ArevaEPRDCPEm Resource

From: WELLS Russell D (AREVA NP INC) [Russell.Wells@areva.com]
Sent: Friday, January 30, 2009 5:12 PM
To: Getachew Tesfaye
Cc: Pederson Ronda M (AREVA NP INC); BENNETT Kathy A (OFR) (AREVA NP INC); DELANO Karen V (AREVA NP INC); SLIVA Dana (EXT)
Subject: Response to U.S. EPR Design Certification Application RAI No. 151, FSAR Ch 9
Attachments: RAI 151 Response US EPR DC.pdf

Getachew,

Attached please find AREVA NP Inc.'s response to the subject request for additional information (RAI). The attached file, "RAI 151 Response US EPR DC.pdf" provides technically correct and complete responses to 11 of 12 questions. Since the response file contains security-related sensitive information that should be withheld from public disclosure in accordance with 10 CFR 2.390, a public version is provided with the security-related sensitive information redacted. This email does not contain any security-related information. The unredacted SUNSI version is provided under separate email.

Appended to this file are affected pages of the U.S. EPR Final Safety Analysis Report in redline-strikeout format which support the response to RAI 151 Questions 09.05.01-54, 09.05.01-54, 09.05.01-56, 09.05.01-57, 09.05.01-59, 09.05.01-61, 09.05.01-62, 09.05.01-64, and 09.05.01-65.

The following table indicates the respective pages in the response document "RAI 151 Response US EPR DC.pdf" that contain AREVA NP's response to the subject questions.

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The schedule for technically correct and complete responses to the remaining question in RAI No. 151 is provided below:

Question #	Response Date
RAI 151 — 09.05.01-60	March 27, 2009

Sincerely,

(Russ Wells on behalf of)

Ronda Pederson
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New Plants Deployment
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From: Getachew Tesfaye [mailto:Getachew.Tesfaye@nrc.gov]
Sent: Wednesday, December 17, 2008 8:08 PM
To: ZZ-DL-A-USEPR-DL
Cc: Edward McCann; Robert Radlinski; Peter Hearn; Joseph Colaccino; John Rycyna; ArevaEPRDCPEm Resource
Subject: U.S. EPR Design Certification Application RAI No. 151 (1689), FSARCh. 9

Attached please find the subject requests for additional information (RAI). A draft of the RAI was provided to you on December 5, 2008. Since you are unable to support a telecon within a reasonable period of time, the RAI is issued as final without any change. The schedule we have established for review of your application assumes technically correct and complete responses within 30 days of receipt of RAIs, excluding the time period of **December 20, 2008 thru January 1, 2009, to account for the holiday season** as discussed with AREVA NP Inc. For any RAIs that cannot be answered **within 45 days**, it is expected that a date for receipt of this information will be provided to the staff within the 45-day period so that the staff can assess how this information will impact the published schedule.

Thanks,
Getachew Tesfaye
Sr. Project Manager
NRO/DNRL/NARP
(301) 415-3361

Hearing Identifier: AREVA_EPR_DC_RAIs
Email Number: 186

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Response to

Request for Additional Information No.151, Revision 0

12/17/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 09.05.01 - Fire Protection Program
Application Section: 9.5.1

QUESTIONS for Fire Protection Team (SFPT)

Question 09.05.01-54:

RG 1.189 Regulatory Position 6.2.6 states that "Cooling towers should be constructed of noncombustible construction or be located and protected in such a way that a fire will not adversely affect any systems or equipment important to safety. Cooling towers should be of noncombustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply." The FSAR does not address RG 1.189 guidance for cooling towers. Address in FSAR Section 9.5.1 the fire protection design criteria for the Essential Service Water Cooling Tower Structure and for the Circulating Water System Cooling Tower Structure.

Response to Question 09.05.01-54:

The Essential Service Water Cooling Tower Structure is noncombustible and within the scope of the U.S EPR FSAR. The Circulating Water System Cooling Tower Structure is a site-specific structure and is addressed by an existing COL item. Item No. 9.5-14 in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items states:

> "A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers."

To provide further clarification, the following paragraph will be included in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 under "Architectural and Structural Features":

> "The cooling towers comply with Regulatory Guide 1.189, Regulatory Position C.6.2.6. The Essential Service Water Cooling Tower Structure is of noncombustible construction. The Circulating Water System Cooling Tower Structure is either of noncombustible construction or is located and protected in such a way that a fire will not adversely affect any systems or equipment important to safety. A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers."

RG Section C.6.2.6 in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189 will be revised as follows:

Change Compliance Column to:

> "Compliance for the Essential Service Water System Cooling Tower Structure. COL Applicant for the Circulating Water System Cooling Tower Structure."

Change U.S. EPR Comment Column to:

> "Note 3 for the Circulating Water System Cooling Tower Structure."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 and Table 9.5.1-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-55:

FSAR Table 9A-2 appears to have incorrect figure references for columns 85 through 99. Review FSAR Table 9A-2 to determine if the Figures referenced are correct and update as necessary.

Response to Question 09.05.01-55:

U.S. EPR FSAR Tier 2, Table 9A-2—Fire Area Parameters will be revised so that the correct figure references are identified in each column.

U.S. EPR FSAR Tier 2, Figure 9A-38—Fire Zone Layouts-Safeguard Building (UJH and UJK): 4, Section A-A will be revised so that fire area FA-3UJH-10 is identified and associated changes are incorporated.

FSAR Impact:

U.S. EPR FSAR Tier 2, Table 9A-2 and Figure 9A-38, will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-56:

Response to RAI No. 25, Revision 0 for Question 09.05.01-45 stated that "The Fire Protection Analysis (FPA) will assess postulated fires on a scenario-by- scenario basis. Where quantitative and computational methods are employed, recognized fire protection engineering practices, methods and analytical tools, such as those promulgated by NUREG-1805 and NUREG- 1824, will be utilized and appropriately applied." Describe in the FSAR the specific recognized fire protection practices and criteria for providing detection and suppression that are to be employed when using analytical tools.

Response to Question 09.05.01-56:

The response provided to RAI No. 25 Question 09.05.01-45 states in part "For determination of fire detection and suppression system requirements, compliance with regulatory requirements and guidance take precedence." This statement conveys that where an NRC position states that fire detection system and/or fire suppression system capability should be provided for specific plant areas, the NRC position will prevail over considerations such as the magnitude of the hazards in the area, plant damage, business interruption concerns, etc. Risk-informed, performance-based methods, or other quantitative/computational methods or tools are not utilized to determine where fire detection and suppression systems will or will not be installed. However, where fire detection and suppression systems are provided in accordance with regulatory guidance, recognized fire protection engineering practices, methods and analytical tools, such as those promulgated by NUREG-1805 and NUREG-1824 may be used to assess the performance capability of such systems.

For example, for diesel fuel oil storage areas, RG 1.189 Regulatory Position 7.4 states "An automatic fire suppression system should protect aboveground oil storage, including those tanks located in a separate building." On this basis, the U. S. EPR design provides for automatic fixed water spray system coverage of the diesel fuel oil storage tanks. Pertaining to the *recognized fire protection engineering practices, methods, and analytical tools* , the methodology outlined by Chapter 12, "Estimating Heat Detector Response Time" of NUREG-1805 could be utilized to estimate the heat detector response time for these systems based on the fire scenarios postulated by the FPA. However, for this methodology, NUREG-1805, Chapter 12 (alone) cites four main references, and six additional sources for the technical approach used. It was expected that reference to NUREG-1805 and NUREG-1824 as examples of recognized fire protection engineering practice sources would be sufficient without describing further reference and information sources. Therefore, reference to NUREG-1805 and NUREG-1824 in the response to RAI No. 25 Question 09.05.01-45 was only intended to exemplify general sources for analytical tools that could be employed for fire detection and suppression system design applications. Finally, while reference to the *SFPE Handbook of Fire Protection Engineering* could also be cited for recognized practices, it would be preclusive for the U.S. EPR FSAR to describe all technical methods included in the SFPE Handbook.

To provide additional clarification, the following statement will be included at the end of Specific Element 8 in U.S. EPR FSAR Tier 2, Section 9A.2.2:

> "Risk-informed, performance-based methods, or other quantitative/computational methods or tools are not utilized to determine where fire detection and suppression systems will or will not be installed. However, where fire detection and suppression systems are provided in accordance with regulatory guidance, recognized fire protection

engineering practices, methods and analytical tools, such as those promulgated by NUREG-1805 and NUREG-1824 may be used to assess the performance capability of such systems."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9A.2.2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-57:

Response to RAI No. 25, Revision 0 for Question 09.05.01-47 stated that "Outside oil-filled transformers are separated from plant buildings and from each other in accordance with the guidance in NFPA 804 by either distance or two-hour rated fire barriers. Where the distance from transformer to plant building is less than fifty feet, or distance between transformers is less than thirty feet, fire barriers are provided for separation." RG 1.189 Regulatory Position 7.3 states that "Such transformers should be located at least 15.2 m (50 ft) distant from the building, or building walls within 15.2 m (50 ft) of oil-filled transformers should be without openings and have a fire-resistance rating of at least 3 hours." Provide in the EPR design 3 hour rated walls adjacent to outdoor oil–filled transformers that are within 50 ft of building walls or justify the above 2 hour rated fire barriers are acceptable.

