U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

SEP 05 2017

Mr. Daniel G. Shelton
President
HazMat Resources, Inc.
124 Rainbow Drive, Suite 2471
Livingston, TX 77399-1024

Reference No. 16-0183

Dear Mr. Shelton:

This letter is in response to your October 14, 2016, letter and e-mail requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the installation of Department of Transportation (DOT) 400 series cargo tank vents on Motor Carrier (MC) 300 series cargo tank motor vehicles (CTMV). Specifically, you ask several questions concerning the application of these requirements. You also enclose guidance documents from your organization and the Truck Trailer Manufacturers Association; one memorandum from the Federal Motor Carrier Safety Administration (FMCSA); and clarification letters on this topic issued by the Pipeline and Hazardous Materials Safety Administration (PHMSA).

Scenario #1

An MC 307 CTMV has a maximum allowable working pressure (MAWP) of 35 pounds per square inch gauge (psig), and a total surface area of 884 square feet. This CTMV has a pressure relief device (PRD) on it with: 1) a set pressure of 35 psig that is manufactured for a DOT 407 CMTV; and 2) a venting flow rate of 460,443 standard cubic feet per hour (SCFH) at 52.5 psig with an exposed surface area of 1,061 square feet. A DOT 407 PRD with a set pressure of 35 psig may open between 42 and 46.2 psig.

Q1. Is the PRD in the above scenario set at the correct pressure for the CTMV?

A1. No. Sections 173.33(d)(3), 180.405(h)(3), and 180.405(c)(2)(iv) allow the modification of PRDs on MC 307 CTMVs to more recent DOT 407 PRD specifications as long as the minimum venting capacity of the MC 307 and the DOT 407 CTMV requirements in §§ 178.345-10 and 178.345-11 are met.

Q2. Is the CTMV in violation of § 180.407(a)(2) if the internal pressure exceeds 35 psig and the PRD does not open until at least 42 psig?

A2. No. Section 180.407 addresses requirements for the testing and inspection of specification CTMVs. In this case, § 178.345-10(d) prescribes the setting requirements for CTMV PRDs and permits them to operate within this range.

Q3. Is the CTMV in violation of § 180.407(h)(3) for venting capacity for the CTMV specification if the PRD does not open until 46 psig? According to former § 178.342-4(b) that prescribed the total venting capacity requirements for MC 307 CTMVs, the PRD must limit the internal pressure of the MC 307 CTMV to 130 percent of the MAWP (35 x 130% = 45.5 psig). However, the DOT 407 specification vent installed on the cargo tank is marked with a flow rating at 52.5 psig, not 45.5 psig.

A3. No. PHMSA amended the HMR to discontinue construction of MC 300 series cargo tanks, and to permit the use of DOT 400 series PRDs on the remaining in-service MC 300 series cargo tanks. FMCSA reports fewer than 300 of these in-service cargo tanks currently exist. After thorough review of the applicable provisions of the HMR, PHMSA has confirmed that use of the DOT 400 series PRDs on MC 300 series cargo tanks is acceptable under the HMR. These replacement PRDs on MC-specification cargo tanks must comply with §§ 180.405(c)(2) and 180.405(h)(1)-(3). Although this means that the minimum venting capacity of the MC 307 PRD you described must be met, the rest of the MC 307 PRD specifications, including the open and/or closing pressures, do not apply. Instead, these PRD specifications must conform with § 178.345-10. Further, these PRDs must have a minimum flow rate/flow capacity that conforms to their applicable vent capacity prescribed in Table I of § 178.345-10(e). The vent capacities prescribed in this table are identical to those prescribed in the outdated MC 307 specification section for total (venting) capacity (former § 178.342-4(b)). Because your example states the DOT 407 specification flow rate is approximately 460,000 cubic feet free air per hour for an exposed surface area of 1,061 square feet, the minimum venting capacity specification for the MC 307 PRD is met. *Note: PHMSA has received no incident report data regarding the failure of these upgraded PRDs on MC 300 series cargo tanks for over 20 years.*

Q4. Is the CTMV in violation of § 173.33(d)(3) for the venting capacity for the MC 307 specification if the PRD does not meet the venting flow rate until 52.5 psig?

A4. No. See Answer A3.

Q5. If the PRD is bench tested and conforms to § 180.407(j)(1)(ii)(B), is it permissible to operate the PRD on this CTMV with no further alterations?

A5. Yes, provided testing requirements in § 180.407(j)(1)(ii)(B) are met. See Answer A1.

Q6. Do the HMR allow a Registered Inspector to change the set pressure of a PRD for a specification CTMV? If the answer is yes, what equipment would be required to determine the flow rating of that vent at that set pressure, and what training is required to perform these operations?

A6. The HMR do not state who is allowed to set the PRD or what equipment must be used, only that testing and setting requirements must be met (see § 180.407(j)(1)(ii)(B)). This information may be found in the PRD owner's manual or may be obtained by contacting the PRD manufacturer. See § 180.409(a) for the applicable training and experience requirements.

Q7. If a Registered Inspector bench tests the PRD and finds that it complies with § 180.407(j)(1)(ii)(B), then changes the set pressure to 35 psig to match the MAWP of the CTMV, does the Registered Inspector have to use § 180.407(j)(1)(ii)(A) or (j)(1)(ii)(B) to re-bench test the PRD to determine its suitability?

