

# UNDERGROUND STORAGE TANK LINING REQUIREMENTS

*For Use by Unidocs Member Agencies or where approved by your Local Jurisdiction.*

*Authority Cited: 1994 California Fire Code Standards, California Underground Storage Tank Regulations (Title 23, Division 3, Chapter 16 CCR), State Water Resources Control Board Guidance*

All facilities in Santa Clara County which desire to line their underground storage tanks shall meet all requirements listed in the attached documents:

- California Underground Storage Tank Regulations (Title 23, Division 3, Chapter 16 CCR);
- 1994 California Fire Code Standards for General Safety and Tank Inspection, Preparation, and Qualification;
- State Water Resources Control Board Local Guidance LG-136 with enclosures: Interior Lining and Cathodic Protection of Underground Storage Tanks (*Question and Answer*); and Example Plan Check for Tank Lining.

Tank lining shall be limited to the following circumstances:

- Tank lining may be performed only on tanks storing motor vehicle fuel. Tank lining may not be performed on tanks containing non-motor vehicle fuels (e.g. solvents) or hazardous wastes (e.g. waste oil);
- If the tank site is already contaminated, tank lining is only allowed if the contamination can be mitigated and remediated with the tank in place.
- Before a tank can be lined, a special inspector (i.e. qualified professional engineer) must certify in writing that the tank is suitable for lining and continued use. This necessitates opening the tank and inspecting the inside of it.

**Excerpts from:  
California Underground Storage Tank Regulations  
(Title 23, Division 3, Chapter 16 CCR)**

**2663 Interior Tank Lining Requirements**

- (a) Tank lining may be used to satisfy part of the upgrade requirements of section 2662 or to repair a tank pursuant to section 2661. However, a tank that has been repaired using the interior lining method may not be repaired a second time using the interior lining method. The evaluations described in subsections (b) and (c) of this section shall be completed before the lining of a primary container may be authorized by the local agency. The local agency shall deny the proposed lining if the owner fails to demonstrate that the lined primary container will provide continued containment based on the evaluations described in subsections (b) and (c).
- (b) Appropriate tests shall be conducted by a special inspector who shall certify that the shell will provide structural support if the tank is lined. A copy of this certification shall be provided by the owner to the local agency. The special inspector shall make this certification by entering and inspecting the entire interior surface of the tank and shall base this certification upon one of the following sets of procedures and criteria:
  - (1) If a tank is made of non-corrodible material, the following shall be performed:
    - (A) The tank shall be cleaned so that no residue remains on the tank wall surface;
    - (B) The special inspector shall take interior diameter measurements and, if the cross-section of the tank has compressed more than one percent of the original diameter, the tank shall neither be certified nor returned to service unless the tank is excavated and repaired to correct the compression;
    - (C) The special inspector shall conduct an interior inspection to identify any area where compression or tension cracking is occurring and shall determine whether additional fiberglass reinforcing is required for certification before the tank may be lined; and
    - (D) If the special inspector does not certify the tank as suitable for lining because it failed a test conducted in accordance with subdivisions (1)(A) through (C) of this subsection, the tank shall be closed in accordance with Article 7.
  - (2) If the tank is constructed of steel or steel clad with a non-corrodible material, the following shall be performed:

- (A) The tank interior surface shall be abrasive-blasted completely free of scale, rust, and foreign matter; and,
- (B) The entire tank interior shall be tested using a thickness gauge on a one-foot grid pattern with wall thicknesses recorded on a form that identifies the location of each reading. The tank shall be closed in accordance with Article 7 if the tank's average metal thickness is less than 75 percent of the original wall thickness or if the tank has any of the following defects:
  - (i) An open seam or a split longer than three inches.
  - (ii) A perforation larger than one and one half inches in diameter except directly below a gauging opening at the bottom of a tank where the perforation shall be no larger than two and one half inches in diameter.
  - (iii) Five or more perforations in any one square-foot area.
  - (iv) Multiple perforations of which any single perforation is larger than one half inch in diameter.
- (3) A test approved by the State Water Board as comparable to the tests specified in subsections (b)(1) or (2) above.
- (c) The owner or operator shall demonstrate to the satisfaction of the local agency, based on the tests conducted in accordance with subsection (b) above, that a serious corrosion or structural problem does not exist. If the local agency or special inspector determines that a serious corrosion or structural problem exists, interior lining may be performed only if it can be demonstrated to the satisfaction of the local agency that new or additional corrosion protection will significantly minimize the corrosion and that the existing corrosion problem does not threaten the structural integrity or containment ability of the underground storage tank.
- (d) Before lining a tank, thin areas or other flaws in the tank walls which need additional reinforcing shall be reinforced in accordance with section 2661(d).
- (e) On and after August 9, 1992, the lining material and lining process shall be listed or certified by an independent testing organization based on voluntary consensus standards.
- (f) Before being returned to service, any tank which has been lined shall be internally inspected by a coating expert or special inspector for conformance with the standards under which the tank was lined. This inspection shall be conducted in accordance with section 2663(h) except for subdivisions (h)(3) and (h)(5).

