9.5 OTHER AUXILIARY SYSTEMS

9.5.1 FIRE PROTECTION SYSTEM

Fire protection is provided in accordance with the requirements of 10 CFR 50, Appendix A, GDC-3.

The fire protection system (FPS) is designed to detect fires, protect the plant against damage from fire, minimize hazards to personnel, and reduce property loss due to fire. Refer to the Site Addendum, Section 9.5.1, for the fire protection system outside the standard power block.

Appendix 9.5B provides an evaluation of the effects of postulated fires within the plant, to ensure the integrity of the reactor coolant system boundary, enable the plant to be placed in a safe condition, and minimize the release of radioactivity.

9.5.1.1 Design Bases

9.5.1.1.1 Safety Design Bases

Structures, systems, and components important to safety are designed and located to minimize the fire hazard consistent with other safety requirements. Noncombustible and heat resistant materials are used wherever practical throughout the unit to minimize the fire intensity in any combustion zone. This requirement is in compliance with 10 CFR 50, General Design Criterion 3, Fire Protection.

The basic fire protection for safety-related items is achieved by fire inception avoidance and through remote separation of systems serving the same safety function or by fire barriers between such installations.

Therefore, except for an associated containment penetration, the FPS is not a safety-related system.

SAFETY DESIGN BASIS ONE - The containment isolation valves in the FPS are selected, tested, and located in accordance with the requirements of 10 CFR 50, Appendix A, General Design Criteria 54 and 56 and 10 CFR 50, Appendix J, Type C testing.

9.5.1.1.2 Power Generation Design Bases

POWER GENERATION DESIGN BASIS ONE - The fire protection system is designed to minimize the effects of fires. It is designed to provide the capability to extinguish fires encountered in all plant areas. Areas which are protected by means of manual fire protection are accessible with respect to heat, smoke, toxic combustion products, and radiation.

POWER GENERATION DESIGN BASIS TWO - The plant fire protection water supply system is capable of supplying rated flow with the largest pump out of service. Refer to the Site Addendum. The fire protection water supply system is rated to supply simultaneously the maximum design flow for any sprinkler or water spray system and 1,000 gpm for fire hoses, assuming the shortest fire main flow path is valved out of service. Refer to the Site Addendum.

POWER GENERATION DESIGN BASIS THREE - The fire protection water supply yard main is arranged so that each branch line from the main may be supplied with water from the pumps by alternate flow paths. Two-way hydrants are installed at about 250-foot intervals along the main. Fire fighting equipment is supplied by two mobile units. Refer to the Site Addendum.

POWER GENERATION DESIGN BASIS FOUR - Fixed water suppression systems are installed as required in areas with a high fire or loss potential. Criteria for determining the need for these systems are in substantial compliance with the American Nuclear Insurers (ANI) "Basic Fire Protection for Nuclear Power Plants" (March 1976).

POWER GENERATION DESIGN BASIS FIVE - Halon 1301 flooding systems are provided in the control room cable trenches and chases, ESF switch gear rooms, MG sets room, and cable penetrations rooms.

POWER GENERATION DESIGN BASIS SIX - Standpipe connections and hose stations are provided in areas adjacent to and within stair towers and other points not greater than 100 feet apart in all normally accessible areas.

POWER GENERATION DESIGN BASIS SEVEN - Portable fire extinguishers are provided throughout normally accessible areas of the plant based on applicable NFPA, OSHA, and ANI regulations and recommendations.

POWER GENERATION DESIGN BASIS EIGHT - Alarms are provided in the control room and signal upon activation of the automatic fire protection systems. Fire and smoke monitoring and detection systems are installed as required where a potential for fire exists. These systems alarm in the control room and, if personnel can be in the vicinity, locally.

9.5.1.2 System Description

9.5.1.2.1 General Description

The standard plant fire suppression systems are shown schematically in Figure 9.5.1-1. The fire area boundaries are indicated in Figure 9.5.1-2. A comparison of the Callaway Plant design with Regulatory Guide 1.120 is presented in Appendix 9.5A. The plant fire protection system is comprised of diversified monitoring, detection, alarm, and suppression facilities particularly selected to protect the area or equipment from damage by fire and includes, among other things, the following major features:

a. Suppression systems/capabilities

b. Fire and smoke detection and alarm system

c. Fire barriers

d. Smoke and heat isolation and ventilation

e. Other fire protection features

The capability of the fire detection and extinguishing systems provided for each area associated with safe shutdown structures, systems, and components is evaluated in Appendix 9.5B.

Where required, portions of the fire protection system that pass through areas containing safety-related equipment are seismically analyzed and supported to prevent damage to this equipment. The system is designed to preclude adverse flooding of safety-related equipment under seismic conditions, as discussed in Section 3.6.

Adequate drainage is provided to prevent accumulation from suppression system discharge from causing water damage to structures required for safe shutdown of the plant.

Accessibility is provided for the safety-related equipment areas which rely on manual fire protection.

Egress is provided through the power block in accordance with 29 CFR 1910, Subpart E, "Means of Egress."

Appendix 9.5B presents an area-by-area analysis of the fire loading and the associated fire detection and suppression systems. In the unlikely event that the fire cannot be extinguished, fire barriers or physical separation of redundant components will prevent the fire from causing the failure of redundant components and systems required for safe shutdown. For redundant systems which cannot physically be located in separate fire areas, protection is provided by separation distance and a combination of fire resistive wraps and fire detection and suppression systems.

Noncombustible construction is employed throughout all the buildings to minimize fire potential. Employment of heat- and flame-resistant materials of construction and fire resistant coatings reduces the potential for fire, particularly in areas which contain or may interact with safety-related equipment or rely solely on manual fire protection. Figure 9.5.1-2 shows the applicable areas of the plant.

Heat and smoke are vented by the normal ventilation exhaust systems in the auxiliary, radwaste, fuel, diesel, and control buildings. Heat and smoke are vented by the automatic actuation of heat and smoke vents in the turbine building and auxiliary boiler room. All flammable gases used in the Callaway Plant other than small quantities of speciality gases for laboratory analysis or localized testings will be stored outside safety-related areas so that a fire involving these gases cannot cause the failure of any safety-related equipment, as discussed in Section 9.3.5.

Thermal antisweat insulation with appropriate Underwriters' Laboratories ratings of 25 or less for flame spread is provided for piping which is located in safety-related areas.

The fire suppression systems are designed so that in the event of the failure of the primary suppression system in a given area, a backup suppression system will be available. In areas so protected, the primary suppression system is a fixed water- or gas-type system with secondary protection from portable extinguishers and hose stations. In areas of low fire loading, the primary method of fire extinguishment is by portable extinguishers with secondary protection from hose stations. All hose stations are located so that if a fire occurs at a hose station, preventing access to the hose, the fire may be extinguished by the hose stream from an adjacent hose station.

The plant FPS components in safety-related equipment areas utilize proven components and have been selected to minimize the risks of inadvertent operation. Drip-proof safety-related pump motors and electrical equipment are used, when feasible, to minimize the possibility of damage should fire fighting operations be required. Wet-pipe sprinkler systems are not used in electric motor-driven safety-related pump rooms and electrical equipment rooms. Extinguishing materials used in the FPS are compatible with the equipment in the areas served to avoid damage to the equipment in the event of a break in the system. Adequate drainage is provided in the areas where sprinkler or waterspray systems are used.

