9.9 FIRE PROTECTION PROGRAM REPORT

9.9.1 INTRODUCTION

The Fire Protection Program at the Calvert Cliffs Nuclear Power Plant (CCNPP) provides the necessary controls to protect the health and safety of CCNPP workers and the general public, satisfy NRC and Insurer requirements, meet applicable State of Maryland codes and standards and safeguard Company assets by preventing fires and minimizing the consequences of any fire that may occur.

The fire protection program is based on NRC requirements and guidelines, Nuclear Electric Insurance Limited (NEIL) Property Loss Prevention Standards and related industry standards. With regard to NRC criteria, the fire protection program meets the requirements of 10 CFR 50.48(c), which incorporates, with exceptions, the National Fire Protection Association's (NFPA) 805 (Reference 1). The fire protection program also uses the guidance of Nuclear Energy Institute (NEI) 04-02 (Reference 2), as endorsed by Regulatory Guide 1.205 (Reference 3). Adoption of NFPA 805 is the method of satisfying 10 CFR 50.48(a) and General Design Criterion (GDC) 3. Prior to adoption of NFPA 805, draft GDC 3 was followed in the design of safety and non-safety related structures, systems, and components (SSCs), as required by 10 CFR 50.48(a).

NFPA 805 does not supersede the requirements of GDC 3, or 10 CFR 50.48(a). Those regulatory requirements continue to apply. However, under NFPA 805, the means by which GDC 3 or 10 CFR 50.48(a) requirements are met may be different than under 10 CFR 50.48(b).

An NRC Safety Evaluation was issued (Reference 4) that modified the operating licenses and Technical Specifications to incorporate a new licensing basis in accordance with 10 CFR 50.48(c). Title 10 CFR Part 50, Appendix R is no longer the licensing basis for fire protection at CCNPP.

The licensing basis is a risk-informed, performance-based program based on NFPA 805. This licensing basis requires that CCNPP meet the performance goals, objectives and criteria that are itemized in Chapter 1 of NFPA 805 through the implementation of performance based or deterministic approaches (see Sections 9.9.2.1 and 9.9.2.2). The plant fire protection requirements are established using the methodology in Chapter 2 of NFPA 805, so that the minimum fire protection program elements and design criteria contained in Chapter 3 of NFPA 805 are satisfied. Then the fire areas and fire hazards are established through a plant-wide analysis and a performance based or deterministic approach is applied to meet the nuclear safety performance criteria. As part of the performance based approach, engineering evaluations, probabilistic safety evaluations and the fire modeling calculations are used to show that the criteria are met. Chapter 4 of NFPA 805 establishes the methodology to determine the fire protection systems and features required to achieve the nuclear safety performance criteria. It also specifies that at least one success path to achieve the nuclear safety performance criteria shall be maintained free of damage by a single fire.

A discussion of general and plant specific sections of the fire protection program follow. Refer to Engineering Standard ES-056 (latest revision in FCMS) for Fire Protection Codes and Standards applicable to CCNPP.

Figure 9-22 provides a simplified system drawing of the fire protection system.

9.9.2 INTRODUCTION AND METHODOLOGY

9.9.2.1 Goals and Performance Criteria

The design basis for the fire protection program is based on the nuclear safety and radiological release goals and performance criteria contained in Sections 1.3 and 1.5 of NFPA 805. These goals and performance criteria are described below.

Nuclear Safety Performance Goal

The nuclear safety performance goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition. A safe and stable condition is defined as Mode 3 when the reactor vessel head is on and tensioned. In other conditions, safe and stable condition is defined as k_{eff} below 0.99 and coolant temperatures below boiling.

- Nuclear Safety Performance Criteria.

  Fire protection features are capable of providing reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition. To demonstrate this, the following performance criteria is met.

  a. Reactivity Control. Reactivity control is capable of inserting negative reactivity to achieve and maintain subcritical conditions. Negative reactivity insertion occurs rapidly enough such that fuel design limits are not exceeded.

  b. Inventory and Pressure Control. With fuel in the reactor vessel, head on and tensioned, inventory and pressure control is capable of controlling coolant level such that sub-cooling is maintained such that fuel clad damage as a result of a fire is prevented.

  c. Decay Heat Removal. Decay heat removal is capable of removing sufficient heat from the reactor core or spent fuel such that fuel is maintained in a safe and stable condition. Feed and bleed methods for decay heat removal are not permitted.

  d. Vital Auxiliaries. Vital auxiliaries are capable of providing the necessary auxiliary support equipment and systems to assure that the systems required under (a), (b), (c), and (e) are capable of performing their required nuclear safety function.

  e. Process Monitoring. Process monitoring is capable of providing the necessary indication to assure the criteria addressed in (a) through (d) have been achieved and are being maintained.

Radioactive Release Goal

The radioactive release goal is to provide reasonable assurance that a fire will not result in a radiological release that adversely affects the public, plant personnel, or the environment. Structures, systems, and components relied upon to meet the radioactive release criteria are documented in NFPA-805-00004, Radiological Release Review (see FCMS).

- Radioactive Release Performance Criteria.

  Radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) is as low as reasonably achievable and does not exceed applicable 10 CFR, Part 20 limits.

9.9.2.2 Methodology

The fundamental fire protection program is established as described in Section 9.9.3. The program includes a fire protection plan, fire prevention, fire brigade, a water supply, standpipes and hose stations, alarm and detection systems, water based fire suppression systems, gaseous fire suppression systems, and passive fire protection features.

Fire areas are established and listed in Table 9-20A. The fire hazards within each fire area are identified. The equipment and cables in each fire area needed to meet the performance criteria in Section 9.9.2.1 are determined. Fire scenarios are defined and modeled for each fire area to evaluate the effects of a fire and fire suppression activities on the ability to achieve the performance criteria. A nuclear safety capability assessment is performed to select systems and equipment, and cables needed to achieve the performance goal in each fire area. The list of systems, equipment and cables selected for the nuclear safety capability assessment are contained in NFPA-805-00005, Nuclear Safety Capability Safety Assessment Methodology Review (B-2 Table). See FCMS. Compliance with the performance criteria is evaluated using either a deterministic or performance based approach. Section 9.9.4 describes these approaches in more detail.

If a performance based approach is used, engineering analyses are performed to demonstrate that performance based requirements are satisfied. These analyses include engineering evaluations, probabilistic safety assessments or fire modeling calculations, as needed. Risk informed changes may be made to the fire protection program in accordance with Unit 1 and Unit 2 License Conditions. Prior NRC review and approval is not required if the change results in a decrease in risk and is consistent with the defense-in-depth philosophy. Additionally, prior NRC review and approval is not required for changes that result in a risk increase of less than or equal to 10^{-7} for core damage frequency (CDF) and 10^{-8} for large early release frequency (LERF).

If a deterministic approach is used, compliance with deterministic criteria (Section 9.9.4) are demonstrated.