- (g) Following the lining process and before it is returned to service, the tank shall be given a tank integrity test.
- (h) If a steel tank is lined for the purpose of satisfying the requirements of section 2662(c), or if any tank is repaired using the interior lining method, it shall be inspected by a coatings expert or special inspector within ten years of lining and every five years thereafter. Written certification of the inspection shall be provided by the tank owner and the party performing the inspection to the local agency within 30 calendar days of completion of the inspection. The inspection shall include all of the following:
  - (1) Determining that the tank has been cleaned so that no residue remains on the tank walls.
  - (2) Determining that the tank has been vacuum tested at a vacuum of 5.3 inches of Hg for no less than one minute. This vacuum test is not required if the tank is constructed of fiberglass and is submerged in groundwater by more than 50% of its depth.
  - (3) If the tank is constructed of fiberglass, taking interior diameter measurements to verify whether the cross-section has compressed by more than one percent of the original diameter.
  - (4) Visually checking the tank interior and lining for discontinuity, compression, tension cracking, and corrosion.
  - (5) For steel tanks, testing the entire tank interior using a thickness gauge on a one-foot grid pattern with metal wall thickness recorded on a form that identifies the location of each reading in order to verify that average metal thickness is greater than 75 percent of the original wall thickness.
  - (6) Testing for thickness and hardness of the lining in accordance with nationally recognized industry codes to verify that the lining meets the standards under which the lining was applied.
  - (7) For steel tanks, testing the lining using an electrical resistance holiday detector in accordance with nationally-recognized industry codes. The owner or operator shall have all holidays repaired and checked in accordance with nationally recognized industry codes.
  - (8) Certification from the special inspector or coatings expert that:
    - (A) the tank is suitable for continued use for a minimum of five years.
    - (B) the tank is suitable for continued use for a minimum of five years only if it is relined or other improvements are made.

(C) the tank is no longer suitable for continued use and shall be closed in accordance with Article 7.

(9) A lined tank shall be closed in accordance with Article 7 at the end of its operational life.

Authority: Health and Safety Code 25299.3, 25299.7

Reference: Health and Safety Code 25292, 25292.1, 25296, 40 CFR 280.21, and 280.33

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**2661 Requirements for Repairing Underground Storage Tanks** (*Excerpts from Subsection "d" only*)

- (d) Holes in steel tanks shall be plugged using self-tapping bolts, boiler plugs, water-tight hydraulic cement, or by welding. In addition, holes in steel and fiberglass tanks shall be repaired as follows:
- (1) Repair areas shall be covered with epoxy or isophthalic polyester based resin. The resin shall be compatible with the intended use of the tank.
  - (2) Fiberglass cloth with a minimum weight of 1.5 oz/yd that is silane-treated shall be worked completely into the resin base. The resin base shall be installed a minimum of two inches beyond the fiberglass cloth.
  - (3) All repairs shall include installation of fiberglass cloth with a minimum dimension of 12 x 12 inches centered over the area to be repaired. Larger repairs shall require the cloth to be large enough to provide cloth coverage of at least five inches of cloth bonded to the tank wall, measured from the outermost edge of the repair area to the cloth's edge.
  - (4) A second layer of fiberglass cloth of the same weight as specified in subsection (d)(2) above, shall be installed directly over the primary cloth layer and shall be cut to overlap the primary patch by 1.5 inches on all sides.
  - (5) The repair shall be allowed sufficient cure time, as determined by the resin manufacturer, to provide an acceptable base for tank lining installation.

**Excerpts from:  
California Fire Code Standards for  
Safety Requirements; Tank Inspection, Preparation and Qualification;  
and Application of Lining and Tank Closing**

**Section 79.602**

**SAFETY REQUIREMENTS**

**79.602.1 Site Conditions**

**79.602.1.1 Ignition Controls.** Prior to excavation, the site shall be safeguarded from all sources of ignition for an area of 25 feet in all directions until the area is vapor free. All open flame and spark-producing equipment within the area shall be shut down. Barricades and warning signs reading "Flammable - No Smoking" shall be provided as required by the chief.

**79.602.1.2 Fire Extinguisher.** Two portable fire extinguishers, each having a rating not less than 80B:C, shall be provided on the site in accordance with U.F.C. Standard 10-1 for extra (high) hazard.

**79.602.1.3 Emergency Communications.** A dependable method, acceptable to the chief, shall be available for notifying the fire department in the event of a fire or other emergency.