Response to Question 09.05.01-57:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.1 "Combustible Control Practices," will be revised to address R.G 1.189, Regulatory Position 7.3 by including the following text:

> "Outside oil-filled transformers are separated from plant buildings by either distance or fire barriers. Where the distance from transformer to plant building is less than 50 feet, three-hour, fire rated barriers without openings are provided for separation."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-58:

Response to RAI No.20 for Question 09.05.01-5 stated that "For digital equipment, Regulatory Guide 1.209, "Guidelines for Environmental Qualification of Safety-Related Computer-Based Instrumentation and Control Systems in Nuclear Power Plants," March 2007, states the following:

"The most effective approach for addressing smoke susceptibility is to minimize the likelihood of smoke exposure by rigorously adhering to the fire protection requirements in 10 CFR 50.48, "Fire Protection," or other individual plant license commitments.

Consistent with this approach, the U.S. EPR computer-based digital control system is channelized with each division housed in a separate Safeguard Building fire area of the plant. In each Safeguard Building, the equipment for each division is located in a benign environment in that the rooms are environmentally controlled and no significant hazards or ignition sources exist. The equipment is considered low voltage. In addition, each area is equipped with early warning detection to recognize a potential fire in its incipient stages, thus allowing the fire brigade to be summoned to extinguish the fire prior to significant development. Consequently, in the unlikely event that a fire occurs any equipment damage in these areas is expected to be minimal and smoke generation negligible."

This approach concentrates on the unlikely event of fire and smoke generation due to fire prevention and detection considerations given above which do mitigate the consequence of a fire in the area where the equipment is located. Discuss in FSAR Section 9.5.1 digital system attributes that would reduce the possibility of spurious actuations such as fiber optic cables, 16 bit digital signals, workstation disable switches, signal recognition outside of Control Room before action is taken, and verification of actions from Control Rooms before actions are taken such that effects of fire and smoke on digital equipment could be precluded.

Response to Question 09.05.01-58:

In addition to the information previously provided in the response to RAI 20, Question 09.05.01-5, U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 states that the U.S. EPR plant digital control system design makes extensive use of fiber optic cable. Inherent design features of fiber optic wiring are credited to eliminate fire-induced spurious actuations as a concern for the U.S. EPR.

With regard to smoke intrusion into digital equipment, the response to RAI 20, Question 09.05.01-5 identifies that the equipment has not been subjected to testing or analysis regarding smoke/product of combustion-induced spurious signal development. Therefore, it is not possible to unequivocally state that the effects of fire and smoke can be precluded merely by the equipment design. As no credit is taken for digital equipment design features to preclude fire-induced spurious actuations, this is not discussed in U.S. EPR FSAR Tier 2, Section 9.5.1.

As noted in the response to RAI 20, Question 09.05.01-5, digital equipment is among the population of those components subject to spurious actuation review per the requirements of Regulatory Guide 1.189. This includes any digital equipment not subjected to a failure modes and effects analysis (FMEA) that considers spurious signal generation. The response to RAI 20, Question 09.05.01-5 identifies that FMEAs are documented in U.S. EPR FSAR Tier 2, Table 7.2-2—FMEA Summary for Reactor Trip and Table 7.3-2—FMEA Summary for ESF Actuations. Additional FMEAs are contained in U.S. EPR FSAR Tier 2, Table 7.3-3—FMEA Summary for

EDG Actuation and Table 7.3-4—FMEA Summary for RCP Trip. Included in the scope of the FMEAs are undetectable failures that lead to spurious actuations.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 09.05.01-59:

Response to RAI No. 20 for Question 09.05.01-19 stated that “The last sentence in U.S. EPR FSAR Tier 2 ,Section 9.5.1.6 will be changed to: “Implementation of the site-specific fire protection program (FPP) described in part herein will be in accordance with Regulatory Guide 1.189, Regulatory Position 1.1 and is the responsibility of the COL applicant (refer to Section 13.4).” Refer in FSAR Section 9.5.1.6 to all of RG 1.189 Regulatory Position 1, not just subsection 1.1.

Response to Question 09.05.01-59:

The last sentence in U.S. EPR FSAR Tier 2, Section 9.5.1.6 will be changed to refer to “Regulatory Position 1” instead of “Regulatory Position 1.1”.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.6 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-60:

Response to RAI No. 20 for Question 09.05.01-28 stated that "The reactor coolant pump (RCP) oil collection system was evaluated for inclusion into U.S. EPR FSAR Tier 1 during the development of U.S. EPR FSAR Tier 2, Section 14.3, Tables 14.3-1 through 14.3-7; the level of hazard associated with this system was not considered significant enough for inclusion into Tier 1. Also, the RCP oil collection system is located within the Reactor Containment Building (RCB). As discussed above, divisional separation is safety significant for the U.S. EPR and a fire mitigation feature within the RCB does not need an ITAAC item. Therefore, ITAAC for the RCP oil collection system have not been included in Tier 1." The significance of the fire hazard associated with the RCP lubricating oil system for the current fleet of nuclear plants based on operating experience is such that the oil collection system is a regulatory requirement of 10 CFR Part 50 Appendix R. While Appendix R is not applicable to the EPR design, unless it can be demonstrated that the EPR RCP lube oil systems do not pose a significant fire hazard, include an ITAAC for the RCP oil collection system in the FSAR. Additionally, demonstrate that the RCP oil collection system only affects one division and is not safety significant since all divisions are in containment.

Response to Question 09.05.01-60:

A response to this question will be provided by March 27, 2009.

Question 09.05.01-61:

Response to RAI No. 20 for Question 09.05.01-35 stated that "A new Section 9.5.1.2.2 will be added to the U.S. EPR FSAR Tier 2, which addresses the alternate compliance entries identified in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189". Confirm in the new FSAR Section 9.5.1.2.2 description for electrical cabinets that plant computer rooms have manually actuated suppression systems and that combustibles and ignition sources in rooms adjacent to the control room will be controlled by administrative procedures as per AREVA's response to question 09.05.01-11. State in the new FSAR Section 9.5.1.2.2 description for the cable spreading room that the sub-floor areas have manually actuated clean agent suppression systems. State in the new FSAR Section 9.5.1.2.2 description for switchgear rooms that these areas have manually actuated suppression systems.

Response to Question 09.05.01-61:

As stated in the response to RAI 20, Question 09.05.01-35, the computer rooms comply with RG Section C.6.1.4.

The following information will be added to U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 under "Plant Arrangement":

> "The computer rooms outside the MCR in SB 2 and SB 3 contain non-safety-related computers. These computer rooms are separated from each other and other areas of the plant by three-hour fire rated barriers. The interfaces for the digital control system for each of the four safety divisions are located in the instrumentation and control cabinet rooms in their respective SBs. The instrumentation and control rooms are separated from each other by three-hour fire rated barriers. Automatic fire detection and manual fire protection by standpipe and hose and portable extinguishers are provided for each computer room and instrumentation and control cabinet rooms. The smoke confinement system (SCS) Nuclear Island (NI) provides smoke removal for the computer rooms and the instrumentation and control cabinet rooms."

There is no sub-floor in the cable spreading room. There is a sub-floor in the MCR and it has a manually actuated gaseous fire suppression system.

To support the lack of suppression in MCR complex peripheral rooms and the suppression in the MCR sub-floor being manually actuated, the following information will be added to U.S. EPR FSAR Tier 2, Section 9.5.1.2.2 under "Fire Areas":

> "Control Room Complex
>
> Generally, the control room complex complies with RG 1.189, Regulatory Positions 6.1.2 and 6.1.2.1. Alternative compliance is provided because of:
>
> 1) The lack of automatic water suppression for the peripheral rooms in the control room complex and,
> 2) The gaseous fire suppression system being manually actuated via a local hand switch actuation by MCR operators, in lieu of automatic activation of the fire

detection system for the sub-floor in the MCR. This is to preclude concerns regarding inadvertent activation of this fire extinguishing system.

The lack of automatic water suppression systems for the peripheral rooms in the control room complex is acceptable due to the control room complex being constantly manned and area wide automatic smoke detection being provided throughout, including within cabinets and consoles. Manual fire suppression is provided by standpipe and hose and portable extinguishers. Combustible materials and ignition sources are controlled and limited in the MCR complex by administrative procedures to those required for operation.

Having the suppression system for the MCR sub-floor being manually actuated instead of automatically actuated is acceptable based on the MCR being manned at all times the plant is operating, and the relatively small volume of the sub-floor area, which provides reasonable assurance so that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel."

To provide further clarification, the following phrase will be added to U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 under "Automatic Fire Suppression Systems":

"…and the sub-floor area having a relatively small volume so that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel,"

In the response to RAI 20, Question 09.05.01-35, alternate compliance justification is provided for lack of fixed fire suppression systems for the switchgear rooms. Justification is provided in U.S. EPR FSAR Tier 2, Section 9.5.1.2.2 for the acceptability of not providing fixed suppression in these areas.

To reflect the above information, RG Sections C.6.1.2 and C.6.1.2.1 in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189, will be revised as follows:

Change U.S. EPR Comment Column to:

"Refer to Section 9.5.1.2.2 for justification."

