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.:	**329-8424**
SRP Section:	**14.03.08 – Radiation Protection Inspections, Tests, Analyses, and Acceptance Criteria**
Application Section:	**Tier 1**
Date of RAI Issue:	**12/09/2015**

Question No. 14.03.08-13

This is a follow-up To RAI 8054, Question 14.03.08-6.

Regulatory Basis

10 CFR 50, GDC 19 requires that adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.

GDC 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed with appropriate containment, confinement, and filtering systems.

SRP Section 14.3 indicates that the purpose of inspections, tests, analysis, and acceptance criteria (ITAAC), is to verify that a facility referencing the design certification is built and operates in accordance with the design certification and applicable regulations. In addition, SRP Section 14.3.8 indicates that the reviewer should ensure that Tier 1 identifies and describes, commensurate with their safety significance, those SSCs that provide radiation shielding, confinement or containment of radioactivity, ventilation of airborne contamination, or radiation (or radioactivity concentration) monitoring for normal operations and during accidents.

Information Needed

1. In RAI 8054, Question 14.03.08-6, the staff requested, in part, that the applicant include ITAAC or initial tests, as appropriate, for engineered-safety-feature (ESF) atmosphere cleanup systems to ensure that the total leakage rate from these systems is less than the values assumed in the post-accident dose consequence design basis. In response to this question, the applicant provided tests in the initial test program for leakage from the plant ventilation systems. However, these tests do not specifically ensure that the

total leakage rate from the main control room and technical support center ventilation systems is less than the values assumed in the post-accident dose consequence design basis. FSAR Chapter 15 specifies that unfiltered in-leakage to the main control room and technical support center from the ventilation systems during design basis accidents is assumed to be 8.50 cubic meters per minute. If leakage exceeds this value it is outside the accident dose analysis performed in Chapter 15 and therefore control room operators could receive doses in excess of the 5 rem limit provided in GDC 19. Since the information is necessary to ensure that the facility is built and will be operated in accordance with the design certification, it is appropriate for inclusion in ITAAC. Therefore, please update Tier 1 to include an ITAAC to ensure that the in-leakage to the main control room and technical support center does not exceed 8.50 cubic meters per minute.

2. In response to Question 14.03.08-6, the applicant indicated that tests to ensure that leakage from ductworks and air cleaning unit housings is performed in accordance with TA-4300 of ASME AG-1-2009 with addenda. However, the proposed FSAR updates do not specify which version of ASME AG-1 is being used. Please update the FSAR to specify that the version of ASME AG-1 being referenced is the 2009 version, with addenda, as appropriate.

Response

1. The control room HVAC system serves the areas enclosed within the control room envelope (CRE). The CRE consists of the main control room (MCR), technical support center (TSC), computer room, and other areas as described in DCD Tier 2 Section 6.4.2.1 and shown in Figure 6.4-1. The unfiltered inleakage rate is the total unfiltered inleakage rate into the entire CRE.

   DCD Tier 1, Subsection 2.7.3.1.1, Item 11 provides the ITAAC for CRE inleakage. The acceptance criteria for Item 11 is that the unfiltered inleakage must be less than 510 cmh (300 cfm or 8.50 cubic meters per minute) in the emergency mode.

   The inleakage test method is described in DCD Tier 2, Subsection 14.2.12.1.95, which is the initial plant test program of the control room HVAC system. The acceptance criteria for the inleakage test will be added to DCD Tier 2, Subsection 14.2.12.1.95.

2. DCD, Tier 2 Subsections will be revised to include ASME AG-1-2009 with addenda as the appropriate version.

Impact on DCD

DCD Tier 2, Subsections 14.2.12.1.94, 14.2.12.1.95, 14.2.12.1.98, 14.2.12.1.99, and 14.2.12.1.132 will be revised as indicated 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.

3.2 Verify alarms, indicating instruments and status lights are functional.

3.3 Verify design airflows for high-volume purge, low-volume purge subsystems.

3.4 Perform filter and carbon adsorber efficiency tests.

3.5 Demonstrate system responses to a high-radiation signal.

3.6 Operate control valves from all appropriate control positions. Observe valve operation and position indication and measure opening and closing times.

3.7 Verify power-operated valves fail to the position specified in Subsection 9.4.6 upon loss of motive power.

3.8 Simulate containment isolation actuation signal (CIAS), containment purge isolation actuation signal (CPIAS) and observe isolation valve response.

3.9 Verify the proper operation of containment purge system radiation monitors.

3.10 Testing of air cleaning units (ACUs) is performed in accordance with RG 1.140 (Reference 10) and ASME N510 (Testing of Nuclear Air-Treatment Systems).

4.0 DATA REQUIRED

Add

4.1 Air balancing verification

4.2 Fan operating data for low-volume purge and high-volume purge fans

4.3 Filter and carbon adsorber data for exhaust filter trains

3.11 Testing of the leakage from ductwork and ACU housing is performed in accordance with TA-4300 of ASME ~~AG-1~~ (Code on Nuclear Air and Gas Treatment).