The basic fire protection for a safety-related area is achieved through separation or by fire barriers. The fire protection system, designed to detect, control, and extinguish any fire rapidly and effectively, is not a safety-related system and is, therefore, a nonseismic Category I system.

The fire protection system is designed so that an inadvertent actuation will not prevent a safe shutdown of the plant. In most cases, where fixed water suppression systems are required for safety-related equipment, preaction systems are provided. The preaction system is provided with closed-head nozzles and is pressurized with air. Inadvertent opening of a sprinkler head will result in a loss of air pressure, which will be alarmed in the control room. Opening of the deluge valve will be alarmed in the control room. Inadvertent opening of the deluge valve will not affect the integrity of the safety-related equipment, since the fire suppression system will remain intact with the closed heads.

Standpipes which service safety-related equipment are located outside the boundary of the equipment room, where possible, so that an inadvertent pipe failure will not create a flooding condition in the vicinity of the safety-related equipment. Manual valves are provided to isolate the failed standpipe. The safety-related equipment located in the basement of the auxiliary building is enclosed by watertight doors and walls to prevent a flooding condition within the equipment room. Standpipes in the control building are routed in the stairwells, where possible, to preclude pipe failures, creating a flooding condition in the vicinity of the safety-related equipment. Floor drains have been provided throughout the control building to preclude flooding at any elevation due to a failure or if fire water is required to extinguish a postulated fire.

Fire detection circuits are continuously supervised for circuit continuity, and open circuit failure is annunciated by the circuits' supervisory alarm.

The FPS supply piping to the containment is designed to protect the system from a single active failure. The inside containment isolation valve is a check valve which is highly reliable by design and considered to be exempt from active failure due to the absence of any external electrical or control signals which may be disabled from a fire inside the containment. Refer to Section 3.1.1 for a discussion of the single failure criteria. A fire inside the containment will not disable the operability or impair the access to the outside isolation valve, which may be operated either automatically or manually.

9.5.1.2.2 Component Description

Codes and standards applicable to the fire protection system are listed in Table 3.2-1. The plant fire protection system is designed in accordance with applicable sections of Title 29, Chapter XVIII, Part 1910 (Occupational Safety and Health Standards) of the Code of Federal Regulations. It is designed in substantial compliance with the requirements of the American Nuclear Insurers (ANI) and the National Fire Codes of the National Fire Protection Association (NFPA).

9.5.1.2.2.1 Suppression Systems/Capabilities

FIRE PROTECTION WATER SUPPLIES, YARD MAINS, AND HYDRANTS - Water supply for the permanent fire protection installation is based on the maximum automatic sprinkler or fixed water spray system demand with the simultaneous flow of 1,000 gpm for hose streams outside the power block. The maximum demand for fire water within the power block is 2,300 gpm with a residual pressure of approximately 80 psig at the site interface. Fire protection water is fresh. For additional information regarding water supplies, yard mains, and hydrants, refer to Section 9.5.1 of the Site Addendum.

AUTOMATIC WET-PIPE SPRINKLER SYSTEMS - Automatic wet-pipe sprinklers are provided based on NFPA Nos. 13-1975 or 1976 and 231C-1995 to protect the area and equipment shown on Table 9.5.1-1. Each system consists of a network of piping which distributes water to closed head sprinklers or spray nozzles. The wet-pipe systems for the cable chases and the cable area above the access control area have pendant type spray nozzles with fusible link closure.

The wet-pipe system for the vertical cable chases in the auxiliary and control buildings is equipped with closed head spray nozzles. Systems are provided with an alarm check valve equipped to alarm locally and in the control room when a leakage or flow greater than 10 gpm occurs. The alarm check valve trim includes a spring-loaded auxiliary valve, a restriction orifice, and a self-draining retarding chamber in the alarm line to prevent false alarms.

The wet-pipe system for the auxiliary feedwater pipe chase area is equipped with upright sprinkler heads and fusible link closures. A supply header flow switch will actuate a local alarm and control room alarm when leakage flow greater than 10 gpm occurs.

The sprinkler system in the access control area covers all associated rooms with the exception of the toilet and shower areas, which have negligible fire loadings.

AUTOMATIC WATER SPRAY SYSTEM - Automatic water spray systems, hydraulically designed based on NFPA No. 15-1973, are provided to protect the equipment as shown on Table 9.5.1-1. Each system utilizes directional solid-cone nozzles and provides a spray density of 0.25-0.30 gpm per square foot. Automatic systems are provided with diaphragm-type deluge valves. The valve trim consists of ball check valve, main and auxiliary drains, ball drip valve, drip funnel and support, pressure gauges to indicate pressure below diaphragm, and a manual pull control station for local manual actuation. Piping downstream of the deluge valves is galvanized.

The deluge valves are tripped by solenoid valves. Pressure switches are provided on the alarm lines from the deluge valves to alarm in the control room on the establishment of a water flow. It is possible to periodically test the alarm line circuit without tripping the deluge valve. Each automatic spray system has a local control panel that performs the following functions:

a. On detection, transmits a fire alarm to the control room and to local bell.

b. Initiates operation of the deluge valve.

c. Transmits water flow alarm to the control room.

d. Supervises deluge valve actuation device circuits and transmits a trouble alarm to the control room in the event of a malfunction or power failure.

Failure of the detection system will not trip the deluge valve but will register a trouble alarm in the control room.

MANUAL WATER SPRAY SYSTEM - Manual water spray systems, hydraulically designed based on NFPA No. 15-1973, are provided to protect the equipment, as shown on Table 9.5.1-1. Each system utilizes directional solid-cone nozzles and provides a spray density of 0.25-0.30 gpm per square foot. Manually actuated systems are provided with normally closed outside screw and yoke (OS&Y) isolation (gate) valves with limit switches to indicate the position of the valves in the control room. Refer to Fire and Smoke Detection Alarm Systems of this section (9.5.1.2.2) for further description of valve supervision. The charcoal adsorbers are equipped with water spray piping with an external connector. Hose from the nearest hose station can be connected through the connector to supply water to the spray piping.

AUTOMATIC PREACTION SPRINKLER SYSTEM - Automatic preaction sprinklers are provided based on NFPA Nos. 13-1975 or 1976 to protect the areas and equipment as shown on Table 9.5.1-1. Each preaction system includes a deluge valve, a check valve, and a network of distribution piping with closed head sprinklers or spray nozzles. All areas served by the preaction systems have upright or pendant heads with a fusible link closure. The piping downstream of the deluge valve is galvanized and is normally dry and pressurized to approximately 20 psig with air. Service air is used, and necessary pressure regulators are provided. A pressure switch is installed to alarm in the control room on loss of air pressure (indicating either a breakage or fusing of sprinkler heads).

Refer to the automatic water spray system described above for a description of the deluge valve and related trim and the local control panel.

MANUAL PREACTION SPRINKLER SYSTEM - Manual preaction sprinklers are provided based on NFPA No. 13-1976 to protect the areas and equipment, as shown on Table 9.5.1-1. Manual preaction sprinkler systems are similar to the automatic preaction sprinklers, with the following exceptions:

a. The system is not pressurized. Therefore, a check valve, air pressure regulators, and air pressure switch are not provided.

b. Since the actuation is manual, there are no automatic release devices. Therefore, local water flow alarms are not provided.

The system is designed to provide 0.30 gpm per square foot of floor area for the most remote 1,000 square feet. The system utilizes pendant-type spray nozzles with fusible link closures.

STANDPIPES AND HOSE RACKS - Wet standpipes for fire hoses are designed based on the requirements for Class II service of NFPA No. 14-1976.

Except in the containment, hose racks are supplied water from wet standpipes located throughout the plant. Hose racks are provided for use by the plant personnel and are located adjacent to stairways and at interior columns so that no more than 100 feet separates adjacent hose racks. Since the fire hazard analysis must consider fires by transient combustibles, any hose station in the plant may be blocked by fire. However, a fire at any hose station may be reached and extinguished by water from an adjacent hose station. In containment, an additional length of hose can be added, if required.

The standpipes inside the containment are normally dry. Hand pull stations are provided adjacent to each hose station. Actuation of any station registers an alarm in the control room. The control room operator can open the containment isolation valve and charge the standpipes. Hose racks located inside the containment are spaced no more than

100 feet from an adjacent hose rack. Additional hose racks are provided in the truck bay of the radwaste building to obviate the need for sprinklers or fire barriers in this area. Coverage by interior hose racks is provided for every accessible area of the power block and the ESW pumphouse. The hose stations in the ESW pumphouse are supplied by ESW/SW.

Four-inch standpipes are provided for multiple hose stations, and 2-1/2-inch standpipes are provided for single hose stations. Each standpipe hose station is equipped with a pressure-reducing 1-1/2-inch angle hose valve with the hose rack assembly for use by the plant personnel and, except for inside the containment, most are equipped with a 2-1/2-inch hose valve suitable for connection to a fire department hose. The fire department hose connections are spaced throughout the plant so that no more than 130 feet separates two adjacent hose valves.

Each hose rack is provided with 75 feet of 1-1/2-inch hose and adjustable nozzle, with the exception of the diesel generator rooms and cable spreading rooms which are protected by hose racks having 100 feet of hose.

Isolation valves for main supply headers and water suppression systems have supervisory switches. Isolation valves in the standpipes are locked open with breakaway locks. Pressure indicators will be provided at the top of the most remotely located standpipes in the plant.

The hose stations and standpipes provided for the Callaway Plant are in accordance with the requirements of BTP 9.5-1, Appendix A for plants which received a construction permit before July 1, 1976 which does not require a Seismic Category I water system. It should be noted that portions of the fire water supply piping have been seismically designed to the requirements of Regulatory Position C.2 of Regulatory Guide 1.29 where their failure could affect safety-related equipment.

PORTABLE FIRE EXTINGUISHERS - Portable fire extinguishers for manual extinguishment of fires are provided throughout normally accessible areas of the plant, based on NFPA No. 10-1975 and OSHA regulations.

Where possible, the hand extinguishers are located conveniently and ready for immediate use. Portable extinguishers are provided as appropriate for the class of combustible and the type of equipment located in the hazard area. Figure 9.5.1-2 shows the approximate location and type of fire extinguishers or their equivalent installed in the power block buildings.

Self-contained breathing apparatus and protective clothing will be available in the plant to permit access to hazard areas during and after a fire.

HALON 1301 SYSTEM - Halon 1301 fire suppression systems are designed based on NFPA No. 12A-1973 and are provided locally to protect the areas shown in Table 9.5.1-1. The systems are a flooding type and, with the exception of the control room cable chase and trench system, the systems are designed to maintain a minimum 5-percent concentration at the height of the highest combustible in the room for 10 minutes. The system serving the control room cable chases and trenches provides two successive applications of Halon 1301 and is intended to achieve an average concentration of 5 percent throughout the vertical wall chase and floor trenches. The Halon 1301 storage cylinders are mounted on racks located outside the hazard areas. A 100-percent reserve bank is provided for each bank of cylinders. The one piece extruded storage cylinders are charged to 600 psig and are designed to meet the requirements of the U.S. Department of Transportation. Each cylinder has a control head (normally closed) which is opened by applying pilot pressure from the pilot cylinder and a pressure indicator. All manifold and distribution piping is galvanized. A local control panel is provided with each system to perform the following functions:

a. Sound a local alarm horn and initiate Halon discharge on second level of detection.

b. Transmit discharge alarm to the control room.

c. Close selected ventilation dampers and shut off associated ventilation and/ or air conditioning fan motors.

d. Supervise and transmit a trouble alarm to the control room on power failure.

Check valves are provided to prevent the loss of Halon if any cylinder is disconnected. Bleeder valves are provided to prevent accidental reserve bank discharge after the main bank has operated. Where one bank serves more than one area, solenoid-operated selector valves are installed.

9.5.1.2.2.2 Fire and Smoke Detection and Alarm System

Automatic fire and smoke detection systems are provided, as indicated in Appendix 9.5B, based on NFPA Numbers 72D-1975 (Class A) and 72E-1978.

The fire detection and alarm system is divided into convenient zones. There are provisions for at least 259 zones made up as follows:

		No. of zones
a.	Power block and the ESW pumphouse and spares	210
b.	Site related	49

There are four alarm control units (ACU), one of which is site related associated with the fire detection and alarm system. The ACU is of a solid state modular construction. Each

ACU has one power control module. A relay module is provided in the ACU for automatic actuation of systems on detection and other miscellaneous functions. The detection system operates on low voltage (24 V dc). The primary power for each ACU is the non-Class 1E instrument ac system. The non-Class 1E instrument ac system is continuously supplied by the Class 1E ac emergency power system. The preferred and normal source of the Class 1E power system is the offsite power system. Two physically independent sources of offsite power are fed to the onsite power system. Secondary power is provided by the station emergency diesel generator to each 4.16 kV bus. The arrangement, fuel supply, etc., of the SNUPPS station diesel exceed the minimum requirements of NFPA 72D.

A backup secondary power source is provided by the non-Class 1E 125 V dc system. An automatic auctioneering circuit at each ACU selects the dc source upon failure of all ac sources and reverts back to the ac source upon ac source restoration.

The non-Class 1E 125 V dc system is supplied through batteries and battery chargers. The battery chargers are sized to carry the total connected load indefinitely. The battery chargers are normally fed from the Class 1E emergency power system. Upon failure of a battery charger, each separation group battery can carry the total connected load for 2 hours. Additional load carrying time can be obtained by selective load shedding and/or closing the bus tie switches between the separation group buses.

The primary power for the remote fire protection panels is provided by the non-Class 1E 125 V dc system. Each ACU is utilized as power distribution panels for the remote panels. The non-Class 1E 125 V dc system is continuously supplied by the 480 V 1E bus via the battery chargers. Two physically independent offsite power sources provide the normal and preferred source to this system.

The standby power source for the secondary supply to the local panels is provided by the station emergency diesel generator. The arrangement, fuel supply, etc., of the station diesel exceeds the minimum requirements of NFPA 72D.

The non-Class 1E 125 V dc system is supplied through batteries and battery chargers. The battery chargers are sized to carry the total connected load indefinitely. The battery chargers are fed from the Class 1E emergency power system.

In the event of a battery charger failure, each battery can carry the dc loads for approximately 6 hours. This assumes that ac sources are still available for other non-1E loads. This exceeds the 4-hour requirement of NFPA 72D.

All cables to remote fire protection panels are routed in conduit and supervised for integrity. Loss of power to these panels is immediately alarmed in the control room on the fire protection annunciator.

