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.:	**197-8176**
SRP Section:	**14.03.12 – Physical Security Hardware – Inspections, Tests, Analyses, and Acceptance Criteria**
Application Section:	
Date of RAI Issue:	**09/02/2015**

Question No. 14.03.12-3

Tier 1, Section 2.12.2, Inspections, Tests, Analyses, and Acceptance Criteria, Table 2.12-1, ITAAC Item Nos. 16.a., 16.b, and 16.c (Page 2.12-7) and Tier 1, Section 2.6.8, “Lighting Systems,” (Page 2.6-57) and Section 2.6.8.2, “Inspection, Tests, Analyses, and Acceptance Criteria,” Table 2.5.8-1 (Page 2.6-57 to 2.6-60):

a. Discuss whether the plant emergency DC lighting subsystem, described in Section 2.6.8.1, Item No. 4.b, is relied on for illumination for performing security functions (i.e., assessments, monitoring, observations, and security responses for interdiction and neutralization) within the interior and exterior of the APR1400 structures. Indicate whether the plant emergency DC lighting system provide sufficient illumination for security functions and specify the design and performance requirements for the minimum illumination provided for perform security functions. Indicate whether the ITA, specific for verifying the construction and installation of lighting system providing illumination for security, will reside within the verification of ITAAC described in physical security ITAAC described in Table 2.12-1 or plant emergency lighting ITAAC described in Table 2.6.8-1.

b. If the plant emergency lighting is not relied on to enable performing security functions during loss of normal plant lighting, as implied in Tier 2, Section 9.5.3, “Light Systems,” provide the design descriptions for the dedicated “security lighting system,” with the appropriate descriptions of interface between plant and security specific systems (e.g., Tier 2 Sections 13.6 and 9.5.3). Include in Tier 1, Section 2.12, “Physical Security Hardware,” the appropriate design descriptions and physical security ITAAC for the “security lighting system,” along with the appropriate supporting technical information in Section 14.3.12

   Note: RAI responses/revisions to DCD, with specific detail of how design of plant or independent security lighting system meets the requirements of 10 CFR 73.55 must be

protected accordance with requirements for safeguards information and/or security-related information.

c. Verify that the minimum illumination design requirement (i.e., 0.1 foot-candle/square feet at the floor level) also include a criteria for system performance of minimum illumination of not less than average of 1 foot candle (10.8 lux) for Section 2.6.8, Item No. 4.b and corresponding lighting system ITAAC No. 4.b. For example, a typical performance standard established in industry Life Safety Code states that performance of the emergency lighting provide illumination of egress is not less than an average of 1 foot-candle (10.8 lux) and, at any point, not less than 0.1 foot-candle (1.1 lux), measured along the path of egress at floor level (i.e., National Fire Protection Association Standard NFPA 101, Life Safety Code, Chapter 7.9.2.1.1).

d. Specify the minimum illumination level that will be provided by design of plant emergency lighting system (or a dedicate security lighting system) for illumination in security alarm stations or other security locations. Indicate whether the design for a minimum of 10 foot-candle/square feet applies to security alarm stations for performing security functions and other important locations (e.g., Emergency Operating Center, Technical Support Center, Operational Support Center, etc.) that support plant operations and/or emergency response in the event of a loss of plant normal lighting. If 0.1 foot-candle at the floor level is the acceptance criteria at other locations, provide the technical basis on how minimum illumination of 0.1 foot-candle vs. a 10 foot-candle is adequate to enable reliable performance of tasks for activities required for safety/security response activities at these locations during loss of normal power or emergencies.

Regulatory Basis: Subpart B of 10 CFR 52, § 52.47, requires that information submitted for a design certification must include performance requirements and design information sufficiently detailed to permit the preparation of acceptance and inspection requirements by the NRC, and procurement specifications and construction and installation specifications by an applicant. Title 10 CFR 52.48 requires the applications filed will be reviewed for compliance with the standards set out in 10 CFR Part 73. Title 10 CFR 52.47(b)(1) requires that the application must contain proposed inspections, tests, analyses, and acceptance criteria that are necessary and sufficient to provide reasonable assurance that, if the inspections, tests, and analyses are performed and the acceptance criteria met, a facility that incorporates the design certification has been constructed and will be operated in conformity with the design certification, the provisions of the Act, and the Commission's rules and regulations.

