THE FORCES IMPOSED BY A 100 YEAR FLOOD.
7. USE OF THIS DETAIL FOR MANHOLE IN HIGH EROSION AREAS MUST BE APPROVED BY THE DIRECTOR OF PIMA COUNTY WASTEWATER MANAGEMENT.

ISSUED:		<p>STANDARD DETAIL</p> <p>MANHOLE JOINT REINFORCEMENT</p>		DETAIL NO.
8/92				WWM 223
REVISED:				SHEET 1 OF 1
8/05				



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2005-03

Effective Date: October 1, 2005

SUBJECT: PUBLIC SEWER STUB-OUT

STATEMENT OF PURPOSE

This Directive establishes that a public sewer pipe stub-out (pipe extension beyond the manhole for a future connection) may not be constructed without a manhole at the end. A terminal manhole clearly defines the extent of public ownership and responsibility, and provides an access point from which to extend a public or private sewer system. Where a future connection is planned, a block-out shall be constructed within the connecting manhole (Standard Detail WWM 203), or the manhole can be re-constructed at the time of extension. A stub-out without a terminal manhole shall be private. A private stub-out cannot be converted to public ownership, and shall be re-constructed at the time of a public system extension.

GENERAL PROVISIONS

1. Constructing a public sewer stub-out, without a terminal manhole, shall not be accepted.
2. A sewer stub-out without a terminal manhole shall be private.
3. A block-out within the manhole can be used to provide for future sewer extension.
4. Connection to a manhole without a block-out may require a new manhole, based on the connection elevation and flow.
5. If a stub-out is originally constructed as a private line, and a public extension is requested, then the private portion must be evaluated to the satisfaction of Pima County Wastewater Management or re-constructed under the inspection of Pima County Wastewater Management.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage.

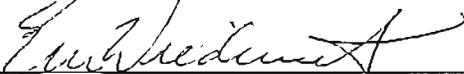
PROCEDURE

All public sewer design and construction shall be required to follow this Directive.

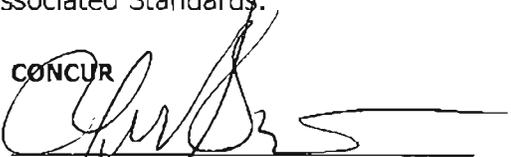
PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND


Eric Wieduwilt, P.E.
Chief Engineer- Engineering Division

CONCUR


Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

APPROVED


Mike Gritzuk, P.E.
Director- Pima County Wastewater Management

Date: 10/3/05



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
ENGINEERING DIRECTIVE**

Directive: ENG2005-04

Effective Date: October 1, 2005

SUBJECT: ENGINEERING STANDARDS COMMITTEE

STATEMENT OF PURPOSE

A Standards Committee shall be established to manage and implement the Pima County Wastewater Management Design Standards and Specifications (Standards) for public sanitary sewer systems design and construction. This committee shall address additions, deletions, modifications, and amendments to the standards of design and construction of sanitary conveyance systems, pumping systems, and other appurtenances. This committee shall also review and respond to variance requests for specific project deviations from the established standards.

GENERAL PROVISIONS

I. STANDARDS COMMITTEE

1. It is the responsibility of the Pima County Wastewater Management (PCWWM) Engineering Division Manager (Chief Engineer) to coordinate the activities of a Standards Committee, hereafter referred to as the "Committee". The Chief Engineer may also seek the recommendation of the Committee for interpretations of the standards.
2. The appointed Committee shall have the following characteristics:
 - a. Number of members: The Committee shall be composed of seven (7) voting members and one (1) non-voting member.
 - b. Affiliation and qualifications of members:
 - i. The Chief Engineer will serve as chair of the committee. Four (4) members shall be from PCWWM and shall include at least one representative each from the Design Section, the Field Engineering Section, and the Field Operations Division. Two (2) seats in the committee will be recommended by the Chief Engineer from the community at large, and will represent the construction and engineering stakeholders. The eighth member is non-voting, and from the Development Services Department, recommended by the Development Services Director.
 - ii. All PCWWM employee members shall be registered Professional Engineers (P.E.) in the State of Arizona.
 - iii. All members shall have knowledge and experience in sanitary sewer design and/or construction.
 - c. Appointing Authority: The Director of PCWWM shall confirm all Committee appointments.
 - d. Term: Committee members shall serve at the discretion of the PCWWM Director.
3. Transaction of Business:
 - a. Calling a Meeting: A meeting will be called at least annually to review all Directives for permanent incorporation into the design standards and specifications, and to review all recommended ordinance language changes to be incorporated in the annual financial plan. A meeting will also be called to address a variance request.
 - b. Procedures: The Committee may adopt policies and standard operating procedures, subject to the approval of the PCWWM Chief Engineer, to assure the

efficient and balanced administration of the Committee's work. Robert's Rules of Order shall serve as a guide for the meeting process.

- c. Meeting frequency: The Committee shall meet as necessary to conduct the Committee's business, but no more frequent than twice per month.
- d. Quorum: At least four (4) voting members shall be present for the Committee to conduct business. If fewer than four voting members are present, then the meeting shall be re-scheduled.
- e. Voting: Each member of the Committee shall have one vote in all decisions. A request to the committee for an interpretation, addition, deletion, modification, or variance requires a vote.
- f. Minutes: A recording secretary shall prepare meeting minutes, which shall include all agenda and discussion items and all votes and actions made by the committee. Minority opinions shall be included in the meeting minutes when requested by the member(s) casting the minority vote(s).

II. AMENDMENTS

Additions, deletions, and modifications are amendments to the Standards. Amendments shall be incorporated into the Standards either through a Directive, or during the annual review of the Standards. Amendments may be initially incorporated into the Standards, through the issuance of an Engineering Directive by the Director of PCWWM. An annual review of the Standards shall incorporate the Directives and other recommended amendments into a revised Standards document, which is approved by the Pima County Board of Supervisors.

1. The Committee members shall monitor the current Standards and Directives to ensure:
 - a. That the operational and structural life expectancy is provided for.
 - b. That the documents are consistent with the latest accepted engineering practices.
 - c. That no extraordinary burdens are placed on typical utility projects or land development projects.
 - d. That there are no conflict with other policies, provisions, regulations, and requirements in the Pima County Code, Arizona State Law, Federal Law, or the best interest of the general public.
2. If a member of the general public, PCWWM staff, the PCWWM Chief Engineer, or any Committee member believes that the Standards in effect are in conflict with the statements made above, or that the Standards should be revised, they shall bring the issue to the attention of the Committee by written proposal.
3. The Committee shall be charged with evaluating a written, proposed amendment to the Standards, coordinating review by Pima County staff for compliance with applicable County, State, and Federal laws, and assuring that the design, operation, and maintenance of the sewer system are not compromised by, or in conflict with, the recommendation. The Committee shall decide by vote whether or not to recommend an amendment to the Standards.
4. If the Chief Engineer agrees with the Committee's recommendation to amend the Standards, the Chief Engineer has the option to present the recommendation in the form of an Engineering Directive to the Deputy Director for Planning/Engineering. If the Deputy Director concurs with the Directive, the Directive will be forwarded to the Director of PCWWM for final approval and issuance as an Engineering Directive.

5. For a written, proposed amendment to the Standards from outside the committee, the committee shall provide a written response to the requester within five (5) working days after a final determination has been made.
6. The Committee shall conduct an annual review of the Standards, and incorporate Directives and other committee recommendations into a revised Standards document, for approval by the Director of PCWWM and the Pima County Board of Supervisors.
7. Amendments to the Standards may be enforced for all construction after the effective date of the Directive or revised Standards. Grandfathering of standards shall not be allowed. PCWWM may consider referencing the effective date to a submittal date, approved plans date, or other development process record date.
8. The effective date of a Directive shall take into account the magnitude of the amendment both on its impact to the development community, and on its impact to the health, safety, and investment of the general public.

III. VARIANCE REQUEST

1. Variance: an approved exception to the PCWWM Design Standards. The Merriam-Webster dictionary defines a variance as:
 - a) The fact, quality, or state of being variable or variant : DIFFERENCE, VARIATION <yearly variance in crops>.
 - b) The fact or state of being in disagreement : DISSENSION, DISPUTE.
 - c) A disagreement between two parts of the same legal proceeding that must be consonant.
 - d) A license to do some act contrary to the usual rule <a zoning variance>.
 - e) The square of the standard deviation - at variance : not in harmony or agreement.
2. PCWWM understands that, in some cases, strict compliance with the Standards may not be possible. In those cases, PCWWM may allow a one-time, project specific, variance from the Standards.
3. The variance procedure provides for the review of a written, requested variance, submitted during the design or construction process prior to constructing such a variance, and results in a recommended approval or denial of the requested variance.
4. A plans review fee shall be charged for a variance request, since a detailed review of the design plans will need to be conducted.
5. For unforeseen, construction related variance requests, the committee will make every effort to conduct the review under an expedited schedule.
6. This procedure enables administrative relief from PCWWM sanitary sewer standards when such relief is justified. The committee is expressly prohibited from indiscriminate granting of special privileges.
7. Each variance is a unique case, which is approved or denied on the basis of sound engineering judgment. The information required to make the determination comes from the

- documentation provided by the requester, additional selective research, and optional field inspections performed by the Committee members or other representatives of PCWWM.
8. Because of special circumstances applicable to a subject project (including location, sewer system elevations, size, shape, topography, or surroundings) the strict application of the sanitary sewer Standards may not be possible. This situation alone does not warrant the approval of a variance request.
 9. For a variance to be granted for a given situation, the Committee must be able to clearly apply the following criteria:
 - a. The Standards as written would deprive subject property or utility of privileges enjoyed by other properties in the vicinity and under similar geographic condition and/or, prevent the completion of sanitary sewer repairs, improvements, or relocations for the benefit of the general public.
 - b. The hardship did not arise from a condition created by an action of the owner/developer/engineer of the property/utility.
 - c. The variance is in harmony with the general intent and purposes of the Design Standards.
 - d. The variance does not violate State law, Federal law, or provisions of Pima County ordinances or policies.
 - e. The variance will not cause injury to, or adversely affect, the rights of the surrounding property owners, Pima County, future residents, or any other entities impacted by the action.
 - f. The variance is the minimum necessary to afford relief.
 - g. The variance is not granted solely to increase economic return from the owner/developer/engineer/utility.
 - h. The variance will not reduce the functional utility of the sewer system.
 - i. The approval of a variance would not constitute a grant of special privilege inconsistent with the limitation upon other properties/utilities in the vicinity and zone in which subject variance is situated.
 10. The following arguments do NOT justify a variance approval:
 - a. A variance would result in more economical, practical, convenient, or profitable development of the property.
 - b. The project was completed in violation, constructed without permits and/or not in compliance with current standards. A variance would resolve the violation. In these cases, the Department reserves the right to require removal and replacement of the features in violation of current Standards.
 - c. The proposed project design and completed plans were based on a misinterpretation of the regulations or a miscalculation of the engineering properties (i.e. miscalculation of pipe slopes of existing sewer lines, manhole inverts elevations, etc) used in the design.
 - d. The County has in the past granted comparable variances elsewhere.
 - e. The proposal is an minor deviation from the required standard.
 11. If a variance is recommended for approval, the Chief Engineer may include conditions deemed reasonable and necessary under the circumstances to preserve the integrity of the public sewer and to ensure that the general purposes and intent of the Standards are preserved.