**79.602.1.4 Static Electricity Control.** Precautions shall be taken to prevent the accumulation and discharge of static electricity. See API 2003 - March 1982.

**79.602.1.5 Electrical Equipment.** Electrical equipment used in the area shall be explosion proof, meeting the requirements of Class I, Group D, Division 1, or approved for the service.

**79.602.2 Preparation for Opening the Tank**

**79.602.2.1 Tank Isolation.** Before work on the exterior surface of the tank begins, tanks shall be inspected to determine how the tank is to be isolated. If a tank is equipped with a manifold vent, fill line or siphon assembly, necessary measures shall be taken to isolate the tank to be worked on from other tanks. Product and vapor-recovery piping shall be disconnected and blanked off. The vent for the tank being lined shall be isolated from vents for other tanks which could still be in service. When necessary, a temporary, separate vent for the tank being lined shall be installed.

**79.602.2.2 Electrical Disconnect.** Electrical switches supplying electrical current to submerged pumps and other equipment connected to the tank shall be disconnected and locked.

**79.602.3 Removal of Liquid Product.** Product, water and sediment shall be removed as thoroughly as is possible using explosion-proof or air-driven pumps. Pump motors and suction hoses shall be bonded to the tank to prevent electrostatic ignition hazards. See API 2003 - March 1982. A small quantity of water is allowed to be pumped into the tank to float the product from a low spot where it can be

pumped from the tank. Also, where possible, fill or drop tubes shall be removed to allow for maximum removal of all liquids and to provide for adequate air ventilation.

**EXCEPTION:** When purging using an eductor-type air mover, the fill or drop tube shall remain in place. See Appendix I, Figure No. 79-6-1.

#### **79.602.4 Purging**

**79.602.4.1 Removal of Flammable Vapors (Gas Freeing).** The tank shall be thoroughly purged with air to remove flammable vapors. The concentration of flammable vapors in a tank could go through the flammable range before a safe atmosphere is obtained. Precautions shall be taken to eliminate the possibility of static electricity discharge during gas-freeing procedures. See API 2003 - March 1982.

**79.602.4.2 Pressure Limit.** Air pressure in the tank must not exceed 5-pounds-per-square-inch gauge. To prevent excess air pressure, the vent line shall be checked to make certain it is free from obstruction and traps.

**79.602.4.3 Methods.** Ventilation of the tank shall be accomplished by one of three methods as listed below:

1. An eductor-type air mover, usually driven by compressed air, shall be properly bonded to prevent the possibility of static electricity generation and discharge. When using this method, the fill or drop tube shall remain in place to assure the vapors are drawn from the bottom of the tank. An extension shall be used to discharge vapors to a minimum of 12 feet above the grade. See Appendix I, Figure No. 79-6-1.
2. A diffused air blower shall have the air-diffusing pipe properly bonded to prevent the possibility of static electricity generation and discharge. Fill or drop tubes are allowed to be removed to enhance diffusion of the air in the tank. Air supply shall be from a compressor which has been checked to ensure a clean air supply, free from volatile vapors. Air pressure in the tank shall not exceed 5-pounds-per-square-inch gauge. See Appendix I, Figure No. 79-6-2.
3. A fan-type air mover shall be used to blow air into the tank through the fill opening of the tank. The fan shall be driven by compressed air or a Class I, Division 1, Group D approved electric motor. The fan shall be properly bonded to the tank to prevent the possibility of static electricity generation and discharge. Fill or drop tubes are allowed to be removed to enhance diffusion of air in the tank. The tank vent shall be inspected to make sure it is free of all obstructions. Air pressure in the tank shall not exceed 5-pounds-per-square-inch gauge. See Appendix I, Figure No. 79-6-3.

**79.602.5 Testing Flammable Vapor Concentrations** Tests shall be conducted to determine flammability of the vapor in the excavated area and in the tank. Such tests shall be made with a combustible gas indicator, which is properly calibrated on hexane in air and thoroughly checked and maintained in accordance with manufacturer's instructions. Persons responsible for testing shall be trained and thoroughly familiar with the use of the instrument and interpretation of the instrument's readings.

When purging is being performed by a diffused air blower or fan air blower, the tank shall be tested by placing the combustible gas indicator probe into the fill opening with the fill or drop tube removed. Readings shall be taken at the bottom, middle and upper portions of the tank, and the instrument shall be purged with fresh air after each reading. When purging is being performed by a eductor-type air mover, readings shall be conducted through a probe hole provided at the base of the eductor. See Appendix I, Figure No. 79-6-1. Readings of 10 percent or less of the lower flammable limit, as indicated in the tank and at the vent riser or eductor, shall be obtained before the tank is considered safe for opening.