A7. Section 180.407(j)(1)(ii)(B) must be used to bench test a modified PRD of DOT 407 specification to be used on an MC 307 CTMV.

Scenario #2

An MC 306 CTMV has a MAWP of 5 psig.

Q8. If the PRD is bench tested and conforms to § 180.407(j)(1)(i), is it permissible to operate the PRD on this CTMV with no further alterations?

A8. Yes. If the PRD is of the MC 306 specification and is tested in conformance with § 180.407(j)(1)(i)(A), it is permissible to use. This is due to the venting requirements of former § 178.341-4(d)(2) not prohibiting the PRD from opening below the MAWP. If the PRD has been modified in accordance with § 180.405(c)(2)(ii) and is tested in conformance with § 180.407(j)(1)(i)(B), it is also permissible to use. In the second example, the PRD must be tested to open at not less than 110 percent (5.5 psig) of the MAWP and not more than 138 percent (6.9 psig) of the MAWP as prescribed in § 178.346-3(c)(1).

Scenario #3

An MC 312 CTMV has a MAWP of 120 psig. The HMR do not mandate self-closing PRDs or specify a set pressure for PRDs for MC 312 CTMVs.

Q9. If the PRD is set at 95 psig, is this CTMV in violation of the HMR? If so, under what section? If not, how do I comply with § 180.407(j)(1)(iii) for bench testing?

A9. If the PRD has not been modified per § 180.405(c)(2)(vi), it must meet the requirements of an MC 312 CTMV and is not in violation of the HMR. With that being said, when mandated by the HMR to bench test the PRD, it will have to conform to the requirements of § 180.407(j)(1)(iii)(A) and must open between 100 and 110 percent of the MAWP and must reseat at no less than 90 percent of the MAWP. If the PRD has been modified in

accordance with § 180.405(c)(2)(vi), then it is in violation of the HMR. Section 178.345 10(d) states that the set pressure of the PRD must be no less than 120 percent of the MAWP and no more than 132 percent of the MAWP. When mandated by the HMR to bench test the PRD, it must conform to the requirements of § 180.407(j)(1)(iii)(B).

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

Sincerely,

for

Shane Kelley
Acting Director
Standards and Rulemaking Division
Office of Hazardous Materials Safety

Edmonson
180.407
Cargo Tanks
16-0183

Goodall, Shante CTR (PHMSA)

From: DerKinderen, Dirk (PHMSA)
Sent: Tuesday, November 15, 2016 9:12 AM
To: Goodall, Shante CTR (PHMSA)
Subject: FW: Request for Interpretation
Attachments: How to UNZIP.html; SecureZIP Attachments.zip

For assignment to Eileen as a companion to the David Ford letter/memo.

From: Betts, Charles (PHMSA)
Sent: Friday, October 14, 2016 11:27 AM
To: DerKinderen, Dirk (PHMSA)
Subject: FW: Request for Interpretation

Dirk –

I would like to discuss this will you Monday.

Thanks,
Charles

From: Daniel Shelton [mailto:dshelton@hazmatresources.com]
Sent: Friday, October 14, 2016 11:16 AM
To: Betts, Charles (PHMSA)
Cc: Solomey, Joe (PHMSA)
Subject: Request for Interpretation

Please see the attached request and supporting documents.

Regards

HazMat Resources, Inc.

OCTOBER 14, 2016

Mr. Charles Betts
Director, Office of Hazardous Materials Standards
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
East Building, 2nd Floor
Mail Stop: E21-317
1200 New Jersey Ave., SE
Washington, DC 20590

1

Mr. Betts,

Please accept this letter as an official request for an interpretation regarding the installation of 400 series vents on 300 series cargo tank motor vehicles. Some individuals and some associations representing a portion of the cargo tank industry believe that MC306, MC307 and MC312 cargo tank motor vehicles can have their 300 series vents replaced with 400 series vents and, if equipped, discard the fusible caps. I have provided for your information a copy of a document issued by The Truck Trailer Manufactures Association (TTMA) with the full support of the engineering committee of TTMA which takes exception to a Safety Advisory Notice that HazMat Resources published in July of 2016 which explains the basics of venting in accordance with the regulations, not in accordance with what one thinks the intent of the regulations might be.

TTMA is considering the creation of 180.407(j) as a solution to the venting issue when placing a DOT 407 vent on a MC307 cargo tank but the folks that I am talking to believe just the opposite. The publishing of 180.407(j) does nothing but establish that a 407 vent must operate as a 407 vent on a 307 cargo tank. How is that a solution to anything of any importance. Some will say that a MC 307 is designed to operate at pressures higher than the MAWP stamped on the specification plate but that was not the requirement of the specification. The specification required and still requires today that the vent be flow rated at 130% of the MAWP stamped on the specification plate. Just because a company may have designed their cargo tanks to operate at pressures higher than the MAWP, that was not the requirement of the specification and they were only required to be tested at 1.5 times the MAWP or 40 psi once every 5 years, not be subject to pressures greater than the MAWP every day. The regulations still state in 180.407(a) that a cargo tank may not be subject to a pressure greater than its MAWP except during a pressure test. It also goes without saying that some companies that manufacture vents are encouraging the industry to use their vents and discard the fusible caps and this policy is endorsed by TTMA.

I have described for you some various situations that occur every single day at a cargo tank facility and I would like for you to provide me the answers to these questions.

