Enclosure 2

MFN 15-054

GEH Response to Item #23 - Fuel Oil Transfer System

ABWR DCD DRAFT Revision 6 Markups

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replace by
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add
"Non-Safety Related "

3.7.3.8.2 Qualification by Design by Rule

For distributive systems such as cable trays, conduits, and HVAC ducts, an alternative to qualification by analysis described in Subsection 3.7.3.8.1 is the design by rule method approved by the NRC at the time of COL application.

3.7.3.9 Multi-Supported Equipment and Components with Distinct Inputs

The procedure and criteria for analysis are described in Subsections 3.7.2.1.3, 3.7.3.3.1.3, and 3.7.3.8.1.10.

replaced with "All Seismic Category I utilities (i.e. piping, conduits, or auxiliary system components) that are routed underground are installed in reinforced concrete tunnels in direct contact with soil. The design and analysis follows engineering process specified in SRP 3.7.3 for "Seismic Category I Buried Piping, Conduits and Tunnels."

3.7.3.10 Use of Constant Vertical Static Factors

All Seismic Category I subsystems and compone with the vertical floor spectra or time histories defining the input. A static analysis is performed in lieu of dynamic analysis if the peak value of the applicable floor spectra times a factor of 1.5 is used in the analysis. A factor of 1.0 instead of 1.5 can be used if the equipment is simple enough such that it behaves essentially as a single degree of freedom system. If the fundamental frequency of a component in the vertical direction is greater than or equal to 33 Hz, it is treated as seismically rigid and analyzed statically using the zero period acceleration (ZPA) of the response spectrum.

replace with "approaches"

3.7.3.11 Torsional Effects of Eccentric Masses

Torsional effects of eccentric masses are included for Seismic Category I subsystems similar to that for the piping systems discussed in Subsection 3.7.3.3.1.2.

3.7.3.12 Buried Seismic Category I Piping and Tunnels

~~All underground Category I buried piping systems are installed in tunnels~~. The following ~~items~~ are considered in the design and analysis:

replace with " Buried reinforced concrete tunnel systems (including contained piping and cabling), are"

(1) The inertial effects due to an earthquake upon tunnel sy accounted for in the design and analysis. ~~In case of buried tunnel systems~~ sufficiently flexible relative to the surrounding or underlying soil, it is assumed that the systems will follow essentially the displacements and deformations that the soil would have ~~if the systems were absent~~. When applicable, procedures, which take into account the phenomena of wave travel and wave reflection in compacting soil displacements from the ground displacements, are employed and the effects due to local soil settlements, soil arching, etc., are also considered in the design and analysis.

Insert " The enclosure of the tunnel needs to be designed to provide adequate dynamic clearance to its housing piping/cabling to avoid direct transmission of seismic in-ground accelerations and seismic in-ground displacements."

insert "and "

insert "dynamic soil pressure, "

insert
", rebar stresses and required rebar splices "

concrete stresses at locations of interest. In addition, the report contains reinforcement details for the basemat, seismic walls, and floors.

3.8.4.1.4 Seismic Category I Cable Trays, Cable Tray Supports, Conduit, and Conduit Supports

Electrical cables are carried on continuous horizontal and vertical runs of steel trays supported at intervals by structural steel frames. The tray locations and elevations are predetermined based on the requirements of the electrical cable network. Generally, several trays of different sizes are grouped together and connected to a common support.

The support frame spacing is determined by allowable tray spans, which are governed by rigidity and stress. The frames may be ceiling-supported, or wall-supported, or a combination of both. Various types of frames form a support system with transverse and longitudinal bracing to the nearest wall or ceiling to take the seismic loads.

3.8.4.1.5 Seismic Category I HVAC Ducts and Supports

HVAC ducts are supported at intervals by structural steel frames. The duct locations and elevations are predetermined based on the requirements of the HVAC system.

The support frame spacing is determined by allowable tray spans, which are governed by rigidity and stress. The frames may be ceiling-supported, or wall-supported, or a combination of both. Various types of frames form a support system with transverse and longitudinal bracing to the nearest wall or ceiling to take the seismic loads.

3.8.4.2 Applicable Codes, Standards, and Specifications

3.8.4.2.1 Reactor Building

The major portion of the Reactor Building is not subjected to the abnormal and severe accident conditions associated with a containment. A listing of applicable documents follows:

(1) [*ACI 349, Code Requirements for Nuclear Safety-Related Concrete Structures (as modified by Table 3.8-10)*.]*

(2) [*ANSI/AISC-N690, "Specification for the Design, Fabrication and Erection of Steel Safety-Related Structures for Nuclear Facilities" (as modified by Table 3.8-9)*.]†

(3) "ASME Boiler and Pressure Vessel Code Section III", Subsection NE, Division 1, Class MC (for design of main steam tunnel embedment piping anchorage in the R/B and C/B only).

Add section
"3.8.4.1.6 Seismic Category I Buried Piping, Conduit and Tunnels
Seismic Category I buried piping, conduit, and tunnels shall be designed and analyzed per SRP 3.7.3."

* See Subsection 3.8.3.2.

† See Subsection 3.8.3.2.

where F_s and F_p are the shearing and sliding resistance, and passive soil pressure resistance, respectively. F_d is the maximum lateral seismic force including any dynamic active earth pressure, and F_h is the maximum lateral force due to all loads except seismic loads.

