§ 178.59 Specification 8 steel cylinders with porous fillings for acetylene.

(a) **Type and service pressure.** A DOT 8 cylinder is a seamless cylinder with a service pressure of 250 psig. The following steel is authorized:

1. A longitudinal seam if forge lap welded;
2. Attachment of heads by welding or by brazing by dipping process; or
3. A welded circumferential body seam if the cylinder has no longitudinal seam.

(b) **Steel.** Open-hearth, electric or basic oxygen process steel of uniform quality must be used. Content percent may not exceed the following: Carbon, 0.25; phosphorus, 0.045; sulphur, 0.050.

(c) **Identification of steel.** Materials must be identified by any suitable method except that plates and billets for hot-drawn cylinders must be marked with the heat number.

(d) **Manufacture.** Cylinders must be manufactured using equipment and processes adequate to ensure that each cylinder produced conforms to the requirements of this subpart. No defect is acceptable that is likely to weaken the finished cylinder appreciably. A reasonably smooth and uniform surface finish is required. Welding procedures and operators must be qualified in accordance with CGA Pamphlet C-3 (IBR, see § 171.7 of this subchapter).

(e) **Exposed bottom welds.** Exposed bottom welds on cylinders over 18 inches long must be protected by footrings.

(f) **Heat treatment.** Body and heads formed by drawing or pressing must be uniformly and properly heat treated prior to tests.

(g) **Openings.** Openings in the cylinders must comply with the following:

1. Standard taper pipe threads are required;
2. Length may not be less than as specified for American Standard pipe threads; tapped to gauge; clean cut, even, and without checks.

(h) **Hydrostatic test.** Each cylinder must successfully withstand a hydrostatic test as follows:

1. The test must be by water-jacket, or other suitable method, operated so as to obtain accurate data. The pressure gauge must permit reading to an accuracy of 1 percent. The expansion gauge must permit reading of total expansion to an accuracy of either 1 percent or 0.1 cubic centimeter.
2. Pressure must be maintained for at least 30 seconds and sufficiently longer to ensure complete expansion. Any internal pressure applied after heat-treatment and previous to the official test may not exceed 90 percent of the test pressure.
3. Permanent volumetric expansion may not exceed 10 percent of total volumetric expansion at test pressure.
4. One cylinder out of each lot of 200 or less must be hydrostatically tested to at least 750 psig. Cylinders not so tested must be examined under pressure of between 500 and 600 psig and show no defect. If hydrostatically tested cylinder fails, each cylinder in the lot may be hydrostatically tested and those passing are acceptable.

(i) **Leakage test.** Cylinders with bottoms closed in by spinning must be subjected to a leakage test by setting the interior air or gas pressure to not less than the service pressure. Cylinders which leak must be rejected.

(j) **Physical test.** A physical test must be conducted as follows:

1. The test is required on 2 specimens cut longitudinally from 1 cylinder or part thereof taken at random out of each lot of 200 or less, after heat treatment.
2. Specimens must conform to a gauge length of 8 inches with a width not over 1 1/2 inches, a gauge length of 2 inches with width not over 1 1/2, or a gauge length at least 24 times thickness with a width not over 6 times thickness is authorized when a cylinder wall is not over 3/16 inch thick.
3. The yield strength in tension must be the stress corresponding to a permanent strain of 0.2 percent of the gauge length. The following conditions apply:
   1. The yield strength must be determined by either the “offset” method or the “extension under load” method as prescribed in ASTM E 8 (IBR, see §171.7 of this subchapter).
   2. In using the “extension under load” method, the total strain (or “extension under load”) corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined with sufficient accuracy by calculating the elastic extension of the cylinder.
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The tare weight is the combined weight of the cylinder proper, porous filling, valve, and solvent, without removable cap.

(n) Duties of inspector. In addition to the requirements of §178.35, the inspector is required to—

(1) Certify chemical analyses of steel used, signed by manufacturer thereof; also verify by, check analyses of samples taken from each heat or from 1 out

(2) When the porosity of each cylinder is not known, a cylinder taken at random from a lot of 200 or less must be tested for porosity. If the test cylinder fails, each cylinder in the lot may be tested individually and those cylinders that pass the test are acceptable.

(3) For filling that is molded and dried before insertion in cylinders, porosity test may be made on a sample block taken at random from material to be used.

