REVISED 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.:	**355-8438**
SRP Section:	**09.05.04 – Emergency Diesel Engine Fuel Oil Storage and Transfer System**
Application Section:	**9.5.4**
Date of RAI Issue:	**12/28/2015**

Question No. 09.05.04-8

Please describe the codes and standards that will be applied to the coatings on the underground tanks, piping, and other components. In addition, describe your plans to add this information to the FSAR. This information is needed for conformance with position C.9 of Regulatory Guide 1.137, Rev. 2, which states that external corrosion should be addressed by following NACE International standard practice SP0169-2007, “Control of External Corrosion on Underground or Submerged Metallic Piping Systems.” If SP0169-2007 is not being used, provide a justification for the proposed alternative. For additional background, the staff notes that License Renewal Interim Staff Guidance, LR-ISG-2015-01, “Changes to Buried and Underground Piping and Tank Recommendations,” identifies loss of material on steel and copper components in underground vaults due to moisture in the air.

Response – (Rev. 1)

Since the APR1400 standard design piping layout does not dictate the use or nonuse of buried and underground piping, KHNP will ensure that NACE SP0169-2007 recommended by Regulatory Guide 1.137 is applied by having a COL Item directing the COL applicant to meet the requirements of RG 1.137. Therefore, DCD Tier 2, Subsection 9.5.4 will be revised to provide the provision for the COL applicant as follows;

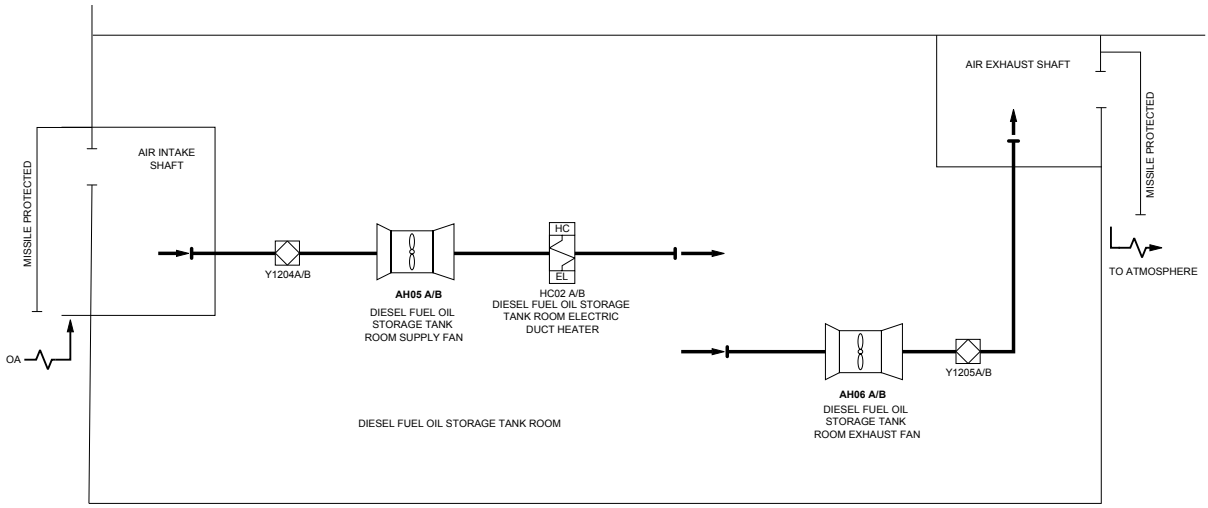
> “The COL applicant is to identify the applicable codes and standards for the external coating on the underground piping in accordance with NRC RG 1.137.”

Generally, all ferrous underground piping is provided with a protective coating such as a fusion-bonded epoxy coating as is required in Table 1a of NACE SP0169. Also, publications of the following agencies are applicable to the protective coating work requirements included in the Construction Specifications. All references to their publications are to the latest issue of each, together with the latest additions and amendments thereto, as of the date of contract.

- American Water Works Association (AWWA)
- Federal Government Military Specifications (MIL)
- National Association of Corrosion Engineers (NACE)
- The Society of Protective Coatings (SSPC)

License Renewal Interim Staff Guidance, LR-ISG-2015-01, noted that “the typical air conditions in underground vaults have higher moisture content than uncontrolled indoor air conditions in plant spaces within buildings”.