12. The Committee's recommendation shall be approved or denied by the Director of PCWWM, or a designated representative, within five (5) working days after the committee's recommendation.
13. The committee shall provide a written response to the requester within five (5) working days after a final determination has been made.
14. All approved variances shall be clearly identified on the construction plans or as built plans, depending on whether requested during design or construction.
15. The Committee may also delegate an administrative variance approval authority, for repetitive variance requests of a specific nature.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Initiating a Review

1. The Committee shall conduct an annual review of all Standards and Directives at a meeting called by the Chief Engineer. The timing of the meeting should coincide with the annual Ordinance review process.
2. Any party may submit a written request to the Chief Engineer for additions, deletions, and/or modifications to the Standards. All requests will contain adequate information for evaluation. The request will be addressed following the Amendment review process. All approved changes will be incorporated into the Standards as an Engineering Directive and/or included in the Standards during the annual review process. All decisions will be documented with a letter responding to the requester.
3. Any party may submit a written request to the Chief Engineer for an individual project variance to the Standards. All requests will contain adequate information for evaluation. The request will be addressed following the Variance review process. All decisions will be documented with a letter responding to the requester. A variance approval letter shall be contained in the construction drawings as proof of variance approval.

Actions on Variance and Amendment Requests

Once a request is submitted and the applicable fee is paid (variance request only), the following actions will occur:

1. A meeting of the Committee will be scheduled at a date that will provide a minimum of 10 workdays for research and review of the request. If a Committee meeting is already scheduled, and at the discretion of the PCWWM Chief Engineer, the request may be reviewed at the scheduled meeting in conjunction with other requests, or a new date may be set for the Committee to review the request.
2. PCWWM will notify the applicant of the date of the Committee meeting in which the request will be entertained. Applicants are encouraged to attend the meeting to present their rationale for requesting the modification and to answer the Committee's questions.

3. In some cases, requests may also require consultation from technical experts from fields not represented on the Committee. In those cases, the requester may bring such experts (acceptable to the Committee), at their expense, to the meeting to provide technical opinion and advice to the requester. Technical experts invited to advise the requester or Committee shall have no voting authority.
4. Conditions may be imposed on a request approval that will secure the purpose of this procedure and preserve compatibility with the purpose, intent, general regulations, and provisions of the applicable Standards and that mitigate adverse impacts to the Variance or Modification.
5. A request may be continued by the majority of the Committee members, if more information is needed. The continuance shall not exceed ten (10) working days unless the applicant requests and receives approval for additional time.
6. If the majority of the Committee members vote to approve a request, the committee recommendation shall be forwarded to the Director for action. In the event of a tie vote, the request shall be recorded as a denial.
7. The Director, or his designee, may accept or reject the Committee's recommendation within five (5) working days of the Committee's recommendation.
8. PCWWM will notify the applicant in writing that the request has been either approved or denied by the Director, and give the basis for the decision, within five (5) working days of the final decision.
9. PCWWM will notify the applicant in writing of a committee denial, giving the basis for rejection by the committee, within five (5) working days of the final decision.
10. For unforeseen, construction related variance requests, the committee will make every effort to conduct the review under an expedited schedule.

PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), are responsible for the enforcement of this Directive and the associated Standard. It is the responsibility of the Chief Engineer to administer, coordinate, and enforce the provisions contained in the latest edition of the Standards. The Standards are defined in this document as:

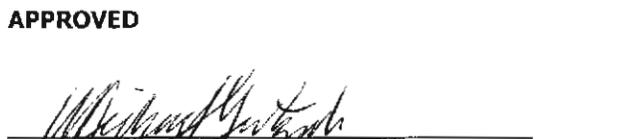
- Manual of Engineering Standards and Procedures
- The Standard Specifications for Public Improvements
- The Standard Details for Public Improvements
- Wastewater Management Department Directives
- Other Approved Documents

RECOMMEND

 Eric Wieduwilt P.E.
 Chief Engineer- Engineering Division

CONCUR

 Paul M. Bennett, P.E.
 Deputy Director- Planning/Engineering

APPROVED

 Mike Gritzuk P.E.
 Director- Pima County Wastewater Management

Date: 9/13/05



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2005-05

Effective Date: September 1, 2005

SUBJECT: MAINTENANCE VEHICLE ACCESS WITHIN CUL-DE-SACS

STATEMENT OF PURPOSE

This Directive clarifies the sewer maintenance vehicle access requirements for cul-de-sacs. The current outside radius for a cul-de-sac does not provide sufficient space for sewer maintenance vehicles to navigate a turn-around in one circular motion. The Pima County Subdivision and Development Streets Standards allow a 42 feet minimum radius (Standard Cul-de-Sac Detail 3.3 and Cul-de-Sac Landscaping Detail 3.5). A combination cleaner has an extended front end, which is restricted from overhanging the curb, due to mailboxes and other curb features. These obstructions past the plane of the asphalt, require the vehicle to navigate a three-point turn within a cul-de-sac. The presence of parked vehicles and installation of cul-de-sac islands make the navigation dangerous and potentially unachievable.

GENERAL PROVISIONS

1. When a public sewer is located in a street (public or private) with a cul-de-sac, reasonable access for turning around must be provided for sewer maintenance vehicles.
2. Islands are not permitted within cul-de-sacs, unless the road surface dimensions provide for an unimpeded 35-foot inside radius, and a 55-foot outside radius as described in WWM 109.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Sewer design documents, transportation design documents, neighborhood improvement projects, and other development documents shall reflect this requirement.

PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), are responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND

Eric Wieduwilt, P.E.
Chief Engineer- Engineering Division

CONCUR

Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

APPROVED

Mike Gritzuk, P.E.
Director- Pima County Wastewater Management

Date: 9/13/05



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2005-06

Effective Date: October 1, 2005

SUBJECT: SHORT EASEMENT ACCESS

STATEMENT OF PURPOSE

This directive identifies an exception to the requirement of a turn-around for easement maintenance vehicular access. While each situation must be evaluated, it is presumed that for short distances, a maintenance vehicle can safely navigate in reverse. The safety of the public and of the maintenance staff cannot be compromised, therefore adequate visual and navigational room must be available within the easement and where the easement joins the public right-of-way. A turn-around may still be required if the safety of the vehicle is hindered by heavy traffic, difficult terrain, or other factors.

GENERAL PROVISIONS

The requirement for a turn-around at a manhole may be waived, providing that:

1. The easement is a straight line, and not greater than 150 feet long to the last manhole in the easement,
2. The minimum easement width is 20 feet, or twice the depth if over 10 feet deep, with a 16 foot stabilized surface,
3. There are no obstructions for the vehicle or driver to navigate within the easement or onto the right-of-way at the beginning of the easement, and
4. The exclusion of a turn-around for a short easement access has been approved by Pima County Wastewater Management or a delegated authority.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage.

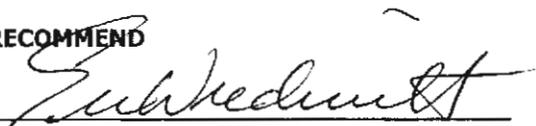
PROCEDURE

Sewer improvement plans and other development documents shall reference this exception with prior approval by Pima County Wastewater Management or a delegated authority.

PROCEDURAL RESPONSIBILITY

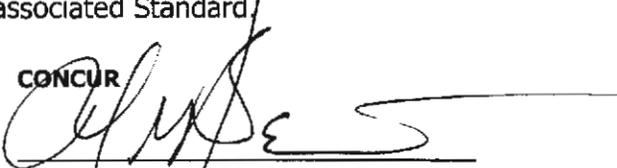
Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), are responsible for the enforcement of this Directive and the associated Standard.

RECOMMEND



Eric Wieduwilt, P.E.
Chief Engineer- Engineering Division

CONCUR



Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

APPROVED



Mike Grizuk, P.E.
Director- Pima County Wastewater Management

Date: 9/13/05



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2006-08

Effective Date: April 1, 2006

SUBJECT: PRIVATE SEWER LATERALS IN A TERMINAL MANHOLE

STATEMENT OF PURPOSE

This Directive expands the design standard to now allow private sewer lateral connections (HCS) to a terminal manhole that is adjacent to another terminal manhole within a fully developed subdivision, and with no feasibility of future extension. The existing standard for connections into a terminal manhole within a cul-de-sac remains. Private sewer laterals connected to a terminal manhole are not encouraged, as they increase the cost and difficulty of manhole repairs, and potentially interfere with other uses such as emergency flow management and future sewer modifications.

GENERAL PROVISIONS

Private sewer laterals may be connected into a terminal manhole that is within a cul-de-sac or adjacent to another terminal manhole in a fully developed subdivision. The private sewer lateral in the public Right of Way shall be straight, without horizontal curves or bends. The maximum number of private sewer laterals that can be connected is three (3), 4-inch laterals in a cul-de-sac, and two (2), 4-inch laterals for adjacent terminal manholes. The terminal manhole must be located adjacent (within the property boundary extension) to the properties connected to it. The standard will be disallowed if parcels close to the terminal manhole may be reasonably served in the future by an extension of the public line from the terminal manhole or an additional manhole connection. A private sewer lateral may be required to connect to the sewer pipe, if the configuration provides for such a connection. Private sewer lateral connections to a terminal manhole are not permitted in any other configuration without a written variance approval from Pima County Wastewater Management.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Sewer improvement plans and connection permits shall comply with this requirement.

PROCEDURAL RESPONSIBILITY

The Manager of Sanitary Engineering of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND

Eric Wieduwilt, P.E.
Manager - Sanitary Engineering

CONCUR

Paul M. Bennett, P.E.
Deputy Director- Planning & Engineering

APPROVED

Mike Gritzuk, P.E.
Director- Pima County Wastewater Management

Date: 3/14/06



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
ENGINEERING DIRECTIVE**

Directive: ENG2006-09

Effective Date: April 1, 2006

SUBJECT: FLOW MANAGEMENT CONSIDERATIONS DURING DESIGN

STATEMENT OF PURPOSE

This Directive outlines the requirements of how and when a flow management plan shall be provided. Flow management plans are required for all sewer improvement plans connecting to an existing public sanitary sewer, or any utility design where the utility will impact the public sewer. The requirements for a Flow Management Plan are defined in Standard Detail WWM A-5. Incorporating flow management information (either Flow Management Data or a Flow Management Design) during the design phase allows for early flow management planning and provides the bidding contractors with information to estimate flow management activities and costs.

