

## **§ 178.42 Specification 3E seamless steel cylinders.**

- (a) **Type, size, and service pressure.** A DOT 3E cylinder is a seamless steel cylinder with an outside diameter not greater than 2 inches nominal, a length less than 2 feet and a service pressure of 1,800 psig.
- (b) **Steel.** Open-hearth or electric steel of uniform quality must be used. Content percent may not exceed the following: Carbon, 0.55; phosphorus, 0.045; sulphur, 0.050.
- (c) **Identification of steel.** Materials must be identified by any suitable method.
- (d) **Manufacture.** Cylinders must be manufactured by best appliances and methods. No defect is permitted that is likely to weaken the finished cylinder appreciably. A reasonably smooth and uniform surface finish is required. The thickness of the spun bottom is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thickness must be measured within an area bounded by a line representing the points of contact between the cylinder and floor when the cylinder is in a vertical position.
- (e) **Openings in cylinders and connections (valves, fuse plugs, etc.) for those openings.** Threads conforming to the following are required on openings.
- (1) Threads must be clean cut, even, without checks, and to gauge.
  - (2) Taper threads, when used, must be of length not less than as specified for American Standard taper pipe threads.
  - (3) Straight threads having at least 4 engaged threads are authorized. Straight threads must have a tight fit and a calculated shear strength of at least 10 times the test pressure of the cylinder. Gaskets, adequate to prevent leakage, are required.
- (f) **Pressure testing.** Cylinders must be tested as follows:
- (1) One cylinder out of each lot of 500 or fewer must be subjected to a hydrostatic test pressure of 6,000 psig or higher.
  - (2) The cylinder referred to in [paragraph \(f\)\(1\)](#) of this section must burst at a pressure higher than 6,000 psig without fragmenting or otherwise showing lack of ductility, or must hold a pressure of 12,000 psig for 30 seconds without bursting. In which case, it must be subjected to a flattening test without cracking to six times wall thickness between knife edges, wedge shaped 60 degree angle, rounded out to a 1/2 inch radius. The inspector's report must be suitably changed to show results of latter alternate and flattening test. The testing equipment must be calibrated as prescribed in CGA C-1 (IBR, see [§ 171.7 of this subchapter](#)). All testing equipment and pressure indicating devices must be accurate within the parameters defined in CGA C-1.

(3) The remaining cylinders of the lot must be pressure tested by the proof pressure water-jacket or direct expansion test method as prescribed in CGA C-1. Cylinders must be examined under pressure of at least 3,000 psig and not to exceed 4,500 psig and show no defect. Cylinders tested at a pressure in excess of 3,600 psig must burst at a pressure higher than 7,500 psig when tested as specified in [paragraph \(f\)\(2\)](#) of this section. The pressure must be maintained for at least 30 seconds and sufficiently longer to ensure complete examination. The testing equipment must be calibrated as prescribed in CGA C-1. All testing equipment and pressure indicating devices must be accurate within the parameters defined in CGA C-1. If, due to failure of the test apparatus or operator error, the test pressure cannot be maintained, the test may be repeated in accordance with CGA C-1 5.7.2 or 7.1.2, as appropriate. Determination of expansion properties is not required.

(g) **Leakage test.** All spun cylinders and plugged cylinders must be tested for leakage by gas or air pressure after the bottom has been cleaned and is free from all moisture subject to the following conditions and limitations:

(1) A pressure, approximately the same as but not less than the service pressure, must be applied to one side of the finished bottom over an area of at least 1/16 of the total area of the bottom but not less than 3/4 inch in diameter, including the closure, for at least one minute, during which time the other side of the bottom exposed to pressure must be covered with water and closely examined for indications of leakage. Accept as provided in [paragraph \(h\)](#) of this section, a cylinder must be rejected if there is any leakage.

(2) A spun cylinder is one in which an end closure in the finished cylinder has been welded by the spinning process.

(3) A plugged cylinder is one in which a permanent closure in the bottom of a finished cylinder has been effected by a plug.

(4) As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, the manufacturer shall design the test apparatus so that the pressure is applied to the smallest area practicable, around the point of closure, and so as to use the smallest possible volume of air or gas.

(h) **Rejected cylinders.** Reheat treatment is authorized for rejected cylinders. Subsequent thereto, cylinders must pass all prescribed tests to be acceptable. Repair by welding or spinning is not authorized. Spun cylinders rejected under the provisions of [paragraph \(g\)](#) of this section may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

(i) **Marking.** Markings required by [§ 178.35](#) must be stamped plainly and permanently on the shoulder, top head, neck or sidewall of each cylinder.

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