U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590

November 23, 2020

Paul Horgan
353 Porter St.
Woodland, CA 95695

Reference No. 20-0066

Dear Mr. Horgan:

This letter is in response to your August 20, 2020, email requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the requirements in § 180.407 pertaining to testing and inspection of specification cargo tanks. Specifically, you ask whether inspection of a cargo tank using the wet fluorescent magnetic particle method is required for MC330 and 331 cargo tanks in dedicated carbon dioxide refrigerated liquid service. In addition, you ask whether carbon dioxide refrigerated liquid is considered a source of stress corrosion cracking in SA 517E type steel, quenched and tempered cargo tanks.

The need to use the wet fluorescent magnetic particle method must be determined by the cargo tank motor vehicle (CTMV) owner and the Registered Inspector (RI) performing the inspection of the CTMV based on knowledge and experience of MC 330 or 331 in this service. As provided in § 180.407(g)(3), the wet fluorescent magnetic particle method must be performed to internally inspect a cargo tank used to transport any hazardous material that may cause stress corrosion cracking prior to and in conjunction with the performance of the pressure test requirements. Furthermore, the CTMV owner and the RI may use publicly available information or rely on their operations and maintenance records to aid in determining whether a hazardous material may cause stress corrosion cracking and the necessary method for inspection.

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

Sincerely,

Dirk Der Kinderen
Chief, Standards Development Branch
Standards and Rulemaking Division

Casey

20-0066

From: DerKinderen, Dirk (PHMSA)
To: Dodd, Alice (PHMSA)
Cc: Kelley, Shane (PHMSA); Foster, Glenn (PHMSA)
Subject: FW: Wet Fluorescent Magnetic Particle Testing of MC330/331 Cargo Tanks in Dedicated Carbon Dioxide Refrigerated Liquid make with SA 517E, 115KSI steel.
Date: Tuesday, August 25, 2020 9:42:38 AM
Attachments: image002.png

Alice,

Please enter into the system as a request for an interpretation. Leonard notes that this was also sent to the HMIC so doublecheck our FMP records so we don't have duplicate interps on this.

Thanks,
Dirk

From: Majors, Leonard (PHMSA)
Sent: Friday, August 21, 2020 1:32 PM
To: DerKinderen, Dirk (PHMSA) <Dirk.DerKinderen@dot.gov>
Cc: Freeman, Cheryl (PHMSA) <cheryl.freeman@dot.gov>; Bomgardner, Paul (FMCSA) <paul.bomgardner@dot.gov>
Subject: FW: Wet Fluorescent Magnetic Particle Testing of MC330/331 Cargo Tanks in Dedicated Carbon Dioxide Refrigerated Liquid make with SA 517E, 115KSI steel.

Hello Dirk,

I received the email below from an industry representative. He has a question about the Wet Fluorescent Magnetic Particle Testing for a MC-330/331 cargo tank motor vehicle. This request was also sent to the PHMSA Information Center. I believe it is in the best interest of the Office of Hazardous Materials Safety to give a formal response. My concern is any answer provided from PHH-22 may be considered guidance or additional regulatory burden.

Please let me know if you want to chat on how to handle this issue. FMCSA is aware of these questions.

Thanks,

Leonard J. Majors
Division of Sciences, Engineering and Research

US Department of Transportation
Pipeline and Hazardous Materials Safety Administration
1200 New Jersey Avenue, SE, Washington D.C. 20590
Office: 202.366.4545

PHMSA Home | LinkedIn | Twitter | HAZMAT | OPS

From: Paul Horgan [mailto:hmctman@gmail.com]
Sent: Thursday, August 20, 2020 7:17 PM
To: INFOCNTR (PHMSA) <INFOCNTR.INFOCNTR@dot.gov>; Majors, Leonard (PHMSA) <leonard.majors@dot.gov>; Bomgardner, Paul (FMCSA) <paul.bomgardner@dot.gov>
Subject: Re: Wet Fluorescent Magnetic Particle Testing of MC330/331 Cargo Tanks in Dedicated Carbon Dioxide Refrigerated Liquid make with SA 517E, 115KSI steel.