GENERAL PROVISIONS

Flow management information shall be added to the construction plans for all construction projects that impact the public sanitary sewer by either connecting to the public sanitary sewer, or if excavation is required, within two (2) feet vertical or six (6) feet horizontal of the public sewer.

1. **For construction projects impacting sewer pipe 12 inches in diameter or less:** Flow Management Data shall be incorporated into the construction plans on the sheet containing the connecting manhole. The Flow Management Data will provide the contractor with sewer system information from which to generate a Flow Management Plan. At the discretion of PCWMD, a Flow Management Design may be required at design due to unique field or system conditions. Flow management data shall be clearly described on the sheet showing the connection or impact location, and shall include:
 - a) A reference to Standard Detail WWM A-5: Flow Management Plan,
 - b) Wastewater flow information (provided by PCWMD at a noted time and date),
 - c) Sewer asset information (e.g. upstream and downstream manhole locations, depths, invert elevations, manhole and pipe diameters, manhole and pipe material, etc.), and
 - d) A description of possible flow management options and constraints.

The final Flow Management Plan shall be developed by the contractor, and submitted to PCWMD Field Engineering for approval prior to commencing construction.

2. **For construction projects impacting sewer pipe greater than 12 inches in diameter:** A Flow Management Design shall be incorporated into the construction plans during design as a new detail sheet or other approved format. For low flow conditions, with prior approval by PCWMD, the requirements for sewer pipe less than or equal to 12 inches in diameter may be substituted. The Flow Management Design shall be approved by PCWMD Field Engineering, and include all requirements of Standard Detail WWM A-5. A list of required contractor submittals shall be included, to verify contractor conformance to the design.

In addition to the requirements for sewer pipe 12 inches in diameter and less, Flow Management Design utilizing by-pass pumping shall contain:

- a) Proposed flow management by-pass pumping set-up,

- b) Calculations of total head pressure, head loss, and flow requirements for the proposed pumping,
- c) Discharge piping lengths and diameters,
- d) A list of submittals to verify contractor conformance to the design, and
- e) Any additional information necessary for the contractor to quickly implement the Flow Management Design.

Prior to construction, the contractor must verify flow. If no changes exist, the contractor may use the Flow Management Design as the approved Flow Management Plan. All submittals for equipment and material shall be expeditiously reviewed by PCWMD Field Engineering for approval. If site conditions change, a modified Flow Management Plan shall be developed and submitted by the contractor for approval by PCWMD Field Engineering prior to construction.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage. Pima County Wastewater Management Department is a member of the Arizona Blue Stake Center, and is responsible for Blue Stake requests regarding the sewers under its authority.

PROCEDURE

The flow management information shall be titled "Flow Management", and be incorporated into the sewer improvement plan or utility construction plan. A construction plan impacting the public sewer will not be approved without flow management information. The flow management information will be reviewed by PCWMD Field Engineering staff for approved, through the standard Development Services or PCWMD Utility review process.

PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND


 Eric Wieduwilt, P.E.
 Chief Engineer- Engineering Division

CONCUR


 Paul M. Bennett, P.E.
 Deputy Director- Planning/Engineering

APPROVED


 Mike Gritzuk, P.E.
 Director- Pima County Wastewater Management

Date: 3/7/04

**Pima County Wastewater Management
Engineering Division**

**Flow Management Guide for Connections into a
Public Sewer 12 Inches in Diameter and Less**

Table of Contents

1. Introduction.....	3
2. Connecting Private Sewer Laterals into the Public Sewer	3
3. Connecting New Sewer Pipe Through the Construction of a New Manhole	4
4. Connecting New Sewer Pipe to an Existing Terminal Manhole.....	5
5. Connecting New Sewer Pipe to an Existing In-Line Manhole	5
6. Working Near an Active Public Sewer Line	6

1. Introduction

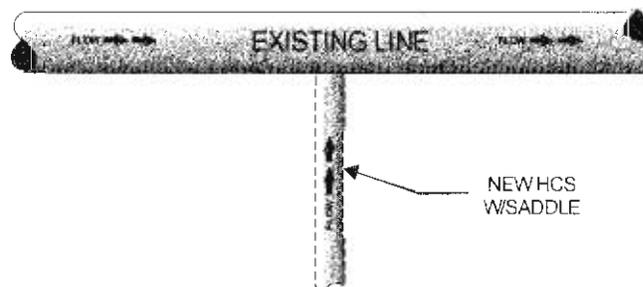
This Flow Management Guide is a guide to the management of wastewater flow when connecting to a public sewer. The emphasis of this guide is on connections to lines 12 inches in diameter and less, since those are the most common. Connections to sewers with diameters greater than 12 inches require more detailed evaluations and discussion with Pima County Wastewater Management Department (PCWMD) staff.

Common connection scenarios are shown, and several possible flow management options for those situations are presented. The options are to be used as a guide, as actual site conditions may require other solutions.

Regardless of the situation, a Flow Management Plan must be submitted and approved by PCWMD. For the simplest of conditions, this plan may be only one paragraph, stating the flows provided by PCWMD and the proposed elements based on the guidelines below. More complicated situations may require multi-page Flow Management Plans.

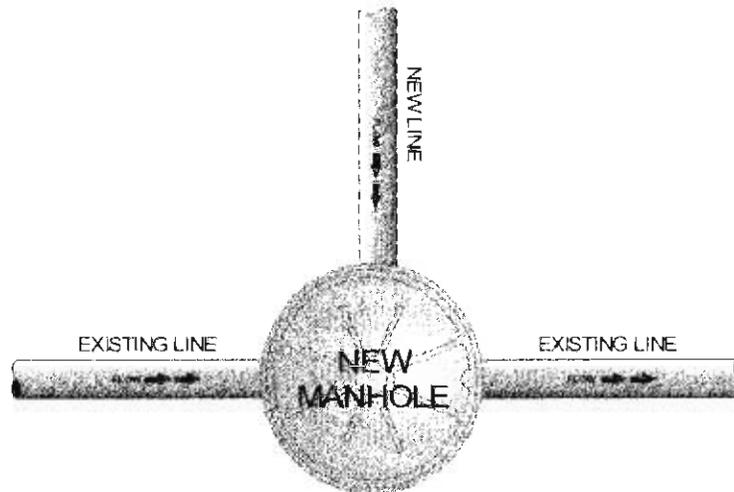
The purpose for a Flow Management Plan is to: 1) Provide a mechanism to educate the contractor on the risks of sewer connections, and 2) Minimize the health, safety, and regulatory risks by taking all reasonable measures to avoid sanitary sewer overflows.

2. Connecting Private Sewer Laterals into the Public Sewer



When a single House Connection Sewer (HCS) or Private Sewer Lateral is to be connected to an active public sewer, the flow management approach is dependent on the flow level in the pipe. If wastewater flow is less than half-pipe, flow management may consist of only limiting the time of connection to low-flow periods. If flow is equal to, or greater than, half-pipe at the time of connection, additional flow management options must be evaluated. (See PCWMD Development Services Connection Procedure)

3. Connecting New Sewer Pipe Through the Construction of a New Manhole



When a new sewer line is to be connected to a public sewer by constructing a new manhole on the existing public sewer, the flow in the existing public sewer guides the flow management options.

a) For Low flow in Public Line:

Flow management options include plug and monitor the upstream manhole, or, depending on the pipe material, hand dig and support the live pipe while a new bench is poured. Ductile Iron and Polyvinyl Chloride pipe are less prone to flexural cracks than Vitrified Clay or Asbestos Cement pipes. VCP and AC pipes have shorter length between joints, thus making it difficult to maintain the overall pipe slopes when spanning several joints for the construction of the base.

b) For Medium flow in Public Line:

Flow management options include hand dig and support for DIP and PVC pipe only, plug the upstream manhole and haul the retained wastewater, or set up a small pump by-pass from an upstream manhole.

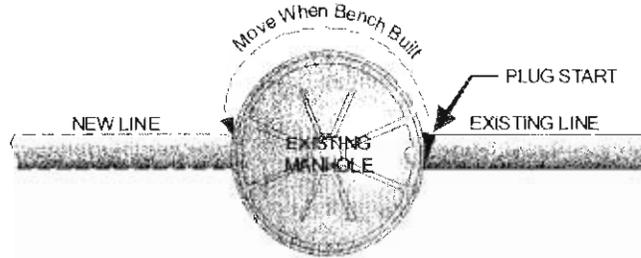
c) For High flow in Public Line:

Flow management options at this level of flow are usually limited to a pump by-pass from an upstream manhole.

Note that for any of the above situations, a standby pump or pump truck is required, and the pump, pipe, and plug must be in a staging area and ready for deployment. Pump capacity should contain a 1.5 safety factor over the maximum measured flow. If a plug is used, it must be secured to the steps with chain or steel cable, and the plug must be identified with the contractor's company name. Because brick manholes cannot be surcharged due to their poor sealing ability, an inspection of the upstream manholes is necessary. For concrete manholes, the level of surcharging shall not be less than three (3) feet from the rim. See PCWMD Flow Management Plan Detail WWM A-5 for pump by-pass requirements.

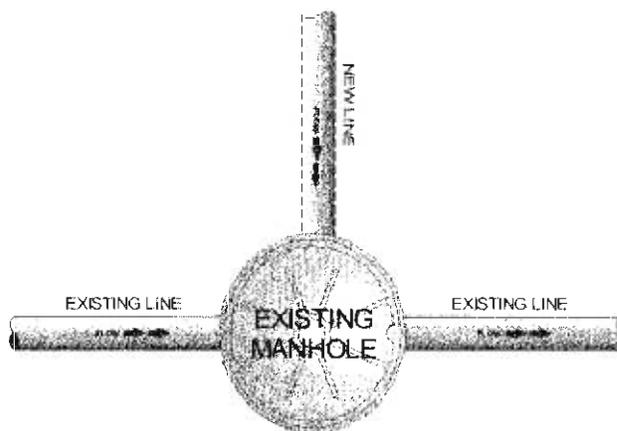
4. Connecting New Sewer Pipe to an Existing Terminal Manhole

When a new sewer line is to be connected at an existing, public, terminal manhole, the concerns are to protect the downstream line from construction debris and to protect the work area from unanticipated surcharging from the active downstream sewer.



A downstream plug is required to protect the line from debris and to isolate the open system. The plug must be secured to the steps with chain or steel cable, and the plug must be identified with the contractor's company name. Once the work is complete, the plug shall be moved to the upstream pipe to isolate the new construction from the active public sewer.

