
USACE / NAVFAC / AFCEA / NASA UFGS-33 56 17 (April 2006)

Preparing Activity: USACE Replacing without change
UFGS-13203 (August 2004)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 9 October 2006

Latest change indicated by CHG tags

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04/06

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SECTION 33 56 17

TIGHTNESS TESTING OF UNDERGROUND FUEL SYSTEMS 04/06

NOTE: This guide specification covers the requirements for tightness testing procedures of existing underground fuel storage tanks and related piping systems.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

PART 1 GENERAL

1.1 REFERENCES

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update

the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN PETROLEUM INSTITUTE (API)

API RP 1110 (1997) Pressure Testing of Liquid Petroleum Pipelines

ASME INTERNATIONAL (ASME)

ASME B31.3 (2004) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM D 396 (2004) Fuel Oils

ASTM D 4814 (2004a) Automotive Spark-Ignition Engine Fuel

ASTM D 975 (2004be1) Diesel Fuel Oils

1.2 TESTING DESCRIPTION

NOTE: This specification is written only for the testing procedures of systems which handle petroleum products. It is recommended that if a leak is confirmed by the tests that a separate contract be developed to correct the problems. A separate contract is recommended because work involving the location and repair of leaks, the excavation of soil, repeat testing of the tank and piping, isolation of the piping and tank, the transfer of fuel, and the restoration of surfaces would be very difficult if not impossible for a Contractor to bid prior to performing any testing. However, if a decision is made to incorporate the work mentioned above into this specification, the contract will have to be designed to allow a Contractor to bid on the work mentioned above on a cost per occurrence or a cost per quantity basis (i.e. cost per cubic meter (yard) for excavation).

This specification section defines the requirements for tightness testing of existing underground fuel storage tanks and related piping systems.

1.3 SUBMITTALS

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for [Contractor Quality Control approval.] [information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Tightness Tests

Manufacturer's standard catalog data giving the brand names and catalog numbers of the testing equipment and accessories required in performing the tightness tests. The catalog data shall be in sufficient detail to demonstrate that the release detection equipment meets the specified requirements of this section.

A letter, within [45] [_____] days after receiving the notice to proceed, advising the Contracting Officer of the proposed test schedule for each tank and piping system.

Verification of Dimensions

A letter, prior to performing any testing, stating the date the site was visited and a list of discrepancies found.

Fuel Supply

A letter, at least [30] [_____] days prior to fuel delivery, stating the amount of fuel required for testing the system. The letter shall define the required dates of each fuel delivery.

Test Plan

A test plan report, at least [45] [_____] days prior to any site preparation work, for each tank system to be tested. The report shall be in a letter-size bound booklet.

Site Preparation

A letter, at least [10] [_____] working days prior to the start of any site preparation, advising the Contracting Officer of the date for the proposed site preparation.

Confirmed Leakage

A written statement within [2] [_____] working days following the location of each confirmed leak.

SD-04 Samples

Fuel Supply[; G][; G, [_____]]

One fuel sample of each individual fuel type, prior to any tank overfilling process, taken from the fuel supply to be provided. The Contracting Officer may reserve the right to have the submitted samples tested by a chemical laboratory in order to verify each sample's quality. The Government will be responsible for the expense of any tests performed upon the fuel samples.

A written statement, within [2] [_____] working days after a spill.

One fuel sample of each individual fuel type, prior to any tank overfilling process, taken from the fuel supply to be provided. The Contracting Officer may reserve the right to have the submitted samples tested by a chemical laboratory in order to verify each sample's quality. The Government will be responsible for the expense of any tests performed upon the fuel samples.

SD-06 Test Reports

Tightness Tests[; G][; G, [_____]]

[Six] [_____] copies, at least [15] [_____] working days following the completion of all testing, containing the information described below in letter-size bound booklets. The tightness test report shall include the following information for each tank and pipe line tested:

1. A complete list of the tabulated data and corresponding calculations used in the testing.
2. A tabulated summary of test results. The summary shall include original copies of the individual instrument printouts.

