U.S. Department
of Transportation

**Pipeline and Hazardous
Materials Safety
Administration**

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

SEP 2 4 2013

Mr. Eric Larson
Custom Metalcraft, Inc.
2332 E. Division, P.O. Box 10587
Springfield, Missouri 65808

Ref. No.: 13-0116

Dear Mr. Larson:

This responds to your May 16, 2013 letter requesting clarification of the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180) applicable to the manufacturing and design of portable tanks. In your letter, you describe the calculations you use for the testing of a specification United Nations (UN) portable tank, under § 178.275, for the transportation of liquid and solid hazardous materials. You ask this Office to verify whether the calculations as presented in your letter are correct and would meet the design requirements prescribed in § 178.275.

This Office does not perform the function of certifying whether a portable tank design meets the UN specification as prescribed in Part 6 of the UN Model Regulations. However, the HMR provide an application process for approval of a Specification UN portable tank design as specified in § 178.273. Such applications are submitted to a designated approval agency authorized to approve portable tank designs in accordance with the procedures specified in Subpart E, Part 107, of 49 CFR Volume II, chapter I, subchapter A.

I hope this satisfies your inquiry. Please contact us if we can be of further assistance.

Sincerely,

T. Glenn Foster
Chief, Regulatory Review and Reinvention Branch
Standards and Rulemaking Division

Andrews
§ 172.102
§ 178.275 (B)
Portable Tanks
13-0116

Drakeford, Carolyn (PHMSA)

From: INFOCNTR (PHMSA)
Sent: Tuesday, May 28, 2013 12:17 PM
To: Drakeford, Carolyn (PHMSA)
Subject: FW: requesting a letter of interpretation
Attachments: 20130524104316272.pdf

Hi Carolyn,

This caller requested we submit this e-mail as a formal letter of interpretation.

Thanks,
Victoria

From: Eric Larson [mailto:ericl@custom-metalcraft.com]
Sent: Friday, May 24, 2013 12:10 PM
To: INFOCNTR (PHMSA); Majors, Leonard (PHMSA)
Cc: Steve Allred; Jeff Nelson; Mike Bither
Subject: requesting a letter of interpretation

I am requesting a letter of interpretation on the information contained in the attached pdf. If this is the improper format to request a letter of interpretation please let me know. In the mean time please respond to the information contained in the pdf via email. If I get no response to the information contained in the pdf I will assume my statements in the pdf are correct and will proceed with vessel design and fabrication under that assumption.

From: Eric Larson
Sent: Monday, May 13, 2013 10:13 AM
To: 'leonard.majors@dot.gov'
Subject: Questions

Please submit a response as we discussed on the phone:

1) Special provisions B14 & TP38 specify a thermal conductance of no more than .075 Btu/(Hr Ft^2 F) which take as the thermal conductivity k per inch of thickness. We have a "repeat" job that was originally DOT 51 that had essentially 2" thick insulation. I don't know of any insulation that will satisfy the maximum of .075 Btu/(Hr Ft^2 F) with a 2" thickness along with maximum insulation temperature requirements. Am I reading this correct? I am taking k and dividing it by the insulation thickness which must be less than or equal to .075 Btu/(Hr Ft^2 F). k/t<=.075 Btu/(Hr Ft^2 F)? If that is the case we are looking at 3" to 6" of insulation depending on what insulation material is used (see pdf). We use 2" of insulation on vessels unless there is some reason to go thicker and in this case we have an existing design we want to try and keep. In addition, what parts of the vessel need to be insulated (see pdf of original tank)? I would assume any parts that need to be insulated would have to have a minimum thickness measured perpendicular to the shell surface per the thermal conductance criteria?
2) Per 178.275(B) "The partial pressure (in bar) of air or other gases in the ullage space, resulting from their compression during filling without pressure relief by a maximum ullage temperature of 65 °C (149 °F) and a liquid expansion due to an increase in mean bulk temperature of 35 °C (95 °F); and" Does this mean that we are starting with an empty tank that is totally closed off, no pressure relief valve or venting of any kind, with air at atmospheric pressure and temperature inside the tank and then filling to the maximum fill level with the hazardous material, the resulting pressure due to the compression of the air would then be calculated at the maximum fill level at 149 °F and the design pressure must not, in part, be less than this?

Andrews
§172.102
§178.275(B)
Portable Tanks
13-0116

178.275 (b)(1)(B):

V_{FU} = Full Volume of Vessel (Uncorroded)
V_N = Nominal Volume of Vessel (max. Product Volume)
d_{21} = density of Product @ 21°C (≈70°F)] ≥ 35C° Increase
d_{65} = density of Product @ 65°C (149°F)]
T_A = Atmospheric Temperature 294 K (≈21°C) (≈70°F)
P_A = Absolute Atmospheric Pressure 1 bar (≈15 PSI)

Step 1)

Choose the Full Volume of Vessel V_{FU}

Step 2)

Calculate:
P_B = max. uncorroded Gauge Pressure of the Ullage Space (Air)
T_U = max. uncorroded Ullage Temperature (Air)

Start with Empty Vessel at Atmospheric (0 PSIG 70°F) Pressure and temperature, Disable all venting and Pressure relief, Fill the vessel to the nominal volume of vessel. the air in the Ullage Space will now be at P_B and T_U.

Using Isentropic Ideal gas relations and a constant k value for air of 1.4 P_B and T_U can be calculated.

$$P_B = P_A \left(\frac{V_{FU}}{V_{FU} - V_W \left(\frac{d_{21}}{d_{65}} \right)} \right)^{1.4}$$, P_A absolute

$$T_U = T_A \left(\frac{V_{FU}}{V_{FU} - V_W \left(\frac{d_{21}}{d_{65}} \right)} \right)^{(1.4-1)}$$, T_A Kelvins

STEP 3)

Recalculate Per step 1) and Step 2) Until T_U is Less than or Equal to 65 °C (149 °F).

Based on Step 1), Step 2) and Step 3), The Vessel now complies with 178.275(b)(ii)(B) and V_{FU} is the full volume of the vessel that will be Built and in addition the Vessel can be Filled to a maximum volume of V_W. IS this Statement correct? If Not Please EXPlain.

172.102 TP2:

Per 178.275(b)(i)(B) a maximum Degree of Filling is Determined $\left(\frac{V_R}{V_{FU}}\right)$. This is For the specific case where all venting and Pressure relief has Failed, Been caped off or removed/Disabled. 172.102 TP2 is For the case where all venting and Pressure relief is working Properly as specified and Designed. The maximum Degree of Filling is the Lesser of that Determined Per 178.275(b)(i)(B) and 172.102 TP2. Is this statement correct? IF not Please Explain.