



U.S. Department  
of Transportation

**Pipeline and Hazardous  
Materials Safety  
Administration**

1200 New Jersey Avenue, SE  
Washington, D.C. 20590

OCT 13 2009

Mr. Steven T. Gentry  
Regulatory Affairs Manager  
Worthington Cylinder Corporation  
1085 Dearborn Drive  
Columbus, Ohio 43085

Ref. No.: 09-0177

Dear Mr. Gentry:

This responds to your letter regarding a previous interpretation on the proof pressure test requirements in the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180), as they apply to DOT-4 series cylinders used for refrigerant gas recovery. Specifically, you ask us to rescind a previously issued letter of clarification on this subject (Ref. No. 03-0164) because it is inconsistent with Transport Canada and industry guidelines.

Section 180.209(e) establishes proof pressure test requirements for DOT 4B, 4BA, 4BW, and 4E cylinders used exclusively for certain hazardous materials, including refrigerant gases. The requirements specified in this section apply only to cylinders used to transport the listed materials when they are commercially free of corroding components. Such cylinders may be requalified by volumetric expansion testing every 12 years, or by proof pressure testing every 7 years after expiration of the first 12-year period. You are correct that § 180.209(e) does not apply to DOT-4 series cylinders used to transport reclaimed refrigerant gases because these gases are considered corrosive due to contamination. The applicable retest period for DOT 4-series cylinders used to transport reclaimed refrigerant gases is every 5 years using the volumetric expansion method.

To clarify the confusion and correct this misunderstanding, we are rescinding our previous letter of clarification.

Sincerely,

Charles E. Betts  
Chief, Standards Development  
Office of Hazardous Materials Standards

Engrum  
§ 180.209  
Cylinders  
09-0177



**WORTHINGTON**  
CYLINDERS  
A Worthington Industries Company

July 31, 2009

Mr. Edward Mazzullo  
Director, Hazardous Materials Standards  
US Department of Transportation  
PHH-10  
East Building  
1200 New Jersey Avenue, SE  
Washington, DC 20590-0001

Dear Mr. Mazzullo:

I have been recently advised by customers and industry experts that an interpretation was given by DOT in 2003 which can be considered to be inconsistent with the requirements of Transport Canada and industry guidelines. The interpretation has to do with the requalification criteria for cylinders used to requalify cylinders that may have contained or did contain contaminated or potentially contaminated refrigerant gases. I have attached a copy of interpretation 03-0164 for your review.

When North America began the capturing of spent refrigerant gases due to environment concerns, low pressure steel cylinders were determined to be the best tool for both capturing and transporting the materials for disposal and or reclamation. It was known that some of these spent materials will contain hydrochloric acid. The percentage of HCL will vary from system to system based on the degradation of the materials. In as much, I personally worked with the Engineering and Standards groups at DOT, Air Conditioning and Refrigeration Institute and Transport Canada on this subject matter to assure there would be a consistent answer to cylinder requalification requirements. The consistent answer was that the cylinder shall be requalified within 5 years of the date of manufacture and within each 5 years thereafter. In as much, this information was incorporated into CAN/CSA B-339 and into ARI Guideline K. It was the DOT position that 49 CFR 173.34 was perfectly clear that the cylinder did not contain fluorinated hydrocarbons that were commercially free of corroding components [Ref. 49 CFR 173.34 (e)(13)] nor was the product a pure refrigerant [Ref. 49 CFR 173.34 (e)(11)]. Therefore, the cylinder would require requalification by the volumetric expansion testing method [Ref. 49 CFR 173.34 (e)]. I believe that although the sections in 49 CFR have been moved to Section 180, the requirements are still intact today.

The confusion comes with the verbiage that is used in Interpretation 03-0164. Clearly, I can see that the interpretation states that requalification by the proof pressure test method is permitted for refrigerant gases that are free of corroding components as described in 49 CFR 180.209 (e). The problem lies in the fact that the specific question asks "whether DOT-4 Series cylinders

used for refrigerant gas recovery” be requalified by the proof pressure test method. The answer given is yes. The answer that I believe should have been given is no. Recovered gas may not be commercially free of corroding components. This was the position of DOT, TC and ARI in the 1980’s and in my opinion, nothing has changed that would modify this position. Until the recovered gas is completely analyzed, it is unknown if the refrigerant is contaminated and therefore must be treated as contaminated refrigerant. Clearly, the proof pressure test will verify the structural integrity of the pressure vessel but, the internal inspection and the volumetric expansion data will validate the potential for interior corrosion and degradation of the cylinder.