3. Any observations or special actions taken during the testing procedures.

4. Each confirmed leakage written notification.

5. Any recommendations for additional tank requirements.

6. Final comments on the status of each of the tank systems in respect to tightness and operation.

SD-07 Certificates

Qualifications

Evidence of the testing personnel's experience, training, and equipment certification. A current certification number from the test equipment vendor shall be included for each testing personnel.

1.4 QUALIFICATIONS

NOTE: Include any state and local regulatory requirements or certifications which must be met by testing personnel.

Personnel responsible for performing the tightness testing shall be trained and certified by the equipment vendors to use the test equipment needed to perform the tightness test. Each certified individual shall have a current certification number from the test equipment vendor.

1.5 REGULATORY REQUIREMENTS

NOTE: Some states and local governments have additional evaluation methods and standards to be met (i.e. third party testing, the limit of the release detection method to certain size (capacity) tanks, etc.). Include these methods or standards if applicable.

The type of tightness test to be performed shall meet applicable federal, state, and local requirements as well as the requirements within this section.

1.6 PROJECT/SITE CONDITIONS

NOTE: Include with this specification site drawings which indicate the location and layout of each storage tank and piping system to be tested by this section. For each storage tank, include on the drawings the nominal tank volume (liters (gallons)), the tank contents, the type of tank (FRP or steel), the date of installation, and the date the last tightness test was performed if applicable. The drawings should also define the water table at each

site. If the groundwater level is continually above the bottom of a tank, then indicate on the drawings the installation of a 50 mm (2 inch) PVC pipe which would extend 610 mm (2 feet) below the tank bottom. Indicate that the pipe shall be used for monitoring groundwater levels during the tightness tests. Following the tightness tests, require the Contractor to remove the pipe and fill the hole.

1.6.1 Verification of Dimensions

The Contractor shall become familiar with all details of the work, verify the location, the capacity, and the contents of each tank to be tested, verify dimensions in the field, determine the location of utilities, obstacles, or conditions that would interfere with the testing of each system, and advise the Contracting Officer of any discrepancy or problems before performing any work.

1.6.2 Property Damage

The Contractor is responsible for assuring that contamination and damage to tank products, the tank, and the piping does not occur from the testing procedures. If at any time any Government or private property is damaged or destroyed by any of the testing procedures or personnel, immediate notification shall be given to the Contracting Officer.

1.6.3 Fuel Supply

NOTE: For volumetric testing, determine if the agency which is responsible for fuel deliver will be willing to supply the fuel products necessary for topping off a tank (above the 95 percent liquid level) since this would be the most desired alternative. If the fueling agency will not supply the additional fuel required, then this paragraph will need to be modified to require the Contractor to provide the additional fuel. Note, however, that a Contractor will not be able to supply aviation type fuels (JP-4, JP-5, JP-7, etc.) since these fuels are not commercially available. A Contractor can only be required to supply non-aviation type fuels (i.e., gasoline, diesel, fuel oils, etc.). Fuel to be supplied by the Contractor must be specified in Part 2 of this section. If fuel is to be supplied by the Contractor, then the submittal "SD-04 Samples" will remain in the specification. If fuel is only to be supplied by the Government, then "SD-04 Samples" will be deleted from the specification.

Fuel required for the testing of storage tanks and related piping systems as specified in this section shall be provided by the [Government] [Contractor]. The [Government will] [Contractor shall] furnish the tank trucks, operators, equipment, and services required for the fueling operations, except as modified herein. Fuel to be supplied shall meet the quality requirements as specified in paragraph "Fuels". The Contractor

shall provide the labor, equipment, appliances, and materials required for the testing procedures. Systems shall not be tested with any fuel or liquid not intended for final system operation. Fuel used in the system shall remain the property of the Government. Fuel shortages not attributable to normal handling losses shall be reimbursed to the Government. The Contractor shall record material transfers and reconcile the inventory records.

