Enclosure 2

MFN 15-063, Supplement 1

GEH's Supplemental Response to Item #5 - Minimize Contamination

ABWR DCD Revision 6 Markups

Table 1.8-21 Industrial Codes and Standards* Applicable to ABWR (Continued)

Code or Standard Number	Year	Title
American Nuclear Society (ANS)		
2.3†	1983	Standard for Estimating Tornado and Other Extreme Wind Characteristics at Nuclear Power Sites
2.8†	1981	Determining Design Basis Flooding at Power Reactor Sites
4.5†	1988	Criteria for Accident Monitoring Functions in Light-Water-Cooled
55.1†	1992	Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants
		Safety Systems of NPGS](3)(4)
18.1 (ANSI N237)	1984	Radioactive Source Term for Normal Operation of LWRs
52.1†	1983	Nuclear Safety Design Criteria for the Design of Stationary Boiling Water Reactor Plants
55.4	1979	Gaseous Radioactive Waste Processing Systems for Light Water Reactors
56.5	1979	PWR and BWR Containment Spray System Design Criteria
56.11†	1988	Standard Design Criteria for Protection Against the Effects of
55.6†	1993	Liquid Radioactive Waste Processing System for Light Water Reactor Plants
57.3	1983	Design Requirements for New Fuel Storage Facilities at LWR Plants
[*57.5*†	*1981*	*Light Water Reactor Fuel Assembly Mechanical Design and Evaluation*](2)
[*58.2*†	*1988*	*Design Basis for Protection of Light Water NPP Against Effects of Postulated Pipe Rupture*](8)
58.8†	1984	Time Response Design Criteria for Nuclear Safety Related Operator Actions
59.51 (ANSI N195)	1976	Fuel Oil Systems for Standby Diesel-Generators
American National Standards Institute (ANSI)‡		
A40	1993	National Plumbing Code
A58.1	1982	Minimum Design Loads for Buildings and other Structures, revised and redesigned as ASCE 7-1988
AG-1		(See ASME AG-1)
B3.5	1960	American Standard Tolerance for Ball and Roller Bearings
B30.2		(See ASME B30.2)
B30.9		(See ASME B30.9)

Editorial Note: Section 12.3.1.2 Plant Design for Maintaining Exposure (ALARA) Continued

gamma shielding. There are certain penetrations where these two approaches are not feasible or are not sufficiently effective. In those cases, a shielded enclosure around the penetration as it exits in the shield wall, with a 90 degree bend of the process pipe as it exits the penetration, is employed.

(2) Sample Stations

Sample stations in the plant provide for the routine surveillance of reactor water quality. These sample stations are located in low radiation areas to reduce the exposure to operating personnel. Flushing provisions are included using demineralized water, and pipe drains to plant sumps are provided to minimize the possibility of spills. Fume hoods are employed for airborne contamination control. Both working areas and fume hoods are constructed of polished stainless steel to ease decontamination if a spill does occur. Grab spouts are located above the sink to reduce the possibility of contaminating surrounding areas during the sampling process.

(3) HVAC Systems

Major HVAC equipment (blowers, coolers, and the like) is located in dedicated low radiation areas to maintain exposures to personnel maintaining these equipment ALA
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Some process piping may be embedded in concrete (e.g., feed-throughs with short sections). Minimization of embedded piping to the extent practicable facilitates the dismantlement of the systems and the decommissioning of the facility, as required by 10 CFR 20.1406. In addition, the applicable regulatory and technical guidance documents are NRC Regulatory Guides 1.143 (Reference 12.3-13), 4.21 and 8.8 (Reference 12.3-14) as well as ANSI/ANS Standards 55.1 and 55.6 (References 12.3-15 and 12.3-16).

(4) Pipin

Piping containing radioactive fluids is routed through shielded pipe chases, shielded equipment cubicles, or embedded in concrete walls and floors, whenever possible. "Clean" services such as compressed air and demineralized water are not routed through shielded pipe chases.

For situations in which radioactive piping must be routed through corridors or other low radiation areas, an analysis is conducted to ensure that this routing does not compromise the existing radiation zoning.

Radioactive services are routed separately from piping containing nonradioactive fluids, whenever possible, to minimize the exposure to personnel during maintenance. When such routing combinations are required, however, drain provisions are provided to remove the radioactive fluid contained in equipment and piping. In such situations, provisions are made for the valves required for process operation to be controlled remotely, without need for entering the cubicle.

Editorial Note: Section 12.3.1.5.1 Design Considerations Continued

- Objective 1 - Minimize leaks and spills and provide containment in areas where such events may occur.
- Objective 2 - Provide adequate leak detection capability to provide prompt detection of leakage from any structure, system, or component that has the potential for leakage.
- Objective 3 - Use leak detection methods (e.g., instrumentation, automated samplers) capable of early detection of leaks in areas where it is difficult (inaccessible) to conduct regular inspections (such as spent fuel pools, tanks that are in contact with the ground, and buried, embedded, or subterranean piping) to avoid release of contamination.
- Objective 4 - Reduce the need to decontaminate equipment and structures by decreasing the probability of any release, reducing any amounts released, and decreasing the spread of the contaminant from the source.
- Objective 5 - Facilitate decommissioning by (1) minimizing embedded and buried piping, and (2) designing the facility to facilitate the removal of any equipment or components that may require removal or replacement during facility operation or decommissioning.
- Objective 6 - Minimize the generation and volume of radioactive waste during operation and decommissioning (by minimizing the volume of components and structures that become contaminated during plant operation).