Tier 1 Section 2.6.8 and respective plant lighting ITAAC (Table 2.6.8-1) include emergency DC lighting for a minimum illumination and durations for loss of normal plant lighting. The design descriptions in Section 2.6.8 (or Section 2.12.1) does not address illumination for security within or exterior of structures of the APR1400. However, Tier 2, Section 9.5.3 of the DCD identify a security lighting system. Clarification is needed with regards to the design of the plant system to meet both safety and security function or whether there is a dedicated and separate system for meeting security functions. Appropriate interface between Section 2.6.8 and Section 2.12 is need to ensure adequate design descriptions and ITAAC for system and hardware providing illumination for safety and security.

The APR1400's design descriptions of 0.1 foot-candle at the floor level for DC emergency lighting does not capture the design for an average level of illumination (e.g., not less than 1 foot-candle) found in building codes and standard for life safety egress. KHNP should verify whether the design of the emergency lighting will be capable of providing such performance for the design descriptions and ITAAC in Section 2.6.8. The minimum illumination value found in 10 CFR 73.55 for enabling security functions of monitoring, observations, assessment and initiation of contingency response exterior of structures in the protected area is at least 0.2 foot-candle measured horizontally at ground level. Interior building emergency lighting system that comply with building codes and standards is relied on for performing security functions, including assessment and security response within internal of structures.

Response

The following provides a response to each item of the staff's request above.

a. In the APR1400 lighting system, the isolation zones and exterior areas within the protected area are provided with the illumination, a minimum of 0.2 foot-candle, by the dedicated security lighting system as described in DCD Tier 2, Subsection 9.5.3.2 (paragraph c). The interior areas for internal security response, as well as the plant operation areas, are provided with the illumination by the plant lighting systems such as the normal, emergency AC, and DC lighting system as described in DCD Tier 2, Subsection 9.5.3.2 (paragraphs a and b). In the event of a loss of plant normal lighting, the emergency AC and DC lighting systems provide sufficient illumination to perform security functions with the illumination levels as described in DCD Tier 2, Subsection 9.5.3.2 (paragraph b).

   For the security alarm stations, the lighting equipment is supplied from the security power system, which is backed up by a dedicated uninterruptible power supply (UPS) for the security power system. The minimum illumination level in the security alarm stations is included in the response to Question "d".

   The ITAAC for the plant lighting system and the security lighting system for the isolation zones and exterior areas are included in DCD Tier 1, Table 2.6.8-1 and Table 2.12-1, respectively.

   The ITAAC for the lighting equipment in the security alarm stations will be included in DCD Tier 1, Subsection 2.12.1 and Table 2.12-1.

b. The plant lighting systems and illumination for the security alarm stations relied on for enabling and performing security functions, and the ITAAC for the lighting systems relied on for the security functions are discussed in the response to Question "a".

c. The emergency illumination level is not less than an average of 1 foot-candle, and at least 0.1 foot-candle along the path of egress at the floor level for 8 hours in accordance with NFPA 101, Life Safety Code, Subsection 7.9.2.1.1.

d. The normal illumination level for the security alarm stations is 75 foot-candles, which corresponds to the illumination level for the control room in accordance with Illuminating Engineering Society of North America (IESNA) Lighting Handbook. The

minimum emergency illumination level for the security alarm station is 10 foot-candles, the same as the illumination level in the control rooms ensured by the emergency lighting.

The required minimum illumination level in other important locations such as the main control room (MCR), radwaste control room, emergency TSC, OSC, remote shutdown room (RSR), EDG room, Class 1E battery room, and Class-1E SWGR room is 10 foot-candles as described in DCD Tier 2, Subsection 9.5.3.2.

Impact on DCD

DCD Tier 1, Subsection 2.6.8.1, Table 2.6.8-1, Subsection 2.12.1, and Table 2.12-1 and DCD Tier 2 Subsection 9.5.3.2 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.

2.6.8 Lighting Systems

2.6.8.1 Design Description

The plant lighting system is non-Class 1E and consists of two subsystems which are normal lighting and emergency lighting. Emergency lighting system is divided into emergency ac and dc lighting system.

1. The functional arrangement of the lighting system is as described in the Design Description of Subsection 2.6.8.1.

2. The normal lighting system provides normal levels of illumination throughout the plant and is powered from the non-Class 1E ac buses.

3. The emergency ac lighting system is powered from the Class 1E ac buses backed-up by the Class 1E emergency diesel generators.

4.a There are two configurations for lighting fixture used within the emergency dc lighting system, lighting fixtures powered from non-Class 1E station battery and self-contained battery pack unit lighting fixtures.

4.b The emergency dc lighting fixtures equipped with self-contained rechargeable battery pack are powered from Class 1E or non-Class 1E ac in accordance with area designation. The emergency illumination level is ~~at least 0.1 foot-candle at the floor level for 8 hours.~~

5. The emergency illumination levels in MCR and RSR are minimum 10 foot-candle for 8 hours.

2.6.8.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.6.8-1 specifies the inspections, tests, analyses, and associated acceptance criteria for the lighting system.

not less than an average of 1 foot-candle and at least 0.1 foot-candle at the floor level for 8 hours for access and egress route.

