

**LG 163-1, ENCLOSURE 1**  
**GENERAL RECOMMENDATIONS FOR TESTING LEAK DETECTION SENSORS**

**PURPOSE**

The purpose of this document is to provide general recommendations for testing leak detection sensors as part of the annual monitoring equipment certification required per California Code of Regulations (CCR), title 23, section 2638. This document does not cover site safety provisions or other federal, state, and local requirements that may be applicable when performing this type of work.

**INTRODUCTION**

Health & Safety Code, section 25284.1 (a)(4)(C) and Chapter 16, Title 23, CCR require that all underground storage tank (UST) monitoring equipment (including sensors) be tested and certified annually by qualified service technicians. Based on the findings of the August 2002 report on the *Field Evaluation of Underground Storage Tank (UST) System Leak Detection Sensors*, conducted by the State Water Resources Control Board (SWRCB) UST Program staff, which may be found through links provided at <http://www.swrcb.ca.gov/ust>, sensors can be a reliable form of leak detection only when properly installed, calibrated, programmed, maintained, and operated. Existing regulations specify that all sensors must be tested in accordance with the manufacturer's testing procedures, but do not specify in detail how that testing should be performed. Although the recommendations described below are not mandatory, we recommend that service technicians follow them when testing leak detection sensors, and that manufacturers consider incorporating them into their testing procedures.

**APPLICABLE REGULATORY REQUIREMENTS AND RECOMMENDATIONS**

The following is a brief overview of the important regulatory requirements applicable to monitoring equipment certifications and service technicians performing the tests. Only qualified service technicians may install, repair, maintain, calibrate, or perform annual certification of monitoring equipment.

❖ **Service Technician Qualifications**

◆ **Licensing** - [*Cal. Code Regs. tit. 23, § 2715(i)(1)*]

- Individuals who possess or are employed by a person who possesses a current class A, C-10, C-34, C-36, or a C-61 (D40) license issued by the Contractors State License Board (CSLB), as applicable; **or**
- *Individuals licensed by the SWRCB as tank testers.*

**AND**

◆ **Training** - [*Cal. Code Regs. tit. 23, § 2715(i)(2)(B) & (C), and 2715(i)(3)*]

- Service technicians performing work on monitoring equipment must obtain training and certification from the manufacturer of the monitoring equipment. *In the event that no training or certification exists that would satisfy this requirement, the local agency may approve comparable alternate training or certification.*

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- Service technicians must be re-certified by the manufacturer at the time interval recommended by the manufacturer, or every 36 months, whichever is shorter. Re-certification should include completion of the manufacturer’s refresher course.

**AND**

◆ **Certification** - [Cal. Code Regs. tit. 23, § 2715(i)(4)]

- *Effective July 1, 2005, service technicians must possess or work under the direct and personal supervision of an individual physically present at the work site who possesses a **current** certificate from the International Code Council (ICC), indicating he or she has passed the California UST Service Technician exam. If the California UST Service Technician exam is not available by July 1, 2004, this requirement will be effective twelve months after the date the exam is available. The individual must renew the ICC certification, by passing the California UST Service Technician exam, every 24 months.*

❖ **Local Agency Notification** - [Cal. Code Regs. tit. 23, § 2638(e)]

- ◆ UST owners/operators must notify the local agency at least 48 hours prior to conducting the installation, repair, replacement, calibration, or certification of monitoring equipment, unless the notification requirement is waived by the local agency.

Note: Some local agencies do not accept annual monitoring equipment certification results unless a local agency representative is present during the test. Service technicians should coordinate the test schedule with the appropriate local agency.

❖ **Recording & Results Submittal** - [Cal. Code Regs. tit. 23, § 2638(c) & (d)]

- ◆ Service technicians must use the “Monitoring System Certification” form to document testing and servicing of monitoring equipment. (See appendix VI of the CCR, title 23.) The “Monitoring System Certification” form is available through links provided at <http://www.swrcb.ca.gov/ust>.
- ◆ UST owners/operators must submit a completed “Monitoring System Certification” form to their local agency within 30 days after completion of the certification.

Note: A copy of the “Monitoring System Certification” form must be provided to the UST owner/operator.

❖ **Tag/Sticker Requirements** - [Cal. Code Regs. tit. 23, § 2638(f)]

- ◆ The service technician conducting the monitoring equipment certification must affix a tag/sticker on each monitoring equipment component that is certified, repaired, or replaced. The tag/sticker must be placed in a readily visible location and must include the date the

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monitoring equipment component was certified, repaired, or replaced, and the contractor's or tank tester's license number. This includes certification of the monitoring system control panel as well as each sensor, probe, and line leak detector.