(4) The porosity of the filling material must be determined. The amount of solvent at 70 °F for a cylinder:

(i) Having shell volumetric capacity above 20 pounds water capacity (nominal) may not exceed the following:

(ii) Having volumetric capacity of 20 pounds or less water capacity (nominal), may not exceed the following:

(iii) Porous filling. (1) Cylinders must be filled with a porous material in accordance with the following:

(iv) The clearance may not impair the functions of the filling material;

(v) The installed filling material must meet the requirements of CGA C–12 (IBR, see §171.7 of this subchapter); and

(vi) Porosity of filling material may not exceed 80 percent except that filling material with a porosity of up to 92 percent may be used when tested with satisfactory results in accordance with CGA Pamphlet C–12.

(d) Cross-head speed of the testing machine may not exceed 1⁄8 inch per minute during yield strength determination.

(e) Yield strength may not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

(k) Rejected cylinders. Reheat treatment of rejected cylinder is authorized. Subsequent thereto, cylinders must pass all prescribed tests to be acceptable. Repair by welding is authorized.

(l) Porous filling. (1) Cylinders must be filled with a porous material in accordance with the following:

(ii) The porous material may not disintegrate or sag when wet with solvent or when subjected to normal service;

(iii) Overall shrinkage of the filling material is authorized if the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed 1⁄2 of 1 percent of the respective diameter or length, but not to exceed ½ inch, measured diametrically and longitudinally;

(iv) The clearance may not impair the functions of the filling material;

(v) The installed filling material must meet the requirements of CGA C–12 (IBR, see §171.7 of this subchapter); and

(m) Tare weight. The tare weight is the combined weight of the cylinder proper, porous filling, valve, and solvent, without removable cap.

(n) Duties of inspector. In addition to the requirements of §178.35, the inspector is required to—

(1) Certify chemical analyses of steel used, signed by manufacturer thereof; also verify by, check analyses of samples taken from each heat or from 1 out

(gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations must be based on an elastic modulus of 30,000,000. In the event of controversy, the entire stress-strain diagram must be plotted and the yield strength determined from the 0.2 offset.

(iii) For the purpose of strain measurement, the initial strain must be set while the specimen is under a stress of 12,000 psi and the strain indicator reading being set at the calculated corresponding strain.

(iv) Cross-head speed of the testing machine may not exceed 1⁄8 inch per minute during yield strength determination.

(4) Yield strength may not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

(2) When the porosity of each cylinder is not known, a cylinder taken at random from a lot of 200 or less must be tested for porosity. If the test cylinder fails, each cylinder in the lot may be tested individually and those cylinders that pass the test are acceptable.

(3) For filling that is molded and dried before insertion in cylinders, porosity test may be made on a sample block taken at random from material to be used.

(4) The porosity of the filling material must be determined. The amount of solvent at 70 °F for a cylinder:

(i) Having shell volumetric capacity above 20 pounds water capacity (nominal) may not exceed the following:

(ii) Having volumetric capacity of 20 pounds or less water capacity (nominal), may not exceed the following:

(iii) Overall shrinkage of the filling material is authorized if the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed 1⁄2 of 1 percent of the respective diameter or length, but not to exceed ½ inch, measured diametrically and longitudinally;

(iv) The clearance may not impair the functions of the filling material;

(v) The installed filling material must meet the requirements of CGA C–12 (IBR, see §171.7 of this subchapter); and

(vi) Porosity of filling material may not exceed 80 percent except that filling material with a porosity of up to 92 percent may be used when tested with satisfactory results in accordance with CGA Pamphlet C–12.

(d) Cross-head speed of the testing machine may not exceed 1⁄8 inch per minute during yield strength determination.

(e) Yield strength may not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

(k) Rejected cylinders. Reheat treatment of rejected cylinder is authorized. Subsequent thereto, cylinders must pass all prescribed tests to be acceptable. Repair by welding is authorized.

(l) Porous filling. (1) Cylinders must be filled with a porous material in accordance with the following:

(ii) The porous material may not disintegrate or sag when wet with solvent or when subjected to normal service;

(iii) Overall shrinkage of the filling material is authorized if the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed 1⁄2 of 1 percent of the respective diameter or length, but not to exceed ½ inch, measured diametrically and longitudinally;

(iv) The clearance may not impair the functions of the filling material;

(v) The installed filling material must meet the requirements of CGA C–12 (IBR, see §171.7 of this subchapter); and

(vi) Porosity of filling material may not exceed 80 percent except that filling material with a porosity of up to 92 percent may be used when tested with satisfactory results in accordance with CGA Pamphlet C–12.

(d) Cross-head speed of the testing machine may not exceed 1⁄8 inch per minute during yield strength determination.

(e) Yield strength may not exceed 73 percent of tensile strength. Elongation must be at least 40 percent in 2 inch or 20 percent in other cases.