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Table 2.6.8-1 (2 of 2)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
4.b The emergency dc lighting fixtures equipped with self-contained rechargeable battery pack are powered from Class 1E or non-Class 1E ac in accordance with area designation. The emergency illumination level is ~~at least 0.1 foot-candle at the floor level for 8 hours.~~	4.b.i Inspection of the as-built emergency dc lighting will be performed.	4.b.i The as-built emergency dc lighting fixture equipped with self-contained rechargeable battery pack are powered from Class 1E or non-Class 1E ac in accordance with area designation.
	4.b.ii Test of the emergency dc self-contained battery pack lighting units will be performed.	4.b.ii The illumination level is ~~at least 0.1 foot-candle at the floor level for 8 hours~~.
5. The emergency illumination levels in MCR and RSR are minimum 10 foot-candle for 8 hours.	5. Test of the as-built emergency lighting system in MCR and RSR are will be performed.	5. The as-built emergency illumination levels in MCR and RSR are minimum 10 foot-candle for 8 hours as required by NUREG-0700.

not less than an average of 1 foot-candle and at least 0.1 foot-candle at the floor level for 8 hours for access and egress route.

not less than an average of 1 foot-candle and at least 0.1 foot-candle at the floor level for 8 hours for access and egress route.

2.12 Physical Security Hardware

2.12.1 Design Description

The physical security system provides physical features to detect, delay, assist response to, and defend against the design basis threat (DBT) for radiological sabotage. The physical security system consists of physical barriers, intrusion detection, surveillance, communications, alarm stations, and power supplies. The details of the design of physical security system are categorized as sensitive security information.

1.a Vital equipment is located only within a vital area.

1.b Access to vital equipment requires passage through the vital area barrier.

2.a COL information

2.b COL information

2.c COL information

3.a COL information

3.b COL information

3.c COL information

4.a COL information

4.b Included in 11.a below.

4.c COL information

5. Isolation zones and exterior areas within the protected area are provided with illumination to permit observation of abnormal presence or activity of persons or vehicles.

6. The external walls, doors, ceilings, and floors in the main control room, the central alarm station and the secondary alarm station are bullet-resistant to at least Underwrites Laboratory Ballistic Standard 752, level 4.

5.a

5.b The security alarm stations are provided with illumination to perform security functions.

APR1400 DCD TIER 1

Table 2.12-1 (1 of 4)

Physical Security Hardware ITAAC

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a Vital equipment is located only within a vital area.	1.a Inspection will be performed to confirm that vital equipment is located within a vital area.	1.a All vital equipment is located only within a vital area.
1.b Access to vital equipment requires passage through the vital area barrier.	1.b Inspection will be performed to confirm that access to vital equipment requires passage through the vital area barrier.	1.b Vital equipment is located within a protected area such that access to vital equipment requires passage through the vital area barrier.
2.a COL information		
2.b COL information		
2.c COL information		
3.a COL information		
3.b COL information		
3.c COL information		
4.a COL information		
4.b Included in 11.a below		
4.c COL information		
~~5.~~ Isolation zones and exterior areas within the protected area are provided with illumination to permit observation of abnormal presence or activity of persons or vehicles.	~~5.~~ Inspection of the illumination in the isolation zones and external areas of the protected area will be performed.	~~5.~~ The illumination in isolation zones and exterior areas within the protected area is 0.2 ~~foot candles~~ measured horizontally at ground level or, alternatively, sufficient to permit observation.
6. The external walls, doors, ceilings, and floors in the main control room, the central alarm station and the secondary alarm station are bullet-resistant to at least Underwrites Laboratory Ballistic Standard 752, level 4.	6. Inspections and/or analysis of the central and secondary alarm station will be performed.	6. The external walls, doors, ceilings, and floors in the main control room, the central alarm station and the secondary alarm station are bullet-resistant to at least Underwrites Laboratory Ballistic Standard 752, level 4.
7. The vehicle barrier system is installed and located at the necessary stand-off distance to protect against the design basis threat (DBT) vehicle bombs.	7. Inspections and analysis will be performed for the vehicle barrier system.	7. The vehicle barrier system will protect against the DBT vehicle bombs based upon the stand-off distance of the system.
5.b The security alarm stations are provided with illumination to perform security functions.	5.b Inspection of the illumination for the security alarm stations will be performed.	5.b The emergency illumination level for the security alarm stations is at least 10 foot-candles.

