



Global Expertise • One Voice

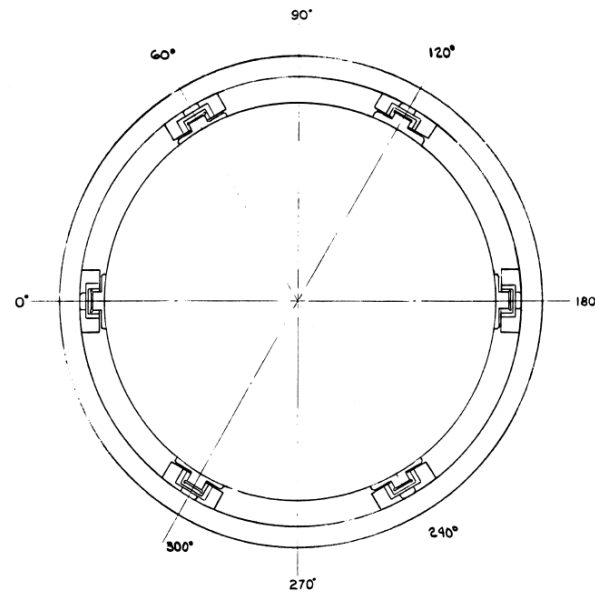
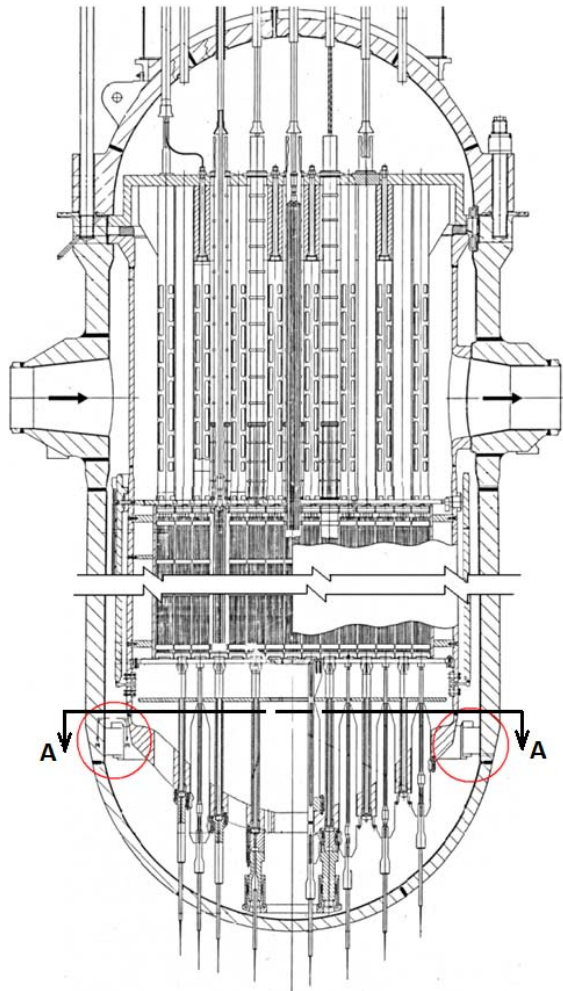
Industry and NRC Coordination Meeting Materials Programs Technical Exchange

Clevis Insert Bolt Update

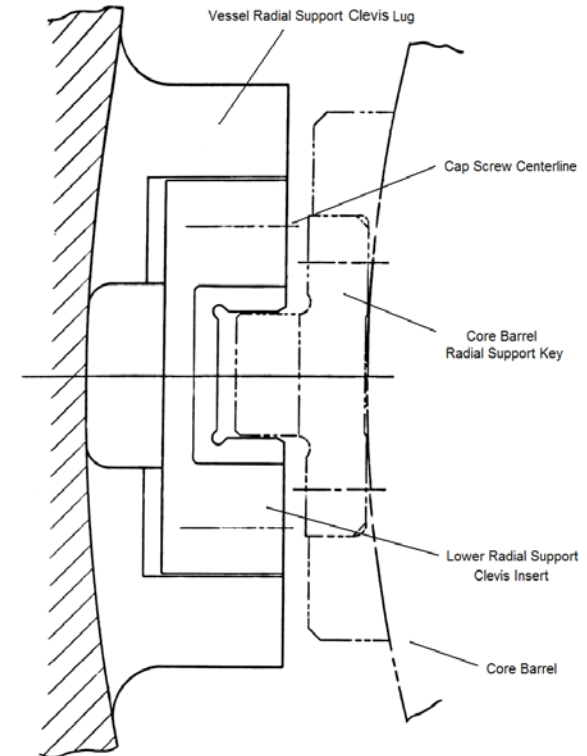
Bryan Wilson, Westinghouse

June 2014

Industry and NRC Coordination Meeting Materials Programs Technical Exchange Clevis Insert Bolt Update - Background