I am asking that DOT please reconsider the interpretation given since it is creating considerable confusion for retesting organizations, independent inspectors and others dealing with cylinder requalification. If this is not possible, could you please support my request for an interpretation that I will submit to clarify this subject matter?

Respectfully Submitted:

*Steven T. Gentry*

Steven T. Gentry  
Regulatory Affairs Manager  
Worthington Cylinder Corporation

Attachments

Cc: Mr. Charles Hochman – DOT (PHH-20)  
Ms. Hattie Mitchell – DOT (PHH-12)  
Mr. Richard Tarr PhD – DOT (PHH-33)  
Mr. Pascal Verville – Transport Canada  
Mr. Stephen Yurek – Air Conditioning, Heating & Refrigeration Institute  
Mr. Marc Meteyer – The Compressed Gas Association

**Exhibit 1**  
**DOT Interpretation 03-0164**



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

AUG 11 2003

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

Mr. George Plum  
USA Services, Inc.  
1111 Ingleside Road  
P. O. Box 12103  
Norfolk, VA 23502

Ref. No.: 03-0164

Dear Mr. Plum:

This responds to your letter regarding proof pressure test requirements under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you asked whether the proof pressure test prescribed in §180.209(e) may be performed on certain DOT-4 series cylinders used for refrigerant gas recovery.

The answer is yes. A cylinder made in conformance with specification DOT 4B, 4BA, 4BW, or 4E that is protected externally by a suitable corrosion-resistant coating and used exclusively for the materials specified in §180.209(e), which include refrigerant gases, that are commercially free from corroding components may be requalified by volumetric expansion testing every 12 years instead of every five years. As an alternative, the cylinder may be subjected to a proof pressure test at least two times the marked service pressure, but this latter type of test must be repeated every seven years after expiration of the first 12-year period. When subjected to a proof pressure test, the cylinder must be carefully examined under test pressure and removed from service if a leak or defect is found.

I hope this satisfies your inquiry. If we can be of further assistance, please contact us.

Sincerely,

A handwritten signature in cursive script, appearing to read "Susan Gorsky".

Susan Gorsky  
Senior Transportation Regulations Specialist  
Office of Hazardous Materials Standards

Exhibit 2  
CAN/CSA B-339

**B339-08**



# **Cylinders, spheres, and tubes for the transportation of dangerous goods**



## Exhibit 3

### CAN/CSA B-339 Definitions of Reclaimed & Recovered Refrigerants

B339-08

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**Macro etch test** — an examination for revealing macrostructure that is performed in accordance with ASTM E340.

**Mass of a container** — the mass of a completed container with all its affixed appurtenances, but excluding its valve(s) and excluding any devices that have to be removed for filling the container. For cylinders with porous filler, the mass of the filler, solvent, and saturation gas is included.

**Material grade** — a type and chemical composition of material from a given supplier, in which variations within the specified limits of the chemical composition have no significant effects on the mechanical properties achieved by the same heat-treatment or resin-curing schedule.

**Minister** — the Minister of Transport for Canada.

**Neutral** — a furnace atmosphere containing no excess of fuel or oxygen.

**Noncorrosive** — chemically and metallurgically compatible with the container such that the pressure-retaining integrity of the container is not adversely affected under the conditions of containment.

**Nonrefillable container** — a container that can be filled only once for the transportation of dangerous goods.

**Plugged cylinder** — a cylinder, the bottom end of which has been spun closed and permanently sealed by a threaded plug.

**Pressure of contents** — the sum of the partial pressures of all the commodities shipped in a single container, less one atmosphere (gauge pressure).

**Pressure-relief device** — a device intended to release the pressure in a container in the event of accidental overpressure or exposure to fire.

**Product analysis** — a chemical analysis of the semi-finished or finished material to determine conformance with the requirements of a specification.