The calculations supporting this analysis are plant records in FCMS. Any changes to fire protection program elements (described in Section 9.9.3) are evaluated to determine if they are acceptable. Configuration control is maintained using procedure-required reviews of plant changes. Quality control of the calculational methods is maintained in accordance with procedures.

9.9.3 FIRE PROTECTION PROGRAM AND DESIGN ELEMENTS

Calvert Cliffs Nuclear Power Plant complies with Chapter 3.3, Prevention, of NFPA 805 with approved exceptions. Exceptions are listed within the applicable sections. All exceptions were approved in Reference 4.

9.9.3.1 Introduction

Chapter 3 of NFPA 805 contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. Compliance with Chapter 3 of NFPA 805 is documented in NFPA-805-00002, NFPA 805 Chapter 3 Fundamental Fire Protection and Design Elements Review (B-1 Table). See FCMS. A summary of the requirements of NFPA 805 and any exceptions listed in NFPA-805-00002 are discussed below.

Where used in NFPA 805 Chapter 3 the terms “Power Block” and “Plant” refer to structures that have equipment required for nuclear plant operations. Table 9-20A lists the structures and areas that are included in the fire protection program.

9.9.3.2 Fire Protection Plan

A fire protection program is established and is documented in a fleet procedure (CC-AA-211). It describes the fire protection program activities and exceptions including the following aspects of the Fire Protection Plan:

- Management Policy and Direction
- Fire Prevention Activities, including control of combustible materials
- Procedures - The NRC approved (Reference 4) a performance based exception for procedures related to inspection, testing and maintenance of fire protection systems and features credited by the fire protection program. Performance based surveillance frequencies may be updated based on the guidance of Electric Power Research Institute (EPRI) TR-1006756 (Reference 5). As a minimum, surveillance frequencies for fire dampers will be reviewed against the EPRI guidance and updated, if needed.

Administrative controls associated with the Fire Protection Program are provided through several administrative procedures and the Exelon Quality Assurance Topical Report. Administrative requirements provide controls for activities that could affect fire protection, including the following:

- In-situ and transient combustibles;
- Ignition sources;
- Hot work activities;
- Smoking;
- Design, maintenance, and plant modification processes; and
- Surveillance of fire protection systems and equipment.

Fire protection equipment and systems are inspected and tested upon initial installation and periodically thereafter. The inspection and testing is conducted following the guidance of applicable NFPA Codes and Standards as well as recommendations and requirements of the insurance carrier. Plant procedures mandate test frequencies and the testing process. Applicability, compensatory actions, testing requirements, and testing frequencies for those fire protection systems which protect equipment needed to achieve and maintain a safe and stable condition are contained in the CCNPP Technical Requirements Manual (OP-CA-TRM-100). Plant procedures also identify compensatory actions to be taken when equipment required for fire scenario safe and stable actions becomes inoperable.

9.9.3.3 Prevention

9.9.3.3.1 Fire Prevention for Operational Activities

The fire prevention program consists of the necessary elements to address the control of ignition sources and transient combustible materials during all modes of plant operation.

General Activities

- Training on fire safety information is provided for all employees and contractors, including fire prevention, fire reporting and plant emergency alarms.
- Unanalyzed fire hazards that are identified are entered into the corrective action program.
- Administrative controls exist addressing the review of plant modifications and maintenance to ensure that the impact on fire protection and the creation of fire hazards are minimized.

Control of Combustible Material

- Procedures exist for control of general housekeeping and control of transient combustible material.
- Wood used in the power block shall be pressure impregnated or coated with a listed fire-retardant material.
- Plastic sheeting used in the power block shall be fire retardant types that have passed NFPA 701 testing or equivalent.
- Waste and debris shall be removed from an area immediately following completion of work or at the end of a shift, whichever comes first.
- Combustible storage or staging areas shall be established with limits on the types and quantities of material stored there.
- Controls on the use and storage of flammable liquids are in accordance with NFPA 30. Controls on the use and storage of flammable gasses are in accordance with NFPA 50A.

Control of Ignition Sources

- A hot work safety program has been implemented and is in accordance with NFPA 51B.
    - Except that welding, cutting and other hot work in sprinklered buildings is permitted while the suppression system is impaired.
- Smoking is restricted to designated safe areas of the plant.
- Open flames or combustion generated smoke is not permitted for leak or air flow testing.
- Administrative procedures control the use of portable electrical heaters and fuel fired heaters in the power block.

9.9.3.3.2 Structural

Wall, floors, and components required to maintain structural integrity are of noncombustible construction as defined in NFPA 220.

9.9.3.3.3 Interior Finishes

Interior wall or ceiling finishes are in accordance with NFPA 101. Interior floor finishes are in accordance with NFPA 101 for Class I interior floor finishes.

- Interior wall, ceiling and floor finishes for the main Control Room were approved in a 1979 NRC Safety Evaluation (Reference 6). They consist of mineral fiberboard ceiling with aluminum eggcrate inserts, carpet with a less than 25 rating per ASTM E-84, gypsum wallboard and painted concrete masonry unit walls. The auxiliary building, turbine

building, intake structure, containment, and service building are either unfinished or painted.

9.9.3.3.4 Insulation Materials

Thermal insulation materials, radiation shielding, ventilation duct materials and soundproofing materials are noncombustible or limited combustible.

- RTV 627 silicone rubber is used for radiation shielding in various areas. This type of radiation shielding has been tested with the ASTM E-119 surface burn test and withstood exposure for 6 hours.

9.9.3.3.5 Electrical

- Wiring above suspended ceilings shall be kept to a minimum. Where installed, the wiring is listed for plenum use, in armored cable, in metallic conduit or routed in cable trays with solid metal top and bottom covers.
  - The current (circa 2016) configuration of wiring above suspended ceilings has been approved.
- The use of non-metallic or thin wall metallic tubing for power, instrument or control cables has been approved as an acceptable alternative.
- Current (circa 2016) cable installations complied with testing approved by the NRC during evaluation of CCNPP's response to Generic Letter 88-20. New, permanent cable installations comply with acceptable cable construction tests listed in FAQ 06-0022 as described in Attachment 3 of CNG-FES-007 (see FCMS).

9.9.3.3.6 Roofs

Metal roof decking is designed and installed so the roof will not sustain a self-propagating fire when heated from underneath by a fire inside the building. Roof covering is Class A as determined by tests described in NFPA 256.

9.9.3.3.7 Bulk Flammable Gas Storage

- Bulk compressed gas storage is not permitted in buildings with SSCs important to nuclear safety. Storage of flammable gas is located outdoors or in detached buildings so that a fire or explosion will not adversely impact SSCs important to nuclear safety.
- Outdoor high-pressure flammable gas storage tanks are located so that the long axis is not pointed at buildings.
  - A performance based exception was approved by the NRC to allow the current configuration of the H_2 storage tanks.
- Flammable gas storage cylinders not required for normal plant operation are isolated from the system.