### **79.602.6 Opening the Tank**

**79.602.6.1 Steel Tank.** If no access opening exists in a tank, an opening with the minimum dimension of 24 inches by 30 inches shall be cut in the top. The tank section to be removed shall be marked square with chalk, and a hole drilled with a nonsparking drill, such as air-driven drill, at one corner of the section using lubricating oil to reduce friction, heat and possible sparks. After the hole is drilled, the tank vapors shall again be tested by inserting the meter probe into the hole to verify that the vapor concentration does not exceed 10 percent of the lower flammable limit.

The tank shall be cut using a nonsparking tool, such as an air-driven saber saw or snipper, using lubricating oil to reduce friction, heat and possible sparks. Prior to the final cut, the plate shall be supported to prevent it from falling into the tank.

**79.602.6.2 Purging Safety.** Purging, air ventilation and testing shall continue throughout the entire operation. During the tank-cutting operation, minimal air pressure shall be maintained to prevent a blow out.

### **79.602.7 Tank Entry**

**79.602.7.1 Pre-entry Procedures.** When entering tanks, safe entry procedures shall be followed. See API Publications 2015 - September 1985 and 2015A - June 1982. Procedures shall include checking the oxygen content inside the tank with a properly calibrated oxygen monitor. At all times, personnel entering the tank shall be equipped with positive-pressure air-supplied equipment with full-face enclosure and safety harness connected to a safety line held by a standby person outside the tank. A self-contained breathing apparatus shall be immediately available to the standby person for rescue operations or other emergencies.

Oil- and water-resistant rubber or neoprene boots and gloves shall be worn. Clothing shall cover the arms, legs, torso and head of the tank entry personnel. Disposable clothing, impervious to product shall be used. Clothing saturated with product shall be removed immediately. Personnel working inside the tank shall be knowledgeable of safety requirements for working in tanks and confined spaces. See ANSI Z117.1 - 1977.

**79.602.7.2 Post-entry Procedures.** Tests with the combustible gas indicator shall be performed periodically in the tank to ascertain that the tank vapors are 10 percent or less of lower flammable limit. During sludge removal, monitoring shall be continuous. The vent line shall remain clear and unobstructed to allow continuous ventilation. All other lines and openings shall be plugged or capped off to ensure no liquids or vapors can enter the tank during the lining operation.

**79.602.8 Sludge Removal.** Sludge accumulation on the bottom of the tank shall be removed and placed in approved containers. Disposal and documentation shall be in accordance with appropriate local, state and federal regulations.

## **Section 79.603**

### **TANK INSPECTION, PREPARATION AND QUALIFICATION**

#### **79.603.1 Abrasive Blasting**

**79.603.1.1 Precautions.** Abrasive blasting personnel shall be familiar with ignition hazards and necessary precautions. See API Publication 2027 - December 1982.

Before abrasive blasting, the tank shall be checked with the combustible gas indicator to ensure that flammable vapors have not entered the tank.

Abrasive blast cleaning operations shall not be conducted on surfaces that will be wet after blasting and before application of the lining material, when the surface is less than 5°F above the dewpoint or when the relative humidity of the air is greater than 85 percent.

Abrasive blast operators shall wear approved helmets connected to sources of clean air. Bonding shall be provided between the blasting nozzle and the work surface, or the blasting nozzle shall be grounded to provide equivalent protection from static charges.

Separators and traps shall be used to remove oil and water from compressed air utilized to operate blasting equipment.

**79.603.1.2 Preliminary Inspection.** A visual inspection and assessment of the tank's condition shall be conducted prior to sandblasting to determine if the tank will satisfy the criteria for acceptance.

**79.603.1.3 Steel Tanks.** The entire internal tank surface shall be abrasive blasted to a white-metal finish, completely free of scale, rust and foreign matter. See SSPC SP 5, White Metal Blast Cleaning - 1985.

Following completion of the abrasive blasting operation, the surface shall be brushed with a clean brush constructed of hair bristle or fiber, blown with compressed air and vacuum cleaned.

#### **79.603.2 Tank Inspection and Testing**

**79.603.2.1 Qualifications.** Openings are allowed to be cut in tanks for entry inspection purposes.

**79.603.2.2 Equipment.** During tank inspection, the entire internal surface of the tank shall be visually inspected using a light fixture, and cords if required, approved for Class I, Division 1, Group D hazardous locations.

**79.603.2.3 Steel Tanks.** The visual inspection of steel tanks shall determine the existence and extent of defects such as pitting, perforations, split seams, internal corrosion and evidence of shell metal thickness. Shell metal thickness shall be determined by one of the following test methods:

1. Ultrasonic technique, nondestructive test method.
2. Other test methods approved by the chief.

**79.603.2.4 Ultrasonic Thickness Gauging.** Ultrasonic thickness gauging procedures, when used, shall establish that the average shell metal thickness is greater than 75 percent of the original shell thickness. In no case shall the shell thickness be less than 1/8 inch.