**Quenching crack** — a crack formed in a metal as a result of thermal stresses produced by rapid cooling from a high temperature

**Rebuilt container** — a container subjected to a major repair, including any one or a combination of the following procedures:

- (a) the repair of a welded pressure-retaining seam, where the repair welds exceed 75 mm in length or are spaced by less than 75 mm between the termination of one weld and the beginning of the next weld;
- (b) the repair of a welded or brazed attachment joint to a pressure-retaining part involving welds or brazed joints that exceed 75 mm in length or are spaced by less than 75 mm between the termination of one joint and the beginning of the next joint;
- (c) the replacement of a pressure-retaining component; and
- (d) for Series-8 cylinders, the replacement of the porous filler.

**Reclaimed refrigerant gas** — used refrigerant gas processed to new product specifications.

**Recovered refrigerant gas** — refrigerant gas, in any condition, removed from a system.

**Recycled refrigerant gas** — used refrigerant gas processed to reduce contaminants by separating oil, removing noncondensables, and reducing moisture, acidity, and particulate matter to the levels specified in the Air-Conditioning and Refrigeration Institute publication IRG-2, *Handling and Reuse of Refrigerants in the United States* (1994).

**Reducing** — a furnace atmosphere containing either an excess of fuel or a deficiency of air or oxygen, such that the air or oxygen is removed from substances or materials exposed to that atmosphere.

## Exhibit 4

### CAN/CSA B-339 Requalification Requirements Clause 24.2.5

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*Cylinders, spheres, and tubes for the  
transportation of dangerous goods*

with volumetric expansion measurement every 12 years. The container shall be protected externally by a suitable corrosion-resistant coating, such as, but not limited to, paint. Alternatively, the same containers may be proof pressure retested every 7 years.

#### **24.2.5 Containers used for reclaiming, recycling, or recovered refrigerant gases**

Containers used for reclaimed refrigerant gases shall be requalified in accordance with the applicable basic or alternative requalification procedures and periods specified in Clause 24.2.1. Containers used for recycled or recovered refrigerant gases shall be requalified in accordance with the basic requalification procedures and periods specified in Clause 24.2.1. Recycled and recovered refrigerant gases are considered to be corrosive due to contamination.

#### **24.2.6 TC-3HTM and CTC-3HT cylinders**

##### **24.2.6.1**

In addition to the visual inspection requirements, TC-3HTM and CTC-3HT cylinders shall be requalified in accordance with CGA C-8 and shall conform with the requirements of Clauses 24.2.6.2 to 24.2.6.5.

##### **24.2.6.2**

A cylinder shall not be returned to service if the elastic expansion at retest exceeds the original elastic expansion by more than 5% or the rejection elastic expansion limit (REE) marked on the cylinder.

##### **24.2.6.3**

A cylinder shall not be requalified at the termination of a 24-year period following the date of the original test or after 4380 pressurizations, whichever occurs first. If a cylinder is refilled more than an average of once every other day, an accurate record of the number of refillings shall be maintained.

##### **24.2.6.4**

Retest markings shall be applied by low-stress-type steel stamping to a depth no greater than that of the original marking at the time of manufacture. Stamping on the sidewall shall be prohibited.

##### **24.2.6.5**

When a cylinder not marked with a rejection elastic expansion (REE) is retested, it shall be stamped with the REE in millilitres near the existing marked original elastic expansion. The REE for a cylinder shall be 1.05 times its original elastic expansion.

#### **24.2.7 TC-3CCM, TC-3FCM, and TC-3HWM cylinders**

TC-3CCM, TC-3FCM, and TC-3HWM cylinders shall be condemned at the termination of a 15-year period following the date of the original test.

#### **24.2.8 Series-8 cylinders**

Series-8 cylinders shall be retested and reinspected in accordance with CGA C-13.

#### **24.2.9 Requalification by visual reinspection only**

##### **24.2.9.1**

The containers identified in Clause 24.2.9.3 and used exclusively for the corresponding services indicated therein may be periodically requalified by external visual reinspection without pressure retesting.

Visual reinspections shall be performed in accordance with CGA C-6, C-6.1, or C-6.3, as applicable.

## Exhibit 5

### CAN/CSA General Requirements for Requalification Clause 24.2.1

B339-08

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## 24 Requalification, reheat treatment, repair, and rebuilding

### 24.1 General

#### 24.1.1 Scope

Clause 24 covers the requalification by retesting and reinspection, the reheat treatment, the repair, and the rebuilding of used containers.