124 RAINBOW DRIVE, SUITE 2471 ◆ LIVINGSTON, TX ◆ 77399-1024 ◆ SHELTON10104@GMAIL.COM ◆ 423-863-2252

Scenario #1

We have a MC307 cargo tank motor vehicle with a MAWP of 35 psig. One places a PRD on the cargo tank that was manufactured for a DOT407 cargo tank, and has a set pressure of 35 psig. The PRD has a venting flow rate of 460,443 SCFH at 52.5 psig with an exposed surface area of 1,061 sq. ft. A DOT407 PRD with a set pressure of 35 may open between 42 and 46.2 psig. The MC307 CTMV has a total surface area of 884 sg. ft.

1. Is the PRD in the above scenario set at the correct pressure to open between 42 and 46.2 for the cargo tank?

2. Is the cargo tank in violation of 180.407(a)(2) if the internal pressure exceeds 35 psig and the PRD doesn't open until at least 42 psig?

3. Is the cargo tank in violation of 180.407(h)(3) for venting capacity for the cargo tank specification if the PRD does not open until 46 psig? According to 178.342-4(b), the PRD must limit the internal pressure of the CTMV to 130% of the MAWP (35 x 130%= 45.5 psig) and the DOT 407 vent installed on the cargo tank is marked with a flow rating at 52.5 psig, not 45.5 psig.

4. Is the cargo tank in violation of 173.33(d)(3) for the venting capacity for the MC307 specification if the PRD does not meet the flow rate until 52.5 psig when the specification for that specific cargo tank says it must meet the flow rating at 45.5?

5. If the PRD is bench tested and complies with Section 180.407(j)(1)(ii)(B), is it legal to operate the PRD on this CTMV with no further alterations even though the vent does not comply with 180.405(h)(3) or 173.33(d)(3)?

6. Does the HMR allow a Registered Inspector to change the set pressure of a pressure relief device for a specification cargo tank and if so what equipment would be required to determine the flow rating of that vent at that set pressure? What training is required to modify a vent with a new set pressure, flow rate the vent at the new pressures and mark the vent with the new Manufactures Name, Model Number, Set Pressure and Rate flow as is currently required by 178.345-10(h)?

7. The Registered Inspector bench tests the PRD and it complies with Section 180.407(j)(1)(ii)(B). The Registered Inspector then changes the set pressure to 35 psig to match the MAWP of the CTMV. Does the Registered Inspector now have to re-bench test the PRD to verify it will open at the new set pressure? If so, does the Registered Inspector use Section 180.407(j)(1)(ii)(A) or (B) to determine the suitability of the PRD?

Scenario #2
I have a MC306 cargo tank motor vehicle with a MAWP of 5 psig. If the PRD is bench tested and complies with Section 180.407(j)(1)(i), is it legal to operate the PRD on this CTMV with no further alterations?

Scenario #3
I have a MC312 cargo tank motor vehicle with a MAWP of 120 psig. The MC312 specification does not mandate self-closing pressure relief devices nor does it specify a set pressure for the pressure relief device. If the PRD is set at 95 psig, is this CTMV in violation? If so, under what section? If not, how do I comply with Section 180.407(j)(1)(iii) for bench testing?

We have reviewed 180.407(j) in its entirety and we see nothing in this section which would allow a pressure relief device to be installed on a cargo tank when the device fails to provide the venting capacity required by the original specification. We have also attached for your review copies of interpretation and guidance documents issue by RSPA and PHMSA from 1996 until the present and they all have the same message; the venting capacity must be determined in accordance with the original specification. There is no physical way that a 400 series vent can meet the flow rating requirements when it is flow rated at 130% of the MAWP, the vent may not even be open at 130% of the MAWP much less provide the flow rating.

I trust you will find this information helpful and in order, but if you need additional information or need to discuss this request in more detail please do not hesitate to contact HazMat Resources, Inc. at 423-863-2252. Because of the wide ranging implications of this interpretation we are respectfully requesting this interpretation be issues by the Office of Chief Counsel. We thank you in advance for your consideration to our request for interpretation.

Regards

Daniel G. Shelton
President, HazMat Resources, Inc.

Cc: Joseph Solomey, Assistant Chief Counsel for HazMat Safety
Attachments: Interpretation 96-1094 dated June 10, 1996
Interpretation 01-0247 dated October 25, 2001
Interpretation 01-0295 dated November 12, 2002
Staff Response to Questions on cargo tanks dated November 10, 2005
Interpretation 14-0035 dated June 13, 2014
TTMA's response to HazMat Resources, Inc. "Basics of Venting"
HazMat Resources, Inc. "Basics of Venting"

124 Rainbow Drive, Suite 2471 ◆ Livingston, TX ◆ 77399-1024 ◆ Shelton10104@gmail.com ◆ 423-863-2252

Pipeline and Hazardous Materials Safety Administration
Office of Hazardous Materials Safety
November 10, 2005

Staff Response to Questions and Answers Addressing Cargo Tank Design Pressure Requirements Under the Department of Transportation's Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180)

Q1. An MC-307 cargo tank has a design pressure of 30 psig. Is it permissible to have a 25 psig MC-300 series pressure relief device (PRD) device installed on the cargo tank? This PRD will limit tank pressure to 130% of the tank's design pressure (39 psig) as required by § 178.342-2(b).

