

January 23, 2004



U.S. Department
of Transportation

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

**Research and
Special Programs
Administration**

DOT-E 11916
(FIFTH REVISION)

EXPIRATION DATE: December 31, 2005

(FOR RENEWAL, SEE 49 CFR § 107.109)

1. GRANTEE: CP Industries, Inc.
McKeesport, PA
2. PURPOSE AND LIMITATION:
 - a. This exemption authorizes the use of certain DOT Specification 3A, 3AX, 3AA or 3AAX cylinders that are retested by a 100% ultrasonic examination procedure described in paragraph 7 in lieu of the internal visual inspection and the hydrostatic retest for the transportation in commerce of the compressed gases listed in paragraph 6. This exemption provides no relief from the Hazardous Materials Regulations (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. The safety analyses did not consider the hazards and risks associated with consumer use, use as a component of a transport vehicle or other device, or other uses not associated with transportation in commerce.
3. REGULATORY SYSTEM AFFECTED: 49 CFR Parts 106, 107 and 171-180.

4. REGULATIONS FROM WHICH EXEMPTED: 49 CFR §§ 180.205(c), (f) and (g); §§ 173.302a(b)(2), (4) and (5) in that an ultrasonic examination (UE) performed in lieu of the specified hydrostatic pressure test and internal visual inspection is not authorized, except as specified herein.
5. BASIS: This exemption is based on the application of CP Industries dated December 12, 2003, submitted in accordance with § 107.109.
6. HAZARDOUS MATERIALS (49 CFR § 172.101):

Proper Shipping Name/ Hazardous Materials Description	Hazard Class/ Division	Identi- fication Number	Packing Group
Liquefied or nonliquefied compressed gases, or mixtures of such gases which are authorized in the HMR for transportation in DOT Specification 3A, 3AX, 3AA, or 3AAX cylinders with outside diameters greater than or equal to 22 inches.	As Appropriate	As Appropriate	N/A

7. SAFETY CONTROL MEASURES:

a. PACKAGING - Prescribed packaging is a DOT Specification 3A, 3AX, 3AA or 3AAX cylinder (tube) with an outside diameter greater than or equal to 22 inches that is subjected to periodic retesting, reinspection and marking prescribed in § 180.205, except that the cylinder is examined by ultrasonic examination in lieu of the hydrostatic pressure test and internal visual inspection prescribed in §§ 180.205(c), (f), and (g). Each cylinder must be retested and marked in accordance with the procedure described herein and Appendix I of CP Industries procedure No. CP-QC-4001D, Rev.4 (Dated 3-14-2000), on file with the Office of Hazardous Materials Exemptions and Approvals (OHMEA).

b. Ultrasonic equipment and Performance. The ultrasonic equipment performance must conform to Appendix I of CP Industries, procedure No. CP-QC-4001D, Rev.4 (Dated 3-14-2000) and as prescribed in this exemption. The UE equipment incorporates multiple transducers arranged to perform

straight and angle beam examinations. The ultrasonic pulses must enter into the cylinder wall in both longitudinal and circumferential directions and normal to the cylinder wall to ensure 100 percent coverage of the cylinder wall. All defects (such as isolated pits and line corrosion) must be detected and measured. The transducers must be arranged so that the ultrasonic beams are aimed at a single location in the cylinder wall and all beams enter and exit at their respective location. Search units of 1 to 5 MHz nominal frequency and 1/4" to a 1" diameter must be used during ultrasonic examination. The equipment must continuously monitor acoustic coupling between the transducer assembly and cylinder wall to assure 100% cylinder wall coverage during the UE. It must be equipped with a sensor that indicates a lack of coupling. This device must be an integral part of the test equipment design incorporating Lack-of-Expected-Response (L.E.R.). If coupling is lost or compromised the operator must either terminate the test and re-examine the cylinder or complete the test and re-examine the areas where L.E.R. occurred. All areas re-examined must be documented in the report and approved by the Senior Review Technologist (SRT).

c. Calibration Standards.

(1) A cylinder section used as a calibration standard must be of the same nominal diameter, surface finish and metallurgical condition as the cylinders under the test. Prior to machining for calibration defects and the minimum wall thickness, the average minimum wall thickness for the calibration cylinder must be determined by means of an independent method. The calibration cylinder must be machined with defects simulating those that occur during service conditions, such as a reduction in wall thickness (area corrosion), isolated pits, and line corrosion.