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 9.5.1.2.1 and 9.5.1.2.2 and Table 9.5.1-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-62:

The response to RAI No. 20 Supplement 2 for Question 09.05.01-8 provided additional description of plant features to mitigate smoke, hot gases, and fire suppressant migration. This response stated that FSAR Tables 2.1.1-7, 2.1.2-1, and 2.1.2-2 ITAACs will be revised to confirm that barriers that separate redundant divisions are capable of limiting smoke migration to the extent that safe shutdown is not adversely affected as required by SECY-93-087 and SECY 90-016 instead of adding a COL information item to establish provisions for manual smoke control by manual actions of the fire brigade for all plant areas. This response stated that the FSAR allows the use of portable exhaust fan systems and that the fire protection engineer has the responsibility of pre-fire planning which addresses smoke control/removal on a fire area by fire area basis. The staff finds the approach in the above response acceptable with additional FSAR changes stated below. Include the first four paragraphs of the response in the applicable sections of FSAR Section 9.5.1 and document the design. Ensure that all the references given in this response are in the applicable text sections of FSAR Section 9.5.1 and are included in Section 9.5.1.7, References.

Response to Question 09.05.01-62:

The following information will be added to U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 after the "Ventilation System Design Considerations" section and before the "Fire Detection and Alarm System" section:

"**Control of Smoke, Hot Gases, and Fire Suppressant**

RG 1.189, Section 8.2 stipulates that new reactor designs should ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe-shutdown capabilities, including operator actions. To confirm that these objectives are satisfied for the U.S. EPR, a smoke effects analysis is performed. The analysis considers the location of redundant safe shutdown (SSD) equipment and components, the proximity of fire area boundaries, ventilation system operation, potential effluent types and quantities resulting from a fire, potential effluent migration paths, and the sensitivity of redundant SSD equipment and components to potential effluents.

For most areas of the plant, standard fire barriers and associated components (e.g., fire doors, fire dampers and penetration seals) provide the primary means to prevent migration of smoke, hot gas and fire suppressant between fire areas. Fire doors and fire dampers are in accordance with NPFA 80 (Reference 14). Penetration seals in fire barriers are qualified for an F-rating equivalent to the hourly fire rating of the associated barrier. Penetration seal F-ratings will be determined by testing in accordance with the requirements of ASTM E814 (Reference 31), UL 1479 (Reference 36) or IEEE Std. 634 (Reference 33).

Where more robust fire barriers are deemed necessary to achieve these objectives, enhanced fire barrier features are used, as necessary, to control smoke, hot gas and fire suppressant migration. Enhanced fire barrier features may include smoke doors and smoke dampers to limit smoke propagation. Smoke doors are in accordance with NFPA 105 (Reference 43). Ventilation penetrations in enhanced fire barriers are protected by combination fire and smoke rated dampers, or by fire rated dampers and separate

smoke control dampers. Smoke dampers and combination fire/smoke dampers are in accordance with NFPA 80 (Reference 14). Smoke dampers and combination fire/smoke dampers in enhanced fire barriers that are relied upon to control effluent migration will either close on smoke detection or will be closed via operator actions from the Control Room in response to an alarm from the fire detection system.

In the event of a Control Room evacuation, passage from the Control Room to the Remote Shutdown Panel is via the stairwells and the interconnecting passageway, which are protected by the smoke confinement system (SCS). The SCS access and egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire."

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 9.5.1.2.1 and 9.5.1.7 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-63:

Response to RAI No. 20 for Question 09.05.01-14 provided a communication summary in FSAR Section 9.5.1.2.1 and modified FSAR Section 9.5.2.2.1 for portable wireless communication system repeaters, antennas, and interconnecting cables usage. The staff finds the approach in the above response acceptable with additional FSAR changes stated below. FSAR Table 2.4.21-2 ITAAC for communication includes the digital telephone system, the public address and alarm system, and the sound powered system. Include the Portable Wireless Communication System in Table 2.4.21-2. FSAR Table 2.4.21-1, Communication Equipment Locations, does not include SBO Operating Areas which are required for special emergency lighting. Include SBO Operation Areas in Table 2.4.21-1.

Response to Question 09.05.01-63:

U.S. EPR FSAR Tier 1 provides ITAAC to verify the safety significant design features are present in the as-built design. U.S. EPR FSAR Tier 2, Table 14.3-3—Fire Protection (Safety-Significant Features), contains the list of safety-significant features for fire protection. No safety-significant features are identified for the portable wireless communication system. Therefore, ITAAC are not included in U.S. EPR FSAR Tier 1, Table 2.4.21-2—Communication System ITAAC.

The question assumes a correlation between special emergency lighting and communication equipment. AREVA NP does not understand the correlation between communication equipment locations and special emergency lighting; therefore, no changes will be made to Table 2.4.21-1—Communication Equipment Locations.

FSAR Impact:

The U.S. EPR FSAR will not be changed as a result of this question.

Question 09.05.01-64:

RG 1.189 Regulatory Position 6.1.2 states that "Peripheral rooms in the control room complex should have automatic water suppression and should be separated from the control room by noncombustible construction with a fire-resistance rating of 1 hour." Section 9.5.1.2.1 does not address the above peripheral room separation from the main control room and Table 9.5.1-1 does not take exception to this separation. However, as per Figure 9.A-23 the peripheral rooms in the control room complex are not separated from the main control room by noncombustible 1 hour fire rated barriers. Provide noncombustible 1 hour fire rated barriers between the peripheral rooms in the control room complex and the main control room.

Response to Question 09.05.01-64:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 and U.S. EPR FSAR Tier 2, Figure 9A-23—Fire Zone Layouts-Safeguard Buildings 2 and 3, +53 Feet will both be revised to comply with RG 1.189, Regulatory Position 6.1.2 for separation of peripheral rooms from the main control room (MCR) by noncombustible construction having a fire-resistance rating of one hour.

Specifically, one hour fire-rated barriers are provided to separate the MCR from the storage room and instrumentation and controls (I & C) service area on the west side and from the entrance hatch and viewing area on the east side. Openings in these barriers are furnished with approved protective opening devices as required (e.g., fire doors and penetration seals) meeting a fire rating of one hour. The shift office is an integral part of the operation of the main control room (MCR) and as such, is not considered a peripheral area.

The following information will be added to the first bullet in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, under "Electrical System Design and Electrical Separation":

> "Peripheral rooms are separated from the MCR including the shift office by noncombustible construction with a fire-resistance rating of one hour. All other openings/penetrations through the barriers afforded protective devices as required (fire doors, penetration seals) meet a fire rating of one hour."

U.S. EPR FSAR Tier 2, Figure 9A-23 will be revised to show one hour fire barriers between the MCR and the storage room and I & C service area on the west side and from the entrance hatch and viewing area on the east side.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 and Figure 9A-23 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-65:

RG 1.189 Regulatory Position 6.1.2 states that "Cables in under-floor and ceiling spaces should meet the separation criteria necessary for fire protection." RG 1.189 Regulatory Position 6.1.2.1 states that "Fully enclosed electrical raceways located in under-floor and ceiling spaces, if over 0.09 m2 (1 ft) in cross-sectional area, should have automatic fire suppression 2 inside. Area automatic fire suppression should be provided for under-floor and ceiling spaces if these spaces are used for cable runs, unless all cable is run in 10-centimeter (4-in.) or smaller steel conduit or the cables are in fully enclosed raceways internally protected by automatic fire suppression." Section 9.5.1.2.1 does not state if the sub-floor areas meets the separation criteria necessary for fire protection as per guidance given in RG 1.189 Regulatory Position 6.1.2. Section 9.5.1.2.1 states that the sub-floor areas which are part of the control room complex are protected with a manually-actuated clean agent fire extinguishing system. Section 9.5.1.2.1 states that having the above manually-actuated system is acceptable since the MCR is occupied at all times while the plant is operating which is not as per the guidance given in RG 1.189 Regulatory Position 6.1.2.1. Provide separation in the sub-floor areas that meets the criteria necessary for fire protection as per guidance given in RG 1.189 Regulatory Position 6.1.2. Provide for a automatic suppression system in the sub-floor areas that is in accordance with RG 1.189 Regulatory Position.

Response to Question 09.05.01-65:

Electrical cable separation in the sub-floor area of the main control room (MCR) meets the separation requirements in RG 1.189, Regulatory Position 4.1.3.4. As described in U.S. EPR FSAR Tier 2, Section 7.1.2.4.5, redundant divisions of Class 1E electrical cables, which may be required to mitigate the consequences of design basis accidents but are not relied upon to achieve post-fire safe shutdown, will meet the separation requirements in RG 1.75. This includes Class 1E electrical cables routed in the MCR sub-floor area.

To provide further clarification, the following statement will be included at the end of the second paragraph of the first bullet in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, under "Electrical System Design and Electrical Separation":

> "Cable separation in the MCR sub-floor area meets the separation requirements in RG 1.75. Refer to U.S. EPR FSAR Tier 2, Section 7.1.2.4.5."

Additionally, Class 1E electrical cables located in the MCR sub-floor area will not be routed in fully enclosed electrical raceways which exceed 1 ft^2 in cross-sectional area. Fixed fire suppression capability in the form of a clean agent (gaseous) fire extinguishing system is provided for the MCR sub-floor area based on the considerations of R.G. 1.189, Regulatory Position 6.1.2.1. However, to preclude concerns regarding inadvertent activation of this fire extinguishing system, clean agent gas release will be via local hand switch actuation by MCR operators, in lieu of automatic release by activation of the fire detection system. The basis for manual actuation of the fire extinguishing system is the MCR being manned at all times while the plant is operating and the sub-floor area having a relatively small volume so that the quantity and location of ionization type fire detectors installed in the sub-floor area will provide early warning for a timely response by MCR personnel. Refer to the response to RAI 151, Question 09.05.01-61.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR Final Safety Analysis Report Markups

A COL applicant that references the U.S. EPR design certification will provide a description and simplified Fire Protection System piping and instrumentation diagrams for site-specific systems.