A1. No. For the MC-307 cargo tank to be in compliance with the HMR, the cargo tank owner may install a 30 psig PRD or have the cargo tank re-rated to 25 psig design pressure. If the design pressure is lowered, certification by a Design Certifying Engineer is not required because the lower design pressure does not affect the structural integrity of the cargo tank.

Q2. An MC-307 cargo tank has a design pressure of 25 psig. Is it permissible to have a 30 psig PRD on the cargo tank? This PRD will limit tank pressure to 130% of the tank's design pressure (32.5 psig) as required by §178.342-2(b).

A2. No. A self-closing PRD set to open above the cargo tank's design pressure would allow the cargo tank to be operated above its design pressure in violation of § 180.407(a)(2). An MC-307 cargo tank with a design pressure of 25 psig must have a PRD that opens at 25 psig to assure that the cargo tank is not operating above its design pressure. A 25 psig PRD will limit tank pressure to 130% of the design pressure in accordance with § 178.342-4.

Q3. An MC-307 cargo tank has a design pressure of 25 psig. Is it permissible to replace the original pressure actuated vent with a 400 series PRD that will limit tank pressure to 130% of the tank's design pressure (32.5 psig) as required by § 178.342-2(b), but will not open until the pressure in the tank reaches 30 psig?

A3. No. See A2 above.

Q4. When replacing a reclosing pressure relief valve on an MC-307 tank, must a reclosing pressure relief valve meeting the DOT 400 series specification be installed on the unit?

A4. No. A "properly functioning" reclosing pressure relief valve is one that functions according to the specification in the HMR. After August 31, 1998, replacement reclosing pressure relief valves for MC 300 series cargo tanks must meet the requirements in

§ 180.405(h)(2). That is, a replacement for any reclosing pressure relief valve must be capable of reseating to a leak-tight condition after a pressure surge, and the volume of lading released may not exceed 1 L. Specific performance requirements for these pressure relief valves are set forth in § 178.345-10(b)(3). In accordance with § 178.345-10(b)(3), each pressure relief system must be designed to withstand a dynamic pressure surge reaching 30 psig above the design set pressure and sustained above the design set pressure for at least 60 milliseconds with a total volume of liquid released not exceeding 1 L before the relief valve recloses to a leak-tight condition.

Q5. According to § 173.33(d)(3), the pressure relief system on an MC 300 series cargo tank may be upgraded to a DOT 400 series pressure relief system if "the venting capacity requirements of the original specification are met when a pressure relief valve is modified." However, the methods for determining venting capacity are different for the MC 300 series and the DOT 400 series cargo tanks. According to § 178.345-10(g), the DOT 400 series PRDs are to be flow rated at a pressure not to exceed the test pressure for the cargo tank. DOT- 407 specification vents are typically tested and rated at 1.5 times MAWP. The MC-307 specification (§ 178.342-4) requires the devices to be tested at 130%. For an MC 300 series cargo tank that is equipped with a DOT 400 series PRD, at what pressure should the flow capacity be determined?

A5. The flow capacity must be determined using the requirements of the tank's original venting capacity specification, as stated in §§ 173.33(d)(3) and 180.405(h)(3). Therefore, in your example, the DOT- 407 PRD used on an MC-307 vent must be flow-tested at 130% of the cargo tank's design pressure to accurately determine compliance with the minimum venting requirements of § 178.342-4.

Q6. Can a DOT- 407 cargo tank with a 25 psig MAWP be tested at 45 psig and have a marked test pressure of 45 psig on the nameplate? The certification requirement for a DOT- 407 cargo tank in § 178.347-5(a) states: "Each cargo tank must be tested in accordance with § 178.345-13 and this section." Paragraphs (b) and (b)(1) of § 178.345-13 require each cargo tank or cargo tank compartment to be tested hydrostatically or pneumatically pressurized as prescribed in the applicable specification. The DOT-407 specification, at § 178.347-5(b)(1), requires the test pressure for the hydrostatic test method to be at least 40 psig or 1.5 times tank MAWP, whichever is greater. However, the periodic test requirements in § 180.407(g)(1)(iv) state: "Each cargo tank must be tested hydrostatically or pneumatically to the internal pressure specified in the following table. At no time during the pressure test may a cargo tank be subject to pressures that exceed those identified in the following table." The table indicates a DOT- 407 cargo tank should be tested at "275.8 kPa (40 psig) or 1.5 times the design pressure, whichever is greater." Section 180.407(g)(1)(viii) reads: "*Hydrostatic test method*". Each cargo tank, including its domes, must be filled with water or other liquid having similar viscosity, at a temperature not exceeding 100°F. The cargo tank must then be pressurized to not less than the pressure specified in paragraph (g)(1)(iv) of this section."

Therefore, the regulatory language permits the test pressure to be not less than the greater of 40 psig or 1.5 times the MAWP in certain paragraphs and that it may not exceed the greater of 40 psig or 1.5 times the design pressure in a different paragraph. What is correct?

A6. This inconsistency will be addressed in a future rulemaking. Part 178 establishes a benchmark of "at least 40 psig or 1.5 times tank MAWP, whichever is greater" for the testing of the DOT cargo tanks at the time of manufacture. The regulations do not prohibit a manufacturer from testing and certifying a DOT- 407 cargo tank to pressures above 40 psig; therefore, the tank could be tested and marked with 45 psig. Additionally, when undergoing a required requalification pressure test, a cargo tank must be tested at the greater value of 40 psig, 1.5 times tank MAWP or the marked test pressure, whichever is greater.