(2) The calibration cylinder must have a minimum of two different thickness steps machined in it. The artificial defects for reduction in wall thickness (area corrosion) must be 2.375-inch diameter and less than or equal 1/5 of the design minimum wall thickness (t_m). The remaining wall thickness must conform to the design minimum wall for a cylinder under the test. The artificial defects for isolated pits must be 1/4-inch diameter and less than or equal 1/3 of the t_m in depth. The artificial defects for line corrosion must include

a minimum of two pits (1/4-inch diameter by 1/5 of t_m in depth). The pits for simulating line corrosion must be adjacent to each other. A certification statement signed by a person certified as a Level III operator (in UT) must be available for inspection for each calibrated cylinder at each site where testing is performed. The certification statement must include drawing, dimensions and location of each simulated defect.

d. System Calibration. System calibration must be performed using the calibration standards referenced in paragraph 7.c. of this exemption. The equipment calibration and set up for testing must be such that simulated defects specified on the calibration standards are detected and the following simulated defects must be rejected:

(1) In any area larger than 4.4 in² (or 2.375 inch diameter) the maximum wall stress calculated from the following formula

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

where:

S = wall stress in pounds per square inch;

P = minimum test pressure in pounds per square inch;

D = outside diameter in inches;

d = $D - 2t$, where t = minimum wall thickness determined by ultrasonic testing, in inches; exceeds 58,000 psi for DOT-3A and 3AX or 73,000 psi for DOT-3AA and 3AAX Specification cylinders.

(2) An isolated pit that is deeper than 1/4 of the design minimum wall thickness (t_m) and larger than 1/4-inch diameter.

(3) Line corrosion deeper than 1/5 of the design minimum wall thickness (t_m) and longer than 1/4-inch in length (the length of a line corrosion is measured from a center of first pit to the center of the last pit).

(4) Hand held ultrasonic testing equipment used for secondary ultrasonic examination (contact or immersion) must be calibrated in accordance with ASTM E 213-99.

e. Test Procedures.

(1) A written test procedure for performing UT examination of cylinders under the terms of this exemption must be at each facility performing UT examination. At a minimum, this procedure must:

(i) include a description of the test set-up; test parameters; transducer model number, frequency, and size; transducer assembly; couplant used; system calibration method and threshold gain used during the test; and other pertinent information such as additional gain used during the UT examination to confirm the defects.

(ii) require recalibration of the test equipment when ultrasonic examination of 50 cylinders has been completed, or a time period of more than 4 hours has elapsed since equipment calibration, whichever occurs first. The equipment must be recalibrated in accordance with the requirements of paragraph 7.d. of this exemption.

(iii) be made available to a DOT official when requested. Any change to the written procedure must be submitted to OHMEA as soon as practicable.

(2) The equipment may not allow testing of a cylinder unless the system has been properly calibrated.

(3) Rotational speed of a calibration piece must be such that all artificial defects are adequately detected, measured and recorded.

(4) The area of ultrasonic examination (UE) coverage must be 100% of the cylindrical section to a point three inches beyond the point of tangency with the hemispherical heads.

(5) Surface of the cylinder to be examined must be free of loose material such as scale, and dirt.

(6) The rotational speed of the cylinder under UE must not exceed the rotational speed used during the calibration.

f. UE Acceptance/Rejection Criteria. A cylinder with any of the following defects must be rejected:

(1) Wall thickness less than the design minimum wall thickness (calculated per paragraph d.(1) above) for an

area **larger than 4.4 in² (or 2.375 inch diameter)** .

(2) Any isolated pit greater than or equal to the dimensions described in paragraph 7.d.(2) must be set aside for secondary (manual) UE.

If the isolated pit is deeper than 1/4 of the design minimum wall thickness t_m and larger than 1-inch diameter (or 0.78 in²), the cylinder must be rejected.

(3) Any line corrosion greater than or equal to the dimensions described in paragraph 7.d.(3) must be set aside for secondary (manual) UE. If the line corrosion is deeper than 1/5 of t_m and longer than 2.375-inch in length, the cylinder must be rejected.

- g. Rejected cylinders. When a cylinder is rejected, the retester must stamp a series of X's over the DOT Specification number and marked service pressure or stamp "CONDEMNED" on the shoulder, top head, or neck using a steel stamp, and must notify the cylinder owner, in writing, that the cylinder is rejected and may not be filled with hazardous material for transportation in commerce. Alternatively, at the direction of the owner, the retester may render the cylinder incapable of holding pressure.
- h. Marking. Each cylinder passing retests under the provisions of this exemption must be marked as prescribed in § 180.205(i)). In addition, each cylinder must be marked UE, in characters not less than 1/4 inch high at a location close to the retester's marking.
- i. UE Report. A report must be generated for each cylinder that is examined. The UE report must include the following:
- (1) UE equipment, model and serial No.
 - (2) Transducer specification, size, frequency and manufacturer
 - (3) Specification of the calibration standard used to complete UE
 - (4) Cylinder serial no. and type
 - (5) UE technicians' name and certification level
 - (6) Date of the UE
 - (7) All recorded defects (pitting, corrosion, etc.)
 - (8) Brief description of the UE acceptance/rejection

result

(9) Size (depth, diameter, length) of each isolated pit and/or line corrosion for each cylinder which was removed for a secondary UE

(10) The UE report must be on file at the test site, and made available to a DOT official when requested

j. A cylinder that has been exposed to fire or to excessive heat (temperatures of 1000 °F or greater) must not be retested under the terms of this exemption.

k. Personnel Qualification: Each person who performs retesting or who evaluates or certifies retest results must meet the following requirements:

(1) Project Manager - is the senior manager of CPI responsible for compliance with DOT regulations including this exemption.

