



Designation: **E947 – 83 (Reapproved 2007) E947 – 83 (Reapproved 2015)**

## Standard Specification for Sampling Single-Phase Geothermal Liquid or Steam for Purposes of Chemical Analysis<sup>1</sup>

This standard is issued under the fixed designation E947; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This specification covers the basic requirements for equipment to be used for the collection of uncontaminated and representative samples from single-phase geothermal liquid or steam. Geopressured liquids are included. See Fig. 1.

### 2. Referenced Documents

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

**D1192 Guide for Equipment for Sampling Water and Steam in Closed Conduits** (Withdrawn 2003)<sup>3</sup>

### 3. Application

3.1 This specification covers only that equipment which is commonly used for the sampling of single-phase geothermal liquid or steam. It does not cover specialized equipment required for, and unique to, a specific test or method of analysis. The specification covers items such as valves, fittings, tubing, cooling coils and condensers, pumps, degassers, sample containers, sample probes, and packaging materials, but excludes equipment used in specific testing and analysis.

3.2 This procedure applies to single-phase steam or liquid streams prior to separation and to separated single-phase steam or liquid streams.

3.3 For most geothermal and geopressured fluids tested by the procedures outlined in this specification, both liquid and gas samples may be collected.

### 4. Sample Probes

4.1 Sample probes shall be used to extract liquid or steam from the main part of the geothermal flow rather than using a wall-accessing valve and pipe arrangement.

4.1.1 The probe permits the sampling of various positions within the flow to determine whether stratified or annular two-phase flow is present which would bias a single-point sample.

4.2 Sample probes shall be designed to extract representative samples from flowing systems. Special attention during construction of the probe shall be given to the stresses that the probe will later be subjected to during insertion into, and operation in, a pressurized flowing system.

4.3 The sampling probe (see Fig. 2) passes through the sliding seal and access valve in order that liquid or steam can be sampled from the mainstream of the flow line. Thereafter, the sample contacts only surfaces that the operator can verify are noncontaminating and nonabsorbing.

4.3.1 Moving the probe tip across the diameter of the pipe may allow the operator to determine the existence of stratification or multiphase sampling problems.

4.3.2 Flow regulation is accomplished downstream of the cooling coils in order to avoid residual flashing into steam at the point of pressure reduction. Flashing may cause scale deposition which would preclude the accurate determination of certain constituents.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee E44 on Solar, Geothermal and Other Alternative Energy Sources and is the direct responsibility of Subcommittee E44.15 on Geothermal Field Development, Utilization and Materials.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at 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.

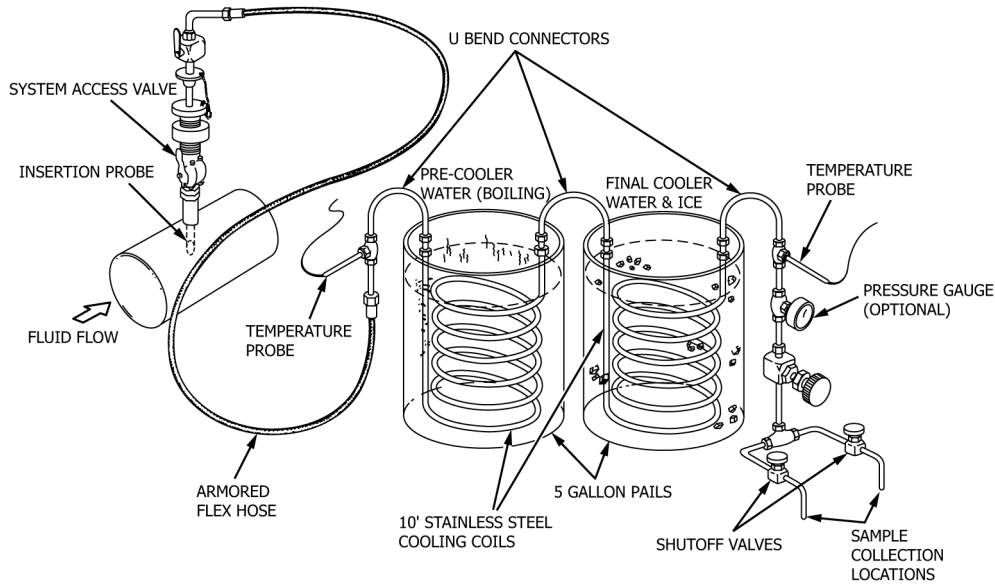


FIG. 1 Example Assembly (Particularly Suited for Liquid Flows)

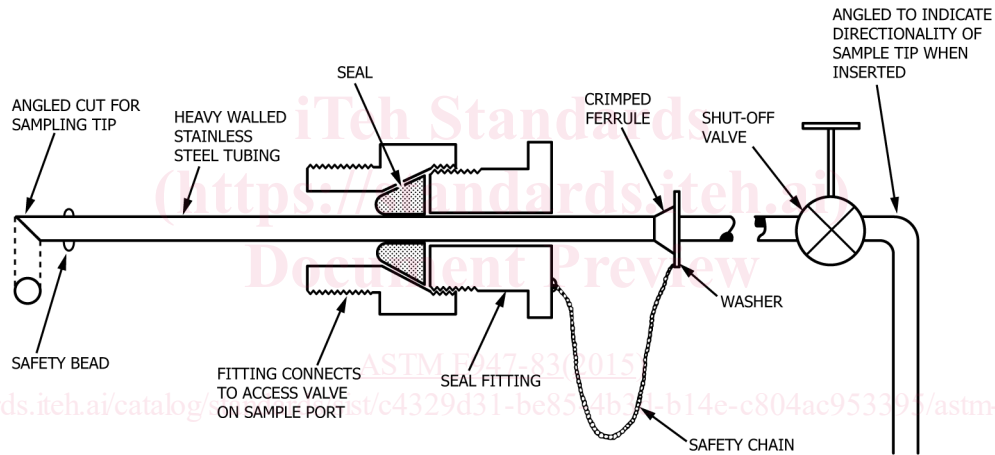


FIG. 2 Sample Probe

## 5. Sampling Lines

5.1 *Safety*—Sampling lines shall be as short as practical and of sufficient strength to prevent structural failure.

5.2 *Construction*—All sample lines shall be constructed to eliminate traps in which condensate, entrained particulates, or scale precipitates might settle since they may be partially emptied with changes in flow conditions and may result in sample contamination. Allow for thermal expansion.

## 6. Valves, Fittings, and Gages

6.1 Valves which control access to the sampling point shall have straight throats (frequently designated as ball, plug, and gate valves). This permits a probe to be inserted directly into the flow.

6.2 It is recommended that at least one full-port shut-off valve be placed on the downstream end of the sample probe so that the sampling line may be isolated when desired.

6.3 Throttling devices such as valves, capillary tubes, or orifices, if used, shall be placed at the sample outlet of the cooler or condenser. This practice will ensure cooling at the highest pressure and will minimize the possibility of fluid flashing or scale forming in the cooling coil. A head column such as that recommended for normal water and steam sampling (Specification D1192, for Equipment for Sampling Water and Steam) shall not be used because it provides a mechanism for gas separation and escape prior to sample collection.

6.4 Equipment adequate to determine the pressure and temperature of the mainsteam liquid or steam flow shall be utilized.