
USACE / NAVFAC / AFCESA / NASA UFGS-33 59 00 (April 2007)

Preparing Activity: USACE Superseding
UFGS-33 56 17 (April 2006)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated April 2010

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DIVISION 33 - UTILITIES

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04/07

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SECTION 33 59 00

TIGHTNESS TESTING OF EXISTING UNDERGROUND FUEL SYSTEMS 04/07

NOTE: This guide specification covers the requirements for tightness testing procedures of existing underground fuel storage tanks and related piping systems that are required to comply with 40 CFR 280.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

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).

PART 1 GENERAL

NOTE: This specification is written such that a system's operating fuel is to be used as the test medium for the tests defined herein. If water is required as the test medium, the designer will be responsible for modifying the specification accordingly. The main problems associated with using water as the test medium are high disposal costs and fuel contamination.

The following is a list of suggested conditions that should be met when using fuel as a test medium:

1. Tested systems are not offshore related.
2. Tested systems are not in close proximity to environmentally sensitive areas.
3. Tested systems are not in close proximity to highly populated areas.
4. Facilities within 300 feet of the tested systems are unoccupied at the time of the tests.
5. Tested systems are kept under constant surveillance during the test.
6. Suitable contingency response equipment and personnel for spill cleanup are on-call during testing.

If a leak is confirmed by the tests defined herein, a separate contract should 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.

If, however, 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).

Following any repairs, require tightness testing procedures be performed again on the repaired area.

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 570 (2009) Piping Inspection Code: In-Service Inspection, Rating, Repair and Alteration of Piping Systems

API RP 1110 (2007) Pressure Testing of Steel Pipelines for the Transportation of Gas, Highly Volatile Liquids or Carbon Dioxide

ASME INTERNATIONAL (ASME)

ASME B31.3 (2008) Process Piping

ASTM INTERNATIONAL (ASTM)

ASTM D 396 (2009a) Standard Specification for Fuel Oils

ASTM D 975 (2009b) Standard Specification for Diesel Fuel Oils

1.2 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.] Submit the following in accordance with Section 01 33 00
SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Test Plan[; G][; G, [_____]]

SD-03 Product Data

Tightness Tests

SD-04 Samples

Fuel Supply

SD-06 Test Reports

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

SD-07 Certificates

Qualifications
API Inspection
Fuel Supply[; G][; G, [_____]]
Fuel Spills
Confirmed Leakage

1.3 QUALITY ASSURANCE

1.3.1 Qualifications

**NOTE: Include any state and local regulatory
requirements or certifications that 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. Submit evidence of
the testing personnel's experience, training, and certification to use the
test equipment.

1.3.2 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.

1.3.3 API Inspection

NOTE: Only include this paragraph if the utmost in accuracy and assurance is required in a particular project. Note that an API 570 inspector can add a significant cost to a project; however in turn the inspector can assure the Government that the test results are accurate and that the testing truly conforms to the required testing standards (e.g., API RP 1110).

Tightness testing policies, procedures, and results shall be inspected and approved by an authorized piping inspector that is certified in accordance with API 570. Submit evidence of the inspector's experience and certification. Following testing, submit evidence of the inspector's approval of the test results.

1.4 PROJECT/SITE CONDITIONS

NOTE: For tightness testing projects, develop design drawings that show the approximate location and layout of each storage tank and piping system to be tested.

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.

Also indicate on the drawings the groundwater level at each site. If the groundwater level is continually above the bottom of a tank, then require on the drawings the installation of a 50 mm (2 inch) PVC pipe that would extend 610 mm (2 feet) below the tank bottom. Require the pipe to 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.

1.4.1 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.

1.4.2 Fuel Supply

NOTE: For volumetric testing, determine if the agency that is responsible for fuel delivery 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-8, 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 "Fuel Supply" will remain in the specification. If fuel is only to be supplied by the Government, then the submittal "Fuel Supply" will be deleted from the specification.

Fuel required for the testing of storage tanks and related piping systems as specified in this section [will be provided by the Government] [shall be provided by the 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".] Provide the labor, equipment, appliances, and materials required for the testing procedures. Do not test systems 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. Record material transfers and reconcile inventory records. [Submit a letter, at least [30] [_____] days prior to fuel delivery, stating the amount of fuel required for testing the system. In the submittal, define the required dates of each fuel delivery.] [Submit one fuel sample of each individual fuel type, prior to any tank filling 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.]

1.4.3 Fuel Spills

In the event any fuel product spill results during the testing procedures specified herein, give immediate verbal notification to the Contracting Officer. Following verbal notification, submit within [2] [_____] days a written statement that indicates the type of substance spilled, quantity, the location of the accident, the reason for spillage, a list of any

cleanup procedures taken, and a list of any personnel injuries. Stop testing procedures immediately until notification is given by the Contracting Officer to begin testing again.