Plant Fire Prevention and Control Features

Plant Arrangement

In accordance with GDC 3, SSC important to safety must be designed and located to minimize the probability and effect of fires and explosions. The requirements of GDC 3 are met, in part, by compartmentation of the plant into separate fire areas. Specifically, based on the hazards and the need for physical separation of SSC important to safety, the plant is segregated into separate fire areas by passive, fire-rated structural barriers (i.e., walls, floors, and ceilings). In some instances, such as the RB, fire areas may be sub-divided into fire zones based on physical separation, location of plant equipment, or for fire hazard analysis purposes. These fire areas and zones serve the primary purpose of confining the effects of fires to a single compartment or area, thereby minimizing the potential for adverse effects from fires on redundant SSC important to safety. Each of the four divisions of systems in the Safeguard Buildings (SB), Essential Service Water Buildings, and Emergency Power Generating Buildings (EPGB) are separated by three hour rated structural fire barriers. Outside of the MCR and the RB, each of the four redundant trains of emergency core cooling is separated by three hour rated structural fire barriers.

The plant layout also provides adequate means of access to all plant areas ~~is provided~~ for manual fire suppression activities and to allow safe access and egress for personnel. The layout and travel distances of access and egress routes meet the intent of NFPA 101 (Reference 18) to the extent practicable. Potential delays in plant access or egress due to security locking systems are considered.

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The MCR is designed to permit rapid detection and suppression of fires, including the sub-floor and ceiling spaces.

The computer rooms outside the MCR in SB 2 and SB 3 contain non-safety-related computers. These computer rooms are separated from each other and other areas of the plant by three-hour fire rated barriers. The interfaces for the digital control system for each of the four safety divisions are located in the instrumentation and control cabinet rooms in their respective SBs. The instrumentation and control rooms are separated from each other by three-hour fire rated barriers. Automatic fire detection and manual fire protection by standpipe and hose and portable extinguishers are provided for each computer room and instrumentation and control cabinet rooms. The smoke confinement system (SCS) Nuclear Island (NI) provides smoke removal for the computer rooms and the instrumentation and control cabinet rooms.

Architectural and Structural Features

Materials used in plant construction are non-combustible or heat resistant to the extent practicable in accordance with GDC 3. Walls, floors, roofs, including structural materials, suspended ceilings, thermal insulation, radiation shielding materials, soundproofing, and interior finishes are non-combustible or meet applicable qualification test acceptance criteria unless identified and suitably justified. ASTM E84 (Reference 29), NFPA 253 (Reference 22), and NFPA 703 (Reference 25) are considered when evaluating the qualification of interior surface and finish materials. Concealed spaces are devoid of combustibles unless identified and suitably justified.

Individual fire areas are separated by passive, fire-rated structural barriers (i.e., walls, floors and ceilings). Structural fire barriers are of non-combustible construction. Structural fire barriers are designed and installed to meet specific fire resistance ratings using assemblies qualified by fire tests. The qualification fire tests are conducted in accordance with, and meet the acceptance criteria of NFPA 251 (Reference 20) or ASTM E119 (Reference 30) The guidance from RG 1.189 was considered for specifying the fire resistance ratings of fire area boundaries.

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The cooling towers comply with Regulatory Guide 1.189, Regulatory Position C.6.2.6. The Essential Service Water Cooling Tower Structure is of noncombustible construction. The Circulating Water System Cooling Tower Structure is either of noncombustible construction or is located and protected in such a way that a fire will not adversely affect any systems or equipment important to safety. A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers.

Except for specialty doors and closure devices, penetrations in fire area boundaries are provided with listed fire-rated door assemblies, shutter assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire rating of the fire barrier. Fire door assemblies, fire dampers, and fire shutters used in two-hour rated fire barriers are listed for not less than a 1.5 hour rating. However, where approved full-scale fire tests demonstrate that protection of fire barrier penetrations is not necessary; protection of such openings is not required. Fire doors and dampers conform to the applicable portions of the following NFPA standards:

- NFPA 80 – Standard for Fire Doors and Fire Windows (Reference 14).
- NFPA 252 – Standard Methods of Tests of Door Assemblies (Reference 21).
- NFPA 90A – Standard for the Installation of Air-Conditioning and Ventilating Systems (Reference 16).
- NFPA 92A – Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences (Reference 17).

design meets the enhanced fire protection criteria. Appendix A of SRP 9.5.1 (Reference 37) describes the criteria:

"Evolutionary advanced light water reactor (ALWR) designers must ensure that safe shutdown can be achieved assuming that all equipment in any one fire area will be rendered inoperable by fire and that re-entry into the fire area for repairs and operator actions is not possible. Because of its physical configuration, the control room is excluded from this approach, provided that an independent alternative shutdown capability that is physically and electrically independent of the control room is included in the design. Evolutionary ALWRs must provide fire protection for redundant shutdown systems in the reactor containment building that will ensure, to the extent practical, that one shutdown division will be free of fire damage. Additionally, the evolutionary ALWR designers must ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator actions."

The fire protection shutdown capability demonstrates that the required number of trains of equipment necessary to achieve and maintain safe shutdown remains available in the event of a fire at any location within the plant. RG 1.189 specifies that redundant systems used to mitigate the consequences of design basis accidents but are not necessary for safe shutdown may be lost to a single exposure fire. However, protection should be provided so that a fire within only one such system will not damage the redundant system. Therefore, the following separation criteria apply only to the electrical cabling needed to support the systems that are used for safe shutdown. The other redundant Class IE and associated cables meet the separation criteria of RG 1.75. When the electrical cabling is covered by separation criteria required for both safe shutdown and accident mitigation, the more stringent separation criteria would apply.

The separation criteria given in the previous paragraphs are employed for all plant areas with the exception of the MCR, cable spreading areas, and the RB:

- The MCR is located in Division 2 of the SB. The MCR is excluded from the separation criteria because all four safety divisions of instrumentation and controls are present. Therefore, alternative shutdown capability is provided. This alternative shutdown capability is provided using the remote shutdown station (RSS) located in Division 3 of the SB, which is physically and electrically independent of the MCR.

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The MCR together with its adjacent room complex is one common fire area separated from other areas of the plant by floor, walls, and roof having minimum fire resistance ratings of three hours. Peripheral rooms are separated from the MCR including the shift office by noncombustible construction with a fire-resistance rating of one hour. All other openings/penetrations through the barriers afforded protective devices as required (fire doors, penetration seals) meet a fire rating of one hour. All cables that enter the MCR terminate in the MCR.

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Specifically, no cables are routed through the MCR from one area to another. Cables enter the MCR by rising up from the cable spreading areas to the MCR sub-floor area. The sub-floor area is approximately 18 inches high and constitutes part of the MCR fire area. Because of the potential difficulty in accessing the MCR sub-floor areas for manual firefighting, the sub-floor areas are protected with a manually-actuated clean agent fire extinguishing system. Cable separation in the MCR sub-floor area meets the separation requirements in RG 1.75. Refer to Section 7.1.2.4.5.

- The cables to the MCR are routed through the cable floor. The cable floor is a separate fire area from the MCR assigned to Division 2 of the SBs. Safety-related cables from each of the other three divisions (1, 3, and 4) are routed from the cable floor to the MCR sub-floor area in the MCR via separate non-combustible~~, fire resistive~~ cable ducts having a minimum fire resistance rating of three hours. Similarly, the RSS is located in its own fire area that is separated from other areas of the plant by floor, walls, and ceiling having minimum fire resistance ratings of three hours. The RSS cable floor is its own fire area assigned to Division 3 of the SBs. Safety-related cables from each of the other three divisions (1, 2, and 4) are also routed from the RSS cable floor to the RSS via separate non-combustible~~, fire resistive~~ cable ducts having a minimum fire resistance rating of three hours.

- Postfire safe shutdown systems in the Fuel Building (FB) are separated by three hour rated structural fire barriers.

- The RB is a combination of the annulus area and the containment. The RB annulus area is used for cable connections between the four SBs and the RB, and for additional routing of mainly non-safety-related cables as well as physical protection of cables to the connected buildings. As such, the annulus area contains cabling allocated to all four safety divisions. The cable connections between SBs 1-4 and the divisional assigned components inside the RB are routed from the cable rooms in SBs via airtight penetrations to the annulus. In the annulus, the cables are routed to the connection boxes on both sides of the containment penetrations. Fire protection for redundant divisions is provided to make sure that that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. Train separation in the annulus is provided by three hour rated fire barriers or a combination of spatial separation and defense-in-depth fire protection features such as fire barriers, fire rated cable, fire detection, fire suppression, and administrative controls to prevent storage of transient combustibles in the annulus.~~Separation of safety-related divisions is provided by a combination of spatial separation and the use of non-combustible, fire resistive structural barriers consisting of wall and ceiling elements.~~ The containment contains all four divisions of electrical equipment and cabling. Train separation is provided by a combination of spatial separation, physical barriers, and defense-in-depth fire protection features such as fire detection and suppression systems. Fire protection for redundant divisions is provided to provide reasonable assurance that that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage. To comply with the criteria of RG 1.189, separation inside the RB is based on separation as previously described or separation of cables and equipment and associated non-safety-related

smoke ~~removal~~confinement systems complies with NFPA 92A (Reference 17) and NFPA 204 (Reference 19). Access and egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire. Smoke confinement systems are also provided in large electrical areas such as switchgear rooms and electrical rooms where the potential exists for heavy smoke conditions.