5.a

5.a

5.a

foot-candle

level

The self-contained battery lighting fixtures are equipped with sealed-beam, an 8-hour battery, and a battery charger. The power is automatically provided from the self-contained battery upon loss of normal or emergency ac lighting power.

The self-contained battery lighting provides ~~more than 0.1 foot-candles of illumination at the areas where emergency ac lightings are provided.~~

c. Security lighting system

foot-candle

A minimum illumination level of 0.2 ~~foot-candles~~ is provided and measured horizontally at ground level in the isolation zones and appropriate exterior areas within the protected area. The security lighting is powered from offsite and backed up by the AAC source upon loss of offsite power.

The COL applicant is to provide offsite power for the security lighting system.

9.5.3.3 Safety Evaluation

The normal lighting is not available during LOOP, SSE, and SBO conditions.

a. The emergency ac lighting is normally turned on and supplements the normal lighting. The emergency dc lighting is normally turned off.

b. During LOOP, SSE, and SBO, the emergency ac lighting fed from the Class 1E 480 Vac bus is interrupted until the power supply to the Class 1E ac buses is restored. During this period, emergency dc lighting powered from the station battery or the individual self-contained battery provides adequate illumination for safe shutdown operations and for movement of personnel to the access and egress routes.

c. Emergency ac or dc lighting provides a minimum illumination level of 10 foot-candles in the MCR and RSR. Emergency dc lighting provides illumination when emergency ac lighting is lost.

not less than an average of 1 foot-candle and at least 0.1 foot-candle at the floor level for 8 hours for access and egress route.

The lighting for the security alarm stations is powered from the security power system and backed up by a UPS for the security power system. The normal and minimum emergency illumination level for security alarm stations are 75 foot-candles and 10 foot-candles, respectively.

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.:	**197-8176**
SRP Section:	**14.03.12 – Physical Security Hardware – Inspections, Tests, Analyses, and Acceptance Criteria**
Application Section:	**Tier 1 Sections 2.12, 2.6.8, 2.6.9 and Tier 2 Sections 14.2.13, 14.3.2.12, 14.3.6, 14.3.7**
Date of RAI Issue:	**09/02/2015**

Question No. 14.03.12-4

(U) Tier 1, Section 2.12.2, Inspections, Tests, Analyses, and Acceptance Criteria, Table 2.12-1, ITAAC Item Nos. 16.a., 16.b, and 16.c (Page 2.12-7) and Tier 1, Section 2.6.9.2, Inspections, Tests, Analyses, and Acceptance Criteria, Table 2.6.9-1, Communications System ITAAC (Page 2.6-63):

a. **(U)** Provide appropriate design descriptions for interface between the verifications of security communication system and hardware and the plant communication system captured under ITAAC show in Table 2.12-1 and Table 2.6.9-1, respectively. Specifically indicate whether the verifications of Table 2.12-1, Items No. 16.a, 16.b, and 16.c, are performed independently for ITAAC described in Table 2.12-1 or they are within the verifications for plant communication for ITAAC described in Table 2.6.9-1 (i.e., Items No. 2 and 3).

b. **(U)** Indicate how ITAAC for each, Item No. 16.a, 16.b, and 16.c, will be adequately inspected, tested, or combinations of inspected and tested, analyzed, and documented and closed.

c. **(U)** Describe, in supporting Tier 2, Section 13.6 or technical reports incorporated by reference, the detail descriptions of how the design of the plant communication systems relied-on (or if independent from plant communications system the dedicate security communications system) for meeting physical security functions identified in design descriptions in Tier 1, Section 2.12.2 and ITTAC identified in Table 2.12-1, Item Nos. 16.a, 16.b, and 16.c.

Response

The information corresponding to each item (a through c) is provided as follows:

a. The security communication system and the plant communication system are independent of each other. The verifications of Table 2.12-1, Items No. 16.a, 16.b, and 16.c are performed independently from those for the plant communication system.

b. As stated in DCD Tier 2, Subsection 9.5.2.4, the communication systems are to be tested and inspected prior to initial start-up. The testing and inspection procedures for the communication systems are within the scope of the COL applicant as mentioned in DCD Tier 2, Table 14.2-7 (11 of 18), item No. 1.o.13 and Subsection 14.2.13 (COL 14.2(11)). Once the COL applicant develops the testing and inspection procedures for the security communication system, the associated tests and inspections will be performed according to those procedures. The results of the tests and inspections will be duly documented and the ITAAC process will be finalized when the results are proven to meet the acceptance criteria.

c. The security communication system consists of security telephone system, security wireless communication system, and power supply system. These subsystems provide conventional telephone service, primary source of communications for emergency personnel such as security, and supply power to non-portable communications equipment in the event of a loss of normal power. The security communication system is relied on to maintain continuous communications capability with onsite and offsite resources for effective command and control, and provides continuous communication among all on-duty security force personnel and individuals in each alarm station.

