
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.: 116-8054
SRP Section: 14.03.08 – Radiation Protection Inspections, Tests, Analyses, and Acceptance Criteria
Application Section: Tier 1, Various Sections
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Question No. 14.03.08-6

10 CFR 50, GDC 61, requires that the fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

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.

RG 1.52 indicates that engineered-safety-feature (ESF) atmosphere cleanup system housings and ductwork should be tested to assure that the total leakage rate from ducting is less than the values assumed in the post-accident dose consequence design bases. However, staff cannot find any ITAAC or initial tests in the initial test program assuring that this criteria is met. Please include ITAAC and initial tests, as appropriate, to ensuring that these tests are performed and that the criteria are met or justify not including them.

Response

In accordance with Regulatory Guide (RG) 1.52 and RG 1.140, the air cleaning unit (ACU) housing and ductwork are tested to provide reasonable assurance that the leakage rate from ductwork and ACU housing is less than the allowable leakage rate as defined in sections HA-4500 and SA-4500, respectively, of ASME AG-1-2009 with addenda. Ductwork and ACU housing leak tests are performed in accordance with section TA-4300 of ASME AG-1-2009 with addenda.

The ductwork and ACU housing leak testing will be added to the initial plant tests detailed in DCD Tier 2, Subsections 14.2.12.1.94 for the containment purge system, 14.2.12.1.98 for the fuel handling area HVAC system, 14.2.12.1.99 for the compound building HVAC system, and 14.2.12.1.132 for the auxiliary building controlled area HVAC system.

There are no specific requirements related to ductwork and ACU housing leak testing in SRP 14.3.8, "Radiation Protection – Inspections, Tests, Analyses, and Acceptance Criteria" and the initial plant test acceptance criteria for the ductwork and ACU housing leak testing will adequately assure that the total leakage rate from ducting is less than the allowable leakage rate. Therefore, KHNP believes that additional testing via ITAAC is not warranted.

Impact on DCD

DCD Tier 2, Subsections 14.2.12.1.94, 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.

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- 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

- 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).

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- 4.4 Valve opening and closing times, where required
- 4.5 Valve position indication
- 4.6 Position response of valves to loss of motive power
- 4.7 Setpoints at which alarms and interlocks occur
- 4.8 Temperatures of air supply (outside) to high-volume purge supply and discharge into containment
- 4.9 Valve responses to simulated CIAS and CPIAS signals
- 4.10 Reactor containment purge system radiation monitors performance data

5.0 ACCEPTANCE CRITERIA

- 5.1 Reactor containment purge system performs as described in Subsection 9.4.6.
- 5.2 Reactor containment purge system radiation monitors perform as described in Table 11.5-1.

14.2.12.1.95 Control Room HVAC System Test

1.0 OBJECTIVE

Add

- 1.1 To verify the functional operation of the control room HVAC system and to provide reasonable assurance of a proper environment for personnel and equipment under all modes of operation.
- 1.2 To perform a control room envelope integrity test

Note: The preoperational tests on the balance of the control room HVAC system are described in Subsection 14.2.12.1.100.

5.3 Reactor containment purge system meets ductwork and ACU housing leakage requirements.

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- 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).

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4.7 Fuel handling area HVAC system radiation monitor performance data

5.0 ACCEPTANCE CRITERIA

5.1 The fuel handling area HVAC system operates as described in Subsection 9.4.2.

5.2 The fuel handling area HVAC system radiation monitor performs as described in Table 11.5-1.

14.2.12.1.99 Compound Building HVAC System Test

1.0 OBJECTIVE

Add

1.1 To demonstrate the proper operation of the compound building HVAC system to maintain design condition

2.0 PREREQUISITES

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

2.2 Compound building HVAC system instrumentation has been calibrated.

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

2.4 Test instrumentation is available and calibrated.

2.5 HEPA filters, prefilters, and carbon adsorber material used during construction are completely replaced.

3.0 TEST METHOD

3.1 Verify all control logic.

5.3 The fuel handling area HVAC system meets ductwork and ACU housing leakage requirements.

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- 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
- 4.1 Air balancing verification
 - 4.2 Fan and damper operating data
 - 4.3 Temperature data
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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).

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- 4.4 Setpoints of alarms interlocks and controls
- 4.5 Compound building negative pressurization
- 4.6 Compound building HVAC system radiation monitor performance data

5.0 ACCEPTANCE CRITERIA

- 5.1 The compound building HVAC system operates as described in Subsection 9.4.7.
- 5.2 The compound building HVAC system radiation monitor performs as described in Table 11.5-1.

14.2.12.1.100 Balance of Control Room HVAC System Test**1.0 OBJECTIVE****Add**

- 1.1 To demonstrate that the control room HVAC system airflow is balanced for normal mode

2.0 PREREQUISITES

- 2.1 Construction activities in the control room are complete with all penetrations sealed in place.
- 2.2 Construction activities on the control room HVAC system have been completed.
- 2.3 Control room HVAC system instrumentation has been calibrated.
- 2.4 Support systems required for operation of the control room HVAC system are complete and operational.
- 2.5 Test instrumentation is available and calibrated.

5.3 The compound building HVAC system meets ductwork and ACU housing leakage requirements.

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- 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

3.13 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).

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4.6 Filter and carbon adsorber data

4.7 Auxiliary building controlled area HVAC system radiation monitor performance data

5.0 ACCEPTANCE CRITERIA

5.1 The auxiliary building controlled area HVAC system operates as described in Subsection 9.4.5.1.3.

5.2 The auxiliary building controlled area HVAC system radiation monitors perform as described in Table 11.5-1.

14.2.12.1.133 Auxiliary Building Clean Area HVAC System Test

1.0 OBJECTIVE

Add

1.1 To demonstrate the proper operation of the auxiliary building clean area HVAC system to maintain design condition

2.0 PREREQUISITES

2.1 Construction activities on the auxiliary building clean area HVAC system have been completed.

2.2 Auxiliary building clean area HVAC system instrumentation has been calibrated.

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

2.4 Test instrumentation is available and calibrated.

5.3 The auxiliary building controlled area HVAC system meets ductwork and ACU housing leakage requirements.