(k) Rejected cylinders. Reheat treatment of rejected cylinder is authorized. Subsequent thereto, cylinders must pass all prescribed tests to be acceptable. Repair by welding is authorized.

(l) Porous filling. (1) Cylinders must be filled with a porous material in accordance with the following:

(ii) The porous material may not disintegrate or sag when wet with solvent or when subjected to normal service;

(iii) Overall shrinkage of the filling material is authorized if the total clearance between the cylinder shell and filling material, after solvent has been added, does not exceed 1⁄2 of 1 percent of the respective diameter or length, but not to exceed ½ inch, measured diametrically and longitudinally;

(iv) The clearance may not impair the functions of the filling material;

(v) The installed filling material must meet the requirements of CGA C–12 (IBR, see §171.7 of this subchapter); and

(vi) Porosity of filling material may not exceed 80 percent except that filling material with a porosity of up to 92 percent may be used when tested with satisfactory results in accordance with CGA Pamphlet C–12.
Pipeline and Hazardous Materials Safety Administration, DOT § 178.60

§ 178.60 Specification 8AL steel cylinders with porous fillings for acetylene.

(a) Type and service pressure. A DOT 8AL cylinder is a seamless steel cylinder with a service pressure of 250 psig. However, the attachment of heads by welding or by brazing by dipping process and a welded circumferential body seam is authorized. Longitudinal seams are not authorized.

(b) Authorized steel. The authorized steel is as specified in table I of appendix A to this part.

(c) Identification of steel. Material must be identified by any suitable method except that plates and billets for hot-drawn cylinders must be marked with heat number.

(d) Manufacture. Cylinders must be manufactured using equipment and processes adequate to ensure that each cylinder produced conforms to the requirements of this subpart. No defect is permitted that is likely to weaken the finished cylinder appreciably. A reasonably smooth and uniform surface finish is required. Welding procedures and operators must be qualified in accordance with CGA Pamphlet C–3 (IBR, see §171.7 of this subchapter).

(e) Footrings. Exposed bottom welds on cylinders over 18 inches long must be protected by footrings.

(f) Welding or brazing. Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) The attachment to the tops or bottoms of cylinders of neckings, footrings, handlers, bosses, pads, and valve protection collar which is permanently attached to the cylinder and forming integral part thereof.

(2) Tare weight of cylinder, in pounds and ounces, must be marked on the cylinder.

(3) Cylinders, not completed, when delivered must each be marked for identification of each lot of 200 or less.

§ 178.60 Specification 8AL steel cylinders with porous fillings for acetylene.

(a) Type and service pressure. A DOT 8AL cylinder is a seamless steel cylinder with a service pressure of 250 psig. However, the attachment of heads by welding or by brazing by dipping process and a welded circumferential body seam is authorized. Longitudinal seams are not authorized.

(b) Authorized steel. The authorized steel is as specified in table I of appendix A to this part.

(c) Identification of steel. Material must be identified by any suitable method except that plates and billets for hot-drawn cylinders must be marked with heat number.

(d) Manufacture. Cylinders must be manufactured using equipment and processes adequate to ensure that each cylinder produced conforms to the requirements of this subpart. No defect is permitted that is likely to weaken the finished cylinder appreciably. A reasonably smooth and uniform surface finish is required. Welding procedures and operators must be qualified in accordance with CGA Pamphlet C–3 (IBR, see §171.7 of this subchapter).

(e) Footrings. Exposed bottom welds on cylinders over 18 inches long must be protected by footrings.

(f) Welding or brazing. Welding or brazing for any purpose whatsoever is prohibited except as follows:

(1) The attachment to the tops or bottoms of cylinders of neckings, footrings, handlers, bosses, pads, and valve protecting rings is authorized provided that such attachments and the portion of the container to which they are attached are made of weldable steel, the carbon content of which may not exceed 0.25 percent.

(2) Heat treatment is not required after welding or brazing weldable low carbon parts to attachments, specified in paragraph (f)(1) of this section, of similar material which have been previously welded or brazed to the top or bottom of cylinders and properly heat treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400 °F in any part of the top or bottom material.

(g) Wall thickness; wall stress. The wall thickness/wall stress of the cylinder must conform to the following:

(1) The calculated wall stress at 750 psi may not exceed 35,000 psi, or one-half of the minimum ultimate strength of the steel as determined in paragraph (l) of this section, whichever value is the smaller. The measured wall thickness may not include galvanizing or other protective coating.

(i) Calculation of wall stress must be made by the formula: