

## 9.5 Other Auxiliary Systems

### 9.5.1 Fire Protection System

The purpose of the fire protection system (FPS) is to provide the capability to safely shut down the reactor, maintain it in a safe shutdown condition, control radioactive releases to the environment, and to prevent personnel injury and property damage in the event of a fire.

The FPS consists of design features, personnel, equipment, and procedures to provide defense-in-depth protection of public health and safety. The program is implemented during station operations by the prevention, detection, annunciation, confinement, and extinguishment of fire. Administrative controls, training, inspection, testing, and quality assurance (QA) provide reasonable assurance of the operability of the program.

The FPS, including administrative controls and the fire brigade, are implemented prior to receiving fuel on site for fuel storage areas and for the entire station prior to reactor startup.

#### 9.5.1.1 Design Basis

The FPS is designed in accordance with:

- 10 CFR 50.48 - Fire Protection.
- 10 CFR Part 50, Appendix A, GDC 3 - Fire Protection.
- 10 CFR Part 50, Appendix A, GDC 5 - Sharing of Structures, Systems, and Components.
- 10 CFR Part 50, Appendix A, GDC 19 - Control Room.
- 10 CFR Part 50, Appendix A, GDC 23 - Protection System Failure Modes.
- 10 CFR Part 50, Appendix A, GDC 56 - Primary Containment Isolation.
- NUREG-0800, Standard Review Plan 9.5.1 - Fire Protection Program (Reference 37).
- RG 1.189 - Fire Protection for Nuclear Power Plants, Revision 1.

The FPS is designed to:

- Prevent fire initiation by controlling, separating, and limiting the quantities of combustibles and sources of ignition.

- Isolate combustible materials and limit the spread of fire by subdividing plant buildings into fire areas separated by fire barriers.
- Provide the capability to rapidly detect, control, and promptly extinguish fires that do occur.
- Provide protection for structures, systems, and components (SSC) important to safety so that a fire, not promptly extinguished, will not prevent the safe shutdown of the plant or result in the release of radioactive materials to the environment.
- Maintain one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) free of fire damage assuming all equipment in any one fire area will be rendered inoperable by fire, and post-fire re-entry for repairs or operator actions is not possible. Because of its physical configuration, the main control room (MCR) is excluded from this approach, but an independent alternative shutdown capability that is physically and electrically independent of the MCR is included in the design.
- Provide fire protection features for redundant shutdown systems in the Reactor Building (RB) that will make sure to the extent practicable that that one success path of SSC necessary to achieve safe shutdown conditions (i.e., cold shutdown) is free of fire damage.
- Separate redundant trains of safety-related equipment used to mitigate the consequences of a design basis accident (but not required for safe shutdown following a fire) are separated so that a fire within one train will not damage a redundant train.
- Prevent smoke, hot gases, or fire suppressant agents from migrating from one fire area to another to the extent they could adversely affect safe shutdown capabilities, including operator actions.
- Prevent failure or inadvertent operation of the FPS from impairing the safety capability of SSC important to safety.
- Preclude the loss of structural support, due to warping or distortion of building structural members caused by the heat from a fire, to the extent that such a failure could adversely affect safe shutdown capabilities.
- Provide floor drains sized to remove expected firefighting water flow without flooding safety-related equipment.
- Provide firefighting personnel access and life safety escape routes for each fire area.
- Provide emergency lighting and communications to facilitate safe shutdown following a fire.

- Limit the radiological release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) to as low as reasonably achievable and does not exceed applicable regulatory limits.

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**

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

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.

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

## **Plant Fire Prevention and Control Features**

### *Plant Arrangement*

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

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

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

### *Architectural and Structural Features*

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

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

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

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

- UL 555 – Standard for Fire Dampers (Reference 35).
- NFPA 101 – Life Safety Code (Reference 18).

Except for specialty doors and closure devices, cable openings, piping openings and building joints are provided with penetration seals having a fire resistance rating consistent with the designated fire rating of the fire barrier. Such penetration seals meet the requirements of ASTM E814 (Reference 31), UL 1479 (Reference 36), or IEEE Std 634 (Reference 33) and IEEE Std 1202 (Reference 34). Materials used for penetration seals are a limited-combustible or non-combustible material in accordance with NFPA 259 (Reference 23).

Conduits are sealed at the barrier with a fire-rated seal, if accessible. Alternatively, conduits are provided with a non-fire-rated smoke and hot gas seal at the first break in the conduit on both sides of the barrier. The fire resistance rating for internal conduit seals is consistent with the designated fire rating of the fire barrier.

Exceptions include:

- Where approved full-scale fire tests demonstrate that internal conduit seals are not necessary, internal conduit seals are not required.
- 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 required to be listed or fire-rated.

Additionally, where specialty components are used in lieu of fire-rated penetration seals, such as containment penetration assemblies; these components are not required to be fire-rated.

### **Electrical System Design and Electrical Separation**

Electrical system design and electrical separation is provided in accordance with the criteria specified in NUREG-0800 SRP 9.5.1 (Reference 37) and RG 1.189. As described in SRP 9.5.1 (Reference 37) and SECY-90-016 (Reference 38), the U.S.EPR design meets the enhanced fire protection criteria. Appendix A of SRP 9.5.1 (Reference 37) describes the criteria:

“Evolutionary advanced light water reactor (ALWR) designers must ensure that safe shutdown can be achieved assuming that all equipment in any one fire area will be rendered inoperable by fire and that re-entry into the fire area for repairs and operator actions is not possible. Because of its physical configuration, the control room is excluded from this approach, provided that an independent alternative shutdown capability that is physically and electrically independent of the control room is included in the design. Evolutionary ALWRs must provide fire protection for redundant shutdown systems in the reactor containment building that will ensure, to

the extent practical, that one shutdown division will be free of fire damage. Additionally, the evolutionary ALWR designers must ensure that smoke, hot gases or fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator actions.”

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

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

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

The MCR together with its adjacent room complex is one common fire area separated from other areas of the plant by floor, walls, and roof having minimum fire resistance ratings of three hours. All cables that enter the MCR terminate in the MCR. Specifically, no cables are routed through the MCR from one area to another. Cables enter the MCR by rising up from the cable spreading areas to the MCR sub-floor area. The sub-floor area is approximately 18 inches high and constitutes part of the MCR fire area. Because of the potential difficulty in accessing the MCR sub-floor areas for manual firefighting, the sub-floor areas are protected with a manually-actuated clean agent fire extinguishing system.

- The cables to the MCR are routed through the cable floor. The cable floor is a separate fire area from the MCR assigned to Division 2 of the SBs. Safety-related cables from each of the other three divisions (1, 3, and 4) are routed from the cable floor to the MCR sub-floor area in the MCR via separate non-combustible, fire resistive cable ducts. 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.

- 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.

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.

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.

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

#### *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 necessary to achieve and maintain CSD may be permitted per the RG, the U.S. EPR design provides the capability to achieve cold shutdown conditions within 72 hours without the need for repairs to facilitate the use of one success path. This is the case whether CSD is achieved from the MCR or RSS. In addition, when shutdown is accomplished from either operating location, systems and equipment necessary to achieve CSD have the capability of being powered from onsite sources.

#### *Spurious Operation of Components*

The U.S. EPR plant digital control system design makes extensive use of fiber optic cable. The inherent design features of the digital control system and its associated fiber optic wiring eliminate fire-induced spurious actuations as a concern for the U.S. EPR plant. In support of this position, the Standard Review Plan (Reference 37), Section 9.5.1, Appendix A, Subsection 6.2, Item f, recognizes that on a macroscopic level the use of fiber optic cable reduces the overall likelihood of hot shorts and spurious actuations. Therefore, fire-induced failures of fiber optic wiring leading to spurious component actuations are not considered credible for the U.S. EPR Plant.

For those components where spurious actuation may be a concern, the U.S. EPR design provides reasonable assurance that one shutdown success path remains free of fire damage for a single fire in any single fire area by utilizing a deterministic analytical approach. In accordance with RG 1.189, components whose fire-induced spurious actuation could adversely impact safe shutdown are addressed and appropriate protection provided. The methodology employed in determining the potential type and number of spurious actuations to consider in any given fire area is that identified in NEI 00-01, Revision 1 (Reference 39). The NRC has endorsed NEI 00-01 via Regulatory Issue Summary 2005-30 as providing an acceptable deterministic analytical methodology to address spurious actuations. Consequently, these documents provide the basis and assumptions considered for spurious actuations for the U.S. EPR design.

### *Operator Manual Actions*

For the U.S. EPR Plant, an operator manual action is defined as an action that takes place outside of the MCR in support of achieving and maintaining HSB from within the MCR. Operator manual actions associated with the credited shutdown success path are not required to achieve and maintain HSB.

### *Associated Circuits of Concern*

Associated circuits are generally defined as those circuits that do not meet divisional separation requirements and:

- Share a common power source with shutdown 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.

### **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.

The release of smoke and gases, containing radioactive materials, to the environment is monitored in accordance with RG 1.101. Where possible, isolation is provided where the release of smoke and gases could contain radioactive materials in a fire condition. However, where venting is required, filtration equipment used to reduce doses is designed or protected to withstand the smoke and heat resulting from the fire. Ventilation systems designed to exhaust potentially radioactive smoke or gases have been evaluated to make sure that inadvertent operation or single failures do not violate the radiologically controlled areas.

Plant operations staff is protected from the effects of fire and fire suppression (e.g., gaseous suppression agents) to provide reasonable assurance of safe shutdown of the plant including operator manual actions. The arrangement of the MCR, egress pathways and the RSS provides habitability in these areas. During normal operation and for a radiological event, the MCR is maintained at positive pressure with respect to the outside and adjacent areas. The design of the HVAC system places the MCR in recirculation mode for a fire outside the MCR so that any fires in these outside and

adjacent areas will not affect the habitability of the MCR. Smoke and heat removal throughout the facility is provided by portable systems or by manual operation of the non-safety-related HVAC systems.

A smoke confinement system (SCS) Nuclear Island (NI) is provided to make sure habitability of the access and egress pathways throughout the facility. See Section 9.4.13 for a detail description and operation of the SCS. The design of the smoke removal systems complies with NFPA 92A (Reference 17) and NFPA 204 (Reference 19). Access and egress pathways are maintained at higher pressure than adjacent areas to minimize smoke infiltration during a fire. Smoke confinement systems are also provided in large electrical areas such as switchgear rooms and electrical rooms where the potential exists for heavy smoke conditions.