9.9.3.3.8 Bulk Storage of Flammable and Combustible Liquids

- Bulk storage of flammable and combustible liquids is not permitted inside buildings containing SSCs important to nuclear safety.
  - A performance based exception was approved by the NRC for the current configuration of the 1A Fuel Oil Storage Tank in the 1A Diesel Generator building. Note that tanks connected to a

system (i.e., day tanks, lube oil tanks) are not considered bulk storage.

9.9.3.3.9 Transformers

- Transformer oil collection basins and drain paths are periodically inspected to ensure that they are free of debris and capable of performing their design function.
  - Transformer oil collection basins are not required for spare transformers (i.e., transformers whose coils are not electrically connected and energized).

9.9.3.3.10 Hot pipes and Surfaces

- Combustible liquids are kept from coming into contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls require the prompt cleanup of oil on insulation

9.9.3.3.11 Electrical Equipment

- Adequate clearance, free of combustible material, is maintained around energized electrical equipment.
  - The definition of "adequate clearance" is contained in Section K.5 of NEI 04-02 (Reference 2)

9.9.3.3.12 Reactor Coolant Pumps

- The RCP oil collection is described in Section 4.1.3.3.2. The NRC had previously approved the existing RCP oil collection system and that approval carried forward as an existing engineering equivalency.

9.9.3.4 Industrial Fire Brigade

9.9.3.4.1 On-Site Fire Fighting Capability

A fully staffed, trained and equipped fire-fighting force is available at all times to control and extinguish fires on site. The force has a minimum compliment of 5 people. Members of the fire brigade do not include the minimum operations shift crew necessary for operation and shutdown of both Units.

- The requirements in NFPA 600, Chapter 5 are met for interior structural fire fighting. CCNPP meets the requirements in NFPA 600, Chapter 5. For exterior fires that could jeopardize the ability to meet the performance criteria described in UFSAR Section 9.9.2.1, the ability to control and extinguish those fires is demonstrated.

No fire brigade member is assigned a task that would require more than a nominal action to put the associated equipment in a safe condition. Additionally, the five assigned fire brigade members are excluded from assignment to the on-shift Emergency Response Organization (other than fire brigade). The on-shift Reactor Operators, Senior Reactor Operators, and Shift Technical Advisor assigned to the Emergency Response Organization are not assigned to the fire brigade.

During every shift, the brigade leader and at least two brigade members have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance criteria. An acceptable alternative is that an Operations

Technical Advisor (a licensed Operator) is dedicated to respond with the fire brigade. If used, Operations Technical Advisor position is in excess of the on-shift Reactor Operators, Senior Reactor Operators, and Shift Technical Advisor assigned to the Emergency Response Organization.

The fire brigade is notified immediately following verification of a fire.

Fire brigade members are required to pass an annual physical examination to determine that they can perform the strenuous activity required during manual firefighting operations. Each fire brigade member is required to be physically fit to wear self-contained breathing apparatus and a respirator.

9.9.3.4.2 Pre-Fire Plans

Current, detailed pre-fire plans are available to the fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 9.9.2.1. The plans detail the fire hazards in the area, along with any nuclear safety components and fire protection systems that are present. These pre-fire plans are reviewed and updated as needed. They are available in the Control Room. The pre-fire plans also address coordination with other groups during fire emergencies.

9.9.3.4.3 Training and Drills

Training is provided to the fire brigade and other plant personnel commensurate with their emergency responsibilities.

- The fire brigade training complies with the requirements of NFPA 600-2000 Edition. Fire brigade members are given quarterly training and practice in fire fighting, including radioactivity considerations to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire. A written program details the fire brigade training program. Written records are maintained for each fire brigade member. They include: initial fire brigade classroom and hands on training, refresher training, special training school attendance and leadership training.
- Plant personnel who respond with the fire brigade are trained as to their responsibilities.
- Drills are conducted quarterly for each shift to test the response capability of the fire brigade. Drills are developed to test and challenge fire brigade response, including performance as a team, use of equipment, use of pre-fire plans and coordination with other groups. These drills evaluate the fire brigade's ability to react, respond and demonstrate proper fire fighting techniques. Fire brigade drills are conducted in various plant areas, especially those areas identified to be essential to plant operation and to contain significant fire hazards. Drill records are maintained detailing the drill scenario, fire brigade response and ability of the fire brigade to perform as a team. A critique is held after each drill.

9.9.3.4.4 Fire Fighting Equipment

The fire brigade is provided with approved firefighting protective equipment, including turnout gear and self-contained breathing apparatus. Additional fire-fighting equipment is available, such as: hoses, nozzles, smoke ejectors, foam-making equipment, and other specialized tools. This equipment conforms to the applicable NFPA standards. Minimum

quantities of fire-fighting equipment are identified by plant procedures. Plant procedures also provided for periodic inspection and testing of fire-fighting equipment.

9.9.3.4.5 Off Site Fire Department Interface

Mutual aid agreements have been established with off-site fire departments to provide assistance to the plant fire brigade on an as-needed basis. The mutual aid agreements include an offer of site-specific training for the off-site fire departments and an offer of a plan for interface with the on-site fire brigade. Plant security and radiation protection plans address the response of the off-site fire departments.

9.9.3.4.6 Communications

An effective emergency communications capability is provided to the fire brigade.

9.9.3.5 Water Supply

The fire protection water supply is dedicated for fire protection use only. Except the pre-treated water storage tanks can serve other functions if there is a dedicated capacity capable of providing the maximum fire protection demand. Administrative procedures ensure an adequate water supply in these tanks for fire protection purposes.

Storage Tanks

- The water is supplied by three wells located on site through water pumps to two 500,000 gallon capacity (pretreated) water storage tanks located at the Fire Pump House. The layout of the discharge piping from the tanks is such that a minimum of 300,000 gallons (each tank) is always available to the fire protection system. The 300,000 gallons provides a 2-hour supply for the largest demand suppression system (diesel generator rooms), plus 1,000 gpm available for manual hose streams. Each of the tanks is also equipped with low-level alarms (less than 303,000 gallons) which annunciate in the Control Room and locally. The well pumps have the capacity to replenish the minimum required 300,000 gallons to one of the storage tanks within 8 hours. These tanks can be used as a backup water supply for the auxiliary feedwater system (see Section 10.3.1).
- The pre-treated water tanks are cross connected so that the fire pumps could take suction from either tank. Although the tanks are cross-connected, the cross-connect valve in the fire pump house is maintained locked shut, except when necessary to provide interconnection for firefighting purposes.