   The current descriptions of the security communication system will be removed from DCD Tier 2, Subsections 9.5.2.2.1.5 and 9.5.2.2.1.8, and described in the following separate subsections: Subsections 9.5.2.2.3, 9.5.2.2.3.1, 9.5.2.2.3.2, and 9.5.2.2.3.3. In addition, Subsections 9.5.2.1, 9.5.2.2, 9.5.2.2.2.3, 14.2.13, and Tables 14.2-7 (11 of 18) and 1.8-2 (25 of 29) will be revised to clarify the independence of the security communication systems.

Impact on 14.3.6, 14.3.7DCD

DCD Tier 2, Subsections 9.5.2.1, 9.5.2.2, 9.5.2.2.1.5, 9.5.2.2.1.8, 9.5.2.2.2.3, 14.2.13, and Tables 14.2-7 (11 of 18) and 1.8-2 (25 of 29) will be revised and Subsections 9.5.2.2.3, 9.5.2.2.3.1, 9.5.2.2.3.2, and 9.5.2.2.3.3 will be added as shown in the Attachment.

Impact on PRA

There is no impact on the P14.3.6, 14.3.7RA.

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 (25 of 29)

Item No.	Description
COL 14.2(8)	The COL applicant that references the APR1400 design certification is to identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660, "NRC Action Plans Developed as a Result of the TMI-2 Accident," Revision 1, August 1980 and (2) NUREG-0737, "Clarification of TMI Action Plan Requirements."
COL 14.2(9)	The COL applicant is to prepare the pre-operational test of cooling tower and associated auxiliaries, and raw wa systems described in Subsection 9.5.2
COL 14.2(10)	The COL applica procedures for est program of personnel monitors and radiation survey instruments.
COL 14.2(11)	The COL applicant is to develop the test ~~procedure of~~ the communication ~~system~~.
COL 14.3(1)	The COL applicant is to provide the ITAAC for the site-specific portion of the plant systems specified in Subsection 14.3.3.
COL 14.3(2)	The COL applicant is to provide the proposed ITAAC for the facility's emergency planning addressed in Subsection 14.3.2.10.
COL 14.3(3)	The COL applicant is to provide the proposed ITAAC for the facility's physical security hardware addressed in Subsection 14.3.2.12.
COL 14.3(4)	The COL applicant is to provide a DAC closure schedule for implementing the piping DAC.
COL 15.0(1)	The COL applicant is to perform the radiological consequence analysis using site-specific χ/Q values, unless the χ/Q values used in the DCD envelop the site-specific short-term or long-term χ/Q values of the DCD, and to show that the resultant doses are within the guideline values of 10 CFR 50.34 for EAB and LPZ and that of 10 CFR Part 50, Appendix A, GDC 19 for the MCR and TSC.
COL 17.4(1)	The COL applicant is to develop and implement Phases 2 and 3 of the design RAP, including QA requirements. In Phase 2, the plant's site-specific information is to be subjected to the design RAP process, and the site-specific risk-significant SSCs are combined with the APR1400 design risk-significant SSCs into one list for the plant. Phase 2 is to be performed during the COL application phase and updated/maintained during the COL license holder phase. In Phase 3, procurement, fabrication, construction, and test specifications for the SSCs within the scope of the RAP provide reasonable assurance that key assumptions, such as equipment reliability, are realistic and achievable. The QA requirements are implemented during the procurement, fabrication, construction, and pre-operational testing of the SSCs within the scope of the RAP. Phase 3 is to be performed during the COL license holder phase and prior to initial fuel loading. The COL applicant is to propose a method for incorporating the objectives of the reliability assurance program into other programs for design or operational errors that degrade non-safety-related, risk-significant SSCs.

The emergency response facilities include the technical support center (TSC), the operational support center (OSC), and the emergency operations facility (EOF) in accordance with 10 CFR 50.34(f)(2)(xxv) (Reference 57). The COL applicant is to address the emergency response facilities (COL 13.1(1)).

c. 10 CFR 50.47(a)(8), Equipment and Facilities to Support Emergency Response

Adequate emergency facilities and equipment to support the response are provided and maintained in accordance with 10 CFR 50.47(b)(8) (Reference 58). The COL applicant is to provide details of emergency response facilities and associated communication capabilities (COL 9.5(6)).

d. 10 CFR Part 50 Appendix A – General Design Criteria

GDC 1, 2, 3, and 4 apply to structures, systems, and components important to safety. The communication systems are classified as non-Class 1E systems, and therefore serve no safety-related functions. GDC 19 requires equipment at appropriate locations outside the MCR to be provided for prompt hot shutdown of the reactor with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures. While there is communication equipment located in the remote shutdown room, the communication equipment is not required to function for hot or cold shutdown of the reactor.

