U.S. Department
of Transportation
**Research and
Special Programs
Administration**

400 Seventh St., S.W.
Washington, D.C. 20590

MAR 1 3 2001

DOT-E 9450
(SIXTH REVISION)

EXPIRATION DATE: February 28, 2003

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: Taylor-Wharton
Huntsville, Alabama

2. PURPOSE AND LIMITATIONS:

a. This exemption authorizes the manufacture, mark, sale and use of non-DOT specification cylinders conforming with all regulations applicable to a DOT specification 4BW cylinder, except as specified herein, for the transportation in commerce of the materials authorized by this exemption. This exemption provides no relief from any Hazardous Materials Regulation (HMR) other than as specifically stated herein.

b. The safety analyses performed in development of this exemption only considered the hazards and risks associated with transportation in commerce.

3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 173.302(a), 173.304(a), and 175.3 in that non-DOT specification cylinders are not authorized except as specified herein.

5. BASIS: This exemption is based on the application of Taylor-Wharton dated February 16, 2001, submitted in accordance with § 107.109.

MAR 13 2001

6. HAZARDOUS MATERIALS (49 CFR § 172.101):

| Proper Shipping Name/ Hazardous Material Description | Hazard Class/ Division | Identi-fication Number | Packing Group |
|---|---|---|---|
| Division 2.1 and Division 2.2 compressed or liquefied gases authorized in DOT 4BW cylinders | As appropri-ate | As appropri -ate | n/a |

7. SAFETY CONTROL MEASURES:

PACKAGING - Packaging prescribed are non-DOT specification steel cylinders which comply with DOT Specification 4BW ( §§ 178.35 and 178.61) except as follows:

§ 178.35(c) *Duties of Inspector*

* * * * *

(5) Verify that design qualification tests prescribed in § 178.61(d) of this exemption have been performed with satisfactory results prior to initial production of any new design or design change.

(6) Verify that pipe or tubing starting material is in conformance with all requirements of the applicable ASTM specification.

§ 178.35(f) *Markings*

Applies except for "DOT-E 9450" in lieu of "DOT-4BW" followed by the service pressure.

§ 178.61(a) *Type, Size and Service Pressure*

Must be welded type with longitudinal electric resistance welded (ERW) seam not over 180 pounds water capacity (nominal); service pressure at least 150 pounds per square inch gauge. Cylinders closed in by spinning process are authorized.

§ 178.61(b) *Authorized Steel*

Steel must be made by the open-hearth, electric furnace or basic-oxygen process; formed and longitudinally welded by the electric resistance welding (ERW) method into pipe or

tubing; may be either cold expanded or nonexpanded; and supplied with a black finish. Authorized materials are as follows:

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Form | Pipe | Pipe | Tubing | Pipe | Pipe | Tubing |
| ASTM | A53 | A135 | A513 | A53 | A135 | A513 |
| Type | E | ___ | ___ | E | ___ | ___ |
| Grade | A | A | MT 1010<br>MT 1015<br>MX 1015<br>MT 1020<br>MTX 1020<br>1015 thru<br>1024 | ___ | ___ | ___ |
| C% | 0.25 max. | 0.25 max. | .10/.25 | As specified in 49 CFR Part 178 Appendix A Table 1 | | |
| Mn% | 0.95 max. | 0.95 max. | .30/1.65 | | | |
| P% | 0.05 max. | 0.05 max. | .04 max | | | |
| S% | 0.06 max. | 0.05 max. | .05 max | | | |
| Tensile strength | 48 ksi. min. | 48 ksi. min. | 48 ksi. min. | 70 ksi. nom. | 70 ksi. nom. | 70 ksi. nom. |
| Design stress | 24 ksi. max. | 24 ksi. max. | See § 178.61-10 | 35 ksi max. | 35 ksi max. | 35 ksi max. |

Each tube or pipe must be subjected to the nondestructive test prescribed in ASTM- A513 Paragraph S8 with satisfactory results.

§ 178.61(d) *Manufacture*

(1) By best processes and methods; dirt and scale to be removed as necessary to afford proper inspection; no fissure or other defects acceptable that is likely to weaken the finished cylinder appreciably; reasonably smooth and uniform surface finish required.

