

Procedure 5: Firetube Repair Procedure – Rebuild Non PWHT

A#	0403525	Facility	Fort St. John North, West Blueberry	
CRN#	N-5217.21	LSD	12-29-088-25W6	
S/N	C-756A-CB			
MAWP	Atmospheric	Vessel Description	Line Heater; Atmospheric Non Code 10" dia. Fire Tube	
Material	SA-36-B, SA 106-B			
Shell Thickness	N/A	Scope of Work: Rebuild firetube using SA-106-B; 10" schedule 40 pipe salvaging tube sheet, burner and stack flanges due to severe pitting throughout the tube. Preference for return bend fabrication would be 180 or 90 elbows as apposed to a miter bend.		
Fire Tube Thickness	10" X .365" sch. 40			

Scope

*Anthony Meade
June 3/08*

1. The repair of cracks to a firetube constructed of P-I Group 1 or 2 materials.
2. Severe cracking into the firetube parent metal or through wall cracking or pitting may require the replacement of a section of the firetube.

Procedure

Weld Preparation

1. Defects identified by Wet Fluorescent Magnetic Particle Inspection shall be removed using an air arc gouger or grinder. Area shall be reinspected (including beveled surfaces of weld prep) using WFMPI to ensure all defects have been removed.
2. Area to be welded to shall be cleaned to white metal for a distance of 10 mm beyond the expected weld area.

Hydrogen Bake out and Sulfur removal: (remove this section if this firetube is not in sour service)

3. Vessels that have been exposed to sour or sulfur bearing process streams shall required the weld attachment area to undergo a "Bake Out" procedure. This procedure shall consist of heating the weld attachment area and 10 cm on each side to 315 C (600 F) and holding that temperature for a minimum of 60 minutes. Bake out should be done prior to cutting out, if cutout is done thermally. Stipulate controls methods.
4. *Bake Out* is performed by either induction coil (use thermocouples as control instrumentation) or propane torch

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(use temperature-sensitive crayons – upper and lower temperature to be controlled). Oxyacetylene torches are **not** acceptable.

5. If induction coils are used, a 250 C (482 F) four-hours heat treatment may be substituted for the normal 315 C (600 F) one-hour heat treatment.

Preheat and Welding:

Non-Post Weld Heat Treated Equipment

6. Minimum pre-heat shall be 80 C (176 F) for a 100 mm band on both sides of the weld build-up area. Temperature is to be monitored by use of temple sticks or pyrometer.



Note

The 80 C (176 F) pre-heat temperature has been selected for alignment with NB-23, Appendix B assuming the specific carbon content of the material is not known.

7. Welds shall be completed using new 2.4 mm (3/32”) E 7018-1 electrodes.
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8. Maximum interpass temperature shall not exceed 230 C (450 F).
9. The Owner’s Inspector, shall witness seal on the box being broken and ensure that once the box has been opened the electrodes are stored in an oven.
10. Perform repair to the procedure as outlined in the registered WPS.
11. Perform dry MPI on the root weld.
12. Fill and cap using E7018 low hydrogen electrodes. Minimize the weave (maximum 4 times electrode size and minimize heat input).
13. Ensure all fillet welds are transitioned to ensure there are no areas of undercut or stress risers.

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14. Once the welds are completed the weld area shall be wrapped with an insulating blanket and allowed to slow cool to 100 C (212 F). The cooling rate shall not exceed 260 C (500 F) / hour.

Post Welding NDE:

15. Perform MT 12 hours after completion of the work

16. No hydrotest is required.

Documentation:

17. Ensure Company Approved Contractor has completed QC documentation.

18. Sign off QC documentation and ensure one copy is submitted to Customer and one is retained on file in the equipment inspection file.

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Section	Comments	Sign Off	Date
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