5. Connecting New Sewer Pipe to an Existing In-Line Manhole



When a new sewer line is to be connected at an existing public manhole, the flow in the existing manhole guides the flow management options. Connections to an existing manhole are made through either a stub-out/block-out or by coring the manhole barrel above the base. Coring of the base is not permitted.

a) For Low flow in Public Line:

Flow management options include plug and monitor the upstream manhole, or use of a flow-through plug to contain the wastewater.

b) For Medium flow in Public Line:

Flow management options include plug the upstream manhole and haul the retained wastewater, or use of a flow-through plug to contain the wastewater.

c) For High flow in Public Line:

Flow management options at this level of flow are usually limited to a pump by-pass from an upstream manhole.

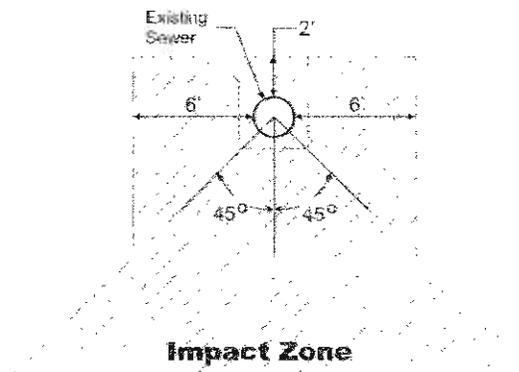
Note that for any of the above situations, a standby pump or pump truck is required, and the pump, pipe, and plug must be in a staging area and ready for deployment. The plug must be secured to the steps with chain or steel cable, and the plug must be identified with the contractor's company name. Pump capacity should contain a 1.5 safety factor over the maximum measured flow. Because brick manholes cannot be surcharged due to their poor sealing ability, an inspection of the upstream manholes is necessary. For concrete manholes, the level of surcharging should not be less than three (3) feet from the rim. See PCWMD Flow Management Plan Detail WWM A-5 for pump by-pass requirements.

6. Working Near an Active Public Sewer Line

Contractors should be aware that work close to an active sewer line may require a flow management plan if there is potential for pipe or bedding damage and a resulting sanitary sewer overflow. Excavation near a sewer pipe can cause the pipe bedding to flow out and undermine the pipe support.

A new utility should not be located near a sewer pipe, without additional evaluation, within six (6) foot horizontal from the outside of the sewer feature, or within two (2) feet vertical above the sewer feature.

For construction of features below the sewer pipe, the safe working zone is outside the area defined by a vertical plane six feet away from the structure, extending down to where it intersects with an outward extending plane at 45 degrees to the horizontal from the sewer feature. Any construction within this zone will require a flow management plan due to the potential for sewer pipe bedding loss and settlement.





**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2006-10

Effective Date: September 1, 2006

SUBJECT: CONES AND GRADE RINGS IN MANHOLE CONSTRUCTION

STATEMENT OF PURPOSE

This Directive allows eccentric cones in manholes with at least six (6) vertical feet of barrel section below the cone and also resolves measurement inconsistencies in the Standard Details regarding grade ring sections, clarifying that the maximum total grade ring height is twelve (12) vertical inches.

GENERAL PROVISIONS

Eccentric Manhole Cones

The design standard requiring a flat-top manhole for all structures allowed for better maintenance access, but is not the best solution in roadways where crowned pavement intersects the edges of the flat-top. For that reason, and for the projected reduction in cement material use, the previous standard allowing eccentric manholes is being reinstated. Manhole construction with an eccentric cone will be allowed for forty-eight (48) inch and sixty (60) inch diameter manhole structures where at least six (6) feet of vertical barrel section is maintained below the cone. (see WWM 206) Flat Top

Grade Rings

This Directive also resolves measurement inconsistencies in the Standard Details regarding grade ring sections, clarifying that a maximum of twelve (12) vertical inches is permitted for grade rings (e.g. two six-inch rings). If the grade adjustment between the frame and the manhole sections exceeds the nominal twelve (12) inches, an additional twelve (12) inch barrel section must be added.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Sewer design and construction shall comply with this requirement. Pima County Wastewater Management Engineering and delegated review authorities may allow cones to be used in roadways by written approval.

PROCEDURAL RESPONSIBILITY

The manager of Sanitary Engineering for Pima County Wastewater Management, and/or designated representative(s), are responsible for the enforcement of this directive and the associated Standards.

RECOMMEND

Eric Wieduwilt, P.E.
Manager – Sanitary Engineering/Chief Engineer

CONCUR

Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

APPROVED

Mike Gritzuk, P.E.
Director- Pima County Wastewater Management



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2006-11

Effective Date: September 1, 2006

SUBJECT: Survey Cut Sheet Deliverable

STATEMENT OF PURPOSE

This Directive clarifies the requirements for submitting survey cut sheets prior to commencing sewer construction.

GENERAL PROVISIONS

Survey cut sheets shall be developed by a Registered Surveyor, for the staking of line and grade of public sewers and for identifying manhole and private house connection sewer locations on new sewer construction. The surveyor shall use the attached form or approved equal, and shall submit the completed, sealed form to the Wastewater Management inspector. This form shall be submitted prior to commencement of construction, and work may be stopped if the deliverable is not submitted in a timely manner. The cut sheets are for the project file and commencement of sewer construction will not be delayed due to review of the deliverable. Any errors or emissions resulting in improper sewer construction shall not be the responsibility of Pima County.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Sewer Cut Sheets shall be submitted to the project inspector prior to commencing construction.

PROCEDURAL RESPONSIBILITY

The Manager of Sanitary Engineering of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND

Eric Wieduwilt, P.E.
Manager - Sanitary Engineering/Chief Engineer

CONCUR

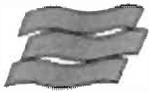
Paul M. Bennett, P.E.
Deputy Director- Planning & Engineering

APPROVED

Mike Gritzuk, P.E.
Director- Pima County Wastewater Management

Date: 9/14/06

Attachment: Sewer Cut Sheet Form: Revision 1



12/21

Eng.

**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2006-13

Effective Date: December 31, 2006

SUBJECT: MANHOLE INVERT SLOPES

STATEMENT OF PURPOSE

This Directive modifies the requirements for invert elevation drops between the inlet pipes and outlet pipe(s) within a standard manhole.

GENERAL PROVISIONS

The following table identifies the required minimum invert elevation drops within a manhole:

Horizontal Sewer Deflection Angle	Required Invert Drop within Manhole
0 to 9 degrees	Drop shall be the average slope between inlet and outlet pipe slopes
10 to 45 degrees	Drop shall be 0.10 feet between inlet and outlet pipes
46 to 90 degrees	Drop shall be 0.20 feet between inlet and outlet pipes

All channels within the manhole shall be shaped and formed to provide a smooth transition of flow between inlet pipe(s) and outlet pipe(s).

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

Sewer design and construction shall comply with the drop requirements. Any variance must be approved in writing by the Manager of Sanitary Engineering, through the Variance Procedure ENG2005-04.

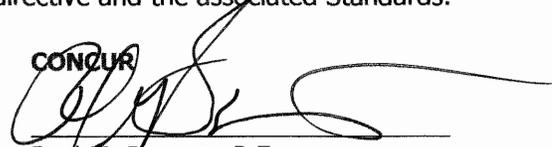
PROCEDURAL RESPONSIBILITY

The Manager of Sanitary Engineering for Pima County Wastewater Management, and/or designated representative(s), are responsible for the enforcement of this directive and the associated Standards.

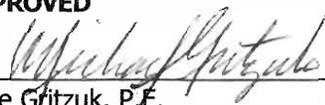
RECOMMEND

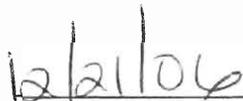

Eric Wieduwilt, P.E.
Manager – Sanitary Engineering

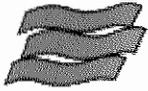
CONCUR


Paul M. Bennett, P.E.
Deputy Director- Planning/Engineering

APPROVED


Mike Gritzuk, P.E.
Director- Pima County Wastewater Management


Date



**PIMA COUNTY
WASTEWATER MANAGEMENT DEPARTMENT
DIRECTIVE**

Directive: ENG2006-15

Effective Date: December 31, 2006

Revision 1

Effective Date: September 24, 2007

Changes: Backwater Valve removed from the requirements

SUBJECT: Manhole Interior Coating Requirements

STATEMENT OF PURPOSE

Unprotected concrete manholes on sewer pipe of 18" diameter and greater and at force main discharge locations are at risk for exposure to hydrogen sulfide gas and acid corrosion. PCWMD desires to protect the useful life of such public assets by coating the "at-risk" concrete surfaces (see Standard Details WWM A-2.22, WWM A-3.5.a. and WWM A-3.8.a), while also considering worker and system safety, and economies of scale. Coatings are to be applied per COT/Pima County Standard Specifications for Public Improvements (Section 509 Sanitary Manholes-2.09 Coatings). This Directive defines when manhole coatings are required at the time of construction, and when it is prudent to postpone coating until a system-wide coating rehabilitation program can perform the work in a more effective and efficient manner.

GENERAL PROVISIONS

1. The installation or full reconstruction of concrete manholes over sewer pipe 18" diameter and greater shall include interior coating during construction. All new manholes constructed within 200 feet of the new installation, which are open to gas migration from the large-diameter sewer, shall also be coated during construction.
2. The tapping of an existing manhole over a sewer pipe 18" diameter and greater, with an 8" sewer or smaller shall be excluded from coating at the time of connection, as well as the coating of new manholes within 200 feet of the connection.
3. All force main discharge connections shall require coating of the receiving manhole during construction/connection.
4. Coatings shall be applied to all exposed interior surfaces, and if full by-pass flow management is required for the connection, the invert shall also be coated at the time of by-pass. The requirement for coating shall not dictate flow management requirements.
5. Reasonable means and methods shall be used to avoid the entry of foreign matter into the public sewer. Wood platforms with fine-mesh drain screens on the bench, or flow-through plugs are acceptable options. All means and methods to protect workers over an active sewer shall be incorporated into the safety plan.
6. A coating bond shall be required for the acceptance of the manhole. The bonding period for the application of manhole interior coatings (labor and materials) from the Prime Contractor is three (3) years. Due to the limits on available bonding terms, the Contractor may supply a two-year bond, followed by a one-year bond. The product warranty requirement remains at five (5) years. It shall be the responsibility of PCWMD to conduct an inspection of the coating and request any necessary corrections from the bonded firm prior to expiration of the bond.

AUTHORITY

Arizona State Regulations, Pima County Ordinances and other enabling legislation, which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

The design engineer is responsible for ensuring that all coating requirements are noted on the sewer improvement plan or private development plan, and that coatings required at the time of construction are clearly identified. Regardless of the design engineer's notations or lack thereof, the coatings shall still be required per this Directive. This Directive is in full effect on the effective date.