**TESTING LEAK DETECTION SENSORS**

The following is a brief overview of the basic recommendations for testing leak detection sensors:

❖ **Prior to Functional Testing of Sensors**

- ◆ **Secure work area as appropriate (with tape, cones, or barricades, etc.).** When working at UST facilities, adhere to all applicable federal, state, and local safety standards.
- ◆ **Check the control unit for any alarm conditions and print an alarm history report.** This should be done prior to activating any alarms for testing. The report can be used by local agency inspectors to verify the monitoring history of the site. Attach the alarm history report to the "Monitoring System Certification" form.
- ◆ **Check that leak detection sensors are properly programmed and used appropriately.** Print a system set-up report to verify that sensors are properly programmed and that the onsite equipment reflects the facility's monitoring plan. Sensors used in applications for which they are not designed (e.g., fiberglass tank sensor used in a steel tank) should be replaced, since they may not reliably detect a release from the primary containment. Check in advance with the local agency, because some local agencies require a permit before service technicians replace any equipment. Sensor application information may be found in LG 113 through links provided at <http://www.swrcb.ca.gov/ust>.
- ◆ **Check that leak detection sensors are installed at proper location within secondary containment.** Sensors must be installed and maintained so they are capable of detecting leaks at the earliest possible opportunity, as required by CCR, title 23, section 2630(d). Typically, this means the sensor must be located at the lowest point within the secondary containment. If the sensors are not located at the proper place, document the information on the "Monitoring System Certification" form, and return the sensors to the proper positions after testing.
- ◆ **Remove and contain all liquid and debris found in the secondary containment.** Secondary containment must be clean and free of liquid (water and product) or debris. Therefore, if liquid or debris is found in secondary containment, document what is found on the "Monitoring System Certification" form.

❖ **Functional Testing of Sensors**

- ◆ **Remove leak detection sensor and probe from containment area and visually inspect sensor for any damage to the cable or sensor housing.** Float sensors may not work properly if debris or dirt within the secondary containment interfere with the float mechanism. Sensors with cracked housings or damaged cables must be replaced.

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- ◆ **Test detection capability of sensors.** During field testing, it is important to verify that sensors are capable of detecting water or product.
  - **Non-discriminating (Liquid Sensors):** All non-discriminating liquid sensors should be tested in water or product, as appropriate. Sensors that are tested in product should be tested using the substance stored (e.g., gasoline or diesel). Inverting or shaking float switch sensors does not accurately simulate the condition sensors encounter in the event of a leak.
  - **Optical Sensors:** Optical technologies use light refraction to activate the sensor. To avoid interference from an outside light source, it may be necessary to test optical sensors in a dark environment. Sensors should be tested using the stored substance (e.g., gasoline or diesel).
  - **Discriminating Sensors:** All discriminating sensors should be tested in water and product. The product used for testing should be the stored substance (e.g., gasoline or diesel). It is important to verify that both the water and product detection capabilities of the sensors are functional.
  - **Vacuum / Pressure Sensors:** Testing of vacuum and pressure sensors should verify that the sensor activates an alarm at the appropriate vacuum / pressure level, and that there is communication throughout the interstitial zone that the sensor is monitoring. Both these goals can be accomplished by introducing a simulated leak at the end of the interstitial space farthest from the vacuum / pressure sensor. Alternatively, the sensor can be exposed to atmospheric pressure to verify functionality, and another means can be used to verify interstitial communication (e.g, checking a manual pressure gauge at the far end of the system, visual inspection of isolation valves, etc.). Unless required by the manufacturer's test procedure, it is not necessary to verify that the monitoring system alarms at a specific vacuum/pressure decay rate, since this capability was verified during third-party evaluation.

Note: To expedite testing, service technicians should make an effort to maintain interstitial vacuum where practicable. This is particularly true with larger interstitial spaces, where it could take hours to fully restore vacuum using the monitoring system's limited-flow vacuum pump.

- ◆ **Test activation height.** The activation height is the height of liquid needed to activate the sensor. Verify that the testing liquid is high enough to trigger the low and/or high float mechanisms, as applicable.
- ◆ **Observe sensor response time.** The response time is the amount of time the sensor must be exposed to a leak event before it responds. The response time for some sensors, such as float switches, may be instantaneous. However, even this type of sensor may take a longer time to respond, depending on the configuration of the site and where the sensor is located. Determine whether the response time is excessive in comparison to manufacturer's recommendations and

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the third-party certification specifications. (**Note:** If the test response time seems excessive, installation of a new sensor should be considered.)