In the APR1400 design, the diesel fuel oil storage tanks and associated piping are located in vaults, which have dedicated HVAC systems as described in DCD Tier 2, Subsection 9.4.5.2.1.3. Supply and exhaust fans for the diesel fuel oil storage tank rooms operate continuously to prevent possible accumulation of oil fumes and to provide ventilation during all modes of plant operation. The electric duct heater operates to maintain the minimum required room temperature in the diesel fuel oil storage tank room. A sketch of the dedicated HVAC system is shown below (DCD Tier 2, Figure 9.4.5-1 provides a more detailed drawing of the system).



Schematic Diagram of Diesel Fuel Oil Storage Tank HVAC System

Therefore, the air condition in the vault does not have higher moisture content than uncontrolled indoor air conditions in plant spaces within buildings.

Additionally, the exterior surface of the diesel fuel oil storage tanks is coated by one coat of inorganic zinc primer followed by one coat of epoxy finish for corrosion protection as a protective coating. This protective coating is designated Service Level II according to the guidance in RG 1.54.

Impact on DCD

DCD Tier 2, Table 1.8-2, Subsection 9.5.4, 9.5.10, and 9.5.11 will be revised as shown in the attachment.

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.

Table 1.8-2 (16 of 29)

Item No.	Description
COL 9.5(7)	The COL applicant is to provide the fire brigade radio systems.
COL 9.5(8)	The COL applicant is to provide the LAN and VPN system.
COL 9.5(9)	The COL applicant is to provide the emergency offsite communication system including dedication hotline, local law enforcement radio equipment, and wireless communication system.
COL 9.5(10)	The COL applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.
COL 9.5(11)	The COL applicant is to provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.
COL 9.5(12)	The COL applicant is to provide the security radio system that consists of a base unit, mobile units, and portable units.
COL 9.5(13)	The COL applicant is to provide the local law enforcement communications including dedicated conventional telephone and radio-transmitted two-way communication system.
COL 9.5(14)	The COL applicant is to provide electric power for the security lighting system.
COL 9.5(15)	The COL applicant is to provide the system design information of AAC GTG building HVAC system including flow diagram, if the AAC GTG building requires the HVAC system.
COL 10.2(1)	The COL applicant is to identify the turbine vendor and model.
COL 10.2(2)	The COL applicant is to identify how the functional requirements for the overspeed protection system are met and provide a schematic of the TGCS and protection systems from sensors through valve actuators.
COL 10.2(3)	The COL applicant is to provide a description of how the turbine missile probability analysis conforms with Subsection 10.2.3.6 to ensure that requirements for protection against turbine missiles (e.g., applicable material properties, method of calculating the fracture toughness properties per SRP Section 10.2.3 Acceptance Criteria, preservice inspections) will be met.
COL 10.3(1)	The COL applicant is to provide operating and maintenance procedures including adequate precautions to prevent water (steam) hammer and relief valve discharge loads and water entrainment effects in accordance with NUREG–0927 and a milestone schedule for implementation of the procedure.
COL 10.3(2)	The COL applicant is to establish operational procedures and maintenance programs as related to leak detection and contamination control.
COL 10.3(3)	The COL applicant is to provide a description of the FAC monitoring program for carbon steel portions of the steam and power conversion systems that contain water or wet steam and are susceptible to erosion-corrosion damage. The description is to address consistency with GL 89-08 and NSAC-202L-R3 and provide a milestone schedule for implementation of the program.

COL 9.5(16) The COL applicant is to identify the applicable codes and standards for the external coating on the underground piping in accordance with NRC RG 1.137 .

A sampling connection is provided to the bottom of each tank for periodic sampling of the fuel oil for quality and for drawing off any accumulated condensation and sediment. The exterior surfaces of the day tanks are painted for corrosion protection.

Instrumentation is provided as described in Subsection 9.5.4.6. When the setpoint level is reached, fuel oil is automatically added to the day tank by the transfer pump from the diesel storage tank.

Each diesel fuel oil day tank has the external connections to supply fuel oil for portable equipment.

The COL applicant is to identify the applicable codes and standards for the external coating on the underground piping in accordance with NRC RG 1.137 (COL 9.5(16)).

9.5.4.2.2.6 Piping and Valves

Piping for the EDEFOS is safety Class 3, seismic Category I, except for a portion of the piping leading to vents, fills, and drains, which is seismic Category II or III, and is made of carbon steel. The exterior surfaces of the piping are painted for corrosion protection. The fuel oil storage tank is interconnected to the day tank through the overflow line of day tank.