PROCEDURAL RESPONSIBILITY

The Manager of Sanitary Engineering of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND



Eric Wieduwilt, P.E.
Manager of Sanitary Engineering

CONCUR



Mike Bunch
Deputy Director- Planning/Engineering

APPROVED



Michael Gritzuk, P.E.
Director- Pima County Wastewater Management



Date



**PIMA COUNTY
REGIONAL WASTEWATER RECLAMATION DEPARTMENT
DIRECTIVE**

Directive: ENG2008-16

Effective Date: March 17, 2008

**SUBJECT: Revised Sand Bedding for Sanitary Sewers –
Standard Details WWM-104 & WWM-105**

STATEMENT OF PURPOSE

This Directive modifies the sand bedding specifications as currently described in "City of Tucson/Pima County Standard Details for Public Improvement" 2003 Edition, WWM-104 Rigid Pipe Bedding for Sanitary Sewers and WWM-105 Flexible Pipe Bedding for Sanitary Sewers, and "COT/PC Standard Specifications for Public Improvements", 2003 Edition, Section 508-2.05, Bedding Material. The modification changes the #200 passing range from 0-5% to 0-10% and add a soil box resistivity test to the standard.

GENERAL PROVISIONS

Sand bedding must meet the following Criteria:

- Sand Bedding Sieve Analysis

Nominal Size	% Passing
1 Inch (25 mm)	100
#4 (4.8 mm)	60-100
#200 (0.075 mm)	0-10

- Maximum P.I. = 5
- Maximum L.L. = 30
- Minimum Resistivity = 2000 ohm-cm
- The resistivity shall be laboratory tested by ASHTO T 288 or ASTM G187-05 test method.
- Use of lime is not permitted in bedding material.
- Use of Recycled Asphalt Product (RAP) is not permitted in bedding material.

PROCEDURE

Bedding shall be certified by an independent testing facility when delivered to the project site or by stockpile, as directed by project inspector. Reference section 106-4 Tests and Acceptance of Materials - COT/PC 2003 Specifications, as amended or superseded by PCRWRD Procedures.

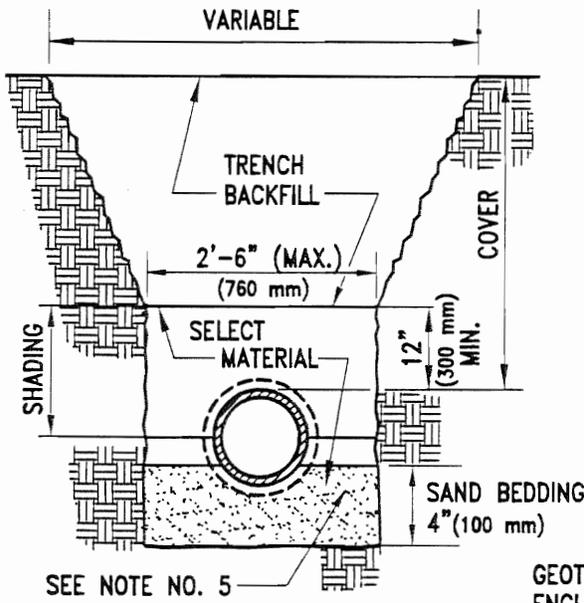
RECOMMEND

Eric Wieduwilt, P.E.
Deputy Director- Planning and Engineering

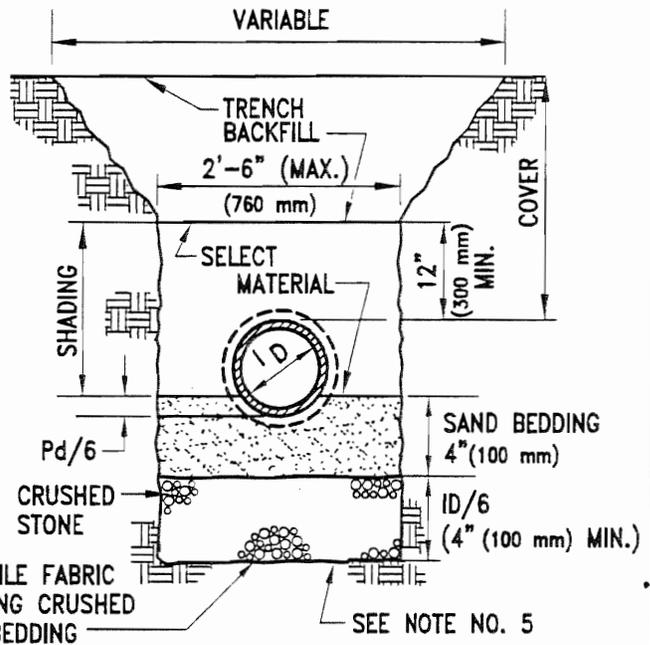
APPROVED

Michael Gritzuk, P.E.
Director – Pima County Regional Wastewater Reclamation Department

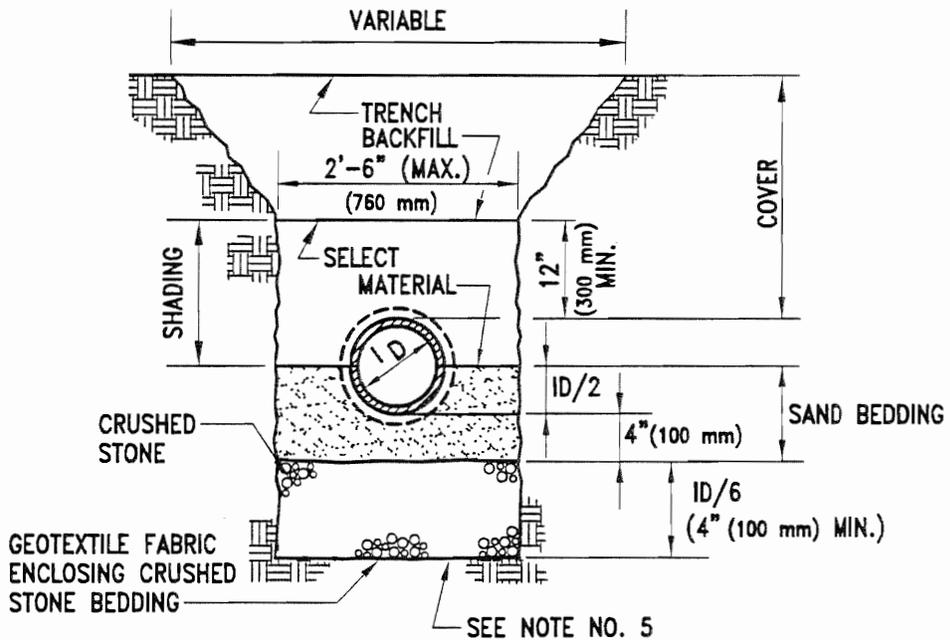
Date 4-7-08



TYPE 1 BEDDING



TYPE 2 BEDDING



TYPE 3 BEDDING

ISSUED:
8/92
REVISED:
7/02



STANDARD DETAIL
**RIGID PIPE BEDDING
 FOR
 SANITARY SEWERS**



DETAIL NO.
WWM 104
SHEET 1 OF 2

PIPE COVER LIMITATION TABLE (MAXIMUM TRENCH WIDTH 30" (760 mm) AT TOP OF PIPE)					
PIPE SPECIFICATION			MIN.-MAX. COVER		
SIZE (ID)	MATERIAL	TYPE AND MIN. CLASS	TYPE 1	TYPE 2	TYPE 3
8" (200 mm)	V. C.	EXTRA STR.	4'-10' (1.2 m-3.0 m)	4'-26' (1.2 m-7.9 m)	4'-30' (1.2 m-9.1 m)
10" (250 mm)	V. C.	EXTRA STR.	4'-11' (1.2 m-3.4 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
12" (300 mm)	V. C.	EXTRA STR.	4'-14' (1.2 m-4.3 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
15" (375 mm)	V. C.	EXTRA STR.	4'-20' (1.2 m-6.1 m)	4'-30' (1.2 m-9.1 m)	4'-30' (1.2 m-9.1 m)
8"-16" (200 mm-400 mm)	D. I.	SEE NOTE #3	2'-17' (610 mm-5.2 m)	2'-24' (610 mm-7.3 m)	2'-30' (610 mm-9.1 m)

SIEVE ANALYSIS CHART					
CRUSHED STONE A.S.T.M. D-448, GR.67		SAND		SELECT MATERIAL	
NOM. SIZE	% PASSING	NOM. SIZE	% PASSING	NOM. SIZE	% PASSING
1" (25 mm)	100	1" (25 mm)	100	3" (75 mm)	100
3/4" (19 mm)	90-100	#4 (4.8 mm)	60-100	3/4" (19 mm)	60-100
3/8" (10 mm)	20-55	#200 (75 μm)	0-50-10	#8 (2.4 mm)	35-80
#4 (4.8 mm)	0-10	MAX. P.I.=5		#200 (75 μm)	0-25
#8 (2.4 mm)	0-5	MAX. L.L.=30		P.I. + MINUS #200 (75 μm)	< 25
MINIMUM RESISTIVITY 2000 ohm-cm					

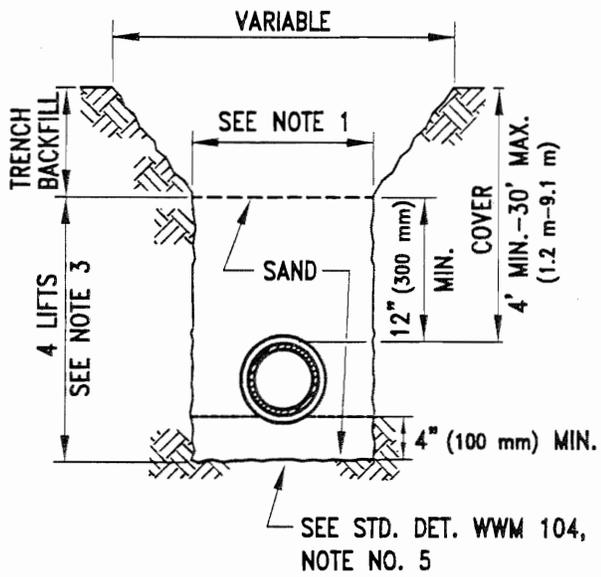
ALL SIEVE ANALYSES SHALL BE CERTIFIED AND SUBMITTED TO PCWMD PRIOR TO STARTING CONSTRUCTION.

- The resistivity shall be laboratory tested by ASHTO T 288 or ASTM G187-05 test method.
- Use of lime is not permitted in bedding material.
- Use of Recycled Asphalt Product (RAP) is not permitted in bedding material.