1.6.4 Spills

In the event any fuel product spill results during the testing procedures specified herein, immediate verbal notification shall be given to the Contracting Officer. Following verbal notification, a written statement shall be developed which indicates the type of substance spilled, the location of the accident, the reason for spillage, a list of any cleanup procedures taken, and a list of any personnel injuries. Testing procedures shall stop immediately until notification is given by the Contracting Officer to begin testing again.

PART 2 PRODUCTS

2.1 FUELS

NOTE: Delete any inapplicable fuels.

Testing procedures as required by this section shall be compatible with the following fuels. Fuels as referenced within this specification shall be in accordance with the following fuels.

2.1.1 Motor Gasoline (Mogas)

Mogas shall be in accordance with [ASTM D 4814](#).

2.1.2 Diesel

Diesel shall be in accordance with [ASTM D 975](#).

2.1.3 No. 2, 4, 5, and 6 Fuel Oils

Fuel oils shall be in accordance with [ASTM D 396](#).

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 [Test Plan](#)

Prior to performing any site preparation work, a test plan shall be prepared which addresses the following items for each of the storage tanks and piping systems to be tested.

3.1.1.1 Test Method

The test plan shall include a complete description of the proposed tightness test method to be performed. The description shall include equipment and step-by-step procedures required in the tightness test. The description shall explain the accuracy involved with identifying the

approximate location of a leak.

3.1.1.2 Detail Drawings

The test plan shall include detail drawings which indicate the location of the test points for each system and the points where existing piping is to be isolated. The drawings shall indicate specifically how existing product pipes are to be isolated and tested. The drawings shall define any demolition or alteration (permanent or temporary) to existing tanks and piping that may be required in order to perform the tightness tests.

3.1.1.3 Downtime

The test plan shall indicate the maximum amount of downtime that will be required for each system to be tested. If the testing procedures can be performed while a fueling system is under operation, then the test plan shall indicate any required coordination between the testing personnel and the fueling system operators.

3.1.1.4 Site Preparation Procedures

The test plan shall include a list of site preparation procedures, if applicable, to be performed by the Contractor in preparing each storage tank and piping system for testing.

3.1.2 Site Preparation

Prior to performing the tightness tests, the site preparation procedures as defined and approved in the test plan shall be performed. Each testing site shall be secured with blockades and safety barriers to prevent unwanted entry. Accessible fittings and equipment connections shall be inspected and tightened if applicable.

3.2 TIGHTNESS TESTS

Note: The 0.1 gallon per hour leak rate is specified in 40 CFR 280.43(c) for tank tightness testing and in 40 CFR 280.44(b) for line tightness testing. If state or local requirements specify a more stringent leak rate detection, then insert that value.

Nonvolumetric tightness testing may not provide an exact leak rate, however the method should provide an analysis of the system in relation to the specified leak rate at a probability of detection of 0.95 and a probability of false alarm of 0.05.

The tightness testing method to be used on both a storage tank and piping system shall be capable of detecting a [0.38 liter 0.1 gallon] [_____] per hour leak rate with a probability of detection of 0.95 and a probability of false alarm of 0.05. Each storage tank and piping system shall be isolated and tested separately. The test methods to be used for testing shall be capable of identifying the approximate location of a confirmed leak. Permanent monitoring wells shall not be installed for monitoring groundwater levels.

3.2.1 Tank Tests

**NOTE: Delete the last sentence if waste oil tanks
are not to be tested.**

Tank tightness testing shall be capable of detecting a leak from any portion of the tank that routinely contains product while accounting for the effects of thermal expansion or contraction of the product, vapor pockets, tank end deflections, evaporation or condensation, temperature change, wind, vibration, noise, and the location of the water table. Acceptable tank tightness testing methods shall be either volumetric or nonvolumetric as described in this section. Waste oil tanks shall only be tested using a nonvolumetric test.

