



Designation: D7352 – 18

## Standard Practice for Volatile Contaminant Logging Using a Membrane Interface Probe (MIP) in Unconsolidated Formations with Direct Push Methods<sup>1</sup>

This standard is issued under the fixed designation D7352; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This standard practice describes a field procedure for the rapid delineation of volatile organic compounds (VOC) in the subsurface using a membrane interface probe. Logging with the membrane interface probe is usually performed with direct push (DP) equipment. DP methods are typically used in soils and unconsolidated formations, not competent rock.

1.2 This standard practice describes how to obtain a real time vertical log of VOCs with depth. The data obtained is indicative of the total VOC level in the subsurface at depth. The MIP detector responses provide insight into the relative contaminant concentration based upon the magnitude of detector responses and a determination of compound class based upon which detectors of the series respond.

1.3 The use of a lithologic logging tool is highly recommended to define hydrostratigraphic conditions, such as migration pathways, and to guide confirmation sampling and remediation efforts. Other sensors, such as electrical conductivity, hydraulic profiling tool, fluorescence detectors, and cone penetration tools may be included to provide additional information.

1.4 Since MIP results are not quantitative, soil and water sampling (Guides D6001, D6282, D6724, and Practice D6725) methods are needed to identify specific analytes and exact concentrations. MIP detection limits are subject to the selectivity of the gas phase detector applied and characteristics of the formation being penetrated (for example: permeability, saturation, clay and organic carbon content).

1.5 The values stated in either SI units or inch-pound units [given in brackets] are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-

conformance with the standard. Reporting of test results in units other than SI shall not be regarded as nonconformance with this standard.

1.6 All observed and calculated values shall conform to the guidelines for significant digits and rounding established in Practice D6026, unless superseded by this standard.

1.6.1 The procedures used to specify how data is collected/recorded and calculated in the standard are regarded as the industry standard. In addition, they are representative of the significant digits that generally should be retained. The procedures used do not consider material variation, purpose for obtaining the data, special purpose studies, or any considerations for the user's objectives; and it is common practice to increase or reduce significant digits of reported data to be commensurate with these considerations. It is beyond the scope of these test methods to consider significant digits used in analytical methods for engineering data.

1.7 *This practice offers a set of instructions for performing one or more specific operations. This document cannot replace education or experience and should be used in conjunction with professional judgment. Not all aspects of this practice may be applicable in all circumstances. This ASTM standard is not intended to represent or replace the standard of care by which the adequacy of a given professional service must be judged, nor should this document be applied without the consideration of a project's many unique aspects. The word "standard" in the title means that the document has been approved through the ASTM consensus process.*

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

1.9 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D18 on Soil and Rock and is the direct responsibility of Subcommittee D18.21 on Groundwater and Vadose Zone Investigations.

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\*A Summary of Changes section appears at the end of this standard

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

- D653** Terminology Relating to Soil, Rock, and Contained Fluids
- D3740** Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction
- D5092** Practice for Design and Installation of Groundwater Monitoring Wells
- D5299** Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities
- D5730** Guide for Site Characterization for Environmental Purposes With Emphasis on Soil, Rock, the Vadose Zone and Groundwater (Withdrawn 2013)<sup>3</sup>
- D5792** Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
- D6001** Guide for Direct-Push Groundwater Sampling for Environmental Site Characterization
- D6026** Practice for Using Significant Digits in Geotechnical Data
- D6067** Practice for Using the Electronic Piezocone Penetrometer Tests for Environmental Site Characterization and Estimation of Hydraulic Conductivity
- D6282** Guide for Direct Push Soil Sampling for Environmental Site Characterizations
- D6724** Guide for Installation of Direct Push Groundwater Monitoring Wells
- D6725** Practice for Direct Push Installation of Prepacked Screen Monitoring Wells in Unconsolidated Aquifers
- D8037** Practice for Direct Push Hydraulic Logging for Profiling Variations of Permeability in Soils
- E355** Practice for Gas Chromatography Terms and Relationships
- E1689** Guide for Developing Conceptual Site Models for Contaminated Sites

## 3. Terminology

3.1 For definitions of common technical terms used in this standard, refer to Terminology **D653**.

### 3.2 Definitions of Terms Specific to This Standard:

3.2.1 *carry over*—retention of contaminant in the membrane and trunkline which may result in false positive results or an increased detector baseline at subsequent depth intervals.

3.2.2 *chemical response test*—a test of the working MIP system performed by exposing the MIP membrane to an aqueous phase solution with a known contaminant of known concentration.

3.2.2.1 *Discussion*—Performed before and after each MIP

log to validate the MIP system performance. Also used so that log data from different locations across a site may be compared.

3.2.3 *closed couple flow*—the trunkline carrier gas return flow with the trunkline gas lines connected together when the MIP probe is bypassed.

3.2.3.1 *Discussion*—Used during troubleshooting to determine the source of a gas leak in the MIP system.

3.2.4 *gas dryer*—a selectively permeable membrane tubing is used to continuously dry the MIP carrier gas stream before it enters the detectors by removing only water vapor.

3.2.4.1 *Discussion*—The gas dryer may need to be removed to improve detection of some analytes with high water solubility, such as MTBE, acetone, dioxane or ethanol.

3.2.5 *gas phase detectors*—heated laboratory grade detectors used for gas chromatography (Practice **E355**).

3.2.5.1 *Discussion*—Carrier gas effluent from the MIP probe flows through these detectors at the surface for the analysis of VOCs. Detectors most often used with the MIP include photoionization detector (PID), flame ionization detector (FID), and a halogen specific detector (XSD) (**Fig. A2.2**). Other, appropriate gas phase detectors may be used.

3.2.6 *membrane interface probe (MIP)*—a subsurface logging tool for detection of VOCs.

3.2.7 *parts per billion (ppb)*—the number of units of a contaminant per 1 billion units of total mass, typically measured as either µg/Kg or µg/L depending if a solid or liquid is being measured.

3.2.8 *parts per million (ppm)*—the number of units of a contaminant per 1 million units of total mass, typically measured as either mg/Kg or mg/L depending if a solid or liquid is being measured.

3.2.9 *trigger*—software icon interface between the operator and the acquisition software to initiate or terminate data collection.

3.2.10 *trip time*—the time required for an analyte to diffuse across the semipermeable membrane and travel to the gas phase detectors at the surface through a fixed length of tubing.

3.2.11 *trunkline*—a durable, protective jacketed cord containing electrical wires for the heaters in the probe block, electrical wires for other sensors, and tubing for the transport of carrier gas and the analytes to the surface detectors which is pre-strung through steel drive rods prior to logging.

3.2.11.1 *Discussion*—The trunkline connects the MIP probe containing the onboard sensors with the surface instrumentation.

3.2.12 *working standard*—an aqueous chemical standard used in response testing the MIP system.

## 4. Summary of Practice

4.1 This practice describes the field method for delineation of VOCs with depth via the MIP (**1-4**).<sup>4</sup> The MIP is advanced through the soil or unconsolidated formations using a direct

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> The boldface numbers in parentheses refer to the list of references at the end of this standard.