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Standard Guide for Using Release Detection Devices with Underground Storage Tanks[1]

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INTRODUCTION

Before presenting guidance on device selection and use, it is necessary to identify the three categories of release detection available for use by the public (Fig. 1). First, internal monitoring devices or procedures, or both, are used to determine the integrity of a storage tank system. These include periodic tank tightness tests and in-tank monitors. Measurements are used to make a statistical determination of whether a tank system is leaking as well as an estimate of the leak rate. Second, interstitial devices determine whether a release has occurred between the inner and outer walls of a double-walled tank or piping or the inner and outer barriers of a tank with secondary containment. Third, external devices, such as soil gas monitors and groundwater monitoring wells, detect releases from tank systems and in the tank excavation or surrounding environment.

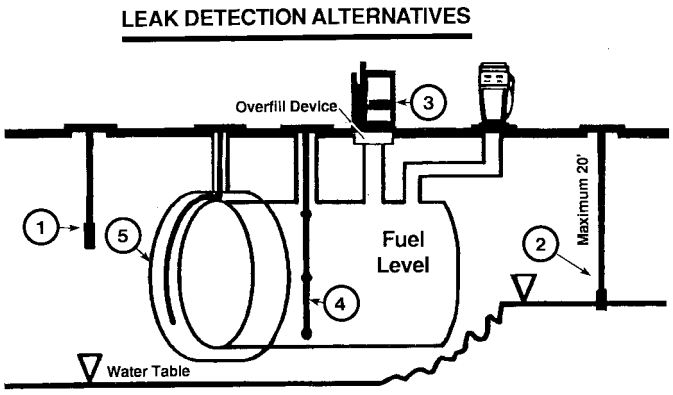

FIG. 1 Leak (Release) Detection Alternatives

1. Scope

1.1 This guide provides tank owners/operators, regulators, equipment manufacturers/suppliers, and others concerned with tanks, with information relevant to the selection and use of release detection devices for underground storage tanks (USTs) that contain petroleum products or other regulated substances. As used in the phrase "release detection devices," the meaning of release includes leak or spill. The "state-of-the-art" in release detection technology and techniques is rapidly evolving; therefore, this guidance cannot and will not provide design-related answers to when, where, or how to use or select appropriate detection devices. Rather, this guide introduces a common approach for using and selecting detectors as part of the design and use of an overall detection system. For more detailed information on release detection, Appendix X2 at the end of this guide should be reviewed.

1.2 *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*

D 2434 Test Method for Permeability of Granular Soils (Constant Head)[2]

2.2 *Federal Standard:*

40 CFR, 280.40 et Section, Subpart D-Release Detection[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *continuous detection*—refers to a permanently installed device that makes measurements, processes data, and signals, without operator involvement, if the data are outside normal operating conditions. These non-normal conditions may indicate a leak, spill, false alarm, or malfunctioning equipment.

[1] This guide is under the jurisdiction of ASTM Committee E-50 on Environmental Assessment and is the direct responsibility of Subcommittee E50.01 on Storage Tanks.

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[2] *Annual Book of ASTM Standards*, Vol 04.08.

[3] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

3.1.2 *external devices*—a term referring to release detection devices which operate outside the primary containment tank or piping where there is no secondary barrier.

3.1.3 *guide*—a series of options of instructions that does not recommend a specific course of action. A guide only suggests an approach. The purpose of a guide is to offer advice based on a consensus of viewpoints, but not establish a fixed procedure. A guide is intended to increase the awareness of the user to available techniques in a given subject area and to provide information from which subsequent evaluation and standardization can be derived.

3.1.4 *intermittent detection*—refers to detection methods in which operator on a periodic basis, must physically take measurements, or interpret data to determine whether a leak spill occurred or may have occurred. While an optimal manual system may approach daily operation, others may operate on a monthly, or even less frequent basis.