Pumps

- Water for the plant fire suppression systems is supplied by two full-capacity fire pumps. One pump is electrically-driven and the other is diesel engine-driven. These pumps are designed and installed in accordance with NFPA 20.
- The diesel engine-driven pump is arranged to provide backup for the electrically-driven pump in case the latter does not start or does not maintain adequate pressure at the header. The diesel engine-driven pump also starts automatically if electric power is interrupted to the electrically-driven pump. The diesel engine-driven fire pump is supplied with 8 hours of fuel from a nominal 500 gallon fuel tank located in the Fire Pump House.

- The NRC approved an exception to the requirement to separate the fire pumps with a rated fire barrier. The fire pumps are in a sprinklered building.
- Both fire pumps are designed to start automatically. The electrically-driven pump starts automatically on a low-header pressure of 95 psig with the diesel engine-driven pump being started at 85 psig.
- There are individual fire pump connections to the yard fire main loop. Each fire pump discharges into the yard main through a 12 inch diameter underground line. An isolation valve is provided between the two points at which the fire pump discharge lines connect to the yard main so that in the event of the failure of one of the pumps, the other pump is still available.
- Excessive pressure developed at the discharge side of the fire pumps is relieved through pressure regulating valves. These valves, along with bypass lines on the wet pipe sprinkler system alarm check valves located in the lower elevations of the plant, prevent over-pressurizing the fire water distribution system.
- A jockey pump is provided to automatically maintain pressure in the system, thus eliminating the need for the main fire pumps to maintain system pressure. This pump maintains a pressure of 115 to 125 psig in the fire protection water system under normal no-use conditions.
- A makeup fire pump is located in a sprinkler area of the Unit 1 Turbine Building basement. The makeup pump takes suction from a plant service water main and discharges to the fire protection system to meet the intermittent usage of water for the purposes other than fire protection. An administrative procedure establishes control for use of the fire system for purposes other than fire-fighting by limiting use to a single 1-1/2 inch hose stream and use of the makeup pump. This restriction to a single 1-1/2 inch hose applies to all non-fire protection use of the fire protection water supply unless evaluated and approved by the site fire protection engineer and documented in a procedure.
- Alarms are provided to immediately notify the Control Room of operation of the fire pumps.

Yard Fire Main, Hydrants and Headers

- An underground yard fire main loop has been designed and installed in accordance with NFPA 24. The fire yard main loop consists of 12 inch cement-lined iron piping and completely surrounds the plant. The yard main is cross-connected by distribution piping that is routed through the plant structures using carbon steel pipe. The distribution piping supplies the various fire protection systems and provides alternate paths for water flow should any portion of the fire main become disabled. The water-based suppression systems in the power block structures and the yard hydrants within the Protected Area of the plant are supplied by this fire protection water supply system. This system also supplies fire protection water to the warehouses.
- A separate fire protection system and yard main encircles the Nuclear Security Facility/Nuclear Office Facility and a single cross-connection is provided to the main plant fire protection system through a normally locked-closed valve. Should the fire protection system inside the Protected Area become disabled, opening this valve permits these fire pumps and associated water supply to provide a back-up to the Protected Area fire protection water supply system. This system is not covered by the plant Quality Assurance program and no credit for its availability is assumed in the plant fire protection design basis.
- Post indicator type valves are provided to isolate portions of the yard fire main loop for maintenance and repair purposes. These isolation devices are located so that isolation of a portion of the yard main loop does not simultaneously shut off the supply to both fixed fire suppression and fire hose stations provided for

manual backup. Sprinkler systems and manual hose station standpipes are connected to the plant fire protection water supply so that a single active failure or a crack in the water supply piping to these systems does not impair both the primary and backup fire suppression systems.

- All hydrants, hose couplings and standpipe risers are threaded so that they are compatible with local fire departments connections.
- Headers fed from each end are permitted inside buildings to supply both sprinkler and standpipe systems. The steel piping and fittings meet the requirements of American National Standards Institute B31.1 up to and including the first valve. The NRC approved an exception to the requirement to seismically design interior supply standpipes and headers. The water supply for firefighting was not required to be designed to withstand a Safe Shutdown Earthquake for these interior parts. These headers are considered an extension of the yard main system. The sprinkler and standpipe system is equipped with an approved shutoff valve.
- The fire protection water supply and fire suppression system control valves are inspected periodically to ensure they are in their correct positions. One of the following methods is acceptable: locking valves in their normal position, sealing valves in their normal position, or providing alarms in the Control Room for valves out of position.
- The requirement is to have fire hydrants which are installed approximately every 250 feet apart on the yard fire main system. Yard hydrants have been provided at intervals of approximately 200 feet to 300 feet around the exterior of the plant. Hose cabinets are equipped with hose, combination nozzle and other auxiliary equipment specified in NFPA 24. These hose cabinets are provided at interval not exceeding 1000 feet along the yard main system.

9.9.3.6 Standpipe and Hose Stations

These systems consist of standpipes/hose stations supplied with water from the fire protection water supply system. The standpipes/hose stations are located throughout the plant in permanent structures. The typical standpipe/hose station system consists of two 2-1/2 inch hose connection outlets. Each of the standpipes/hose stations is also provided with a universal spanner wrench. The standpipes/hose stations are spaced at approximately 100 foot intervals, located on all building elevations, and arranged to reach all safety-related components in the plant.

- For the power block buildings (see Table 9-20A) the NRC approved the use of NFPA 14 Class I standpipe and hose systems in lieu of Class III standpipe and hose systems.
- Hose stations are designed to ensure an adequate water flow rate and nozzle pressure. Hose station pressure reducers are provided where necessary for the safety of the fire brigade and the off-site fire department personnel.
- Hose nozzles supplied to each power block area (see Table 9-20A) are based on the area fire hazards. The combination spray/straight stream nozzle is not used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles are provided at locations where high voltage shock hazards exist. All hose nozzles have shutoff capability and are able to control water flow from full open to full closed.
- Per the requirements of Branch Technical Position 9.5-1, (Reference 7) plants operating in 1977 were not required to provide water to standpipes and hose stations for manual fire suppression in areas containing systems and

components performing nuclear safety functions following a Safe Shutdown Earthquake. This is an exception to NFPA 805.

9.9.3.7 Fire Extinguishers

Portable fire extinguishers are provided at locations throughout the plant. The extinguishing agents utilized are appropriate for the service requirements of the area. The portable fire extinguishers are located and installed following the guidance of NFPA 10. Fire extinguishers may be positioned outside of fire areas due to radiological conditions.

- The fire extinguishers comply with NFPA 10-1970 and 1973 editions. Current (circa 2016) fire extinguisher locations were reviewed per Section K.8 of NEI 04-02 (Reference 2).

9.9.3.8 Fire Alarm and Detection System

Fire Alarm

A fire alarm system is installed in accordance with NFPA 72D for a Class B system, except that the signals are not recorded automatically. The alarm system transmits signals to the Control Room. An audible-visual alarm system is provided in the Control Room with annunciator windows to warn of the occurrence of the following conditions: actuation of any required fire detector, actuation of a fixed suppression system, actuation of a manual fire alarm station, fire-alarm system trouble (includes valve supervision), electrical fire pump operation, diesel fire pump operation, and fire pump trouble. In addition, there are annunciator windows to designate the affected area. An audible alarm which is distinctive from other Control Room alarms is also provided.