Ultrasonic thickness gauging qualifications, procedures, reports and acceptance standards shall be approved by the chief. See Appendix II.

## **Section 79.604**

### **APPLICATION OF LINING AND TANK CLOSING**

#### **79.604.1 Application of Lining**

**79.604.1.1 General.** Personnel safety and clothing shall comply with the requirements of Sections 79.602.1 and 79.602.7.

**79.604.1.2 Steel Tanks.** Prior to application of lining material, a minimum 1/4-inch-thick steel reinforcing plate, rolled to the contour of the tank, and with minimum dimensions of 8 inches by 8 inches shall be installed under the fill or drop tube and the gauging tube. The plate shall be covered with fiberglass cloth embedded in resin.

The blast-cleaned surface shall be lined or primed within eight hours after blasting and before any visible rusting occurs. Only those lining materials meeting the specifications in section 79.601.5 shall be used. Manufacturer's instructions shall be followed on handling and mixing of resin compounds, and the compounds shall be applied to the entire interior surface of the tank by the manufacturer or authorized distributor following the specified method of application. The lining shall be applied to a minimum thickness of 100 mils and a nominal thickness of 125 mils at the recommended application temperature. If a heater is used to accelerate the curing process, other work that might release flammable vapors in the work area shall be discontinued. The heating unit shall be attended whenever it is in operation.

#### **79.604.2 Post-lining Testing**

**79.604.2.1 Steel Tanks.** Upon completion of lining application, the following tests shall be performed:

1. A high-voltage electrical inspection, Holiday Tightness Test, shall be performed using a Tinker Razor Holiday Detector Model AP/W output power voltage pac 6,000 volt/1,600 volt 15-inch silicon brush electrode, or other acceptable instrument to ensure the absence of air pockets or pin holes in the lining material. The test shall be conducted at a rate of 100 volts per mil of nominal lining thickness, but in no case less than 10,000 volts. See NACE Standard RP-02-74.
2. A lining thickness test shall be performed using an Elcometer thickness gauge or other acceptable instrument to determine that the lining thickness meets the above requirements.

3. A lining hardness test shall be performed using a Barcol Hardness Tester GYZJ 935 or other acceptable instrument to determine that the lining hardness meets the manufacturer's specifications.

**79.604.2.2 Pipe Testing.** Prior to closing a tank, pressure tightness tests of the piping are allowed to be conducted from the interior of the tank in accordance with California Fire Code Section 7901 in lieu of conducting pipe line tests from the exterior after the tank has been closed. Piping shall be free of flammable and combustible liquids or vapors prior to conducting pressure tightness tests of pipes.

**79.604.2.3 Remedial Action.** Test failures shall require correction and retesting until test specifications are met.

**State Water Resources Control Board  
Underground Storage Tank Program  
Local Guidance (LG) Letter**

To: Local Implementing Agencies (LIAs) and Other Interested Parties

LG-136: INTERIOR LINING AND CATHODIC PROTECTION OF UNDERGROUND STORAGE TANKS (USTs)

As tank owners prepare to meet the December 22, 1998 deadline for upgrading single-walled tanks, we expect LIAs to receive many requests for permits to use interior lining and cathodic protection to meet those requirements.

The purpose of this letter is to outline tank lining and cathodic protection requirements and to provide references to specific sections of the UST regulations. For exact regulatory language, please refer to the California Code of Regulations (CCR), Title 23, Division 3, Chapter 16, Article 6, "Underground Storage Tank Upgrade and Repair Requirements". The numbers in the boxes in the margins refer to sections of the UST regulations.

There may be tank lining requirements in addition to those in the UST regulations. For example, the local air quality authority or fire department may have their own requirements and should be consulted.

I hope this answers questions you may have regarding UST interior lining and cathodic protection. Questions may be directed to David Holtry at (916) 227-4332 or Arron Rambach at (916) 227-4483.

Sincerely,

James George Giannopoulos  
Supervising Engineer

Enclosures (2)

## **INTERIOR LINING AND CATHODIC PROTECTION OF UNDERGROUND STORAGE TANKS**

FOLLOWING ARE ANSWERS TO COMMONLY ASKED QUESTIONS CONCERNING UPGRADING USTS BY INTERIOR LINING AND CATHODIC PROTECTION:

### DO LINING MATERIALS AND PROCESSES NEED TO BE THIRD PARTY LISTED OR CERTIFIED?

YES. Tank lining materials and processes must be third-party evaluated by an independent testing organization in accordance with voluntary consensus standards. Some of those standards include: UL 1856 (Underwriters Laboratories), NLPA 631 (National Leak Prevention Association), API 1631 (American Petroleum Institute), and Uniform Fire Code 79-6.