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

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

NOV 12 2002

Ref. No. 01-0295

Mr. John Freiler
Girard Equipment, Inc.
1004 Route 1
Rahway, NJ 07065

Dear Mr. Freiler:

This is in response to your November 9, 2001 letter and subsequent conversations with members of my staff requesting clarification on the replacement of vents on MC 300 series cargo tanks with vents designed for DOT 400 series cargo tanks meeting the performance requirements of § 178.345-10(b)(3) in the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). In addition to clarifying RSPA's position on this issue, you also request that RSPA allow 25 psig maximum allowable working pressure (MAWP) MC 307 tanks to have their vents upgraded to DOT 407 vents having a set pressure of 30 psig as required by the requirements for DOT 407 vents as described in § 178.345-10. I apologize for the delay in responding to your letter.

The interpretation issued by this office by Hattie Mitchell in 1996 is correct. Section 173.33(d)(3) requires the replacement DOT 407 series valve only to meet the original MC 307 cargo tank venting capacity requirements. Thus, the letter to Bill Quade (Ref. No. 01-0247) should be amended to clarify that only the venting capacity requirements for the 300 series tank need be met.

In addition, your request to allow MC 307 cargo tanks with a maximum allowable working pressure (MAWP) of 25 psig to have their vents upgraded to DOT 407 vents having a set pressure of 30 psig (as required in § 178.345-10 for DOT 407 vents) must be submitted as a petition for rulemaking under the requirements of § 106.31 in order for RSPA to consider a rule change.

We hope this satisfies your request.

Sincerely,

Robert A. McGuire
Associate Administrator
Office of Hazardous Materials Safety

010295

178.345-10

February 13, 2002

John Freiler
Engineering Manager
Girard Equipment, Inc.
1004 US Route 1
Rahway, NJ 07065
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Fax: (732) 382-4650
E-mail: jfreiler@girardequip.com

Michael Johnson
Tr. Reg. Spec.
Standards Development, DHM-11
Fax: (202) 366-3012

Dear Mr. Johnson;

Thank you for returning my phone call and discussing my November 9, 2001 letter.

During that conversation, we uncovered some confusion with the second to last paragraph in my letter:

> In light of these points, I ask if you could revisit your answer and change it to allow 25 psig MAWP MC 307 tanks to have their vents upgraded to DOT 407 vents having a set pressure of 30 psig as required by the requirements for DOT 407 vents as laid out in 178.345-10.

It is important to note the word "set pressure". The DOT 407 vent I'm referring to would be set nominally at 30 psig and could be set as high as 33 psig as per the requirements of 49CFR§178/345-10(d)(1):

> *Settings of pressure relief system...*
> *Primary pressure relief system.* The set pressure of each primary pressure relief valve must be no less than 120 percent of the MAWP, and no more than 132 percent of the MAWP. ...

So for the 25 psi MAWP MC 307 tank in question, a DOT 407 venting system would have to be set at no less than 120% of 25 psig or 30 psig and no more than 132% of 25 psig or 33 psig.

So, a DOT 407 vent having a set pressure of 30 psig is a 25 psig DOT 407 vent.

I look forward to talking with you further on this subject on Thursday, February 21st.

Sincerely,

John Freiler

November 9, 2001

John Freiler
Engineering Manager
Girard Equipment, Inc.
1004 US Route 1
Rahway, NJ 07065
Ph: 1-800-526-4330 ext. 618
Fax:(732) 382-4650
E-mail: jfreiler@girardequip.com

Delmer F. Billings
Chief, Standards Development, DHM-11
Fax (202) 366-3012

Dear Mr. Billings;

I have recently come into possession of a memorandum (Ref. No. 01-0247) from you to William Quade, Chief, Hazardous Materials Division, MC-ECH, which offers up some clarifications to the concerning cargo tank regulations in the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180).

I feel that the clarifications you offered up are in error, and would not only cause financial hardship and confusion, but would also create a safety hazard if they were to be enforced as written.

In your letter, you said:

...

Q3. According to § 173.33(d)(3) the pressure relief system on a 300 series cargo tank may be upgraded to a pressure relief system meeting the requirements of a 400 series cargo tank, as long as "the venting capacity requirements of the original specification are met when the valve is modified." However, the methods for determining venting capacity are different for the 300 series and the 400 series cargo tanks. According to § 178.345-10(g) the 400 series pressure relief devices are typically tested and rated at 1.5 times MAWP. The MC-307 specification (§ 178.342-4) requires the devices to be tested at 130%. For a 300 series cargo tank that is equipped with a pressure relief device manufactured in accordance with 400 series requirements, at what pressure should the flow capacity be determined?

A3. The flow capacity must be determined using the requirements of the original specification, as stated in §173.33(d)(3). Therefore, in the example you included above, the DOT-407 vent used on an MC-307 cargo tank must be flow tested at 130% of the design pressure to accurately determine compliance with the minimum venting requirements of § 178.340-4. This information should be supplied by the valve manufacturer of the pressure relief device.