Manual pull stations and station communication equipment is installed throughout the power block to allow a person observing a fire at any location to quickly and reliably communicate to the Control Room.

Communications devices and protocols are provided to promptly notify personnel on site, the fire brigade and off-site emergency response agencies of the existence of a fire emergency so they can determine an appropriate course of action. Two independent means of notifying off-site agencies exists.

Detection

A fire detection system consisting of various types of smoke, heat and flame detectors is provided where required as determined by NFPA 805, Chapter 4. These required detection systems are identified in Table B-3 (NFPA-805-00007, see FCMS) and listed in OP-CA-TRM-100. A general description of the types of detection equipment is described below. The required detection systems are installed in accordance with NFPA 72, except smoke detector spacing in the Units 1 and 2 69’ West electrical room (Rooms 529 and 532). This exception is an approved engineering equivalency evaluation.

Smoke detection includes both ionization and photoelectric type detectors. Most of the detectors provide an “alarm only” function, however, there are several smoke detector sub-system installations which also cause actuation of an associated fixed suppression system. A third type of smoke detector, beam type detectors, are installed in the Independent Spent Fuel Storage Installation warehouse and weld shop.

Heat detection consists of both spot-type detectors and line-type detectors. Spot-type detectors consist of one of three types: rate-of-rise, fixed temperature, or a combination of the two types (rate-compensated). The spot-type detectors installed in the plant are generally installed as part of a fixed suppression system. These detectors cause the suppression system to actuate as well as transmit an alarm to the Control Room. The line-type detectors, which are installed in several cable trays in the containment buildings and for some transformers, provide an alarm-only function.

Infra-red type flame detectors are installed in several areas of the Auxiliary Building where smoke detection is not appropriate. The flame detectors provide an alarm-only function.

9.9.3.9 Automatic and Manual Water Based Fire Suppression System

Fixed water suppression systems consist of several different types of systems including deluge systems, pre-action, wet pipe, dry pipe sprinkler, manual, and foam systems. The systems are automatically actuated except for the sprinkler systems protecting the main turbine bearings, the foam systems, and Cable Chase 1A, 1B, 2A, and 2B.

Required water suppression systems are installed in accordance with NFPA 13. Exceptions to sprinkler system installation per NFPA 13 are: the 1B, 2A, and 2B EDG rooms (Rooms 421, 422 and 416), Truck Bay (Room 419), the 1E switchgear room (Room DB104), DG pedestal area (Room SB002), 1A EDG building (various rooms), DG fan room (Room DB203), DG Trench (Room DB004), and underneath the snubber shop (Room 1109).

Each required water suppression system is equipped with a water flow alarm. Alarms from the water suppression systems are annunciated in the Control Room as noted in Section 9.9.3.8. All valves in the required water suppression systems are supervised with one of the following methods: locking valves in their normal position, sealing valves in their normal position, or providing alarms in the Control Room for valves out of position. The required water-based fire suppression systems are equipped with approved isolation valves as described in Section 9.9.3.5.

Deluge water spray system piping is normally dry. These systems are automatically actuated by an associated heat detection system. These systems are installed to provide protection for equipment containing significant quantities of oil. In addition, the systems are provided with open head sprinklers, thus water flows from all the sprinklers upon actuation of the system's deluge valve. The main isolation valve for each of these systems is either electrically supervised or locked in the open position. If the system is actuated, an alarm is automatically transmitted to the Control Room.

Pre-action sprinkler system piping is normally dry. These systems are automatically actuated by an associated heat detection system that allows water into the system piping. In addition, the systems are provided with fusible head sprinklers which operate only when exposed to high temperatures. These systems are installed to provide general area protection (except for the turbine bearing systems which are hazard specific). The main isolation valve for each of these systems is either electrically supervised or locked in the open position. If the system is actuated, an alarm is automatically transmitted to the Control Room.

Wet pipe sprinkler system piping is normally water-filled. These systems are provided with fusible head sprinklers which operate only when exposed to high temperatures. These systems are installed to provide general area protection. The

main isolation valve for each of these systems is either electrically supervised or locked in the open position. If the system is actuated, an alarm is automatically transmitted to the Control Room.

Dry pipe sprinkler system piping is normally dry. These systems are provided with fusible head sprinklers which operate when exposed to high temperatures. These systems are installed to provide general area protection. The main isolation valve for each of these systems is either electrically supervised or locked in the open position. If the system is actuated, an alarm is automatically transmitted to the Control Room.

The foam systems provide protection for the two outdoor fuel oil storage tanks. The foam system piping is normally dry. The systems are designed to be operated manually in the event of a fire. The foam concentrate storage tank is located on the west side of the plant.

9.9.3.10 Gaseous Fire Suppression Systems

These systems are automatically actuated by detection systems located in the protected rooms. Upon actuation, the systems distribute Halon 1301 throughout the Protected Area via system piping. In addition, air flow in and out of the room is isolated prior to system discharge so that the Halon concentration is maintained within the protected room. Actuation of each of these systems is annunciated in the Control Room. Provisions exist for locally disarming the automatic suppression system. These provisions are secured in the operating position and under administrative control.

9.9.3.11 Passive Fire Protection Features

Passive fire protection features include wall, ceiling and floor assemblies, fire doors, fire dampers, through wall fire penetration seals, and electrical raceway fire barrier systems. Calvert Cliffs currently does not utilize Electrical Raceway Fire Barrier Systems.

Building Separation

Each building in the power block is separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 feet, or by a space that meets the requirements of NFPA 80A. The North Service Building and the Turbine Building are treated as a single fire area. An Engineering Equivalency Evaluation justifies excluding the 45’-0” of the North Service Building from the power block. An Engineering Equivalency Evaluation also justifies the nonrated portions of the barriers between the Turbine Building and the Auxiliary Building.

Fire Barriers

Required fire barriers, have fire resistance ratings supported by fire testing, are designated as either 1-hour, 2-hour, or 3-hour fire-rated barriers. The qualification fire tests are performed in accordance with NFPA 251.