An independent testing organization tests products or systems to make sure they comply with voluntary consensus standards. The organization must conduct periodic inspections of the production of products or systems to make sure that the product or system continues to meet appropriate standards. And the organization must have no financial interest in the product or system being tested.

Tanks may be lined only in accordance with the third-party evaluation. For example, some evaluations limit the lining material and process to steel tanks only. Other lining materials and processes are limited to petroleum products only.

### IS A CONTRACTORS' LICENSE REQUIRED TO LINE TANKS?

YES. The Contractors' State License Board (CSLB) allows only those contractors who possess one of the following licenses to line tanks:

- General Engineering Contractor (A)
- Limited Specialty/Service Station Maintenance (C-61/D40)\*
- Limited Specialty/Synthetic Products (C-61/D12)
- Limited Specialty/Protective Coating (C-61/D51)\*
- Painting and Decorating (C-33)

\*This license is no longer issued, but valid licenses may still exist.

CSLB does not require contractors to possess the hazardous substance removal certification to line tanks.

### WHICH TANKS MAY BE LINED?

Tank lining may be performed only on tanks storing motor vehicle fuel. Lining may be performed as a preventive measure to satisfy the December 1998 upgrade requirements for steel tanks. However, single-walled fiberglass tanks storing motor vehicle fuel do not require lining or replacement by 1998. Likewise, single-walled steel tanks which store motor vehicle fuel and are clad on the outside with fiberglass or another non-corrosive material do not require lining or replacement .

### IS SOIL SAMPLING REQUIRED PRIOR TO LINING?

This is left up to the LIA. In accordance with sections 25296(c) Health and Safety Code, a continuous vapor or ground water monitoring system must be installed adjacent to a single-walled tank if the tank that is proposed to be interior lined had previously leaked. The purpose of the continuous monitoring system is to differentiate between any residual contamination from the prior leak and any future failure of the operational integrity of the lining. There is no requirement to install this monitoring system where it can be determined to the satisfaction of the LIA that the tank itself has not previously leaked.

The law gives broad authority to the LIAs to adopt more stringent requirements (Section 25299.2 Health and Safety Code) including the determination of whether a tank has previously leaked. In the past, some LIAs have required soil samples at each end of the tank. Others have trusted monitoring results such as the most recent tank tightness test. Since a tank test result can only determine whether a tank is leaking at the time the test is performed, reviewing inventory reconciliation records over long periods may be beneficial. And finally, some LIAs consider the inspection results from the special inspector who enters the tank and performs evaluations on the tank shell when determining whether the tank itself has previously leaked.

If the LIA chooses to require soil samples to determine whether the tank itself has previously leaked, then only samples at locations adjacent to the tank are necessary to verify whether the tank itself has leaked (as opposed to piping leaks, dispenser leaks, spills, overfills, etc.). Therefore, it is not necessary to take soil samples underneath dispensers or along lengthy piping runs to determine whether a continuous vapor or ground water monitoring system must be installed during the lining process.

### CAN TANKS THAT HAVE PREVIOUSLY LEAKED BE LINED?

YES. Section 25296(a) Health and Safety Code allows a tank to be repaired by lining. Lining may be performed to repair a steel, fiberglass, or clad tank that has minimal structural or corrosion problems. However, a tank that was previously lined may not be lined a second time if it leaks. In other words, relining of a previously lined tank that leaks is not allowed so as to avoid repeated repair of a tank that is fundamentally unsound.

### CAN TANKS LOCATED AT CONTAMINATED SITES BE LINED?

This will depend upon the results of a soil and ground water investigation. If any of the conditions in section 2724 CCR are present, then a complete soil and ground water investigation of the entire site must be completed to determine the effects of contamination. Consequently, conditions may exist that require soil and ground water investigations involving sampling in order to assess the effects of contamination, if any. If there is known contamination, regardless of the source, soil and/or ground water sampling is required to conduct a site assessment in accordance with Article 11 CCR. With concurrence from the regulatory agency overseeing cleanup, a tank that has leaked may be repaired by lining if the contamination can be remediated and mitigated with the tanks in place. On the other hand, if the site assessment indicates that tank removal is necessary to remediate or mitigate potential adverse affects of the unauthorized release, then tank lining should not be allowed.