AG-1-2009 with Addenda

4.8 Control room HVAC system radiation monitor performance data

5.0 ACCEPTANCE CRITERIA

5.1 The control room HVAC system operates as described in Subsections 6.4.2 and 9.4.1.

5.2 The control room HVAC system radiation monitors perform as described in Table 11.5-1.

5.3 The control room HVAC system maintains CRE integrity.

14.2.12.1.96 Turbine Generator Building HVAC System Test

1.0 OBJECTIVE

1.1 To demonstrate that the turbine building HVAC system provides a suitable operating environment for equipment and personnel during normal operations

Add

2.0 PREREQUISITES

2.1 Construction activities on the turbine building HVAC system have been completed.

2.2 Turbine building HVAC system instrumentation has been calibrated.

2.3 Support systems required for operation of the turbine building HVAC system are complete and operational.

2.4 Test instrumentation is available and calibrated.

3.0 TEST METHOD

3.1 Verify all control logic.

5.4 The ASTM E741-00 tests confirm that total unfiltered inleakage rate to the CRE is less than 510 cmh (300 cfm) in the emergency mode.

3.5 Verify the proper operation of the fuel handling area exhaust air cleaning units (ACUs).

3.6 Verify filter efficiency, carbon adsorber efficiency, and airflow capacity.

3.7 Verify the system is at rated airflow and is air balanced.

3.8 Verify the proper operation of all protective devices, controls, interlocks, instrumentation, and alarms, using actual or simulated inputs.

3.9 Verify the proper operation of the fuel handling area HVAC system radiation monitor and system response to a high-radiation signal.

3.10 Verify that the ACUs perform in accordance with RG 1.140 (Reference 10), RG 1.52 (Reference 11) and ASME N510 (Testing of Nuclear Air-Treatment Systems).

3.11 Verify isolation of safety-related dampers installed upstream of normal supply AHU and downstream of normal ACU on a simulated fuel handling area emergency ventilation action signal (FHEVAS).

4.0 DATA REQUIRED

Add

4.1 Air balancing verification

4.2 Fan and damper operating data

4.3 Temperature data in the fuel handling area

4.4 Setpoints at which alarms, interlocks, and controls occur

4.5 Fuel handling area negative pressurization data during normal and postulated emergency conditions

4.6 Filter and carbon adsorber data

3.12 Testing of the leakage from ductwork and ACU housing is performed in accordance with TA-4300 of ASME ~~AG-1~~ (Code on Nuclear Air and Gas Treatment).

AG-1-2009 with Addenda

3.2 Verify the proper operation, stroking speed, and position indication of all dampers.

3.3 Verify the capacity of the HVAC system to maintain the area temperature.

3.4 Verify the system maintains the radwaste controlled area at a negative pressure.

3.5 Verify the proper operation of the general supply air handling units (AHUs), fans, and cubicle coolers.

3.6 Verify the proper operation of the general exhaust air cleaning units (ACUs) and fans.

3.7 Verify filter efficiency and airflow capacity.

3.8 Verify the system is at rated airflow and is air balanced.

3.9 Verify the proper operation of all protective devices, controls, interlocks, instrumentation, and alarms, using actual or simulated inputs.

3.10 Verify the proper operation of the compound building HVAC system radiation monitor system response to a high-radiation signal.

3.11 Verify that the ACUs perform in accordance with RG 1.140 (Reference 10) and ASME N510 (Testing of Nuclear Air-Treatment Systems).

4.0 DATA REQUIRED

Add

4.1 Air balancing verification

4.2 Fan and damper operating data

4.3 Temperature data

3.12 Testing of the leakage from ductwork and ACU housing is performed in accordance with TA-4300 of ASME ~~AG-1~~ (Code on Nuclear Air and Gas Treatment).

AG-1-2009 with Addenda

3.5 Verify the proper operation of the air cleaning units (ACUs) and fans.

3.6 Verify the proper operation of all cubicle coolers.

3.7 Verify filter efficiency, carbon adsorber efficiency, and airflow capacity.

3.8 Verify the system is at rated airflow and is air balanced.

3.9 Verify the proper operation of all protective devices, controls, interlocks, instrumentation, and alarms using actual or simulated inputs.

3.10 Verify the proper operation of the auxiliary building controlled area HVAC system radiation monitor and system response to a high-radiation signal.

3.11 Verify that the ACU performs in accordance with NRC RGs 1.140 (Reference 10), 1.52 (Reference 11), and ASME N510 (Testing of Nuclear Air –Treatment Systems).

3.12 Verify isolation of the safety-related dampers installed downstream of normal supply AHU and upstream of normal exhaust ACU on a simulated safety injection action signal (SIAS).

4.0 DATA REQUIRED

Add

4.1 Air balancing verification

4.2 Fan and damper operating data

4.3 Temperature data of building area

4.4 Setpoints of alarms, interlocks, and controls

4.5 Auxiliary building controlled area negative pressurization data

3.12 Testing of the leakage from ductwork and ACU housing is performed in accordance with TA-4300 of ASME ~~AG-1~~ (Code on Nuclear Air and Gas Treatment).

AG-1-2009 with Addenda