

# Welded Repairs and Alterations to Anhydrous Ammonia Nurse Tank

Presentation by: Greg McRae

A stylized silhouette of a mountain range in shades of teal, located in the bottom right corner of the slide.













**NURSE TANK FINAL RESTING PLACE**













Tank failed hydro test in Canada



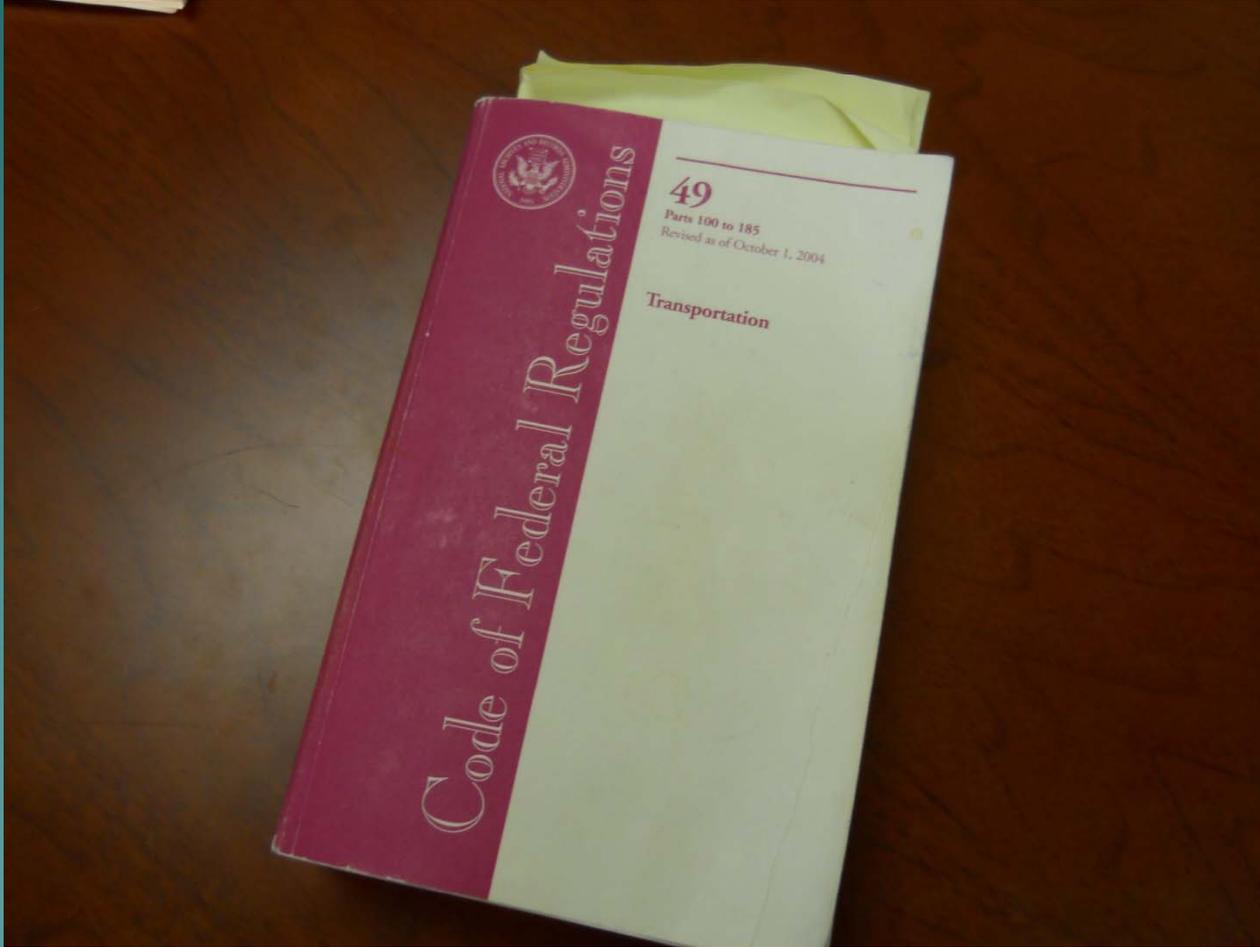
## The Fertilizer Institute-----

200,000 Nurse tanks in the industry,  
60% of which, will not pass  
inspection.

# Codes and Standards for Nurse Tanks

The background is a solid teal color. At the bottom right, there is a silhouette of a mountain range in a slightly darker shade of teal.





Code of Federal Regulations

49  
Parts 100 to 185  
Revised as of October 1, 2004

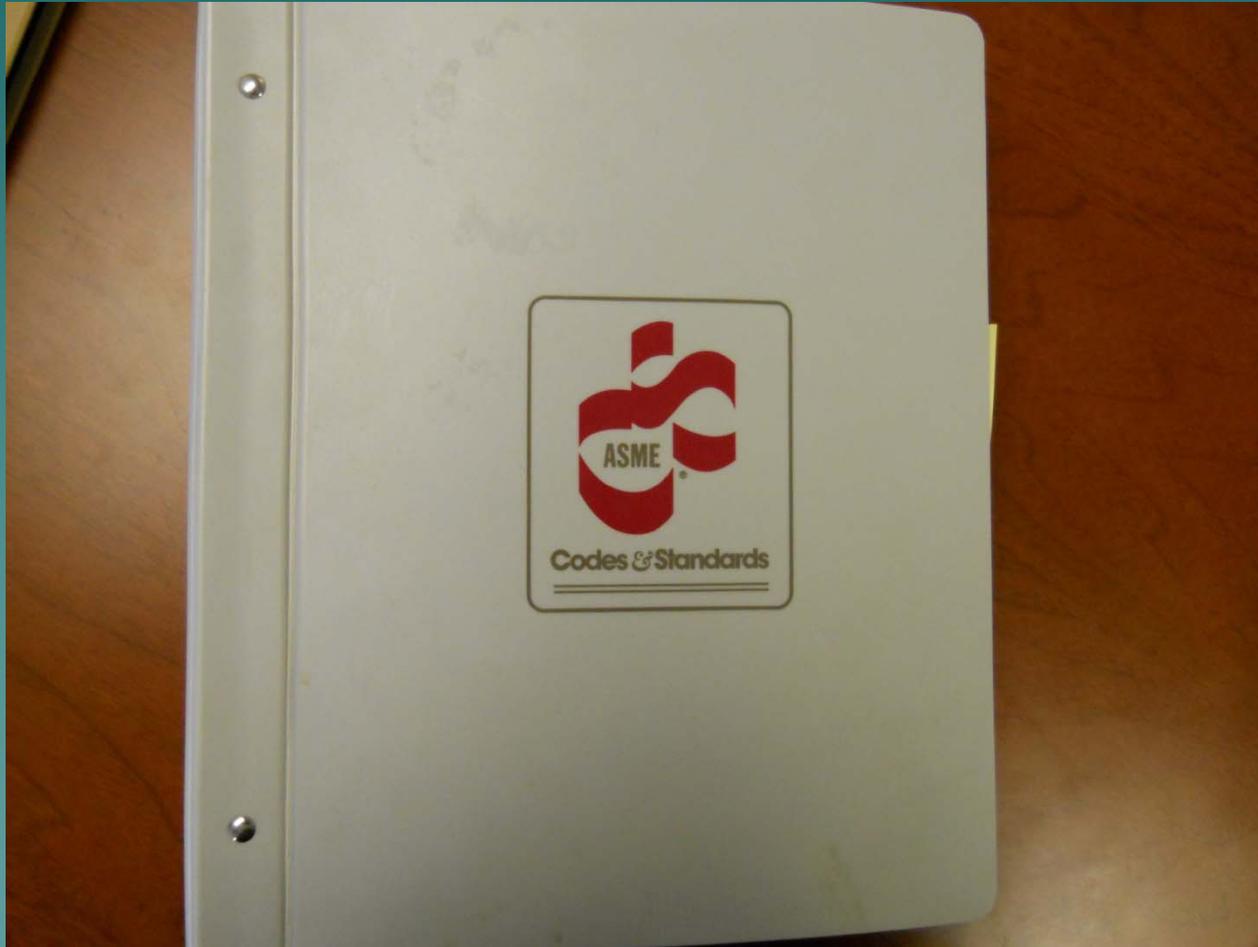
Transportation

**U.S. Department of Transportation**  
**Code of Federal Regulations- Title 49**

**Subpart G- Gases, Preparation and Packaging,  
paragraph 173.315-(m)**

**Cargo tanks (commonly know as a Nurse tanks)**

- (1) Has a minimum design pressure of 250 psig and meets the requirements of the edition of the ASME code in effect at the time it was manufactured and marked.**
- (2) Equipped with a safety relief valve**
- (3) Is painted White or Aluminum**
- (4) Has a capacity of 3000 gallons or less**
- (5) Filling to a density of not greater than 56 percent**
- (6) Is securely mounted on a farm wagon; and-----**



ASME Section VIII, div. 1- Pressure Vessel Code

Design, Fabrication, Welding and Inspection, Third  
Party Inspection

Joint type, Joint Efficiency, Degree of Radiography,  
Hydrostatic Test Pressure

Material selection-----

ANSI K61.1—1999  
CGA G-2.1—1999



Approval Date: March 30, 1999

AMERICAN NATIONAL STANDARD  
SAFETY REQUIREMENTS FOR  
THE STORAGE AND HANDLING  
OF ANHYDROUS AMMONIA

COMPRESSED GAS  
ASSOCIATION, INC.



**ANSI K-61.1 Compressed Gas Association (G-2.1)  
Requirements for Handling and Storage of Anhydrous  
Ammonia**

**2 Definitions**

**2.9 Repair.** The work necessary to restore a container, cylinder, or system to a safe and satisfactory operating condition provided there is, in all cases, no deviation from the original design.

## Codes and Standards for Nurse Tanks

State Rules and Regulations such as, Indiana  
Agricultural Ammonia Law



**NBIC** 07

an american national standard

*National  
Board  
Inspection  
Code*

—PART 3—  
repairs and  
alterations

ANSI/NB23

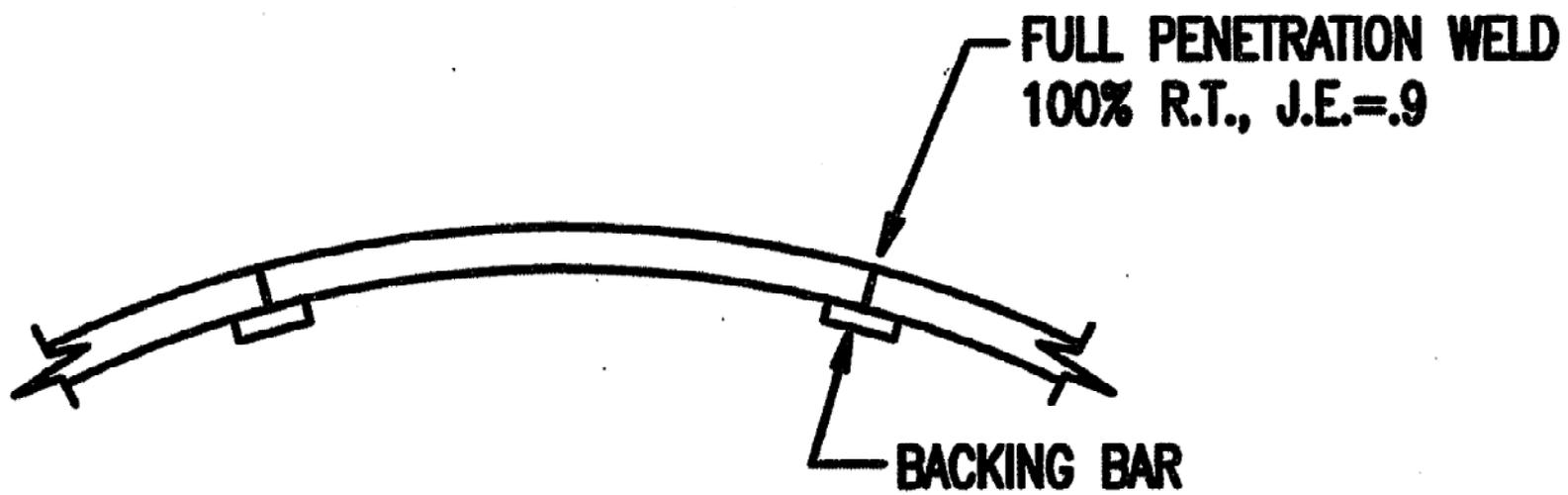
NBIC is used to properly document repairs and alterations using the appropriate forms and applying the proper nameplate.

# Design Changes

Significant changes that will affect repairs and alterations

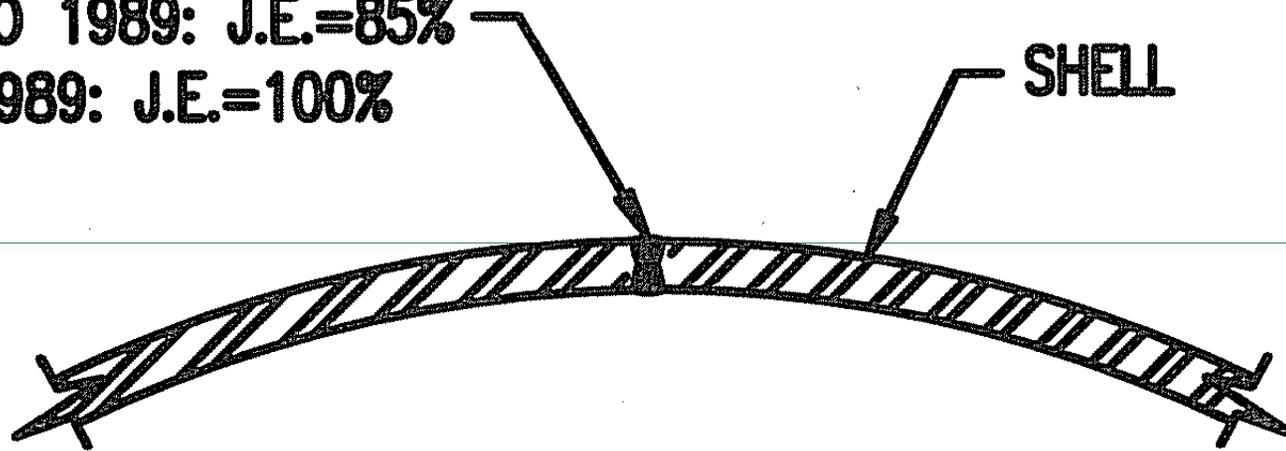
- (1) In-Motion Radiography (1989)
- (2) Change in the joint efficiency from .85 to 1
- (3) Design Margin 4:1 to 3.5:1
- (4) Hydrostatic pressure 375 to 325 psi



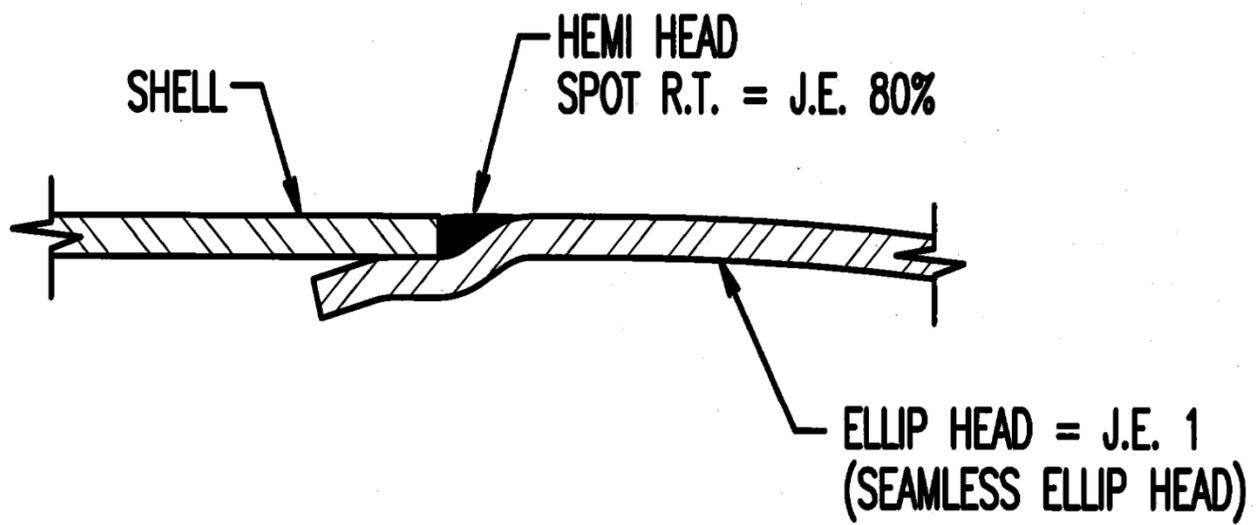




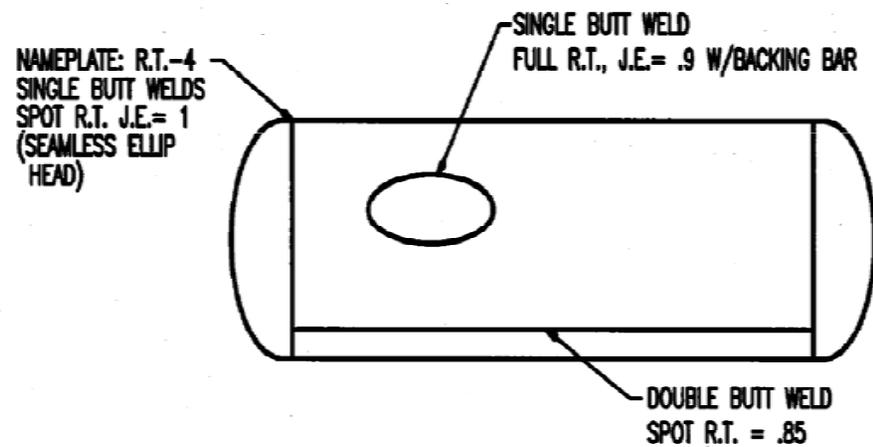
PRIOR TO 1989: J.E.=85%  
AFTER 1989: J.E.=100%



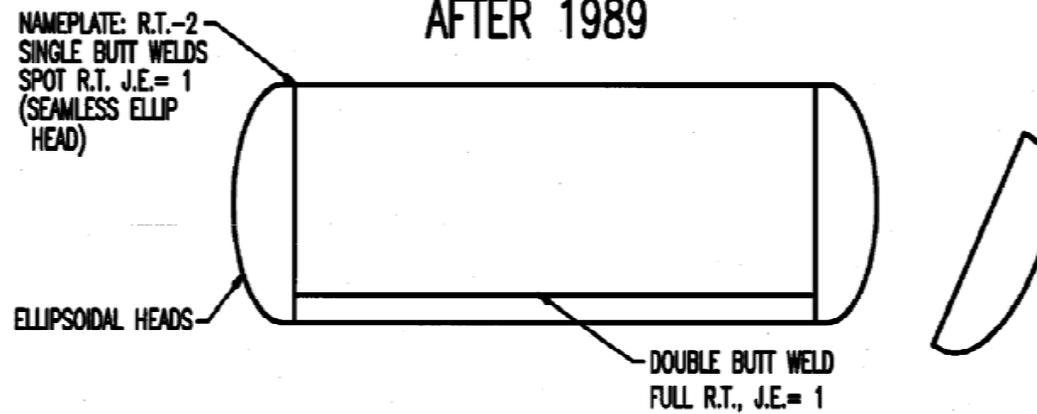
DOUBLE BUTT WELD  
LONG. SEAM



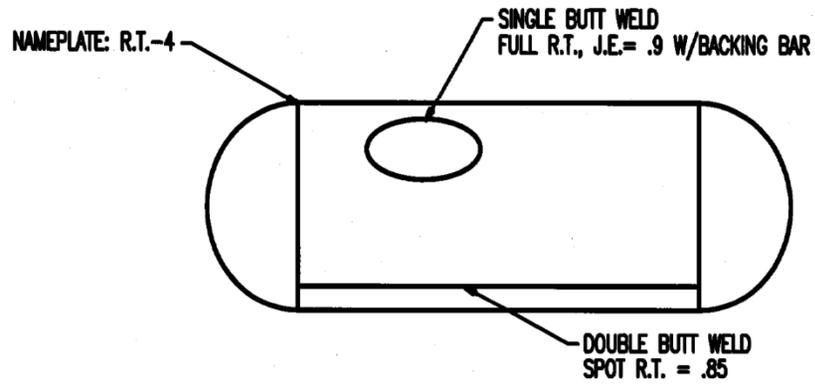
## PRIOR TO 1989



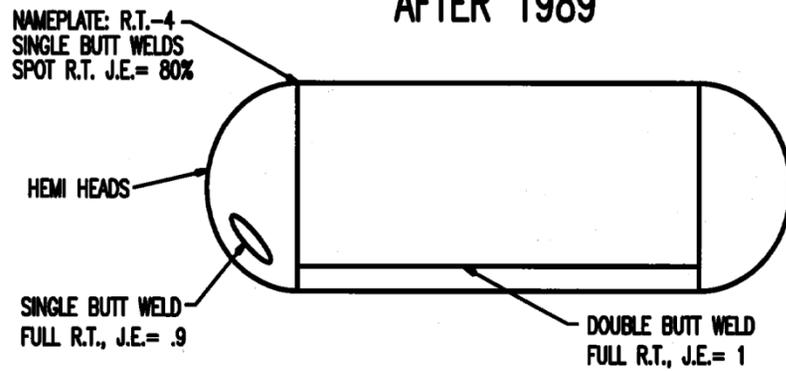
## AFTER 1989



## PRIOR TO 1989



## AFTER 1989



Construction Code Used for Repair Performed:

