U.S. Department
of Transportation

**Pipeline and
Hazardous Materials Safety
Administration**

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

MAR 18 2005

Mr. Michael Fox
Chemical Accident Reconstruction Services, Inc.
9121 E. Tanque Verde Road, # 105
Tucson, Arizona 85749

Ref. No. 04-0203

Dear Mr. Fox:

This is in response to your letter and subsequent telephone conversation with a member of my staff and Mr. Staniszewski of our Office of Hazardous Materials Technology requesting clarification on the testing requirements of aerosol containers, DOT 2P or 2Q under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically, you request clarification of the provisions in § 173.306(a)(3)(ii). We apologize for the delay in responding and any inconvenience it may have caused.

Section 173.306(a)(3)(ii) requires a metal aerosol container to be capable of withstanding without bursting a pressure of one-and-one-half times the equilibrium pressure of the content at 130° F. The HMR do not specify a method for demonstrating that the container is capable of withstanding the specified pressure. You may demonstrate that the container meets the standard by testing or design specifications.

I hope this information is helpful. Please contact us if we can be of further assistance.

Sincerely,

John A. Gale
Chief, Standards Development
Office of Hazardous Materials Standards

040203

173.306(a)(3)(ii)

# Chemical Accident Reconstruction Services, Inc.

Stevens
§173.306(a)(3)(ii)
Limited quantities
of Compressed Gases
04-0203

August 28, 2004 (Via First Class Mail) & October 4, 2004 (via Certified Mail)

U.S. Department of Transportation
Office of Hazardous Materials Standards
ATTN: Director
Washington, D.C 20590

Second Request

Re: 49 CFR 173.306(a)(3)(ii)

Dear Director:

It is my understanding from reviewing the subject DOT Regulations that containers for limited quantities of compressed gas, such as aerosol containers,

> "must be capable of withstanding without bursting a pressure of one and one-half times the equilibrium pressure of the content at 130F."

From my experience in testing many hundreds of aerosol containers I have learned that the pressure at which an aerosol container will burst depends upon the test method used. For example, I recently tested a DOT 2Q container using a hydro tester. If precautions are taken to remove all the air prior to a hydro test, there is no compressed gas (or energy) inside the container. Under these conditions, the container will very slowly deform as the pressure is increased. Each time the container deforms, the pressure drops and stops the deformation. Using hydro testing on a DOT 2Q container, the bottom bulged at 250 psig but did not fail until 390 psig. Since the DOT 2Q specification for burst pressure is 270 psig, the container passed the test.

For the product described above, I know the temperature-pressure behavior of the product in the container very well as I have measured it several different ways.

When I heat the aerosol product to bursting, I find that the bottom snaps out at 250 psig and then the bottom instantaneously explodes off. Obviously, the kinetic energy of the product expanding and the bottom snapping out adds to the total force against the bottom, which leads to the explosion at 250 psig, which is below the 270 psig DOT burst specification for a 2Q container.

The dilemma is obvious. Using the hydro test method, I could assert that the container more than meets DOT specifications for a 2Q container. However, testing with the product in the container and using heat to increase pressure, I would be forced to conclude that the container does not meet DOT 2Q specifications.

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Since the regulation itself [49 CFR 173.306(a)(3)(ii)] refers to the "equilibrium pressure of *the content* at 130F" it would seem that the heating test would be more appropriate as it directly involves *the content* inside the container. It would also make more sense from a safety viewpoint, as the hydro test would over-estimate the actual safety of the container-content combination. In other words, if the hydro test was used to determine if the container meets DOT Regulations, that could conceivably put unsafe container-content combinations into transportation.

Your help in clarifying this dilemma would be greatly appreciated.

Thank you for your assistance.

Sincerely,

Michael Fox 10/02/04

Michael Fox, Ph.D.
Founder