**Notes:**

- (1) *The prefix of a specification designation on a container identifies the regulatory authority responsible at the time the container was manufactured. In Clause 24, an obsolete specification is referenced by a prefix identifying the last regulatory authority under which containers of that specification are believed to have been manufactured. The prefix represents also the previous Canadian regulatory authorities or the US regulatory authorities under which containers of the same specification may have been manufactured.*
- (2) *The prefixes other than "TC" are as follows:*
  - (a) CRC: Canadian Railway Commission;
  - (b) BTC: Board of Transport Commissioners for Canada;
  - (c) CTC: Canadian Transport Commission;
  - (d) ICC: US Interstate Commerce Commission; and
  - (e) DOT: US Department of Transportation.
- (3) *Containers bearing the prefix "ICC" or "DOT" are containers that were manufactured to a US specification. Many such containers have been in use in Canada for years. In Clause 24, a specification designation preceded by the letters "ICC" or "DOT" identifies a specification that has never been adopted in Canada.*
- (4) *All "TC" specifications include the letter "M". The addition of the letter "M" to a specification indicates a metric specification. Containers to specifications not including the letter "M" were built using yard-pound units of measurement, with service pressure in pounds per square inch.*

#### 24.1.2 Requirements

The requalification, the repair, and the rebuilding of containers shall be conducted in accordance with CGA C-1, C-3, C-5, C-6, C-6.1, C-6.2, C-6.3, C-8, and C-13. Rejected containers shall be reinspected, retested, reheat-treated, repaired, or rebuilt before being returned to service.

**Note:** *Where air or other gases are allowed in testing, proper precautions should be taken to protect personnel.*

## 24.2 Requalification

### 24.2.1 General requirements

#### 24.2.1.1

Each cylinder, sphere, or tube shall be requalified periodically in accordance with the requirements of Clause 24.2 and Table 29, except as provided in Clauses 24.2.1.6 and 24.2.1.7. Table 29 specifies the basic requalification procedures and periods. It also specifies alternative requalification procedures and periods that may be used, depending on service conditions. Alternative requalification methods and periods are referenced to specific clauses for complete descriptions of conditions under which the alternative procedures may be used.

#### 24.2.1.2

Hydrostatic retests with volumetric expansion measurements and proof pressure retests, as required by Table 29, shall be performed in accordance with Clause 4.13.1.

#### 24.2.1.3

Containers subject to a hydrostatic retest with volumetric expansion measurement shall also be visually inspected both internally, inasmuch as the size of the orifice(s) permit(s), and externally, in accordance with CGA C-6, C-6.1, C-6.2, or C-6.3. The permanent expansion shall not exceed 10% of the total expansion, except for

- (a) TC-3ALM cylinders, where it shall not exceed 6%;

## Exhibit 6

### CAN/CSA B-339 Requalification Table 29 for TC-4BAM and TC-4BWM Cylinders

*Cylinders, spheres, and tubes for the transportation of dangerous goods*

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**Table 29 (Continued)**

Container specification	Minimum retest pressure	Hydrostatic retest with volumetric expansion measurement		Proof pressure retest		Visual re-inspection (see Clause 24.2.9)	
		Period, years	Procedure	Period, years	Procedure	Period, years	Procedure (see Clause 24.2.9.3)
CTC-3B	2 SP	5 10	Basic In accordance with Clause 24.2.3			5 or 10	Alternative (a), (b), (d), or (e)
TC-3EM CTC-3E		Retest not required					
TC-3FCM TC-3HWM	1.5 SP	3	Basic				
TC-3CCM	1.5 SP	5	Basic				
TC-3HTM	1.5 SP	3	Basic and Clause 24.2.6				
CTC-3HT	1.67 SP						
TC-4AAM33 CTC-4AA480	2SP	5	Basic			5 or 10	Alternative (a), (d), or (e)
TC-4BM, CTC-4B, TC-4BAM, CTC-4BA, TC-4BWM, CTC-4BW, TC-4BM17ET, CTC-4B240ET, CTC-4B240FLW	2 SP	5	Basic	7	Alternative Clause 24.2.4	5 or 10	Alternative (a), (b), (c), (d), or (e)
TC-4DM, CTC-4D, TC-4DAM, CTC-4DA, TC-4DSM, CTC-4DS	2 SP	12 5	Alternative Clause 24.2.4 Basic			5	Alternative (d) or (e)
TC-4EM CTC-4E	2 SP	5 12	Basic Alternative Clause 24.2.4	7	Alternative 24.2.4	5 or 10	Alternative (d) or (e)