The smoke confinement system is normally in a standby mode and is automatically actuated by the fire alarm system or manually actuated as required. The smoke confinement system consists of four subsystems:

1. The staircase supply air subsystem provides forced airflow through the main access and egress routes of the SBs, FB, Nuclear Auxiliary Building (NAB), Access Building (ACB) and Radioactive Waste Processing Building (RWB). The primary purpose of this system is to prevent in-leakage of smoke from adjacent areas.

2. The SBs 2 and 3 interconnecting passageway supply and exhaust air subsystem provides outside air to pressurize the SBs 2 and 3 interconnecting passageway and the safeguard escape ladder shaft. The primary purpose of this system is to prevent in-leakage of smoke from adjacent areas.

3. The NI interconnecting passageway supply and exhaust air subsystem pressurizes and purges the interconnecting passageway and service corridors of the SBs, FB, NAB, and RWB. These passageways are at ground level and are the main emergency pathways for the NI.

4. The smoke extraction subsystem removes smoke and provides ventilation for large electrical areas such as cable rooms, switchgear rooms and electrical rooms.

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Portable smoke exhaust fan systems (i.e., smoke ejectors) are also available for the controlled removal of heat, smoke, and other products of combustion from these and other areas of the plant.

Control of Smoke, Hot Gases, and Fire Suppressant

RG 1.189, Section 8.2 stipulates that new reactor designs should ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe-shutdown capabilities, including operator actions. To confirm that these objectives are satisfied for the U.S. EPR, a smoke effects analysis is performed. The analysis considers the location of redundant safe shutdown (SSD) equipment and components, the proximity of fire area boundaries, ventilation system operation, potential effluent types and quantities resulting from a fire, potential effluent migration paths, and the sensitivity of redundant SSD equipment and components to potential effluents.

For most areas of the plant, standard fire barriers and associated components (e.g., fire doors, fire dampers and penetration seals) provide the primary means to prevent migration of smoke, hot gas and fire suppressant between fire areas. Fire doors and fire

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dampers are in accordance with NPFA 80 (Reference 14). Penetration seals in fire barriers are qualified for an F-rating equivalent to the hourly fire rating of the associated barrier. Penetration seal F-ratings will be determined by testing in accordance with the requirements of ASTM E814 (Reference 31), UL 1479 (Reference 36) or IEEE Std. 634 (Reference 33).

Where more robust fire barriers are deemed necessary to achieve these objectives, enhanced fire barrier features are used, as necessary, to control smoke, hot gas and fire suppressant migration. Enhanced fire barrier features may include smoke doors and smoke dampers to limit smoke propagation. Smoke doors are in accordance with NFPA 105 (Reference 43). Ventilation penetrations in enhanced fire barriers are protected by combination fire and smoke rated dampers, or by fire rated dampers and separate smoke control dampers. Smoke dampers and combination fire/smoke dampers are in accordance with NFPA 80 (Reference 14). Smoke dampers and combination fire/smoke dampers in enhanced fire barriers that are relied upon to control effluent migration will either close on smoke detection or will be closed via operator actions from the Control Room in response to an alarm from the fire detection system.

In the event of a Control Room evacuation, passage from the Control Room to the Remote Shutdown Panel is via the stairwells and the interconnecting passageway, which are protected by the smoke confinement system (SCS). The SCS access and egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire.

Fire Detection and Alarm System

The plant fire detection and alarm system meets the guidance provided by SRP 9.5.1 of Reference 37, RG 1.189, NFPA 72 (Reference 13), and NFPA 70 (Reference 12). ~~Deviations from the requirements of these standards are identified and suitably justified as part of the fire protection analysis.~~

The plant fire alarm system provides monitoring of all fire alarm detection devices and circuits, suppression system supervision and releasing when applicable, and plant specific area personnel notification. The plant fire alarm system annunciates a fire alarm, suppression and water supply system supervisory alarms, and overall fire alarm system trouble conditions at the main fire alarm panel located in the MCR.

The plant fire alarm system is provided with both an electrically supervised primary and secondary power source that transfers automatically to the secondary source upon the loss of the primary source. The loss of either power source annunciates a trouble condition to the main alarm panel in the MCR.

Fire detectors respond to smoke, flame, heat, or the products of combustion. Fire detectors are installed in accordance with NFPA 72 (Reference 13) and the

Clean agent fire extinguishing systems designed and installed in accordance with NFPA 2001 (Reference 28) are provided for these:

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- Safeguard buildings electrical (2-3 SB).
  - MCR sub-floor area.

Because the MCR is occupied at all times while the plant is operating, and the sub-floor area having a relatively small volume so that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel, the design of the clean agent fire extinguishing system installed in the MCR sub-floor area is of manual-only actuation. While NFPA 2001 (Reference 28) requires clean agent fire extinguishing systems to be automatically actuated via a signal from the fire detection system, the standard does allow such systems to be of manual-only actuation if acceptable to the authority having jurisdiction.

The boundary of the MCR cable sub-floor area is adequately sealed to prevent a loss of clean agent, or the clean agent quantity is designed to compensate for loss of agent. The operational requirements of the ventilation system, including agent distribution, maintenance of agent concentration during the soak time, and overpressure protection are integrated into the clean agent system design. The toxicity of the clean agent, including potential corrosive characteristics or effects of thermal decomposition products was considered. Measures are provided to verify the agent quantity of the storage cylinders and containers.

Manual Fire Suppression Systems

Manual firefighting capability is provided throughout the plant to limit the extent of fire damage. Standpipe systems, hydrants and portable equipment consisting of hoses, nozzles, and extinguishers are provided for use by fire brigade personnel. Manual fire suppression systems and equipment are designed and installed in accordance with the guidance from SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards. ~~Significant deviations from the requirements of these standards are justified as part of the fire protection analysis.~~

Interior manual hose installations are provided so that each plant location that contains, or could present a fire exposure hazard to, equipment important to safety can be reached with at least one effective hose stream. For all plant power block buildings on all floors, Class III standpipe systems, designed and installed in accordance with NFPA 14 (Reference 3) are provided with hose connections equipped with a maximum of 100 feet of 1.5 inch diameter woven-jacket, lined fire hose, and suitable nozzles. Hose stations are located to facilitate access and use for firefighting operations. Alternative hose stations are provided if a fire hazard could block access to a single hose station serving a plant area.

substantiated by fire testing. ~~Where approved full-scale fire tests demonstrate that internal conduit seals are not necessary, internal conduit seals are not provided.~~ ~~Where specialty doors or closure devices are provided because of design considerations other than fire (e.g., flood, pressure or radiation mitigation) such components are not listed or fire rated. Instances where non-listed or non-fire-rated closure devices or assemblies are installed in fire barrier penetrations are evaluated for equivalency~~ Specialty doors, closure devices or sealing components that are part of a fire barrier but are not listed or fire rated will be evaluated and justified as part of the final FHA. This activity will be performed by the COL applicant as part of the final FHA (refer to Section 9.5.1.3).

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Control Room Complex

Generally, the control room complex complies with RG 1.189, Regulatory Positions 6.1.2 and 6.1.2.1. Alternative compliance is provided because of:

1. The lack of automatic water suppression for the peripheral rooms in the control room complex and,

2. The gaseous fire suppression system being manually actuated via a local hand switch actuation by MCR operators, in lieu of automatic activation of the fire detection system for the sub-floor in the MCR. This is to preclude concerns regarding inadvertent activation of this fire extinguishing system.

The lack of automatic water suppression systems for the peripheral rooms in the control room complex is acceptable due to the control room complex being constantly manned and area wide automatic smoke detection being provided throughout, including within cabinets and consoles. Manual fire suppression is provided by standpipe and hose and portable extinguishers. Combustible materials and ignition sources are controlled and limited in the MCR complex by administrative procedures to those required for operation.

Having the suppression system for the MCR sub-floor being manually actuated instead of automatically actuated is acceptable based on the MCR being manned at all times the plant is operating, and the relatively small volume of the sub-floor area, which provides reasonable assurance that the quantity and location of ionization type fire detectors in the sub-floor area will provide early warning for timely response by MCR personnel.

Electrical Cable System Fire Detection and Suppression

Generally, electrical cable systems comply with RG 1.189, Regulatory Position 4.1.3.3. Alternative compliance is provided due to the lack of a fixed fire suppression system.

with RG 1.189, Regulatory Position 1 and is the responsibility of the COL applicant (refer to Section 13.4).

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9.5.1.6.1 Fire Prevention

Plant Design and Modification Practices

Plant design and modification procedures include fire protection considerations that are in accordance with RG 1.189, Regulatory Position 2.1.2. The procedures contain provisions that evaluate the impacts of modifications on installed FPSs and features, safe shutdown capability, potential for fire induced release of radioactive materials, and the potential to increase or modify (i.e., in a potentially adverse manner) the plant fire hazards. Procedures and practices related to the physical modification of the plant contain provisions that provide reasonable assurance that the modification process will not have adverse affects on the fire protection of the plant SSC important to safety and during the implementation of the modification, an adequate fire protection impairment program is in place.