3.1.5 *internal devices*—a term referring to release detection devices which operate inside the tank or piping and usually measure change in product volume or variances in the normal mode of operation in a tank or piping.

3.1.6 *interstitial devices*—a term referring to release detection devices that operate in the space between a primary containment system and a secondary barrier. A secondary barrier can be a wall, liner, vault, and so forth.

3.1.7 *inventory reconciliation*—a determination of the volume of product placed into a tank and the volume removed or pumped out and identification of any discrepancy and what the ultimate fate of unreconciled product might be, for example, theft, leak, or improper measurement. The techniques and devices used for inventory reconciliation vary from very crude to highly automated.

3.1.8 *liquid detectors*—release detection devices which measure product in a liquid state in the environment or in the tank system.

3.1.9 *release*—any spilling, leaking, emitting, discharging, escaping, leaching, or disposing of a product stored in an UST, which is not usually an intended use of the product, causing exposure or potential exposure of the product to man or the environment in a manner that may cause harm.

3.1.10 *release detection devices*—any devices or systems utilized to detect loss of product from a storage tank system, such as from a leak or from a spill.

3.1.11 *standard*—a document that has been developed and established within the consensus principles of ASTM and conforms to ASTM approval requirements.

3.1.12 *underground storage tank systems*—any underground storage tank, connected piping, its ancillary equipment and containment system, if any.

3.1.13 *vapor detectors*—release detection devices which measure released products in a gaseous state in the environment or in the tank system.

3.1.14 *water table*—the upper limit of the portion of the ground wholly saturated with water.

4. Significance and Use

4.1 *It is not the intent of this guide to address fire, explosion, or health hazards related to the testing or monitoring of USTs with the methods discussed herein.*

4.2 Underground tanks are regulated pursuant to the Resource Conservation and Recovery Act, and state and various local environmental laws and regulations including fire codes. Federal regulation of release detection is provided for at 40 CFR 280.40. The federal rules also govern financial responsibility, corrective action, and other technical requirements for USTs. An abbreviation summary of the rules for petroleum tanks is contained in Appendix X1.

4.3 There is no single "best" release detection system for all tank locations given the wide variety of site conditions where USTs are located, the range of products stored in USTs, and the different operating principles employed in different detection systems. However, a uniform approach for selecting and using release detection technology is possible. This guide describes this approach and divides it into four steps which are discussed separately in Section 5:

Site assessment
Consideration of risk and reliability
Selection criteria for release detection
Response to a positive detection signal

5. Approach for Selecting and Using Leak Detection Devices

STEP 1

5.1 *Site Assessment*—Helps to identify the potential liability from consequences of a leak at a particular site in order to select the appropriate leak detection system. Site Assessment is an evaluation of various natural and manmade features of the site where the UST is located. These site characteristics can greatly influence the choice of appropriate detection technology.

5.1.1 The following series of general questions applies to some and not every site. The answers to these questions will provide sufficient information about the site to select a "proper" leak detection system. Some general observations about each question are provided to suggest the relevance of the parameters being addressed.

5.1.2 What is the nature of the native soil?

NOTE 1—Soil permeability influences the extent and rate of movement of any leaked or spilled material. Low permeability is generally associated with:

Low flow rate
Slow vapor transport
Confined spills

High permeability is generally associated with:

High flow rate
Rapid vapor movement
Disperse spills

Other soil properties such as soil organic carbon content, moisture level, and microbial activity may also affect transports of vapors and liquids. See Test Method D 2434 for a method on limitations for clays and fine grain materials.

5.1.3 What is the backfill material?

NOTE 2—The properties of the material that is reintroduced into the excavation zone as backfill affect the rate and extent of a leak or spill's movement. In general, low-permeability materials, such as clay, do not make appropriate backfill. Sand or gravel has higher permeability allowing for rapid liquid and vapor movement.

5.1.4 What is the depth to groundwater?

NOTE 3—The depth to the water table, including perched water table, is important to determine which detection systems are appropriate. If the