(Continued)

**Exhibit 7**  
**ARI Guideline K, 2004**

**2004  
GUIDELINE for**

**CONTAINERS FOR  
RECOVERED  
NON-FLAMMABLE  
FLUOROCARBON  
REFRIGERANTS**



**Guideline K**

4100 N. FAIRFAX DR., SUITE. 200 • ARLINGTON, VIRGINIA 22203

**Exhibit 8  
ARI Guideline K Paragraph 7.1.1**

**6.4.1** Each container should display a precautionary label prepared in accordance with ANSI Z129.1. Federal law requires that this label include:

- product identity
- instructions in case of fire, spill, or leak
- instructions in case of contact or exposure
- signal word
- statement of hazards
- instructions for container handling and storage
- antidotes
- precautionary measures
- notes to physicians

**6.4.2** Federal law requires that cylinders and drums be marked as shown below in one-inch (minimum) letters and numerals:

RECOVERED REFRIGERANT \_\_\_\_ (enter number)

Federal law requires that this mark appear on the valve end chime of ton tanks.

**6.4.3** Printing on labels should be clear and legible.

**6.5** *User Information.* Each container should be labeled with the filler's name, address and date filled.

**6.6** *Color.* Following are examples of coloring schemes for various recovery containers. Depending upon the provider of the recovery container, the actual shading of the color may vary. However, the use of the color yellow as specified below will identify the container as a recovery vessel.

**6.6.1** Cylinders with non-removable collars:

The body should be gray. The collar should be yellow.

**6.6.2** Cylinders with removable caps:

The body should be gray. The shoulder and the cap should be yellow.

**6.6.3** Drums:

The drum should be gray. The top head should be yellow.

**6.6.4** Ton Tanks:

The body should be gray. The ends and chimes should be yellow.

### **Section 7. Filling Procedures**

**IMPORTANT: DO NOT MIX REFRIGERANTS WHEN FILLING CONTAINERS.**

**7.1** *Cylinders and Ton Tanks.*

**7.1.1** Per DOT requirements, do not fill if the present date is more than five years past the test date on the container. The test date will be stamped on the shoulder or collar of cylinders and on the valve end chime of ton tanks and appear as follows:

A1  
12 01  
32

Note: This indicates the cylinder was retested in December of 2001 by retester number A132.

**7.1.2** Cylinders and ton tanks should be continuously weighed during filling to ensure user safety. "MAXIMUM GROSS WEIGHT" is indicated on the side of the cylinder or ton tank and should never be exceeded.

**7.1.3** Cylinders and ton tanks should be checked for leakage prior to shipment. Federal Law requires that leaking cylinders and ton tanks not be shipped and be immediately evacuated into acceptable cylinders or ton tanks.

## **7.2** *Drums.*

**7.2.1** Recovered refrigerant R-11, R-113, or R-123 should be placed into a new drum or a drum that previously contained new refrigerant R-11, R-113, or R-123, respectively.

**7.2.2** Drums should be filled to allow a vapor space equal to at least 10% of the drum height between the top of the liquid and the bottom of the drum top.

**7.2.3** Drums should be sealed by wrench-tightening the closure devices until the gaskets are firmly seated.

**7.2.4** Drums should be checked for leakage prior to shipment. Federal law requires that leaking drums not be shipped and be immediately transferred into acceptable containers.

## **Section 8. Transportation**

**8.1** *Local Regulations.* Per Federal regulations, the shipper of recovered refrigerant is responsible to determine if there is any state or local regulations restricting transportation, such as classifying recovered refrigerant and oil mixtures as hazardous wastes. As of the date of publication hereof, the U.S. Environmental Protection Agency does not classify these materials as hazardous waste.

**8.2** *Shipping Papers.* Per DOT requirements the shipper is required to properly fill out the shipping papers when returning the recovered refrigerant. The shipping papers always contain:

**8.2.1** The quantity and type of container.

**8.2.2** The total gross weight of recovered refrigerants, lb [kg].

**8.2.3** For DOT hazardous materials, the shipping descriptions always include the following, in sequence:

The DOT proper shipping name, for example: Chlorodifluoromethane Mixture

The DOT hazard class, for example: "2.2"

The UN identification number, for example: "UN 1018"

**8.2.4** For material not regulated by DOT as a hazardous material, the words "Not Regulated as a Hazardous Material by DOT" are recommended.