### WHAT TESTS ARE REQUIRED PRIOR TO TANK LINING?

Before a tank may be lined, a special inspector (i.e., qualified professional engineer) must certify in writing that the tank is suitable for lining and continued use. Article 6 does not require the engineer to be financially independent of the tank owner or lining company. After the tank is emptied, cleaned, purged, and tested by ultrasound for thickness, the engineer must enter the tank and perform several tests on the tank's interior. For steel tanks, the tank must be cleaned and sandblasted to white metal. The engineer must perform a visual inspection in which he counts the number of holes, splits, perforations, and other defects in order to certify that the tank is structurally sound. For fiberglass tanks, the engineer must perform a visual inspection and take interior diameter measurements to determine if there is structural, tension, or compression problems.

If the engineer certifies that the tank is suitable for lining and continued use, all holes, splits, defects, and thin areas must be reinforced before application of the lining. Materials used to reinforce or plug holes must be compatible with the substance that will be stored. Striker plates must be installed beneath all tank openings that could be used for manual dipsticking.

### WHAT TESTS ARE REQUIRED IMMEDIATELY FOLLOWING LINING?

After the tank is lined, but before it is returned to service, a qualified coatings expert, who is independent of the tank lining company and who has no financial interest in the tank, must enter the tank and conduct several evaluations to ensure that the tank was properly lined. A special inspector (i.e., a qualified professional engineer) may do this in lieu of the coatings expert. In addition to a visual check of the lining, the lining must pass thickness, hardness, and electrical resistance holiday detector tests (the latter is necessary for steel tanks only). If the tank passes those tests, then the access opening is closed, and a vacuum test and a tank integrity test must be performed. If the tank and lining pass all these tests, then the tank may be returned to service.

### IS CATHODIC PROTECTION REQUIRED?

YES. If the exterior surface of the tank is unprotected from corrosion, the tank must be retrofitted with cathodic protection by December 22, 1998. However, if the lining applicator or special inspector notices corrosion during the lining process, then the tank must be retrofitted with cathodic protection before the UST is returned to service.

Cathodic protection systems that are retrofitted on existing tanks must be designed by a corrosion specialist. A corrosion specialist must be certified by the National Association of Corrosion Engineers (NACE) or be a qualified professional engineer. Cathodic protection systems must be tested by a qualified person within six months of installation and at least every three years thereafter. The purpose of these inspections is to ensure that the tank and piping maintain proper corrosion protection in accordance with voluntary consensus standards (such as NACE-02-35 or API 1632). In addition, impressed current cathodic protection systems must be checked every 60 days to ensure that they remain in proper working order. Cathodic protection systems must be checked within six months of any construction in the vicinity of a cathodically-protected UST if the construction could have affected the cathodic protection system. This is to verify that no damage was done to the electrical system.

If piping connected to the tank is single-walled, constructed of steel, and it is not replaced with new double-walled piping, then the cathodic protection system must also protect the piping from corrosion. Stainless steel, galvanized steel, coated steel piping, and wrapped steel piping are not considered corrosion-protected, and therefore, must be replaced or upgraded with cathodic protection by December 22, 1998. Other metal components of the UST system (such as submersible pumps) that routinely contain fuel and are in contact with the ground must also be cathodically protected by December 22, 1998.

### WHAT FUTURE TESTS ARE REQUIRED OF THE INTERIOR LINING AND TANK SHELL?

Within 10 years of the lining, and every five years thereafter, a coatings expert must conduct an evaluation of the tank and lining. A special inspector (i.e., qualified professional engineer) may do this in lieu of the coatings expert. Depending on whether the tank is steel or fiberglass the evaluation must include: cleaning, visual inspection of the interior, interior diameter measurements, ultrasound thickness test of steel walls, thickness test of lining, hardness test of lining, electrical resistance holiday detector test, and a vacuum test. After the evaluation, the coatings expert or special inspector must certify one of the following:

1. The tank is suitable for continued use for a minimum of five years.
2. The tank is suitable for continued use for a minimum of five years only if it is relined or other necessary improvements are made.
3. The tank is no longer suitable for continued use and must be closed immediately.

IF A SINGLE-WALLED TANK WAS LINED PRIOR TO THE ADOPTION OF THE STATE'S LINING REQUIREMENTS, WHEN DOES IT NEED TO BE INTERNALLY INSPECTED?

If a tank was lined prior to August 1991, then it must be internally inspected by December 1998 in order to determine that the tank shell and lining meets the upgrade requirements. However, if a tank was lined prior to August 1991 and it can be shown that interior lining was conducted in accordance with the lining requirements that became effective in August 1991, then the internal inspection is not required until 10 years after the lining was applied.

DO TANKS THAT HAVE BEEN LINED NEED TO BE MONITORED FOR LEAKS?

YES. Tanks that have been lined and connected piping must be monitored for leaks in accordance with Article 4 CCR. The requirements for monitoring lined tanks and connected piping are the same as those for monitoring single-walled tanks and piping that have not been upgraded.