ASME Section VIII, Div. 1

2007/2008

(name / section / division)

(edition / addenda)

7. Repair Type:  Welded

Graphite Pressure Equipment

FRP Pressure Equipment

8. Description of work:

Cut hole in shell, prep, repair baffles, weld same hole back in shell; remove existing dip tube coupling, prep, weld in new 1 1/2" forged steel threaded 3000# half coupling;

(use supplemental sheet, Form R-4, if necessary)

Hydro

Pressure Test, if applied

375 psi

MAWP

250

psi

9. Replacement Parts:

Attached are Manufacturer's Partial Data Reports or Form R-3s properly completed for the following items of this report:

None

(name of part, item number, data report type, mfr.'s name and identifying stamp)

10. Remarks:

CERTIFICATE OF COMPLIANCE

I, \_\_\_\_\_, certify that to the best of my knowledge and belief the statements in this report are correct and that all material, construction, and workmanship on this Repair conforms to the National Board Inspection Code. National Board "R" Certificate of Authorization No. \_\_\_\_\_ expires on \_\_\_\_\_

Date 05/08, 2010

(name of repair organization)

Signature

(authorized representative)

CERTIFICATE OF INSPECTION

I, \_\_\_\_\_, holding a valid Commission issued by The National Board of Boiler and Pressure Vessel Inspectors and certificate of competency issued by the jurisdiction of \_\_\_\_\_ and employed by \_\_\_\_\_ of \_\_\_\_\_ have

inspected the work described in this report on 5/8, 2010 and state that to the best of my knowledge and belief this work complies with the applicable requirements of the National Board Inspection Code.

By signing this certificate, neither the undersigned nor my employer makes any warranty, expressed or implied, concerning the work described in this report. Furthermore, neither the undersigned nor my employer shall be liable in any manner for any personal injury, property damage or loss or any kind arising from or connected with this inspection.

Date 5/8, 2010

Signed

(inspector)

Commissions

(number, jurisdiction, and no.)



U.S. Department  
of Transportation

**Pipeline and  
Hazardous Materials Safety  
Administration**

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

Mr. Greg McRae  
Engineering and  
Technical Director  
Trinity Industries, Inc.  
P.O. Box 56887  
2525 Stemmons Freeway  
Dallas, TX 75356

Ref. No. 06-0020

Dear Mr. McRae:

This responds to your letter regarding the repair of MC 331 cargo tanks under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). I apologize for the delay in responding and for any inconvenience it may have caused. Specifically, you inquire whether a dye penetrant examination is an acceptable alternative to a radiographed examination. Your questions are paraphrased and answered below.

Q1. Is a dye penetrant (liquid penetrant, PT) examination of a welded joint containing a backing bar in the shell or hemispherical head of an MC 331 cargo tank an acceptable alternative to Radiographic (RT) examination of a full penetration weld?

A1. No. The basis for this determination is the original construction requirements for an MC 331 cargo tank under § 178.337-1. This section mandates that the design, construction and certification of an MC 331 cargo tank be in accordance with the ASME Code which in turn requires radiographic examination of this type of weld. See ASME Section VIII, Div 1, Part UW-11; UW-12: Table UW-12. Further, because this action is considered a repair, the requirements for such a repair are mandated by § 180.413 and the National Board Inspection Code (NBIC). See NBIC RC 1090 and RD 2060. NBIC requires welding to be

requirement would be subject to the approval of the Inspector. Additional guidance is provided in RD 1020, which allows for welding methods as alternatives to post-weld heat treatment. In addition, this guidance specifies that if it is not practical to RT the weld, a successful (defect free) PT examination must be conducted and the maximum allowable working pressure (MAWP) of the pressure vessel must be re-evaluated by the jurisdiction.

Q2. If a repaired MC 331 cargo tank was fully radiographed when originally constructed and the repair weld is not radiographed, should the MAWP of the cargo tank be reduced based on lower joint efficiency?

A2. Yes, provided prior agreement is obtained from all parties involved. See reasoning in A1 above.

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

Sincerely,

A handwritten signature in black ink, appearing to read 'Hattie L. Mitchell', with a long, sweeping underline.

Hattie L. Mitchell  
Chief, Regulatory Review and Reinvention  
Office of Hazardous Materials Standards















- ◆ Thanks to the National Board and thanks to all you chief for your time this morning.