

VMA PRESENTATION 2013

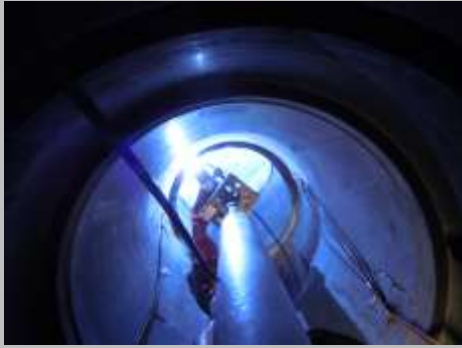


In Line Weld Repairs of Valve Defects

Valve Repair Activities per ASME Section I & B31.1



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If you have valves in your plant manufactured from F-91 or C12A material you may have problems and need repair services.

In the last two years 50 of our customers have found themselves in that position.

CFM/VR-TESCO, LLC is a highly focused valve service company. Our services include disassembly, inspection, repair and reassembly of valves for our customers throughout the Power Generation Sector.

Specialized welding and machining equipment have been developed to effectively complete difficult in-line repairs.

Personnel are given extensive training to perform all our service activities.

Most of the valve repairs over the last two years have ranged in size from 12" to 24". Valves from all the major OEM's have been included in these repairs.

Twenty three (23) of our projects were repairs of Code Boundary valves. These repairs were performed following the guidelines of ASME Section I and National Board Inspection Code as well as Jurisdictional requirements.

Twenty seven (27) plus valves were part of the Boiler external piping. These repairs were performed following the guidelines of ASME B31.1.

Valves manufactured for use in the Power Generation Sector are produced under the American National Standards as outlined in ASME B16.34 and requirements placed on specific valves by the customer. This standard applies to new construction and covers pressure-temperature ratings, dimensions, and tolerances, materials NDE requirements, testing, marking of cast, forged and fabricated valves with flanged, threaded or welded ends.

The manufacturers are responsible to provide the purchaser with documentation that details their Quality Program compliance in the manufacturing of their products. The requirements for manufacturing may be less stringent than those required to repair valves placed in service.

NDE acceptance standards on new valves manufactured are found in ASME B16.34 Mandatory Appendix II for Magnetic Particle Examination and Mandatory Appendix III for Liquid

Penetrant Examination. Both provide Procedure and Acceptance Standards for Castings and Forgings and rolled Wrought material.

These standards are far less restrictive than those of ASME Section I or ASME B31.1.



ASME Section I Repairs

Repair requirements of a valve are usually confined to the location of the valve in the boiler piping system of the power plant. If the valve to be repaired is located in the piping system which is considered part of the boiler proper or part of the external boiler piping it is declared to be inside the Boiler Code Boundary.

The Preamble to ASME Section I paragraphs 4, 5 & 7 provide the detailed information defining Code Boundary. Repairs to piping and valves within the Code Boundary are repaired using the requirements provided in ASME Section I, National Board Inspection Code (NBIC) and the jurisdiction of the repair.



Most of the ASME Section I repairs can be segregated into 3 groups.

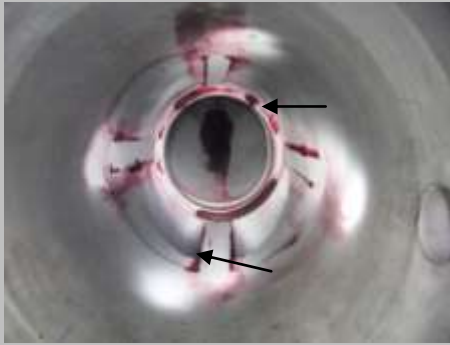
1. Valves requiring a seat or seats replaced
2. Removal and rewelding of Integral valve seats
3. Repair of cracks in the valve body or on the guide ribs or disc guides.

50% of the "R" stamp repairs were on valves requiring replacement of the seat rings. In each case the valve bodies were SA217-C12A material. The entire seat ring to valve body welds had cracks in the partial penetration welds. The majority of them were cracked 360° around the weld allowing the ring to fall out of the seat pocket. Some had hardface material missing from the seat face. All of the valves with 316 SS seats were cracked 360° and were replaced with A182-F91 or A387 Grade 91 Class II material seats.

Valves with seats manufacture from A355-P22 (5A) material were replaced with like for like.

All seat rings were replaced utilizing the following guidelines:

- All seat pockets were measured to insure new seat fit.
- If dissimilar welding was performed on original seat. All old metal was removed and then acid etched to insure complete removal. Rewelded with base metal and machined to size. NDE (Dry MT) of the new pocket.
- Minimum preheat 400°F
- Welding process machine GTAW
- WPS – 15E MN/MC GTAW-HT
- .035" ϕ dia Wire – Er90S-B9 GTAW



- Mn + Ni chemistry <1.0
- PWHT @ 1375°F – 2 hours soak time minimum
- Thermocouples & ceramic pads on ID seat area
- Final NDE (PT) & (VT)

The other 50% of the repairs were on integral seats in the valves.

85% of the valves were on SA217-C12A material. The other 15% were on A217-WC6 material. All the valves had cracks in the seat area Hardface going back into the base material. The majority also had cracking in the guide ribs. In some cases the stellite had become dis-bonded from the base material and had moved downstream. This requires removal of the stellite and undercutting the base material. Both rewelding of base metal and then applying hardfacing is required.



