
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 244-8326
SRP Section: 09.03.03 – Equipment and Floor Drainage System
Application Section: 9.3.3
Date of RAI Issue: 10/14/2015

Question No. 09.03.03-1

GDC 2 requires the capability of safety-related system portions of the Equipment and Floor Drainage System (EFDS) to withstand the effects of natural phenomena (such as seismic event, floods, etc.) without loss of capability to perform safety functions.

As stipulated in item III.1.B of SRP Section 9.3.3, “Equipment and Floor Drainage System”, if the EFDS can result in the inundation of safety-related areas due to drain backflow from malfunction of active components, blockage, or the probable maximum flood, then this portion of the EFDS is considered safety-related in that area.

DCD Tier 2, Section 9.3.3.3, states that the check valves installed in the outlet piping of the engineered safety features (ESF) pump room sump pump is to prevent flooding by backflows. However, there is no mention whether these check valves are safety-related.

The applicant is requested to clarify in the DCD whether the check valves are safety-related and provide justification if they are not to be safety-related.

Response

The equipment and floor drainage system prevents backflow from the floor drain sump to the ESF pump sump because the top elevation of the drain routing connected to the ESF pump sump is much higher than the maximum flood height of the floor drain sump area in auxiliary building.

The piping from ESF sump pump outlet located at EL. 50'-0" is routed to the floor drain sump at 55'-0". Maximum flood height (MFH) in the floor drain sump is EL.64'-0". The highest point of the outlet piping is at 68'-9", which is above the MFH. A potential backflow from the floor drain sump would be unlikely given the height difference between the pipe routing elevation and the elevations of the floor drain sump and MFH. The sketch of the pipe routing is presented in Figure 1.

Therefore, even though the check valves are not designed as safety-related, the flood source from the floor drain sump area is blocked by the drain routing height difference under the condition of the malfunction of check valves or probable maximum flood and the flooding condition in the ESF pump room is not expected.

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Figure 1 Equipment floor drain system schematic drawing in ESF pump room

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

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Question No. 09.03.03-2

GDC 4 requires, in part, that systems, structures, and components (SSCs) important to safety be “appropriately protected against dynamic effects, including... the effects of discharging fluids...”

As stipulated in item III.1.D of SRP Section 9.3.3, “Equipment and Floor Drainage System”, if a failure or malfunction in a portion of the EFDS could adversely affect safety-related (including accident mitigation) SSCs then this portion of the EFDS is considered safety-related.

DCD Tier 2, Section 9.3.3.2.5, “System Operation,” and Figure 9.3.3, indicate that the engineered safety features (ESF) pump room sump contains one sump pump each, while the rest of the EFDS sumps contain redundant sump pumps. During the review, the staff could not find further information regarding the failure or malfunction of an ESF pump room sump pump and the effects that could compromise the safety-related SSCs in that ESF pump room.

The applicant is requested to provide additional information as to how the EFDS design meets GDC 4 given a single failure of the only sump pump in any one of the ESF pump rooms.

Response

A single failure of the sump pump will not affect the ESF function because the flooding prevention design is applied in each ESF pump room.

The drainage system is designed in accordance with the divisional and quadrant separation concept in buildings. The divisional and quadrant separation concept incorporates designs for flood barriers that protect each quadrant by preventing propagation of flood water from one quadrant to any other in the event of flooding. Flood water in a quadrant will be collected to the bottom sump of the auxiliary building by gravity. The sumps have enough capacity to hold flood water within a quadrant without pumping the accumulated water to the liquid treatment systems.

The ESF sump pump does not perform the function of flood mitigation. Instead, flood water will be discharge to the adjacent area through the emergency overflow (EOF) lines installed in the ESF pump room EL 56'-0" to spread flood water to one quadrant during the failure or malfunction of a sump pump in the event of internal flooding.

In addition, a postulated failure or malfunction of a sump pump in one of the ESF pump rooms will not affect the safe shutdown function since it is not required for safe shutdown.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.