PART 2 PRODUCTS

2.1 FUELS

NOTE: If fuel is to be provided by the Government,
delete this paragraph.

2.1.1 Diesel

Provide diesel that conforms to ASTM D 975.

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

Provide fuel oil(s) that conforms to ASTM D 396.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Test Plan

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

3.1.1.1 Test Method

Include a complete description of the proposed tightness test method to be performed. Include equipment and step-by-step procedures required in the tightness test. Explain the accuracy involved with identifying the approximate location of a leak.

3.1.1.2 Detail Drawings/Schematics

Include [detail drawings] [schematics] that indicate the location of the test points for each system and the points where existing piping is to be isolated. Indicate specifically how existing product pipes are to be isolated and tested. 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

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

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, perform the site preparation procedures as defined and approved in the test plan. Secure each testing site with blockades and safety barriers to prevent unwanted entry. Inspect and tighten accessible fittings and equipment connections if applicable.

3.2 FIELD QUALITY CONTROL

3.2.1 Tightness Tests

Note: The 0.1 gallon per hour leak rate is specified in 40 CFR 280 for tank tightness testing and 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 minimum probability of detection of 0.95 and a minimum probability of false alarm of 0.05.

Tests used on both a storage tank and piping system shall be capable of detecting a [0.38 liter (1 gallon) 0.1 gallon] [_____] per hour leak rate with a minimum probability of detection of 0.95 and a minimum probability of false alarm of 0.05. Isolate and test each storage tank and piping system separately. Do not install permanent monitoring wells for monitoring groundwater levels. Isolate equipment such as pumps, filters, and meters from the piping system during the testing. Do not exceed the pressure rating of any component in the piping system during the testing. Submit shop drawings that show the manufacturer's 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.

3.2.1.1 Tank Tests

NOTE: Delete the bracketed sentence if waste oil tanks are not to be tested. If volumetric testing is allowed, coordinate the fuel requirements with the previous paragraph Fuel Supply.

Tests 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 nonvolumetric testing.]

a. Volumetric Testing. Tests shall be the constant-level type. Temperature sensors shall have a precision of 0.001 degrees F 0.002 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 a tank to be filled above the 95 percent capacity level shall record data at intervals of 5 minutes or less. Tests shall not be conducted through any type of drop tube internal to a storage tank. Tanks filled above the 95 percent level shall initially be filled to the 95 percent liquid level and allowed 24 hours to stabilize. Following the 24 hour period and if applicable, top off the tank as required and allow 3 hours to stabilize prior to testing.

b. Nonvolumetric Testing. Nonvolumetric test methods 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.

3.2.1.2 Product Piping Tests

NOTE: Indicate on the drawings the normal working pressure of each pressure piping system to be tested.

Tests shall account for temperature gains and/or losses experienced during the test period. Acceptable tightness testing methods shall be either volumetric, nonvolumetric, or hydrostatic as described in this section.

a. Volumetric Testing. Temperature sensors shall have a precision of 0.001 degrees F 0.002 degrees C or less.

b. Nonvolumetric Testing. Nonvolumetric test methods shall be capable of testing the entire volume of the piping. Vacuum tests shall not damage the integrity of the piping.

c. Hydrostatic Testing. Hydrostatically test product piping with the system's operating fuel in accordance with ASME B31.3 and API RP 1110, except as modified herein, for a minimum 8 hour period. Hydrostatically test pressurized piping systems at not less than 1-1/2 times the normal working pressure but not less than [690 kPa 100 psi] [_____]. Use gauges for measuring the leak rate that have increments small enough to detect a leak of [0.38 liter (0.1 gallon) 0.1 gallon] [_____] per hour or less. Taps for gauges or pressurizing pumps shall be on either flanged connections or on temporary piping. Do not install taps on any permanent piping. Tests shall validate that no leakage or reduction in gauge pressure occurred during the test period.

3.2.1.3 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, submit within [2] [_____] days a written statement that 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.

3.2.1.4 Testing Acceptance

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

3.2.1.5 System Reinstallation

Following the testing acceptance of a system, thoroughly clean disconnected piping to prevent any dirt or contaminant from entering into the tank system. Reassemble the entire system to match initial conditions and to be capable of complete operation. Coordinate adjustments required to make a system operational with the Contracting Officer. Coordinate final operational testing of a system with the Contracting Officer.

3.2.2 Inspections

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

Prior to any final operational testing, visually inspect each tank system to assure that the system is correctly reassembled to match initial conditions. Report any component of the tank system damaged during the tightness tests immediately to the Contracting Officer. During the inspection, verify the following 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 --