Integral seat repairs utilize the following guidelines:

- Remove all the hardfacing and .080" - .100" of base metal.
- Insure all visible defects are removed
- NDE (PT) inspection of all repair areas
- Sketch and dimension all repair areas
- Preheat the valve to 400°F minimum. Note: 300°F for (P-4) material
- Weld excavated repair areas and undercut area with Er90S-B9 (Er80S-B2 for P-4 material)
- Profile all the repair areas and NDE dry (MT) on all P15E materials. Keep base material at 100°F. No moisture is allowed on "as welded" 15E materials.
NOTE: PT or wet (MT) is allowed on all other low alloy materials.
- Re-establish 400°F Preheat
- Apply minimum of (2) layers of Stellite 21
- Cool valve to below 175°F and visually inspect welds
- PWHT minimum hold 2 hours @ 1375°F per heat treat traveler. NOTE: PWHT temp 1250°F for P-4 material
- Profile the seat and guide ribs to OEM specifications
- Final NDE, PT to ASME Section I & VT to ASME B31.1
- Authorized Inspector will review the weld data package and issuance of R-1 form and data plate as required.

ASME B31.1 Valve Repairs

ASME B31.1 covers the external boiler piping as defined for power boilers, high temperature, high pressure boilers in which steam or vapor is generated at a pressure of more than 15psig and high temperature water is generated a pressure exceeding 160psig and/or temperature of 250°F.

All welding or brazing of pipes or items shall be performed by manufacturers or contractors authorized to use the appropriate

symbol shown in Fig. PG-105-1 thru PT-105.3 of ASME Section I of the ASME Boiler and Pressure Vessel Code (B31.1 Chapter 1 100.1.2).

The installer of external boiler piping jointed by welding or brazing is required to have a Quality Control System, meeting the requirements of Mandatory Appendix J of the ASME Section B31.1 Code.



The majority of the valves repaired under B31.1 have been parallel slide gate valves. The valve bodies have been A217-C12A material. The seat rings have been a mix of F91, P22 materials. As with the section I valves the defects have been the same. Seats cracking in the heat affected zone on the body side of the body to seat ring weld. Stellite breaking off the seat ring face and entering into the systems.

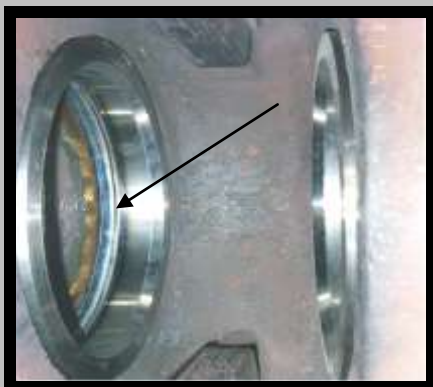
B31.1 requires the following as a minimum be documented :

1. Removal of defect or reduce to acceptable size.
2. NDE of defect area either by PT or MT, acceptance criteria per Chapter V- 136.4.3 for (MT) and 136.4.4 for (PT)
3. Preheat of the base material as required in Chapter V-131 "Welding Preheat".
4. Welding shall be performed by use of PQR's, WPS's & WPQ's as outlined in Chapter V-127.5
5. PWHT of repair as required by Chapter V-132 "PWHT Requirements".
6. Final NDE of the repair as required in Chapter V-136.4 "Examination methods for welds and repairs".

ASME B31.1 Chapter V

- a. Visual Examination (VT) – 136.4.2
- b. Magnetic Particle Examination (MT) – 136.4.3
- c. Liquid Penetrant Examination (PT) – 136.4.4

All examinations to be performed by technicians certified to perform each non-destructive examination per ASME B31.1 Chapter V-136.3.2 "Qualifications of NDE personnel".



Successful repair of valves and valve components are a "Hallmark" of CFM/VR-TESCO, LLC's years of service. It takes a lot more than just welding and machining skills to repair today's valve deficiencies. It starts with gathering all the information available about the valve to be repaired. All the valve component information from the OEM, when the valve was first purchased. Then the customer must supply the following information to allow for completion of the work travelers and R-1 data form if required.

- Boiler Unit Number
- Boiler Manufacturer
- Mfg. Serial Numbers
- National Board Number

- Jurisdiction Number (if applicable)
- Year Built
- Original Code of Construction
- System and location of valve being worked
- Valve Drawing
- Valve Identification
- Valve year of manufacture

Once all the pertinent information is gathered QA and the Welding Departments begin the planning process.

- Initiate work travelers and weld data sheets
- Identify WPS's & Welder Performance Qualifications
- Create PWHT Travelers and contact Heat treat sub contractor
- Identify NDE requirements and notify NDE subcontractor
- Issue filler material and supporting documentation MTR/CMTR's
- Notify Authorized Inspector (If required and establish AI Hold Points)
- Present Weld Traveler & Data Package to Project Manager for review



Specialize machining and welding equipment has been developed for repairing each type of valve and their repairs. Equipment is staged and inspected on a similar valve mock up and tested before shipping to each project.

Personnel received specialized training on the equipment as well as the valve mock-up repairs.

The “Recipe for Success” may seem simple, but care must be taken on each step to insure the “best possible” result for each valve repair.

Working with our valve OEM's and our customers we have been “Teaming Together for Success” for over 26 years.

REFERENCES:

ASME Boiler and Pressure Vessel Code Section I “Rules for – Construction of Power Boilers”. B31.1. “ASME Code for Pressure Piping”. B16.34 “Valves – Flanged, Threaded, and Welding End”, American Society of Mechanical Engineers, New York, NY. USA.

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