3.2.1.1 Volumetric Testing

**NOTE: Coordinate this paragraph with requirements
specified in paragraph Fuel Supply.**

Tests shall be the constant-level type. Temperature sensors shall have a precision of 0.001 degrees C or less. Test methods requiring only a partially filled tank shall record data at intervals of 1 second or less. Test methods requiring an overfilled tank shall record data at intervals of 5 minutes or less. Tests shall be conducted for a minimum of 2 hours. Tests shall not be conducted through any type of drop tube internal to a storage tank. Tanks requiring overfill shall initially be filled to the 95 percent liquid level and allowed 24 hours to stabilize. Following the 24 hour period and if applicable, the standpipe of a tank shall be topped off as required and allowed 3 hours to stabilize prior to testing.

3.2.1.2 Nonvolumetric Testing

Nonvolumetric test methods to be used on a storage tank shall be capable of testing the entire volume of a tank and not just the volume containing liquid on the day of the test. Vacuum tests shall not damage the integrity of a storage tank.

3.2.2 Product Piping Tests

**NOTE: Indicate the normal working pressure of all
pressure piping to be tested. For inlet piping
serving a waste oil tank, determine the type and
availability of fuel to be used in the hydrostatic
tests. Delete the last sentence if waste oil tanks
are not to be tested.**

Piping shall be isolated for testing as indicated in the approved test plan. Piping shall be hydrostatically in accordance with ASME B31.3 and API RP 1110, with no leakage or reduction in gauge pressure for 4 hours. Pressurized piping shall be tested at not less than 1-1/2 times the normal working pressure; suction piping shall be tested at 48 kPa 7 psig. Gauges used for measuring the leak rate shall have increments small enough to detect a leak of [0.38 liter 0.1 gallon] [_____] per hour or less. Taps

for gauges or pressurizing pumps shall be on either flanged connections or on temporary piping. Taps shall not be allowed on any permanent piping. The Contractor shall furnish electricity, instruments, and connecting devices for the test. The hydrostatic testing of a pipe line shall be performed using the fuel which is routinely handled by the piping system. Fuel used in testing the inlet piping of a waste oil storage tank shall be [_____].

3.2.3 Confirmed Leakage

If a storage tank or pipe line is determined to be leaking based on the tightness tests performed, then testing shall be stopped, hydrostatic or vacuum pressures shall be relieved, the entire system shall be visually inspected, and immediate verbal notification shall be provided to the Contracting Officer. Following verbal notification, a written statement shall be developed which lists the possible areas where the leakage is occurring, the type of leakage (i.e. fuel or ground water), the approximate leak rate, etc. Piping systems determined to be leaking shall remain in the isolated condition unless notified otherwise by the Contracting Officer.

3.2.4 Testing Acceptance

A storage tank and related product lines which withstand the tightness tests performed herein shall meet the testing acceptance of this section. System reinstallation shall not begin until the entire system has passed each specified tightness test.

3.2.5 System Reinstallation

Following the testing acceptance of a system, disconnected piping shall be thoroughly cleaned to prevent any dirt or contaminant from entering into the tank system. The entire system shall be reassembled to match initial conditions and be capable of complete operation. Adjustments required to make a system operational shall be coordinated with the Contracting Officer. Final operational testing of a system shall be coordinated with the Contracting Officer.

3.3 INSPECTIONS

NOTE: Delete any of the inspection items which are inapplicable. Add to the inspection list any items that are more site specific.

Prior to any final operational testing, each tank system shall be visually inspected to assure that the system is correctly reassembled to match initial conditions. Any component of the tank system damaged during the tightness tests shall be reported immediately to the Contracting Officer. During the inspection, the following shall be verified as a minimum:

1. The piping system is correctly connected to each storage tank.
2. The piping's protective coating was not damaged during the testing.
3. The storage tanks were not damaged during the testing.
4. Buried utility warning tape uncovered or damaged during the

testing was replaced.

5. The piping's secondary containment system was not damaged during testing.

6. Each tank and pipe line cathodic protection system is connected and performing properly.

-- End of Section --