However, communication systems are selected and designed in accordance with the guidance provided in 10 CFR Part 50 Appendix A, GDC 1, GDC 2, GDC 3, GDC 4, and GDC 19 (Reference 38) to provide reasonable assurance that the facility can operate without undue risk to the health and safety of the public.

e. 10 CFR 73.55(j), Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage – Communications Requirements.

provided

Security communication measures are ~~included as part of the site's communication systems~~ as required by 10 CFR 73.55(j) to support the following functions:

5) Telephone system

6) Plant time synchronizing system

7) LAN and VPN systems

8) Wireless communication system

b. Offsite communication systems

1) Commercial telephone

2) Local law enforcement communications

3) Emergency telephone system

4) Satellite telephone system

Add

c. Security communication systems
1) Security telephone system
2) Security wireless communication system

The design and selection of the communication systems consider environment conditions including weather, moisture, noise levels, and electromagnetic/radio frequency interface that might interfere with effective communication for vital areas.

9.5.2.2.1 Plant Communication Systems

9.5.2.2.1.1 Paging Phone System

The paging phone system consists of handset stations and loud speaker assemblies located throughout the plant. The handset station has its own amplifier and volume control. Each station has one channel paging capability and multiple parties for simultaneous bidirectional voice communications between two or more areas.

Paging phones are located at operator stations, near major equipment, and near stairways. Page and party lines are available for communication between the remote shutdown console room, MCR, and other areas that require operator action during emergency shutdown operations.

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9.5.2.2.1.5 Telephone System

This system consists of desk-type telephones and signal addition units located throughout the plant and plant site. This system is available for allowing interplant communications during normal, abnormal, and accident conditions. This system is a backup to the paging phone system.

a. Private automatic branch telephone exchange

operational support center (OSC)

The plant private automatic branch telephone exchange (PABX) is connected to the offsite commercial telephone system and allows for normal and emergency communications. Emergency communication lines are connected directly to specific telephones located in critical areas of the plant, such as MCR, technical support center (TSC), ~~and security alarm stations~~. The PABX is interfaced to the plant wireless communication system, thereby allowing personnel with plant radios to originate telephone communications if necessary.

b. Internal telephone

The internal telephone system functions as a backup system for the paging phone system providing simultaneous bidirectional communications between various plant areas. Signaling is accomplished by speakers located near each station that emit an audible frequency. A speaker and lamp are provided in high noise areas to alert the operator being called. Acoustic booths are also provided in these areas. The internal telephone locations include operator stations, major control panels, and operator's offices. The main distribution frame of the telephone system consists of several distribution sections. The incoming lines of one division are collected together in the same section.

c. External telephone

The external telephone systems provide a convenient means of communication between major buildings and offsite. Switching and distribution equipment for the external telephone system is compatible with the other neighbor unit.

d. PABX power source

The PABX is powered from the plant non-safety-related load group and consists of independent battery chargers and batteries for each PABX node. The batteries have the capability to operate the plant telephone system for approximately 16 hours following loss of normal alternating current (ac) power.

9.5.2.2.1.6 Plant Time Synchronizing System

The plant time synchronizing system consists of a master clock and subsidiary clocks. The master clock is located in the communication equipment room and subsidiary clocks are located throughout the plant. The master clock provides standard time synchronizing signals to necessary plant equipment.

9.5.2.2.1.7 Local Area Network System and Virtual Private Network

The local area network (LAN) system is a computer network that spans a relatively small area. The LAN consists of routers, backbone switches, workgroup switches, servers, clients, network interface cards, and fiber-optic/twisted pair cables. The plant LAN links up plant terminals with construction and the head office host computers. LAN system is located in the MCR, TSC, OSC, etc. The virtual private network (VPN) system is a private network across public networks like the Internet. It enables a server computer to send and receive data across shared or public networks as if they were an integral part of the private network with all the functionality, security, and management policies of the private network. This is done by establishing a virtual point-to-point connection through the use of dedicated connections, encryption, or a combination of the two. The VPN system provides plant with the capability of communicating to other units and the head office. Plant VPN links the plant computer terminals with the head office host computers. The COL applicant is to provide LAN and VPN system (COL 9.5(8)).

