UST Deflection and Striker Plates Past and Present

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I. Introduction

"Deflection" plates per Underwriters Laboratories UL 1316 *Glass-fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products* and "striker" plates per UL 58 *Steel Underground Tanks for Flammable and Combustible Liquids* are the two most commonly used terms for reinforcing or wear plates installed on the bottom of an underground storage tank (UST) directly below the openings located on the top of the tank. The steel plate protects the bottom tank shell from repeated contact with the gauge stick when it is lowered through the tank opening during manual tank gauging. Often the gauge stick is dropped into the tank from the ground level, which, for a 12-foot diameter tank, can be some 18 feet above grade.

Manual tank gauging has become more frequent due to increased regulatory emphasis on following proper inventory control and tank truck delivery procedures. Manual stick gauging is performed before and after each delivery, for daily liquid level measurements and, where automatic tank gauges (ATG) are installed, for periodic confirmation that the ATG is performing properly.

II. Deflection Plate Location History

A. Fiberglass USTs

a. 1973-1977: Although UL 1316 was not revised to require a deflection plate under each opening or one opening that is so marked until 1983, fiberglass tank manufacturers made deflection plates an available option starting in 1973. In 1977, one deflection plate was standard and the tank user selected which fill opening would be so marked. However, tank users experienced field installation changes when the fill pipe location was relocated to the center or the opposite end of the UST.

b. 1979–1983: As early as 1979, certain fiberglass users specified deflection plates under two openings. By 1983, manufacturers were installing such plates under all three common openings (i.e., both ends and center) because conditions were not the same for each user.

c. 1986: By 1986, all fiberglass tanks were manufactured with deflection plates under all openings.

B. Steel USTs

a. UL 1746: *External Corrosion Protection Systems for Steel Underground Storage Tanks*, addresses three types of steel tanks, namely factory-installed galvanic-type cathodic protected, fiberglass-clad and HDPE jacketed steel tanks. In each case, the UL 1746 tanks are fabricated using UL 58 tanks, thus the UL 58 striker plate

requirements apply. It should be noted that Steel Tank Institute (STI) construction specifications sti-P3 and ACT-100 are more stringent than UL 58 or UL 1746. For example, the May 1, 1987, STI sti-P3 Specification required striker plates under each opening for tank diameters 64 inches and larger. Further, the STI ACT-100 External Corrosion Protection of FRP Composite Steel Underground Storage Tanks required striker plates under all openings.

b. UL 58: *Steel Underground Storage Tanks for Flammable and Combustible Liquids* post-1990 galvanic-type, fiberglass clad and jacketed steel tanks manufactured only to the UL 58 standard may contain one striker plate for the tank gauge opening. If there was an installation change or a later change in the opening used for gauging, a striker plate may be absent under the opening actually used for gauging.

III. Deflection Plate Specifications

A. UL 1316: While UL 1316 specifies 0.053-inch thick deflection plates a minimum of 9-inches wide and one square foot in area, fiberglass manufacturers use nominal 12 to 10-gauge (i.e., 0.105 - 0.1196 inch thick) plates that are 12 x 12 inches under each single opening. Also, although UL 1316 does not address man ways, fiberglass tank deflection plates are 12 x 24 inches for 22-inch diameter man ways and 12 x 36 inches for 36-inch man ways.

B. UL 58: UL 58 first addressed steel tank striker plates in August 1990 and specified a minimum 0.240-inch steel striker plate(s) 9-inches wide and one-square foot in area with the exception that if a fill pipe is used that extends at least 3/4 of the tank diameter into the tank, the area of the striker plate may be reduced to 64 square inches. Later, on December 13 1996, UL 58 was revised, eliminating the exception and reducing the minimum striker plate width to 8-inches and 64 square inches in area.

IV. Deflection Plate Installation

A. UL 1316: UL 1316 does not address plate installation. Manufacturers form the plate to fit the curvature of the tank where the plate is completely encapsulated using fiberglass and resin extending at least three inches beyond the outline of the plate. The resulting thickness of the plate and lay-up averages from a nominal 0.200 to 0.3125 inches and calibration charts are compensated for the deflection plate and lay-up thickness.

B. UL 58: UL 58 does not address plate installation. The sti-P3 specification requires 8-inch x 8-inch x 1/4-inch minimum size plates. The striker plates may be flat or rolled to conform to the internal surface of the tank and the specification states that the effect of a flat striker plate located in the bottom of small diameter tanks must be considered. Similar requirements are contained in the ACT-100 standard, but there is an additional requirement that installed flat or rolled striker plates leave a minimum 1/4-inch gap between the striker plate and the tank shell. ACT-100 also specifies that striker plates greater than 12 inches in width shall be rolled.

V. Deflection Plate Determination

Often, the presence of a deflection plate under a tank opening may be checked in the field by feeling the raised plate using a heavy-duty magnet suspended from the top of the tank on a cord (for fiberglass tanks) or a gauge stick (for steel tanks). While a fiberglass tank deflection plate and lay-up may be more difficult to “feel”, the relatively sharp edges of

a typical 1/4- inch flat steel tank striker plate can be felt. Finally, if there is any doubt, petroleum equipment suppliers' market non-intrusive retrofit metal plates that are inserted into the fill pipe for fiberglass tanks, but they should not be used in contact with steel tank bottoms.

VI. Summary

A. Fiberglass Tanks: Fiberglass tanks manufactured after 1986 (i.e., 27 years ago) should have deflection plates under all openings and many manufactured after 1983 should as well. USTs manufactured after 1979 should have deflection plates under the openings as specified by the user. For the most part, USTs purchased by major oil companies since 1973 should have at least one deflection plate.

B. Steel Tanks: While larger STI sti-P3 tanks manufactured after May 1987 should have striker plates under all openings, it was not until August 1990 when UL 58 and 1746 tanks were required to install either one or multiple striker plates and the one striker plate was to be so marked for the installer.

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