Designation: E947 – 22

Standard Specification for Sampling Single-Phase Geothermal Liquid or Steam for Purposes of Chemical Analysis[1]

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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

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

1.2 The values stated in SI units are to be regarded as standard. The values given in parentheses after SI units are provided for information only and are not considered standard.

1.3 *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.*

1.4 *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.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1192 Guide for Equipment for Sampling Water and Steam in Closed Conduits (Withdrawn 2003)[3]

E1675 Practice for Sampling Two-Phase Geothermal Fluid for Purposes of Chemical Analysis

3. Application

3.1 The equipment 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, sample containers, and sample probes, but excludes equipment used in specific testing and analysis.

3.2 The sampling procedure applies to sampling of single-phase steam or liquid streams, including single-phase steam or liquid streams separated from two-phase flow as described in Practice E1675, dry saturated steam, superheated steam, and pumped geothermal liquid. The sampling procedure is not applicable to the collection of liquid droplets and entrained solids in steam (steam quality and purity), which must be collected by isokinetic sampling utilizing different equipment and techniques. The single-phase steam sampling specification applies to vapor-phase species in the steam only (noncondensable gases, HCl and boric acid). The single-phase liquid sampling specification applies to fully dissolved species in the liquid only, including noncondensable gases if no gas bubbles are present (gas breakout).

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

4. Sample Probes

4.1 Sampling 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. This allows a representative sample to be collected of a homogeneous, single-phase fluid. The probes are not designed for multi-phase sampling or sampling under isokinetic conditions (see Fig. 1). Consideration should be given to the force generated by any specific combination of probe diameter and system pressure and to the limitations and safety of sliding seals. A combination of probe tip bead and safety chain are recommended to restrict forcible ejection of the probe from the line being sampled. In some cases, a permanently installed sampling probe is preferred.

4.2 Sample probes shall be designed to extract representative samples from homogeneous single-phase fluid flow. Special attention during construction of the probe shall be given to

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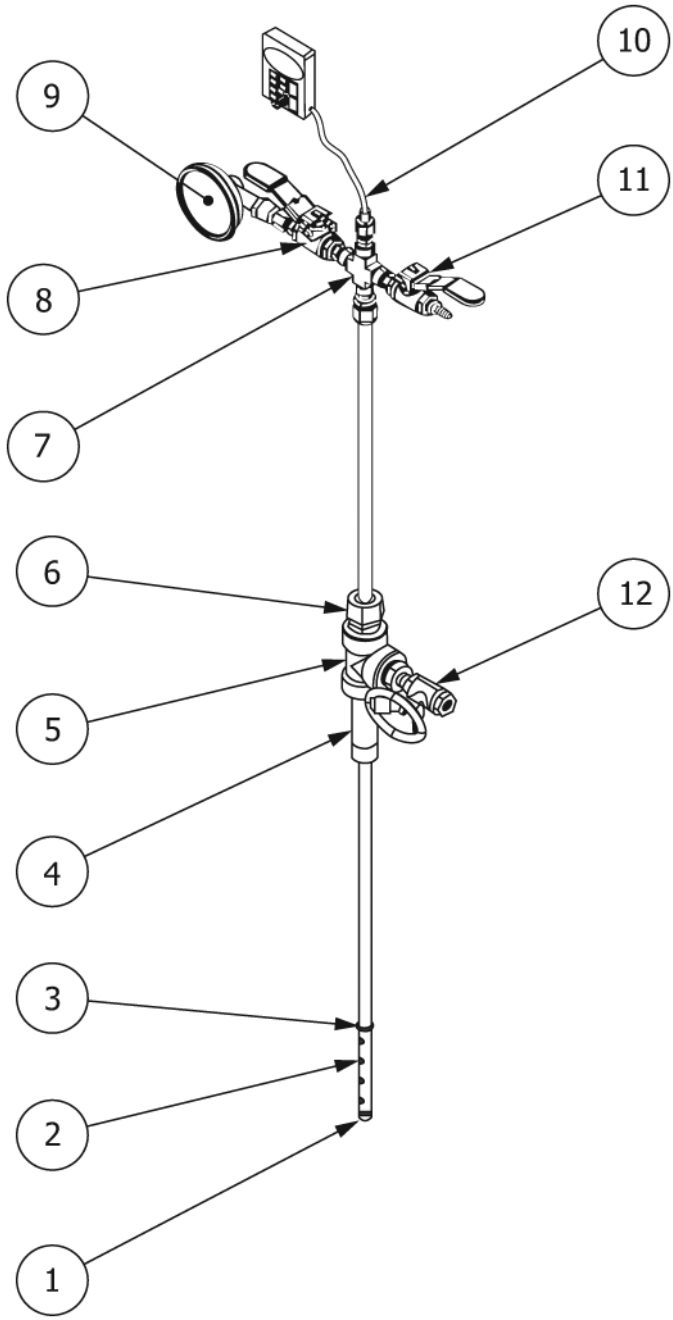
[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.



(1) Welded probe tip, 12.7 mm (½ in.) diameter probe
(2) Sample holes, 6.4 mm (¼ in.) diameter, 4 each
(3) Welded bead safety stop
(4) Pipe nipple, 19.0 mm (¾ in.) NPT
(5) Probe tee, 19.0 mm (¾ in.) NPT
(6) Packing gland with PTFE or flexible graphite sliding seal element, 12.7 mm (½ in.) bore size
(7) Probe cross, 6.4 mm (¼ in.) NPT
(8) Pressure port valve, 6.4 mm (¼ in.) NPT, PTFE seals
(9) Pressure gauge, vibration dampening, range 0 kPa to 2000 kPa (0 psig to 300 psig)
(10) Thermocouple, Type K, transition joint, 3.175 mm (⅛ in.) sheath, length sufficient to reach tip of probe, signal cable
(11) Sample Port Valve, 6.4 mm (¼ in.) NPT, PTFE seals, #6 Male AN/JIC fitting
(12) Vent port valve, 6.4 mm (¼ in.) NPT, PTFE seals

Material specification: All metal components made from UNS S30400, S31600, S30403, or S31603. Alternative materials, such as N06625 may be appropriate when sampling conditions are likely to cause stress corrosion cracking.

FIG. 1 Single-Phase Sampling Probe