9.5.2.2.1.8 Wireless Communication System

The wireless communication system is designed to provide a stand-alone method of plant-wide communication between designated personnel equipped with, or having access to wireless two-way radios. This subsystem is the primary source of communications for emergency personnel such as ~~security and~~ fire brigade. The wireless communication system is comprised of transmitters, receivers, antennas, amplifiers, and radio base station

equipment. Antennas and amplifiers are distributed throughout the plant to enable seamless radio coverage. Repeaters are used to allow seamless radio coverage throughout the plant. Antennas and cables interconnecting the repeaters to the base station equipment are located in a manner to facilitate improved radio signal penetration into areas that are not properly served by the primary antenna. Radio coverage is provided throughout the plant, although radio usage in certain instrumentation and control (I&C) areas is restricted due to potential EMI and RFI considerations. These areas have posted warning signs. The wireless communication system is designed, installed, and tested so that I&C system circuits are not adversely impacted by EMI and RFI from transmitting sources.

The transmitters, receivers, antennas, amplifiers, and radio base station equipment are robust, highly reliable, and capable of withstanding the harsh environment of the facility. Physical separation of the cabinets increases protection against a single accident or fire from affecting multiple modes of communication throughout the plant.

Communication equipment used for fire protection activities are protected from exposure to fire damage in accordance with NRC RG 1.189 (Reference 20). The fire brigade radio communication system is in accordance with NRC RG 1.189 (Reference 20). The fire brigade radio system consists of a base unit, mobile units, and portable units in the site specific. The COL applicant is to provide the fire brigade radio system (COL 9.5(7)). ~~The security radio system consists of a base unit, mobile units, and portable units. The COL applicant is to provide the security radio system which consists of a base unit, mobile units, and portable units (COL 9.5(12)).~~

Wireless communications equipment used with respiratory protective equipment conforms with the requirements in NRC RG 8.15 (Reference 62) and the guidance provided in EPRI NP-6559 (Reference 61).

9.5.2.2.2 Offsite Communication System

9.5.2.2.2.1 Commercial Telephone

Plant-to-offsite communication during normal operation is through a commercial telephone system, with extensions installed at a limited number of locations throughout the plant. The system provides direct dialing to locations outside the plant and also between extensions within the plant.

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9.5.2.2.2.2 Local Law Enforcement Communications

Radio or microwave transmitted two-way voice communication, either directly or through an intermediary, between local law enforcement authorities and the site as required by 10 CFR 73.55 (j)(4)(i) is provided on a 'site specific' basis due to the unique nature of each local law enforcement agency.

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

9.5.2.2.2.3 Emergency Telephone System

The emergency communication system uses two-way (incoming and outgoing) emergency communications from onsite to offsite facilities and agencies, a minimum of two independent communications links are provided. The onsite facilities provided with the emergency communications links are the main control room (MCR), remote shutdown room (RSR), technical support center (TSC), ~~operations~~ support center (OSC)~~, and the security alarm stations~~. The offsite facilities include the emergency operations facility (EOF), NRC resident office, and federal, state and local government agencies (including local law enforcement) as identified in the emergency response plan. The two independent communications links are as follows:

Add and operational

a. Dedicated hotline telephones that provide direct communications to the selected locations in an off-hook condition. The provisions for hotline telephones are incorporated into the design of the onsite digital telephone subsystem.

b. Provisions for two-way radio communications via the portable wireless communication subsystem for personnel with access to specific wireless radios onsite and for the offsite personnel.

The COL applicant is to provide the emergency offsite communication system including dedicated hotline, local law enforcement radio equipment, and wireless communication system (COL 9.5(9)).

9.5.2.2.2.4 Satellite Telephone System

A satellite telephone system is connected to the plant telephone system to fulfill the needs after a beyond design basis external event. This system is tied directly into the plant telephone exchange (PBX) as an alternate source of outside telephone lines for the plant.

This system provides an automatic alternate communication path for outside connections to the public switched telephone network. The satellite telephone equipment includes a roof mounted antenna and transceiver.

Add

9.5.2.2.3 Security Communication System

9.5.2.2.3.1 Security Telephone System

The security telephone system provides conventional telephone service between central alarm station and secondary alarm station and also has continuous telephone service with the main control room and local law enforcement authorities to provide assurance of effective command and control during both normal and emergency situations.

9.5.2.2.3.2 Security Wireless Communication System

The security wireless communication system consists of a base unit, mobile units, and portable units. This system is provided to enable continuous communication among all on-duty security force personnel and individuals in each alarm stations. The security wireless communication system is used as the primary source of communications for security force personnel.
The COL applicant is to provide the security radio system which consists of a base unit, mobile units, and portable units (COL 9.5(12)).