Combustible Control Practices

Administrative procedures strictly control the use of flammable, ~~and~~ combustible and hazardous materials in plant areas important to safety. Bulk storage of combustible and hazardous materials is not permitted inside or adjacent to buildings or systems important to safety. Use and control of transient combustible and hazardous materials (e.g., combustible liquids, wood and plastic products, dry ion exchange resins, hazardous chemicals) are governed by administrative control measures.

Combustible materials in the RSS and MCR are controlled and limited by administrative procedures to those required for operation.

Plant administrative procedures clearly define the use, handling and storage of flammable and combustible liquids and gases. Flammable and combustible liquids are stored in accordance with NFPA 30 (Reference 9). Compressed and liquefied flammable gases are stored in accordance with applicable NFPA codes.

Storage and use practices for hydrogen are in accordance with guidance from NFPA 55 (Reference 11). Hydrogen lines in safety-related areas are designed to Seismic Category I.

Ventilation systems designed to maintain the hydrogen concentration below one percent by volume are provided for battery rooms.

The turbine lubrication oil system, located in the Turbine Building, is separated from areas containing SSC important to safety by three hour rated fire barriers. In addition, the turbine lubrication oil system is protected with automatic fixed fire suppression

systems to maintain barrier integrity and make sure that a major Turbine Building fire does not adversely affect the ability to maintain operator control and safely shut down the plant. Automatic wet pipe sprinkler systems are provided for areas beneath the turbine operating floor, in the oil discharge tank room and lube oil room; and for lube oil lines above the turbine operating floor, including the turbine lagging/skirt and other areas that could accumulate oil as a result of a spill. Automatic pre-action sprinkler systems are provided for the turbine generator/exciter bearings and automatic water spray systems are provided for the hydrogen seal oil unit and lube oil drainage trenches.

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Transformers located within buildings containing SSC important to safety are of the dry type or are insulated and cooled with non-combustible liquid. ~~Outdoor oil-filled transformers are separated from plant buildings in accordance with RG 1.189.~~ Outside oil-filled transformers are separated from plant buildings by either distance or fire barriers. Where the distance from transformer to plant building is less than 50 feet, three-hour fire rated barriers without openings are provided for separation. In addition, each of the outdoor transformers is provided with an automatic deluge water spray system. Oil spill confinement is provided for each transformer by a gravel-filled, secondary containment and drainage system with adequate capacity to collect spilled oil and fire water. NFPA 80A (Reference 15) is considered in the development of the qualification fire barriers where exterior hazards exit.

The diesel fuel oil main storage tanks and the diesel fuel oil service (i.e., day) tanks associated with the EDGs are located within the EPGBs that they serve. Each diesel fuel storage tank and diesel day tank are separated from the remaining portions of the building by three hour rated fire barriers. Potential spills from the tanks are confined by enclosures sized to accommodate more than the entire inventory of each tank. Automatic fire detection system capability is provided throughout the EPGBs. Additionally, each diesel fuel oil main storage tank and diesel day tank are protected by an automatic deluge (i.e., water spray) fire suppression system. Adequate drainage measures are provided for removing fire protection water and diesel fuel oil.

The RCP motors each contain an upper and lower bearing that have independent oil lubrication systems. Both lubrication systems have an internal oil supply that is cooled with water via an oil cooler. Therefore, there is no external lube oil supply or associated connection lines. In the event of a lube oil leak at a bearing, an alarm is displayed in the MCR. Additionally, the ability to confine and safely drain the lube oil leakage is provided via an RCP lube oil collection system at each pump. The RCP lube oil collection system is designed, engineered, and installed so that its failure will not lead to fire during normal or design basis accident conditions, and reasonable assurance is provided that the system will withstand the SSE. Means are provided to collect lube oil from all potentially pressurized and un-pressurized leakage sites in the RCP lube oil systems. The RCP lube oil collection system for each pump is capable of collecting and draining the entire lube oil inventory of the largest potential oil leak to

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

39. NEI 00-01, Revision 1, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Nuclear Energy Institute, 2001.

40. NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities," U.S. Nuclear Regulatory Commission, September 2005.

41. ANP-10266-A, "AREVA NP Inc. Quality Assurance Plan (QAP) for Design Certification of the U.S. EPR Topical Report," AREVA NP Inc, June 2007.

42. NFPA 804, "Standard for Fire Protection for Advanced Light Water Reactor Electric-Generating Plants," National Fire Protection Association Standards, 2006.

43. NFPA 105, "Installation of Smoke Door Assemblies and Other Protective Openings," National Fire Protection Association Standards, 2007.

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Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.6	Fire Protection for Areas Important to Safety		See below.
C.6.1	Areas Related to Power Operation		Compliance Position is as given for each sub-section below.
C.6.1.1	Containment	Compliance	
C.6.1.1.1	Containment Electrical Separation	Compliance	
C.6.1.1.2	Containment Fire Suppression	Alternate Compliance	Suppression systems inside containment are manually actuated.
C.6.1.1.3	Containment Fire Detection	Compliance	
C.6.1.2	Control Room Complex	Alternate Compliance	~~Manual fire suppression methods are provided for the control room complex.~~Refer to Section 9.5.1.2.2 for justification.
C.6.1.2.1	Control Room Fire Suppression	Alternate Compliance	~~Fire suppression for MCR sub-floor area is manually actuated.~~Refer to Section 9.5.1.2.2 for justification.
C.6.1.2.2	Control Room Fire Detection	Compliance	
C.6.1.2.3	Control Room Ventilation	Compliance	
C.6.1.3	Cable Spreading Room	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification.~~The fire protection analysis—Appendix 9A addresses the design features fire area by fire area.~~
C.6.1.4	Plant Computer Rooms	~~Alternate~~ Compliance	~~Suppression systems are manually actuated. The fire protection analysis—Appendix 9A addresses the design features fire area by fire area.~~

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Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
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R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
C.6.1.5	Switchgear Rooms	Alternate Compliance	Refer to Section 9.5.1.2.2 for justification. ~~Suppression systems are manually actuated. The fire protection analysis—Appendix 9A addresses the design features fire area by fire area.~~
C.6.1.6	Alternative/Dedicated Shutdown Panels	Compliance	
C.6.1.7	Station Battery Rooms	Compliance	
C.6.1.8	Diesel Generator Rooms	Compliance	
C.6.1.9	Pump Rooms	Compliance	
C.6.2	Other Areas		See below.
C.6.2.1	New Fuel Areas	Compliance	
C.6.2.2	Spent Fuel Areas	Compliance	
C.6.2.3	Radwaste Building/Storage Areas and Decontamination Areas	Compliance	
C.6.2.4	Independent Spent Fuel Storage Areas	COL Applicant	Note 3
C.6.2.5	Water Tanks	Compliance	
C.6.2.6	Cooling Towers 09.05.01-54	~~COL Applicant~~ Compliance for the Essential Service Water System Cooling Tower Structure. COL Applicant for the Circulating Water System Cooling Tower Structure.	Note 3 for the Circulating Water System Cooling Tower Structure.
C.7	Protection of Special Fire Hazards Exposing Areas Important to Safety		See below.
C.7.1	Reactor Coolant Pump Oil Collection	Compliance	
C.7.2	Turbine/Generator Building	Compliance	
C.7.2.1	Oil Systems	Compliance	

determination may or may not reflect the need for detailed assessment of transient fire hazards. A THL-3 determination generally reflects the need for detailed assessment of transient fire hazards within the area analysis. In such cases, the material type, quantity, and associated thermal properties comprising the transient hazard package is evaluated. More than one type of transient hazard source may apply to a given fire area. Section 9A.2.3.3 provides additional information regarding the transient fire hazard determination process.

Based on compartmentation of the plant by three hour rated structural fire barriers, additional fire protection features (e.g., fire detection system capability, fixed fire suppression system capability, electrical raceway fire barrier systems) are generally not required in order to provide adequate separation of redundant trains of safe shutdown systems, components, and cables. However, for provision of fire protection features, ~~Therefore, provision of such fire protection features are based on factors such as regulatory requirements, regulatory guidance, the magnitude of the hazards within the fire area, insights from the probabilistic fire risk assessment and plant damage business interruption considerations). R~~regulatory requirements and regulatory guidance take~~s~~ precedence~~t over the other considerations~~. Risk-informed, performance-based methods, or other quantitative/computational methods or tools are not utilized to determine where fire detection and suppression systems will or will not be installed. However, where fire detection and suppression systems are provided in accordance with regulatory guidance, recognized fire protection engineering practices, methods and analytical tools, such as those promulgated by NUREG-1805 and NUREG-1824 may be used to assess the performance capability of such systems.

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8. Based on the previously mentioned considerations, suitable fire protection defense-in-depth features are specified for all plant fire areas.

   The fire protection features provided (e.g., fire barriers and closure devices, fire detection systems, fire suppression systems and equipment) are designed and installed in accordance with applicable regulatory guidance, codes and NFPA standards. Deviations from the above requirements are justified. See Section 9.5.1 for further information regarding fire protection features.