There are provisions in the design to prevent entrance of water into the diesel oil storage tank during adverse environmental conditions, including maximum expected flood conditions. These include a vent line with a flame arrester, which is goose-necked downward, and the fill connections that are capped and penetrate building walls at elevations well above the flood level.

The maximum probable flood level does not exceed the elevations of the vent and fill connections, which are not subject to flood conditions. Any connections do not allow the entry of water into the system during adverse environmental conditions.

9.5.4.2.2.7 Flame Arrestors

Flame arresters are installed in the vent lines at the fuel oil storage and day tanks to prevent potentially explosive mixtures from igniting and also insects from flying or crawling into the vent piping and fouling the fuel in the tanks during standby and operating modes.

d. The fill and sample lines of fuel oil storage tanks are locked-closed with isolation valves, and their connections are capped and locked to prevent entry of moisture. The fuel oil storage tanks are vented to atmosphere, and the end of the vent lines is placed at an elevation higher than the maximum flood level.

e. The vent lines of fuel oil storage tanks and day tanks are fitted with a flame arrester to protect the tanks from an external open fire. The end of the goose-necked vent is covered with a fine-meshed screen to prevent insects and debris from entering the vent. The seismic Category I portions of EDEFOS fuel oil piping, located between the diesel fuel storage structure and the AB and EDGB, are routed in concrete pipe chases to prepare for any possible contamination arising from fuel oil leakage~~, and a protective coating is applied to the fuel oil storage tanks and day tanks to avoid any corrosion.~~

f. The capacity of each fuel oil storage tank is sufficient for at least 7 days of EDG operation at its continuous rating.

g. An overflow line is mounted on each fuel oil storage tank, and this overflow line has a valve that is normally closed, except for during filling operations, when it is open. In addition, a level indicator is located near the fill connection to permit the operator to monitor tank levels during filling operations. This provides reasonable assurance that fuel oil does not flow out of the tanks during filling operations. . The exterior of carbon steel tanks is coated. A protective coating which is designated Service Level II according to the guidance in RG 1.54 is applied to the fuel oil storage tanks located in vaults to avoid any corrosion.

h. Prior to adding or refilling fuel oil to fuel oil storage tanks, the fuel oil storage structures are heated up and maintained at a suitable temperature above the cloud point of fuel oil. The heatup is done by using electric unit heaters, and the overall maintenance process is described in the fuel oil program.

i. Each train is provided with an emergency fill connection to allow fuel oil to be directly pumped from an outside fuel source into the day tank, bypassing the fuel oil storage tank and transfer pump.

COL 9.5(10) The COL applicant is to specify that adequate and acceptable sources of fuel oil are available, including the means of transporting and recharging the fuel storage tank, following a design basis accident.

COL 9.5(11) A COL applicant is to provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.

COL 9.5(12) The COL applicant is to provide the security radio system that consists of a base unit, mobile units, and portable units.

COL 9.5(13) The COL applicant is to provide the local law enforcement communications including dedicated conventional telephone and radio transmitted two-way communication system.

COL 9.5(14) The COL applicant is to provide electric power for the security lighting system.

COL 9.5(15) The COL applicant is to provide the system design information of AAC GTG building HVAC system including flow diagram, if the AAC GTG building requires the HVAC system.

9.5.11 References

1. SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and Their Relationship to Current Regulatory Requirements," U.S. Nuclear Regulatory Commission, January 12, 1990.

2. SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Designs." U.S. Nuclear Regulatory Commission, April 2, 1993.

3. NUREG-0800, Standard Review Plan, Section 9.5.1.1, "Fire Protection Program," U.S. Nuclear Regulatory Commission, February 2009.

COL 9.5(16) The COL applicant is to identify the applicable codes and standards for the external coating on the underground piping in accordance with NRC RG 1.137

79. Regulatory Guide 1.137, “Fuel Oil Systems for Nuclear Power Plant,” Rev. 3, U.S. Nuclear Regulatory Commission, June 2013.

80. Regulatory Guide 1.32, “Criteria for Power Systems for Nuclear Power Plant,” Rev. 3, U.S. Nuclear Regulatory Commission, March 2004.

81. NFPA 101, “Life Safety Code,” National Fire Protection Association, 2012.

84. Regulatory Guide 1.54, "Service Level I, II, and III Protective Coatings Applied to Nuclear Power Plants," Rev. 2, U.S. Nuclear Regulatory Commission, October 2010.