The ACU powers and supervises all detectors, except those for extinguishing system actuation in the following areas:

a. Turbine building, including the transformers

b. Fuel building railroad bay

c. Diesel generator rooms

d. BOP computer room, EQ ready room, and operations conference room (comm. corridor, 2047'-6")

The detection systems in these areas actuate the automatic suppression systems installed in the above areas directly, and are powered by local control panels. The ACU supplies the power to these panels.

For area detection and alarm systems and for all detection for actuation of extinguishing systems in areas not listed above, the signal is received by the ACU. Alarm and control functions are then initiated by the ACU with the appropriate annunciation in the control room. For valve supervision, extinguishing system discharge, and all other alarm and trouble signals generated by the local extinguishing system control panels, the signals feed through the ACU multiplexer to the control room panel.

Solid state multiplex transmitter/receiver (T/R) units are installed with each ACU. The four ACU units are connected to a multiplex controller located in the fire protection control panel in the control room. The wiring between each T/R and the controller consists of two data loops. The controller constantly interrogates the T/R units for alarm and circuit information, and displays this information on the fire protection control panel.

The fire protection control panel houses the multiplexer controller, multiplex power supply module, site-related fire pump controls, strip printer, and an annunciator panel. One window is provided on the annunciator panel for each trouble and alarm zone. The zone identification and area description is engraved on each window. Each window is designed to show alarm (red) or trouble (yellow) conditions. The windows are backlighted. A minimum of 49 windows is reserved for site-related fire protection system annunciators. Test switches are provided to test the condition of the lights in groups.

The fire alarm system meets the requirements for Class A systems per NFPA 72D-1975, paragraph 1321 as detailed below and the requirements for Class 1 circuits as stated in the National Electrical Code - 1978, Article 725-11. Each signaling line circuit between the multiplexers and the fire protection control panel in the main control room is capable of operating for its intended signaling services during a single break or a single ground fault condition in the circuit. All initiating device circuits are continuously supervised and provide a trouble alarm in the event of a break in the circuit. Additionally, initiating device circuits (detectors) serving pre-action suppression systems for safety-related areas are capable of operating during a single break or a single ground fault condition. The initiating device circuits for remote alarm pressure switches are designed in accordance with NFPA 72D-1975, paragraph 1322 or 1323.

Supervision of the fire protection panel will not be the primary function of the plant operator assigned to monitoring the panel. Since there will be few and infrequent signals to this panel, a full-time supervisor is not justified. Upon receipt of an alarm or trouble signal at the panel, an audible alarm will alert all the operators in the control room of this condition.

The fire detection and alarm system includes the following, which is supplemental to the requirements of NFPA 72D, Class A:

a. For Halon extinguishing systems which are actuated by two zones of detection in the same hazard area, each zone is not designed to maintain detection capabilities during a single ground fault or break. Upon generation of a trouble signal in one of the fire detection zones, a trouble alarm will be sent to the control room. In this condition, the system will automatically discharge the Halon on receipt of an alarm signal from the second zone of detection.

b. Upon receipt of a trouble signal for a detection zone on the fire protection annunciation panel in the control room, the detection zone is considered inoperable and appropriate compensatory measures are taken.

The alarm system will be of the limited power type as defined in Article 760 of the N.E.C. and meet the requirements of Class I circuits given in the N.E.C., 1978, Article 725-11.

All suppression system and main header isolation valves are provided with position switches which are grouped into zones for annunciation of out-of-normal condition in the control room. Valves which are not electrically supervised will be subject to administrative supervision which will consist of locking valves in their normal position and periodic inspection. This, however, does not include the drain, vent, and hose valves which are normally maintained closed and instrument root valves which are normally maintained open since reversing the valve position will not inhibit operation of the FPS.

The general area alarm is by electric horns located throughout the power block. The sound pressure level is either 90 db or 110 db, both measured 10 feet from the source, depending upon background noise levels. In addition, integral flashing lights are installed with the horn within each diesel generator room. Local manual pull stations are installed throughout the power block buildings. The detector bases are equipped with lights, except for heat detectors, to quickly identify the detector that has actuated.

Line-type thermal detectors are provided for the reactor coolant pumps as well as the cable trays inside the containment. As a backup to these detectors, ionization-type duct detectors are provided in the containment cooling system.

As noted in Appendix 9.5B, all detectors alarm locally as well as in the control room.

9.5.1.2.2.3 Fire Barriers

Fire barrier walls, floors, and ceilings are provided as indicated necessary by the results of the fire hazards analysis, Appendix 9.5B. The fire barrier ratings and locations are indicated in Figure 9.5.1-2.

The design, construction, test method, and acceptance criteria for the fire barriers and related items are as follows:

a. Fire Rated Barriers - Per applicable sections (determined by construction type) of ASTM E-119, UL standards, and state building codes.

b. Fire Barrier Penetration Seals - All fire rated cable tray penetration seals were tested by an independent testing laboratory utilizing the following for test guidance:

    1. ASTM E 119

    2. IEEE 634

    3. ANI/MAERP standard test method

    The test program, procedures, and results were approved by ANI. The tests consisted of exposing all typical penetration seals (installed in a test slab) to an ASTM E 119 standard controlled test fire. All penetrations used on Callaway Plant passed the test including a hose stream test.

    Fire stops are provided for cable trays at each penetration of a fire-rated wall, floor, or ceiling. The cable rating is compatible with the fire stop construction. Vertical tray runs that are not protected by the automatic fire detection and suppression system generally do not exceed 20 feet in length. In isolated cases where this is not the case, auxiliary protection is provided in the form of fire retardant coatings, automatic sprinklers, or other means deemed necessary by the Fire Hazards Analysis. Horizontal tray runs are generally protected by separating the corresponding redundant circuits. This is accomplished by 3-hour fire barriers between the redundant circuits. Where this is not feasible, a combination of alternate fire protection means is used such as fire resistance materials, automatic fire detection, and suppression system or other provisions deemed necessary by the Fire Hazards Analysis.

    The results of the tests, which confirm the integrity of the fire penetration seals, are documented in reports entitled "Qualification Test on Silicone Foam Floor Penetration Seals," July 25, 1980; "Fire Qualification Test on Penetration Seals," August 28, 1981; and "Fire Qualification Test of Penetration Seals," June 16, 1982.

c. The notes contained on Figure 9.5.1-2, Sheet 1, define the structural steel fire proofing requirements. The structural steel of all of the ceilings of the fire areas is fire proofed for 3-hour protection with the exception that no fireproofing is provided on the underside of the fuel building roof. Since the fire loading in this area is very low, no credible fire can affect the roof. In addition, the roof is missile proof, 2-foot-thick reinforced concrete. Therefore, fireproofing is not required in this area.

d. Fire Dampers/Fire Doors - Test method and acceptance criteria for dampers requiring a fire rating are based on the guidelines established in Underwriters Laboratories Standard UL-10B. Vertical dampers will carry the UL label. All damper devices will be installed in sleeves of 10 gauge (minimum) steel which are attached to the ductwork and supported by the wallor floor/roof slab. The devices will be positioned between the two wall or floor/roof slab surfaces or will be located on the surface of the wall or floor/roof slab. A failure of the duct on either side of the wall or floor/roof slab will not violate the fire barrier. Double-lock guide/latch brackets for 72 horizontal fire dampers, mounted in floor or roof slab sleeves within the Power Block, have been modified since initial installation to improve damper closure reliability. The revised bracket configuration has not been Underwriter Laboratories tested. However, the modified damper bracket configuration resembles the current Ruskin horizontal bracket profile which was UL tested. The double-lock feature is not affected and the basic form, fit and function of the dampers remains unchanged. Damper closure reliability is improved and the response to a fire has not been changed by this modification.