(2) Circumferential seams are not authorized.

(3) Longitudinal seams:

(i) Must be electric resistance welded in conformance with the tubing or pipe specification authorized.

(ii) Joint efficiency may not exceed 0.85.

(4) Welding procedures and operators must be qualified in accordance with the sections of CGA Pamphlet C-3 that apply.

(Add)

(5) The thickness of the bottoms of cylinders welded or formed by spinning is, under no condition, to be less than two times the minimum wall thickness of the cylindrical shell; such bottom thicknesses to 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.

(6) Each new design and any significant change to any acceptable design must be qualified for production by subjecting at least three prototype samples to pressure cycling tests and burst tests as follows:

(i) Cycle Test. The cycle test must be performed on the completed cylinder after hydrostatic test by subjecting the cylinder to successive hydrostatic pressurization from the lower cyclic pressure to the upper cyclic pressure at a rate not to exceed 10 cycles per minute. Adequate recording instrumentation must be provided if equipment is to be left unattended for any period of time. Lower cyclic pressure may not exceed 10 percent of the upper cyclic pressure. Upper cyclic pressure must be at least equal to the minimum prescribed test pressure.

(ii) Burst Pressure Test. The burst pressure test must be performed on the completed cylinder by hydrostatically pressurizing the cylinder to destruction. Rate of pressurization may not exceed 200 psi per second.

(7) Cylinders subjected to design qualification cycling tests must withstand at least 10,000 cyclic pressurization without distortion or failure.

(8) Cylinders subjected to design qualification burst tests must withstand a pressure of at least 4.0 times the service pressure without failure. Failure must initiate in the sidewall in a longitudinal direction, and the cylinder must remain in one piece.

(9) In this specification "significant change" means a 10 percent or greater change in cylinder wall thickness, service pressure, or diameter; a 30 percent or greater change in water capacity or base thickness; any change in material; over 100 percent increase in size of openings; or any change in the number of openings.

(10) Transverse Tensile Test. In addition to the design qualification tests prescribed in paragraph (6) of this section, three tensile specimens must be tested from representative starting material, heat treated as prescribed in § 178.61(g). Each specimen must be taken across the longitudinal seam and must be prepared and tested in accordance with and must meet the requirements of CGA Pamphlet C-3.

§ 178.61(f) *Wall Thickness*

(1) For outside diameters over 6" the minimum wall thickness must be 0.090". In any case the minimum wall thickness must be such that the calculated wall stress at minimum test pressure must not exceed the lesser value of any of the following:

(i) The value shown in Section § 178.61(b) of this exemption for the particular material under consideration;

(ii) One-half of the minimum tensile strength of the material determined as required in § 178.61(j);

(iii) 35,000 pounds per square inch.

(2) Stress must be calculated by the formula:

$$S = [P(1.3D^2+0.4d^2)] / [E(D^2-d^2)]$$

Where:

S = wall stress in pounds per square inch;
P = minimum test pressure prescribed for water jacket test;
D = outside diameter in inches;
d = inside diameter in inches;
E = joint efficiency of the longitudinal seam, not to exceed 0.85.

§ 178.61(g) *Heat Treatment*

Each cylinder must be uniformly and properly heat treated prior to tests and after all forming and welding operations. Any suitable heat treatment in excess of 1100°F is authorized, except that liquid quenching is not permitted.

* * * * *

§ 178.61(i) *Hydrostatic and Leakage Tests*

(1) * * *

(2) * * *

(3) * * *

(4) Cylinders must be tested as follows:

(i) At least 1 cylinder selected at random out of each lot of 200 or less must be tested as outlined in paragraphs (a), (b), and (c) of this section to at least two times service pressure, or 450 psig whichever is greater.

(ii) All cylinders not tested as outlined in paragraph (4)(i) of this section must be examined under pressure of at least two times service pressure or 450 psig whichever is greater and show no defect.

(5) One finished cylinder selected at random out of each lot of 500 or less successively produced must be hydrostatically tested to four times service pressure or 900 psig whichever is greater, without bursting.

(6) 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. Pressure, approximately the same as but no less than 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.

Leakers must be rejected.

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

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

(iii) As a safety precaution, if the manufacturer elects to make this test before the hydrostatic test, he should design his 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.

