Response to

Request for Additional Information No. 20, Revision 0

7/28/2008
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
SFPT Branch

Question 09.05.01-1:

EPR FSAR Section 9.5.1.6.1 states that 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. As noted in Regulatory Position 1.8.1 of RG 1.189, Rev.1, this criterion should not be applied to new reactor plants. The change process for new reactor fire protection programs should be the same as that for the rest of the plant, i.e. in accordance with 10 CFR 52.98(c). Basis: RG 1.189, Regulatory Position 1.8.1

Response to Question 09.05.01-1:

The referenced paragraph under "Plant Design and Modification Practices," in U.S. EPR FSAR Tier 2, Section 9.5.1.6.1, addresses Regulatory Guide 1.189, Regulatory Position 2.1.2. The first sentence in this paragraph will be changed to: "Plant design and modification procedures include fire protection considerations that are in accordance with Regulatory Guide 1.189, Regulatory Position 2.1.2."

U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189, indicates that compliance with Regulatory Guide 1.189, Regulatory Position 1.8.1, is the responsibility of the COL applicant. This COL action item is included in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as Combined License Information Item No. 9.5-6.

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 09.05.01-2:

The EPR FSAR should include a COL information item that directs the applicant to identify and evaluate deviations between the certified design and the as-purchased, as-built plant for the Fire Protection System. This COL information item should direct the applicant to perform a Final Fire Hazards and Safe Shutdown Analyses which includes the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement, and includes a review against the assumptions and requirements stated in the FSAR Fire Hazards and Safe Shutdown Analysis. The final FHA and Safe Shutdown Analysis should also include a detailed post-fire safe-shutdown circuit analysis performed and documented using a methodology similar to that described in NEI guidance document, NEI 00-01, "Guidance for Post-Fire Safe-Shutdown Circuit Analysis". This COL information item should direct the applicant to describe how this as-built analyses will be performed and documented, and how will the NRC be made aware of deviations from the FSAR, if any? Basis: RG 1.189 Regulatory Position 1.2 and 1.3; RG 1.206 Section C.III.1, Chapter 9, Section C.I.9.5.1.1 (4); and 10 CFR 52.98(c).

Response to Question 09.05.01-2:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, will be changed to include the following information. It will be added after the last paragraph under the "Implementation of Criteria" subsection.

"A COL applicant that references the U.S. EPR design certification will perform an as-built, post-fire Safe Shutdown Analysis, which includes final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01, 'Guidance for Post-Fire Safe-Shutdown Circuit Analysis.'"

The following Combined License Information, Item No. 9.5-16 will be added to U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items:

"A COL applicant that references the U.S. EPR design certification will perform an as-built, post-fire Safe Shutdown Analysis, which includes final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01."

U.S. EPR FSAR Tier 2, Section 9.5.1.3 will be changed to include the following information. It will be added after the last paragraph in this section.

"A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and

requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any."

The following Combined License Information Item No. 9.5-17 will be added to U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items:

"A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any."

FSAR Impact:

U.S. EPR FSAR Tier 2 Sections 9.5.1.2.1 and 9.5.1.3 will be revised as described in the response and indicated on the enclosed markup; U.S. EPR FSAR Tier 2 Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-3:

The EPR FSAR should include a COL information item to provide the Fire Hazards and Safe Shutdown Analyses for site-specific areas of the plant not analyzed by the FSAR. Basis: Completeness of application.

Response to Question 09.05.01-3:

U.S. EPR FSAR Tier 2, Section 9.5.1.3 will be changed to include the following information. It will be added after the last paragraph in this section, immediately proceeding Section 9.5.1.4.

"A COL applicant that references the U.S. EPR design certification will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the FSAR."

The following Combined License Information Item No. 9.5-18 will be added to U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items:

"A COL applicant that references the U.S. EPR design certification will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the FSAR."

The response to Question 09.05.01-2 addresses the performance of the post-fire Safe Shutdown Analysis.

FSAR Impact:

U.S. EPR FSAR Tier 2 Section 9.5.1.3 will be revised as described in the response and indicated on the enclosed markup; and U.S. EPR FSAR Tier 2 Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-4:

The FHA analysis results for the control room complex Table 9A-2 column 16 states that this area has Manual Fixed Fire Suppression which gives the impression that the whole area may have this suppression.

Section 9.5.1.2.1 states that the main control room sub-floor areas are protected with a manually-actuated clean agent fire extinguishing system.

Table 9A-2 should be specific as to exactly where in the fire area the fixed suppression is being used and also should describe the type of fixed fire suppression as stated in Section 9.5.1.2.1.

A total review of Table 9A-2 should also be performed to find any additional fire areas where suppression or detection coverage or type is not specific enough to avoid misapplying table.

Basis: Clarification of design.

Response to Question 09.05.01-4:

A response to the question will be provided by September 12, 2008.

Question 09.05.01-5:

Effects of Fire and Smoke on Digital I&C System Components – How does the EPR design ensure that fire and smoke in the fire area will not cause spurious actuations to be initiated by the digital equipment in the fire area that would prevent safe shutdown? Will digital equipment be designed and tested to prevent spurious actuations caused by the effects of fire and/or will potential spurious actuations resulting from these effects be analyzed to demonstrate that they will not prevent safe shutdown? Basis: SECY-90-016 and SECY-93-087.

Response to Question 09.05.01-5:

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.

U.S. EPR FSAR Tier 2, Section 7.1 describes the design of the U.S. EPR digital control system. U.S. EPR digital control system equipment has not been specifically tested for operation under smoke and/or fire conditions. However, analyses have been performed to address potential spurious actuations as noted below.

U.S. EPR FSAR Tier 2 ,Table 7.2.2—FMEA Summary for Reactor Trip, contains an analysis of reactor trip inputs and the results for detected and undetected potential failures. The undetected failures include consideration of failures that result in spurious signals.

U.S. EPR FSAR Tier 2, Table 7.3.2—FMEA Summary for ESF Actuations, addresses detectable and undetectable failures, including spurious actuations of elemental components that result in Engineered Safety Features equipment actuation.

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 discusses components whose fire-induced spurious actuation could adversely impact post-fire safe shutdown. Digital equipment is among the population of those components. Spurious actuations are analyzed as described in the response to Question 09.05.01-6.

The response to Question 09.05.01-2 identifies the requirement for the performance of a detailed post-fire safe shutdown analysis, including a circuit analysis.

FSAR Impact:

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

Question 09.05.01-6:

Multiple Spurious Actuations – As noted in RG 1.189, Rev 1, the one-at-a-time assumption for spurious actuations may not adequately address the potential risk attributed to fire. Additionally, NEI 00-01 Rev 1 also does not fully address multiple spurious actuations (Draft Rev 2 of NEI 00-01 is currently being developed to address multiple spurious actuations). What assumptions and methodologies will be used by the applicant to identify, assess and resolve the potential for multiple spurious actuations that may prevent post-fire safe shutdown? Basis: RG 1.189, Regulatory Position 5.3.4.

Response to Question 09.05.01-6:

NEI 00-01, Rev. 1, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," is the only formal NRC endorsed guideline currently available to the industry that addresses spurious actuations. Preparation of NEI 00-01, Rev. 2 is in progress and has not yet been finalized or endorsed by the NRC. Until such time it is endorsed by the NRC, utilization of NEI 00-01, Rev. 2 is not considered appropriate. It is also not considered appropriate to independently develop assumptions and guidelines for the design of the U.S. EPR, as those developed may be inconsistent with the final industry/NRC product. It is the intent of the U.S. EPR design to follow the NRC endorsed/issued spurious actuation guidance in effect when the U.S. EPR post-fire safe shutdown analysis is formally initiated.

FSAR Impact:

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

Question 09.05.01-7:

The EPR FSAR should add a COL information item to provide specific design and certification testing details for fire barriers in accordance with NFPA 251, ASTM E-119, and the guidance in RG 1.189. Basis: RG 1.189, Regulatory Position 4.2.

Response to Question 09.05.01-7:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, under "Architectural and Structural Features," specifies:

"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."

Compliance with Regulatory Guide 1.189, Regulatory Position C.4.2, Passive Fire-Resistive Features, is indicated in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189.

A COL information item providing specific design and certification testing details for fire barriers is not necessary. A COL applicant who references the U.S. EPR standard design certification is required to satisfy commitments and requirements in the U.S. EPR FSAR or take an exception and provide suitable justification for the departure.

FSAR Impact:

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

Question 09.05.01-8:

Smoke, hot gases and fire suppressant migration between redundant trains – SECYs-93-087/90-016 include the criteria that the design should ensure that smoke, hot gases, or fire suppressant will not migrate into other fire areas to the extent that safe shutdown could be adversely affected. Provide a description of the plant features that will provide this assurance, including acceptance criteria for fire barrier penetration seals, as well as the use and qualification of smoke dampers. The EPR FSAR should verify that fire dampers that do not close on smoke detection will not be relied upon to prevent the migration of smoke from one redundant train area to another. Also describe how the fire hazards analysis will evaluate the potential for the migration of smoke, hot gases or fire suppressant to prevent safe shutdown, including any impact on the ability to access a fire area for manual suppression or, in the case of a control room evacuation, any impact on the ability to access and operate the remote shutdown panel. The EPR FSAR allows for the use of portable smoke exhaust fan systems. The EPR FSAR should add a COL information item to establish provisions for manual smoke control by manual actions of the fire brigade for all plant areas. Basis: SECYs-93-087/90-016

Response to Question 09.05.01-8:

A response to the question will be provided by October 31, 2008.

Question 09.05.01-9:

The EPR FSAR should add a COL information item to provide simplified FPS piping and instrumentation diagrams showing complete site-specific systems. Nuclear Island definition is different in Figure 9.5.1-1 then in Tier 1 Section 2.1.1. Modify FSAR accordingly. Basis: Completeness of application.

Response to Question 09.05.01-9:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be changed to include: “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.”

The following Combined License Information Item No. 9.5-19 will be added to U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items: “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.”

U.S. EPR FSAR Tier 2, Figure 9.5.1-1 depicts the fire water distribution system for the Nuclear Island (NI) and plant areas not considered part of the NI. However, the current title for this figure is “Fire Water Distribution System Inside Nuclear Island.”

The title for U.S. EPR FSAR Tier 2, Figure 9.5.1-1 will be changed to “Fire Water Distribution System.” The reference to this figure in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, under “Fire Water Supply System,” will be revised to reflect the new title identified above.

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 FSAR Tier 2, Figure 9.5.1-1 will be revised as described in the response and indicated on the enclosed markup. U.S. EPR FSAR Tier 2, Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-10:

The EPR FSAR Section 9.5.1.6.2 provides the FPP organization functions in accordance with RG 1.189. Section 9.5.1.6.2 states "The COL applicant is responsible for determining the individual position responsible for the organizational functions described herein." This section should reference Section 13.1 since it contains the applicable COL information item 13.1-1. Additionally, not all the fire protection engineer responsibilities are listed in Section 9.5.1.6.2 and, therefore, suggest adding "but not limited to" after "including" in the fire protection engineer responsibility paragraph. Basis: RG 1.189, Regulatory Position 1.1

Response to Question 09.05.01-10:

The last sentence of the first paragraph in U.S. EPR FSAR Tier 2, Section 9.5.1.6.2 will be changed to: "The COL applicant is responsible for determining the individual position responsible for the organizational functions described herein (refer to Section 13.1)."

This COL action item is included in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as Combined License Information Item No. 13.1-1.

With reference to the fire protection program (FPP) and fire protection system (FPS), the second paragraph under the fourth bullet in U.S. EPR FSAR Tier 2, Section 9.5.1.6.2 will be changed to:

"The fire protection engineer is delegated responsibility for development and administration of the FPP including, but not limited to, administrative controls, periodic fire prevention inspections, FPS and FPS equipment inspections and testing, evaluations of work activities for transient fire loads, identification of fire protection training requirements, prefire planning, indoctrination training for all plant contractor personnel and fire fighting training for operating plant personnel and the fire brigade."

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-11:

The FSAR takes exception to RG 1.189 guidance to provide automatic suppression in the rooms adjacent to the main control room. The basis for this exception is that manual fire suppression is provided for the control room complex. Piles of paper on desktops and paper in open bookcases contribute to the combustible loading in a room and ignition sources such as electrical appliances may be present. The EPR FSAR should provide a COL information item that would direct the applicant to describe its program to control the fire hazard presented by paper or other combustible materials, as well as potential ignition sources (e.g., coffee makers) to justify not having automatic suppression in the rooms adjacent to the main control room. Basis: RG 1.189, Regulatory Position 6.1.2

Response to Question 09.05.01-11:

The U.S. EPR FSAR Tier 2 will be revised to indicate that administrative measures are in place to control combustibles and ignition sources in rooms adjacent to the MCR.

The second paragraph under "Combustible Control Practices," in U.S. EPR FSAR Tier 2, Section 9.5.1.6.1, will be changed to: "Combustible materials in the RSS and MCR are controlled and limited by administrative procedures to those required for operation." In the same section, under "Ignition Source Control Practices," a new bulleted item will be added:

- "Potential ignition sources are controlled and limited in the MCR complex by administrative procedures."

The U.S. EPR Comment in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189, R.G. Section C.6.1.2, will be changed to: "Manual fire suppression methods are provided for the MCR complex. Combustible materials and ignition sources in the MCR complex are controlled and limited by administrative procedures to those required for operation." Based on these changes, a COL information item is not necessary since the applicant will implement U.S. EPR FSAR Tier 2, Section 9.5.1.6.1.

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

Question 09.05.01-12:

The FSAR takes exception to RG 1.189 guidance to provide smoke detectors in the control room cabinets and consoles. The EPR FSAR should provide for a COL information item that directs the applicant to describe the cabinet design features that will facilitate the rapid identification of the specific cabinet/console that is on fire and facilitate rapid access to the cabinets/consoles for fire fighting. Basis: RG 1.189, Regulatory Position 6.1.2.2

Response to Question 09.05.01-12:

The U.S. EPR FSAR does not take exception to RG 1.189 guidance to provide smoke detectors in the control room cabinets and consoles. Fire detection is provided throughout the Main Control Room in the U.S. EPR, including inside cabinets and consoles. Compliance with Regulatory Guide 1.189, Regulatory Position C.6.1.2.2 is indicated in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189.

FSAR Impact:

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

Question 09.05.01-13:

RG 1.189 states that fire water supplies should be filtered and treated as necessary to prevent or control biofouling or microbiologically induced corrosion of fire water systems. The EPR FSAR should direct the applicant to describe the program to monitor and maintain an acceptable level of quality of their fire water sources. Basis: RG 1.189, Regulatory Position 3.2.1

Response to Question 09.05.01-13:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be changed to include: “A COL applicant that references the U.S. EPR design certification will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.”

The following Combined License Information Item No. 9.5-20 will be added to U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items: “A COL applicant that references the U.S. EPR design certification will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.”

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 FSAR Tier 2, Table 1.8-2 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-14:

RG 1.189 states that the communication system design should provide effective communication between plant personnel in all vital areas during fire conditions under maximum potential noise levels. The EPR FSAR should provide a brief description in Section 9.5.1.3 of the communication systems available, refer to Section 9.5.2, include a statement similar to 9A-2 Note 11, and include any exceptions to Note 11 as given in Section 9.5.2.1. The EPR FSAR should provide a COL information item or modify COL information item 9.5-1 that directs the applicant to verify that for a fire in any one fire area that disables a communication system or systems such as a loss of a repeater that creates a dead spot that those areas in the plant that require communication will have it. COL information item 9.5-1 only addresses normal and accident conditions. Basis: RG 1.189 Regulatory Position 4.1.7; RG 1.206, Section C.III.1, Chapter 9, Section C.I.9.5.2

Response to Question 09.05.01-14:

A COL information item related to verification of the ability to communicate under post-fire conditions is not necessary as the proposed FSAR changes establish the requirement to maintain effective communications capability for all fire areas of the plant, including site specific areas.

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be revised to include the following information concerning communications. It will be added before the "Ventilation System Design Considerations" subsection and after the "Emergency Lighting" subsection, which was added to support the response to Question 09.05.01-20.

"Communications

Section 9.5.2 describes the following diverse on-site communications systems provided in the U.S. EPR:

- Portable Wireless Communication.
- Digital Telephone.
- Public Address System.
- Sound-Powered.
- Security Communication.

For the purposes of fire fighting and operational post-fire safe shutdown activities, primary reliance is placed upon the portable wireless communication system. This system is multi-channeled, allowing unimpeded simultaneous communications for various purposes. It also has the capability to interface with the station public address and digital telephone systems.

The repeaters for the portable wireless communication system do not require dedicated fire protection. Due to the diversity of the plant communications systems, at least one method of communication is available in the event of a fire."

U.S. EPR FSAR Tier 2, Section 9.5.2.2.1 will be changed to include:

“Repeaters are utilized to allow seamless radio coverage throughout the plant. Antennas and cables interconnecting the repeaters to the base station equipment are located in a manner to facilitate radio signal penetration into areas that are not properly served by the primary antenna. Section 9.5.1 provides information regarding Regulatory Guide 1.189 compliance for the protection of repeaters from the effects of fire.”

FSAR Impact:

U.S. EPR FSAR Tier 2, Sections 9.5.1.2.1 and 9.5.2.2.1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-15:

QA Program: RG 1.206, Reg Position C.III.1, Section C.I.9.5.1.1 identifies that the COL applicant should provide information on the fire protection operational program and procedures. RG 1.189 states that there are two options: either include the FP program in the plant's overall QA program under Appendix B or provide a description of the FP QA program. The EPR FSAR Section 17.5 refers to Topical Report ANP-10266A, Rev 1. ANP-10266A, Rev 1 Section 3.2 states that for non-safety related fire protection components RG 1.189 Regulatory Position 1.7, April 2001 will be used as guidance. The EPR FSAR should clarify that the QA program for non-safety related fire protection components will not be under Appendix B in Section 9.5.1.6.5. Additionally, RG 1.189, Rev 1 should be used for the QA rather than Rev 0 as stated in the topical report. COL Information items 9.5-2, 3, and 4 only address RG 1.189 Sections 1.7.1, 2, and 3 and not the whole of Section 1.7. The EPR FSAR should include a COL information item or modify COL information items 9.5-2, 3, and 4 that directs the applicant to provide details of the fire protection QA program. Basis: RG 1.189 Reg Position 1.7; RG 1.206, Section C.III.1, Chapter 9, Section C.I.9.5.1.189 Section 1.7

Response to Question 09.05.01-15:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.5 will be replaced in its entirety by the following:

"The overall plant quality assurance plan (QAP) includes the QA program for fire protection. The QAP provides reasonable assurance that the fire protection systems are designed, fabricated, erected, tested, maintained and operated so that they will function as intended. As stated in U.S. EPR FSAR Section 17.5, the QAP for the design of the U.S. EPR is addressed in AREVA NP Topical Report ANP-10266A, Revision 1, "AREVA NP Inc. Quality Assurance Plan (QAP) for Design Certification of the U.S. EPR Topical Report." The AREVA QAP implements quality requirements for the fire protection system in accordance with Regulatory Position 1.7 of Regulatory Guide 1.189 directly by reference.

As stated in U.S. EPR FSAR Section 17.2, a COL applicant that references the U.S. EPR design certification will provide the Quality Assurance Programs associated with the construction and operations phase. The program description to be provided by the applicant also includes a description of the fire protection system quality assurance program to be applied during fabrication, erection, installation and operations."

Based on this change, a COL information item is not necessary to direct the applicant to provide details of the fire protection QA program. This COL action item is included in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as Combined License Information Item No. 17.2-1.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.5 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-16:

RG 1.189 Position 3.5.1.2 gives guidance for the equipment that should be provided for the fire brigade. The EPR FSAR should describe this equipment as per RG 1.189 or an appropriate COL information item should be included in the FSAR. Basis: RG 1.189 Regulatory Position 3.5.1.2; RG 1.206, Section C.III.1, Chapter 9, Section C.I.9.5.1.1

Response to Question 09.05.01-16:

The U.S. EPR FSAR Tier 2 will be revised to include guidance for the equipment that should be provided for the fire brigade.

The following paragraph will be inserted at the end of U.S. EPR FSAR Tier 2, Section 9.5.1.6.4:

"Fire brigade equipment, including personal protective equipment for structural firefighting, is provided for the plant fire brigade in accordance with Regulatory Guide 1.189. Each fire brigade member is equipped with a helmet (with face shield), turnout coat, bunker pants, footwear, gloves, protective hood, emergency communications equipment, portable lights, portable smoke removal equipment, self-contained breathing apparatus and portable extinguishers. All equipment conforms to appropriate NFPA standards and is stored in accordance with manufacturers' recommendations. An adequate inventory of firefighting equipment is maintained to outfit a full complement of brigade members with consideration of the possibility of sustained fire response operations (i.e., multiple crews)."

