



# Standard Practice for Containing Hydrocarbon Fluid Samples Using a Floating Piston Cylinder<sup>1</sup>

This standard is issued under the fixed designation D 3700; 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 practice describes equipment and a procedure for obtaining a representative sample of a homogeneous hydrocarbon fluid and the subsequent preparation of that sample for laboratory analysis.

1.2 It is not possible, nor is it the intent of this practice, to provide a procedure that will be applicable for all sampling situations. It is strongly recommended that the samples be obtained under the supervision of a person knowledgeable in the phase behavior of hydrocarbon systems and experienced in all sampling operations.

1.3 This practice does not include recommendations for the location of the sampling point in a line or vessel, although the importance of the proper sampling location cannot be over-emphasized.

1.4 *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 and health practices and determine the applicability of regulatory limitations prior to use.* For specific hazard statements, see 5.1 and Annex A2.

## 2. Summary of Practice

2.1 A hydrocarbon fluid sample is transferred under pressure from a source to a moving piston cylinder. The piston-type cylinder is designed to collect fluid samples by displacing a pressurizing fluid (usually an inert gas) at sampling pressure. The piston serves as a barrier between the sample and the inert gas which maintains the integrity of the sample by preventing the selective absorption of sample components in the pressurizing fluid as is possible in conventional displacement techniques. The method provides for a 20 % inert gas volume for safe storage and transport of the sample.

## 3. Significance and Use

3.1 The objective of any sampling operation is to secure, in a suitable container, an adequate portion of hydrocarbon fluid under pressure having the same composition as the stream being sampled.

3.2 Particular emphasis should be given to the necessity of obtaining accurate, representative samples for analysis since those analyses, regardless of the care and accuracy of the laboratory test, can be useless if the samples are not valid.

## 4. Apparatus

4.1 *Container*, shown in Fig. 1 as Cylinder X, constructed of metal tubing, honed, and polished on the inside surface. The cylinder is closed with threaded end caps to provide access to remove and service the moving piston. The end caps are drilled and tapped for valves. The cylinder is designed to exceed the maximum pressure anticipated during sampling and to be resistant to materials being sampled, the pressurizing fluid, the cleaning solvents, and the expected corrodents. The volume of the cylinder will depend on the amount of sample needed for the laboratory analysis.

4.1.1 The cylinder contains a moving piston. The piston is equipped with O-rings, TFE-fluorocarbon rings, or other devices to affect a leak-free seal between the sample and the pressurizing fluid, and to allow for the free movement of the piston within the cylinder. The use of guide rings is recommended to ensure smooth piston travel. The piston and sealing device must be resistant to the sample, the pressurizing fluid, the cleaning solvents, and expected corrodents.

4.1.2 All valves and safety devices must meet the appropriate material and pressure specifications.

4.2 *Displacement Container*—This container, Fig. 1, Cylinder Y, shall be fabricated from metal tubing, be designed to meet the same pressure requirements as the piston cylinder, and have a volume of no more than 80 % of the pressurizing volume of the piston cylinder (80 % of piston cylinder volume minus the volume of the piston).

4.3 *Transfer Lines, Valves, and Gages*—The transfer system shall be designed to exceed the maximum anticipated pressure and be resistant to all expected corrodents. The transfer lines should have a minimum diameter of 6.35 mm ( $\frac{1}{4}$ in.) and be as short as is practical, see Fig. 1. The use of filters and dryers is discouraged.

## 5. Hazards

### 5.1 Safety Precautions:

5.1.1 **Warning**—Sampling hydrocarbon fluids can be hazardous. Persons responsible for obtaining samples should be familiar with and adhere to safe practices for handling flammable fluid under pressure.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee D-2 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.01 on Liquefied Petroleum Gases.

