



CHINO VALLEY INDEPENDENT FIRE DISTRICT FIRE PROTECTION STANDARD

LINING OF UNDERGROUND FLAMMABLE LIQUID TANKS

STANDARD # 115

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The purpose of this standard is to establish a method to repair underground storage tanks so that they are fire safe during the repair process. The repair of the tank shall meet the following requirements:

1. Spot repairs will not be accepted.
2. A listing of materials, approved by an acceptable independent testing laboratory, shall be submitted. This listing shall include a data sheet that outlines the procedures used in the testing process, and the recommended installation procedures to be used for field application of the lining materials.
3. Prior to opening the tank, the contractor shall obtain a permit to do the work from:
 - a. Environmental Health Services (EHS).
 - b. Fire Prevention Division.
4. The tank shall be purged of all flammable vapors and shall be maintained in a nonexplosive state during all phases of the inspection and repair.

SCOPE

This standard covers the requirements for the lining of underground flammable liquid storage tanks. The standard also covers the method to be followed for the safeguarding of flammable liquid tank atmospheres for the purpose of cleaning, inspecting and coating the interior of the tank. Methods are outlined for the removal of combustible vapors preparatory to the removal of sediment, rust, etc. Instructions are included for the interior surface of the tanks. All work must be done in accordance with the current Occupational Safety and health Administration Codes (OSHA).

The procedure for the lining of underground storage tanks includes the following:

1. Isolating the tank.
2. Gas freeing the tank.

3. Entering the tank.
4. Cleaning and sandblasting the tank.
5. Determining suitability for lining the tank.
6. Coating the interior of the tank.
7. Sealing the tank.
8. Testing the tank.

PROCEDURES

Site Inspection

The applicator shall visit the site, ascertain local conditions and scope of the work. Approval from Environmental Health Services (EHS) and the Fire Prevention Division shall be obtained prior to starting any work.

Inspection of Storage Tank Site

The tank site shall be inspected by a competent person to determine how long the tank has been in service, the approximate amount of product and sediment in the tank and the physical condition of the tank. If the tank is not structurally sound and has open joints or extremely porous metal, the tank shall not be lined. All sources of ignition shall be removed from the surrounding area. Work shall not be started if the direction of the wind will carry vapors into areas where they could produce a hazardous condition. All open flame and spark-producing equipment used in the area shall be explosion proof (i.e.; Class ID, Division 1).

The tank shall be completely isolated before any work begins by blanking all suction lines, pumps and other lines.

NOTE: The vapor hazard area shall be continually monitored until the atmosphere is deemed safe.

Removal of Flammable Vapors

Purging the tank of flammable vapor shall be accomplished by the use of fresh air. A gas free atmosphere shall be maintained by continuous ventilation. During the purging process the air/vapor mix will go through the flammable range before a safe atmosphere is reached; therefore, all precautions will be taken to insure that the air moving apparatus be bonded to the tank to minimize the hazard of ignition.

Ventilation of the tank shall be accomplished by the use of adductor type air moving equipment. All air moving equipment used shall be explosion proof and all bearings and fan shall be non-ferrous or non-sparking materials.

Obtain Air Quality Management District (AQMD) requirements for purging prior to extraction of vapors.

The following steps shall be taken for the purging process:

a. Preparation

1. Remove as much product as possible. (Use explosion-proof pumps and lines.) Lines at the dispensers shall be closed and blanked so that no vapors or product can issue from the lines during the maintenance operation.
2. Siphon lines and any connections to a common fill line must be cut.
3. A small amount of water may be pumped into the tank to float the product from a low spot to a point from which it can be removed from the tank.

b. Purging

The tank will be thoroughly purged for the removal of flammable vapor atmosphere, or any residue capable of producing flammable vapors in the tank and connected distribution lines, so that subsequent natural ventilation atmosphere is within the tank.

In order to maintain a safe working atmosphere the following procedure must be followed:

1. Aerating equipment shall be located where the air will not be contaminated by flammable vapors or the exhaust from internal combustion engines.
 - a. suitable grounding shall be provided to prevent a spark from igniting any flammable vapors in the immediate area.
 - b. Air pressure in the tank shall not exceed five (5) P.S.I. Air shall be supplied from equipment that has been approved to provide clean air supply without volatile flammable fumes feeding the air supply.
2. To insure against static electricity the purging pipe shall be copper with an attached copper grounding wire. The bottom of the purging pipe shall rest on the bottom of the tank and ground wire shall be attached to the fill line and to the nearest water meter that will give the proper electrical ground.