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

1. The staircase supply air subsystem provides forced airflow through the main access and egress routes of the SBs, FB, Nuclear Auxiliary Building (NAB), Access Building (ACB) and Radioactive Waste Processing Building (RWB). The primary purpose of this system is to prevent in-leakage of smoke from adjacent areas.
2. The SBs 2 and 3 interconnecting passageway supply and exhaust air subsystem provides outside air to pressurize the SBs 2 and 3 interconnecting passageway and the safeguard escape ladder shaft. The primary purpose of this system is to prevent in-leakage of smoke from adjacent areas.
3. The NI interconnecting passageway supply and exhaust air subsystem pressurizes and purges the interconnecting passageway and service corridors of the SBs, FB, NAB, and RWB. These passageways are at ground level and are the main emergency pathways for the NI.
4. The smoke extraction subsystem removes smoke and provides ventilation for large electrical areas such as cable rooms, switchgear rooms and electrical rooms.

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**

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.

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).

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.

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

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**

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.

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.

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.

### **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.

#### **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). 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.

#### **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.

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 herein is the responsibility of the COL applicant.

##### **9.5.1.6.1 Fire Prevention**

#### **Plant Design and Modification Practices**

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

#### **Combustible Control Practices**

Administrative procedures strictly control the use of flammable and combustible materials in plant areas important to safety. Bulk storage of combustible materials is not permitted inside or adjacent to buildings or systems important to safety. Use and

control of transient combustible materials (e.g., combustible liquids, wood and plastic products, dry ion exchange resins) are governed by administrative control measures.

Combustible materials in the RSS are controlled and limited 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 building by three hour rated fire barriers. Potential spills from the tanks are confined by enclosures sized to accommodate more than the entire inventory of each tank. Automatic fire detection system capability is provided throughout the EPGBs. Additionally, each diesel fuel oil main storage tank and diesel day tank are protected by an automatic deluge (i.e., water spray) fire suppression system. Adequate drainage measures are provided for removing fire protection water and diesel fuel oil.

The RCP motors each contain an upper and lower bearing that have independent oil lubrication systems. Both lubrication systems have an internal oil supply that is cooled with water via an oil cooler. Therefore, there is no external lube oil supply or associated connection lines. In the event of a lube oil leak at a bearing, an alarm is displayed in the MCR. Additionally, the ability to confine and safely drain the lube oil leakage is provided via an RCP lube oil collection system at each pump. The RCP lube oil collection system is designed, engineered, and installed so that its failure will not lead to fire during normal or design basis accident conditions, and reasonable

assurance is provided that the system will withstand the SSE. Means are provided to collect lube oil from all potentially pressurized and un-pressurized leakage sites in the RCP lube oil systems. The RCP lube oil collection system for each pump is capable of collecting and draining the entire lube oil inventory of the largest potential oil leak to a vented closed container. The container is sized to hold the lube oil inventory of all RCPs draining to that container. A flame arrester is provided if the flashpoint characteristics of the lube oil present the hazard of fire flashback.

Automatic fire detection system coverage is provided in the area surrounding each RCP. Additionally, the oil risk areas surrounding the RCPs are protected by fixed deluge (or water spray) systems which are manually actuated from the MCR.

### **Control of Radioactive Materials**

Materials that collect or contain radioactivity, such as spent ion exchange resins and filters, are protected and stored in accordance with RG 1.189.

### **Ignition Source Control Practices**

Design, installation, modification, maintenance and operational procedures, and practices control potential ignition sources such as electrical equipment (i.e., permanent and temporary), hot work activities (e.g., open flame, welding, cutting and grinding), reactive chemicals, static electricity, and smoking.

- Hot work involving open flame or spark producing activities such as cutting, welding and grinding operations are governed by a permit system as required by station administrative controls. NFPA 51B (Reference 10) guidance is considered in developing hot work administrative controls. Each task is reviewed, the work area is protected, and personnel that are trained to perform fire watch and suppress incipient fires are present during and after the work.
- 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.

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

### **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.

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 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.

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 size of the fire brigade is based on the functions required to fight credible and challenging fires for each operating shift with allowance for injuries, but includes at least five members per shift.
  - Fire brigade staffing accounts for all operational and emergency response demands on shift personnel in the event of a significant fire.

### **9.5.1.6.3 Fire Protection Training and Personnel Qualifications**

#### **Fire Protection Engineer**

The individual responsible for developing and implementing the overall FPP is designated as the fire protection engineer. The fire protection engineer meets the educational and experience requirements necessary to be considered eligible for member grade (or professional member) status in the Society of Fire Protection Engineers (SFPE) or is a member (professional member) in the SFPE.