§ 178.61(l) *Tests of Welds*

(1) Not required.

(2) * * *

(3) * * *

§ 178.61(m) *Radiographic examination*

Radiographic examination not applicable. See § 178.61(b) requirements for ERW welds.

§ 178.61(n) *Rejected Cylinders*

(1) * * *

(2) Reheat treatment authorized; subsequent thereto, acceptable cylinders must pass all prescribed tests. Repair of welded seams by welding is not authorized.

(3) Spun cylinders rejected for leakage (See § 178.61(i)(6)) may be removed from the spun cylinder category by drilling to remove defective material, tapping and plugging.

§ 178.61(p) *Inspector's Report*

(Add)

"A certificate of test on the electric resistance tubing has been obtained from the tubing manufacturer. Records thereof are attached hereto."

8. SPECIAL PROVISIONS:

a. In accordance with the provisions of Paragraph (b) of § 173.22a, persons may use the packaging authorized by this exemption for the transportation of the hazardous materials specified in paragraph 6, only in conformance with the terms of this exemption.

b. A person who is not a holder of this exemption, but receives a package covered by this exemption, may reoffer it for transportation provided no modifications or changes are made to the package and it is offered for transportation in conformance with this exemption and the HMR.

c. A current copy of this exemption must be maintained at each facility where the package is offered or reoffered for transportation.

d. Each packaging manufactured under the authority of this exemption must be marked with a registration symbol designated by the Office of Hazardous Materials Exemptions and Approvals for a specific manufacturing facility.

e. A current copy of this exemption must be maintained at each facility where the package is manufactured under this exemption. It must be made available to a DOT representative upon request.

f. Transportation of Division 2.1 (flammable gases) are not authorized aboard cargo vessel or aircraft unless specifically authorized in the Hazardous Materials Table (§ 172.101).

g. Transportation of oxygen is only authorized when in accordance with § 172.102(c)(2) Special Provision A52 and §§ 175.(h) and (i).

h. Cylinders must be retested in accordance with the requirements of § 173.34(e) that apply to DOT-4BW cylinders.

9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel, cargo aircraft only, and passenger-carrying aircraft (see paragraph 8.f and g for restrictions).

10. MODAL REQUIREMENTS: A current copy of this exemption must be carried aboard each cargo vessel or aircraft used to transport packages covered by this exemption. The shipper must furnish a copy of this exemption to the air carrier before or at the time the shipment is tendered.

11. COMPLIANCE: Failure by a person to comply with any of the following may result in suspension or revocation of this exemption and penalties prescribed by the Federal hazardous materials transportation law, 49 U.S.C. 5101 et seq:

    - All terms and conditions prescribed in this exemption and the Hazardous Materials Regulations, Parts 171-180.

    - Registration required by § 107.601 et seq., when applicable.

    Each "Hazmat employee", as defined in § 171.8, who performs a function subject to this exemption must receive training on the requirements and conditions of this exemption in addition to the training required by §§ 172.700 through 172.704.

    No person may use or apply this exemption, including display of its number, when the exemption has expired or is otherwise no longer in effect.

12. REPORTING REQUIREMENTS: The carrier is required to report any incident involving loss of packaging contents or packaging failure to the Associate Administrator for Hazardous Materials Safety (AAHMS) as soon as practicable. (Sections 171.15 and 171.16 apply to any activity undertaken under the authority of this exemption.) In addition, the holder(s) of this exemption must also inform the AAHMS, in writing, as soon as practicable of any incidents involving the package and shipments made under this exemption.

Issued in Washington, D.C.

MAR 1 3 2001

(DATE)

for Robert A. McGuire
Associate Administrator for
Hazardous Materials Safety

Address all inquiries to: Associate Administrator for Hazardous Materials Safety, Research and Special Programs Administration, Department of Transportation, Washington, D.C. 20590.

Attention: DHM-31.

The original of this exemption is on file at the above office. Photo reproductions and legible reductions of this exemption are permitted. Any alteration of this exemption is prohibited.

Copies of exemptions may be obtained from the AAHMS, U.S. Department of Transportation, 400 7th Street, S.W., Washington, DC 20590-0001, Attention: Records Center, 202-366-5046.

PO: KFW/AM