



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