(2) The personnel responsible for performing cylinder retesting under this exemption must be qualified to an appropriate Level (Level I, II or III)- Ultrasonic Testing in accordance with the American Society for Nondestructive Testing (ASNT) Recommended Practice SNT-TC-1A depending upon the assigned responsibility as described below:

(i) System startup and calibration must be performed by a Level II operator. A Level II operator may review and certify test results when a written acceptance and rejection criteria for cylinders has been provided by a Senior Review Technologist. Based upon written criteria, the Level II Operator may authorize cylinders that pass the retest to be marked in accordance with paragraph 7.h. of this exemption. However, a person with Level I certification may perform a system startup, check calibration, and perform ultrasonic testing under the direct guidance and supervision of a Senior Review Technologist or a Level II Operator, either of whom must be physically present at the test site so as to be able to observe testing conducted under this exemption.

(ii) Senior Review Technologist (SRT) - is a person who reviews overall test results, provides supervisory training and technical guidance to

operators, and reviews and verifies the retest results. A SRT must have a Level III Certification in UT, and a thorough understanding of the DOT Regulations (49 CFR) pertaining to the re-qualification and reuse of the DOT cylinders authorized under this exemption. The SRT must prepare and submit the reports required in paragraphs 7.i. and annually verify that the UE program is being operated in accordance with the requirements of this exemption.

8. SPECIAL PROVISIONS:

a. During the initial use of the exemption, the summary results of UE and additional technical information deemed pertinent in successful application of the retest procedure must be reported to OHMEA. The purpose of this information is to determine whether certain testing procedures and criteria require modification. In particular, special attention should be paid to evaluating and compiling information on any cylinders rejected by the UE procedure. For any rejected cylinder and those cylinders that required hand scanning, the specific type of axial and circumferential location must be identified. The defect causing the rejection must be fully characterized and profiled. That is, the specific type of defect should be identified (i.e. crack, pit, general corrosion, etc.) and the specific size of the defect should be determined (i.e. length, depth, width, area, etc.). The cylinder type, size, minimum design wall thickness, age, etc. of the cylinder in question must be reported. These results must be summarized and reported to OHMEA on an annual basis. CPI must submit to DOT an evaluation of the effectiveness of the ultrasonic testing program authorized by this exemption as part of any request to renew the exemption submitted in accordance with § 107.105.

b. The total number of cylinders tested under this exemption must be reported by type (i.e. 3AX, 3AAX) and age. The number of cylinders rejected and the total number of cylinders tested in each lot inspected under the provision of this exemption must be reported by cylinder type and age. These results must be summarized and reported to OHMEA on an annual basis.

c. A cylinder that meets the requirements of this exemption and the introductory text and paragraph (1) of § 173.302a(b) may be marked with a plus sign (+) following the test date marking on the cylinder.

- d. 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.
- e. No person may perform UE of cylinders subject to this exemption unless that person (1) is an employee or agent of CPI and has a current copy of this exemption at the location of such inspection and testing, and (2) complies with all the terms and conditions of this exemption. The marking of the retester's symbol on the cylinders certifies compliance with all of the terms and conditions of this exemption.
- f. Each facility approved by the Department to test cylinders under the terms of this exemption must have a resident operator with at least a Level II certification.
- g. Transportation of oxygen is only authorized by aircraft when in accordance with § 172.102(c)(2) Special Provision A52 and §§ 175.85(h) and (i).
9. MODES OF TRANSPORTATION AUTHORIZED: Motor vehicle, rail freight, cargo vessel, cargo aircraft only.
10. MODAL REQUIREMENTS: See paragraph 8.g. for restrictions by aircraft.
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:
- o All terms and conditions prescribed in this exemption and the Hazardous Materials Regulations, 49 CFR Parts 171-180.
 - o 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 this 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 inform the AAHMS, in writing, of any incident involving the package and shipments made under the terms of this exemption.

Issued in Washington, D.C.:



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.

Copies of this exemption may be obtained by accessing the Hazardous Materials Safety Homepage at <http://hazmat.dot.gov/exemptions> Photo reproductions and legible reductions of this exemption are permitted. Any alteration of this exemption is prohibited.

PO: MToughiry/alb