



Designation: F 306 – 70 (Reapproved 1999)

An American National Standard

Standard Practice for Sampling Particulates from Man-Accessible Storage Vessels for Aerospace Fluids by Vacuum Entrainment Technique (General Method)¹

This standard is issued under the fixed designation F 306; 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 practice covers a procedure for the collection of particulate contamination in the analysis of cleanliness of man-accessible propellant tanks and storage vessels.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

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 and health practices and determine the applicability of regulatory limitations prior to use.* (See hazard statement, Section 5.

2. Referenced Documents

2.1 ASTM Standards:

E 11 Specification for Wire-Cloth Sieves for Testing Purposes²

3. Summary of Practice

3.1 Using mechanical vibration to loosen particulate matter, contamination is collected by means of a vacuum impingement on a collection device.

4. Apparatus

4.1 *Plastic Hammer*, approximately 8 oz (250 mL).

4.2 *Vacuum Cleaner*.

4.3 *Wand Attachment*, with screen adapter and extension pieces or equivalent.

4.4 *Screens*, conforming to Specification E 11.

4.5 *Screen Holder*, to adapt to wand.

4.6 *Wiping Cloth*, of hydrocarbon-controlled synthetic fiber, lint-free, with sealed edges to prevent fraying.

4.7 *Suitable Solvent* having a nonvolatile residue of 10 ppm or less.

NOTE 1—Reference solvent selected for safety and function, such as

¹ This practice is under the jurisdiction of ASTM Committee E-21 on Space Simulation and Applications of Space Technology and is the direct responsibility of Subcommittee E21.05 on Contamination.

Current edition approved Aug. 14, 1970. Published October 1970. Originally issued 1966. Replaced D 2537 – 66 T. Redesignated F 306 in 1970. Last previous edition F 306 – 70.

² *Annual Book of ASTM Standards*, Vol 14.02.

low residue conforming to trichlorotrifluoroethane MIL-C-81302 or trichloroethylene MIL-T-27602, has been found suitable.

4.8 *Suitable Plastic Film*.

4.9 *Flashlight*, wrapped with clean poly-(vinyl chloride) (PVC) tape.

4.10 *Oxygen Analyzer*, portable.

4.11 *Explosimeter*.

4.12 *Protective Clothing*, consisting of the following:

4.12.1 Clean shoe covers,

4.12.2 Clean coveralls,

4.12.3 Clean gloves, and

4.12.4 Clean head covering.

4.13 *Clean Air-Breathing Equipment*, as required where entry is necessary in other than normal atmospheres.

5. Safety Hazards

5.1 The atmosphere in the vessels should be checked with an oxygen analyzer to ensure that it is safe for man-entry. If the vessel atmosphere is deficient in oxygen, personnel shall wear breathing equipment while in the vessel.

5.2 The atmosphere shall also be checked with explosimeter to ensure that no explosive or flammable hazard exists before entry.

6. Procedure

6.1 Clean the area adjacent to the manhole cover with a vacuum cleaner followed by wiping with a clean cloth moistened with solvent.

6.2 Cover the adjacent area to the tank with polyethylene film or protective paper that is to be used only by personnel donning or removing tank-entry clothing.

6.3 Personnel entering the tank shall don protective clothing.

6.4 Remove the manhole cover, wrap with polyethylene film, and store in a safe place.

6.5 Inspect the inside of the tank for structural or equipment damage.

6.6 Remove the particles that are lodged in inaccessible areas by using blasts of filtered compressed air or nitrogen.

6.7 Begin the vacuum-cleaning inspection at one end of the tank and work toward the manhole entrance, taking care to vacuum entrapment areas and fraying edges. During the entire vacuum-cleaning operation, use a plastic hammer to vibrate the

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internal structure of the tank to loosen trapped particles. Hold a flashlight close to and nearly parallel with the surface being cleaned to most effectively show up contaminating particles.

6.8 The tapping or vibrating operation must not be vigorous to the extent that it will cause any damage to tank members or structure. The impact shall not exceed that delivered by the hammer in a free fall of 12 in. (305 mm). The tapping operation shall be timed to deliver one blow every 2 s with the points of impact spaced approximately 1 in. (25 mm) apart.

6.9 Tapping shall start halfway up the tank wall and extend to the bottom on one side, then to the top on the opposite side. If the tank can be rotated, the process shall be undertaken on the other half of the tank in the same manner. Care should be taken not to tap on frangible members or sections where damage might occur.

6.10 Hold the vacuum wand close to the area being tapped to pick up loosened particles and prevent them from falling and becoming lodged in other areas of the tank.

6.11 After the first vacuum-cleaning operation, inspect the tank for evidence of the following:

6.11.1 Visually examine, without the aid of magnification, evidence of oil, grease, ink markings, residual organic contamination, or other foreign material on surfaces that contact liquid propellants.

6.11.2 If such contaminants are found, remove them by wiping the surfaces of the tank clean, using clean cloth

dampened with solvent, having a nonvolatile residue of 10 ppm or less.

6.12 Install a screen trap into the vacuum wand and vacuum the tank a second time, as described in 6.7. The second vacuum cleaning operation (and any subsequent cleaning) shall be performed to qualify the tank to meet the cleanliness requirements.

6.13 After the vacuum-cleaning inspection operation is completed, remove the hose from the tank while the vacuum is on. Hold the wand that contains the screen trap in a vertical position to prevent loss of particles collected on the screen. After removal from the tank, stop the vacuum carefully, remove the screen trap, and secure a suitable plastic film such as polyethylene or poly(vinyl chloride) over the end. Deliver the screen trap and adaptor for analysis of particle count with the particles to the appropriate laboratory for analysis of particle count evaluation.

6.14 After a tank has been inspected, all equipment and personnel are out, and safety requirements have been complied with, replace the manhole cover and seal by an antitamper method.

7. Keywords

7.1 aerospace fluids; particulates; vacuum entrainment technique

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