Test methods and acceptance criteria for standard type doors requiring a fire rating are based on the guidelines established in ASTM E 152 or they are UL labeled. Labeled fire doors are provided, where feasible, with an equivalent rating to the fire barrier in which they are installed. Other doors utilized in fire barriers are described below. Where required, security devices, thresholds, door sweeps, and weatherstripping are installed on door assemblies. The installation of these devices is judged not to adversely affect the performance of the door and frame assembly.

e. Metal Deck Roof - Construction of the metal deck roof assemblies conforms to FM category 1 or UL Class A. The test method and acceptance criteria are as specified in UL-790 or the FM-approved guide.

MISSILE DOORS - An evaluation was performed on the Callaway Plant missile doors located in fire barrier walls to evaluate the doors based on the criteria established in ANSI/ASTM E 152, Standard Methods of Fire Tests of Door Assemblies. The evaluation concludes that the missile doors will satisfactorily meet the ASTM E 152 acceptance criteria.

The plant has 17 missile doors and utilizes 11 missile doors in fire-rated walls. Seven of the doors are single swing and four are double swing doors. Each leaf of the 11 doors is of similar construction which includes a 2 1/2-inch-thick steel plate front and vertical and horizontal reinforcing beams which form a boxed-in area near the perimeter of the door. The multiple point latching mechanisms pass through the reinforcing beams and fix the doors in the opening.

ELEVATOR AND DUMBWAITER DOORS - Elevator and dumbwaiter doors are rated at 1 1/2 hours as required by ANSI A17.1. The 1 1/2-hour doors are an industry standard and, as stated in ANSI A17.1, are acceptable for use in a 2-hour rated elevator or dumbwaiter shaft. For a fire to propagate from one floor elevation to another, it would have to penetrate two doors.

AUXILIARY BUILDING BUTTRESS HATCH COVERS - The hatch covers are located in the floor at El. 2026' and 2047.5'. These covers are fabricated from checker plate and sealed between the plate and supporting structure interface with fire resistant sealant. This configuration will prevent the propagation of fire between fire areas A-8, A-16 and A-19. (Reference A-0802, A-0803 and A-0804)

WATERTIGHT DOORS - A fire test was performed to evaluate the fire resistance performance of watertight doors located in fire barrier walls. The fire test was performed in accordance with the Standard for Fire Tests of Door Assemblies, UL 10B. Immediately after the fire exposure, the door was exposed to a hose stream test as specified for 3-hour fire doors. The watertight doors without gaskets are classified by UL as Special-Purpose Type Fire Doors and Frame Assemblies, Rating 3 hour (A). To achieve watertight integrity criteria, gasketing material was added to the door assembly in accordance with the manufacturer's recommendations.

HATCHWAYS - The auxiliary building is provided with two sets of equipment hatchways in the northern and southern ends of the auxiliary building corridors. A monorail hoist serves each set of hatchways to allow equipment to be moved from one elevation to another. Hatch covers (checkerplate steel) and automatic sprinkler water curtains are provided for each hatchway at elevations 2000'-0", 2026'-0", and 2047'-0" to separate the corridor fire areas (A-1, A-8, A-16, A-19, and A-20).

At elevation 2000'-0" in the center of the auxiliary building, two adjacent hatchways are provided above the RHR and containment spray valve encapsulation tanks located on elevation 1988'-0". These two hatchways are covered with steel checker plate. The major portion of the cover will only be removed when repair/maintenance work is performed on the encapsulated valves. There are no installed or transient combustibles located in the pipe chase (Rooms 1203 and 1204) at elevation 1988'-0" since it contains no process valves or electrical equipment.

Small vent valves are located in the curbed area surrounding the hatchways.

These hatch covers are only provided for separation of Fire Zones A-1 and A-8. Fires are not postulated in Rooms 1203 and 1204 because there are no combustibles and the rooms are well separated from the remainder of Fire Area A-1. The two doors into the area are fire rated; however, the piping penetrations are not necessarily provided with fire-rated seals.

TRENCH COVER - In Fire Area F-2, the floor is on grade with the exception of a small pipe trench which opens into the room and connects with the radwaste tunnel. The trench opening in this room is closed by a heavy steel cover plate approximately 4 feet x 8 feet. A fire in this area could not damage the equipment located in the radwaste tunnel more than 50 feet away with no intervening combustibles.

REACTOR BUILDING PENETRATIONS - The reactor building shell is 4 feet thick, is lined with a continuous 1/4-inch thick liner plate, and is designed to be airtight at a design pressure of 60 psig. All penetrations through the containment shell are designed to ASME Section III. Since the penetrations are an integral part of the reactor building boundary and do not incorporate independent fire barrier seals, no testing was performed to establish a rating of the penetrations. The following discussions describe the reactor building penetrations into adjacent buildings.

MECHANICAL PENETRATIONS - Refer to Figures 3.8-47 and 3.8-50 for details of the process and sampling lines which penetrate the reactor building wall into the auxiliary building Fire Areas A-19, A-20, A-23, A-24, and A-25. In A-19 and A-20, the containment purge penetration (36-inch-diameter line) penetrates the containment. Redundant containment isolation valves are provided on either side of the reactor building wall. In A-23, A-24, and A-25, process and instrument lines are welded to the heads on larger penetration sleeves which are in turn welded to the containment liner. Fire and smoke will not pass through or around the process/instrument lines due to the steel construction. The mechanical penetrations provide equivalent protection to a 3-hour fire barrier.

PERSONNEL HATCH - The personnel hatch, shown on Figure 3.8-45, penetrates the reactor building into Fire Area A-20. The hatch has two bulk head doors on either side of the reactor building wall which are secured by multiple pin latches. The gap between the door and the bulk heads is sealed by double-o-ring gaskets. When closed, the gap between the door and the bulk head is less than 5 mills. The bulk heads and hatch doors are in series and provide redundant fire barrier protection.

ELECTRICAL PENETRATIONS - Electrical penetrations communicate with Fire Areas A-17 and A-18, which are Halon 1301 protected spaces with ionization detectors. The penetrations, shown on Figure 3.8-49, consist of a steel sleeve through the reactor building wall which is flanged in the auxiliary building. Each flange contains seven 3-inch-diameter penetrations which are sealed with an epoxy-based resin into which the solid electrical conductors have been molded. The electrical penetrations are designed to IEEE 317-76 which is the industry standard for containment electrical penetrations.

Mounted directly to the flange is a sealed NEMA-3R enclosure which contains termination strips. These enclosures are air- and dust-tight and help protect the penetration from postulated transient fires in the penetration room. Fires within the enclosures are not postulated due to the IEEE 383 cable which is not susceptible to electrically generated fires. Due to lack of space within the enclosures, transient combustibles are not present within the enclosures.

On the reactor building side, all penetration sleeves are provided with similar NEMA-3R enclosures which provide protection for the flanged penetration in the auxiliary building. Again, the cables within the enclosure and passing within the steel sleeved reactor building wall are qualified to IEEE 383. Only the four medium voltage penetrations providing power to the reactor coolant pumps are not provided with enclosures on the reactor building side of the penetration. Transient fires are not postulated in the vicinity of the electrical penetrations in the reactor building. Also, the areas containing the electrical penetrations and the cable trays in the area of the penetrations are provided with an area coverage water spray system as described in Appendix 9.5B.

