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Davis-Besse Containment System
Primary Steel Containment and Shield Building
November 17, 2011

References:
Davis-Besse USAR Section 1.2.10, "Containment Systems"
Davis-Besse TS 3.6.1, "Containment"
Davis-Besse TS 3.7.12, "Station Emergency Ventilation System"

Description:

As described in the USAR, the "containment . . . consists of two structures: a steel containment vessel and a reinforced concrete shield building, and their associated systems." The steel containment vessel is 2.5 inches thick on the sides and provides a large volume to contain the energy released from a loss-of-coolant accident (and steam line breaks, etc. inside containment). The design internal pressure is 40 psig. This steel structure also must meet 10 CFR Part 50, Appendix J, "Leakage Testing" requirements to limit the release of radionuclides that might exist outside of the reactor system after an accident to a very small percentage of the total volume of the steel vessel.

The shield building is reinforced concrete structure, with a 2.5 feet thick side thickness, that surrounds the steel vessel. There is an approximate distance of 4.5 feet between the shield building internal surface and the steel containment vessel. The shield building "shields" the steel vessel from environmental conditions (rain, snow, wind, etc) including tornado forces and any missiles that might be generated by high wind conditions or turbine failures. The volume between the two structures also provides a path for ventilation (the Emergency Ventilation System) to sweep any radionuclides that might leak from the steel vessel, post-accident, into an Engineered Safety System that can filter (HEPAs and Charcoal) the swept air/leakage before release through a ventilation stack to the environment. This "sweeping and filtering" is utilized to limit exposure to the public, from a hypothetical accident, to below 10 CFR Part 100 guidelines. The shield building also helps reduce the radiation field that might exist, outside of the structures, because of conditions inside the steel containment vessel. The shield building was designed to withstand forces generated by design bases seismic events in addition to forces from temperature changes, etc.

TS 3.6.1 requires that the Containment be operable in Modes 1 through 4. For the primary vessel this requires meeting the leakage limitations and having required valve isolation capability. For the shield building this specification requires periodic visual examination of the surfaces (internal and exterior) of the shield building.

TS 3.7.12 requires that the Emergency Ventilation System, which includes the space between the shield building and the steel vessel, be operable in Modes 1 through 4 (anything greater than 200 degrees F in the reactor coolant system). The Emergency Ventilation System, as part of that specification, must be capable of maintaining a slight negative pressure, relative to existing atmospheric pressure, within the space between the shield building and the steel vessel. This is to ensure that anything leaking, post-accident, from the steel vessel, is swept and filtered prior to release to the environment.

The existing as-found condition of cracking in the concrete of the shield building has raised questions on the ability of the structure to maintain its ability to perform its design functions under conditions that would introduce active forces in the structure (such as a seismic event or potentially rapid changes in environmental conditions).

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