First I shall discuss why I feel this is in error. This same question arose in 1995 when an officer in the California Highway Patrol made the inquiry of me. I sent a request for clarification to your office and received a reply in a letter dated June 10, 1996 from Hattie L. Mitchell, then Chief of Exemptions and Regulations Termination OHMS that read as follows:

> Dear Mr. Freiler:
>
> This is in response to your letter requesting clarification of the pressure relief requirements specified in 49 CFR 173.33(d). Specifically, you asked if § 173.33(d)(3) prohibits upgrading vents on MC 307 and MC 312 cargo tanks to DOT 407 and DOT 412 vents that are flow rated in accordance with § 178.345-10. I apologize for the delay in responding and regret any inconvenience it may have caused.
>
> The answer is no. Section 173.33(d)(3) provides that pressure relief devices or outlets on a specification cargo tank motor vehicle listed in column 1 may be modified to meet the applicable requirements for the specification listed in column 2. However, replacement devices constructed to the requirements of §.178.345-10 must provide the minimum venting capacity required by the original specification to which the cargo tank was design and constructed.
>
> I trust this satisfies your inquiry.
>
> Hattie L. Mitchell, Chief

Further, we should consider the intent under which the provision found in § 173.33(d)(3) "The venting capacity requirements of the original DOT cargo tank must be met whenever a pressure relief valve is modified" was inserted into the CFR. This provision was added to the code in response to comments made at public meetings that I attended. At those meetings, there was much concern expressed by vent makers in regard to the so-called "Smart Vent" or "Dual Function" requirements {the reduced leakage during surge requirements laid out in § 178.345-10 (b)(3) }. Betts Industries, a leading Manufacturer of vents for MC-306 cargo tanks had developed a style of vent for the DOT 406 requirements that would leak less than one gallon during surge, but those vents had a reduced capacity *at the set and flow rate pressures for a DOT 406 cargo tank* when compared to the vents currently in service on MC-306 tanks. It was felt that a potential safety hazard existed wherein a MC-306 cargo tank operator could replace his existing vents one for one with the new smart vents, not realizing that their capacity *as measured at the DOT 406 pressures* would be lower in terms of SCFH than that cargo tank originally required. This lead to the following entry in the Federal Register Vol. 59, No. 212, Thursday, November 3, 1994, pg. 55163 & 55169:

> Page: 55163:
> *Section 173.33*
> Consistent with the changes made in § 180.405(h) in this final rule, a new sentence is added to paragraph (d) stating that the venting requirements of the original DOT cargo tank

specification must be met whenever a pressure relief valve is modified to a more recent specification. See preamble discussion for § 180.405(h).

Page: 55169:
Section 180.405

...

Paragraph (h) specifies that replacement for any pressure replacement for any reclosing pressure relief valve must be capable of re-seating to a leak-tight condition after a pressure surge. Section 180.405(c) authorizes modifying the reclosing pressure relief valves of an MC 306 cargo tank by installing the dual function pressure relief valves which are required for DOT406 cargo tank motor vehicles. Commentators pointed out that this replacement could result in an MC 306 cargo tank having lower emergency venting capacity than its specification requires: because it is difficult to produce a valve that achieves the comparatively high flow rates of the MC 306 units, withstands the pressure surges specified in the DOT 406 specification, and recloses with minimal loss of lading. A reduced flow capacity is less likely to be encountered in fitting and MC 307 with a DOT 407 valve replacement, and in fitting an MC 312 with a DOT 412 valve replacement, because of the larger pressure differentials which are commonly used in these cargo tanks. Regardless of the equipment installed, the venting requirements specified in the particular cargo tank specification must be met whenever a pressure relief valve is replaced. ...

Note that our company was the one queried as to the status of Vents available for DOT 407 and DOT 412 cargo tanks. No mention was made of a vent that was essentially a crippled DOT 407 or DOT 412 vent; one made to those specifications, but with flow rates made to the obsolete MC 307 or MC 312 specifications. Only "capacity" is referenced. Indeed, it is the DOT 407 and DOT 412 cargo tanks that have "larger pressure differentials" than their corresponding obsolete MC 307 or MC 312 specification.

Finally, in discussions with the Late Mr. Ron Kirkpatrick of your office (DHM-22) regarding the 1995 California Highway Patrol inquiry discussed previously, Mr. Kirkpatrick Faxed me the following letter Dated June 8, 1995:

ANALYSIS OF VENTING OF MC 307 CARGO TANKS WEITH DOT 407 PRESSURE RELIEF DEVICES INSTALLED.

Both §§ 173.33(d)(3) and 180.405(c)(2) authorizes the modification of pressure relief devices and outlets on various MC 300-series cargo tanks to the related DOT 400-series specifications; the table in § 173.33(d)(3) clearly shows the specifications for which these modifications are authorized. For example, pressure relief devices on the MC 307 may be modified in accordance the DOT 407 specification.

In order to illustrate the steps required to carry out the MC 307 to DOT 407 venting modification, the DOT 407 type reclosing pressure relief valve (407PRV) would be installed and all parts of the MC 307 pressure relief system would have to be removed, i.e. each MC 307 type pressure relief system would have to be removed, and each fusible or frangible device. Non-reclosing pressure relief devices are not authorized in DOT 407 pressure relief systems except when in series with a reclosing pressure relief device, see § 178.345-10(b). In carrying out this modification, the total venting capacity required by § 178.342-4(b) must be maintained, as stated in § 180.405(h)(3). The number of 407 PRVs required to meet the total venting capacity for the MC 307 must be determined based on the area exposed (to fire), see § 178.342-4, Table III.