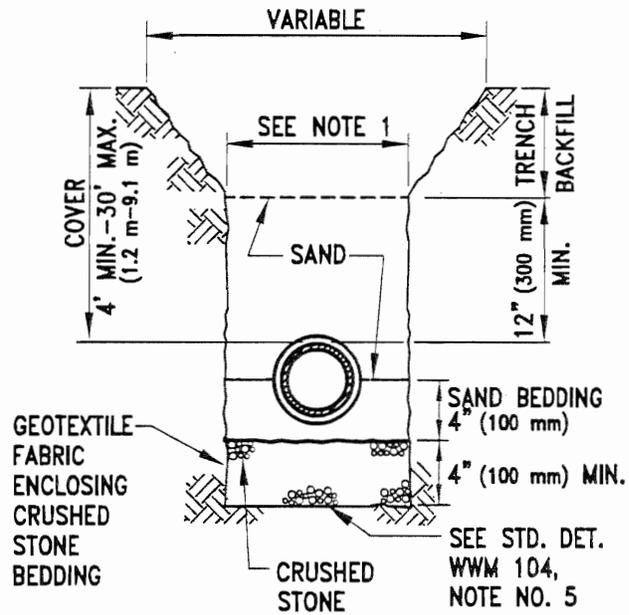
NOTES:

1. TRENCH BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 508-2.07 OF THE PIMA COUNTY/CITY OF TUCSON STANDARD SPECIFICATIONS FOR PUBLIC IMPROVEMENTS. COMPACTION OF THE BACKFILL SHALL CONFORM TO THE REQUIREMENTS OF SUBSECTION 508-3.04(A) UNLESS OTHERWISE NOTED ON THE PLANS OR IN THE SPECIAL PROVISIONS.
2. SHADING SHALL BE CAREFULLY PLACED. MINIMUM DENSITY TO BE 95% OF THE DRY DENSITY DETERMINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL.
3. ALL DUCTILE IRON PIPE AND ALL PIPE 18" (450 mm) IN DIAMETER AND LARGER WILL REQUIRE SPECIAL APPROVAL OF THE DESIGN AND INSTALLATION BY PCWMD.
4. PCWMD RESERVES THE RIGHT TO ADJUST, ON AN INDIVIDUAL CASE BASIS, THE PIPE BEDDING REQUIREMENTS TO MEET UNEXPECTED FIELD/SOIL CONDITIONS.
5. UNDISTURBED EARTH OR SELECT MATERIAL SHALL BE COMPACTED TO 95% OF THE MAXIMUM DENSITY DETERMINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL
6. CRUSHED STONE BEDDING SHALL NOT BE USED WITH DUCTILE IRON PIPE UNLESS APPROVED IN WRITING BY PCWMD.
7. NATIVE MATERIAL MEETING THE GRADATION OF SELECT MATERIAL MAY BE USED IN LIEU OF SELECT MATERIAL.

ISSUED:		STANDARD DETAIL		DETAIL NO.
8/92		RIGID PIPE BEDDING FOR SANITARY SEWERS		WWM 104
REVISED:				SHEET 2 OF 2
3/08				



SAND BEDDING



CRUSHED STONE BEDDING

NOTES:

1. NOTES 1 THRU 6 OF STANDARD DETAIL NO. WWM 104 (RIGID PIPE) ARE ALSO APPLICABLE TO FLEXIBLE PIPE INSTALLATIONS.
2. WHEN USING A MOVABLE TRENCH BOX, THE INSIDE WALLS OF THE BOX MUST CLEAR THE SEWER PIPE AS NOT TO DISTURB THE BEDDING WITHIN TWO PIPE DIAMETERS (O.D.) ON EACH SIDE OF THE PIPE.
3. FOR SAND BEDDING, PLACE SAND FROM BOTTOM OF TRENCH TO 12" (300 mm) OVER THE PIPE IN FOUR LIFTS, WITH EACH LIFT COMPACTED TO 95% OF THE MAXIMUM DENSITY DETERMINED IN ACCORDANCE WITH THE REQUIREMENTS OF THE APPLICABLE TEST METHODS OF THE ADOT MATERIALS TESTING MANUAL, USING HAND OR MECHANICAL TAMPING. WATER SETTLING OF FLEXIBLE PIPE WILL NOT BE PERMITTED. USE CARE SO AS NOT TO MOVE PIPE OFF LINE OR GRADE.
4. REFER TO SIEVE ANALYSIS CHART ON STANDARD DETAIL NO. WWM 104 FOR CRUSHED STONE, SAND AND SELECT NATIVE MATERIALS.
5. IF CRUSHED STONE IS USED FOR THE BEDDING MATERIAL, SAND SHALL BE USED FOR THE SHADING MATERIAL.

ISSUED:		STANDARD DETAIL FLEXIBLE PIPE BEDDING FOR SANITARY SEWERS		DETAIL NO.
8/92				WWM 105
REVISED:				SHEET 1 OF 1
7/02				



**PIMA COUNTY REGIONAL
WASTEWATER RECLAMATION DEPARTMENT
DIRECTIVE**

Directive: ENG2008-17

Effective Date: July 14, 2008

SUBJECT: CCTV Inspection for Sewer Construction Acceptance

STATEMENT OF PURPOSE

In order to identify all sewer pipe installed at a reverse slope and subject to removal and reinstallation per Section 508 (COT/PC Standard Specifications for Public Improvements– 2003), and to improve the visual inspection of new sewer construction, all new sewers will be subject to a Closed Circuit Television (CCTV) inspection, as authorized by Arizona Department of Environmental Quality (R18-9-E301), prior to approval of as-built drawings and final acceptance of the public sewer by Pima County Regional Wastewater Reclamation Department (PCRWRD).

GENERAL PROVISIONS

1. The CCTV inspection shall identify all sewer pipe installed at a reverse slope and subject to removal and reinstallation. Mirror inspection after a water dump can be used as a preliminary inspection for identifying sags through the ponding of water in the pipe. CCTV will be conducted by PCRWRD in addition to the established inspection tests of Mandrel, Mirror, and Leakage.
2. All sewer lines will be subject to inspection by CCTV prior to as-built acceptance. CCTV inspection shall occur no earlier than 7 days after completion of backfill compaction, and after Mandrel, Mirror, and Leakage testing. The CCTV vehicle must have clear access to all manholes, and the sewer pipe shall be clean and free of dirt and debris. Inspections, regardless of timing, shall abide by the criteria established in this Directive.
3. The CCTV inspection shall consist of video equipment expressly designed for pipeline inspection purposes and operated by National Association of Sewer Service Companies (NASSCO) certified personnel. The software and data management elements shall be defined by PCRWRD. The video operator shall acquire a continuous video of each sewer reach, and maintain a log noting location and condition of all sags (start and stop), sewer taps and defects. The video operator shall also photograph all sags, taps and defects. The video shall identify deviations from the uniform slope by measuring the depth of standing water.
4. A mechanical gauge will be mounted in front of the camera to show the depth of any standing water (sag) in the invert. The gauge shall clearly indicate markings of 5/8" and 1 and 1/4" for pipe 8" through 12" in diameter, and markings of 1 and 1/4" and 2" for pipe 15" through 24" in diameter. See CORRECTIVE ACTION REQUIREMENTS for a description of when corrective action is required.
5. DVD or paper prints of the CCTV inspection, including still photos, will be supplied to the contractor, by the inspector, after each day's inspection. The project inspector shall provide a written inspection report on the corrective actions necessary for acceptance at the end of the scheduled inspection.

6. The Contractor shall bear all costs incurred in correcting deficiencies found during the CCTV inspection, and shall bear the cost of the follow-up CCTV verification of the repairs. Only the repaired reaches shall require follow-up CCTV inspection, Mirror, Mandrel, and Leakage testing.
7. CCTV inspections may be scheduled during the one-year warranty period after acceptance of the Bill of Sale by PCRWRD. The contractor shall be responsible for all warranty repairs.

CORRECTIVE ACTION REQUIREMENTS

Pipe Diameter	Observed Sag	Corrective Action Required
8" to 12"	Less than or equal to 5/8 inch	None
8" to 12"	Greater than 5/8, but less than or equal to 1 and 1/4 inches	YES, if longer than 10 feet, or more than 3 occurrences in 100 feet
8" to 12"	Greater than 1 and 1/4 inches	YES
Greater Than 12" to 24"	Less than or equal to 1 and 1/4 inches	None
Greater Than 12" to 24"	Greater than 1 and 1/4, but less than or equal to 2 inches	YES, if longer than 20 feet, or more than 6 occurrences in 100 feet
Greater Than 12" to 24"	Greater than 2 inches	YES

1. For pipe greater than 24 inches in diameter, sags greater than 5% the diameter shall be reviewed by PCRWRD Field Engineering for determination of corrective actions.
2. Any sag in the sewer pipe entering or exiting a manhole requires corrective action.
3. The inspection of manholes for compliance with standard specifications for public improvements is not covered in this procedure.
4. Where multiple defects are found, the repairs shall be made in the order of severity (highest first), until the number of remaining defects falls below the corrective action level.

PROCEDURE

1. The contractor shall provide a tentative scheduled date for CCTV inspection at the preconstruction meeting. The contractor shall notify the PCRWRD Inspector in writing, three weeks in advance of completion of sewer installation to finalize the scheduled date for CCTV inspection. If the inspection is scheduled within 3 weeks of the pre-construction meeting, PCRWRMD shall commit to an inspection date at the pre-construction meeting. Scheduling for projects with special circumstances shall be arranged with the inspector at the preconstruction meeting. PCRWRD shall accommodate special requests for scheduling when possible.

2. The contractor may contract and pay for a CCTV inspection by an outside contractor if PCRWRD cannot commit to a CCTV scheduled date; as identified in the inspection notification submitted by the contractor 3 weeks prior to the scheduled inspection date or at the pre-construction meeting if scheduled within 3 weeks of the pre-construction meeting. The PCRWRD inspector shall provide written authorization at the time of scheduling. The initial CCTV inspection fee will be waived if the contractor provides an inspection log and DVD videos of the full CCTV inspection, conducted under the observation of a PCRWRD inspector, and in accordance with PCRWRD CCTV standards and procedures. The contractor's inspection shall serve as the certified inspection. PCRWRD may elect to conduct a follow-up CCTV inspection for data recovery purposes at no cost or delay to the contractor, prior to final acceptance.
3. The contractor shall ensure that the entire sewer system covered by a single ADEQ Construction Authorization permit is ready for inspection at the time of inspection. With prior written approval from PCRWRD Field Engineering, the CCTV inspection may be phased. A mobilization fee will be charged for each additional inspection trip.
4. The contractor shall ensure that all sewers are clean of dirt and debris prior to the scheduled CCTV inspection. If dirt or debris is found in the pipe, that particular reach will be rescheduled for the next available inspection date and a remobilization fee charged. Rescheduling will be waived if the contractor can produce a clean reach for inspection prior to the CCTV equipment completing the original reach list, and leaving the site for the next job. Excessive re-cleaning will result in a re-scheduling of CCTV inspection.
5. A cancellation of the inspection because the contractor was not ready, will result in a re-mobilization fee and the contractor will re-schedule for the next available date. A cancellation of the inspection by PCRWRD will result in a sliding of the schedule to maintain inspection priorities.
6. The contractor shall coordinate with the Inspector a minimum of 48 hours in advance of the scheduled CCTV inspection to confirm the final inspection date, and that the system is ready for inspection. The inspection date may change as a result of unforeseen delays in the prior CCTV inspection jobs. The inspector shall coordinate with the contractor a minimum of 48 hours in advance of the scheduled time about any delays in the inspection schedule due to prior inspections or equipment downtime.
7. On the day prior to inspection, the contractor shall supply adequate water to each reach such that water runs through each downstream manhole, in order to provide the necessary visual indicators of sags in the pipe and manholes and to properly Mirror inspect the line. The Inspector shall monitor the placement of water in advance of Mirroring and the CCTV inspection. The furthest downstream manhole(s) may require dewatering prior to inspection. Guidelines for the volume of water necessary and possible adjustments to the timing of water input may be developed through additional experience with this process.
8. A PCRWRD inspector shall monitor all CCTV inspection work. The inspector shall provide a written report within one working day after each day's completed CCTV inspection, identifying all observed corrective actions necessary for approval. The inspector shall use a defined criteria list for determining corrective action for sags.