Based on the previous discussions, the separation of the reactor building and auxiliary building fire areas where electrical penetrations exist is ensured.

FUEL TRANSFER TUBE PENETRATION - As shown on Figure 3.8-48, the fuel transfer tube connects the reactor and fuel buildings. A double-o-ring flange is located in the reactor building, and a manual gate valve is located in the fuel transfer canal. Either barrier provides equivalent protection to a 3-hour barrier. In addition, the fuel transfer canal contains no installed combustibles.

9.5.1.2.2.4 Smoke and Heat Isolation and Ventilation

Smoke and heat vents are provided in the turbine building. The turbine building vents are fusible link operated, whereas the diesel rooms utilize the exhaust air flow path. The turbine building vents are sized on the basis of at least 1 square foot of venting area for each 150 square feet of floor area. The diesel generator room vents are sized on a basis of at least 1 square foot of venting area for each 200 square feet of floor area. The ventilation systems in other areas of the plant are designed to isolate and confine the smoke and heat from a fire in the affected areas. Portable equipment will be used to vent the smoke, as required.

Smoke and heat transfer from one area to another during a fire will be restricted, and the normal plant ventilation system and portable equipment will be used after the fire is extinguished.

a. The ventilation system equipment used in the fire and smoke isolation of areas in the auxiliary, fuel, radwaste, and control buildings consists of fusible-link actuated fire dampers, power-operated isolation dampers, and centrifugal and vaneaxial fans. Electrothermal links are used in areas protected by halon.

b. Ventilation system operations are controlled from the control room. Fire and smoke are automatically isolated in all areas of the auxiliary, radwaste, fuel, and control buildings by the fusible-link actuated fire dampers located in all rated fire barrier walls or by remote manual operation of area ventilation systems. Each level of the control building can be isolated from the building ventilation systems by control switches in the control room. Electrothermal links are used in areas protected by halon.

c. Following a fire, the fire dampers are accessible only from that area where they are located. Major other systems and components would be remotely operable from the control room.

d. All exhaust fans, with the exception of the control building fans, are centrifugal with the motor located outside of the airstream, making them less susceptible to high gas temperatures. The fans are capable of processing air of temperatures at least as high as the fusible link melting temperature (160°F/165°F) of the fire dampers. The control building exhaust fans are vaneaxial with the motors located in the process airstream. The fan motor is designed for a minimum 150°F temperature rise.

   Since the exhaust fans are all downstream of the system filter units, they will not be subject to damage from high temperature particles.

9.5.1.2.2.5 Other Fire Protection Features

EMERGENCY LIGHTING - Section 9.5.3 describes the emergency lighting system and the design features provided for post fire access and egress. Table 9.5.3-1 provides a listing of rooms in which operator actions are required for safe shutdown following control room evacuation.

RADIO COMMUNICATION - A portable radio annunciation system will be provided which may be used by the fire brigade and other operations personnel involved in safe plant shutdown.

FIRE RESISTANT AND NONCOMBUSTIBLE MATERIALS - Construction materials are noncombustible to the maximum extent practical. Noncombustible materials are those which have a maximum rating of 25 for smoke contribution, fuel contribution, and flame spread. Insulation over metal roof decking and the vapor barrier will be securely attached by approved noncombustible adhesive and perimeter fastening.

Suspended acoustical ceilings and their supports are of UL listed, noncombustible construction. Insulation for pipes and ducts and their adhesives are noncombustible and UL listed, where practical. Concealed spaces are devoid of combustibles, as practical. Materials which give off toxic fumes when exposed to fire are prohibited. Excluding charcoal adsorbers, all ventilation prefilters for filtration units are UL Class 1.

COMBUSTIBLE OIL - Areas in which combustible oil-filled equipment is located are prepared to eliminate the spread of the combustible oil from the immediate area of the equipment. An enclosed gravel filled pit is located beneath the yard transformers. The pit is sized to contain oil from the largest transformer served by the pit. In addition, the pit is designed such that the oil will be contained with the addition of water from two transformer water spray systems operating for 10 minutes (unless the pit serves only one transformer). All transformers inside the building are the dry type. A fire barrier of at least 2-hour rating is provided between all oil-filled transformers which are separated by less than 50 feet (except between the station service and start-up transformers which are within 40 feet of each other without requiring a wall).

The underground diesel fuel storage tanks are set on a firm foundation, backfilled with noncorrosive sand surrounding the tank (6 inches minimum) and provided with a covering of 2 feet (minimum) of earth.

Each diesel fuel oil day tank is provided with protection features to preclude the uncontrolled leakage of diesel fuel. The design features provided for the day tank were reviewed and accepted by the NRC at the Wolf Creek Fire Protection Audit of February 6 to 9, 1984. This audit was also applicable to the Callaway Plant.

An oil collection system to collect and contain the lubricating oil for each reactor coolant pump is installed. Two 300-gallon lube oil collection tanks are installed. One tank serves to collect lube oil from either of two pumps. The tanks will be manually drained as required. The hydrogen bulk supply manifold is located out of doors, at an unexposed location.

ION EXCHANGE RESINS - To ignite and to sustain combustion is relatively difficult in ion exchange resins that are in a hydrated form (as opposed to those in dehydrated form).

The ion exchange resins are received and stored in a hydrated form in nonsafety-related areas of the plant (radwaste and turbine buildings) which are separated from the safety-related areas by 3-hour fire barriers. The only safety-related area of the plant which normally contains resins is Fire Area A-8 at elevation 2000 in the auxiliary building. All of the resin, however, is contained in ASME pressure vessels filled with water. Spent resin is sluiced in a closed pipe to the spent resin storage tank in the radwaste building. Fresh resins, still the hydrated form, will be introduced into the resin filler hopper in Room 1307 above the ion exchange vessels from elevation 2026 of the auxiliary building Room 1405. The ion exchange vessels are then filled from the resin filler hopper. Administrative controls will ensure that Room 1405 is separated from adjacent areas by a 3-hour-rated fire barrier, and automatic smoke detection is provided at the ceiling of the room. This zone is within 75 feet of the hose stations in the corridor (Room 1408 - see Figure 9.5.1-2, Sheet 3). Portable extinguishers are installed outside the room in the corridor.

Since there is no safe shutdown equipment in this room and since a fire in this room will be confined by the fire barriers until extinguished manually, an automatic suppression system is not installed.

9.5.1.2.3 System Operation

Automatic wet-pipe sprinkler system operation is initiated on a rise in the ambient temperature to the melting point of fusible links on sealed sprinkler heads, thus permitting the heads to open. Flow of water through alarm check valves energizes local alarms and registers an alarm condition on the audio-visual fire protection control panel in the control room. Once initiated, wet-pipe sprinkler system operation is terminated manually by shutting an isolation gate valve. Closure of this valve is electrically supervised and annunciated in the control room. A flow switch provides the local and control room water flow alarm signals for the auxiliary feedwater pipe chase wet-pipe sprinkler system.

Water spray system actuation is either manual or automatic, depending upon the hazard. Automatic operation is initiated by rate compensated thermal detectors. These sensors detect attainment of a high fixed temperature or rapid rate of temperature rise and release a tripping device which opens the deluge valve and thus supplies water under pressure to the spray nozzles. Actuation of the heat responsive device also initiates a local alarm and registers an alarm condition on the audio-visual fire protection control panel in the control room. A pressure switch in the alarm lines from the deluge valve transmits an alarm to the fire protection control panel to indicate the deluge valve trip and water flow. System operation is terminated by shutting an isolation gate valve manually. Closure of this valve registers an alarm in the fire protection control panel in the control room. Local hand pull stations are provided to trip the deluge valves manually. Manual tripping is annunciated in the control room.