Based on this change, a COL information item is not necessary since the applicant will implement Section 9.5.1.6.4.

FSAR Impact:

U.S. EPR FSAR Tier 2, Section 9.5.1.6.4 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-17:

Storage of Hazmat Chemicals: RG 1.206, Reg Position C.III.1, Section C.I.9.5.1.1 identifies that the COL applicant should provide information on the fire protection operational program and procedures. RG 1.189 Position 2.1.1.b states hazmat chemicals should not be stored in areas that contain or expose equipment important to safety; however the EPR FSAR does not directly address hazardous chemicals. The EPR FSAR should state that hazmat chemicals should not be stored in areas that contain or expose equipment important to safety. Basis: RG 1.189 Regulatory Position 2.1.1.b; RG 1.206 Section C.III.1, Chapter 9, Section C.I.9.5.1.1

Response to Question 09.05.01-17:

The first paragraph under “Combustible Control Practices,” in U.S. EPR FSAR Tier 2, Section 9.5.1.6.1, will be revised to address hazardous chemicals in accordance with Regulatory Guide 1.189, Regulatory Position 2.1.1:

“Administrative procedures strictly control the use of flammable, 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.”

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 09.05.01-18:

RG 1.189 Position 2.1.1.a states that unused ion exchange resins should not be stored in areas that contain or expose equipment important to safety; however the EPR FSAR does not address storage of unused ion exchange resins. The EPR FSAR should state that unused ion exchange resins should not be stored in areas that contain or expose equipment important to safety.
Basis: RG 1.189, Regulatory Position 2.1.1

Response to Question 09.05.01-18:

The current design of the U.S. EPR considers the storage of dry ion exchange resins. Compliance with Regulatory Guide 1.189, Regulatory Position 2.1.1 is indicated in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189.

Also, U.S. EPR FSAR Tier 2, Section 9.5.1.6.1 contains the following:

"Administrative procedures strictly control the use of flammable, 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."

Note that this paragraph has been revised to reflect the enclosed response to Question 09.05.01-17.

FSAR Impact:

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

Question 09.05.01-19:

The EPR FSAR Section 9.5.1.6 describes the FP program requirements. This section states that "Implementation of the site-specific FPP described herein is the responsibility of the COL applicant." This section should reference Section 13.4 since it contains the applicable COL information item 13.4-1. Additionally, not all the operational aspects of the FP program are discussed in the U.S. EPR FSAR and, therefore, the FSAR should direct the applicant to develop a fire protection program in accordance with RG 1.189. The U.S. EPR Section 9.5.1.6 should be revised to read "Implementation of the site-specific FPP described in part herein is to be in accordance with RG 1.189 and is the responsibility of the COL applicant." Basis: RG 1.189, Regulatory Position 1.1

Response to Question 09.05.01-19:

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)."

This COL action item is included in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as Combined License Information Item No. 13.4-1.

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 09.05.01-20:

RG 1.189 states that "Emergency lighting should be provided throughout the plant as necessary to support fire suppression actions and safe-shutdown operations, including access and egress pathways to safe-shutdown areas during a fire event…. Fixed, self-contained lighting consisting of fluorescent or sealed-beam units with individual 8-hour minimum battery power supplies should be provided in areas needed for operation of safe-shutdown equipment and for access and egress routes thereto." Based on the description in EPR FSAR Sections 9.5.1 and 9.5.3, it is unclear how emergency lights are used for fire scenarios. EPR FSAR Section 9.5.1.3 should describe how the various types of emergency lights are used for fire scenarios and why it is acceptable not to rely on the guidance given in RG 1.189 to use 8 hour battery pack emergency lights. Section 9.5.1.3 should refer to Section 9.5.3 for emergency lighting details. In Table 9A-2, which contains the FHA results, Note 10 for emergency lighting does not provide any detail of what type of lighting is being provided and why it is acceptable if the lighting is not 8 hour battery backed and, therefore, the FHA analysis is incomplete. The EPR FSAR should provide emergency lighting details as described above and update Table 9A-2 as applicable. The EPR FSAR should provide a COL information item that directs the applicant to verify that emergency lighting is available throughout the plant as necessary to support fire suppression actions and safe-shutdown operations, including access and egress pathways to safe-shutdown areas during a fire event as per RG 1.189. Basis: RG 1.189 Regulatory Position 4.1.6; RG 1.206 Section C.III.1, Chapter 9, Section C.I.9.5.3

Response to Question 09.05.01-20:

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be revised to include the following information concerning emergency lighting. It will be added before the "Ventilation System Design Considerations" subsection.

"Emergency Lighting

Section 9.5.3 contains design information for the U.S. EPR lighting system.

Portable hand-held, eight-hour rated lights are provided for use by the fire brigade in accordance with Regulatory Guide 1.189, Rev. 1, Section 4.1.6.2.b. The egress route from the Main Control Room (MCR) to the Remote Shutdown Station (RSS) is illuminated by independent fixed, self-contained eight-hour rated battery powered lighting units. Other post-fire safe shutdown activities performed by operators outside the MCR and RSS are supported by independent fixed, self-contained eight-hour rated battery powered lighting units at the task location and in the access and egress routes.

An alternative approach to fixed, self-contained eight-hour rated battery powered lighting units is taken for illuminating the MCR and RSS in support of post-fire safe shutdown. Both locations are illuminated by the special emergency lighting system. The special emergency lighting system receives power from redundant emergency diesel generator-backed uninterruptible power supplies, thus providing continuous illumination. Adequate lighting is available in the MCR or RSS, as necessary, to facilitate post-fire safe shutdown of the plant."

U.S. EPR FSAR Tier 2, Table 9A-2—Fire Area Parameters, will be revised to include the following items:

dd. "Is provided by the special emergency lighting subsystem. This lighting consists of uninterruptible UPS backed lighting provided for operation of important to safety equipment."

The location (fire area) of the self-contained battery backed fixtures will be determined during performance of the final post-fire Safe Shutdown Analysis identified in the response to Question 09.05.01-2 as Combined License Information Item No. 9.5-16.

A COL information item directing the applicant to verify the adequacy of emergency lighting is not necessary. A COL applicant who references the U.S. EPR standard design certification is required to satisfy commitments and requirements in the U.S. EPR FSAR or take an exception and provide suitable justification for the departure.

FSAR Impact:

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

Question 09.05.01-21:

EPR FSAR Section 8.3.1.1.1 states "The divisional pair functional independence and physical separation are in accordance with IEEE Std 603-1998 (Reference 1) for safety-related system independence. This is accomplished by the separation of safety-related components between divisional pairs. A single failure or internal hazard, or both, in one divisional pair can only affect that one divisional pair. Therefore, during design basis accidents coincident with a single failure to any electrical component in a divisional pair, the second divisional pair supports safety-related function completion in accordance with single failure criteria IEEE Std 379-2000 (Reference 2), as endorsed by RG 1.53." EPR FSAR Section 9.5.1.2.1, Electrical System Design and Electrical Separation, should explain how fire effects on divisional pairs affect fire safe shutdown and how safe shutdown is achieved? EPR FSAR Section 9.5.1.2.1 should explain how excerpts from SECY-90-016 that concern one shutdown division free of fire damage pertains to the EPR divisional pair design. EPR FSAR Section 9.5.1.2.1 uses the term success path for safe shutdown. EPR FSAR should define what a success path is related to divisional pairs. Basis: RG 1.189 Regulatory Position 1.3 and 5; RG 1.206 Section C.III.1, Chapter 9, Section C.I.9.5.1.1 (5)

Response to Question 09.05.01-21:

U.S. EPR FSAR Tier 2, Section 8.3 identifies divisional pairs as:

First Divisional Pair—Divisions 1 and 2

Second Divisional Pair—Divisions 3 and 4

The post-fire safe shutdown analysis is not restricted to utilizing the strict divisional pair designations specified in U.S. EPR FSAR Tier 2, Section 8.3. This analysis takes advantage of the U.S. EPR N+2 design philosophy described in U.S. EPR FSAR Tier 2, Section 1.2.3.1.1. Under this design philosophy, any one division may be out of service with no associated Technical Specification limiting condition for operation (LCO) required. Of the three remaining divisions, the fire is assumed to affect one division, leaving two divisions available to support shutdown. Consequently, the divisions available may for example be Division 2 and 3, or 1 and 4, and do not need to match the divisional pair designations of U.S. EPR FSAR Tier 2, Section 8.3. For the purposes of post-fire safe shutdown, a success path is comprised of any combination of available system divisions that achieve the shutdown performance goals specified in Regulatory Guide 1.189. The divisions credited depend upon the location of the postulated fire.

The term "success path" is equivalent to the term "one shutdown division" discussed in SECY-90-016, "Evolutionary Light Water Reactor (LWR) Certification Issues and their Relationship to Current Regulatory Requirements." "Success path" is used as opposed to "one shutdown division" to eliminate any confusion with electrical divisions, as more than one electrical division may constitute "one shutdown division" depending on the location of the fire and the electrical division assumed out of service with no Technical Specification LCO applicable.

To clarify the equivalency between "success path" and "one shutdown division," the following sentence will be added to the end of the second paragraph under "Implementation of Criteria" in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1:

"The term "success path" utilized in the design of the U.S. EPR, is equivalent to the term "one shutdown division" discussed in SECY 90-016."

Refer also to the response to Question 09.05.01-24.

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.

Question 09.05.01-22:

EPR FSAR Section 9.5.1.2.1, Electrical System Design and Electrical Separation, states that "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. 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." The EPR FSAR should state what the fire ratings of these non-combustible, fire resistive cable ducts are and if they are not 3-hour rated what are the additional features in these areas that would justify not having 3-hour rated ducts. The EPR FSAR should add a COL information item to provide specific design and certification testing details for these ducts in accordance with NFPA 251, ASTM E-119, and the guidance in RG 1.189. Basis: RG 1.189, Regulatory Position 4.2 and 4.3

Response to Question 09.05.01-22:

The subject non-combustible cable ducts have a minimum fire resistance rating of three hours. The second bullet under "Electrical System Design and Electrical Separation," in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, will be changed to:

"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 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 cable ducts, having a minimum fire resistance rating of three hours."

U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, under "Architectural and Structural Features," specifies:

"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."

Compliance with Regulatory Guide 1.189, Regulatory Position C.4.2, Passive Fire-Resistive Features, and Regulatory Position C.4.3, Testing and Qualification of Electrical Raceway Fire Barrier Systems, is indicated in U.S. EPR FSAR Tier 2, Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189.

A COL information item providing specific design and certification testing details for these ducts is not necessary. A COL applicant who references the U.S. EPR standard design certification is required to satisfy commitments and requirements in the U.S. EPR FSAR or take an exception and provide suitable justification for the departure.

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.

Question 09.05.01-24:

The EPR FSAR states that "Operator manual actions associated with the credited shutdown success path are not required to achieve and maintain HSB." The EPR FSAR should clarify what constitutes a success path. For example, does the success path include flow diversion paths directly connected to the main shutdown train and systems/components that are not part of the primary shutdown train but whose spurious actuation could adversely impact the ability of the primary shutdown train to perform its required post-fire safe-shutdown function? Basis: RG 1.189 Regulatory Position 5.

Response to Question 09.05.01-24:

The design of the U.S. EPR employs the same definition of the term "success path" as that defined in Regulatory Guide 1.189, Rev. 1:

"Success Path—The minimum set of structures, systems (including power, instrument, and control circuits and instrument sensing lines) and components that must remain free of fire damage in order to achieve and maintain safe shutdown in the event of a fire. Success path is synonymous with the safe-shutdown 'train free of fire damage' and includes electrical circuits whose fire-induced failure could prevent safe shutdown."

For any given fire area, multiple success paths may be available to operators.

Given that the U.S. EPR FSAR utilizes this term in the same context as Regulatory Guide 1.189, Rev. 1, no change is warranted to the U.S. EPR FSAR.

FSAR Impact:

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

Question 09.05.01-25:

The applicant should develop ITAAC to verify that, under seismic loads, the fire protection standpipe systems will remain functional in areas containing safety-related SSCs. The EPR FSAR should add an ITAAC for verification that the fire protection standpipe systems will withstand seismic loads. Basis: RG 1.206 Section C.II.1.2.2 and Appendix C.II.1-A, Fluid Systems, Section II.F, page C.II.1-A-6

Response to Question 09.05.01-25:

U.S. EPR FSAR Tier 1, Section 2.7.5, Design Commitment 7.7, and U.S. EPR FSAR Tier 1, Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses and Acceptance Criteria, ITAAC No. 7.7, will be revised to provide additional details of the fire protection standpipe and hose systems under seismic loads.

FSAR Impact:

U.S. EPR Tier 1, Section 2.7.5 and Table 2.7.5-3, will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-26:

The applicant should develop ITAAC to verify separation and independence of redundant electrical equipment, circuits, and cabling for post fire safe shutdown. The ITAAC should include analyses to verify equipment short-circuit capability and breaker coordination, and the relevant sections of the COL application should describe those analyses. The EPR FSAR should add an ITAAC for verification of post fire safe shutdown separation, isolation, and electrical coordination. The EPR FSAR should also add an ITAAC for the remote shutdown station (RSS) being electrically isolated from the MCR. Basis: RG 1.206 Section C.II.1.2.6, Appendix C.II.1-A, Electrical Systems, Section II.B, page C.II.1-A-21, and Appendix C.II.1-A, Electrical Systems, Section II.D, page C.II.1-A-22

Response to Question 09.05.01-26:

U.S. EPR FSAR Tier 1, ITAAC Nos. 2.1.1-4.4 and 2.1.1-4.7 will be revised to verify the post-fire safe shutdown analysis indicates at least one success path comprised of the minimum set of structures, systems or components (SSC) is available for safe shutdown. For any given fire area, multiple success paths may be available, so details of a particular set of SSC success paths are not provided in Tier 1. Per the requirements of RG 1.189, Rev. 1, Section 5, an associated circuit review that includes consideration of short circuits and breaker coordination is required as part of the post-fire safe shutdown analysis.

Control of equipment required for safe shutdown is performed using the safety information and control system (SICS) and process information and control system (PICS).

U.S. EPR FSAR Tier 1, Section 2.4.2 and Table 2.4.2-2—Safety Information and Control System ITAAC; and U.S. EPR FSAR Tier 1, Section 2.4.10 and Table 2.4.10-1—Process Information and Control System ITAAC will be revised to include ITAAC for electrical isolation between the remote shutdown station (RSS) and the main control room (MCR).

FSAR Impact:

U.S. EPR Tier 1, Sections 2.4.2 and 2.4.10, and Tables 2.4.2-2 and 2.4.10-1, will be revised as described in the response and indicated on the enclosed markup.

U.S. EPR FSAR Tier 1, Table 2.1.1-7 will be revised as described in the response.

Question 09.05.01-27:

a) The applicant should develop ITAAC to require as-built plant reports for reconciliation with post-fire safe shutdown analyses to ensure consistency with design requirements of SSCs for fire protection and mitigation (e.g., fire detection and alarm systems, fire suppression systems, fire barriers). EPR FSAR should add an ITAAC as stated above for verification of as-built fire detection systems and fire suppression systems.

b) The EPR FSAR should also add an ITAAC for the fire pumps that verifies that each pump is 100% capacity.

Basis: RG 1.206 Section C.II.1.2.7

Response to Question 09.05.01-27:

a) U.S. EPR FSAR Tier 1, Table 2.4.6-2—Plant Fire Alarm System ITAAC, Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses and Acceptance Criteria and Table 2.7.6-1—Gaseous Fire Extinguishing System Inspections, Tests, Analyses and Acceptance Criteria will be revised to include new ITAAC for reconciliation with the post-fire safe shutdown analysis. U.S. EPR FSAR Tier 1, Section 2.7.3 (Sprinkler Systems) was screened for safety significant design features for inclusion into Tier 1 and determined to be “no Tier 1 entries for this system.” It requires no revision.

b) U.S. EPR FSAR Tier 1, Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses and Acceptance Criteria, ITAAC No. 7.2 will be revised to provide additional details on fire pump capacities.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.4.6 and Table 2.4.6-2; Section 2.7.5 and Table 2.7.5-3; and Section 2.7.6 and Table 2.7.6-1 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-28:

Hazard Protection Features:

a) EPR FSAR should add an ITAAC for combustible liquid spill mitigation barriers such as curbs or walls.

b) EPR FSAR should add an ITAAC for Emergency Light Battery Pack.

c) EPR FSAR should add an ITAAC for the RCP Oil Collection System.

Basis: RG 1.206 Appendix C.II.1-A, Fluid Systems, Section I.A.(3) page C.II.1-A-2

Response to Question 09.05.01-28:

a) The U.S. EPR has four safety divisions. Divisional separation is safety significant for the U.S. EPR and is addressed in U.S. EPR FSAR Tier 1, Section 2.1.1, ITAAC Nos. 2.1.1-4.4 and 2.1.1-4.7. Fire protection features within a division, however, such as combustible liquid spill mitigation barriers are not safety significant for the U.S. EPR. Therefore, ITAAC for combustible liquid spill mitigation barriers have not been included in Tier 1.

b) An ITAAC for the Emergency Light Battery Pack was created as part of the response to Question 09.05.03-13 of RAI No. 19. The new design commitment and associated ITAAC is in U.S. EPR FSAR Tier 1, Section 2.5.9.

c) 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.

FSAR Impact:

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

Question 09.05.01-29:

EPR FSAR should add an ITAAC for verification of fully automatic closure of fire dampers in ductwork that penetrates fire barriers that are required to protect SSCs that are important to safety. Basis: RG 1.206 Appendix C.II.1-A, Fluid Systems, Section II.M, page C.II.1-A-7

Response to Question 09.05.01-29:

The U.S. EPR has four safety divisions. Divisional separation is safety significant for the U.S. EPR and is addressed in U.S. EPR FSAR Tier 1, Section 2.1.1, ITAAC Nos. 2.1.1-4.4 and 2.1.1-4.7. Acceptance criteria to test the closure of dampers between divisions will be added to U.S. EPR FSAR Tier 1, Section 2.1.1, ITAAC Nos. 2.1.1-4.4 and 2.1.1-4.7.

Dampers within a division, however, are not safety significant since the U.S. EPR design has four safety divisions. Therefore, ITAAC items are not needed for fire dampers within a division.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.1 and Table 2.1.1-7 will be revised as described in the response.

Question 09.05.01-30:

The FSAR should identify any post-fire safe-shutdown operator manual actions credited by design and state whether the COL applicant will have the option of crediting operator manual actions that are not identified in the FSAR. If operator manual actions are permitted by the COL applicant, the acceptance criteria for the actions should be stated in the FSAR. If operator manual actions are credited for post-fire safe-shutdown for the certified design, an ITAAC item should be included to verify the feasibility and reliability of the actions. Basis: RG 1.206 Appendix C.II.1-A, Electrical Systems, Section II.D, page C.II.1-A-22

Response to Question 09.05.01-30:

As identified in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1, an operator manual action is defined as “an action that takes place outside of the main control room (MCR) in support of achieving and maintaining hot standby (HSB) from within the MCR.” This section further states that “operator manual actions associated with the credited shutdown success path are not required to achieve and maintain HSB.”

Given the above, a COL applicant does not need to implement any site-specific operator manual actions to achieve and maintain HSB conditions; therefore, a COL information item is not required. An ITAAC item to verify the feasibility and reliability of credited operator manual actions is not warranted, since no actions are identified.

FSAR Impact:

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

Question 09.05.01-31:

Fire barriers - The design descriptions should include the fire ratings of divisional walls, floors, doors, and penetrations. EPR FSAR should add an ITAAC to verify that fire barrier testing, qualification and installation, including penetration closures, meet the design. Bases: RG 1.206 Appendix C.II.1-A, Building Structures, Section II.C, page C.II.1-A-23, and Appendix C.II.1-A, Building Structures, Section II.E, page C.II.1-A-23 and RG 1.189 Regulatory Position 4.1.3.3

Response to Question 09.05.01-31:

U.S. EPR FSAR Tier 1, ITAAC Nos. 2.1.1-4.4 and 2.1.1-4.7, address divisional fire barriers. ITAAC No. 2.1.1-4.4 will be revised to provide additional details on fire barriers. ITAAC No. 2.1.1-4.7 already includes an analysis and inspection of barriers, doors, dampers and penetrations, so ITAAC No. 2.1.1-4.7 requires no revision.

FSAR Impact:

U.S. EPR FSAR Tier 1, Section 2.1.1 and Table 2.1.1-7 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-32:

EPR FSAR FHA (Appendix 9A) does not indicate when automatic detection or suppression is provided. EPR FSAR FHA should provide the conditions when automatic detection or suppression is required. Basis: Clarification of design

Response to Question 09.05.01-32:

The U.S. EPR FSAR Fire Protection Analysis (Appendix 9A) indicates the presence of automatic detection and suppression on a fire area-by-fire area basis through reference to U.S. EPR FSAR Tier 2, Table 9A-2—Fire Area Parameters. The conditions that dictate the need for automatic detection or suppression are derived from the guidance provided by Regulatory Guide 1.189, Rev. 1, as determined by the Fire Hazards Analysis (FHA). In accordance with Appendix A of the Standard Review Plan (NUREG-0800), fire protection systems and features are consistent with RG 1.189 criteria to the extent the FHA deems necessary.