The following fire barriers are exceptions to the fire resistance ratings and have been approved using an Engineering Equivalency Evaluation:

- water curtains between the ECCS pump rooms (Rooms 101, 102, 118, and 119) and the containment recirculation pipe tunnels (Rooms 120 and 122);
- gypsum barrier between the east/west hallway of 10’ (Room 104) and the Auxiliary Building stairtower no. 5 (Room AB-5);

- fire area barrier between Unit 1 5’ fan room (Room 225) and the Unit 1 27’ switchgear room (Room 317);
- blockouts in fire area barriers between Unit 2 Component Cooling room (Room 201) the north/south 5’ passage (Room 202 and the Unit 1 Component Cooling room (Room 228);
- blockouts in the fire area barriers between the ECCS pump rooms (Rooms 101, 102, 118 and 119) and the east/west hallway (Room 100);
- blockouts covered with a steel plate installed in fire area barriers on 12’-0” of the Turbine Building;
- gypsum barrier between the Unit 1 69’ west Penetration Room (Room 529) and the Spent Fuel Pool/Cask Handling Area (Room 530);
- non-rated wall between the Units 1 and 2 Main Steam Piping Penetration room (Rooms 315 and 309) and the 27’-0” elevation of the Turbine Building (Rooms L27A and L27B);
- lack of fire rated expansion gap seals on elevations 5’-0”, 27’-0” and 45’-0” or the Auxiliary Building;
- fire separation between duct banks and cable trays routed above the roof of the Auxiliary Building, Access Control Area and Turbine Building, and the rooms below;
- conduits embedded in the elevation 27’-0” Turbine Building floor slab (Rooms L27A and L27B) and the floor/ceiling slab between stairwells AB-4 and AB-5 and the horizontal cable chases (Rooms 517 and 518);
- non-rated features of the exterior barriers on elevation 45’-0” and 69’-0” of the Auxiliary Building;
- barrier walls between the Charging Pump rooms (Rooms 105A, 105B, 105C, 115A, 115B, and 115C) which are not 3-hour rated; and
- nonrated construction features of exterior fire barriers on various plant buildings.

Fire Barrier Penetrations

Fire-rated penetrations consist of fire doors and fire dampers. Each of the fire-rated doors and dampers are listed for the appropriate fire resistance rating by an independent testing laboratory. Fire barrier seal designs for electrical and piping penetrations were subjected to fire testing at an independent testing laboratory.

Exceptions to the fire resistance ratings are listed below. Water curtains were previously approved by NRC to provide a 3-hour fire separation. The following fire barriers have been approved using an Engineering Equivalency Evaluation:

- 1.5-hour fire rated doors in fire area barriers on elevation 27’-0” of the Auxiliary Building;
- No fire dampers in the fire rated floor slab of the Units 1 and 2 main plant exhaust and equipment rooms (Rooms 524 and 526);
- Lack of a fire damper in the area above the roof of the heater bay and the ALARA Office (Room 571);
- Lack of fire dampers in the barriers separating the Units 1 and 2 DAS computer room (Room 431 and 406) and the Units 1 and 2 Blowdown Tank and piping area (Rooms 428 and 408);
- Non-rated penetration seals in the Auxiliary Building, the North Service Building and the Intake Structure;
- Lack of fire dampers between the following rooms: Unit 1 cable spreading room (Room 306), cable chase 1A (Room 1A), and cable chase 1B (Room 1B);

- 1.5-hour fire rated doors installed in a 3 hour fire barrier in various locations in the Auxiliary Building;
- various deficiencies associated with fire doors are justified in ECP-13-000304;
- tendon access hatches installed in the floor/ceiling on elevations 27'-0", 45'-0" and 69'-0" of the Auxiliary Building;
- pinned open fire dampers throughout the Auxiliary Building;
- doors and non-dampered ventilation penetrations through exterior fire barriers in elevations 45'-0" and 69'-0" of the Auxiliary Building;
- dampers and doors in barrier walls between Charging Pump rooms (Rooms 105A, 105B, 105C, 115A, 115B, and 115C) which are not 3-hour fire rated.

Fire doors comply with NFPA 80, 1970 Edition, except the previously approved watertight doors and bullet proof doors that provide a 3-hour fire separation. Door 113B between No. 11 Charging Pump room (Room 115A) and the No. 13 Charging Pump room (Room 115C), and various deficiencies throughout the plant (ECP-13-000304) are approved exceptions also.

Fire dampers comply with NFPA 90A, 1976 Edition. The following fire dampers have been approved using an Engineering Equivalency Evaluation:

- Dampers between the Control Room (Room 405) and the HVAC equipment room (Room 512) which are not installed per the manufacturer's directions
- Damper installed in the barrier between the Truck Bay (Room 419) and the RC Waste Evaporator room (Room 420), which is not installed per the manufacturer's directions
- Damper between the U1 Plant Exhaust equipment room (Room 524) and the area above the heater bay, which is not installed per the manufacturer's directions
- Dampers in fire barriers in the Auxiliary Building and the Turbine Building which are not installed per the manufacturer's directions and/or are 1.5 hour rated
- Dampers in various locations in the Auxiliary Building which are not installed per the manufacturer's directions

Where penetration seal configurations within the plant are not bounded by a fire test, an engineering evaluation has been performed to document acceptability. The penetration seals in barriers requiring a fire rating are of a commensurate fire rating as the barrier itself.

The annular space between the penetrating item and the opening in a fire barrier is filled with a qualified seal assembly capable of maintaining the fire resistance of the barrier. The following penetrations and sealing material have been approved using an Engineering Equivalency Evaluation:

- Cable tray penetrations in fire barriers in various locations in the Auxiliary Building
- Pipe penetrations through the fire barriers at various locations in the Auxiliary Building
- Pipe penetrations through the fire barriers between the Unit 1 69' West Electrical room (Room 529), the Spent Fuel Pool, Cask Handling Area (Room 530), and the Unit 2 69' West Electrical room (Room 532)
- Drain line penetration through the fire barrier separating the North Service Building from the Intake Structure

- Penetrations through the fire barrier between the Unit 1 69' West Electrical room (Room 529), and the Spent Fuel Pool, Cask Handling Area (Room 530)
- Penetrations through the fire barrier between (-)10' East/West hallway (Room 104) and the No. 13 Charging Pump room (Room 115C)
- Use of ceramic fiber for structural penetrations between the Unit 1 69' West Electrical room (Room 529), the Spent Fuel Pool. Cask Handling Area (Room 530) and the Unit 2 69' West Electrical room (Room 532)
- Penetrations in the fire barrier between the No. 11 RC Waste Receiver Tank room (Room 114) and the RC Waste Evaporator room (Room 420)
- Use of certain seal designs for Unistrut penetrations throughout the plant (Calculation DE00815)
- Conduits penetrating the fire barrier between the Unit 1 and 2 Battery rooms (Rooms 301, 304, 305 and 307) and the Unit 1 and 2 Cable Spreading rooms (Rooms 302 and 306)
- Cable tray penetrations through fire barriers between the Unit 2 27' Switchgear room (Room 311), the Unit 2 Containment Purge Air Supply room (Room 312) and the Unit 2 45' Switchgear room (Room 407)
- Cable bundles penetrating the fire barrier between the Plant Chemistry Data Analysis room (Room 584) and the Plant Chemistry Cold Lab (Room 586)
- Penetrations throughout the plant that can only be inspected from one side (ECP-13-000188)
- Penetrations in the fire barrier between the Charging Pump rooms (Rooms 105A, 105B, 105C, 115A, 115B and 115C) which are not 3-hour fire rated
- Four 1-hour rated link seal penetrations in the 3-hour rated fire barriers in the Auxiliary Building
- Kaowool/Flammastic penetration seal in sleeves penetrated by conduit and cables installed in fire barriers throughout the plant
- Penetration seal design which differs from the typical seal design and is used at various locations throughout the plant (ES199601644-000)

Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts are protected as follows. The annular space between the penetrating item and the opening in the fire barrier is filled with a qualified penetration seal assembly capable of maintaining the fire resistance of the barrier. Conduits are provided with an internal fire seal that has an equivalent fire-rating as that of the barrier. The internal fire seal in conduits is installed on either side of the barrier in a location that is as close to the barrier as possible. An exception to conduit sealing is approved in NFPA 805. Openings in conduit ≤ 4 inches in diameter are sealed with an internal seal unless the conduit extends greater than 5 feet on each side of the fire barrier. In that case, the conduit needs to be provided with non-combustible material to a depth of 2 inches to prevent hot gas and smoke from passing through the fire barrier.

The following penetrations and sealing material have been approved using an Engineering Equivalency Evaluation:

- Typical installation detail used for through penetration fire stops throughout the plant (0113-000092-01)
- Conduits penetrating the fire barrier between the Unit 1 and Unit 2 battery rooms (Rooms 301, 304, 305, and 307) and the Unit 1 and Unit 2 Cable Spreading rooms (Rooms 302 and 306)

- Penetrations in fire barriers throughout the plant that can only be inspected from one side (ECP-13-000188)
- Kaowool/Flammastic penetration seal in sleeves penetrated by conduit and cables installed in fire barriers throughout the plant
- Penetration seal design which differs from the typical seal design and is used at various locations throughout the plant (ES199601644-000)

9.9.4 DETERMINATION OF FIRE PROTECTION FEATURES

Chapter 4 of NFPA 805 establishes the methodology to determine the fire protection systems and features required to achieve the nuclear safety performance criteria outlined above in Section 9.9.2.1. The methodology is permitted to be either deterministic or performance-based. Once a determination has been made that a fire protection system or feature is required to achieve the nuclear safety performance criteria of Section 9.9.2.1, its design and qualification shall meet the applicable requirements of NFPA 805, Chapter 3, as modified by approved changes shown in Section 9.9.3. These fire protection systems and features are documented in NFPA-805-00006, Nuclear Safety Capability Assessment (NSCA) and NFPA-805-00006A, NSCA Analysis Results, both located in FCMS.

Deterministic Approach

Deterministic requirements shall be “deemed to satisfy” the performance criteria, defense-in-depth, and safety margin and require no further engineering analysis.

One success path of required cables and equipment needed to achieve and maintain the nuclear safety performance criteria without the use of recovery actions must be protected. Protection consists of 3-hour encapsulation of the success path, or 1-hour encapsulation of the success path with suppression and detection, or 20 feet separation without intervening combustibles and suppression and detection throughout the area.

In containment, the following protection is needed: a radiant energy shield capable of withstanding a 0.5-hour fire exposure, or 20 feet separation without intervening combustibles, or suppression and detection throughout the area.

Changes may be made to the fundamental fire protection program elements and design requirements if an engineering evaluation demonstrates the alternative is functionally equivalent. Also, changes may be made to fire protection program elements if the alternative is adequate for the hazard as determined by an engineering evaluation. Prior NRC approval is not needed for four specific program element changes: Fire Alarm and Detection Systems, Automatic and Manual Water-Based Fire Suppression Systems, Gaseous Fire suppression systems and Passive Fire Protection Features. Other element changes do require prior NRC approval before they are implemented in accordance with the Unit 1 and Unit 2 License Condition.

Performance Based Approach

The performance based approach is used as an alternative to the deterministic approach described above. The fire scenarios and fire design basis are defined for each fire area considered. These fire areas are evaluated using fire modeling to quantify the fire risk and margin of safety, or by the use of probabilistic safety analysis to examine the impact on overall plant risk.

A fire hazard assessment is performed to quantify the fire risk and margin of safety. To perform a fire hazard assessment, the physical location of the equipment requiring protection is determined using the methods described in Section 9.9.2.2. The damage threshold for this equipment is then established, again using the method described in

Section 9.9.2.2. The fire scenarios are established for this area and the evaluation determines if the equipment needed to achieve the nuclear safety performance criteria are maintained free of fire damage. There must be sufficient margin between the maximum expected fire scenario and the limiting (deterministic) fire scenario.

As an alternative, the overall plant risk of the fire protection approach for a fire area may be evaluated. The fire risk evaluation compares the risk associated with the implementation of deterministic requirements with a proposed alternative. The difference in risk of the two approaches must meet a CDF of 10^{-4}/yr and a LERF of 10^{-5}/yr per Regulatory Guide 1.174 (Reference 8). Additionally, prior NRC review and approval is not required for individual changes that result in a risk increase of less than or equal to 10^{-7}/yr for CDF and 10^{-8}/yr for LERF. These criteria were approved in Reference 4 and are contained in the station license conditions. The proposed alternative must also ensure that the philosophy of defense in depth and a sufficient safety margin are maintained.

Operations Guidance

Guidance is provided to the plant operators that details the credited success paths for each fire area, including the performance of recovery actions and repairs. Recovery actions credited to achieve the nuclear safety performance criteria are feasible. Station Abnormal Operating Procedures contain this guidance. If command has shifted from the Control Room to the alternate shutdown panel, the actions taken at the alternate shutdown panel are not considered to be recovery actions.

9.9.5 REFERENCES

1. NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition
2. NEI 04-02, Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c), Revision 2, February 2006
3. Regulatory Guide 1.205, Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants, Revision 1, December 2009
4. Letter from R. V. Guzman (NRC) to B. C. Hanson (EGC), dated August 30, 2016, Issuance of Amendments Regarding Transition to a Risk-Informed, Performance Based Fire Protection Program in Accordance with 10 CFR 50.48(c)
5. EPRI Technical Report 1006756, Fire Protection Equipment Surveillance Optimization and Maintenance Guide, July 2003
6. Letter from R. W. Reid (NRC) to A. E. Lundvall (BGE), dated September 14, 1979, Issuance of Amendments 41 and 23 to Calvert Cliffs Nuclear Power Plant
7. Branch Technical Position APCSB 9.5-1, Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976, February 24, 1977
8. Regulatory Guide 1.174, An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis, Revision 2, May 2011