## **Fire Brigade Members**

Fire brigade members must complete initial training and qualification requirements before serving on the plant fire brigade. This initial training includes individual responsibilities, identification of the type and location of fire hazards, and associated types of fires that could occur including the toxic and corrosive characteristics of expected products of combustion. The training identifies the location, proper use of fire fighting equipment, the correct method of fighting each type of fire including those in confined spaces, and familiarization with plant layout. The training also covers the proper use of communication, lighting, ventilation, and emergency breathing equipment. Also covered are a detailed review of firefighting strategies and procedures, and a review of the latest plant modifications and corresponding changes in firefighting plans. Fire brigade leaders receive instruction on the direction and coordination of firefighting activities. Fire brigade members must also complete on-going training and qualification. This training includes:

- Successful completion of an annual physical examination.
- Attendance to monthly on-shift training, when scheduled.
- Attendance at quarterly fire fighting training.
- Participation in quarterly drills (minimum two drills per year).
- Annual participation in a practice session that provides experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions.
- Successful completion of a fit test for self-contained breathing apparatus every year.

The fire brigade leader and at least two brigade members have sufficient training and knowledge of plant systems to understand the effects of fire and fire suppressants on safe shutdown capability. The fire brigade leader possesses an operator's license or has the equivalent knowledge of plant systems, so that they can competently assess the potential safety consequences of a fire and advise MCR personnel.

## **Fire Protection System Operation, Testing and Maintenance**

Functional groups responsible for FPS operation, maintenance, and testing are qualified by training and experience, and understand functions of the system.

## **Training of the Fire Brigade**

The personnel responsible for the training of the fire brigade are qualified by knowledge, suitable training, and experience.

## **General Employee Training**

Each nuclear plant employee has a responsibility to prevent, detect, and suppress fires. General site employee training introduces all personnel to the elements of the site-specific FPP, including the responsibilities of the FPS staff. Training includes information on the types of fires and related extinguishing agents, specific fire hazards at the site, and actions in the event of a fire suppression system actuation. General employee training provides specific instruction to site and contractor personnel on appropriate actions to be taken upon discovering a fire, actions to be taken upon hearing a fire alarm, administrative controls on the use of combustibles and ignition sources, and actions necessary in the event of a combustible liquid spill or gas release or leaks.

## **Fire Watch Training**

Fire watch training provides instruction on fire watch duties, responsibilities, and required actions for both one hour roving and continuous fire watches. Fire watch qualification includes hands-on training in a practice fire with the extinguishing equipment to be used while on fire watch, and includes record keeping requirements.

### **9.5.1.6.4 Fire Brigade Organization, Training, and Records**

The plant fire brigade must have a minimum of five qualified members on-site at all times. The fire brigade shall not include the minimum shift crew necessary for safe shutdown or any personnel required for other essential functions during a fire emergency. The fire brigade consists of a fire brigade leader who is assigned to the fire brigade and is qualified to assume command of a fire emergency and direct fire-fighting activities. The fire brigade also consists of an additional four fire brigade members who are qualified, trained, and equipped to respond to fire related emergencies.

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.

### **9.5.1.6.5 Quality Assurance**

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.

### 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, 2008.
9. NFPA 30, "Flammable and Combustible Liquids Code," National Fire Protection Association Standards, 2008.
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, 2008.
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.
16. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilation Systems," National Fire Protection Association Standards, 2002.
17. NFPA 92A, "Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences," National Fire Protection Association Standards, 2006.
18. NFPA 101, "Life Safety Code," National Fire Protection Association Standards, 2006.
19. NFPA 204, "Standard for Smoke and Heat Venting," National Fire Protection Association Standards, 2007.
20. NFPA 251, "Standard Methods of Tests of Fire Resistance of Building Construction and Materials," National Fire Protection Association Standards, 2006.
21. NFPA 252, "Standard Methods of Fire Tests of Door Assemblies," National Fire Protection Association Standards, 2008.
22. NFPA 253, "Standard Methods of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source," National Fire Protection Association Standards, 2006.
23. NFPA 259, "Standard Test Method for Potential Heat of Building Materials," National Fire Protection Association Standards, 2008.
24. NFPA 600, "Standard on Industrial Fire Brigades," National Fire Protection Association Standards, 2005.
25. NFPA 703, "Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials," National Fire Protection Association Standards, 2006.
26. NFPA 1961, "Standard on Fire Hose," National Fire Protection Association Standards, 2007.
27. NFPA 1962, "Standard for the Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose," National Fire Protection Association Standards, 2003.
28. NFPA 2001, "Standard on Clean Agent Fire Extinguishing Systems," National Fire Protection Association Standards, 2008.
29. ASTM E84-07, "Standard Test Methods for Surface Burning Characteristics of Building Materials," America Society for Testing and Materials, 1997.

30. ASTM E119, "Standard Test Methods for Fire Test of Building Construction and Materials," America Society for Testing and Materials, 2007.
31. ASTM E814, "Standard Test Method for Fire Tests of Through-Penetration Fire Stops," America Society for Testing and Materials, 2006.
32. ASME B31.1, "Power Piping" - B31.1ab-2004 (including 2005 & 2006 Addenda), American Society of Mechanical Engineers.
33. IEEE Std 634, "IEEE Standard Cable Penetration Fire Stop Qualification Test," Institute of Electrical and Electronics Engineers, Inc., 2004.
34. IEEE Std 1202, "IEEE Standard for Flame-Propagation Testing of Wire and Cable," Institute of Electrical and Electronics Engineers, Inc., 2006.
35. UL 555, "Standard for Fire Dampers," Underwriters Laboratories, 2006.
36. UL 1479, "Standard for Fire Tests of Through-Penetration Firestops," Underwriters Laboratories 2003.
37. NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants.
38. SECY-90-016, "Evolutionary Light-Water Reactor (QA) Certification Issues and Their Relationship to Current Regulatory Requirements."
39. NEI 00-01, Revision 1, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Nuclear Energy Institute, 2001.
40. NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities," September 2005.