9. Appropriate manual fire suppression capability (i.e., hydrants, standpipe and hose systems, and portable fire extinguishers) are specified and described for each plant fire area.

10. Pursuant to GDC 3, the potentially disabling effects of fire suppression systems, due to normal or inadvertent operation, on SSC important to safety are described for each fire area.

11. The FPA describes the means provided to ventilate, exhaust, or isolate each fire area. Additionally, in accordance with ~~SECY-90-016~~ Reference 2, the ventilation system design provides reasonable assurance that smoke, hot gases, and fire suppressants do not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator manual actions. See Section 9.5.1 for further information regarding the ventilation system design.

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Table 9A-2—Fire Area Parameters
Sheet 1 of 40

Column	1	2	3	4	5
Fire Area	FA-UJA-01	FA-1UJH-01	FA-1UJH-02	FA-1UJH-03	FA-1UJH-04
Building	UJA/UJB	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-40 thru 09.APP.9A-51	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16, 09.APP9A-22, and 09.APP.9A-27
Fire Barriers (Notes 3,4,5,6)	See Figures	~~See Figures~~	~~See Figures~~	~~See Figures~~	~~See Figures~~
SSC: important to safety	Yes	Yes	None	Yes	Yes
SCC: post-fire safe shutdown	Yes	None	None	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, e, g	a, b, c	a, b, c, d	a, b, c, d, e, g, r, o	a, b, c, e, g
Transient Fire Loading	THL-1	THL-1	THL-1	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, c, d, m, o	b, n	b, c, n	a, b, c, d, o	b, n
Atypical Ignition Sources (Note 2b)	aa	None	None	aa	aa
Hazard Classification (Note 12)	OH Group-2	Light Hazard	Light Hazard	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	~~Yes~~Partial	None	~~None~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	~~Yes~~Partial	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
Sheet 3 of 40

Column	6	7	8	9	10
Fire Area	FA-1UJH-05	FA-1UJH-06	FA-1UJH-07	FA-1UJH-08	FA-2UJH-01
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16	09.APP.9A-~~0186~~ thru 09.APP.9A-~~28~~16	09.APP.9A-~~0182~~4 ~~thru 09.APP.9A-28~~	09.APP.9A-~~0182~~4 ~~thru~~and 09.APP.9A-~~28~~27	09.APP.9A-~~0181~~7 thru 09.APP.9A-~~28~~27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	None	None	Yes
In situ Loading (Note 1)	a, b, f, m	a, b, c, e, g	a, b, c	a, b, c, d, e, g, h	a, b, c, e, g
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-1
Common Ignition Source (Note 2a)	j, n	b, g	n	b, m, n, o	b, n
Atypical Ignition Sources (Note 2b)	aa	aa	None	aa	None
Hazard Classification (Note 12)	OH Group-2	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Partial	None
Manual Fire Alarms	None	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	11	12	13	14	15
Fire Area	FA-2UJH-02	FA-2UJH-03	FA-2UJH-04	FA-2UJH-05	FA-2UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~018~~17 thru 09.APP.9A-~~28~~27	09.APP.9A-~~018~~ 17thru 09.APP.9A-~~28~~27	09.APP.9A-~~018~~17 thru 09.APP.9A-~~28~~27	09.APP.9A-~~018~~17 thru 09.APP.9A-~~2~~278	09.APP.9A-~~018~~17 thru 09.APP.9A-~~28~~27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, h, r	a, b, c, e, g	a, b, c, e, g	a, b, f, m
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	a, b, c, d, g, m, o	b, g, n	a, b, g, m	j, n
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	OH Group-2
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide
Manual Fire Alarms	Yes	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	16	17	18	19	20
Fire Area	FA-2UJH-07	FA-2UJH-08	FA-2UJH-09	FA-2UJH-10	FA-3UJH-01
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~812 thru 09.APP.9A-~~28~~14	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, e, g, m, n, o, p, q, r, s	a, b, c, g, s	a	a, b, d	a, b, c, g
Transient Fire Loading	THL-2	THL-2	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	b, m, n	m, n	n	n	b, n
Atypical Ignition Sources (Note 2b)	None	None	None	None	aa
Hazard Classification (Note 12)	OH Group-1	OH Group-1	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Area Wide	None	~~Yes~~Partial	None
Manual Fire Alarms	None	Yes	None	None	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	~~Yes~~Partial	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	21	22	23	24	25
Fire Area	FA-3UJH-02	FA-3UJH-03	FA-3UJH-04	FA-3UJH-05	FA-3UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, h, r	a, b, c, e, g	a, b, c, e, g	a, b, c, g, f, m
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	b, c, d, m, n, o	b, g, n	a, b, g, m	j, n
Atypical Ignition Sources (Note 2b)	None	None	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	OH Group-2
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	26	27	28	29	30
Fire Area	FA-3UJH-07	FA-3UJH-08	FA-3UJH-09	FA-3UJH-10	FA-4UJH-01
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~018~~ 17thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~817 thru 09.APP.9A-~~28~~27	09.APP.9A-~~01~~834 thru 09.APP.9A-~~28~~36, 09.APP.9A-38	09.APP.9A-~~01~~828 thru 09.APP.9A-~~28~~38
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	None
In situ Loading (Note 1)	a, b, c, e, g, r, s	a, b, c, g, s	a, b, g, m	a, b, d	a, b, c, g
Transient Fire Loading	THL-2	THL-2	THL-3	THL-1	THL-1
Common Ignition Source (Note 2a)	b, m, n	m, n	n	n	b, n
Atypical Ignition Sources (Note 2b)	aa	None	aa	None	None
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Partial	None
Manual Fire Alarms	None	Yes	None	None	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	31	32	33	34	35
Fire Area	FA-4UJH-02	FA-4UJH-03	FA-4UJH-04	FA-4UJH-05	FA-4UJH-06
Building	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK	UJH/UJK
Figures	09.APP.9A-~~018~~ 28thru 09.APP.9A-~~28~~38	09.APP.9A-~~018~~28 thru 09.APP.9A-~~28~~38	09.APP.9A-22, 09.APP.9A-27, and 09.APP.9A-~~018~~28 thru 09.APP.9A-~~28~~38	09.APP.9A-~~018~~28 thru 09.APP.9A-~~28~~38	09.APP.9A-~~018~~ 28thru 09.APP.9A-~~28~~38
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, f, g, h, j, t	a, b, c, e, g	a, b, f, g, m	a, b, c, e, g
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	c, n	a, b, c, d, o	b, n	j, n	a, b, g
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	aa
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~Partial	~~Yes~~Area Wide	~~Yes~~Area Wide
Manual Fire Alarms	Yes	Yes	Yes	None	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None