FSAR Impact:

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

Question 09.05.01-33:

EPR FSAR Section 9.5.1.2.1, Fire Detection and Alarm System, Fire Water Supply System, Automatic Fire Suppression Systems, and Manual Fire Suppression Systems subsections contain a statement that deviations from the requirements of these standards are justified. The EPR FSAR should summarize these deviations and provide the justification for these deviations in Section 9.5.1.2.1. Basis: Clarification of design.

Response to Question 09.05.01-33:

The subject statement was included in U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 to capture anticipated code deviations that are expected to occur during design activities performed by the COL applicant. To date, no specific code deviations have been identified. U.S. EPR FSAR Tier 2, Section 9.5.1.2.1 will be revised to provide clarification.

Future identified code deviations will be acknowledged and justified in the Fire Hazards Analysis (FHA), and performed by the COL applicant as part of the final FHA. This COL action item is included in U.S. EPR FSAR Tier 2, Table 1.8-2—U.S. EPR Combined License Information Items as Combined License Information Item No. 9.5-16. Refer to response to Question 09.05.01-2.

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.

Question 09.05.01-34:

EPR FSAR Section 9.5.1.5 states that “The fire PRA results are used as input to the FPA to screen or rank plant fire areas based on the risk significance (i.e., net affect on CDF / LERF) of fire-induced consequences within the area under consideration.” The EPR FSAR should describe how these results are used in the FHA (e.g., what is the criteria for screening, are any fire protection features eliminated based on the PRA results, were any high risk significant areas identified and what, if any, changes were made to reduce the risk significance to an acceptable level, etc.). Basis: Clarification of design

Response to Question 09.05.01-34:

A conservative fire PRA was developed which satisfies the requirements of 10 CFR 52.47(a)(v). According to U.S. EPR FSAR Tier 2 Section 19.1.5.3.1.1, the conservative fire PRA concludes that the overall CDF/LRF, as a result of a more detailed internal fire evaluation, will not change the conclusion that the overall CDF/LRF meets the U.S. EPR design objective. Consequently, the results of the fire PRA were not used as input to the Fire Protection Analysis. Additionally, no fire protection features required by Regulatory Guide 1.189 were eliminated as a result of the fire PRA, and no fire protection features were added as a result of the fire PRA.

U.S. EPR FSAR Tier 2 Section 9.5.1.5 will be revised to provide clarification.

FSAR Impact:

U.S EPR FSAR Tier 2 Section 9.5.1.5 will be revised as described in the response and indicated on the enclosed markup.

Question 09.05.01-35:

EPR FSAR Table 9.5.1-1, Fire Protection Program Compliance with Regulatory Guide 1.189, for RG Sections C.4.1.2.1, C.4.1.3.3, C.4.1.3.4, C.4.1.3.6, C.6.1.3, C.6.1.4, and C.6.1.5 indicate an alternate compliance but do not provide a summary of these compliance issues for review. EPR FSAR should summarize these deviations and provide the justification for these deviations in Section 9.5.1.2.1. Basis: Clarification of design.

Response to Question 09.05.01-35:

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. This new section will address RG Sections C.4.1.2.1, C.4.1.3.3, C.4.1.3.6, C.6.1.3, C.6.1.4 and C.6.1.5. U.S. EPR FSAR Tier 2, Table 9.5.1-1 will be revised to reflect this new section.

The entry in Table 9.5.1-1 for C.4.1.3.4 indicates “compliance” so no justification is needed.

The entry in Table 9.5.1-1 for C.6.1.4 was incorrectly indicated as “alternate compliance.” The interfaces for the digital control system for each of the four safety divisions are located in the instrumentation and control cabinet rooms in each of the Safeguard Buildings and are separated from each other by three-hour fire barriers. This entry has been changed to “compliance.”

FSAR Impact:

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

Question 09.05.01-36:

EPR FSAR Section 9.5.1.2.1 states that "The U.S. EPR utilizes cables throughout the plant that have passed the flame propagation criteria of IEEE Std 1202. Self-ignition of these electrical cables is not considered credible because of the protective devices (e.g., fuses, circuit breakers) provided and analyzed to be properly sized. While these cables are still considered combustible, they will not propagate fire unless subjected to an external fire involving other combustibles in the vicinity of the cable trays. In this case, the fire stops would be of little, if any value in stopping the spread of fire. Fire stops would not stop the spread of fire in the area of influence of the exposure fire (i.e., area of the fire where temperatures are high enough to propagate fire along the cable trays) because they are only designed to prevent fire spread in the cable trays. Also, the IEEE Std 1202 qualified cables outside of the area of influence of the exposure fire would keep the fire from propagating and essentially serve the same purpose as the fire stops." What fire stops does the EPR design provide for? What are the fire tests that support not using fire stops are per RG 1.189 especially in vertical runs of cable? Bases: RG 1.189 Regulatory Position 4.2.3.3

Response to Question 09.05.01-36:

As defined by the NRC staff in BTP CMEB 9.5-1, Revision 2, the term "fire stop" is "a feature of construction that prevents fire propagation along the length of cables or prevents spreading of fire to nearby combustibles *within a given fire area or fire zone.*"

The U.S. EPR design does not utilize fire stops to prevent fire propagation along cables routed in cable trays (horizontal or vertical) located within a given fire area or fire zone. It is important to recognize that penetrations through fire area boundaries (i.e., walls, floors and ceilings), containing electrical cables routed in trays, conduits or free air will be sealed with fire-rated penetration seal assemblies having a fire rating commensurate with that of the fire area boundary itself.

The U.S. EPR design utilizes electrical cable construction that has met the acceptance criteria of the IEEE 1202 test standard (or an equivalent standard) for prevention of flame propagation. IEEE 1202 is a vertical flame propagation test protocol. A vertical cable orientation represents a more severe fire test exposure than a horizontal cable orientation. Moreover, the NRC RES Fire Research Branch has stated, "The FT-4 / Vertical Flame Test, included in standard[s] IEEE 1202-1991…is the most rigorous of the 20kW (70000 BTU/hr) tests…What makes this test the most difficult to pass of the 20kW (70000 BTU/hr) tests is its low acceptable damage length of 4.9 ft (1.5m)."[1] Therefore, the ability of cables qualified to the IEEE 1202 test standard (or an equivalent standard) to prevent fire propagation effectively precludes the need for fire stops to prevent the spread of fire along the length of cables routed in trays located within a given fire area or zone.

Furthermore, the guidance provided in Regulatory Guide 1.189 for fire stops (Regulatory Position 4.2.3.3) first appeared in Revision 0 of the regulatory guide. Investigation into the

[1] Response to NRR FAQ 06-0022, "Guidance on Standards and Flame Propagation Tests," U.S. Nuclear Regulatory Commission RES Fire Research Branch, June 21, 2007

history of this requirement reveals that the need for fire stops, as specified in Regulatory Guide 1.189, originally appeared in BTP APCSB 9.5-1, Revision 0. These requirements were clarified in BTP APCSB 9.5-1, Revision 1. Ultimately, the requirements for fire stops were deleted by the omission of such requirements in BTP CMEB 9.5-1, Revision 2. Therefore, existing nuclear power generating stations committed to BTP CMEB 9.5-1 are not required to have fire stops installed.

The reemergence of the requirements for fire stops as specified in Regulatory Guide 1.189 (Regulatory Position 4.2.3.3) appears to be attributable to the comprehensive nature of RG 1.189. The use of fire stops would have been a prudent practice for facilities under construction during the inception of the BTP due to the potential for use of non-IEEE 383 type cables which could propagate fire without direct flame impingement from an outside source. However, improvements in cable technology, including fire resistant compounds, and the use of IEEE 1202 (or equivalent) qualified cable in the design of the U.S. EPR alleviates the need for fire stops.

FSAR Impact:

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

U.S. EPR Final Safety Analysis Report Markups

2.0 Arrangement

2.1 The as-installed basic configuration of the NI structures is as described in Section 2.1.1, 1.0 Description, and as shown on Figures 2.1.1-1, 2.1.1-3—Reactor Building, 2.1.1-4, and 2.1.1-5.

3.0 Key Design Features

3.1 The basic configuration of the NI structures includes: (a) an integrated contiguous barrier (b) decoupling of SBs 2 and 3 and the FB from their respective structures at their exterior walls along the entire wall length and at the SBs 2 and 3 upper ceiling and (c) SBs 2 and 3 decoupling from the RSB above elevation 0 feet, 0 inches as described in Section 2.1.1, and as shown on Figures 2.1.1-1, 2.1.1-2, 2.1.1-4, 2.1.1-6, 2.1.1-8 and 2.1.1-10—Fuel Building - View 2.

3.2 Six rib support structures, provided at the bottom of the reactor cavity, as shown on Figure 2.1.1-13—Concrete Barriers and Rib Support Structures, limit lower reactor pressure vessel head deformation due to thermal expansion and creep during severe accident mitigation.

3.3 As described in Table 2.1.1-3—Spreading Area Water Ingression Barrier a flooding wall is provided to prevent ingress of water into the core melt spreading area. This wall includes a watertight door that provides entry to the venting shaft of the spreading area.

3.4 Core melt cannot relocate to the upper containment due to the existence of concrete barriers as shown on Figure 2.1.1-13.

4.0 Mechanical Design Features, Seismic 1E Classifications

4.1 The NI site grade level is located at elevation 0 feet, 0 inches as indicated on Figures 2.1.1-7—SB 1, 2.1.1-8, 2.1.1-9—SB 4, and 2.1.1-10.

4.2 The NI as-installed basic configuration structural supports, including critical sections, are Sseismic Category I and are constructed to withstand design basis loads without loss of structural integrity and safety-related functions. The design basis loads are those loads associated with:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrostatic, hydrodynamic, and temperature loads).
- External events (including rain, snow, flood, tornado, tornado-generated missiles, earthquake, aircraft hazard, and explosion pressure wave).

4.3 The RCB is designed to retain its pressure boundary integrity associated with the design pressure.

4.4 The as-installed basic configuration of the NI structures, as described in Section 2.1.1, 1.0 Description and as indicated in Table 2.1.1-1—Separation For Internal Hazards separates the four SBs and separates the FB from other NI structures so that the impact of internal hazards including fire, flooding, and high energy line break is contained within the SB or FB of hazard origination.

09.05.01-31

Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance Criteria (~~5~~6 Sheets)

09.05.01-31

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
4.1	The NI site grade level is located at elevation 0’ 0” as indicated on Figures 2.1.1-7, 2.1.1-8, 2.1.1-9 and 2.1.1-10	An inspection of the as-installed NI site grade level will be performed.	The as-installed NI site grade level is located at elevation 0’ 0” as indicated on Figures 2.1.1-7, 2.1.1-8, 2.1.1-9, and 2.1.1-10.
4.2	The NI structures are seismic Category I and are constructed to withstand design basis loads as specified in Section 2.1.1, without loss of structural integrity.	A verification inspection of the NI structures design analysis versus construction records will be performed.	NI structures conform to the approved design and will withstand the design basis loads specified in Section 2.1.1, without loss of structural integrity.
4.3	The RCB as described in Section 2.1.1, and its penetrations as described in Section 3.5, Containment Isolation, retain their pressure boundary integrity associated with the RCB design pressure	A hydrostatic or pressure test will be performed on the components required by the ASME Code Section III to be tested.	Components identified in Table 3.5.1-1 as ASME Code Section III, conform with the requirements of the ASME Code Section III, Division 2, Section CC-6410.
4.4	The as-installed basic configuration of the NI structures, as described in Section 2.1.1 and Table 2.1.1-1, separates the four SBs and separates the FB from other NI structures so that the impact of internal hazards is contained in the SB or FB of hazard origination.	(a)An inspection of the as-installed basic configuration of the NI structures will be performed. (b)An analysis will be performed. (c)Inspection of barriers, doors, dampers and penetrations that separate the four SBs and that separate the FB from other NI structures will be performed.	(a)The as-installed basic configuration of the NI structures provides separation as described in Table 2.1.1-1. (b)Completion of analysis that indicates barriers, doors, dampers, and penetrations that separate the four SBs and that separates the FB from other NI structures have a minimum 3-hour fire rating. (c)The as-built configuration of barriers, doors, dampers and penetrations that separate the four SBs and that separate the FB from other NI structures agrees with construction drawings.

09.05.01-31

Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance Criteria (~~5~~6 Sheets)

09.05.01-31

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
		(d)Testing of dampers that separate the four SBs and that separatw the FB from other NI structures will be performed. (e)An analysis will be performed.	(d)Dampers close. (e)Completion of the post-fire safe shutdown analysis indicates that at least one success path comprised of the minimum set of SSC is available for safe shutdown.
4.5	The NI structures include barriers for post-accident radiation shielding, as described in Section 2.1.1 and in Table 2.1.1-2.	An inspection of the as-installed NI accident radiation barriers will be performed.	The as-installed NI structures barriers that provide post-accident radiation shielding are as described in Table 2.1.1-2.
4.6	As described in Section, 2.1.1, the RSB and RCB are constructed of reinforced concrete and the RCB is pre-stressed.	Inspection of the RSB and RCB construction records will be performed.	The RSB and RCB are constructed of reinforced concrete and the RCB is pre-stressed.
4.7	As described in Section 2.1.1, the RBA is separated from the SBs and the FB by barriers, doors, dampers and penetrations that have a minimum 3-hour fire rating.	(a)An analysis will be performed. (b)Inspection of barriers, doors, dampers and penetrations that separate the RBA from the SBs and FB will be performed.	(a)Completion of analysis that indicates barriers, doors, dampers, and penetrations that separate the RBA from the SBs and FB have a minimum 3-hour fire rating. (b)The as-built configuration of barriers, doors, dampers and penetrations that separate the RBA from the SBs and FB agrees with construction drawings.
		(c)Testing of dampers that separate the RBA from the SBs and FB will be	(c)Dampers close.

09.05.01-31

Table 2.1.1-7—Nuclear Island Inspections, Tests, Analyses, and Acceptance Criteria (~~5~~6 Sheets)

09.05.01-31

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
		performed. (d)An analysis will be performed.	(d)Completion of the post-fire safe shutdown analysis indicates that at least one success path comprised of the minimum set of SSC is available for safe shutdown.
4.8	As described in Section 2.1.1, and shown on Figures 2.1.1-11 and 2.1.1-12, provisions are provided for water flow to the IRWST.	Inspection of the RCB will be performed.	The as-installed RCB configuration includes the following provisions: • As shown on Figure 2.1.1-11 rooms UJA11 002, UJA11 005, UJA11 006, and UJA11 009 contain trapezoidal-shaped openings in the floor and are provided with weirs and trash racks. • As shown on Figure 2.1.1-12, Rooms UJA07 014 and UJA07 015 contain wall openings slightly above the floor to allow water flow into the IRWST.
4.9	Essential ~~SSCs~~SSC in RCB rooms listed in Table 2.1.1-4 are protected from the dynamic effects of pipe breaks.	An analysis will be performed that indicates essential ~~SSCs~~SSC in RCB rooms listed in Table 2.1.1-4 are protected from the dynamic effects of pipe breaks.	Essential ~~SSCs~~SSC in RCB rooms listed in Table 2.1.1-4 are protected from the dynamic effects of pipe breaks.
4.10	As described in Section 2.1.1, RBA penetrations that contain high energy pipelines have guard pipes, as described in Table 2.1.1-5.	Inspection of the RBA will be performed.	RBA penetrations that contain high energy pipelines have guard pipes, as described in Table 2.1.1-5.
4.11	As described in Section 2.1.1, safety-related ~~SSCs~~SSC in the RBA are located above the structural	Inspection of the RBA will be performed.	Safety-related ~~SSCs~~SSC in the RBA are located above elevation 0' 0".

4.5 The SICS hardware and software are developed using a design process with the following life cycle phases:

- Basic design phase.
- Detailed design phase.
- Manufacturing phase.
- Testing phase.
- Installation and commissioning phase.

09.05.01-26

4.6 Electrical isolation is provided between the RSS and the MCR for the SICS.

5.0 Electrical Power

5.1 The equipment identified as Class 1E in Table 2.4.2-1 receives power from a Class 1E power source.

6.0 System Inspections, Tests, Analyses, and Acceptance Criteria

6.1 Table 2.4.2-2—Safety Information and Control System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the SICS.

Table 2.4.2-2—Safety Information and Control System ITAAC
(3 Sheets)

	Commitment Wording	Inspection, Test or Analysis	Acceptance Criteria
			the design outputs of the manufacturing phase of the SICS hardware and software design process. 4a) A report exists and provides the design outputs of the testing phase of the SICS hardware and software design process. 4b) A V&V report exists that address the Test Activity and concludes that the design outputs generated in the testing phase conform to the requirements of this phase. 5a) A report exists and provides the design outputs of the installation and commissioning phase of the SICS hardware and software design process. 5b) A V&V report exists that addresses the Installation and Checkout Activity summary report, if required, for any changes following testing phase and concludes that the design outputs generated in the installation and commissioning phase conform to the requirements of this phase.
4.6	Electrical isolation is provided between the RSS and the MCR for the SICS.	An inspection will be performed.	Electrical isolation is provided between RSS and the MCR for the SICS.
5.1	The equipment identified as Class 1E in Table 2.4.2-1 receives power from a Class 1E power source.	Inspections will be performed to verify the source of power for Class 1E equipment.	The Class 1E equipment listed in Table 2.4.2-1 is powered from a Class 1E power source.

09.05.01-26

Next File

2.4.6 Plant Fire Alarm System

1.0 Description

The plant fire alarm system (PFAS) is a non-safety related alarm signaling system which provides control and monitoring of plant fire protection, suppression and detection system parameters.

The PFAS provides the following non-safety related functions:

- Provides a fire alarm management interface to the operators.
- Controls and monitors plant fire suppression and detection systems.
- Provides the main control room (MCR) operators with information displays and supports automatic and manual control of fire protection equipment.

2.0 I&C Design Features, Displays and Controls

2.1 The PFAS provides the displays listed in Table 2.4.6-1—Plant Fire Alarm System Displays and Alarms – Main Control Room and Remote Shutdown Station.

09.05.01-27

2.2 The as-built plant fire alarm system is consistent with the post-fire safe shutdown analyses.

3.0 Electrical Power

3.1 The PFAS is provided with both an electrically supervised primary and secondary power source that will transfer automatically to the secondary power source upon loss of the primary source. A trouble signal indication is provided in the MCR upon a loss of either power source to any local fire control panel (LFCP) or workstation.

4.0 System Inspections, Tests, Analyses, and Acceptance Criteria

4.1 Table 2.4.6-2—Plant Fire Alarm System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the PFAS.

Table 2.4.6-2—Plant Fire Alarm System ITAAC			
Commitment Wording		**Inspection, Test or Analysis**	**Acceptance Criteria**
2.1	The PFAS provides the displays listed in Table 2.4.6-1. 09.05.01-27	Testing will be performed to verify the existence of the displays on PICS at the MCR and the RSS as listed in Table 2.4.6-1.	(1) The displays listed in Table 2.4.6-1 exist on the PICS in the MCR and the RSS. (2) Turbine Building alarm system signals also displayed at PFAS with same signals listed in Table 2.4.6-1.
2.2	The as-built plant fire alarm system is consistent with the post-fire safe shutdown analyses.	An inspection will be performed.	An inspection report documents that the as-built plant fire alarm system is consistent with the post-fire safe shutdown analysis.
3.1	The PFAS is provided with both an electrically supervised primary and secondary power source that will transfer automatically to the secondary source upon loss of the primary source. A trouble signal indication is provided in the MCR upon a loss of either power source to any LFCP or workstation.	Tests will be performed on the transfer of power of the PFAS from the primary source of power to the secondary source. Testing will be performed to verify the existence of a trouble signal indication in the MCR when either the primary or secondary power source is lost at any LFCP or workstation.	(1) The PFAS is provided with an electrically supervised primary and secondary power source that will transfer automatically to the secondary source upon loss of the primary source. (2) A trouble signal indication is provided in the MCR upon a loss of either power source to any LFCP or workstation.

Next File

2.4.10 Process Information and Control System

1.0 Description

The process information and control system (PICS) is a digital human machine interface (HMI). It provides monitoring and control of plant systems. The PICS is non-safety related and is provided in both the main control room (MCR) and the remote shutdown station (RSS).

2.0 I&C Design Features

2.1 The PICS consists of hardware that is diverse from the safety-related hardware of the Safety Information and Control System (SICS).