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 1 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>                   |
|---------------------|--|-------------------------------|---|
| C.1                 | Fire Protection Program  | Compliance                    |   |
| C.1.1               | Organization, Staffing, and Responsibilities                       | Compliance                    |   |
| C.1.2               | Fire Hazards Analysis  | Compliance                    | See Fire Protection Analysis Appendix 9A. |
| C.1.3               | Safe-Shutdown Analysis   | Compliance                    |   |
| C.1.4               | Fire Test Reports and Fire Data                                    | Compliance                    |   |
| C.1.5               | Compensatory Measures  | Compliance                    |   |
| C.1.6               | Fire Protection Training and Qualifications                        | Compliance                    |   |
| C.1.6.1             | Fire Protection Staff Training and Qualifications                  | Compliance                    |   |
| C.1.6.2             | General Employee Training  | Compliance                    |   |
| C.1.6.3             | Fire Watch Training  | Compliance                    |   |
| C.1.6.4             | Fire Brigade Training and Qualifications                           | Compliance                    |   |
| C.1.6.4.1           | Qualifications   | Compliance                    |   |
| C.1.6.4.2           | Instruction  | Compliance                    |   |
| C.1.6.4.3           | Fire Brigade Practice  | Compliance                    |   |
| C.1.6.4.4           | Fire Brigade Training Records                                      | Compliance                    |   |
| C.1.7               | Quality Assurance  | Compliance                    |   |
| C.1.7.1             | Design and Procurement Document Control                            | COL Applicant                 | Note 3                                    |
| C.1.7.2             | Instructions, Procedures and Drawings                              | COL Applicant                 | Note 3                                    |
| C.1.7.3             | Control of Purchased Material, Equipment, and Services             | COL Applicant                 | Note 3                                    |
| C.1.7.4             | Inspection   | Compliance                    |   |
| C.1.7.5             | Test and Test Control  | Compliance                    |   |
| C.1.7.6             | Inspection, Test, and Operating Status                             | Compliance                    |   |
| C.1.7.7             | Non-conforming Items   | Compliance                    |   |
| C.1.7.8             | Corrective Action  | Compliance                    |   |
| C.1.7.9             | Records  | Compliance                    |   |
| C.1.7.10            | Audits   | Compliance                    |   |
| C.1.7.10.1          | Annual Fire Protection Audit                                       | Compliance                    |   |
| C.1.7.10.2          | 24-Month Fire Protection Audit                                     | Compliance                    |   |
| C.1.7.10.3          | Triennial Fire Protection Audit                                    | Compliance                    |   |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 2 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>   |
|---------------------|--|-------------------------------|---|
| C.1.8               | Fire Protection Program Changes/Code Deviations                    | COL Applicant                 | Note 3  |
| C.1.8.1             | Change Evaluations   | COL Applicant                 | Note 3  |
| C.1.8.2             | Exemptions to Appendix R to 10 CFR Part 50                         | N/A                           | For plants licensed before January 1, 1979.   |
| C.1.8.3             | Appendix R Equivalency Evaluations                                 | N/A                           | For plants licensed before January 1, 1979.   |
| C.1.8.4             | License Amendments   | N/A                           | For plants licensed before January 1, 1979.   |
| C.1.8.5             | 10 CFR 50.72 Notification and 10 CFR 50.73 Reporting               | COL Applicant                 | Note 3  |
| C.1.8.6             | NFPA Code and Standard Deviations Evaluations                      | Compliance                    |   |
| C.1.8.7             | Fire Modeling  | COL Applicant                 | Note 3  |
| C.2                 | Fire Prevention  | Compliance                    |   |
| C.2.1               | Control of Combustibles  | Compliance                    |   |
| C.2.1.1             | Transient Fire Hazards   | Compliance                    |   |
| C.2.1.2             | Modifications  | Compliance                    |   |
| C.2.1.3             | Flammable and Combustible Liquids and Gases                        | Compliance                    |   |
| C.2.1.4             | External/Exposure Fire Hazards                                     | Compliance                    |   |
| C.2.2               | Control of Ignition Sources  | Compliance                    |   |
| C.2.2.1             | Open Flame, Welding, Cutting, and Grinding (Hot Work)              | Compliance                    |   |
| C.2.2.2             | Temporary Electrical Installations                                 | Compliance                    |   |
| C.2.2.3             | Other Sources  | Compliance                    |   |
| C.2.3               | Housekeeping   | Compliance                    |   |
| C.2.4               | Fire Protection System Maintenance and Impairments                 | Compliance                    |   |
| C.3                 | Fire Detection and Suppression                                     |                               | See Fire Protection Analysis – Appendix 9A for fire area by fire area description of system features. |
| C.3.1               | Fire Detection   |                               | See below.  |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 3 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b>  | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>                                |
|---------------------|---|-------------------------------|--|
| C.3.1.1             | Fire Detection and Alarm Design Objectives and Performance Criteria | Compliance                    |  |
| C.3.2               | Fire Protection Water Supply Systems                                |                               | See below.   |
| C.3.2.1             | Fire Protection Water Supply  | Compliance                    |  |
| C.3.2.2             | Fire Pumps  | Compliance                    |  |
| C.3.2.3             | Fire Mains  | Compliance                    |  |
| C.3.3               | Automatic Suppression Systems                                       | Compliance                    |  |
| C.3.3.1             | Water Based Systems   | Compliance                    |  |
| C.3.3.1.1           | Sprinkler and Spray Systems   | Compliance                    |  |
| C.3.3.1.2           | Water Mist Systems  | N/A                           | Water mist suppression systems are not provided.       |
| C.3.3.1.3           | Foam-Water Sprinkler and Spray Systems                              | N/A                           | Foam sprinkler and spray systems are not provided.     |
| C.3.3.2             | Gaseous Fire Suppression  | Compliance                    |  |
| C.3.3.2.1           | Carbon Dioxide (CO <sub>2</sub> ) Systems                           | N/A                           | Carbon dioxide extinguishing systems are not provided. |
| C.3.3.2.2           | Halon   | N/A                           | Halon fire extinguishing systems are not provided.     |
| C.3.3.2.3           | Clean Agents  | Compliance                    |  |
| C.3.4               | Manual Suppression Systems and Equipment                            | Compliance                    |  |
| C.3.4.1             | Standpipes and Hose Stations  | Compliance                    |  |
| C.3.4.2             | Hydrants and Hose Houses  | Compliance                    |  |
| C.3.4.3             | Manual Foam   | Compliance                    |  |
| C.3.4.4             | Fire Extinguishers  | Compliance                    |  |
| C.3.4.5             | Fixed Manual Suppression  |                               |  |