The main and start-up transformers have a deluge enable interlock which does not allow automatic actuation of the water spray system while a transformer is energized. A loss-of-voltage relay in each transformer metering and protection circuit provides the enable interlock to the deluge system. The deluge enable interlock, in addition to dual cross zone detection, is provided to avoid inadvertent spray system actuation, subsequent transformer damage, and unit trips. The first zone of detection will sound alarms locally and in the control room. Detection by both zones, along with a postive indication of a de-energized transformer from the enable interlock, trips the transformer deluge valve.

Manual water spray system is actuated by opening an isolation valve which is normally locked closed with a breakaway lock. Manual opening of the valve is alarmed in the control room. The turbine bearing manual water spray system is equipped with closed head nozzles for protection of the bearings on an unnecessary opening of the isolation valve.

Preaction sprinkler system operation is initiated by an automatic smoke, thermal or photoelectric detector, as appropriate for the hazard. These sensors detect either particles of combustion (ionization detectors), attainment of a fixed high temperature (thermal detectors) or visible smoke concentrations greater than 1.2 percent per foot of light obscuration caused by smoke (photo electric detectors) and release a tripping device to open the deluge valve, thus supplying water under pressure to fill and pressurize the system. Actuation of a detection device also initiates a local alarm, and registers the alarm condition on the audio-visual fire protection control panel in the control room. In addition, water flow is annunciated in the control room. Preaction sprinkler system operation is continued on rise in ambient temperature to the melting point of fusible links on sealed sprinkler heads, thus permitting the heads to open. Once initiated, system operation is terminated by manually shutting an isolation gate valve. Closure of this valve is annunciated in the control room. The piping downstream of the deluge valve is pressurized to approximately 20 psig with air. Low air pressure in this piping will give an audible and visual alarm in the control room, thus loss of air pressure, which is indicative of open sprinkler heads, will be alarmed.

Local hand pull stations are provided to trip the deluge valve manually. Manual tripping is annunciated in the control room and locally.

The containment is served by a manual preaction sprinkler system which is somewhat different than the automatic preaction sprinkler systems discussed above. For the containment, a control room alarm is generated by thermal detectors sensing high temperature. The thermal detectors do not trip the deluge valve. Upon receipt of the alarm the operator will open the motor-operated containment isolation valve KC-HV-253 permitting pressurized water to flow to the deluge valve. The force of the water slug on the deluge valve will cause the valve to open. The bypass valves on the deluge valve assemblies are locked open during power generation. The force of the water slug on the deluge valve will cause the valve to open. The Control Room can verify the deluge valve has opened by monitoring pressure switches which alarm in the Control Room. There is also a pull station for this deluge valve inside containment which can be used by personnel detecting a fire while inside containment. The sprinkler system operation is continued on rise in ambient temperature to the melting point of the fusible link on the sealed sprinkler heads, thus permitting the heads to open. Once activated, system operation is terminated by manually shutting an isolation gate valve or by closing KC-HV-253 from the control room.

Local hand pull stations are provided to trip the deluge valve manually. Manually tripping is annunciated in the control room and locally.

Hose racks are operated manually by plant personnel. Each rack is controlled by a normally closed hose valve which may be opened without release of water until the last fold of hose is removed from the rack. Hose nozzles are fully adjustable from complete shutoff to a straight stream, except in areas where high voltage electrical equipment presents a shock hazard. In such areas, hose nozzles without the straight stream capability are provided.

Halon 1301 system operation is initiated by a cross-zoned ionization smoke detection system. The detectors are mounted in the area protected, sense particles of combustion, and provide early warning of fire to activate the suppression system, thus preventing the development of a deep seated cable tray fire. The first zone of detection initiates an alarm locally and in the control room. Detection by both zones sounds a local horn to warn against impending discharge and starts a discharge time delay device to permit personnel to leave the area.

Halon is discharged after a preset time delay by actuation of a solenoid valve on the pilot Halon cylinder, applying pilot pressure to the control heads on other cylinders in the bank, as required. With the exception of the control room cable trench and chase system, a minimum 5-percent Halon 1301 concentration is achieved in the enclosure to be protected. In addition, the systems are designed to provide a 5-percent concentration for 10 minutes at the elevation of highest combustible material in each area protected. The system serving the control room cable chase and trenches provides two successive applications of Halon 1301. The initial discharge is actuated after a preset time delay in accordance with the normal sequence noted above. A second discharge is actuated following another time delay that begins at the time of the initial discharge and lasts for approximately 3 minutes. An average 5-percent Halon 1301 concentration is achieved throughout the vertical wall chase and floor trenches. Halon that is expelled is manifolded and piped to the hazard area and discharged through nozzles. Halon 1301 system piping does not contain Halon until the system is activated.

A pressure switch is provided to alarm in the control room, indicating Halon discharge. Prior to Halon discharge, selected ventilation dampers close and selected ventilating and/or air conditioning fan motors associated with the hazard area shut down. With the exception of the control room cable trench and chase system, a transfer valve or switch is provided to manually transfer the actuation to the reserve bank after a main bank discharge. The reserve cylinders for the control room cable chase and trench system are rack-mounted and are located in close proximity to the main cylinder bank to allow prompt replacement in order to maintain system operability in the event of a system discharge. Where one bank of cylinders serves more than one area, solenoid-operated selector valves are installed to direct the discharge to the affected area. Local manual actuation is possible by pulling a lever in the pilot cylinder. A pull pin and seal prevents accidental operation of the manual lever. Pushbuttons are provided for areas served by Halon 1301 system for remote manual actuation. Manual actuation is similar to detection by both zones of detection. The time delay device is adjustable. Each Halon system is provided with a momentary contact abort switch to delay the discharge for evacuation purposes. A keylock switch is also provided to disable the system during maintenance operations.

A pressure gauge on each Halon 1301 storage cylinder is provided, and the pressure reading is periodically monitored to ensure that the required pressure is maintained. With the local application of Halon 1301, a leaking cylinder or leakage to adjacent areas poses no immediate danger, since the resulting concentrations are less than 10-volume percent. The activation of the Halon system in an adjacent area, including the cable trenches in the control room, will not endanger the inhabitants within the control room, since the amount of Halon 1301 is sized only for the areas served and the control room is normally pressurized. The control building ventilation system and control room pressurization are discussed in Section 9.4.1.

The fire and smoke detection and alarm devices are activated by the several stages of fire. Ionization detectors alarm at the presence of invisible combustion particles during the incipient stage of a fire. Flame detectors respond directly to the infrared or ultraviolet radiation emanating from a flickering flame sustained for at least 5 seconds. These will be located in the areas where fire develops rapidly with a minimum or no incipient stage. Photoelectric smoke detectors respond directly to visible smoke concentrations of not less than 1.2 percent per foot of light obscuration caused by smoke. These devices will be located in those areas, such as the radwaste building truck bay, where the use of ionization detectors is precluded by the particles of combustion (truck exhaust) normally found in the area. Thermal detectors react to the attainment of a high fixed temperature and provide release service for certain automatic systems as discussed above. Air duct detectors sample the air moving through ducts and alarm at the presence of particles of combustion. All air monitoring, detection, and alarm devices are supervised for reliability in accordance with NFPA 72D, 1975.