2.2 The PICS consists of software that is diverse from the safety-related software of the Safety Information and Control System (SICS).

2.3 The PICS consists of displays that are diverse from the safety-related Qualified Display System (QDS) of the Safety Information and Control System (SICS).

09.05.01-26

2.4 Electrical isolation is provided between the RSS and the MCR for the PICS.

3.0 System Inspections, Tests, Analyses, and Acceptance Criteria

3.1 Table 2.4.10-1—Process Information and Control System ITAAC specifies the inspections, tests, analyses, and acceptance criteria for the PICS.

Table 2.4.10-1—Process Information and Control System ITAAC

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
2.1	The PICS consists of hardware that is diverse from the safety related hardware of the SICS.	An inspection will be performed on documentation that provides an analysis on the diversity between the PICS hardware and the safety related hardware of the SICS.	A report exists and concludes that the PICS consists of hardware that is diverse from the safety related hardware of the SICS.
2.2	The PICS consists of software that is diverse from the safety related software of the SICS.	An inspection will be performed on documentation that provides an analysis on the diversity between the PICS software and the safety related software of the SICS.	A report exists and concludes that the PICS consists of software that is diverse from the safety related software of the SICS.
2.3	The PICS consists of displays that are diverse from the safety related Qualified Display System (QDS) of the Safety Information and Control System (SICS).	An inspection will be performed on documentation that provides an analysis on the diversity between the PICS displays and the safety related Qualified Display System (QDS) of the Safety Information and Control System (SICS).	A report exists and concludes that the PICS consists of displays that are diverse from the safety related Qualified Display System (QDS) of the Safety Information and Control System (SICS).
2.4	Electrical Isolation is provided between the RSS and the MCR for the PICS.	An inspection will be performed.	Electrical isolation is provided between RSS and the MCR for the PICS.

09.05.01-26

Next File

4.3 Actuators listed as being controlled by a ~~Priority~~ priority and ~~Actuation~~actuator ~~and Control~~ control ~~System~~ system (PACS) module in Table 2.7.5-2 are controlled by a PACS module. 09.05.01-27

4.4 The as-built fire water distribution system is consistent with the post-fire safe shutdown analysis.

5.0 Electrical Power Design Features

5.1 The components designated as Class 1E in Table 2.7.5-2 are powered from the Class 1E division as listed in Table 2.7.5-2 in a normal or alternate feed condition.

5.2 Valves listed in Table 2.7.5-2 fail as-is on loss of power.

6.0 Environmental Qualifications

6.1 Electrical drivers for equipment listed in Table 2.7.5-2 for harsh environment can perform the safety function in Table 2.7.5-1 following exposure to the design basis environments for the time required.

7.0 Equipment and System Performance

7.1 The FWDS includes two separate fresh water storage tanks.

7.2 Site FWDS pumps consist of at least one electric motor-driven and one diesel engine-driven pump.

7.3 FWDS pumps have sufficient net positive suction head absolute.

7.4 Class 1E valves listed in Table 2.7.5-2 can perform the function listed in Table 2.7.5-1 under system design conditions.

7.5 The FWDS provides for flow testing of the FWDS pumps during plant operation.

7.6 Containment isolation valves listed in Table 2.7.5-1 close within the containment isolation response time following initiation of a containment isolation signal. 09.05.01-25

7.7 ~~The FWDS standpipe and hose systems are capable of supplying two hose stations.~~The standpipe and hose systems in areas containing systems and components required for safe plant shutdown in the event of a safe shutdown earthquake (SSE), including the water supply to these standpipes, are capable of remaining functional and supplying two hose stations following an SSE.

8.0 Interface Information

8.1 The raw water supply system (RWSS) delivers makeup water to the FWDS fire water storage tanks.

9.0 Inspections, Tests, Analyses, and Acceptance Criteria

9.1 Table 2.7.5-3 specifies the inspections, tests, analyses, and acceptance criteria for the FWDS.

Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
4.3	Actuators listed as being controlled by a PACS module in Table 2.7.5-2 are controlled by a PACS module.	A test will be performed using test signals for the actuators being controlled by a PACS module as listed in Table 2.7.5-2.	The actuators listed as being controlled by a PACS module in Table 2.7.5-2 actuate to the state requested by the signal.
4.4	The as-built fire water distribution system is consistent with the post-fire safe shutdown analyses.	An inspection will be performed.	An inspection report documents that the as-built fire water distribution system is consistent with the post-fire safe shutdown analysis.
5.1	The components designated as Class 1E in Table 2.7.5-2 are powered from the Class 1E division as listed in Table 2.7.5-2 in a normal or alternate feed condition.	a. Testing will be performed for components designated as Class 1E in Table 2.7.5-2 by providing a test signal in each normally aligned division. b. Testing will be performed for components designated as Class 1E in Table 2.7.5-2 by providing a test signal in each division with the alternate feed aligned to the divisional pair.	a. The test signal provided in the normally aligned division is present at the respective Class 1E component identified in Table 2.7.5-2. b. The test signal provided in each division with the alternate feed aligned to the divisional pair is present at the respective Class 1E component identified in Table 2.7.5-2.
5.2	Valves listed in Table 2.7.5-2 fail as-is on loss of power.	Testing will be performed for the valves listed in Table 2.7.5-2 to fail as-is on loss of power.	Following loss of power, the valves listed in Table 2.7.5-2 fail as-is.

09.05.01-27

Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
6.1	Components listed as Class 1E in Table 2.7.5-2 that are designated as harsh environment will perform the function listed in Table 2.7.5-1 in the environments that exist before and during the time required to perform their safety function.	a. Type tests, tests, analyses or a combination of tests and analyses will be performed. b. For equipment listed for harsh environment in Table 2.7.5-2, an inspection will be performed of the as-installed Class 1E equipment and the associated wiring, cables and terminations.	a. A report exists and concludes that the Class 1E equipment listed for harsh environment in Table 2.7.5-2 can perform the function listed in Table 2.7.5-1 before and during design basis accidents for the time required to perform the listed function. b. Inspection concludes the as-installed Class 1E equipment and associated wiring, cables, and terminations as listed in Table 2.7.5-2 for harsh environment conform to the design.
7.1	The FWDS includes two separate fresh water storage tanks.	An inspection of the as-built capacity of the fire water storage tanks will be performed.	Each fire water storage tank is of greater than or equal to 300,000 gallons capacity.
7.2	The FWDS pumps consist of at least one electric motor-driven and one diesel engine-driven pump.	a. An inspection will be performed to verify that at least one electric motor-driven and one diesel engine-driven pump exists. b. An analysis will be performed.	a. At least one electric motor-driven and one diesel engine-driven pump exists. b. Completion of analysis indicates a sufficient number of pumps to provide 100% capacity available assuming failure of the largest pump or loss of offsite power.
7.3	FWDS pumps have sufficient NPSHA.	Testing and analyses will be performed to verify adequate NPSHA for FWDS pumps.	The FWDS pumps have sufficient NPSHA.

09.05.01-27

Table 2.7.5-3—Fire Water Distribution System Inspections, Tests, Analyses, and Acceptance Criteria (4 Sheets)

09.05.01-25

	Commitment Wording	Inspection, Test or Analysis	Acceptance Criteria
7.7	~~The FWDS standpipe and hose systems are capable of supplying two hose stations.~~ The standpipe and hose systems in areas containing systems and components required for safe plant shutdown in the event of a safe shutdown earthquake (SSE), including the water supply to these standpipes, are capable of remaining functional and supplying two hose stations following an SSE.	~~Tests~~ An analysis will be performed ~~on the FWDS standpipe and hose~~.	Completion of analysis that indicates ~~T~~the FWDS is capable of supplying two hose stations with approximately 75 gpm per hose stream for any two hose stations.
8.1	The RWSS delivers makeup water to the FWDS fire water storage tanks.	Testing of the flow delivery of the raw water supply system to the fire water distribution system fire water storage tanks will be performed.	The raw water supply system delivers the required flow to the fire water distribution system fire water storage tanks.

Next File

2.7.6 Gaseous Fire Extinguishing System

1.0 Description

The gaseous fire extinguishing system (GFES) is a non-safety-related system that provides total flooding clean agent gaseous extinguishing system protection for the main control room (MCR) sub-floor area enclosure. The GFES consists of self-contained agent storage tanks, a network of distribution piping with discharge nozzles, supervisory system and manual activation devices.

The GFES provides the following non-safety related functions:

- Delivers total flooding gaseous fire suppression within the MCR sub-floor area enclosure.

2.0 Arrangement

2.1 The GFES is located within the Safeguard Building Division 2 and 3.

3.0 I&C Design Features, Displays and Controls

3.1 GFES system status indications are retrievable in the MCR.

3.2 GFES equipment controls are provided in the MCR.

3.3 The GFES has control interlocks with the MCR air conditioning system (CRACS) to maintain suppressant agent concentration within the MCR sub-floor area enclosure.

09.05.01-27

3.4 The as-built gaseous fire extinguishing system is consistent with the post-fire safe shutdown analysis.

4.0 Equipment and System Performance

4.1 The GFES is designed to provide the required clean agent concentration within the required discharge timeframe and maintain clean agent concentration for the required soak time to extinguish a fire within the MCR sub-floor area enclosure.

5.0 Inspections, Tests, Analyses, and Acceptance Criteria

5.1 Table 2.7.6-1 specifies the inspections, tests, analyses, and acceptance criteria for the GFES.

Table 2.7.6-1—Gaseous Fire Extinguishing System Inspections, Tests, Analyses, and Acceptance Criteria

Commitment Wording		Inspection, Test or Analysis	Acceptance Criteria
2.1	The GFES is located within the Safeguard Building Division 2 and 3.	An inspection will be performed of the location of the equipment.	The GFES is located within the Safeguard Building Division 2 and 3.
3.1	System status indication exists or can be retrieved in the MCR.	Inspections will be performed for the existence or retrieveability of the system status indication in the MCR.	System status indication exists or can be retrieved in the MCR.
3.2	Controls exist in the MCR.	Tests will be performed for the existence of control signals from the MCR.	Controls exist in the MCR.
3.3	The GFES has control interlocks with the MCR air conditioning system (CRACS) to maintain suppressant agent concentration within the MCR sub-floor area enclosure.	Tests will be performed using simulated signals to verify the interlock.	The interlock functions in response to a simulated signal.
3.4	The as-built gaseous fire extinguishing system is consistent with the post-fire safe shutdown analysis.	An inspection will be performed.	An inspection that documents the as-built gaseous fire extinguishing system is consistent with the post-fire safe shutdown analysis.

09.05.01-27

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 28 of 41

Item No.	Description	Section	Action Required by COL Applicant	Action Required by COL Holder
9.5-12	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.5.5.3, Repair Procedures.	Table 9.5.1-1 C.5.5.3	Y	
9.5-13	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.6.2.4, Independent Spent Fuel Storage Areas.	Table 9.5.1-1, Section C.6.2.4	Y	
9.5-14	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.	Table 9.5.1-1, Section C.6.2.6	Y	
9.5-15	A COL applicant that references the U.S. EPR design certification will submit site specific information to address Regulatory Guide 1.189, Regulatory Position C.7.6, Nearby Facilities.	Table 9.5.1-1, Section C.7.6	Y	
9.5-16	A COL applicant that references the U.S. EPR design certification will perform an as-built, post-fire Safe Shutdown Analysis, which includes final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01, "Guidance for Post-Fire Safe-Shutdown Circuit Analysis."	9.5.1.2.1		Y

09.05.01-2

Table 1.8-2—U.S. EPR Combined License Information Items
Sheet 29 of 41

Item No.	Description	Section	Action Required by COL Applicant	Action Required by COL Holder
9.5.17	A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and will consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any.	9.5.1.3		Y
9.5-18	A COL applicant that references the U.S. EPR design certification will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the the FSAR.	9.5.1.3	Y	
9.5-19	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.	9.5.1.2.1	Y	
9.5-20	A COL applicant that references the U.S. EPR design certification will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.	9.5.1.2.1	Y	
10.0-1	A COL applicant that references the U.S. EPR design certification will select Sections 10.1, 10.2 and 10.4.7 or 10.1A, 10.2A and 10.4.7A for inclusion in the COL FSAR as applicable to the chosen turbine-generator design option.	10.0	Y	

09.05.01-2
09.05.01-3
09.05.01-9
09.05.01-13

The FPS is classified as non-safety related. However, the fire protection containment isolation valves and associated piping are classified as safety related as well as special seismic design requirements that are applied to portions of the standpipe system, per RG 1.189 guidance, located in areas containing equipment required for safe shutdown following a safe shutdown earthquake (SSE), as defined in Section 3.0. Refer to Section 3.2 for the seismic and system quality group classification of fire protection. The FPS portion of the containment isolation system meets the containment isolation requirements of GDC 56.

The FPS, except for containment isolation and portions of the standpipe system, is not required to remain functional following a plant accident or natural phenomena.

The FPS is designed to perform the following functions:

- Detect fires and provide operator indication of the location.
- Provide the capability to extinguish fires in plant areas, to protect site personnel, limit fire damage, and protect safe shutdown capabilities.
- Supply fire suppression water at a flow and pressure sufficient to meet the largest hydraulic demand of any automatic sprinkler or water spray system with an additional 500 gpm for fire hose use, for a minimum of two hours.
- Maintain 100 percent of fire pump design capacity, assuming failure of the largest fire pump or the loss of offsite power.
- Following an SSE, provide water to hose stations for manual firefighting in areas containing safe shutdown equipment.
- Containment isolation.

The fire protection analysis (see Appendix 9A) evaluates the adequacy of fire protection for systems and plant areas.

9.5.1.2 System Description

9.5.1.2.1 General Description

09.05.01-33

The FPS and the design of the FPS comply with applicable codes and standards.

Deviations from NFPA code requirements will be identified and justified by the COL applicant as part of the final Fire Hazards Analysis.

In accordance with SRP 9.5.1, "the standards of record related to the design and installation of fire protection systems and features sufficient to satisfy NRC requirements in all new reactor designs are those NFPA codes and standards in effect 6 months prior to the submittal of the application under 10 CFR Part 50 or 10 CFR Part

52. The codes/standards of record are governed by the DC (within 6 months of the DC document submittal date) for aspects of the FPP described in the DC."

"The COL should use industry codes and standards within 6 months of the COL application date for any aspects of the FPP not covered in the DC."

Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189, is a point-by-point description of the conformance of the U.S. EPR Fire Protection Program (FPP) with the guidelines of RG 1.189, including alternative designs.

The FPS detects fires and provides fire extinguishment capability using fixed automatic and manual suppression systems, manual hose streams, and portable fire fighting equipment. The FPS consists of a number of fire detection and fire suppression subsystems, including:

- Detection systems for early detection and notification of a fire.
- A water supply system including storage tanks, fire pumps, yard main, and interior distribution piping headers.
- Fixed automatic and manually-actuated fire suppression systems.
- Manual fire suppression systems and equipment, including hydrants, standpipes, hose stations, and portable fire extinguishers.

09.05.01-9

The fire detection and suppression systems are described later in this section.

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

09.05.01-22

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. 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 circuits of redundant success paths is provided by a non-combustible radiant energy shield having a minimum fire rating of 30 minutes.

- Cable trays are constructed of metal. Only metallic tubing is used for conduits. Thin-wall metallic tubing is not used. Flexible metallic tubing is only used in short lengths. Electrical raceways are constructed in accordance with the guidelines specified in SRP 9.5.1 and RG 1.189. Electrical raceways are only used for cables. Safety-related cable trays located outside of containment are separated from redundant divisions and non-safety-related areas by three-hour, fire rated barriers. Cable trays containing safety-related cables located inside containment are enclosed in non-combustible steel or steel composite materials.

The U.S. EPR utilizes cables throughout the plant that have passed the flame propagation criteria of IEEE Std 1202. Self-ignition of these electrical cables is not considered credible because of the protective devices (e.g., fuses, circuit breakers) provided and analyzed to be properly sized. While these cables are still considered

combustible, they will not propagate fire unless subjected to an external fire involving other combustibles in the vicinity of the cable trays. In this case, the fire stops would be of little, if any value in stopping the spread of fire. Fire stops would not stop the spread of fire in the area of influence of the exposure fire (i.e., area of the fire where temperatures are high enough to propagate fire along the cable trays) because they are only designed to prevent fire spread in the cable trays. Also, the IEEE Std 1202 qualified cables outside of the area of influence of the exposure fire would keep the fire from propagating and essentially serve the same purpose as the fire stops.

Fire Safe Shutdown Capability

The U.S. EPR design provides a defense-in-depth postfire safe shutdown capability in accordance with the NRC acceptance criteria specified in NUREG-0800, SRP 9.5.1, Revision 5, including its Appendix A, and RG 1.189, Revision 1.

Implementation of Criteria

With the exception of the containment, the U.S. EPR design accommodates the requirement that all equipment and cables within a fire area are considered rendered inoperable by the assumed fire and that postfire safe shutdown will be achieved via components and systems independent of the fire area under consideration. In addition, postfire re-entry into a fire affected area for repairs or operator manual actions is not permitted.

09.05.01-21

The advantage of the U.S. EPR design is that redundant systems credited to support post-fire safe shutdown are separated such that a minimum of one success path of structures, systems, and components necessary to achieve hot standby (HSB) and cold shutdown (CSD) is free of fire damage without crediting system repair capabilities. The term "success path" utilized in the design of the U.S. EPR is equivalent to the term "one shutdown division" discussed in SECY 90-016 (Reference 38).

A fire in the MCR may result in the necessity to evacuate the area, either due to loss of equipment control or environmental considerations. In this case, the RSS will be used to achieve postfire safe shutdown.

Inside containment, a combination of separation and fire protection features to the extent practical provide assurance that the required number of shutdown system divisions will be available to support postfire safe shutdown.

The U.S. EPR design provides reasonable assurance that adequate systems and equipment are available to achieve the following objectives:

- Reactor coolant system process variables will be maintained within those predicted for a loss of normal AC power.

- The fission product boundary integrity shall not be affected (i.e., no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary).

- One success path of the system necessary to achieve and maintain HSB conditions from either the MCR or RSS is free of fire damage.

The U.S. EPR postfire safe shutdown performance goals established to make sure that compliance with these objectives are the same whether performing actions from the MCR or RSS and are specified as follows:

- Reactivity control: The reactivity control function shall be capable of achieving and maintaining CSD reactivity conditions.

- Reactor coolant makeup: The reactor coolant makeup function shall be capable of maintaining the reactor coolant level within the level indication of the pressurizer.

- Reactor heat removal: The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.

- Process monitoring: The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the previously listed functions.

- Support: The supporting functions shall be capable of providing the process cooling, lubrication, and other activities necessary to permit operation of equipment used for safe shutdown functions.

09.05.01-2

The diverse design of the U.S. EPR plant makes sure that systems and equipment are available to accomplish the previously listed performance goals.

A COL applicant that references the U.S. EPR design certification will perform an as-built, post-fire Safe Shutdown Analysis, which includes final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01, "Guidance for Post-Fire Safe-Shutdown Circuit Analysis."

(See Reference 39).

Cold Shutdown and Allowable Repairs

RG 1.189, Revision 1 allows fire damage to redundant systems necessary to achieve CSD provided that at least one success path can be repaired or otherwise made operable within 72 hours using onsite capability, or within the time period required to achieve CSD conditions, if less than 72 hours. Although repairs to equipment

- Are directly connected to circuits that could affect the shutdown capability.
- Share a common enclosure with shutdown cables, but are not electrically protected or will propagate fire into the common enclosure.

The U.S. EPR plant provides circuit coordination for non-safe shutdown loads on shared buses and load centers. Cable installed in the plant complies with IEEE Std 1202, or equivalent, to preclude the potential for fire propagation. Non-shutdown cables that share a common enclosure with shutdown cables are electrically protected to provide reasonable assurance that faults are interrupted prior to cable damage. By virtue of this provision, the U.S. EPR plant design provides reasonable assurance that secondary fires do not occur as a result of fire-induced faults.

Shutdown/Low Power Operations

Per RG 1.189, Revision 1, Section 5.6, shutdown operations are defined as refueling or maintenance outages. The U.S. EPR design provides reasonable assurance that fuel integrity is protected by permanent plant systems during refueling operations or maintenance outages. The primary fuel cooling systems are spent fuel cooling and the residual heat removal system. One or both systems are used depending on the location of fuel.

For the U.S. EPR, low power operations is considered to be startup. For the purposes of analysis, startup operation is considered the same as power operation. Therefore, the analysis for postfire shutdown is the same for both modes of operation.

09.05.01-14

Communications

Section 9.5.2 describes the following diverse on-site communications systems provided in the U.S. EPR:

- Portable wireless communication.
- Digital telephone.
- Public address system.
- Sound-powered.
- Security communication.