### EXAMPLE PLAN CHECK FOR TANK LINING

1. Obtain a complete third-party evaluation of the lining material and procedures:
  - a. A resume, including all applicable formal training experience, from personnel who conducted the evaluation (not necessary for Underwriters Laboratories).
  - b. An affidavit from the company that received the third-party evaluation confirming that there are no mutual financial interests between lining company and testing organization (not necessary for Underwriters Laboratories).
  - c. A description of the testing organization's formal periodic inspections of the listed/certified materials and processes. (The purpose of the formal periodic inspections is to ensure that the listed/certified materials and process continue to comply with the listing/certification.)
  - d. A copy of the voluntary consensus standard that was used during the evaluation or a description of the equivalent test protocol, if a voluntary consensus standard was not used.
  - e. The testing organization's raw field data, laboratory results, calculations, graphs, charts, etc.
  - f. The conclusion of the testing organization's evaluation of the lining material.
  - g. The conclusion of the testing organization's evaluation of the lining process.
  - h. Limitations on the listing/certification, if any.
  - i. A statement from the testing organization confirming that all equipment at the test site(s) was properly maintained and calibrated to the level of accuracy necessary for a valid evaluation.
  - j. A statement from the lining applicator confirming that the materials that will be used are the same materials that were evaluated by the testing organization.
  - k. A statement from the lining applicator confirming that the processes that will be used are the same processes that were evaluated by the testing organization.
  - l. A description of tank lining processes to be used by the applicator.
  - m. A statement from the company that received the evaluation describing training provided to the authorized applicator.
  
2. Does lining applicator have one of the following valid, unexpired contractors licenses:
  - General Engineering Contractor (A)
  - Limited Specialty/Service Station Maintenance (C-61/D40)
  - Limited Specialty/Synthetic Products (C-61/D12)
  - Limited Specialty/Protective Coating (C-61/D51)
  - Painting and Decorating (C-33)
  
3. Is lining a preventive upgrade or a repair of a leaking tank?
  - Results of soil samples
  - Holes that may have leaked fuel detected by special inspector
  - Results of tank integrity tests
  - Other monitoring results

- 4. Corrective action, if necessary. Will lining inhibit or delay corrective action, if any?
- 5. A guideline provided by lining company for local agency inspectors to use when conducting field inspections of tank linings.
- 6. Certification by special inspector that the tank is suitable for lining and continued use:
  - a. Steel or clad tanks
    - i. sandblast to white metal
    - ii. ultrasound thickness test of steel walls by appropriately trained person
    - iii. count number of holes, splits, perforations, and other defects
  - b. Fiberglass tanks
    - i. interior walls cleaned by wipe down
    - ii. interior diameter measurements
    - iii. visual check for structural, tension, or compression problems
- 7. Is the special inspector an appropriate registered professional engineer?
- 8. Holes and splits in steel tanks, if any, plugged with self-tapping bolts, boiler plugs, water-tight, hydraulic cement, or welding.
- 9. Striker plates installed beneath all tank openings that could be used for manual dipsticking.
- 10. Lining applied within 8 hours of sandblasting?
- 11. Certification by coatings expert or special inspector that tank was lined properly:
  - a. Steel or clad tanks
    - i. visual check of lining
    - ii. thickness test of lining
    - iii. hardness test of lining
    - iv. electrical resistance holiday detector test
    - v. vacuum test
  - b. Fiberglass tanks
    - i. visual check of lining
    - ii. thickness test of lining
    - iii. hardness test of lining
    - iv. vacuum test (not required if submerged by 50% of depth in ground water)
- 12. If a coatings expert was used, is he financially independent from the tank owner and lining company?

- 13. Tank integrity test conducted.
- 14. Continuous vapor or ground water monitoring system (tanks that have leaked only).
- 15. Tank lining records and test results maintained for remaining operating life of tank.
- 16. Spill container
- 17. Overfill prevention equipment
- 18. Proposed monitoring procedures for the tank(s) and piping that will be used once the UST is put back into service.
- 19. An emergency response plan for the facility that will be used once the UST(s) is put back into service.
- 20. Ten years after lining and every five years thereafter, certification by coatings expert or special inspector that the tank is suitable for continued use:
  - a. Steel or clad tanks
    - i. interior lining cleaned by wipe down
    - ii. visual check of lining
    - iii. thickness test of lining
    - iv. hardness test of lining
    - v. electrical resistance holiday detector test
    - vi. ultrasound thickness test of steel walls by appropriately trained person
    - vii. vacuum test
  - b. Fiberglass tanks
    - i. interior lining cleaned by wipe down
    - ii. visual check of lining
    - iii. thickness test of lining
    - iv. hardness test of lining
    - v. interior diameter measurements
    - vi. vacuum test (not required if submerged by 50% of depth in ground water)