9.5.2.2.3.3 Power Supply

Security communication devices in the central and secondary alarm stations are powered from independent power source in the event of loss of normal power.

9.5.2.3 Safety Evaluation

The communication system
design basis accident. Th
support effective operation
abnormal or emergency eve
complete loss of on-site and

9.5.2.4 Inspection and Te

The communication syst
Preoperational testing is d
systems by standby power a
will test communications
center, and radiological fiel
(Reference 58).

9.5.2.5 Instrumentation

No special instrumentation is required for the communication systems.

9.5.3 Lighting Systems

The lighting systems provide for adequate lighting during normal, transients, fires, accidents, and the loss of all ac power. The lighting systems are composed of normal,

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COL 14.2(8) The COL applicant that references the APR1400 design certification is to identify the specific operator training to be conducted as part of the low-power testing program related to the resolution of TMI Action Plan Item I.G.1, as described in (1) NUREG-0660 – NRC Action Plans Developed as a Result of the TMI-2 Accident, Revision 1, August 1980 and (2) NUREG-0737 – Clarification of TMI Action Plan Requirements.

COL 14.2(9) The COL applicant is to prepare the preoperational test of cooling tower and associated auxiliaries, and raw water and service water cooling systems.

COL 14.2(10) The COL applicant is to develop the test program of personnel monitors and radiation survey instruments.

procedures for

COL 14.2(11) The COL applicant is to develop the test ~~procedure of~~ the communication ~~system~~.

14.2.14 References

systems described in Subsection 9.5.2.

1. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," U.S. Nuclear Regulatory Commission.

2. Regulatory Guide 1.28, "Quality Assurance Program Requirements (Design and Construction)," Rev. 4, U.S. Nuclear Regulatory Commission, June 2010.

3. Regulatory Guide 1.68, "Initial Test Programs for Water-Cooled Nuclear Power Plants," Rev. 4, U.S. Nuclear Regulatory Commission, June 2013.

4. Regulatory Guide 1.68.2, "Initial Startup Test Program to Demonstrate Remote Shutdown Capability for Water-Cooled Nuclear Power Plants, U.S. Nuclear Regulatory Commission, April 2010.

5. Regulatory Guide 1.68.3, "Preoperational Testing of Instrument and Control Air Systems," U.S. Nuclear Regulatory Commission, September 2012.

6. Regulatory Guide 1.79, "Preoperational Testing of Emergency Core Cooling Systems for Pressurized Water Reactors, U.S. Nuclear Regulatory Commission, October 2013.

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Table 14.2-7 (11 of 18)

RG 1.68 APP. A	Subsection #	Individual Test
1.o.3	14.2.12.1.74 14.2.12.1.76	Chilled water system test Component cooling water system test
1.o.4	14.2.12.1.13	Reactor makeup subsystem test
1.o.5	14.2.12.1.52 14.2.12.1.83	Pre-core reactor coolant and secondary water chemistry data Process sampling system test
1.o.6	14.2.12.1.7 14.2.12.1.66	Chemical and volume control system charging subsystem test Steam generator blowdown system test
1.o.7	14.2.12.1.85	Fire protection system test
1.o.8	14.2.12.1.7	Chemical and volume control system charging subsystem test
1.o.9	14.2.12.1.10 14.2.12.1.103	Equipment drain tank subsystem test Liquid waste management system test
1.o.10	14.2.12.1.5	Chemical and volume control system letdown subsystem test
1.o.11	14.2.12.1.82	Compressed air system test
1.o.12	14.2.12.1.15	Boric acid concentrator subsystem test
1.o.13	-	Exception The COL applicant is to develop the test ~~procedure~~ procedures under the communication system description defined in Section 9.5.2.
1.o.14.a	14.2.12.1.132	Auxiliary building controlled area HVAC system test
1.o.14 .b	14.2.12.1.93 14.2.12.1.94	Reactor containment building HVAC system test Reactor containment purge HVAC system test
1.o.14 .c	14.2.12.1.131	Electrical and I&C equipment room area HVAC systems test
1.o.14 .d	14.2.12.1.97	Emergency diesel generator area HVAC system test
1.o.14 .e	14.2.12.1.93 14.2.12.1.94 14.2.12.1.96 14.2.12.1.99 14.2.12.1.133	Reactor containment building HVAC system test Reactor containment purge HVAC system test Turbine generator building HVAC system test Compound building HVAC system test Auxiliary building clean area HVAC system test
1.o.14 .f	14.2.12.1.95 14.2.12.1.100	Control room area HVAC system test Balance of control room area HVAC system test
1.o.14 .g		Exception The COL applicant is to prepare the pre-operational test of ultimate heat sink pump house