

1.12.18. ADVANCED APPROACH OF REACTOR PRESSURE VESSEL HEAD INSPECTION AND REPAIR OF CRDM J-WELD

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The reactor pressure vessel head (RPVH) of Pressurized Water Reactors (PWR's) is an integral part of the reactor coolant pressure boundary. Its integrity is important to the safe operation of the plant. RPVH has penetration nozzles for instrumentation systems and control rod drive mechanisms. The discovery of leaks and nozzle cracking at the US NPP and some other PWR plants has made clear the need for more effective inspections of RPV heads and associated penetration nozzles. Alloy 600 RVHP nozzles & corresponding J-welds cracking and leaking phenomena have been strictly regulated by NRC Order EA-03-009 since 2003. Some additional events on this component (Canopy Seal welds, Thermal sleeve, Control Rods Drive Mechanism...) in nuclear industry have raised concerns about the structural integrity of RPVH and consequently increased extent of Non Destructive Examination employing new state-of-the art NDE and repair methods.

This article presents non destructive examination of Reactor Pressure Vessel Head (RPVH) Penetration by various methods. The scope of this examination and repair methods includes Eddy Current examination of RPVH J-weld surface, ultrasound examination of Penetration Tube from inner side and unique method of surface indications removal.

These article present details of examination techniques with focus on eddy current and ultrasonic examination, as well as details and approach on AST (Automatic Surface Treatment) method of the RPVH J-weld surface.

AST repair method represents new principal approach with combination of design basis justification and As-built measurements which provide to perform repair of J-weld indications without any welding.