For the purposes of fire fighting and operational post-fire safe shutdown activities, primary reliance is placed upon the portable wireless communication system. This system is multi-channeled, allowing unimpeded simultaneous communications for various purposes. It also has the capability to interface with the station public address system and digital telephone system.

The repeaters for the portable wireless communication system do not require dedicated fire protection. Due to the diversity of the plant communications systems, at least one method of communication is available in the event of a fire.

09.05.01-14

Emergency Lighting

09.05.01-20

Section 9.5.3 contains design information for the U.S. EPR lighting system.

Portable hand-held, eight-hour rated lights are provided for use by the fire brigafe in accordance with RG 1.189, Rev. 1, Section 4.1.6.2b. The egress route from the MCR to the RSS is illuminated by independent fixed, self-contained eight-hour rated battery powered lighting units. Other post-fire safe shutdown activities performed by operators outside the MCR and RSS are supported by independent fixed, self-contained eight-hour rated battery lighting units at the task locations and in access and egress routes.

An alternative approach to fixed, self-contained eight-hour rated battery powered lighting uniuts is taken for illuminating the MCR and RSS in support of post-fire safe shutdown. Both locations are illuminated by the special emergency lighting system. The special emergency lighting system receives power from redundant emergency diesel generator backed uninterruptible power supplies, thus providing continuous illumination. Adequate lighting is available in the MCR or RSS as necessary to facilitate post-fire safe shutdown of the plant.

Ventilation System Design Considerations

The design of the heating, ventilation and air conditioning (HVAC) systems are in accordance with SRP 9.5.1 (Reference 37) and RG 1.189. Safety-related HVAC systems are also designed in accordance with NFPA 90A (Reference 16). The HVAC design provides reasonable assurance that smoke, hot gases, or fire suppression agents (e.g., gaseous suppression agents) will not migrate into other fire areas and adversely affect safe shutdown capabilities, including operator actions.

The HVAC systems ventilate, exhaust, or isolate fire areas under fire conditions so that products of combustion do not spread to other fire areas. Ducts penetrating through fire area boundaries are provided with automatic fire dampers that have a fire rating equivalent to the rating of the barrier, or the ducts have a fire rating equivalent to the rating of the barrier and have no openings. Dampers are designed and tested to provide reasonable assurance of their operability under airflow conditions. Where practical, ventilation power and control cables for mechanical ventilation systems are located outside of the fire area served by the systems. Fresh air supply intakes to areas containing equipment or systems important to safety are located remote from the exhaust outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with products of combustion.

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.

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.

Fire Detection and Alarm System

09.05.01-33

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 manufacturer recommendations. Specification of the most appropriate type of fire detector is determined as part of the fire protection analysis based on consideration of the type of hazard, type of combustion products, detector response characteristics, and noted others (see Appendix 9A).

Fire Water Supply System

The site fire protection water supply system meets the guidance provided by SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards. ~~Deviations from the requirements of these standards are identified and suitably justified as part of the fire protection analysis.~~ Two separate 100 percent dedicated capacity freshwater storage tanks, meeting the applicable portions of NFPA 22 (Reference 6), are provided. The tanks are interconnected so that the fire pumps can take suction from one or both, and a failure in one tank or its piping will not cause both tanks to drain. The capacity of each tank is based on the largest hydraulic flowrate for a period of two hours, but not less than 300,000 gallons. In the event that the portion of one tank dedicated to fire

protection use is depleted, means are provided to refill either tank within eight hours. Automated tank level indication is provided for both tanks to make sure that the capacity dedicated to fire protection use is available.

09.05.01-13

A COL applicant that references the U.S. EPR design certification will describe the program used to monitor and maintain an acceptable level of quality in the fire protection system freshwater storage tanks.

The portion of each tank dedicated to fire protection use is based on a 500 gpm outside hose stream allowance plus the largest hydraulic demand of any individual sprinkler system or fixed water spray (or deluge system) in accordance with NFPA 13 (Reference 2) or NFPA 15 (Reference 4).

09.05.01-33

Failure or rupture of one or both water storage tanks will not significantly impair the safety capability of SSC important to safety.

The site fire pump arrangement meets the applicable portions of NFPA 20 (Reference 5). ~~Deviations from the requirements of this standard are identified and suitably justified.~~ Three 100 percent capacity fire pumps (i.e., one electric motor-driven and two diesel engine-driven) are provided. The capacity of each fire pump is adequate to supply a 500 gpm outside hose stream allowance and the largest flowrate required by any individual sprinkler or fixed water spray (or deluge system), with the hydraulically least demanding portion of the underground fire main yard loop assumed to be out of service. Individual fire pump connections to the underground fire main yard loop are provided, with sectionalizing valves between connections. An electric motor-driven jockey pump is provided to automatically maintain fire protection water supply system pressure independent of the fire pumps.

Alarm indication provided in the MCR includes, but is not limited to, these functions:

- Fire protection water storage tank low level.
- Fire pump running.
- Fire pump driver availability.
- Fire pump failure to start.
- Fire protection water supply system low pressure.

Each fire pump and its associated driver and controls are separated from each other and the plant by three hour fire-rated barriers. A separate fuel line and fuel oil storage tank is provided for each diesel engine-driven fire pump. Means other than sight tubes are provided for continuous indication of the amount of fuel oil in each storage tank. The floor around each fire pump and its associated driver and controls is pitched and adequate means for drainage are provided.

An underground fire main yard loop designed in accordance with NFPA 24 (Reference 7) is provided to furnish anticipated water requirements.

Control and sectionalizing valves are provided to isolate portions of the fire main yard loop for maintenance or repair without simultaneously shutting off the water supply to both fixed fire suppression systems, and standpipe and hose systems are provided for manual backup. Fixed fire suppression systems and standpipe and hose systems are connected to the main yard loop so that a single active failure or a pipe crack or break will not impair both primary and backup fire suppression capability.

Failure or rupture of any portion of the underground fire main yard loop will not significantly impair the safety capability of SSC important to safety.

Outside fire hydrants are provided approximately every 250 feet on the main yard loop. Additional hydrants are located near the entrances to the Essential Service Water Pump Building (ESWPB) and the Circulating Water Pump Building (CWPB). Valves are provided to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the plant fire protection water supply capability. Hose houses equipped with fire hose and combination nozzle and other equipment specified by Reference 7 are provided at intervals not exceeding 1000 feet, or alternatively, mobile means are provided which contain fire hose and the associated equipment specified by NFPA 24 (Reference 7). Threads compatible with those used by local fire departments are used on fire hydrants hose couplings and standpipe system risers.

The FPS piping headers, fed from each end, are provided inside plant buildings or groups of buildings to supply both fixed fire suppression systems and standpipe and hose systems. As such, the supply headers are considered as an extension of the fire main yard loop. Where supply headers form part of the seismically analyzed standpipe and hose system, steel piping and fittings used meet the requirements of ASME B31.1 (Reference 32) to a point up to and including the first valve supplying fixed suppression systems.

09.05.01-9

The fire protection water supply system utilizes a three-ring header design as shown in ~~Figure 9.5.1-1—Fire Water Distribution System~~ Figure 9.5.1-1—Fire Water Distribution System.

Failure or rupture of any portion of building supply headers will not significantly impair the safety capability of SSC important to safety.

Automatic Fire Suppression Systems

09.05.01-33

Where automatic fire suppression systems are provided, they are designed and installed in accordance with the guidance provided by SRP 9.5.1 (Reference 37), RG 1.189, and applicable NFPA standards. ~~Deviations from the requirements of these~~

~~standards, such as partial suppression system coverage, are identified and suitably justified.~~

09.05.01-33

Failure, rupture, or inadvertent actuation of fire suppression systems will not significantly impair the safety capability of SSC important to safety.

Automatic sprinkler systems designed and installed in accordance with NFPA 13 (Reference 2) are provided for the following hazards:

- EPGB:
  - Diesel Engine Hall.

Fixed deluge water spray systems designed and installed in accordance with NFPA 15 (Reference 4) are provided for the following hazards:

- 1-2EPGB and 3-4EPGB:
  - EDG main fuel oil tanks (automatic actuation).
- RB:
  - Reactor coolant pumps (RCP) (manual actuation from the MCR).

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

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

Because the MCR is occupied at all times while the plant is operating, 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.~~

09.05.01-33

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.

Supply water distribution capability is provided for reasonable assurance of an adequate water flowrate and nozzle pressure for all hose stations. Hose station pressure reducers are provided where necessary for the safety of plant fire brigade members and offsite fire department personnel.

The proper type of hose nozzle provided for each hose station is based on the fire hazards in the area. Combination spray or straight-stream nozzles are not used in plant areas where a straight stream could cause unacceptable damage or present an electrical hazard to firefighting personnel. UL listed electrically safe fixed fog nozzles are provided in areas where high-voltage shock hazards exist. All nozzles have full shutoff capability.

Fire hose meets the applicable criteria of NFPA 1961 (Reference 26) and is hydrostatically tested in accordance with the applicable guidance of NFPA 1962 (Reference 27).

Provisions are made to supply water at least to standpipes and hose systems for manual fire suppression capability in all plant areas containing systems and components required for safe plant shutdown in the event of an SSE. The piping system serving these hose stations are analyzed for SSE loading and are provided with supports to provide reasonable assurance of system pressure boundary integrity. The piping and valves for the portion of the standpipe and hose systems affected by this functional requirement, as a minimum, satisfy ASME B31.1 (Reference 32) and are capable of providing flow to at least two hose stations (approximately 75 gpm per hose station).

Failure or rupture of standpipe and hose systems will not significantly impair the safety capability of SSC important to safety.

Portable fire extinguishers are provided in all plant areas that contain or could present a fire exposure to equipment important to safety. The number, size, and type of fire extinguishers are provided in accordance with NFPA 10 (Reference 1). In instances where radiological considerations may affect firefighting operations, portable fire extinguishers are pre-staged outside of the immediate area. For dry chemical extinguishers, due consideration is given to possible adverse effects on equipment important to safety in the area.

Failure or rupture of portable fire extinguishers will not significantly impair the safety capability of SSC important to safety.

09.05.01-35

9.5.1.2.2 Alternative Compliance With Regulatory Guide 1.189

The following provides a summary of those compliance issues where "Alternate Compliance" is indicated in Table 9.5.1-1.

Fire Areas

Generally, fire areas comply with RG 1.189, Regulatory Position 4.1.2.1. Alternative compliance is provided for certain specialty doors and certain penetration seals.

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.

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.

The U.S. EPR is a four divisional design. Generally, each of the four divisions outside of the MCR and the Reactor Building are in divisional Safeguard Buildings separated from each other by 3 hour fire-rated barriers. Fire detection is provided in areas containing cables important to safety. Cable trays are accessible for manual fire fighting and manual hose stations and portable extinguishers are provided throughout the facility.

Having each safety division in fully separated buildings from redundant divisions and the fact that there are four safety divisions make it possible for the loss of any one division not to impact safe shutdown capability. There is a high probability that even

with loss of one division from fire an extra division beyond the minimum required for safe shutdown will be available.

The U.S. EPR design utilizes electrical cable construction that has met the acceptance criteria of the IEEE 1202 (Reference 34) test standard (or an equivalent standard) for prevention of flame propagation. IEEE 1202 is a vertical flame propagation test protocol. It is widely recognized that a vertical cable orientation represents a more severe fire test exposure than a horizontal cable orientation. Moreover, the NRC RES Fire Research Branch has stated, "The FT-4 / Vertical Flame Test, included in standard(s) IEEE 1202-1991…is the most rigorous of the 20kW (70000 BTU/hr) tests…What makes this test the most difficult to pass of the 20kW (70000 BTU/hr) tests is its low acceptable damage length of 4.9 ft (1.5m)." Therefore, the ability of cables qualified to the IEEE 1202 test standard (or an equivalent standard) to prevent fire propagation of fire along the length of cables routed in trays located within a given fire area or zone.

Electrical Cabinets

Generally, fire areas comply with RG 1.189, Regulatory Position 4.1.3.6. Alternative compliance is provided due to the lack of a fixed fire suppression system in rooms containing electrical cabinets important to safety and the lack of detection inside cabinets except in the MCR.

The U.S. EPR is a four division design. Generally, electrical cabinets for a given safety division are located in separate divisional Safeguard Buildings which are separated from each other and other areas of the plant by three hour-rated fire barriers. Area smoke detection is provided where electrical cabinets are located and manual hose stations and portable extinguishers are provided throughout the facility. Spatial separation is provided between cabinets.

Having each safety division in separate buildings from redundant cabinets, and the fact that there are four safety divisions, provides reasonable assurance that the loss of any one safety division does not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire, an extra division beyond the minimum required for safe shutdown would be available.

Cable Spreading Room

Generally, the cable floor where all four safety divisions are routed to the MCR and the RSS complies with RG 1.189, Regulatory Position 6.1.3. Alternative compliance is provided due to the lack of a fixed fire suppression system for the cable floor rooms.

The U.S. EPR does not have cable spreading rooms. 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 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 cable ducts having a minimum fire resistance rating of three hours.

Area-wide smoke detection is provided for the cable floor rooms and manual suppression is provided in the form of standpipe and hose and portable fire extinguishers. Combustibles are limited and the quantity of such is much less than anticipated in a cable spreading room because the majority of cables in this area are contained in noncombustible 3 hour fire-rated ducts.

Switchgear Rooms

Generally the plant switchgear rooms comply with RG 1.189 Regulatory Position 6.1.5. Alternative compliance is provided due to the lack of a fixed fire suppression system for these rooms.

The U.S. EPR is a four division design. Each of the four divisional switchgear rooms is located in separate divisional Safeguard Buildings. Switchgear rooms are separated from other areas of the plant and Safeguard Buildings are separated from each other by three hour-rated fire barriers. Area-wide smoke detection is provided throughout the switchgear rooms and manual hose stations and portable extinguishers are provided throughout the facility. A fixed smoke removal system is provided for the switchgear rooms.

Having each divisional switchgear room in a fully separate building from redundant switchgear divisions, and the fact that there are four safety divisions, provides reasonable assurance that the loss of any one switchgear room does not to impact safe shutdown capability. There is a high probability that even with loss of one division from fire, an extra division beyond the minimum required for safe shutdown would be available.

9.5.1.3 Safety Evaluation – Fire Protection Analysis

The overall FPP allows the plant to maintain the ability to perform safe shutdown functions and minimize radioactive releases to the environment in the event of a fire. A major element of this program is the evaluation of potential fire hazards throughout the plant and the effect of postulated fires on safety-related plant areas. See Appendix 9A for the fire protection analysis.

The fire protection analysis evaluates the fire hazards for each area of the plant. Areas are evaluated with consideration of:

- The fuel loading, considering both in-situ and transient combustibles.
- The potential ignition sources and the expected fire severity levels.
- The consequences of postulated fires.
- The fire protection defense-in-depth features provided and the adequacy of these features to protect SSC important to safety.
- The means to ventilate exhaust or isolate each fire area and their adequacy.
- The effect on SSC important to safety due to normal or inadvertent operation of fire suppression systems, the loss of capability to ventilate, exhaust, or isolate due to a fire and flooding associated with automatic and manual fire suppression activities, including inadvertent operation or fire suppression system failure.
- The emergency lighting and plant communication systems and the adequacy of these systems to support fire suppression and safe shutdown activities.

The fire protection analysis includes a set of fire area drawings and a summary of the analysis methodology for each fire area.

09.05.01-2

A COL applicant that references the U.S. EPR design certification will evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will be performed prior to fuel loading and will consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The applicant will describe how this as-built evaluation will be performed and documented, and how the NRC will be made aware of deviations from the FSAR, if any.

09.05.01-3

A COL applicant that references the U.S. EPR design certification will perform a supplemental Fire Protection Analysis for site-specific areas of the plant not analyzed by the the FSAR.

9.5.1.4 Inspection and Testing Requirements

The FPP addresses the inspection, testing, and maintenance of FPSs and features. Disabled or impaired FPSs and features are controlled by a permit system. Procedures and practices also establish appropriate compensatory actions for FPSs or features out-of-service or impaired.

Test plans are established that provide routine functional testing of FPSs and components. NFPA 25 (Reference 8) is considered in the development of the maintenance procedures. Fire barriers and installed assemblies and penetrations are periodically inspected and active components such as fire dampers and doors are functionally tested.

The FPP provides reasonable assurance that qualified personnel perform inspection, testing and maintenance of FPSs.

9.5.1.5 Fire Probabilistic Risk Assessment

In accordance with 10 CFR 52.47(a)(v), as part of the design certification process, a fire probabilistic risk assessment (PRA), specific to the U.S. EPR design is performed (refer to Section 19.1.2.3.4 and Section 19.1.5.3). The fire PRA is performed using state-of-the-art methods, tools, and data. Guidance from NUREG/CR-6850 (Reference 40) is used, as judged applicable to the bounding assessment.

~~The fire PRA results are used as input to the FPA to screen or rank plant fire areas based on the risk significance (i.e., net affect on CDF / LERF) of fire-induced consequences within the area under consideration.~~

09.05.01-34

9.5.1.6 Fire Protection Program

The FPP consists of the fire protection organization, administrative policies, fire prevention controls, applicable administrative, operations, maintenance and emergency procedures, QA, access to fire areas for fire fighting and fire brigade, and emergency response capability.

The primary objective of the FPP is to minimize the probability and consequences of postulated fires. The program requires passive and active fire protection features to provide certainty that the SSC necessary to achieve and maintain safe plant shutdown, with or without offsite power, remains available.

09.05.01-19

Additionally, an FPP objective is to minimize the potential for fire events to impact safety functions such as reactivity control, decay heat removal, and spent fuel pool cooling or result in the release of radioactive materials during non-power modes. Implementation of the site-specific FPP described in part herein will be in accordance with RG 1.189, Regulatory Position 1.1, and is the responsibility of the COL applicant (refer to Section 13.4).

9.5.1.6.1 Fire Prevention

Plant Design and Modification Practices

09.05.01-1

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.

09.05.01-17

Combustible Control Practices

09.05.01-11

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.

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. 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

- Engineering design practices provide certainty that the electrical equipment is properly designed and installed in accordance with industry standards; head generating equipment or equipment with hot surfaces is properly cooled or separated from combustible materials; and systems containing flammable and combustible liquids or gases are properly designed and located to minimize the exposure of these materials to ignition sources.

- Procedures and practices provide reasonable assurance that temporary power sources connected to plant systems are reviewed, evaluated, and documented including determination that the temporary service does not impact SSC important to safety.

- Procedures and practices enable the control of temporary heating devices. Use of space heaters and maintenance equipment in plant areas are strictly controlled and reviewed by fire protection personnel.

09.05.01-11

- Procedures and practices provide reasonable assurance that temporary heating devices are properly installed and separated from combustible materials and surfaces.

- Potential ignition sources are controlled and limited in the MCR complex by administrative procedures.

Plant Cleanliness Practices

Plant cleanliness is maintained through administrative procedures and practices. Routine inspections are performed to make sure that plant conditions do not present unnecessary fire hazards or hazards to safe access to and egress from areas containing equipment important to safety. Operational and maintenance practices provide for timely response and cleanup for spills of chemicals or flammable and combustible liquids: removal of waste, refuse, scrap, and other combustibles resulting from daily operations and maintenance; and inspection of plant areas to verify that fire protection requirements are properly implemented.

9.5.1.6.2 Fire Protection Program

The FPP organization structure and the responsibilities for its establishment and implementation are in accordance with RG 1.189. The COL applicant is responsible for determining the individual position responsible for the organizational functions described herein (refer to Section 13.1).

09.05.01-10

The individual with overall responsibility for the FPP has management control over all organizations involved in fire protection activities. Formulation and verification of FPP implementation may be delegated to a staff composed of personnel prepared by training and experience in fire protection and personnel prepared by training and experience in nuclear plant safety to provide a comprehensive approach in directing the FPP for the plant.

The following organizational positions have been established for the FPP:

- An upper-level manager is responsible for formulating, implementing, and assessing the effectiveness of the FPP.

- Additional managers are directly responsible for formulating, implementing, and periodically assessing the effectiveness of the FPP. Results of these assessments and recommendations are reported to the upper-level manager responsible for the FPP.

- An onsite manager is responsible for the overall administration of the FPP which provides a single point of control and contact for all contingencies.

- The fire protection engineer:

  – The responsibility for implementation of the FPP has been delegated to the fire protection engineer. The fire protection engineer is an individual knowledgeable through education, training, or experience (or a combination of the three) in fire protection and nuclear safety. Other personnel are available to assist the fire protection engineer as necessary.

  – The fire protection engineer is delegated responsibility for development and administration of the FPP including, but not limited to, administrative controls, periodic fire prevention inspections, FPS and FPS equipment inspections and testing, evaluations of work activities for transient fire loads, identification of fire protection training requirements, prefire planning, indoctrination training for all plant contractor personnel, and fire fighting training for operating plant personnel and the fire brigade.