- ◆ **Observe sensor recovery time.** The recovery time is the amount of time that passes before the sensor returns to its baseline reading after it has been removed from the liquid. Determine whether the recovery time is excessive in comparison to manufacturer's recommendations and the third-party certification specifications. (**Note:** If the test recovery time seems excessive, installation of a new sensor should be considered.)
  
- ◆ **Verify audible/visual alarm and pump shutdown (if applicable).**
  - **Verify that audible and visual alarms are operational.** Audible and visual alarms must be verified for both water and product alarms, as applicable.
  
  - **Activate an alarm condition for monitoring systems that are programmed for "pump shutdown".** Confirm pump shutdown, by immersing the sensor in water or product. Depending on the type of sensor or programming, pump shutdown may need to be verified for both water and product.
  
  - **Verify "pump shutdown" for monitoring systems that are programmed for "fail safe".** Confirm pump shutdown, by disconnecting the sensor or interrupting the power to the control panel. "Fail safe" means that a monitoring system will shut down the turbine pump in the event of a power outage, or when the monitoring system fails or is disconnected.

❖ **After Functional Testing of Sensors**

- ◆ **Restore sensor to proper operating condition.** The service technician must ensure that all components of the monitoring system are functional before leaving the site. After testing, liquid sensors must be placed back at the proper location in the secondary containment. For vacuum and pressure systems, the appropriate vacuum / pressure level must be established in the interstitial space. Because the flow rate of vacuum pumps used for interstitial monitoring is limited, large interstitial spaces that have lost vacuum completely during testing will take awhile to return to proper vacuum levels. An intrinsically safe external vacuum source may be used to restore interstitial vacuum more quickly, but care must be taken to ensure that vacuum does not exceed the level permitted within the interstitial space of the components being monitored.
  
- ◆ **Document sensor test results and confirm that results are within the manufacturer's specifications, the third-party certification, or local agency specifications.** Results that are not within specifications or certifications must be indicated on the "Monitoring System Certification" form, and the owner/operator should be notified of what follow-up action is needed to bring the monitoring system into compliance.
  
- ◆ **Check the control unit for any alarm conditions and print an alarm history report.** This should be repeated before leaving the site to document all alarms that occur during functional

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testing. The report can be used by local agency inspectors to verify the monitoring history of the site. Attach the alarm history report to the “Monitoring System Certification” form.

❖ **Important Points Regarding Functional Testing of Sensors**

The following are important notes that must be considered when performing functional testing. In many cases during the 2002 SWRCB field evaluation of leak detection sensors, it was observed that the contractors did not perform functional testing of certain leak detection systems, as described below:

- ◆ **Note 1:** Some manufacturers claim that their monitoring systems are set up to be self-tested from the control unit or that the system is programmed to test each sensor electronically and indicate the sensor’s status on the control unit. However, this type of testing alone does **not** meet the requirement for the annual functional monitoring system certification because it does not accurately simulate a leak condition.
- ◆ **Note 2:** All sensors must be functionally tested, including mechanical floats and chains (e.g., Bravo Boxes) located in under-dispenser containment. Testing procedures should include verification of alarms and pump shutdown where applicable. Without periodic testing, faulty equipment may go unnoticed and may not function properly in the event of a leak.
- ◆ **Note 3:** Sensors that are designed to monitor double-walled brine-filled fiberglass tanks or piping must also be tested. Test both low and high liquid level detection elements, as applicable.

❖ **Replacement of Defective Sensors**

Any sensor failing a functional test must be repaired or replaced. Additionally, service technicians should recommend replacement of operational sensors if they find that the age or condition of the sensors poses a potential problem. The following recommendations should be followed when replacing sensors:

- ◆ Check in advance with the local agency, because some local agencies require a permit before service technicians replace any equipment.
- ◆ Verify that the replacement sensors are compatible with the monitoring system and product stored. Connect replacement sensors to the monitoring system control unit in accordance with manufacturer’s instructions.
- ◆ Do not mix and match sensors. If a sensor fails the functional test, replace it with a proper sensor. Replacement sensors should be the same make and model as original sensors unless another make or model has been approved by the local agency.
- ◆ Place sensors in the proper location and functionally test them.