The factor of safety against flotation is defined as:

$$FS = F_{DL}/F_B$$

where F_{DL} is the downward force due to dead load and F_B is the upward force due to buoyancy.

3.8.5.6 Materials, Quality Control, and Special Construction Techniques

The foundations of Seismic Category I structures are constructed of reinforced concrete using proven methods common to heavy industrial construction. For further discussion, see Subsection 3.8.1.6.

3.8.5.7 Testing and Inservice Inspection Requirements

A formal program of testing and inservice inspection is not planned and is not required for the Seismic Category I structures of the ABWR.

3.8.6 COL License Information

3.8.6.1 Foundation Waterproofing

The capability of foundations to transfer shear loads where foundation waterproofing is used will be evaluated (Subsection 3.8.5.4).

3.8.6.2 Site Specific Physical Properties and Foundation Settlement

Physical properties of the site-specific subgrade medium shall be determined and the settlement of foundations and structures, including Seismic Category I, will be evaluated (Subsection 3.8.5.4).

3.8.6.3 Structural Integrity Pressure Result

Each COL applicant will perform the structural integrity test (SIT) of the ABWR containment in accordance with Subsection 3.8.1.7.1. Additionally, the first ABWR containment is considered as a prototype and its SIT performed accordingly. The details of the test and the instrumentation, as required for such a test, will be provided by the first COL applicant for NRC review and approval.

3.8.6.4 Identification of Seismic Category I Structures

The COL applicant will identify all Seismic Category I Structures (Subsection 3.8.4).

add subsection
"3.8.6.5 Seismic Category I Buried Piping, Conduits, and Tunnels
The COL applicant shall provide Design and Analysis report for Seismic Category I buried piping, conduits and tunnels per SRP 3.7.3 (Subsection 3.7.3.12)."

insert
" and specified in SRP 3.7.3"

the safety-related divisional equipment contained inside. Specific seismic requirements are included in Subsection 3.7.3.12.

(2) The tunnels will be routed independently or provide separate compartments or internal substructures to assure necessary divisional separation requirements between the three (3) divisions.

(3) The tunnels will be designed to withstand the combined effects of hydrostatic head from site flooding and the dynamic effects resulting from internal piping system breaks. Provisions for relieving pressure resulting from pipe breaks will be provided as necessary including the use of external manways.

(4) The tunnels will be designed to ensure that the integrity of the piping penetrations at the interfacing buildings are maintained under design conditions.

(5) The tunnels will be designed to allow periodic inspection of the piping, cables, and piping penetrations.

(6) The tunnels will contain leak detection equipment and provisions for water removal.

(7) Entrances to the tunnels shall be provided with appropriate means to prevent unauthorized access.

(8) Tunnels used for routing fuel oil lines will be constructed in a manner that prevents fuel oil from accumulating next to safety-related structures by sloping them downward away from the building.

3.12.2.2 Description

The purpose of the safety-related tunnels is to provide protected and divisionalized pathways for piping, power cable, and instrumentation and control cable. The safety-related tunnels will be used to route piping and cabling from the Reactor and Control Buildings, to the Emergency Diesel Generator fuel oil storage tanks and the Reactor Service Water pump house.

3.12.2.3 Safety Evaluation

Divisional separation is to be maintained within the tunnel structures. A safety-related division will always be available after considering any combination of a single divisional piping break and a single active component failure.

Pipe break flooding in one division will not degrade the operation of the other two divisions. Ground water intrusion will be prevented.

Penetrations into safety-related structures will be designed to withstand pipe breaks and their effects including hydrostatic forces resulting from pipe tunnel flooding.

Flooding of the tunnels due to site flood conditions will be precluded by protecting the entrances of the tunnel from water entry.

3.12.3 Miscellaneous Tunnels

Add
"Non-Safety Related "

3.12.3.1 Design Basis

The equipment contained in these tunnels is non-safety related and therefore the tunnel will be non-safety related (e.g. radwaste tunnel). The design of these tunnels includes consideration of requirements for water tightness, accessibility, leak detection, and water removal. The design requirements of the tunnel must ensure that tunnel failure will not effect the ability of the plant to be shutdown. The tunnel structures shall be designed so that in the unlikely event of structural failure of a tunnel will not result in unacceptable damage to penetration seals at the interface with safety-related structures. The design must also include consideration for the potential of communicating the effects of pipe breaks from one building to another.

Penetrations at the interface with the safety-related structures will be designed to withstand the combined effects of hydrostatic head from site flooding and the dynamic effects resulting from internal piping system breaks. Provisions for relieving pressure resulting from pipe breaks will be provided as necessary. These tunnels will contain leak detection equipment and provisions for water removal.

3.12.3.2 Safety Evaluation

The use of non-safety related tunnels will not negatively impact the ability of the plant to be shutdown safely. Inter-building flooding via the non-safety-related tunnels will be precluded by penetration seals at each building/tunnel interface. Flooding of the tunnel from external sources (site flood) shall be prevented.

3.12.3.3 Description

The use of tunnels to route piping, cabling and other services from one structure to another will be determined by site characteristics and other design considerations. The ABWR presently includes a radwaste tunnel for routing radwaste piping and other services to and from the Radwaste, Control, Reactor, and Turbine Buildings.