09.05.01-10

The nuclear training manager:

  – Responsible for developing, scheduling and presenting fire protection training in accordance with the requirements of the FPP.

- An onsite individual, responsible for fire protection QA.

  – This person verifies the effective implementation of the FPP by planned inspections and scheduled audits, and the prompt reporting of the results of these inspections and audits to cognizant management personnel.

- The plant fire brigade for fighting fires.

  – The authority and responsibility of each fire brigade position relative to fire protection is clearly defined and corresponds with the actions required by the firefighting procedures.

  – Fighting fires is the primary responsibility of the fire brigade members and their other responsibilities do not adversely affect their (the fire brigade members) ability to perform a required fire fighting function.

The plant fire brigade coordinates training with the local fire department so that responsibilities and duties are delineated in advance. This coordination is part of the training course and is included in the training for the local fire department staff.

Fire brigade members receive training as outlined in Section 9.5.1.6.3. Records of fire brigade member physical examinations, training drills, and critiques are maintained on file for a minimum of three years. NFPA 600 (Reference 24) is used as guidance in the organization and training of the fire brigade.

Fire brigade equipment, including personal protective equipment for structural firefighting, is provided for the plant fire brigade in accordance with RG 1.189. Each fire brigade member is equipped with a helmet (with face shield), turnout coat, bunker pants, footwear, gloves, protective hood, emergency communications equipment, portable lights, portable smoke removal equipment, self-contained breathing apparatus and portable extinguishers. All equipment conforms to appropriate NFPA standards and is stored in accordance with manufacturer's recommendations. An adequate inventory of firefighting equipment is maintained to outfit a full complement of brigade members with consideration of the possibility of sustained fire response operations (i.e., multiple crews).

9.5.1.6.5 Quality Assurance

09.05.01-16

09.05.01-15

The overall plant quality assurance plan (QAP) includes the QA program for fire protection. The QAP provides reasonable assurance that the fire protection systems are designed, fabricated, erected, tested, maintained and operated so that they will function as intended. As stated in U.S. EPR FSAR, Section 17.5, the QAP for the design of the U.S. EPR is addressed in AREVA NP Topical Report ANP-10266-A (Reference 41). The AREVA QAP implements quality requirements for the fire protection system in accordance with RG 1.189, Regulatory Position 1.7, directly by reference.

As stated in the U.S. EPR FSAR, Section 17.2, a COL applicant that references the U.S. EPR design certification will provide the Quality Assurance Programs associated with the construction and operations phase. The program description to be provided by the applicant also includes a description of the fire protection system quality assurance program to be applied during fabrication, erection, installation and operations.~~The overall plant quality assurance plan (QAP) includes the QA program for fire protection. The QAP provides reasonable assurance that the FPSs are designed, fabricated, erected, tested, maintained, and operated so that they will function as intended. Refer to Section 17.5 for a detailed description of the QA program.~~

~~The plants QA organization manages the fire protection QA program. This consists of either formulating and verifying or verifying that the fire protection QA program incorporates suitable requirements and is acceptable to the management responsible~~

~~for fire protection and verifying the effectiveness of the QA program for fire protection through review, surveillance, and audits.~~

09.05.01-15

9.5.1.7 References

1. NFPA 10, "Standard for Portable Fire Extinguishers," National Fire Protection Association Standards, 2007.

2. NFPA 13, "Standard for Installation of Sprinkler Systems," National Fire Protection Association Standards, 2007.

3. NFPA 14, "Standard for the Installation of Standpipe and Hose Systems," National Fire Protection Association Standards, 2007.

4. NFPA 15, "Standard for Water Spray Fixed Systems for Fire Protection," National Fire Protection Association Standards, 2007.

5. NFPA 20, "Standard for the Installation of Stationary Pumps for Fire Protection," National Fire Protection Association Standards, 2007.

6. NFPA 22, "Standard for Water Tanks for Private Fire Protection," National Fire Protection Association Standards, 2003.

7. NFPA 24, "Standard for Installation of Private Fire Service Mains and Their Appurtenances," National Fire Protection Association Standards, 2007.

8. NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," National Fire Protection Association Standards, 200~~8~~2.

9. NFPA 30, "Flammable and Combustible Liquids Code," National Fire Protection Association Standards, 200~~8~~3.

10. NFPA 51B, "Standard for Fire Prevention During Welding, Cutting, and Other Hot Work," National Fire Protection Association Standards, 2003.

11. NFPA 55, "Standard for the Storage, Use and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks," National Fire Protection Association Standards, 2005.

12. NFPA 70, "National Electrical Code," National Fire Protection Association Standards, 200~~8~~5.

13. NFPA 72, "National Fire Alarm Code," National Fire Protection Association Standards, 2007.

14. NFPA 80, "Standard for Fire Doors and Other Opening Protectives," National Fire Protection Association Standards, 2007.

15. NFPA 80A, "Recommended Practices for Protection of Buildings from Exterior Fire Exposures," National Fire Protection Association Standards, 2007.

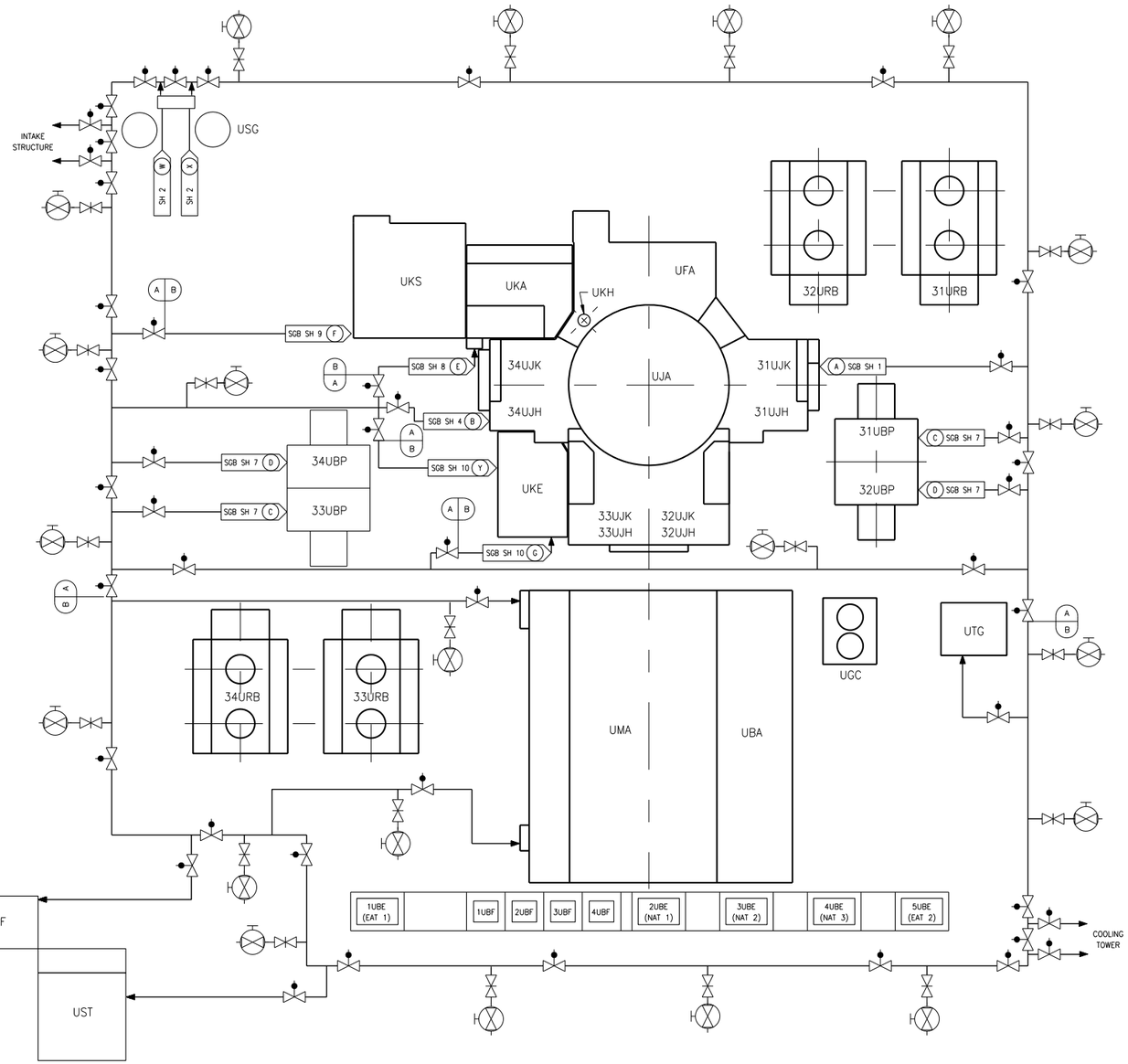
Table 9.5.1-1—Fire Protection Program Compliance with Regulatory Guide 1.189
Sheet 9 of 11

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment
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~~MCR complex. Combustible materials and ignition sources in the MCR complex are controlled and limited by administrative procedures to those required for operation.
C.6.1.2.1	Control Room Fire Suppression	Alternate Compliance	Fire suppression for MCR sub-floor area is manually actuated.
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.~~

09.05.01-11

09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 1 of 13



SGA – FIRE WATER DISTRIBUTION SYSTEM, CONVENTIONAL AREA
SGB – FIRE WATER DISTRIBUTION SYSTEM INSIDE NUCLEAR ISLAND

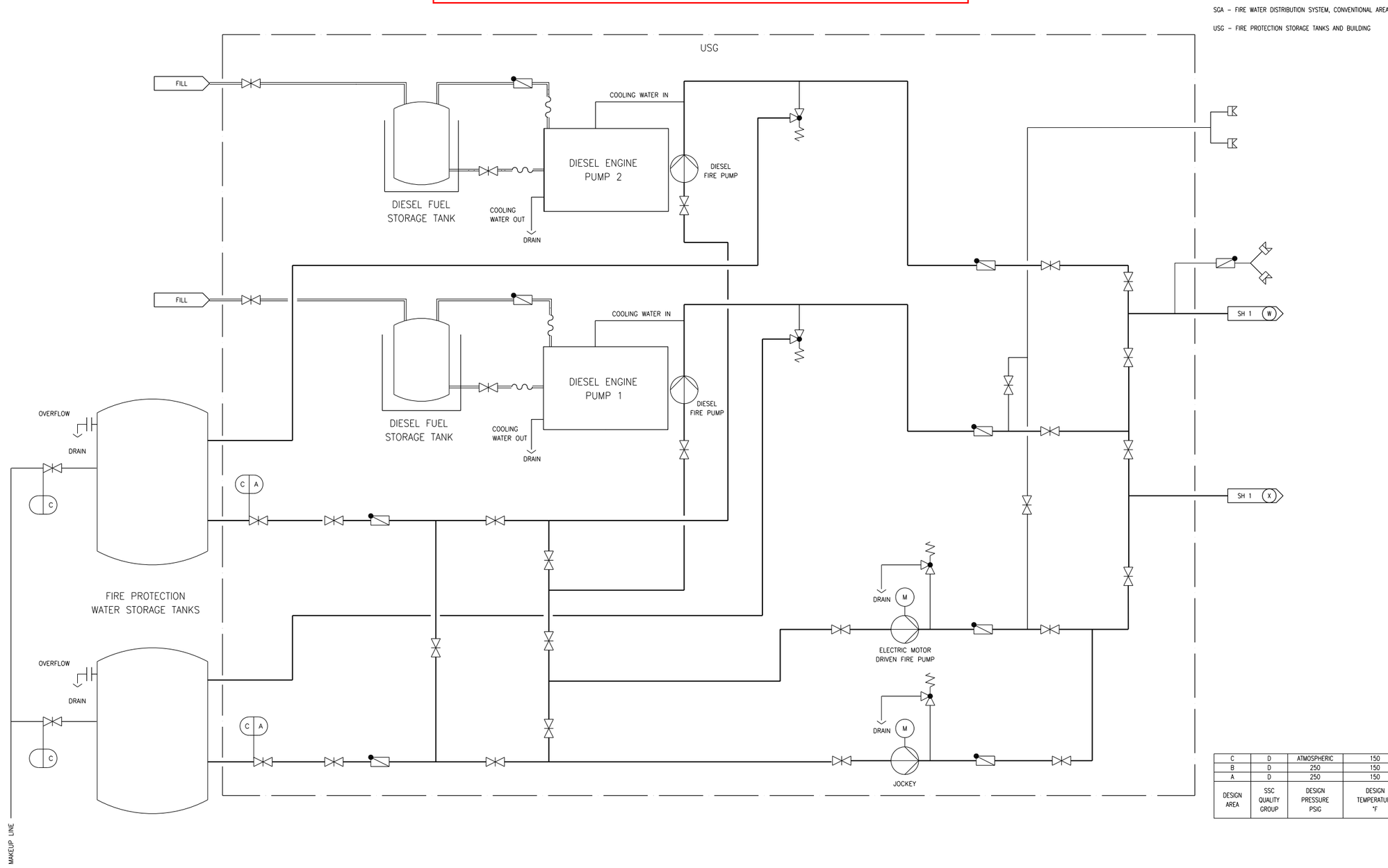
UBA – SWITCHGEAR BUILDING
UBE – AUXILIARY POWER TRANSFORMER AREA
UBF – GENERATOR TRANSFORMER AREA
31UBP – EMERGENCY POWER GENERATING BUILDING 1
32UBP – EMERGENCY POWER GENERATING BUILDING 2
33UBP – EMERGENCY POWER GENERATING BUILDING 3
34UBP – EMERGENCY POWER GENERATING BUILDING 4
UFA – FUEL BUILDING
UGC – DEMINERALIZED WATER STORAGE AREA
UJA – REACTOR BUILDING
31UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 1
32UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 2
33UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 3
34UJH – SAFEGUARD BUILDING MECHANICAL, DIVISION 4
31UJK – SAFEGUARD BUILDING ELECTRICAL, DIVISION 1
32UJK – SAFEGUARD BUILDING ELECTRICAL, DIVISION 2
33UJK – SAFEGUARD BUILDING ELECTRICAL, DIVISION 3
34UJK – SAFEGUARD BUILDING ELECTRICAL, DIVISION 4
UKA – NUCLEAR AUXILIARY BUILDING
UKE – ACCESS BUILDING
UKH – VENT STACK
UKS – RADIOACTIVE WASTE PROCESSING BUILDING
UMA – TURBINE BUILDING
31URB – ESSENTIAL SERVICE WATER COOLING TOWER STRUCTURE, DIVISION 1
32URB – ESSENTIAL SERVICE WATER COOLING TOWER STRUCTURE, DIVISION 2
33URB – ESSENTIAL SERVICE WATER COOLING TOWER STRUCTURE, DIVISION 3
34URB – ESSENTIAL SERVICE WATER COOLING TOWER STRUCTURE, DIVISION 4
USG – FIRE PROTECTION STORAGE TANKS AND BUILDING
UST – WORKSHOP AND WAREHOUSE BUILDING
UTG – CENTRAL GAS SUPPLY BUILDING
UYF – SECURITY ACCESS FACILITY

C	D	ATMOSPHERIC	150	II
B	D	250	150	NSC
A	D	250	150	II
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

SGA01T2

09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 2 of 13

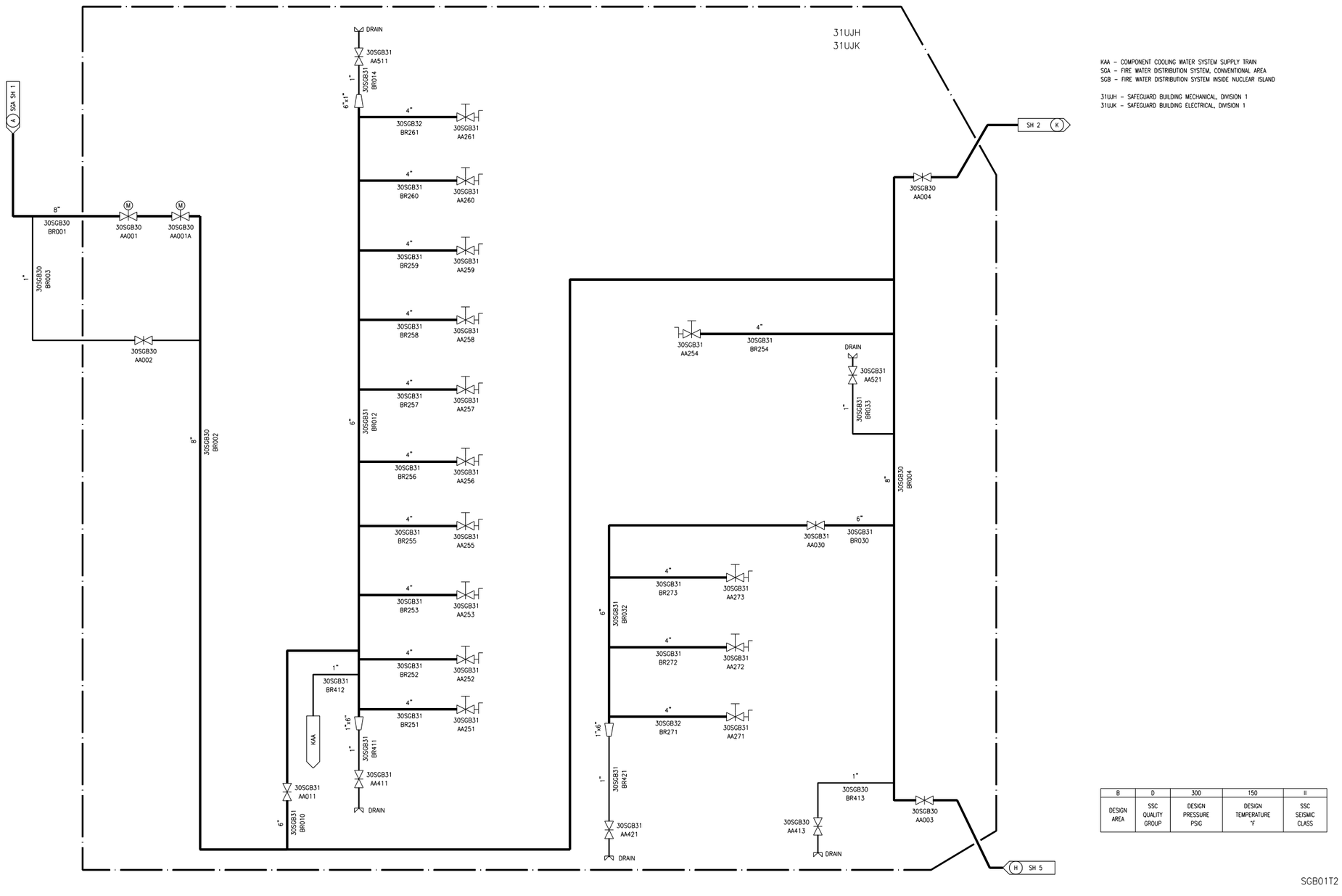


C	D	ATMOSPHERIC	150	II
B	D	250	150	NSC
A	D	250	150	II
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