The venting capacity of the 407 PRV is rated at "not more than the tank test pressure", i.e. 1.5 MAWP. In the MC 307, "one or more device" shall provide "sufficient capacity to limit the tank internal pressure to a maximum of 130 percent" of MAWP. This can be accomplished using any combination of pressure actuated venting (spring loaded) (PAV), and fusible and/or frangible venting devices.

- The PAVs are required to have minimum venting capacity of 12,000 SCFH "measured at a pressure of 130 percent" of MAWP and the set pressure is given as "not less than" MAWP.

- Frangible devices are required to have burst pressures between 130 and 150 percent of MAWP.

- Fusible devices are required to have a minimum area of 1.25 sq. inches, and to operate at a temperature not exceeding 250°F "when the tank pressure is between" MAWP and 130 percent of MAWP.

A typical MC 307 designed for 25 psig MAWP would have one 3" PAV of about 27,000 SCFH capacity, with two 3" fusible devices provided to supply the additional emergency flow requirements.

In a fire situation, it is quite possible that the tank internal pressure could exceed 130 percent of MAWP before the fusibles opened. Similarly, if frangible devices were used to provide the bulk of the emergency flow rather than fusibles, internal pressures greater than 130 percent of MAWP could be anticipated under some circumstances.

Test pressure for MC 307 is 40 psig or a minimum of 1.5 MAWP whichever is greater, see § 178.342-7(a). At the minimum MAWP for this cargo tank, 25 psig, test pressure is 1.6 MAWP; at 26.67 psig and above, the test pressure is 1.5 MAWP. The 407 PRV develops rated flow capacities at 1.5 MAWP or less.

In view of these facts, and considering the following structural considerations:

- maximum calculated stress values must not exceed 20 percent of the minimum ultimate strength for non-ASME tanks, or about 25 percent of ultimate for ASME tanks, and

- emergency flow rates could be expected to be called for only under conditions where dynamic loading is extremely unlikely,

the installation of a DOT 407 pressure relief system on an MC 307 cargo tank will not compromise the structural integrity of the cargo tank.

[*Letter presented in its entirety*]

Note in the third paragraph, Mr. Kirkpatrick specifically addresses the fact that DOT 407 vents are flow rated at pressures different than those required for MC 307 vents. This reflects the view prevalent in the Office of Hazardous Materials Technology at that time, that during an upgrade in venting, the pressures at which the vents are flow rated are those to which the vent was constructed to, i.e. DOT 400-series, and not to the obsolete requirements of the MC 300-series as your memorandum Ref No. 01-0247 indicates.

Next, I will address the fact that this ruling, if enforced would result in financial hardship and confusion. Since 1991 through August 31, 1995, the vast majority of chemical transport cargo tanks produced were made to the MC 307 specification with DOT 407 venting as provided for in § 180.405(c)(2). We sold approximately 2,800 of our *DOT-407 Jet vents* in 1994 alone, during which time, we understand that the vast majority of which went on new-construction MC 307 cargo tanks. Also, from 1996 through to the present, many owners of MC 307 & MC 312 tanks have upgraded their tanks venting to DOT 407 & DOT 412 specifications so as to remove the need to maintain non-reclosing vents such as fusible and frangible devices. These tanks, which amount to many thousands of units are, to my knowledge, all equipped with venting that is both set-to-discharge and flow rated in accordance with the rules and regulations laid out for DOT 400-series tanks in §178.345-10. That is they are set-to-discharge at 120%-132% of MAWP and are flow rated at the tank test pressure, which is the maximum of 150% of MAWP or 40 psig. This has been the standard industry practice for a decade.

If the "clarifications" presented in your memo were to be enforced, it would necessitate the removal and replacement of many thousands of currently legal and safe pressure relief vents, while stalling vast amounts of commerce by making these many thousands of cargo tanks illegal for hazardous materials transport.

Another factor contributing to the confusion this would generate is the fact that absent the set-to-discharge and flow rating pressures, spring loaded pressure relief vents for MC 307 and DOT 407 vents do not differ at all. The DOT 400-series vents do call for a reduced leakage during surge capability in § 178.345-10(b)(3) which is not found in the original MC 307 venting requirements, but is retroactively applied to any new vent installed after August 31, 1998 in § 180.405(h)(2). So in essence, the code provides for upgrades in venting systems, but the "clarification" presented in your memo would remove the possibility: the only vents your clarification seems to allow are ones that comply in full with the MC 307 venting requirements and not at all with the unique requirements for DOT 407 tanks.

The only conclusion a cargo tank operator can come to is that upgrading is in fact not allowed and that they must immediately downgrade their tanks to the less safe venting systems presented in the obsolete MC 300 series code.

Finally, this "clarification" as presented in your memo would result in a safety hazard if enforced. The DOT 400 series venting requirements result in a safer tank than the obsolete MC 300-series requirements:

- The elimination of non-reclosing venting such as fusible and frangible devices when upgrading from MC 300-series to DOT 400-series venting results in greater levels of hazardous material product containment during emergency situations.