ABWR design features that address the above design objectives are described in individual DCD sections and subsections. Table 12.3-8 provides a cross reference of applicable DCD chapters and subsections for structures/systems that address the six design objectives. Note that the s purp present as a design feature in each system/structure. Additionally, examples of generic and specific design features present in the ABWR are listed below.

Generic ABWR design features used to minimize contamination and generation of radioactive waste and facilitate decommissioning include the following:

~~Generic ABWR design features used to minimize contamination, generation of radioactive waste, and facilitate decommissioning include the following:~~

- Design of equipment to minimize the buildup of radioactive material and to facilitate flushing of crud traps;
- Provisions of design features such as the CUW and the condensate demineralizer to minimize crud buildup;
- Provisions for draining, flushing, and decontaminating equipment and piping;
- Penetrations through outer walls of a building containing radiation sources are sealed to prevent miscellaneous leaks to the environment;

Editorial Note: Section 12.3.1.5.1 Design Considerations Continued

Appropriately sloped floors around floor drains in areas where the potential for a spill exists to limit the extent of contamination. The floor drains are monolithic in construction to minimize possibility of liquid penetrating at embedment boundaries. No grout is used in the installation of floor drains. Periodic visual inspections of the installation around the floor drains are performed to ensure no bypass exists in these floor drain areas;

- radwaste HVAC System to remove airborne contaminants evolved from discharges to the sump;

- ~~Appropriately sloped floors around floor drains in areas where the potential for a spill exists to limit the extent of contamination;~~

- ~~Provisions for decontaminable epoxy-type wall and floor coverings, which provide smooth surfaces to ease decontamination;~~

- Equipment and floor drain sumps are stainless steel lined to reduce crud buildup and to provide surfaces easily decontaminated;

Provisions for decontaminable epoxy-type wall and floor coverings, which provide smooth surfaces to ease decontamination. Epoxy-type coatings are applied to both steel surfaces and concrete areas appropriate for contamination control. These areas consist of the walls and floors of the Reactor and Turbine Buildings, radwaste areas, rooms containing equipment with liquid radioactive sources, floor drain areas, washdown bays, and tunnels containing piping transporting potentially radioactive contaminated liquids;

- that have historically been identified as major sources of radioactivity in reactor coolant;

- To facilitate decommissioning, the Reactor Building, Turbine Building, and Radwaste Building are designed for large equipment removal, consisting of entry doors from the outside and numerous cubicles with equipment hatches inside the buildings;

- To facilitate decommissioning and ease of access, the radwaste process pumps are rack-mounted and located in the Radwaste Building, can be readily replaced; and

- For some piping, feed-throughs with short sections, the piping may be embedded in concrete as discussed in DCD Subsection 12.3.1.2. Minimization of embedded piping to the extent practicable facilitates the dismantlement of the systems and decommissioning.

- To the extent practical underground piping is avoided in the ABWR design. The following piping contain segments that will have to run underground:

  – Condensate Storage Tank (CST) Piping and CST Retention Area Drain

  – Radwaste Effluent Discharge Pipeline

  – Cooling Tower Blowdown Line

As such, these lines will be kept as short and direct as practicable.

The underground piping associated with these lines will be designed to preclude inadvertent or unidentified leakage to the environment. They are enclosed and are accessible for visual inspections via a trench or tunnel. Threaded and flanged connections

12.3.7.4 Material Selection

The COL applicant shall address state-of-the-art developments in material selection options for maintaining exposure ALARA.

12.3.7.5 Requirement of 10CFR 20.1406

The COL Applicant will address the operational and post-construction objectives of Regulatory Guide 4.21 to meet the requirement of 10CFR 20.1406 (Subsection 12.3.1.5.2).

12.3.8 References

12.3-13 USNRC RG 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants," Regulatory Guide 1.143, November 2001.

12.3-14 USNRC RG 8.8, "Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Is Reasonable Achievable," Regulatory Guide 8.8, June 1978.

12.3-15 ANSI/ANS-55.1-1992, "Solid Radioactive Waste Processing System for Light-Water-Cooled Reactor Plants," July 1992.

12.3-16 ANSI/ANS-55.6-1993, "Liquid Radioactive Waste Processing System for Light Water Reactor Plants," July 1993.

12.3-5 Lederer, Hollander, and Perlman, "Table of Isotopes", Sixth Edition (1968).

12.3-6 M.A. Capo, "Polynomial Approximation of Gamma Ray Buildup Factors for a Point Isotropic Source", APEX-510, November 1958.

12.3-7 Reactor Physics Constants, Second Edition, ANL-5800, U.S. Atomic Energy Commission, July 1963.

12.3-8 ENDF/B-III and ENDF/B-IV Cross Section Libraries, Brookhaven National Laboratory.

12.3-9 PDS-31 Cross Section Library, Oak Ridge National Laboratory.

12.3-10 DLC-7, ENDF/B Photo Interaction Library.

12.3-11 10 CFR 20.1406, "Minimization of Contamination," Title 10 Code of Federal Regulations, Part 20.1406.

12.3-12 USNRC RG 4.21, "Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning," Regulatory Guide 4.21, June 2008.