**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 4 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b>   | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>  |
|---------------------|--|-------------------------------|--|
|                     | Some fixed fire suppression systems may be manually actuated (e.g., fixed suppression systems provided in accordance with Section III.G.3 of Appendix R to 10 CFR Part 50). Manual actuation is generally limited to water spray systems and should not be used for gaseous suppression systems except when the system provides backup to an automatic water suppression system. Fixed manual suppression systems should be designed in accordance with applicable guidance of the appropriate NFPA standards. A change from an automatic system to a manually actuated system should be supported by an appropriate evaluation. | Alternate Compliance          | A manually actuated gaseous suppression system is provided for the subfloor area of the MCR. The subfloor area is provided with fire detection. The Control Room is continuously occupied allowing for prompt identification and response. See Section 9.5.1.2.1 “Automatic Fire Suppression Systems” for details. |
| C.3.5               | Manual Firefighting Capabilities   | Compliance                    |  |
| C.3.5.1             | Fire Brigade   | Compliance                    |  |
| C.3.5.1.1           | Fire Brigade Staffing  | Compliance                    |  |
| C.3.5.1.2           | Equipment  | Compliance                    |  |
| C.3.5.1.3           | Procedures and Prefire Plans   | Compliance                    |  |
| C.3.5.1.4           | Performance Assessment/Drill Criteria  | Compliance                    |  |
| C.3.5.2             | Offsite Manual Firefighting Resources  | Compliance                    |  |
| C.3.5.2.1           | Capabilities   | Compliance                    |  |
| C.3.5.2.2           | Training   | Compliance                    |  |
| C.3.5.2.3           | Agreement/Plant Exercise   | Compliance                    |  |
| C.4                 | Building Design/Passive Features   | Compliance                    |  |
| C.4.1               | General Building and Building System Design  | Compliance                    |  |
| C.4.1.1             | Combustibility of Building Components and Features   | Compliance                    |  |
| C.4.1.1.1           | Interior Finish  | Compliance                    |  |
| C.4.1.1.2           | Testing and Qualification  | Compliance                    |  |
| C.4.1.2             | Compartmentalization, Fire Areas, and Zones  | Compliance                    |  |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 5 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>  |
|---------------------|--|-------------------------------|--|
| C.4.1.2.1           | Fire Areas   | Alternate Compliance          | See Section 9.5.1.2.1 for details of fire area boundary ratings and fire area separation. Also, see Fire Protection Analysis – Appendix 9A for fire area by fire area analysis.                      |
| C.4.1.2.2           | Fire Zones   | Compliance                    |  |
| C.4.1.2.3           | Access and Egress Design   | Compliance                    |  |
| C.4.1.3             | Electrical Cable System Fire Protection Design                     | Compliance                    |  |
| C.4.1.3.1           | Cable Design   | Alternate Compliance          | Instances where special purpose cabling may not be qualified to the specified standards, an evaluation of the cabling will be performed.   |
| C.4.1.3.2           | Raceway/Cable Tray Construction                                    | Compliance                    |  |
| C.4.1.3.3           | Electrical Cable System Fire Detection and Suppression             | Alternate Compliance          |  |
| C.4.1.3.4           | Electrical Cable Separation  | Compliance                    | See Section 9.5.1.2.1 on “Electrical System Design and Electrical Separation”, “Fire Detection and Alarm System” and the Fire Protection Analysis – Appendix 9A for fire area by fire area analysis. |
| C.4.1.3.5           | Transformers   | Compliance                    |  |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 6 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>  |
|---------------------|--|-------------------------------|--|
| C.4.1.3.6           | Electrical Cabinets  | Alternate Compliance          | See Section 9.5.1.2.1 on “Electrical System Design and Electrical Separation,” “Fire Detection and Alarm System,” “Manual Fire Suppression Systems” for fire protection system design details, and see the Fire Protection Analysis – Appendix 9A for fire area by fire area description of system features. |
| C.4.1.4             | HVAC Design  | Compliance                    |  |
| C.4.1.4.1           | Combustibility of Filter Media                                     | Compliance                    |  |
| C.4.1.4.2           | Smoke Control/Removal  | Compliance                    |  |
| C.4.1.4.3           | Habitability   | Compliance                    |  |
| C.4.1.4.4           | Fire Dampers   | Compliance                    |  |
| C.4.1.5             | Drainage   | Compliance                    |  |
| C.4.1.6             | Emergency Lighting   | Compliance                    |  |
| C.4.1.6.1           | Egress Safety  | Compliance                    |  |
| C.4.1.6.2           | Post-Fire Safe-Shutdown  | Compliance                    |  |
| C.4.1.7             | Communications   | Compliance                    |  |
| C.4.1.8             | Explosion Prevention   | Compliance                    |  |
| C.4.2               | Passive Fire-Resistive Features                                    | Compliance                    |  |
| C.4.2.1             | Structural Fire Barriers   | Compliance                    |  |
| C.4.2.1.1           | Wall, Floor, and Ceiling Assemblies                                | Compliance                    |  |
| C.4.2.1.2           | Fire Doors   | Compliance                    |  |
| C.4.2.1.3           | Fire Dampers   | Compliance                    |  |
| C.4.2.1.4           | Penetration Seals  | Compliance                    |  |
| C.4.2.1.5           | Testing and Qualification  | Compliance                    |  |