CAUTION: This email originated from outside of the Department of Transportation (DOT). Do not click on links or open attachments unless you recognize the sender and know the content is safe.

On Thu, Aug 20, 2020 at 4:06 PM Paul Horgan <hmctman@gmail.com> wrote:

> Does 180.407(g)(3) below, require wet fluorescent magnetic particle testing of MC330/331 cargo tanks in dedicated carbon dioxide refrigerated liquid service?
> Is dedicated carbon dioxide refrigerated liquid considered to create stress corrosion cracking in SA 517E, 115KSI QT cargo tanks?
>
> It appears that pure carbon dioxide does not create stress corrosion cracking without the presence of water, oxygen or other contaminants. What is PHMSA's position on the dedicated CO2 service in Qt cargo tanks?
>
> I found a NACE and DOE (OSTI) article on the Stress Corrosion Cracking (SCC) for carbon dioxide (CO2) in reference to pipeline transportation of aqueous solutions of CO2 and water. They even mention that dehydration of the aqueous solution will eliminate the SCC. Another article with CO2, water and carbon monoxide causing SCC.
>
> Here are links to the articles and the abstract.
>
> https://www.osti.gov/biblio/6698176-internal-stress-corrosion-cracking-aqueous-solutions-co-co-sub
> https://www.osti.gov/servlets/purl/5870161
> https://scholars.uow.edu.au/display/publication97457
> https://www.sciencedirect.com/topics/engineering/carbon-dioxide-corrosion
>
> https://www.sciencedirect.com/topics/engineering/carbon-dioxide-corrosion
>
> **Internal stress-corrosion cracking by aqueous solutions of CO and CO2**

Abstract

Battelle Columbus Laboratories study of stress-corrosion cracking (SCC) of line-pipe steel in aqueous solutions of CO and CO/sub 2/ revealed that pipeline steels are susceptible to SCC at partial pressures of CO/sub 2/ and CO as low as 1 psi (6.9 kPa). For SCC to occur, carbon dioxide, carbon monoxide, and water must be simultaneously present. The SCC morphology involves multiple, transgranular cracks perpendicular to the direction of maximum tensile stresses in the steel. The surest method for control of CO-CO/sub 2/ SCC is to prevent condensation by controlling the gas composition and keeping the temperature above the dewpoint. **Adequate dehydration of the gas prior to injection in the pipeline will prevent SCC**, even for gas compositions that would promote severe **SCC in the presence of water**. The removal of CO/sub 2/ and CO does not appear to be practical because of the low levels of these gases that will still support SCC. In current industry practice, carbon dioxide levels are controlled to 10 psi (69 kPa) or less for control of general corrosion and pitting; however, no limits on CO have been established. In the presence of water, small amounts of CO can promote SCC at CO/sub 2/ concentrations that are acceptable for general-corrosion considerations. Oxygen in the gas greatly increases the severity of SCC and should be avoided

180.407(g)(3) Each MC 330 and MC 331 cargo tank constructed of quenched and tempered steel in accordance with Part UHT in Section VIII of the ASME Code (IBR, see §171.7 of this subchapter), or constructed of other than quenched and tempered steel but without postweld heat treatment, used for the transportation of anhydrous ammonia or any other hazardous materials that may cause corrosion stress cracking, must be internally inspected by the wet fluorescent magnetic particle method immediately prior to and in conjunction with the performance of the pressure test prescribed in this section. Each MC 330 and MC 331 cargo tank constructed of quenched and tempered steel in accordance with Part UHT in Section VIII of the ASME Code and used for the transportation of liquefied petroleum gas must be internally inspected by the wet fluorescent magnetic particle method immediately prior to and in conjunction with the performance of the pressure test prescribed in this section. The wet fluorescent magnetic particle inspection must be in accordance with Section V of the ASME Code and CGA Technical Bulletin TB-2 (IBR, see §171.7 of this subchapter). This paragraph does not apply to cargo tanks that do not have manholes. (See §180.417(c) for reporting requirements.)

--
Paul Horgan
530-304-4590

--
Paul Horgan

530-304-4590