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Table 9A-2—Fire Area Parameters
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Column	36	37	38	39	40
Fire Area	FA-4UJH-07	FA-4UJH-08	FA-UFA-01	FA-UFA-02	FA-UFA-03
Building	UJH/UJK	UJH/UJK	UFA	UFA	UFA
Figures	09.APP.9A-~~018 thru 09.APP.9A-2824~~	09.APP.9A-~~018 thru 09.APP.9A-2824~~	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	None	None	None
SCC: post-fire safe shutdown	None	Yes	None	None	None
In situ Loading (Note 1)	a, b, c	a, b, c, d, e, g, h	a,b	a,b, c, d	a, b, c, d
Transient Fire Loading	THL-2	THL-2	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	n	b, m, n, o	n	n	c, n
Atypical Ignition Sources (Note 2b)	None	aa	None	None	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Partial	~~Yes~~None	~~Yes~~None	~~Yes~~Area Wide
Manual Fire Alarms	Yes	Yes	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	41	42	43	44	45
Fire Area	FA-UFA-04	FA-UFA-05	FA-UFA-06	FA-UFA-07	FA-UFA-08
Building	UFA	UFA	UFA	UFA	UFA
Figures	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	Yes	Yes	Yes	None
SCC: post-fire safe shutdown	None	Yes	None	Yes	None
In situ Loading (Note 1)	a, b, c, d	a, b, c, d, e, g, o, p, q, r	a, g	a, b, c, d, e, g, o, p, q, r	a
Transient Fire Loading	THL-1	THL-2	THL-1	THL-2	THL-1
Common Ignition Source (Note 2a)	c, n	a, b, c, d, m, o	n	a, b, c, d, m, o	n
Atypical Ignition Sources (Note 2b)	None	None	aa	aa	None
Hazard Classification (Note 12)	Light Hazard	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~Area Wide	None
Manual Fire Alarms	None	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	46	47	48	49	50
Fire Area	FA-UFA-09	FA-UFA-10	FA-UFA-11	FA-UFA-12	FA-UFA-13
Building	UFA	UFA	UFA	UFA	UFA
Figures	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	None	None	Yes	Yes
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, g	a	a, b, c, d, p, q, r	a, b, c, h	a, b, c, h
Transient Fire Loading	THL-1	THL-1	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	n	n	c, n,	c, m, n	a, c, m
Atypical Ignition Sources (Note 2b)	aa	None	None	None	None
Hazard Classification (Note 12)	OH Group-1	Light Hazard	OH Group-1	OH Group-1	OH Group-1
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~None~~Area Wide	~~Yes~~None	~~Yes~~None	~~Yes~~Area Wide
Manual Fire Alarms	None	None	Yes	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	51	52	53	54	55
Fire Area	FA-UFA-14	FA-UKA-01	FA-UKA-02	FA-UKA-03	FA-UKA-04
Building	UFA	UKA	UKA	UKA	UKA
Figures	09.APP.9A-~~95~~84 thru 09.APP.9A-~~109~~97	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, g	a, b	a, b, c, d	a, b, c, d, e, g, o, q	a, b, c, d, e, g
Transient Fire Loading	THL-1	THL-1	THL-1	THL-2	THL-2
Common Ignition Source (Note 2a)	n	n	c, n	a, b, c, d, g, l	a, b, c, d, m
Atypical Ignition Sources (Note 2b)	aa	None	None	aa	None
Hazard Classification (Note 12)	OH Group-1	Light Hazard	Light Hazard	OH Group-1	OH Group-1
Automatic Fire Detection Note 13)	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~None	~~Yes~~None
Manual Fire Alarms	None	Yes	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	56	57	58	59	60
Fire Area	FA-UKA-05	FA-UKA-06	FA-UKA-07	FA-UKA-08	FA-UKA-09
Building	UKA	UKA	UKA	UKA	UKA
Figures	09.APP.9A-52 thru 09.APP.9A-65, 09.APP.9A-93 thru 09.APP.9A-94	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65	09.APP.9A-52 thru 09.APP.9A-65
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	Yes	Yes	Yes	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d, e, g, h	a, b, g	a, b, g	b, g	a, b
Transient Fire Loading	THL-2	THL-1	THL-1	THL-1	THL-1
Common Ignition Source (Note 2a)	b, c, d, m, n	a	a	a	n
Atypical Ignition Sources (Note 2b)	None	aa	aa	aa	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-1	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	None
Manual Fire Alarms	Yes	None	None	None	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	71	72	73	74	75
Fire Area	FA-UKS-07	FA-UKS-08	FA-1UBP-01	FA-1UBP-02	FA-1UBP-03
Building	UKS	UKS	UBP	UBP	UBP
Figures	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-66 thru 09.APP.9A-75	09.APP.9A-01 thru 09.APP.9A-065	09.APP.9A-01 thru 09.APP.9A-065	09.APP.9A-01 thru 09.APP.9A-065
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	None	Yes	Yes	Yes
SCC: post-fire safe shutdown	None	None	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, r, s	a, b, h	n	a, b, c, e, g	a, b, c, d, e, g, n
Transient Fire Loading	THL-2	THL-1	THL-1	THL-1	THL-3
Common Ignition Source (Note 2a)	c, n, o	m, n	m, n	b, n	a, b, c, i, m
Atypical Ignition Sources (Note 2b)	None	None	ee	aa	aa, ee
Hazard Classification (Note 12)	OH Group-1	OH Group-1	EH Group-2	OH Group-1	EH Group-2
Automatic Fire Detection (Note 13)	None	None	YesArea Wide	YesArea Wide	YesArea Wide
Manual Fire Alarms	None	None	None	Yes	Yes
Automatic Fixed Fire Suppression (Note 14)	None	None	YesArea Wide	None	YesArea Wide
Manual Fixed Fire Suppression (Note 14)	YesNone	YesNone	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	76	77	78	79	80
Fire Area	FA-2UBP-01	FA-2UBP-02	FA-2UBP-03	FA-3UBP-01	FA-3UBP-02
Building	UBP	UBP	UBP	UBP	UBP
Figures	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	n	a, b, c, e, g	a, b, c, d, e, g, n	n	a, b, c, e, g
Transient Fire Loading	THL-1	THL-1	THL-3	THL-1	THL-1
Common Ignition Source (Note 2a)	m, n	b, n	a, b, c, i, m	m, n	b, n
Atypical Ignition Sources (Note 2b)	ee	aa	aa, ee	ee	aa
Hazard Classification (Note 12)	EH Group-2	OH Group-1	EH Group-2	EH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide
Manual Fire Alarms	None	Yes	Yes	None	Yes
Automatic Fixed Fire Suppression (Note 14)	~~Yes~~Area Wide	None	~~Yes~~Area Wide	~~Yes~~Area Wide	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes

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Column	81	82	83	84	85
Fire Area	FA-3UBP-03	FA-4UBP-01	FA-4UBP-02	FA-4UBP-03	FA-1URB-01
Building	UBP	UBP	UBP	UBP	UQB/URB
Figures	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~0~~1 thru 09.APP.9A-~~06~~5	09.APP.9A-~~87~~76 thru 09.APP.9A-~~94~~83
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	Yes	Yes	Yes	Yes	Yes
SCC: post-fire safe shutdown	Yes	Yes	Yes	Yes	Yes
In situ Loading (Note 1)	a, b, c, d, e, g, n	n	a, b, c, e, g	a, b, c, d, e, g, n	a, b, c, d, e
Transient Fire Loading	THL-3	THL-1	THL-1	THL-3	THL-2
Common Ignition Source (Note 2a)	a, b, c, i, m	m, n	b, n	a, b, c, i, m	a, b, c, d, g, p
Atypical Ignition Sources (Note 2b)	aa, ee	ee	aa	aa, ee	None
Hazard Classification (Note 12)	EH Group-2	EH Group-2	OH Group-1	EH Group-2	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Area Wide	~~Yes~~Partial
Manual Fire Alarms	Yes	None	Yes	Yes	None
Automatic Fixed Fire Suppression (Note 14)	~~Yes~~Area Wide	~~Yes~~Area Wide	None	~~Yes~~Area Wide	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	Yes-Yard area
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	No

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Table 9A-2—Fire Area Parameters
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Column	86	87	88	89	90
Fire Area	FA-2URB-01	FA-3URB-01	FA-4URB-01	FA-UKE-01	FA-UKE-02
Building	UQB/URB	UQB/URB	UQB/URB	UKE	UKE
Figures	09.APP.9A-~~87~~76 thru 09.APP.9A-~~94~~83	09.APP.9A-~~87~~76 thru 09.APP.9A-~~94~~83	09.APP.9A-~~87~~76 thru 09.APP.9A-~~94~~83	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106
Fire Barriers (Notes 3,4,5,6)	~~See Figures~~	~~See Figures~~	~~See Figures~~	~~See Figures~~	~~See Figures~~
SSC: important to safety	Yes	Yes	Yes	None	None
SCC: post-fire safe shutdown	Yes	Yes	Yes	None	None
In situ Loading (Note 1)	a, b, c, d, e	a, b, c, d, e	a, b, c, d, e	a, b	a, b, d
Transient Fire Loading	THL-2	THL-2	THL-2	THL-1	THL-1
Common Ignition Source (Note 2a)	a, b, c, d, g, p	a, b, c, d, g, p	a, b, c, d, g, p	n	c, n
Atypical Ignition Sources (Note 2b)	None	None	None	None	None
Hazard Classification (Note 12)	Light Hazard	Light Hazard	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection (Note 13)	~~Yes~~Partial	~~Yes~~Partial	~~Yes~~Partial	~~Yes~~None	~~Yes~~Area Wide
Manual Fire Alarms	None	None	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	~~Yes-Yard area~~None	~~Yes-Yard area~~None	~~Yes-Yard area~~None	None	None
Standpipe and Hose System (Note 7)	None	None	None	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	91	92	93	94	95
Fire Area	FA-UKE-03	FA-UKE-04	FA-UKE-05	FA-UKE-06	FA-UKE-07
Building	UKE	UKE	UKE	UKE	UKE
Figures	09.APP.9A-39 and 09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d, e, g	a, b, c, d	a, b, g	a, b, c, e, g, o, p, q, r, s	a, b, c, e, g
Transient Fire Loading	THL-2	THL-2	THL-1	THL-3	THL-2
Common Ignition Source (Note 2a)	a, b, c	a, c, m	n	a, c	n
Atypical Ignition Sources (Note 2b)	None	None	None	ee	None
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-2	OH Group-1
Automatic Fire Detection (Note 13)	~~Yes~~Partial	~~Yes~~None	~~Yes~~Area Wide	~~Yes~~Partial	None
Manual Fire Alarms	Yes	None	None	Yes	None
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	None
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	None
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes

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Table 9A-2—Fire Area Parameters
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Column	96	97	98	99	100
Fire Area	FA-UKE-08	FA-UKE-09	FA-UKE-10	FA-UKE-11	
Building	UKE	UKE	UKE	UKE	
Figures	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	09.APP.9A-~~110~~98 thru 09.APP.9A-~~129~~106	
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	
SSC: important to safety	None	None	None	None	
SCC: post-fire safe shutdown	None	None	None	None	
In situ Loading (Note 1)	a, b, c, e, g	a, b, c	a, b, c, e, g	a, b, c, e, g	
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	
Common Ignition Source (Note 2a)	n	n	n	n	
Atypical Ignition Sources (Note 2b)	None	None	None	None	
Hazard Classification (Note 12)	OH Group-1	OH Group-1	OH Group-1	OH Group-1	
Automatic Fire Detection (Note 13)	None	None	None	~~Yes~~None	
Manual Fire Alarms	None	None	None	None	
Automatic Fixed Fire Suppression (Note 14)	None	None	None	None	
Manual Fixed Fire Suppression (Note 14)	None	None	None	None	
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	

Figure 9A-23—Fire Zone Layouts-Safeguard Buildings 2 and 3, +53 Feet

Figure 9A-38—Fire Zone Layouts-Safeguard Building (UJH and UJK): 4, Section A-A