REV 001
SGA02T2

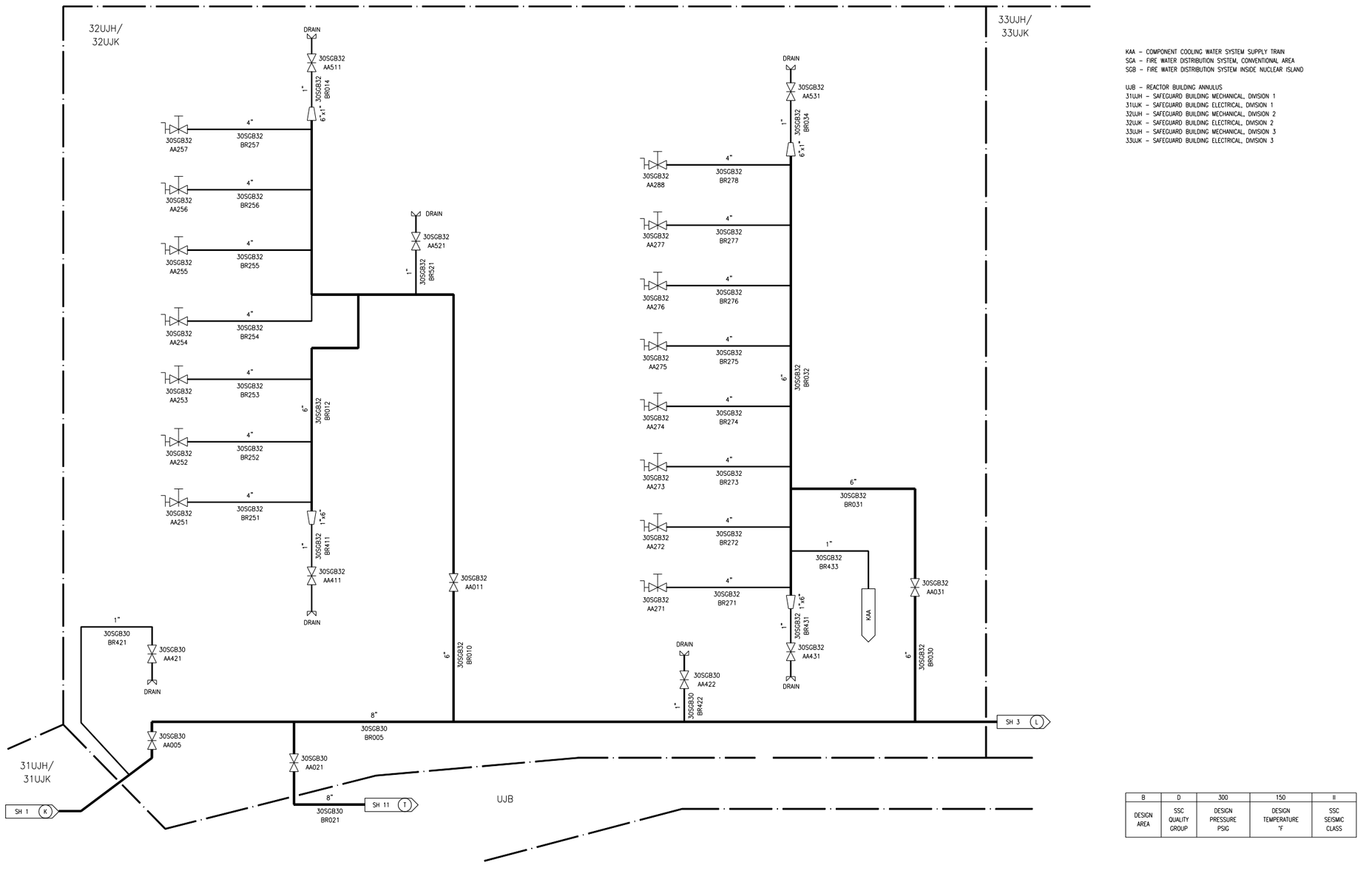
09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 3 of 13



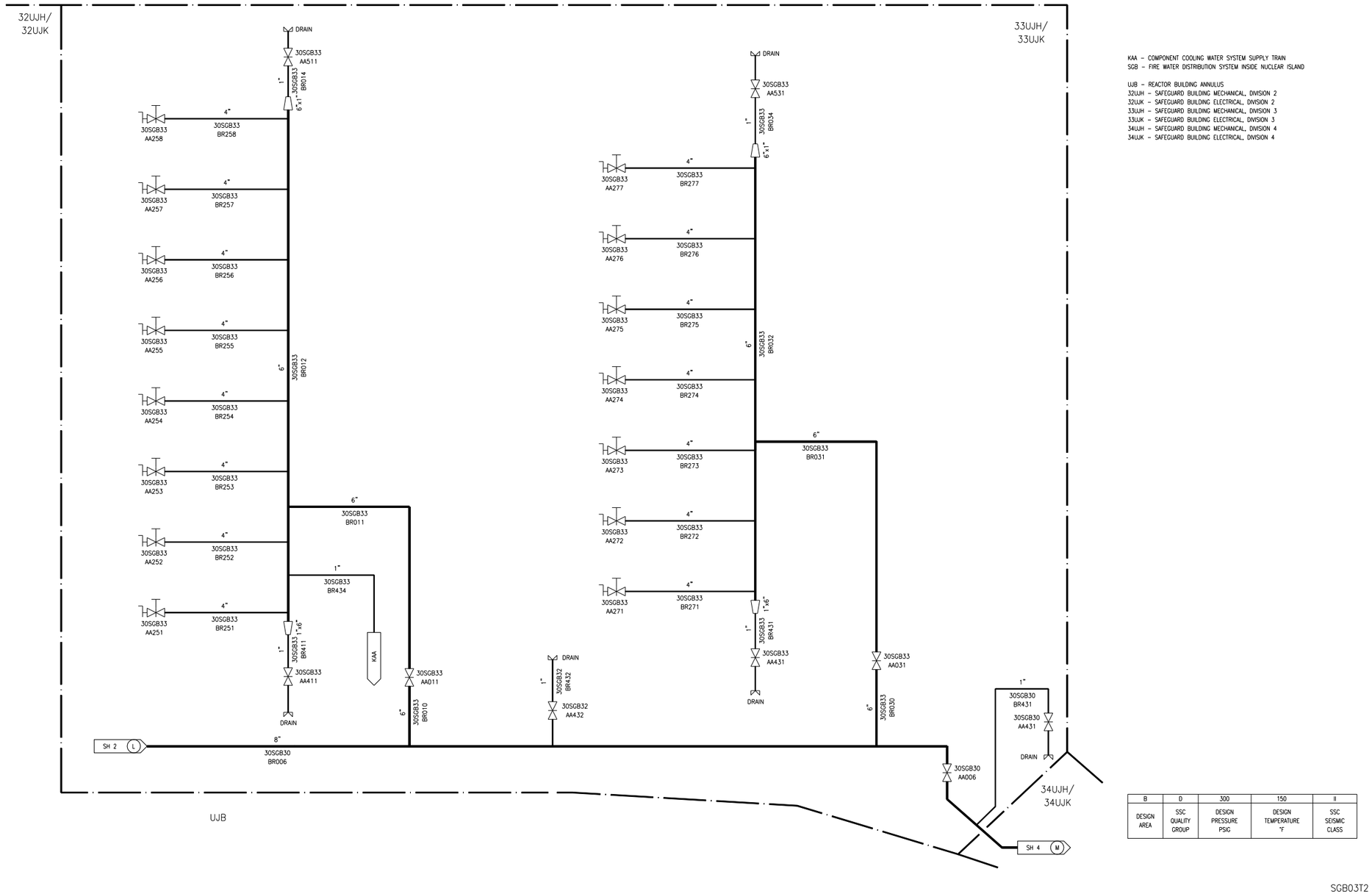
09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 4 of 13



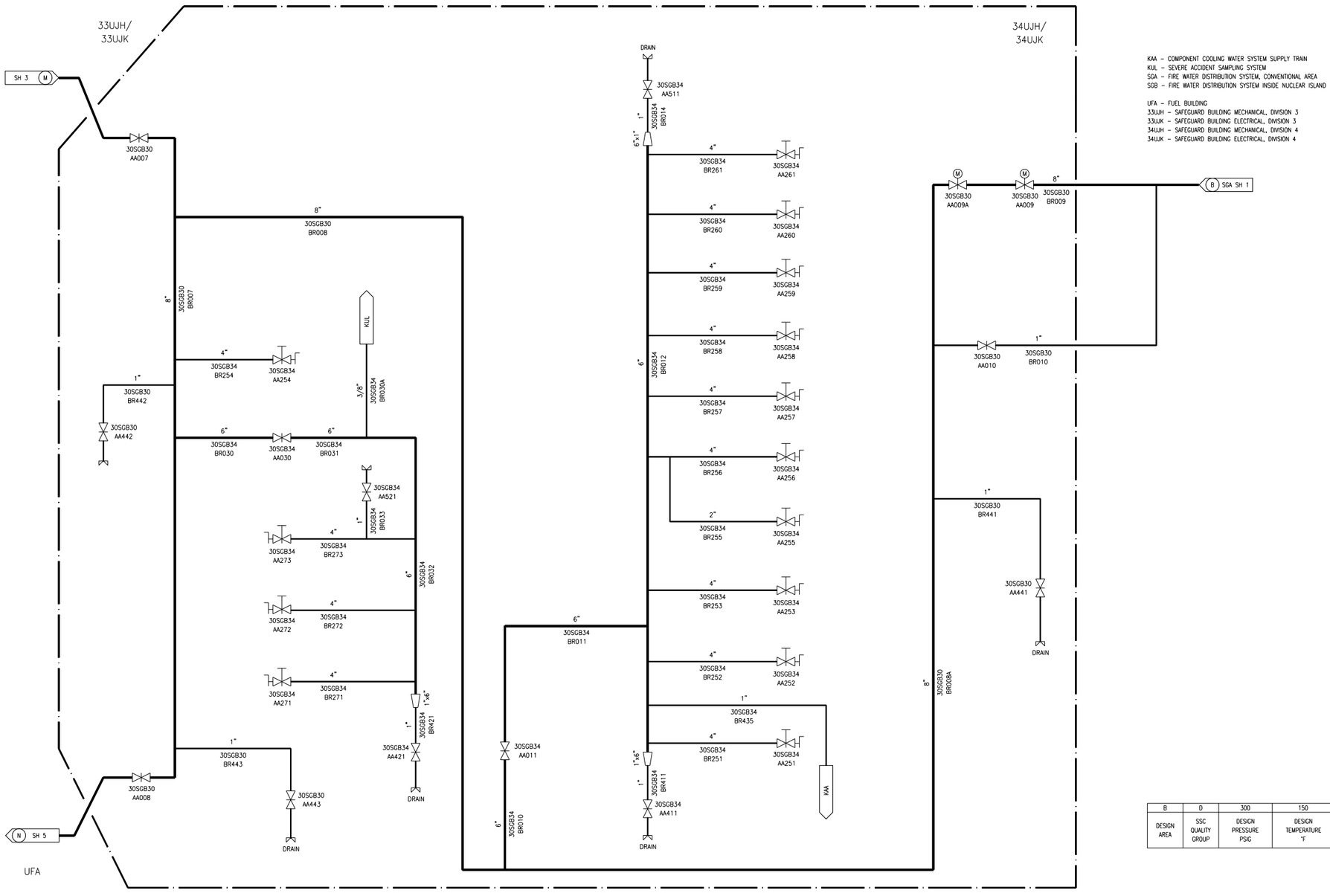
09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 5 of 13



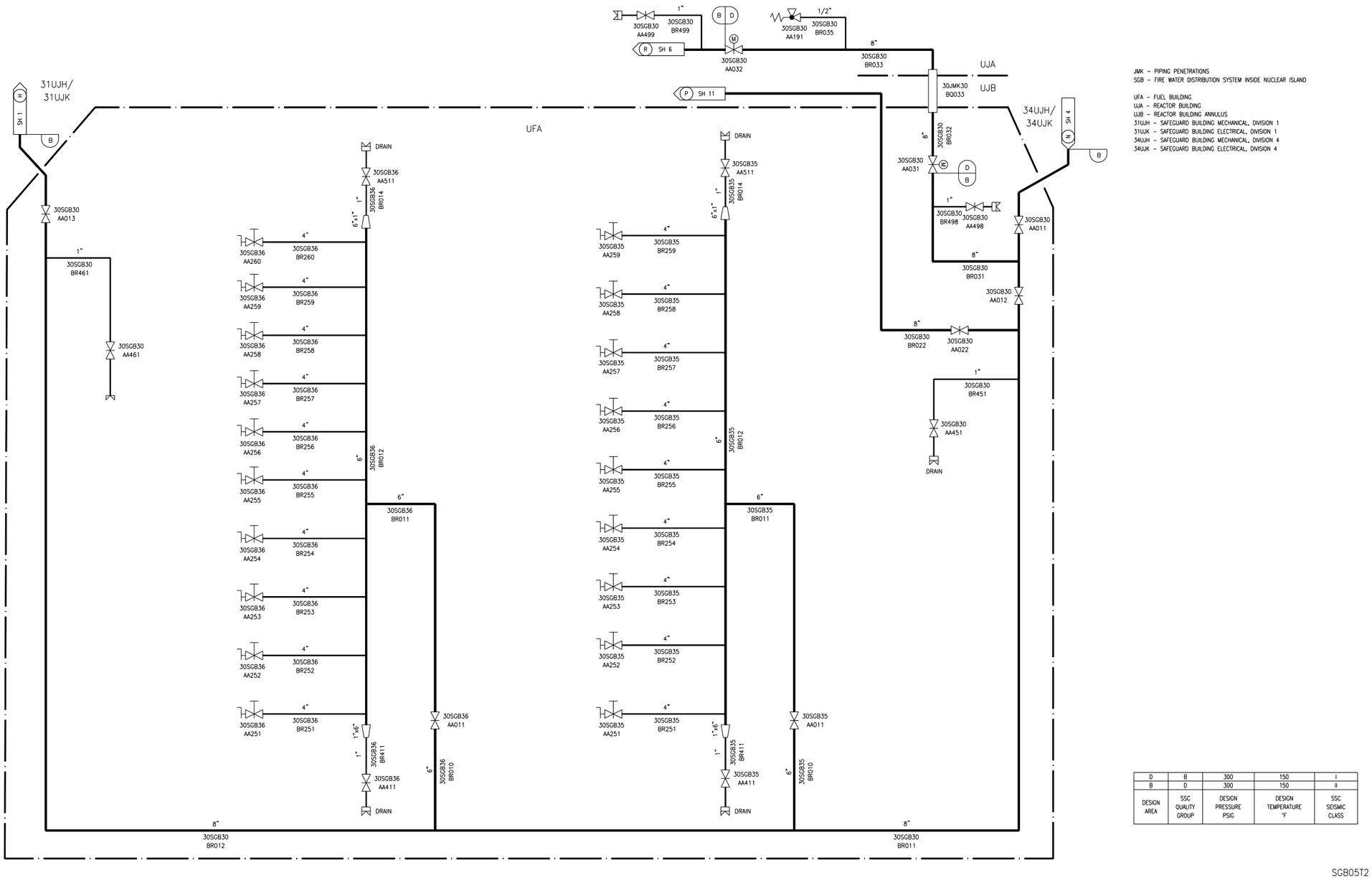
09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 6 of 13



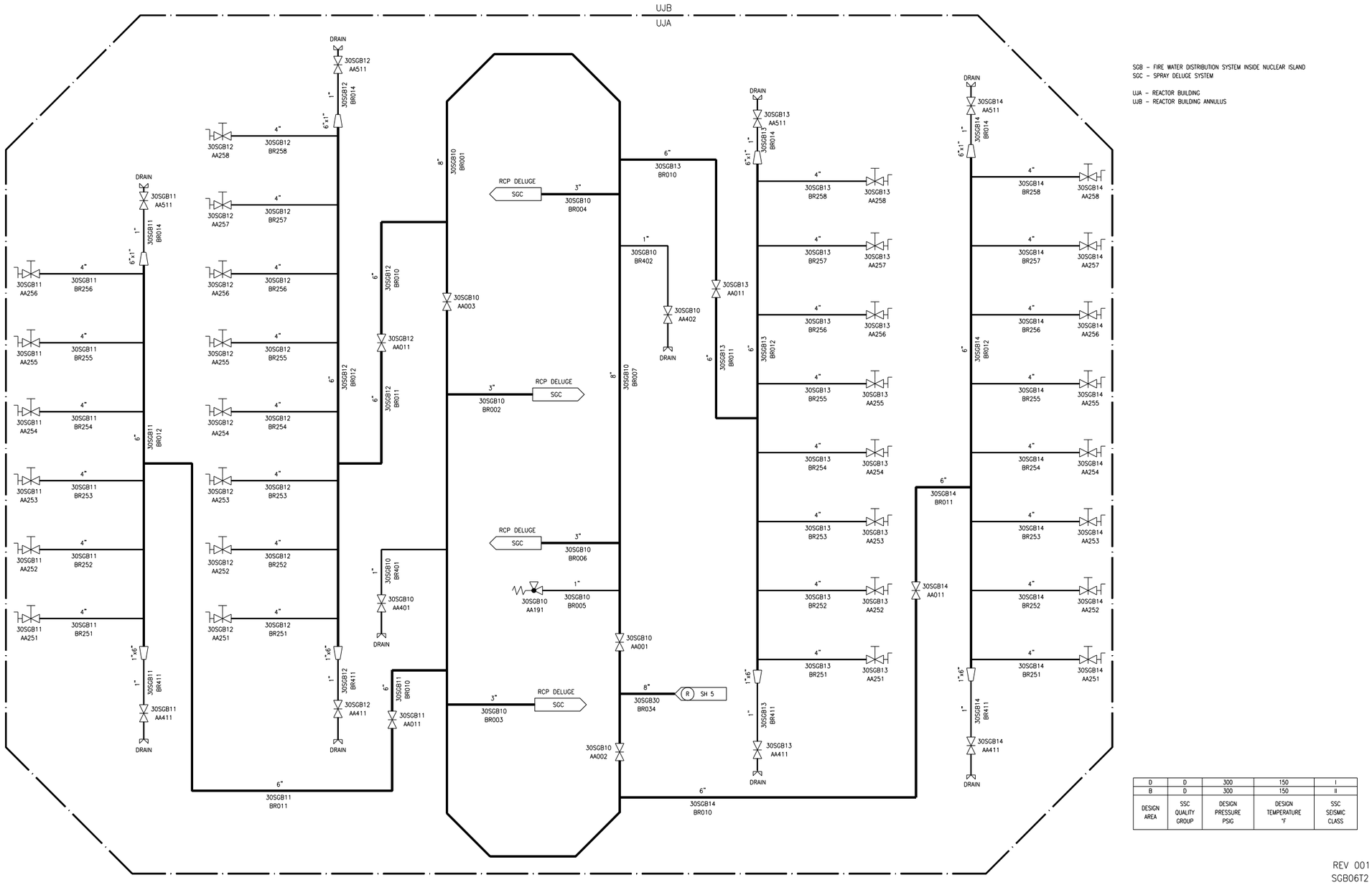
09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 7 of 13



09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 8 of 13

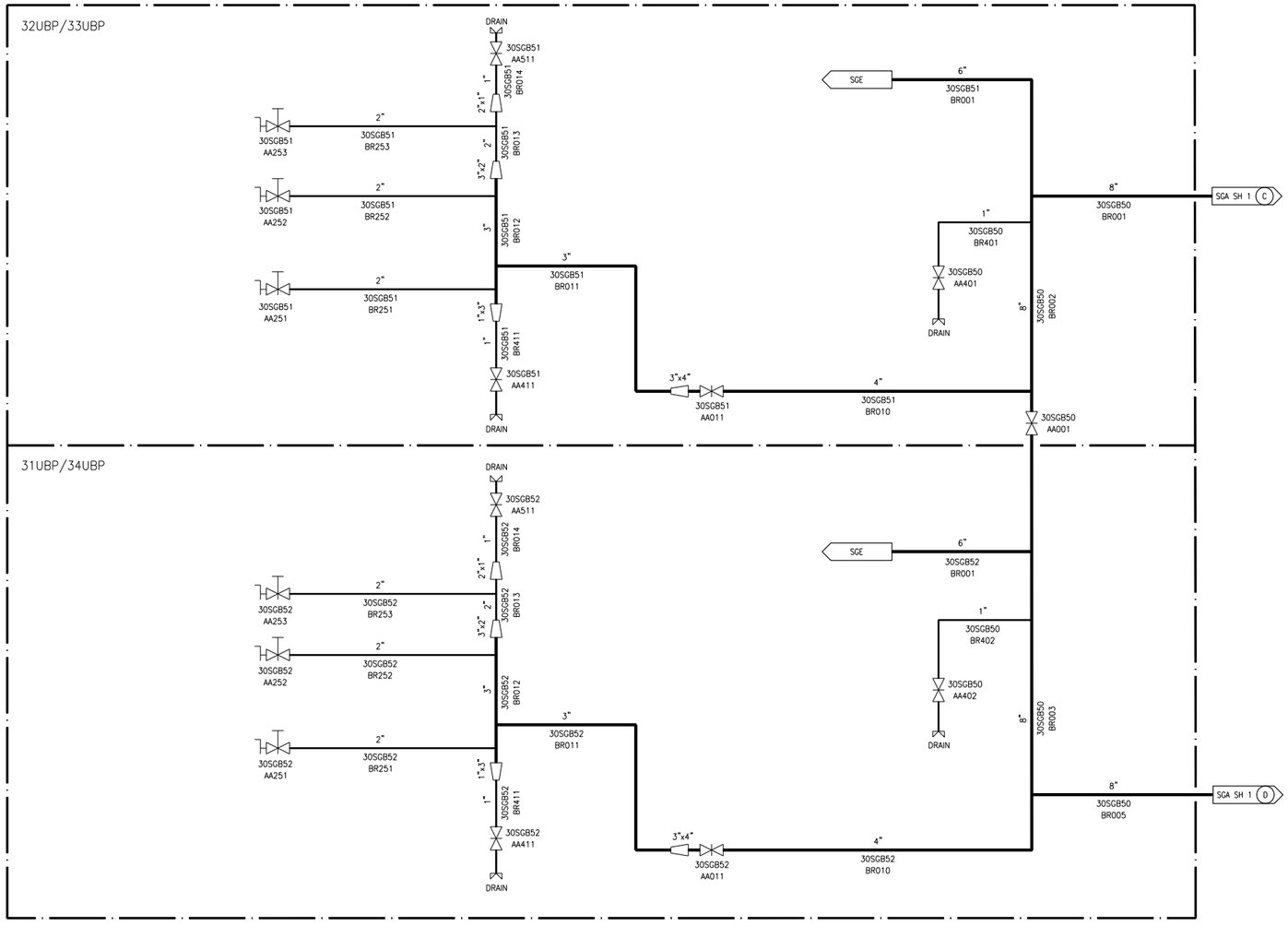


09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 9 of 13

SGA – FIRE WATER DISTRIBUTION SYSTEM, CONVENTIONAL AREA
SGB – FIRE WATER DISTRIBUTION SYSTEM INSIDE NUCLEAR ISLAND
SGE – SPRINKLER SYSTEMS

