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Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

ATTENTION: T. R. QUAY

SUBJECT: ASME SECTION VIII AIR TANKS

Dear Mr. Quay:

The attached discussion provides a comparison of the use of ASME Code, Section VIII criteria versus ASME Code, Section III criteria for construction of air storage tanks for the main control room habitability system. The AP600 design uses Section VIII criteria developed specifically for gas storage vessels rather than Section III rules that are not directly applicable. Appendix B of 10 CFR and 10 CFR Part 21 apply to these safety-related components.

This letter is provided to address open items 2891 and 3053. The use of Section VIII criteria for safety-related gas storage vessels will be reflected in revisions of SSAR Sections 3.2, 3.5, and 6.4.

If you have any additional questions, please contact D. A. Lindgren on (412) 374-4856

Brian A. McIntyre, Manager
Advanced Plant Safety and Licensing

/nja

Attachment

cc: W. Huffman, NRC
N. J. Liparulo, Westinghouse (w/o attachments)

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Comparison of Design Requirements for Safety-related Gas Storage Vessels

The following evaluation provides a comparison of the use of ASME Code, Section III and ASME Code, Section VIII for the design of safety-related gas (including air) storage vessels in the AP600.

A QA program satisfying the criteria of 10 CFR Appendix B applies to AP600 safety-related equipment regardless of the standards used for design criteria. The rules of 10 CFR Part 21 also applies to AP600 safety-related equipment. Section 3.2 of the SSAR will be revised to include the requirements for the use of Section VIII safety-related gas storage vessels.

Design

The rules of Section III apply to vessels in nuclear power plants that are typically fabricated of plates or forgings welded together. These vessels generally contain pressurized water or water and steam. Design of the vessels are the subject of extensive analysis to optimize the design. The strength and integrity of the weld joint is a major focus of interest. Various reduction factors are applied to the strength of the weld joint to account for imperfections that may result in the welding process. The weld joint is typically the limiting portion of the design, setting the thickness requirements.

The rules of Section VIII for gas storage vessels of the type included in AP600 for safety-related functions are found in Section VIII mandatory Appendix 22 and have been developed specifically for the storage of gas under high pressure. Stress is limited to 1/3 of the material minimum tensile strength. The maximum design pressure is limited to 200°F. These tanks are used in a variety of industries to store gas including toxic gasses. These tanks are fabricated without welding. Because there is no weld joint to consider, weld strength reduction factors do not apply which increase the wall thickness.

Material

The material for the integrally forged tanks is ordered to a material specification (SA-372) developed specifically for that type of tank. The material specification is included in Section II of the ASME Code. Because the criteria of Section III do not include integrally forged vessels, this material is not found in Section III, Appendix I. As with any ASME Specification material, it must be supplied by a qualified material supplier. The specification includes requirements for testing and certification. The material specification permits weld repair if agreed to by the purchaser. The AP600 requirements will not permit such weld repair.

Manufacturing

The tanks are formed from a forging that is essentially a seamless pipe. The ends are swaged down to reduce the size of the opening. After completion of the forming operation, the vessel is heat treated. The heat treatment required is based on the requirements in SA-372 for the grade and class of material used. The openings are tapped for the installation of the attached piping or a threaded plug to close off one end. No welding is permitted in the fabrication of the vessel by the Section VIII, Appendix 22 rules required for this type of vessel. Section III does not include specific criteria integrally forged vessels.

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The exterior of the vessel is examined by magnetic particle or liquid penetrant inspection following heat treatment. This is comparable for Section III vessels away from welds.

Testing

The rules of Section VIII require a hydro test at 1.5 times design pressure or a pneumatic test at 1.25 times design pressure following fabrication. See Section VIII, UG-99 and UG-100 for the specific requirements. The air tanks are also tested as part of the system pressure test. The balance of the system (connecting piping and valves) for the main control room is designed to ASME Code, Section III criteria.