3. The equipment providing the clean air shall be equipped with pressure regulating equipment capable of maintaining an internal tank pressure not to exceed five (5) P.S.I. when the vapors are being forced out of the vent pipe. Care must be taken to seal double wall type filler tube so that the flammable vapor is not exhausted through the filler pipe.
4. The tank shall be tested for flammable vapor concentration. An approved meter capable of determining the percentage of the Lower Explosive Limit range at three (3) levels of the tank. Readings shall also be taken at the vent. A safe range of 20% or less of L.E.L. range must be obtained at both the tank and the vent riser before the tank will be considered safe.
5. After it is determined that a safe atmosphere has been established within the tank, the tank may be opened. If cutting or drilling is necessary, the tools are to be air-operated or run by explosion proof motors. During use, testing for flammable vapors is extremely critical. When using electric tools with open switches, the work area shall be monitored continuously for flammable vapors.

When no hatch exists, a manhole not to exceed 22" x 22" may be cut. The cut-out is to be outlined with chalk and two holes are to be drilled in the diagonal corners using a pneumatic drill. It is important that purging is continued throughout the entire operation. Test readings shall be 20% or less of the Lower Explosive Limit. The tank will then be cut using a pneumatic nibbler or an explosion-proof saber saw or equivalent.

A person equipped with complete positive air displacement equipment with face mask and dressed in approved protective clothing can then enter the tank. Tests shall be taken again with the explosion meter by a person in the tank to insure that the tank vapors are 20% or less of the L.E.L.

All sludge and sediment shall be removed from the interior of the tank. Approved O.S.H.A. clothing shall be worn to protect arms, legs, head, ears and torso from contact with waste materials within the tank. Approved breathing apparatus shall be worn at all times.

Persons working inside the tank will be equipped with safety harness and safety lines. Standby persons shall constantly hold safety lines while persons are inside the tanks.

Pumps used for sludge removal shall be explosion proof. Shovels used for the removal of solid sludge shall be non-ferrous.

6. The interior of the tank may be inspected by using one of several forms of internal inspection lamps or flashlights that are approved for Class I, Group D, hazardous locations.

The inspection will include a check of all piping entering the tank to insure that no flammable liquid or vapors are entering the tank. Foot valves shall be removed or covered tightly with plastic tape. Any submerged pumps shall be isolated, suction lines should be removed and openings plugged. The vent pipe must be kept open during the entire operation.

Determining Suitability for Lining

1. The interior of the tank shall be inspected to determine the extent of corrosion. Areas around holes, or areas suspected of being severely corroded are to be tested by tapping with a ballpeen hammer. A tank having porous areas, holes too large to be repaired or splits shall not be lined.
2. Perforations shall be ballpeen hammered (before and after sandblasting) to remove metal and to obtain structurally sound edges. All perforations shall be reamed out until the edges of the hole are a minimum of 1/8" thick.
3. All sandblasting shall meet O.S.H.A. Standards. Sandblasters shall wear U.S. Bureau of Mines approved helmets connected to a source of clean compressed air and all sandblasting hoses shall be grounded to dissipate static charges.
4. Tanks not qualified for repair are:
 - a. Tanks having open seams or splits.
 - b. Tanks with a hole larger than 1/2" diameter.
 - c. Tanks with 10 or more holes larger than 1/4" diameter.
 - d. Tanks showing evidence of exterior corrosion or damage.

Lining Process

1. The tank shall be repaired using methods compatible with the specifications for the lining material. A list of materials and specifications shall be submitted to the Fire Prevention Bureau.
2. The interior of the tank shall be prepared in accordance with the specifications for the material being used for the lining. A list of materials and specifications shall be submitted to the Fire Prevention Bureau for approval.

3. A ¼” steel plate 2’0” x 2’0” square shall be permanently affixed under the fill tube to prevent damage to the lining.

Cover Plate

The cover plate shall overlap the hole at least 2” on each side and shall measure at least 27” x 27”. Fastening the cover to the tank shall be accomplished by drilling ¾” diameter holes 5” on center, 1” from the edge. The cover shall be rolled to the contour of the tank.

Testing

After the tank has been closed, but prior to filling the excavation, the tank shall be tested for leaks. The test will be accomplished by filling the tank with air to not less than 3 pounds per square inch, but not more than 5 pounds per square inch. This test shall hold, without fluctuation, for a period of one hour.

Test Wells

Prior to filling the excavation, a product monitoring system designed to Environmental Health Services specifications shall be installed.

Underground Piping

The installation and testing of all underground piping shall be done in accordance with E.H.S. and Fire Department regulations. The contractor shall contact E.H.S. and the Fire Department for inspections when all piping has been installed and prior to backfilling the excavation.