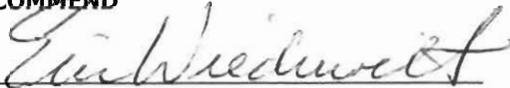
9. The corrective action shall minimize the use of repair couplings. Corrective action for material defects or other construction defects shall be based on the inspector's judgment, and in compliance with PCRWRD construction standards and procedures.

10. Once the contractor notifies the Inspector that all deficiencies have been repaired, a follow-up CCTV inspection for the corrected reach(es) shall be scheduled within 3 working days following the 7-day post-compaction waiting period. The additional re-tests for Mandrel, Mirror, and Leakage shall also be conducted. Follow-up CCTV inspection shall be at the cost of the contractor, but shall follow the same data management processes as the initial inspection, in order to maintain the most current CCTV inspection database.

PROCEDURAL RESPONSIBILITY

The Manager of Sanitary Engineering of Pima County Wastewater Management, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards. Funding of this program shall be established through Ordinance and PCRWRD Procedures.

RECOMMEND



Eric Wieduwilt, P.E.
Chief Engineer
Acting Deputy Director- Planning & Engineering

APPROVED



Mike Gritzuk, P.E.
Director- Pima County Regional Wastewater Reclamation Department



**PIMA COUNTY
REGIONAL WASTEWATER RECLAMATION DEPARTMENT
DIRECTIVE**

Directive: ENG2009-18

Effective Date: May 1, 2009

SUBJECT: Sewer Pipe Slope and Manhole Invert Construction Tolerances

STATEMENT OF PURPOSE

This Directive shall define post-construction sewer elevation and slope tolerances to be used when evaluating the impact of construction variability, as documented by as-built survey information, with respect to the intended operation of a sanitary sewer system as designed and sealed by a registered professional engineer. Construction tolerances are defined as a range of values (within and including the stated limits) that are acceptable variations from the design slope and manhole elevation. As-built sewer slopes and manhole invert elevations within the established tolerances are considered to be inconsequential to the design intent of the sewer system, except where more stringent requirements are noted on the Sewer Improvement Plans. The professional engineer signing the Arizona Department of Environmental Quality (ADEQ) Engineer's Certificate of Completion (ECC) retains the authority to deny variations within the stated tolerances, based on their professional judgment and experience.

GENERAL PROVISIONS

Construction Tolerances for 8-inch Diameter Sewer Pipe

1. For sewer design slopes from 0.33% up to 0.44%, the minimum allowable slope is 0.33%, as established by ADEQ. The slope tolerance from the design slope is +/- 0.06% (as added to or subtracted from the design slope), but is constrained by the ADEQ minimum slope (see Table 1). Note that Pima County Regional Wastewater Reclamation Department's (PCRWRD) design standard sets the minimum slope of an 8" sewer at 0.44% and use of flatter slopes during design requires written approval by the Chief Engineer and utilization of more precise and redundant construction surveying quality control methods.
2. For sewer design slopes from 0.44% up to, and including, 0.71%, the maximum sewer pipe slope tolerance from the design slope is +/- 0.06% (see Table 1).
3. For sewer design slopes greater than 0.71%, the maximum sewer pipe slope tolerance from the design slope is plus or minus 10% of the design slope (as multiplied by the design slope), but not to fall below the minimum slope of 0.65% as constrained by the smaller design slope tolerance (-0.06%) noted above (see Table 1).

Construction Tolerances for 10-inch to 15-inch Diameter Sewer Pipe

The minimum allowable slope, to generate a 2 feet/second velocity when flowing full, is defined by ADEQ as shown in Table 2. For design slopes less than 0.60%, the maximum sewer pipe slope tolerance from the design slope is 0.06%, as added to or subtracted from the design slope, and which is also not below the ADEQ minimum slope for that pipe diameter. For design slopes 0.60% and greater, the tolerance is plus or minus 10%, as multiplied by the design slope. Where the tolerances overlap, the lower tolerance will be used (see Table 3). Tolerances for larger diameter sewer pipe will use this tolerance method unless otherwise noted on the plans or specifications by RWRD.

TABLE 1

Slope Tolerances for 8" pipe as % (ft/100ft)

Lower Range	Design Slope	Upper Range
0.33	0.33*	0.39
0.33	0.34	0.40
0.33	0.35	0.41
0.33	0.36	0.42
0.33	0.37	0.43
0.33	0.38	0.44
0.33	0.39	0.45
0.34	0.40	0.46
0.35	0.41	0.47
0.36	0.42	0.48
0.37	0.43	0.49
0.38	0.44	0.50
0.39	0.45	0.51
0.40	0.46	0.52
0.41	0.47	0.53
0.42	0.48	0.54
0.43	0.49	0.55
0.44	0.50	0.56
0.45	0.51	0.57
0.46	0.52	0.58
0.47	0.53	0.59
0.48	0.54	0.60
0.49	0.55	0.61
0.50	0.56	0.62
0.51	0.57	0.63
0.52	0.58	0.64
0.53	0.59	0.65
0.54	0.60	0.66
0.55	0.61	0.67
0.56	0.62	0.68
0.57	0.63	0.69
0.58	0.64	0.70
0.59	0.65	0.71
0.60	0.66	0.72
0.61	0.67	0.73
0.62	0.68	0.74
0.63	0.69	0.75
0.64	0.70	0.76
0.65	0.71	0.77
0.65	0.72	0.79
0.66	0.73	0.80
0.67	0.74	0.81
0.68	0.75	0.83
0.68	0.76	0.84
0.69	0.77	0.85

TABLE 2

ADEQ Minimum Slope Requirements

Diameter	Slope
10"	0.25%
12"	0.19%
15"	0.14%
18"	0.11%
21"	0.09%
24"	0.08%

Design slope requires prior approval

TABLE 3

Slope Tolerances for 15" pipe as %(ft/100ft)

-10% (multiplied)	-0.06% (subtract)	Design Slope	+0.06% (add)	+10% (multiplied)
	0.14	0.14	0.20	
	0.14	0.15	0.21	
	0.14	0.16	0.22	
	0.14	0.17	0.23	
	0.14	0.18	0.24	
	0.14	0.19	0.25	
	0.14	0.20	0.26	
	0.15	0.21	0.27	
	0.16	0.22	0.28	
	0.17	0.23	0.29	
	0.18	0.24	0.30	
	0.19	0.25	0.31	
	0.20	0.26	0.32	
	0.21	0.27	0.33	
	0.22	0.28	0.34	
	0.23	0.29	0.35	
	0.24	0.30	0.36	
	0.25	0.31	0.37	
	0.26	0.32	0.38	
	~	~	~	
	0.51	0.57	0.63	
	0.52	0.58	0.64	
	0.53	0.59	0.65	
	0.54	0.60		0.66
	0.55	0.61		0.67
	0.56	0.62		0.68
	0.57	0.63		0.69
	0.58	0.64		0.70
	0.59	0.65		0.72
	0.60	0.66		0.73
0.60		0.67		0.74
0.61		0.68		0.75
0.62		0.69		0.76
0.63		0.70		0.77

*ADEQ design slope minimum for 8" sewer

Construction Tolerances – Manholes

1. Manhole invert elevations shall not exceed 0.25 feet higher or lower than the design elevation for terminal manholes or manholes with connecting inverts. Construction tolerances for in-line manholes are, by default, constrained by the pipe slope tolerances.
2. From 0 to 9 degrees invert turns, the slope tolerance across a manhole is the same as the average pipe slope tolerance entering or exiting the manhole if the slope follows the pipe slope (see Table 4).
3. From 10 to 45 degrees invert turns, the slope tolerance across a manhole can be plus or minus 50% of the RWRD required 0.10 feet standard drop across the manhole (see Table 4).
4. From 46 to 90 degrees, the slope tolerance across a manhole can be plus or minus 50% of the RWRD required 0.20 feet standard drop across the manhole (see Table 4).
5. All invert slopes shall always be positively sloping downstream. Absolutely no standing water caused by reverse slope is permitted in a constructed manhole invert. (Note: a 0.33% pipe slope converts to only a 0.013 ft. invert elevation difference in a 4 foot diameter manhole).

Table 4 Manhole Invert Tolerances (from directive ENG2006-13)

Horizontal Sewer Deflection Angle	Required Invert Drop within Manhole	Invert Tolerance
0 to 9 degrees	Drop shall be the average slope between inlet and outlet pipe slopes	average slope
10 to 45 degrees	Drop shall be 0.10 feet between inlet and outlet pipes	0.05
46 to 90 degrees	Drop shall be 0.20 feet between inlet and outlet pipes	0.10

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage.

PROCEDURE

If a sewer is constructed within the established slope and manhole elevation tolerances, those slopes and elevations will be accepted on the as-builts.

If a sewer is constructed with a slope or elevation outside the established tolerance, a post-construction variance request from the contractor shall be submitted to the Field Engineering Inspector. PCRWRD will evaluate the variance request and may elect to require the sewer to be removed and re-constructed, approve the variance based on PCRWRD’s engineering review, or require the engineer-of-record to certify that the as-built system “meets the design intent and system operability requirements of PCRWRD and ADEQ” with his/her seal and statement affixed to the as-built drawing.

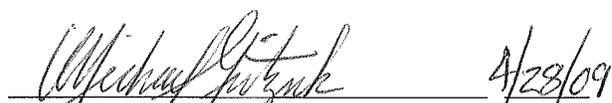
PROCEDURAL RESPONSIBILITY

The Chief Engineer of Pima County Regional Wastewater Reclamation Department, and designated representatives, are responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND

APPROVED


 Eric Wieduwilt, P.E. Date
 Deputy Director- Planning & Engineering


 Michael Gritzuk, P.E. Date
 Director



**PIMA COUNTY
REGIONAL WASTEWATER RECLAMATION DEPARTMENT
DIRECTIVE**

Directive: ENG2009-19

Effective Date: January 1, 2010

SUBJECT: Sewer Design and As-built Slope Annotation

STATEMENT OF PURPOSE

This Directive shall define how a sewer reach's pipe slope and pipe length are displayed on sewer improvement plans, and how the as-built slopes and lengths will be displayed. Current procedures use the center of manhole for the end points of pipe length, which when calculating slope, does not best represent the actual pipe slope. In order to more accurately describe the pipe slope, this directive shall require the design pipe slope to be based on the horizontal pipe length, measured from the inside face of each connecting manhole on the sewer reach.