| C.4.2.1.6           | Evaluation of Penetration Seal Designs with Limited Testing        | Compliance                    |  |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 7 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b>   | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>  |
|---------------------|--|-------------------------------|--|
| C.4.2.2             | Structural Steel Protection  | Compliance                    |  |
| C.4.2.3             | Fire-Resistive Protection for Electrical Circuits                    | Compliance                    |  |
| C.4.2.3.1           | Electrical Raceway Fire Barrier Systems                              | Compliance                    |  |
| C.4.2.3.2           | Fire Rated Cables  | N/A                           | For plants licensed before January 1, 1979.  |
| C.4.2.3.3           | Fire Stops for Cable Routing   | Alternate Compliance          | See Section 9.5.1.2.1 on “Electrical System Design and Electrical Separation” for details of alternate compliance for “fire stops for cable routing.”                            |
| C.4.3               | Testing and Qualification of Electrical Raceway Fire Barrier Systems | N/A                           | Electrical Raceway Fire Barrier Systems are not relied upon to protect post-fire shutdown-related systems and to meet the separation means discussed in Regulatory Position 5.3. |
| C.5                 | Safe-Shutdown Capability   | Compliance                    | The U.S.EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.  |
| C.5.1               | Post-Fire Safe-Shutdown Performance Goals                            | Compliance                    | The U.S. EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.   |
| C.5.2               | Cold Shutdown and Allowable Repairs                                  | Compliance                    | The U.S. EPR is a new reactor design Cold Shutdown Plant. See new reactor design requirements in this RG Position.   |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 8 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>  |
|---------------------|--|-------------------------------|--|
| C.5.3               | Fire Protection of Safe-Shutdown Capability                        | Compliance                    |  |
| C.5.3.1             | Identification and Evaluation of Post-Fire Safe-Shutdown Circuits  | Compliance                    |  |
| C.5.3.2             | High/Low-Pressure Interface  | Compliance                    |  |
| C.5.3.3             | Operator Manual Actions  | Compliance                    |  |
| C.5.3.4             | Spurious Actuations  | Compliance                    |  |
| C.5.4               | Alternative and Dedicated Shutdown Capability                      |                               | See below.   |
| C.5.4.1             | General Guidelines   | Compliance                    |  |
| C.5.4.2             | Associated Circuits of Concern                                     | Compliance                    |  |
| C.5.4.3             | Protection of Associated Circuits of Concern                       | Compliance                    |  |
| C.5.4.3.1           | Common Power Source  | Compliance                    |  |
| C.5.4.3.2           | Spurious Actuation Circuits  | Compliance                    |  |
| C.5.4.3.3           | Common Enclosures  | Compliance                    |  |
| C.5.4.4             | Control Room Fires   | Compliance                    |  |
| C.5.5               | Post-Fire Safe-Shutdown Procedures                                 | COL Applicant                 | Note 3   |
| C.5.5.1             | Safe-Shutdown Procedures   | COL Applicant                 | Note 3   |
| C.5.5.2             | Alternative/Dedicated Shutdown Procedures                          | COL Applicant                 | Note 3   |
| C.5.5.3             | Repair Procedures  | COL Applicant                 | Note 3   |
| C.5.6               | Shutdown/Low-Power Operations                                      | Compliance                    | See Section 9.5.1.2.1 “Shutdown/Low Power Operations” for details of compliance. |
| C.6                 | Fire Protection for Areas Important to Safety                      |                               | See below.   |
| C.6.1               | Areas Related to Power Operation                                   |                               | Compliance Position is as given for each sub-section below.                      |
| C.6.1.1             | Containment  | Compliance                    |  |
| C.6.1.1.1           | Containment Electrical Separation                                  | Compliance                    |  |
| C.6.1.1.2           | Containment Fire Suppression                                       | Alternate Compliance          | Suppression systems inside containment are manually actuated.                    |
| C.6.1.1.3           | Containment Fire Detection   | Compliance                    |  |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 9 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b> | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b>   |
|---------------------|--|-------------------------------|---|
| C.6.1.2             | Control Room Complex   | Alternate Compliance          | Manual fire suppression methods are provided for the control room complex.  |
| 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          | 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. |
| C.6.1.5             | Switchgear Rooms   | Alternate Compliance          | Suppression systems are manually actuated. The fire protection analysis – Appendix 9A addresses the design features fire area by fire area. |
| C.6.1.6             | Alternative/Dedicated Shutdown Panels                              | Compliance                    |   |
| C.6.1.7             | Station Battery Rooms  | Compliance                    |   |
| C.6.1.8             | Diesel Generator Rooms   | Compliance                    |   |
| C.6.1.9             | Pump Rooms   | Compliance                    |   |
| C.6.2               | Other Areas  |                               | See below.  |
| C.6.2.1             | New Fuel Areas   | Compliance                    |   |
| C.6.2.2             | Spent Fuel Areas   | Compliance                    |   |
| C.6.2.3             | Radwaste Building/Storage Areas and Decontamination Areas          | Compliance                    |   |