The detection and alarm system is powered by four control units. The alarm control units also initiate the actuation of automatic suppression systems and perform other fire-related functions, such as driving area alarm horns and tripping miscellaneous equipment. The multiplexer units installed within the alarm control units constantly interrogate in a preprogrammed sequence the status of contacts powered by the alarm control units and the open dry contacts (such as valve supervision, water flow alarms, etc.) connected directly to them. The multiplexer units transmit this status information to the fire protection control panel located in the control room. The fire protection control panel also provides an audio-visual display of specific trouble areas, based on the status input from the multiplexer units. The area local alarm control unit can be silenced and reset from the main fire protection control panel.

9.5.1.3 Safety Evaluation

The power block has been designed to provide protection for safety-related equipment from hazards and events which could reasonably be expected to occur. This protection is provided to ensure that recovery from the event is possible, to ensure the integrity of the reactor coolant pressure boundary, to minimize the release of radioactivity, and to enable the plant to be placed in a safe condition.

Appendix 9.5B provides the basis for and the results of integrated fire hazards analyses for the plant to demonstrate that each safety-related area of the plant can withstand the postulated events.

Even though each area of the plant and each system is designed individually to properly consider the above events, an integrated analysis of rooms, systems, and events is performed to ensure that the above objectives are realized for each postulated event.

Except for an associated containment penetration, the FPS is not a safety-related system.

SAFETY EVALUATION ONE - Sections 6.2.4 and 6.2.6 provide the safety evaluation for the system containment isolation arrangement and testability.

9.5.1.4 Tests and Inspection

Preoperational testing is described in Chapter 14.0. The performance and structural and leaktight integrity of the FPS is routinely demonstrated during plant operation.

9.5.1.5 Instrumentation Applications

Section 9.5.1.2 provides a description of the instruments used to monitor and actuate the various functions of the FPS.

9.5.1.6 Personnel Qualification and Training

Section 9.5.1 of the Site Addendum describes the personnel qualifications and training for the station personnel responsible for firefighting, including those responsible for maintaining and inspecting the FPS equipment.

9.5.1.7 Operability Requirements, Required Actions, and Testing/Inspection Requirements

Table 9.5.1-2 lists the operability requirements for the Fire Protection System, the required actions to be taken when equipment is inoperable, and testing/inspection requirements. These requirements were previously included in the Callaway Plant Technical Specifications (Appendix A to License No. NPF-30) but were removed in accordance with Generic Letter 86-10, Implementation of Fire Protection Requirements, and relocated to Table 9.5.1-2 and plant procedures (refer to Amendment No. 30, 01/13/88 to License No. NPF-30). The bases for the requirements listed in Table 9.5.1-2 are described in section 9.5.1.7.1 through 9.5.1.7.3.

9.5.1.7.1 Fire Detection Instrumentation

Operability of the fire detection instrumentation ensures that adequate warning capability is available for the prompt detection of fires and that Fire Suppression Systems, that are actuated by fire detectors, will discharge extinguishing agents in a timely manner. Prompt detection and suppression of fires will reduce the potential for damage to safety-related equipment and is an integral element in the overall facility Fire Protection Program.

Fire detectors that are used to actuate Fire Suppression Systems represent a more critically important component of a facility's Fire Protection Program than detectors that are installed solely for early fire warning and notification. Consequently, the minimum number of operable fire detectors must be greater.

The loss of detection capability for Fire Suppression Systems, actuated by fire detectors, represents a significant degradation of fire protection for any area. As a result, the establishment of a fire watch patrol must be initiated at an earlier stage than would be warranted for the loss of detectors that provide only early fire warning. The establishment of frequent fire patrols in the affected areas is required to provide detection capability until the inoperable instrumentation is restored to operability.

9.5.1.7.2 Fire Suppression Systems (Water, Spray and/or Sprinklers, Halon and Fire Hose Stations)

The operability of the Fire Suppression Systems ensures that adequate fire suppression capability is available to confine and extinguish fires occurring in any portion of the facility where safety-related equipment is located. The Fire Suppression System consists of the water system, spray and/or sprinklers, Halon, and fire hose stations. The collective capability of the Fire Suppressions Systems is adequate to minimize potential damage to safety-related equipment and is a major element in the facility Fire Protection Program.

In the event that portions of the Fire Suppression Systems are inoperable, alternate backup fire-fighting equipment is required to be made available in the affected areas until the inoperable equipment is restored to service. When the inoperable fire-fighting equipment is intended for use as a backup means of fire suppression, a longer period of time is allowed to provide an alternate means of fire fighting than if the inoperable equipment is the primary means of fire suppression.

The Testing/Inspection Requirements provide assurance that the minimum operability requirements of the fire suppression systems are met. An allowance is made for ensuring a sufficient volume of Halon in the Halon storage tanks by verifying either the weight or the level of the tanks. Level measurements are made by a U.L., or F.M. approved method, or by ultrasonic measurement corrected for temperature using equipment calibrated to standards traceable to NBS. The term "simulated fire" test signal is interpreted to mean actuation of an automatic Fire Protection System by any of the release mechanisms provided, e.g., fire detectors, hand pull stations, fusible link/ mechanical, manual, hydro/mechanical, etc.

In the event the Fire Suppression Water System becomes inoperable, immediate corrective measures must be taken since this system provides the major fire suppression capability of the plant.

9.5.1.7.3 Fire Barrier Penetrations

The functional integrity of the fire barrier penetrations ensures that fires will be confined or adequately retarded from spreading to adjacent portions of the facility. This design feature minimizes the possibility of a single fire rapidly involving several areas of the facility prior to detection of and the extinguishing of the fire. The fire barrier penetrations are a passive element in the facility fire protection program and are subject to periodic inspections.

Fire barrier penetrations, including cable penetration barriers and fire doors are considered functional when the visually observed condition is the same as the as-designed condition. For those fire barrier penetrations that are not in the as-designed condition, an evaluation shall be performed to show that the modification has not degraded the fire rating of the fire barrier penetration. Fire dampers are considered functional if they fully close, as designed, when subjected to periodic drop testing as outlined in plant procedures. Fire barrier test samples and frequencies are described in Table 9.5.1-2.

During periods of time when a barrier is not functional, either: (1) a continuous fire watch is required to be maintained in the vicinity of the affected barrier, or (2) the fire detectors on at least one side of the affected barrier must be verified operable and an hourly fire watch patrol established, until the barrier is restored to functional status.

For inoperable fire barriers/radiant energy heat shields inside Containment, either: (1) with operable detection inside Containment, monitor Containment air temperature at least once per 24 hours in accordance with Technical Specifications, or (2) without operable detection inside containment, monitor containment air temperature at least once per hour in accordance with the locations listed in Technical Specifications.

For inoperable fire barriers (fire wrap) inside Auxiliary Building Pipe Space B (Room 1203), Auxiliary Feedwater Pipe Chase (Room 1304), and Control Building Corridor No. 1 (Room 3401) establish an hourly fire watch patrol in the room.

9.5.2 COMMUNICATION SYSTEMS

The communication systems include internal (in-plant) and external communications designed to provide convenient and effective communications among various plant locations, and between the plant and locations external to the plant.

9.5.2.1 <u>Design Bases</u>

9.5.2.1.1 Safety Design Bases

There is no safety design basis for the communication systems.