Section A-A
(Internal Details Removed for Clarity)



Industry and NRC Coordination Meeting

Materials Programs Technical Exchange

Clevis Insert Bolt Update - Recent OE Root Cause

- D.C. Cook Issued Root Cause Evaluation (AR 2010-1804-10)
 - Root Cause → PWSCC of Alloy X-750 with a susceptible heat treatment
 - All 29 bolts removed, were either already separated, separated during removal, or had cracks present
 - All failures/cracking was at the head-to-shank transition radius
 - Fracture mode was essentially 100% intergranular on all bolts
- Industry Impact:
 - All Westinghouse and CE plants are potentially susceptible:
 - Similar heat treatments are used on all Alloy X-750 clevis insert bolts
 - Preload stress in the bolts is similar for all plant
 - Visual inspection of bolts alone is not 100% reliable for confirming bolt integrity

Industry and NRC Coordination Meeting Materials Programs Technical Exchange **Clevis Insert Bolt Update - NRC 3/27/14 Meeting Summary**

- **Overview**
 - Design Introduction
 - Safety Functions
 - Design Configurations
 - Potential Failure Modes Related to Clevis Insert Bolt Failures
 - Why Failure Modes are Unlikely to Occur
 - Detection Methods
 - Conclusion
- **Basic Conclusions**
 - All design configurations are inherently safe
 - Loose parts are captured (with the possible exception of lock bars)
 - No single point failure leading to loss of function
 - Concerns are primarily commercial in nature
 - Visual inspection of wear surfaces and general condition will provide the appropriate level of aging management without the need for bolt inspections
- **PWROG project, PA-MSC-1198, will provide utilities the technical basis for the safety case argument presented in the NRC discussion**

Industry and NRC Coordination Meeting

Materials Programs Technical Exchange

Clevis Insert Bolt Update - Pending Westinghouse Communication

- Technical Bulletin (TB) is the proposed communication tool
- Much of the detail in IG-10-1 will be included
- The TB will also:
 - Include a discussion on evaluations performed considering the 4 different Westinghouse and CE clevis insert designs
 - Summarize the Root Cause Analysis findings and discuss industry impacts
 - Reaffirm that the findings of the RCA do not change the conclusion that this is not an immediate safety concern
 - Identify that there are asset management risks that need to be considered
 - Provide clear inspection recommendations which can enhance focus of the base aging management program:
 - For monitoring conditions directly related to functional performance
 - For managing bolt degradation to reduce asset management risk
 - Provide optional approaches to support a proactive asset management program

Industry and NRC Coordination Meeting

Materials Programs Technical Exchange

Clevis Insert Bolt Update - Potential Inspection Options

- **Base Aging Management Program**
 - Visual examination (VT3) of the following at your next 10-year ISI or earliest opportunity when the lower internals are removed
 - For monitoring conditions related to functional performance:
 - Radial key / clevis insert interfacing surfaces; look for aggressive or abnormal wear as compared to previous inspection (if available)
 - Interface between the clevis insert and vessel lug; look for signs of looseness or dislocation
 - For managing bolt degradation to reduce asset management risk:
 - Bolt heads; look for wear between the bolt head and lock bar and/or bolt head dislocation (not 100% reliable for confirming bolt integrity)
 - Dowel pins; look for broken tack welds and dislocation of the dowel pin
- **Optional Approaches to Support a Proactive Asset Management Program**
 - UT examination
 - Bolt replacement

Clevis Insert Bolt Update - Aging Management Requirements Clarification

- MRP-227-A requires inspection of the clevis insert for wear only, but lacks specificity
- Considering the following changes for MRP-227, Rev. 1:
 - Recategorization of the clevis inserts and bolts as Primary components
 - Add specifics related to inspection requirements and logic for requiring certain inspections

Questions?

The Materials Subcommittee is established to provide a forum for the identification and resolution of materials issues including their development, modification and implementation to enhance the safe, efficient operation of PWR plants.



Global Expertise • One Voice
www.pwrog.com