- The increase in set-to-discharge pressure from MAWP for MC 300-series venting to 120% of MAWP for DOT 400-series venting allows extra product retention capability during a rollover accident to account for static head of the product. For example, a product that produced a 25 psi vapor pressure hauled in a 25 pound tank would be fine so long as the tank remained upright. But if the tank rolled over, the vent, which would then be on the bottom of the tank, would be exposed not only to the 25 psi vapor pressure, but also to the pressure of the weight of the liquid over it. This would cause an MC 300-series vent to discharge hazardous liquids into the accident scene, while a DOT 400-series vent, by virtue of being set-to-discharge at 120% of 25 psi, will continue to safely retain the product.
- The requirements for vacuum relief in the DOT 400-series vents that are missing in the MC 300-series help eliminate dangers associated with cargo tank implosion, a common event in tanks not equipped with vacuum relief.

It should also be noted that DOT 400-series vents set and flow rated in accordance with the requirements for such vents in § 178.345-10 do not compromise the safety of an MC 300-series cargo tank:

- The conclusion of Mr. Ron Kirkpatrick's letter quoted above states that DOT 400-series venting will not compromise structural integrity of MC 300-series tanks to which they are installed.
- The rating of DOT 400-series vents at the tank test pressure is not a risk to safety since all cargo tanks in hazardous materials service are required to be physically tested to the test pressure on a regular basis of every one to five years as required by § 180.407(c), so we know that the tank is capable of withstanding these pressures without "leakage, bulging or other defect." See § 180.407(g)(1)(viii).
- There remains a large safety factor for the cargo tank as, absent the "leakage, bulge or other defect" requirement: pressure vessels typically have a rupture pressure that is 500% of MAWP.
- This sort of upgrade has been standard industry practice for a decade, without any venting related crisis in safety.

Other safety problems arise when we consider that of the many thousands of cargo tanks that would need to have new pressure relief valves fitted, some small portion of them will be replaced incorrectly, and result in unsafe valves being fitted to cargo tanks, or worse still, the tanks being inadvertently operated without safety relief devices at all.

Also, in this post September 11, 2001 environment, the confusion of throwing so many cargo tanks hauling hazardous materials in the United States into dubious legality will create opportunity for nefarious or terrorist agents to misuse these cargo tanks so as to utilize the hazardous nature of the commodity transported as a weapon against the public.

In light of these points, I urge you to revisit the clarification you offered up in your memo and alter it to agree with current industry practice and with Hattie Mitchell's 1996 clarification: Note that upgrades to DOT 400-series vents from MC 300-series vents must be of the entire venting system being replaced with one conforming to all of the requirements of §178.345-(10) including the set-to-discharge pressure of 120% MAWP and the flow rating at the tanks test pressure.

Also, in the same memo, you stated:

> . . .
>
> Q1. A specification MC-307 cargo tank has a design pressure of 25 psig. Is it permissible to replace the original pressure actuated vent with a 400 series pressure relief device that will limit tank pressure to 130% of design pressure (32.5 psig) as required by § 178.342-2(b), but will not open until 30 psig?
>
> A1. No, a self closing pressure relief device set above a cargo tank's design pressure would allow the unit to be operated above its designed pressure which is in violation of § 180.407(a)(2). For example, an MC-307 cargo tank with a design pressure of 25 psig must have a pressure relief device which opens at 25 psig so to not allow the tank to continually operate over pressurized. The pressure relief device must be able to limit tank pressure to 130% of the design pressure.
>
> . . .

Utilizing the requirements of § 180.407(a)(2) to require that pressure relief device be set at the tanks test pressure would have the effect of making all DOT 407 tanks illegal. Section 180.407(a)(2) applies to all specification cargo tanks, not just MC 307 or other obsolete cargo tanks. DOT 400-series pressure relief vents are required by § 178.345-10(d) to be set to discharge at "no less than 120 percent of MAWP, and no more than 132 percent of MAWP." The only reasonable conclusion is that § 180.407(a)(2) is an operational limitation and not a guideline for setting pressure relief devices on specification cargo tanks.

Also, the requirement "The pressure relief device must be able to limit the tank pressure to 130% of the design pressure" stems from the venting requirements for MC-307 cargo tanks; see § 173.342-4(b). However, the provisions of §§ 173.33(d) and 180.405(c)(2) allow the upgrade of venting systems to the corresponding DOT 400-series venting systems. I submit that the only reasonable interpretation of these requirements is that §§ 173.33(d) and 180.405(c)(2) allow the appropriate venting sections supercede the venting requirements of obsolete specification cargo tank that is having it's venting systems upgraded. Thus the requirements laid out for the original MC 307 cargo tank venting system in § 178.342-4 is superceded in its entirety by the venting requirements laid out in § 178.347-4 (which include the requirements of § 178.345-10) with the exception that the capacity requirements laid out in Table III still stand (this table is identical to the DOT 400-series Table I in § 178.345-10), and thus operators are cautioned against possibly fitting a venting system with insufficient capacity at the new pressures.

In light of these points, I ask if you could revisit your answer and change it to allow 25 psig MAWP MC 307 tanks to have their vents upgraded to DOT 407 vents having a set pressure of 30 psig as required by the requirements for DOT 407 vents as laid out in §178.345-10.

I'd like to thank you for your consideration of these points. If you have any questions, please feel free to contact me by phone, fax or e-mail and I would be happy to discuss or clarify any issues you may have.

Sincerely,

John Freiler
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