**Table 9.5.1-1—Fire Protection Program Compliance with  
Regulatory Guide 1.189  
Sheet 10 of 10**

| <b>R.G. Section</b> | <b>Regulatory Guide 1.189 “C. Regulatory Position”<sup>1</sup></b>    | <b>Compliance<sup>2</sup></b> | <b>U.S. EPR Comment</b> |
|---------------------|---|-------------------------------|-------------------------|
| C.6.2.4             | Independent Spent Fuel Storage Areas                                  | COL Applicant                 | Note 3                  |
| C.6.2.5             | Water Tanks   | Compliance                    |                         |
| C.6.2.6             | Cooling Towers  | COL Applicant                 | Note 3                  |
| C.7                 | Protection of Special Fire Hazards Exposing Areas Important to Safety |                               | See below.              |
| C.7.1               | Reactor Coolant Pump Oil Collection                                   | Compliance                    |                         |
| C.7.2               | Turbine/Generator Building  | Compliance                    |                         |
| C.7.2.1             | Oil Systems   | Compliance                    |                         |
| C.7.2.2             | Hydrogen System   | Compliance                    |                         |
| C.7.2.3             | Smoke Control   | Compliance                    |                         |
| C.7.3               | Station Transformers  | Compliance                    |                         |
| C.7.4               | Diesel Fuel Oil Storage Areas   | Compliance                    |                         |
| C.7.5               | Flammable Gas Storage and Distribution                                | Compliance                    |                         |
| C.7.6               | Nearby Facilities   | COL Applicant                 | Note 3                  |
| C.8                 | Fire Protection for New Reactors                                      |                               | See below.              |
| C.8.1               | General   | Compliance                    |                         |
| C.8.2               | Enhanced Fire Protection Criteria                                     | Compliance                    |                         |
| C.8.3               | Passive Plant Safe-Shutdown Condition                                 | N/A                           |                         |
| C.8.4               | Applicable Industry Codes and Standards                               | Compliance                    |                         |
| C.8.5               | Other New Reactor Designs   | N/A                           |                         |
| C.8.6               | Fire Protection Program Implementation Schedule                       | Compliance                    |                         |
| C.8.7               | Fire Protection for Non-power Operation                               | Compliance                    |                         |
| C.9                 | Fire Protection for License Renewal                                   | N/A                           |                         |

**Notes:**

1. The scope of the Regulatory Position presented in this compliance comparison table is abbreviated, due to the depth of detail contained within the Regulatory Position Appendix C itself. The user should refer to RG 1.189 directly for the text portion of each section addressed by the table.
2. The U.S. EPR compliance to the regulatory positions delineated in RG 1.189 “Fire Protection for Nuclear Power Plants” is as indicated by the following definitions:

- 
- COL Applicant – The COL applicant will address the subject regulatory position.
  - Compliance – The U.S. EPR design supports compliance with the subject regulatory position.
  - N/A – (Not Applicable): The subject regulatory position is not applicable to the current design of the U.S. EPR.
  - Alternate Compliance – The U.S.EPR compliance to the subject regulatory position is provided by alternate means or methods.
  - Non-Compliance – The U.S. EPR does not comply with the subject regulatory position or intent of the subject regulatory position. The justification for the U.S. EPR position is provided in the “Comments” column.
3. A COL applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Position.