31UBP – EMERGENCY POWER GENERATING, DIVISION 1
32UBP – EMERGENCY POWER GENERATING, DIVISION 2
33UBP – EMERGENCY POWER GENERATING, DIVISION 3
34UBP – EMERGENCY POWER GENERATING, DIVISION 4

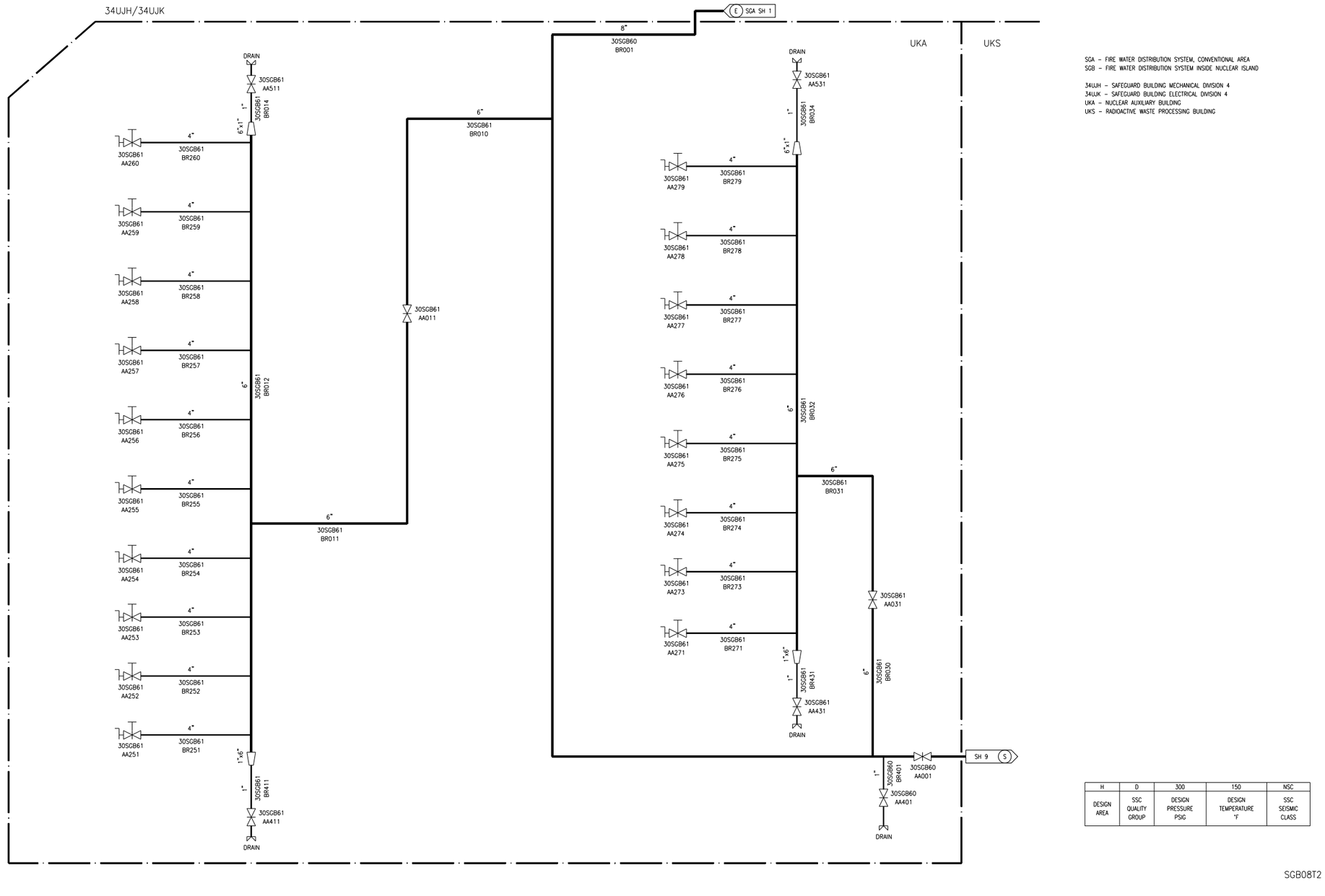


B	D	300	150	II
DESIGN AREA	SSC QUALITY GROUP	DESIGN PRESSURE PSIG	DESIGN TEMPERATURE °F	SSC SEISMIC CLASS

SGB07T2

09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 10 of 13



09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 11 of 13

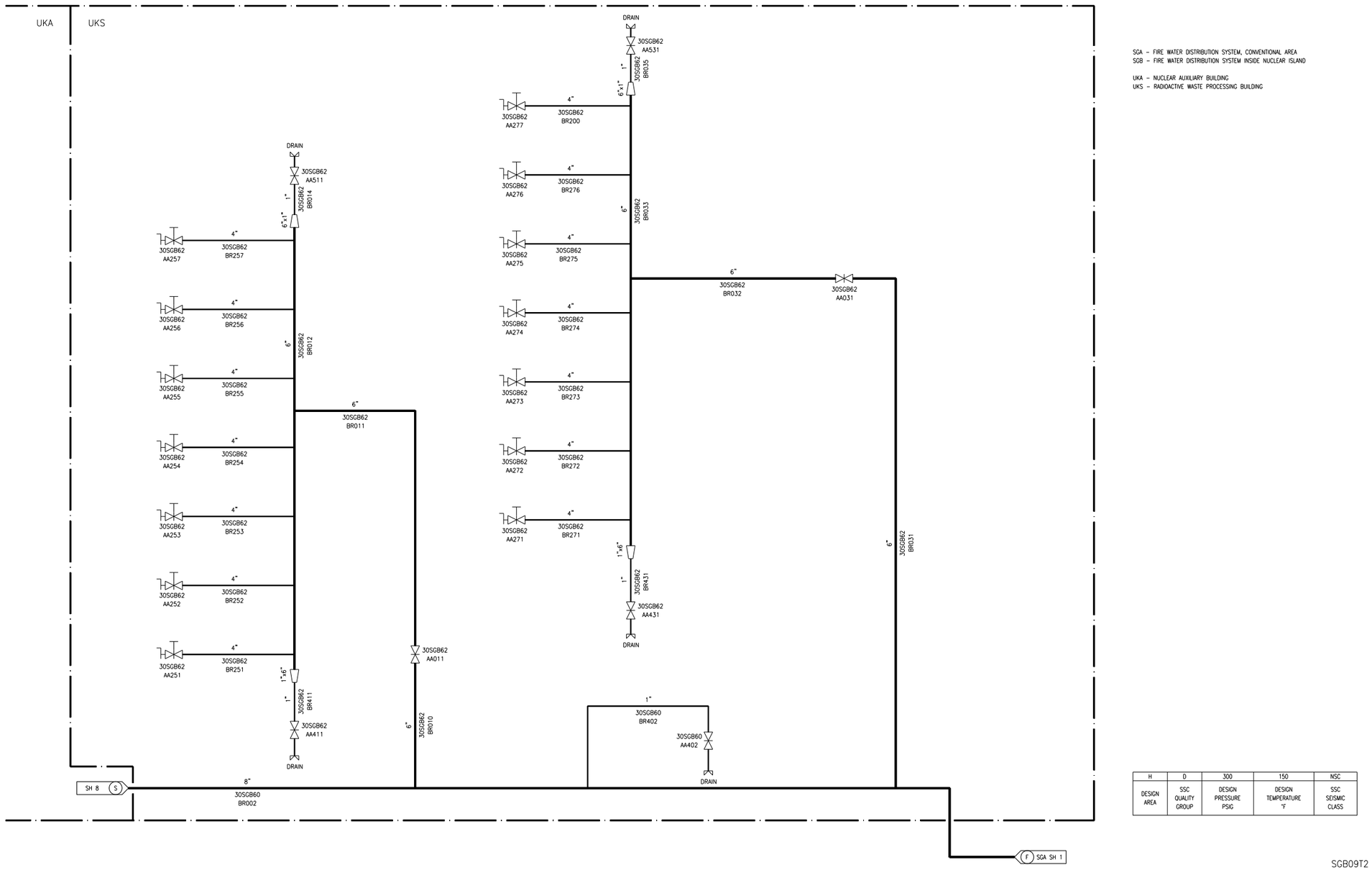


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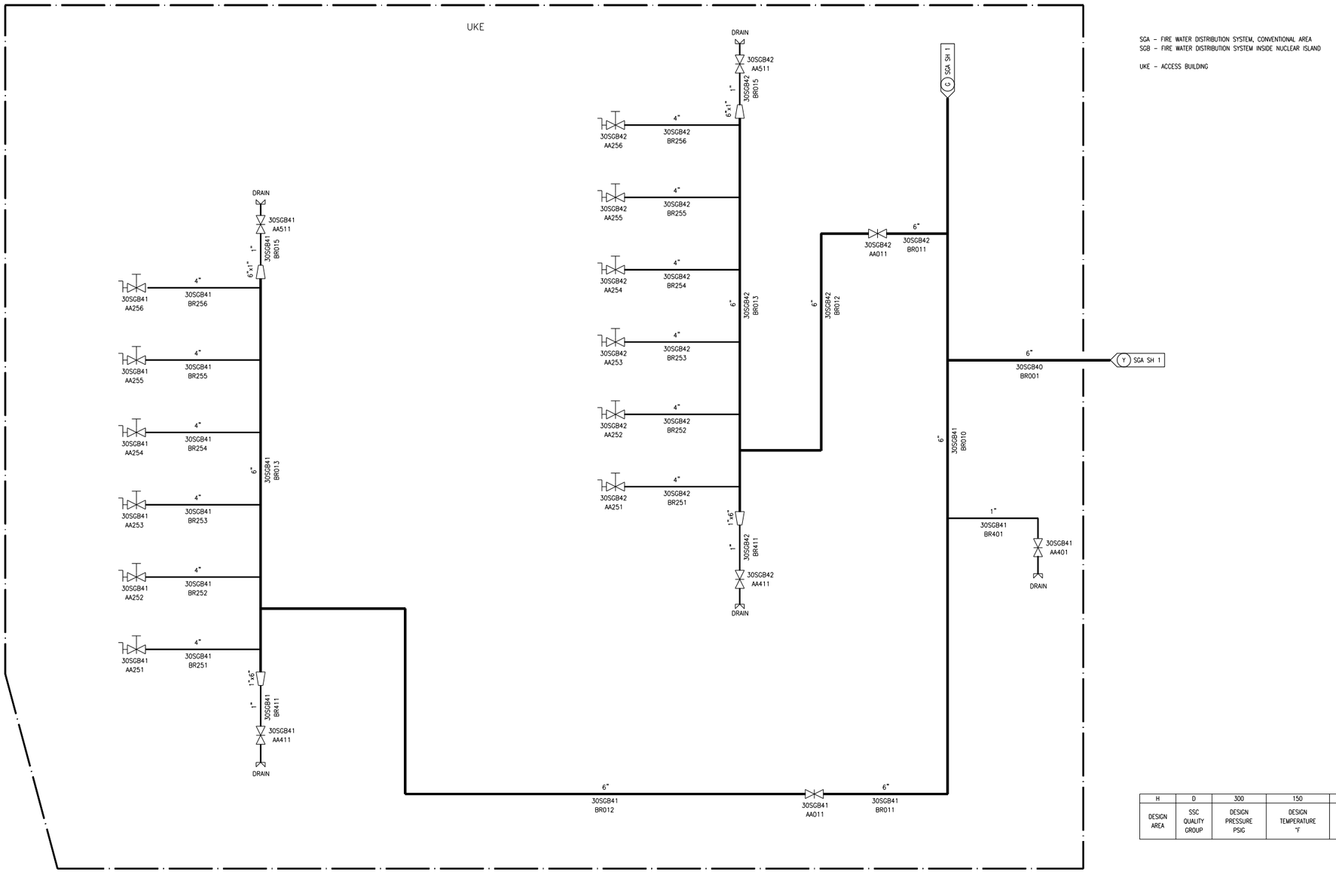
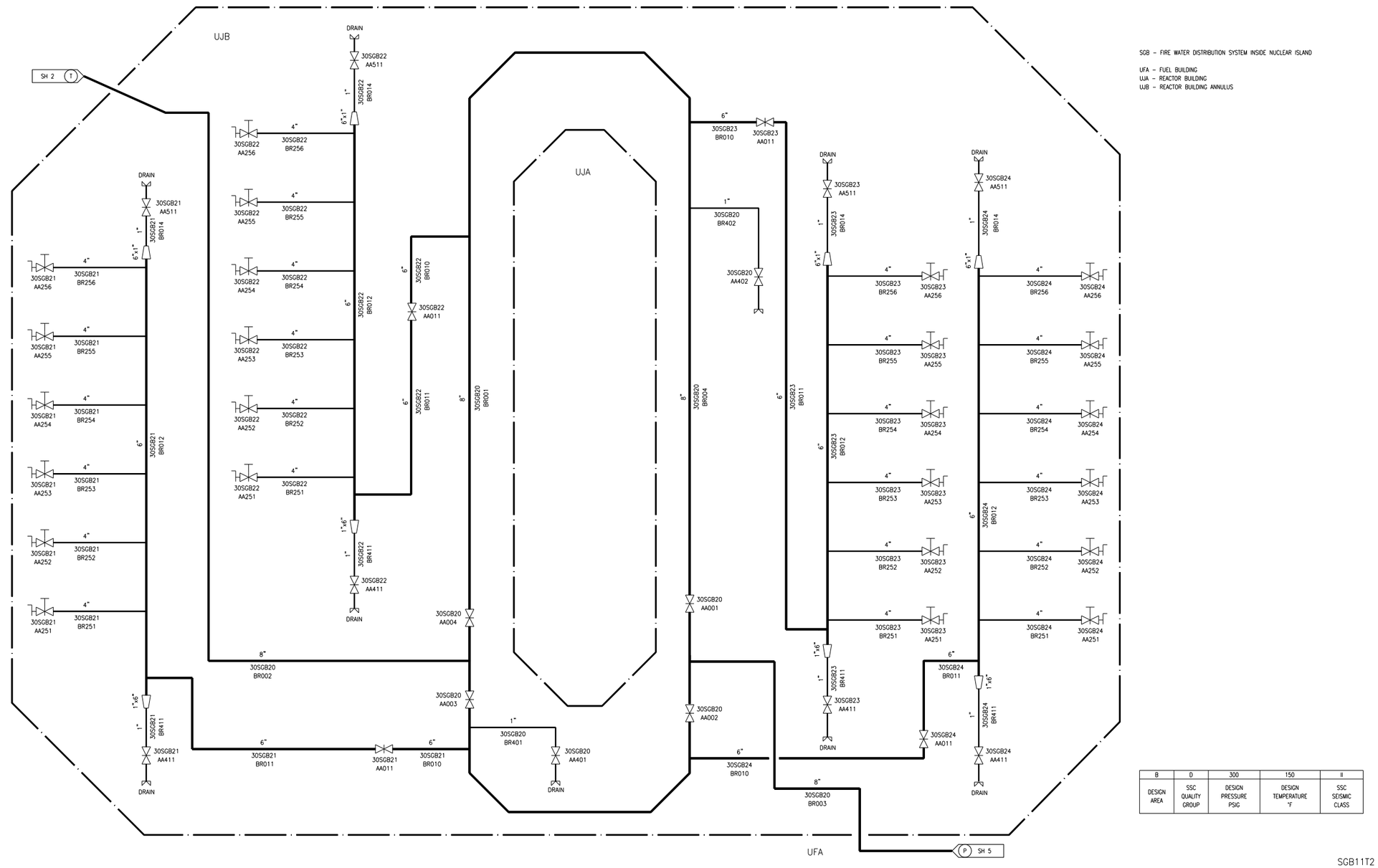
Figure 9.5.1-1—Fire Water Distribution System
Sheet 12 of 13



09.05.01-9

Figure 9.5.1-1—Fire Water Distribution System
Sheet 13 of 13



Mobile, hand-held units are used for direct, unit-to-unit communication via the base station. These units are robust, highly reliable and can withstand the harsh operating environment of the facility. The air interface and radio equipment parameters are identical to that for the base station, except for transmitter power.

The base station equipment for the portable wireless communication system is housed in NEMA 250 Type 4 rated cabinets, which are physically separated from the other subsystem equipment such as the digital telephone, PA, and alarm system. Physical separation of the cabinets increases protection against a single accident or fire from affecting multiple modes of communication throughout the plant.

09.05.01-14

Repeaters are utilized to allow seamless radio coverage throughout the plant. Antennas and cables interconnecting the repeaters to the base station equipment are located in a manner to facilitate the improved radio signal penetration into areas that are not properly served by the primary antenna. ~~In accordance with NRC RG 1.189 Fire Protection for Nuclear Power Plants, the repeaters are protected from exposure to fire damage.~~ Section 9.5.1 provides information regarding RG 1.189 compliance for the protection of repeaters from the effects of fire.

Radio trunking is implemented through the use of a trunking controller. Trunking provides improved channel utilization, spectrum availability, and feature flexibility.

9.5.2.2.2 Digital Telephone System

The digital telephone system provides plant-wide intercom capability for private conversation between personnel via private automatic branch exchange (PABX). The digital telephone system also provides an interconnection to the PSTN, allowing incoming and outgoing offsite communication. Dedicated digital telephone terminals are placed throughout the plant to facilitate access to this mode of communication. This system has access to the PA system, enabling personnel the ability to initiate pages over the PA system loudspeakers.

The telephone system utilizes a switching system capable of providing a telephone service for voice, paging, modem, and fax connections. The system is compatible with interface equipment or circuits used throughout the facility.

The main distribution frame of the telephone system consists of several distribution sections. A distribution section is provided for each Safeguard Building. The incoming lines of one division are collected together in the same section.

The PABX is equipped with a DC power unit and connected to a rectifier/charger and battery system having two hours of backup battery capacity. The rectifier/charger unit has sufficient rating to concurrently power a fully equipped PABX system and simultaneously provide charging current to the battery. The charging current

Table 9A-2—Fire Area Parameters
Sheet 8 of 40

Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression ~~Affects~~Effects	None	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes	Yes
Radiological ~~Affects~~Effects	None	None	None	None	None
HVAC (Note 9)	e	e, i	e	e	e, i
Emergency Lighting (Note 10)	cc, dd	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

09.05.01-20

Table 9A-2—Fire Area Parameters
Sheet 12 of 40

Suppression ~~Affects~~Effects	None	None	None	None	None
Plant Drains	Yes	Yes	Yes	Yes	Yes
Radiological ~~Affects~~Effects	None	None	None	None	None
HVAC (Note 9)	e	e, i	e	e	e, i
Emergency Lighting (Note 10)	cc, dd	aa	aa	aa	aa
Communication (Note 11)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

09.05.01-20

k. DCD 9.4.15 - Main Steam and Feedwater Valve Room Ventilation Systems.

l. DCD 9.4.11 – Essential Service Water Pump Building Ventilation System.

10. Emergency Lighting:

aa. Self-contained, battery backed fixtures installed throughout the fire area which provide minimum illumination for a 90 minute period to make sure that a safe access and egress path in the event of a loss of the normal plant lighting system.

bb. Is provided by the emergency lighting subsystem. This lighting consists of interruptible EDG-backed lighting provided for operation of important to safety equipment in the event of a loss of the normal plant lighting system (TBV).

09.05.01-20

cc. Is provided by the emergency lighting subsystem. This lighting consists of interruptible EDG-backed lighting provided for operation of important to safety equipment in the event of a loss of the normal plant lighting system (TBV). Emergency lighting is also provided for the egress route between the MCR and the RSS.

dd. Is provided by the special emergency lighting subsystem. This lighting consists of uninterruptible UPS-backed lighting provided for operation of important to safety equipment.

11. Communication:

One or more of the following methods of communication are available: plant-wide public address and paging system, in-plant telephone system, external communication links to the outside world, and portable radio communications.

12. Hazard Classification:

See Section 9A.2.2 for definition of hazard classifications.

- Light Hazard.
- Ordinary Hazard (OH Group-1).
- Ordinary Hazard (OH Group-2).
- Extra Hazard (EH Group-1).
- Extra Hazard (EH Group-2).