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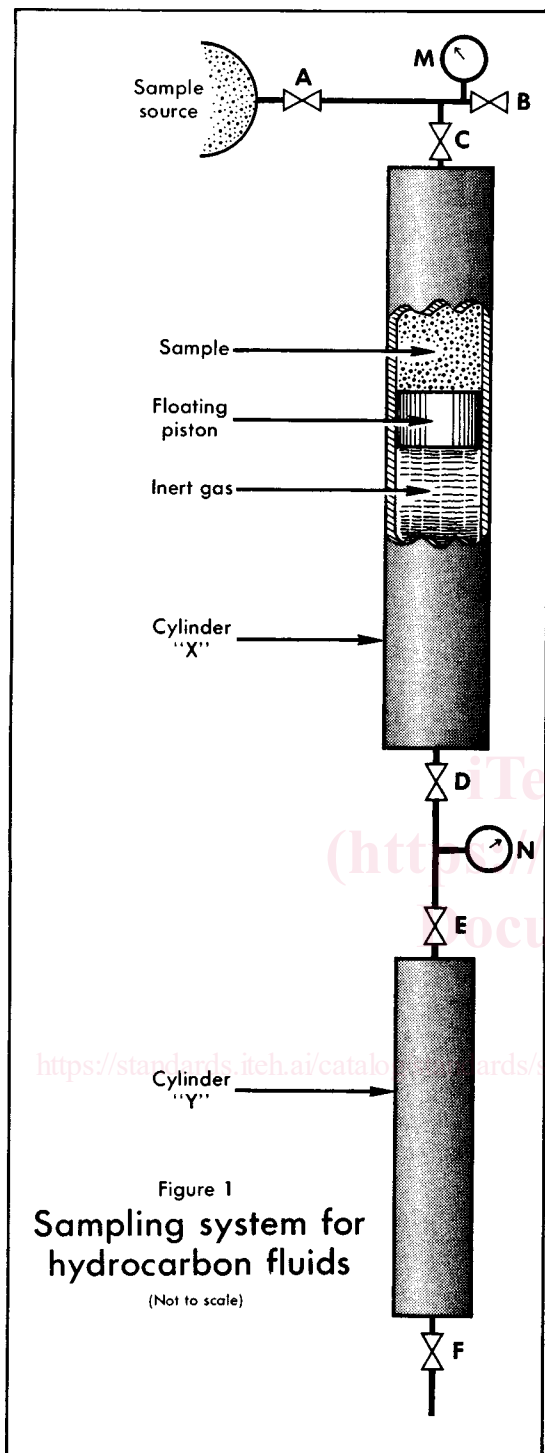


Figure 1  
**Sampling system for hydrocarbon fluids**  
 (Not to scale)

5.1.2 Disassembly of the piston cylinder for maintenance presents a special hazard. Should either end cap be removed while pressure is on the cylinder, the end caps and the piston can be ejected with such force as to cause serious injury to personnel and damage to adjacent equipment. The following steps are recommended for disassembly:

5.1.2.1 **Precaution**—Clamp the piston cylinder firmly to a steady work surface.

5.1.2.2 Vent both ends of the cylinder to atmospheric

pressure before attempting to remove either end cap.

5.1.2.3 Clear the area at either end of the cylinder before loosening the end plug.

5.1.2.4 Provide a mechanical plunger to dislodge the piston from the cylinders. Do not use fluid pressure.

5.2 *Technical Precautions:*

5.2.1 A certain amount of information about a sample is necessary before it can be intelligently handled in the laboratory. Absolutely essential are the sample source, sample date, cylinder identification, sample pressure and temperature, ambient temperature, type of analysis required, and the sampling method used. There can be additional related facts such as field-determined results and operating conditions which will assist in the evaluation of the analytical data. This information should accompany the filled sample cylinder.

5.2.2 If the hydrocarbon fluid samples are to be transported by common carrier within the United States, the sample containers must meet the specifications and be labeled according to the Hazardous Materials Regulations of the Department of Transportation.

5.2.3 Containers must be thoroughly cleaned prior to sampling with an appropriate volatile solvent, for example, petroleum naphtha followed by acetone, and evacuated to remove traces of the solvent. The use of detergent/water solutions or steam is not recommended.

6. **Laboratory Preparation**

6.1 The following procedure is recommended for liquid-phase samples:

6.1.1 Check the sample pressure on inert gas end, Valve D. The sample pressure should equal the sample source pressure corrected for the laboratory ambient temperature.

6.1.2 Connect the external pressure source of inert gas to Valve D and adjust the sample pressure equal to the saturation pressure of the sample at the laboratory ambient temperature plus a minimum of 1380 kPa (200 psi).

6.1.3 Rock the sample cylinder to ensure that the sample is homogeneous.

6.1.4 Place the cylinder in a horizontal position. The sample is now ready to transfer for analysis. The pressure described in 6.1.2 must be maintained on the sample during the transfer operation.

6.1.5 For use with gaseous phase samples, refer to Annex A1.

7. **Sampling Procedure**

7.1 Use the displacement cylinder technique for the liquid phase samples.

7.1.1 With the sample side of the piston cylinder evacuated (from cleaning operation) and Valve C closed, fill the displacement end with an inert gas to approximately (68.9 kPa) (10 psi) above the sampling pressure. Close Valve D.

7.1.2 Connect piston Cylinder X to sample Source A and displacement Cylinder Y to piston cylinder as shown in Fig. 1. Fill the displacement cylinder with air at atmosphere pressure.

7.1.3 With Valves B and C closed, open sample Valve A to full open position. Observe the sample source pressure on Gage M. Crack Valve B and fitting to Valve C to purge line. Do not allow Pressure M to drop below sample