GENERAL PROVISIONS

Design Standards for Sewer Profile Display and Calculation

For sewer profile design, the pipe reach annotation shall identify the standard reach length from center of manhole to center of manhole, and in addition, shall now have parentheses containing the horizontal pipe length measured from the inside face of the opposing manholes, and the pipe slope calculation using that distance (e.g. Length 350.00 feet (pipe length = 346.00 feet, slope = 1.00 %)). The center-of-manhole pipe length shall still be used to determine compliance with maximum manhole spacing regulations.

As-Built Calculation and Annotation

The as-built slope calculations shall be based on the measured horizontal pipe length (inside manhole face to inside manhole face) and the recorded invert elevations from the survey data. Where data differs from the original design, the design values shall have a strikethrough, and the measured values written beside the strikethrough.

AUTHORITY

Federal Regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment, and control of sanitary sewage. The Chief Engineer of Pima County Regional Wastewater Reclamation Department, and designated representatives, are responsible for the enforcement of this Directive and the associated Standards.

PROCEDURE

Effective January 1, 2010, all first submittals of Sewer Improvement Plans or sewer design plans and profile sheets shall show the additional pipe reach annotation.

RECOMMEND

Eric Wieduwilt, P.E.
Deputy Director- Planning & Engineering

APPROVED

Michael Gritzuk, P.E.
Director



PIMA COUNTY REGIONAL WASTEWATER RECLAMATION DEPARTMENT DIRECTIVE

Directive: ENG2010-01

Effective Date: February 1, 2011

SUBJECT: Compaction Testing of Fill and Backfill Installed for Public Sanitary Sewer

DEFINITIONS

1. Field Engineer: RWRD Field Engineering Manager or his/her designee. Responsible for Department Inspection and acceptance of new Sanitary Sewer assets.
2. Geotechnical Engineer: Responsible for project soils characterization and construction backfill compaction quality control testing and certifications.
 - a. Field Technician: Works for Geotechnical Engineer.
3. Geotechnical Engineering Report (this is the design report): The report includes:
 - a. Characterization of the soils present or expected to be present within the construction limits.
 - b. Recommended backfill methods and procedures.
4. Quality Control Plan (this is a construction QC plan): Provides for specific inspections, tests and reviews to be performed during construction.
5. Final Compaction Report (FCR): Provides for final compilation of tests performed and results.
6. Daily Observation and Testing Report: Prepared by Field Technician.

STATEMENT OF PURPOSE

This Directive establishes revised standards and procedures for the installation and testing of fill and backfill for public sanitary sewer construction. The most significant change is that this Directive establishes new requirements for certification of backfill and compaction density test results as specified herein.

GENERAL PROVISIONS

1. References for this Directive are COT/PC Standard Specifications for Public Improvements, 2003 Edition, Section 508-3.04, Shading and Trench Backfill, and all references cited therein; and PCRWRD Engineering Directive ENG2008-16, Revised Sand Bedding for Sanitary Sewers – Standard Details WWM-104 & WWM-105.
2. If Geotechnical Services are required to comply with this Directive, the Services of an Arizona-Registered Professional Engineer (herein referred to as the Geotechnical Engineer) and staff working under the direction of the Geotechnical Engineer will be required for all geotechnical work necessary to conform to this Directive and its references.
3. If Geotechnical Services are required to comply with this Directive, PCRWRD shall require, as a Pre-Construction Submittal, the firm's name and contact information of the Geotechnical Engineer and individual(s) under his/her direction.
4. It is the responsibility of the Contractor to meet compaction and moisture requirements and review all test results for backfill density at the time of installation. Placement of successive lifts shall not be allowed until any failed backfill is reworked and re-compacted to meet required specifications. Failure by the Contractor to adhere to these requirements shall result in suspension of inspection by PCRWRD and cancellation of the construction permit if

the conditions are not immediately put into conformance with the requirements of this Directive.

REQUIREMENTS FOR GEOTECHNICAL OVERSIGHT DURING SEWER CONSTRUCTION

1. The Geotechnical oversight will be required for:
 - a. The installation of a cumulative total of 500 LF or more of 8-inch or larger diameter sanitary sewer.
 - b. For a sanitary sewer project of any type or length where the depth of excavation or depth to final grade exceeds twenty (20) feet.
 - c. For any sanitary sewer project where a geotechnical report, soil borings or historical records indicate a potential for the presence of groundwater.
 - d. For any sanitary sewer project where PCRWRD deems that site conditions warrant a geotechnical oversight (e.g. difficult to process soil type).

There are two options for implementing this Directive. Either OPTION A or OPTION B may be utilized.

OPTION A

The Geotechnical Engineer shall prepare and seal a Geotechnical Quality Control (QC) Plan, based upon accepted sewer plans and the Geotechnical Engineering Report. At a minimum, the QC Plan should include the following:

- Project Information
- Quality Control Organization
- Resumes
- AASHTO Laboratory Certificate
- Control Procedures
 - moisture
 - density (per lift)

The QC Plan shall specify the minimum frequencies of random density and moisture tests to be performed for this project. The QC Plan shall meet the minimum testing requirements as noted herein. The QC Plan shall be submitted as a Preconstruction Submittal for a conformance review by PCRWRD Field Engineering. The Notice to Proceed will not be issued until the QC Plan is accepted by Field Engineering.

Compacted soil density equaling or exceeding minimum standards shall be demonstrated through a weekly submittal of the prior week's validated soil density test results. The submittal shall be from the Geotechnical Engineer to the PCRWRD Field Engineering Inspector. PCRWRD shall require the Contractor and Geotechnical Engineer to consistently coordinate the sharing of this data to ensure acceptable density test results are achieved for all installed backfill. Field copy test results from the Field Technician shall be made available to the PCRWRD Field Engineering Inspector and the contractor by the end of each day of testing.

Additional proctor tests will be conducted as dictated by the variability of backfill material to ensure proper compaction values are recorded.

MINIMUM TESTING LOCATION AND FREQUENCY UNDER OPTION A

1. The Geotechnical Engineer reserves the right to require additional testing at any given location in addition to the requirements herein.
2. Trench Bottom: Visual inspection. If unsuitable material is encountered, it shall be excavated and replaced as directed by the Geotechnical Engineer.
3. Trench Backfill:
 - a. Density testing of trench backfill shall commence at approximately two (2) feet above top of sewer pipe and continue to the base of the roadway structural section, or to the base of the stabilized easement surface; as applicable.
 - b. At a minimum for each sewer reach installed, one (1) density test shall be taken at every two (2) feet of vertical height of trench backfill between manholes, or one every 300 feet, whichever is shorter. The Field Technician shall conduct backfill density tests randomly, both horizontal and vertical, in accordance with the QC Plan. The tests should provide a representation of the compacted effort throughout the sewer reach length.
4. Structure (Manhole) Base: Visual inspection. If unsuitable material is encountered, it shall be over-excavated and replaced as directed by the Geotechnical Engineer. Where over-excavation and replacement under a proposed structure base is required, a minimum of one (1) density test shall be taken at the approximate center of the proposed structure, or as directed by the Geotechnical Engineer.
5. Manhole Structure: Density testing for backfill around manholes shall consist of one (1) test per lift, and rotating with successive 2-foot increments at 120 degree intervals. Density testing of backfill around formed structures shall require one (1) test per lift, alternating sides with successive 2-foot increments as instructed by the Geotechnical Engineer and in accordance with the QC Plan. Density tests will be taken as close as possible to the structure to determine the representative compaction density, but not so close as to interfere with the functioning of the testing equipment.

Upon completion of sewer construction, the Geotechnical Engineer shall provide the PCRWRD Inspector with a Final Compaction Report (FCR). The report shall include a cover letter certifying the report; a compilation of all test data including re-tests, calibration tests, and test methods; and a plan-view map of the project showing test locations referenced by station, and showing depth below grade and percent compaction achieved. The Geotechnical Engineer shall also include a statement confirming that the FCR meets the original requirements of the QC Plan.

Submittal and acceptance of the Final Compaction Report (FCR) will be required prior to issuance of the Engineer's Certificate of Completion (ECC) Release.

Under the provisions of this Directive, geotechnical oversight by the Geotechnical Engineer shall be taken to include review of the project construction documents, development of the QC Plan and Final Compaction Report, supervision of and coordination with the Field Technician(s) performing compaction testing, and review of test results for compliance.

OPTION B

The Geotechnical Engineer shall provide a full-time field technician working under the direction of the Geotechnical Engineer for observation and collection of the density testing of the sewer portion of the project.

Compacted soil density equaling or exceeding minimum approved project requirements shall be demonstrated through the Daily Observation and Testing Report prepared by the Field Technician. PCRWRD shall require the Contractor and Geotechnical Engineer to consistently coordinate the sharing of this information to ensure acceptable density and moisture content test results are achieved for all installed backfill. The Daily Observation and Testing Report shall be made available to the PCRWRD Field Engineering Inspector and the contractor by the end of each day.

Upon completion of sewer construction, the Geotechnical Engineer shall provide an Observation and Testing Report with a cover letter, professionally stamped; stating the sewer trench backfill and compaction (density and moisture content) is in conformance with the approved plans and specifications for the entire sewer project.

AUTHORITY

Federal regulations, Arizona State Regulations, Pima County Ordinances and other enabling legislation which affect the collection, conveyance, treatment and control of sanitary sewage.

PROCEDURE

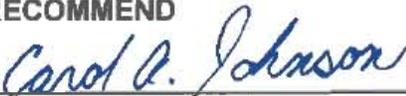
Effective February 1, 2011, on all new construction permits **issued** by RWRD, the Contractor shall indicate which Option is to be used if Geotechnical services are required to comply with this Directive.

This Engineering Directive does not apply to any construction permits issued by RWRD prior to February 1, 2011.

PROCEDURAL RESPONSIBILITY

The Sanitary Engineering Manager of Pima County Regional Wastewater Reclamation Department, and/or designated representative(s), is responsible for the enforcement of this Directive and the associated Standards.

RECOMMEND



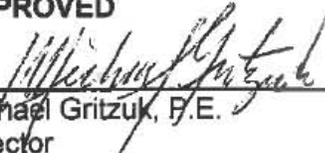
Carol A. Johnson, P.E.
Sanitary Engineering Manager

CONCUR



Eric Wieduwilt, P.E.
Deputy Director Planning & Engineering

APPROVED



Michael Gritzuk, P.E.
Director

Date: 12/2/10