TABLE 9-20A

POWER BLOCK STRUCTURES AND FIRE AREA DESCRIPTION

Power Block Structure	Fire Area	Description
Auxiliary Building	1	U2 21 ECCS Pump Room
Auxiliary Building	2	U2 22 ECCS Pump Room
Auxiliary Building	3	U1 12 ECCS Pump Room
Auxiliary Building	4	U1 11 ECCS Pump Room
Auxiliary Building	5	11 Charging Pump Room
Auxiliary Building	6	12 Charging Pump Room
Auxiliary Building	7	13 Charging Pump Room
Auxiliary Building	8	22 Charging Pump Room
Auxiliary Building	9	23 Charging Pump Room
Auxiliary Building	10	(-) 10'/(-) 15' Hallways and General Areas/ 21 Charging Pump Room
Auxiliary Building	11	Auxiliary Building (All elevations) General and Misc Areas
Auxiliary Building	12	U2 Component Cooling Room
Auxiliary Building	13	U2 5' Fan Room
Auxiliary Building	14	U1 5' Fan Room
Auxiliary Building	15	U1 Component Cooling Room
Auxiliary Building	16	U1 Cable Spreading Room and 1C Cable Chase
Auxiliary Building	16A	11 Battery Room
Auxiliary Building	16B	Hallway Outside U1 CSR and Battery Rooms
Auxiliary Building	16C	12 Battery Room
Auxiliary Building	17	U2 Cable Spreading Room and 2C Cable Chase
Auxiliary Building	17A	21 Battery Room
Auxiliary Building	17B	Hallway Outside U2 CSR and Battery Rooms
Auxiliary Building	17C	22 Battery Room
Auxiliary Building	18	U2 27' Switchgear Room
Auxiliary Building	18A	U2 Containment Purge Air Supply Room
Auxiliary Building	19	U1 27' Switchgear Room
Auxiliary Building	19A	U1 Containment Purge Air Supply Room
Auxiliary Building	20	Cable Chase 1A
Auxiliary Building	21	Cable Chase 1B
Auxiliary Building	22	Cable Chase 2A
Auxiliary Building	23	Cable Chase 2B
Auxiliary Building	24	Control Room Complex
Auxiliary Building	25	U2 45' Switchgear Room
Auxiliary Building	26	U2 45' E Electrical Pen Room
Auxiliary Building	27	U2 45' W Electrical Pen Room
Auxiliary Building	28	2B Diesel Generator Room
Auxiliary Building	29	U2 RWT Room
Auxiliary Building	30	1B Diesel Generator Room and RC Waste Room
Auxiliary Building	31	2A Diesel Generator Room
Auxiliary Building	32	U1 45' W Electrical Pen Room
Auxiliary Building	33	U1 45' E Electrical Pen Room
Auxiliary Building	34	U1 45' Switchgear Room
Auxiliary Building	35	U2 Horizontal Cable Chase

TABLE 9-20A

POWER BLOCK STRUCTURES AND FIRE AREA DESCRIPTION

Power Block Structure	Fire Area	Description
Auxiliary Building	36	U1 Horizontal Cable Chase
Auxiliary Building	37	U1 69' W Electrical Pen Room
Auxiliary Building	38	U2 69' W Electrical Pen Room
Auxiliary Building	39	U1 Service Water Pump Room
Auxiliary Building	40	U2 Service Water Pump Room
Auxiliary Building	41	Misc Waste Evap Control Panel Room
Auxiliary Building	42	U1 AFW Pump Room
Auxiliary Building	43	U2 AFW Pump Room
Auxiliary Building	44	U1 RWT Pump Room
Auxiliary Building	AB-1	Aux Bldg Stairtower No. 1
Auxiliary Building	AB-2	Aux Bldg Stairtower No. 2
Auxiliary Building	AB-3	Aux Bldg Stairtower No. 3
Auxiliary Building	AB-4	Aux Bldg Stairtower No. 4
Auxiliary Building	AB-5	Aux Bldg Stairtower No. 5
Auxiliary Building	ABFL	Aux Bldg Slab Containing NFPA 805 Embedded Conduits 69'
Containment – Unit 1	1CNMT	U1 Containment
Containment – Unit 2	2CNMT	U2 Containment
1A Emergency Diesel Building	DGB1	1A Diesel Generator Building
0C Station Blackout Diesel Generator Building	DGB2	0C Diesel Generator Building
Intake Structure	IS	Intake Structure
Auxiliary Building	KWAL	Vertical K-Line Wall containing NFPA 805 Embedded Conduits
Turbine Building/North Service Building (12' and 27' Elevations)	TBFL	Turbine Bldg Slab Containing NFPA 805 Embedded conduits 12'
Turbine Building/North Service Building (12' and 27' Elevations)	TB/NSB/ACA	U1 and U2 Turbine Building, North Service Building, Access Control Area
13.8 kV Switchgear House Unit 1	YARD	Outside Yard Area and Buildings
13.8 kV Switchgear House Unit 2	YARD	Outside Yard Area and Buildings
13.8 kV Switchgear Unit 1 & 2	YARD	Outside Yard Area and Buildings
Battery/Relay House Unit 1 & 2	YARD	Outside Yard Area and Buildings
Transformer Relay House	YARD	Outside Yard Area and Buildings
Condensate Storage Tank No. 12 Enclosure	YARD	Outside Yard Area and Buildings
Fire Protection Pump House	YARD	Outside Yard Area and Buildings
No. 2 Fuel Oil Storage Tank No. 21 Building	YARD	Outside Yard Area and Buildings
Pretreated-Well Water House	YARD	Outside Yard Area and Buildings

TABLE 9-20

DESIGN DATA FOR FIRE PROTECTION SYSTEM COMPONENTS

Fire Pump, Electrically-Driven	
Type	Horizontal Centrifugal
Number	1
Capacity	2,500 gpm
Discharge Press.	125 psig
Material:	
Discharge Head	Cast Iron
Impeller	Bronze
Motor	250 hp/460 Volts/3 phase/60 Hz
Codes	U.L. Label Motor: NEMA Pump: Standards of the Hydraulic Institute
Fire Pump, Diesel Engine-Driven	
Type	Horizontal Centrifugal
Number	1
Capacity	2500 gpm
Discharge Press.	125 psig
Material:	
Discharge Head	Cast Iron
Impeller	Bronze
Engine	283 hp
Codes	Pump: Standards of the Hydraulic Institute
Fire System Jockey Pump	
Type	Horizontal Centrifugal
Number	1
Capacity	30 gpm
Discharge Press.	129 psig
Material:	
Discharge Head	Cast Iron
Impeller	Bronze
Motor	7-1/2 hp/460 Volts/3 phase/60 Hz
Codes	Motor: NEMA Pumps: Standards of the Hydraulic Institute
Makeup Pump, Electrically-Driven	
Type	Horizontal Centrifugal
Number	1
Capacity	215 gpm
Discharge Press.	125 psig
Material:	
Discharge Head	Cast Iron
Impeller	Bronze
Motor	40 hp/460 Volts/3 phs/60 Hz
Codes	Motor: Underwriters Label, NEMA Pumps Standards of the Hydraulic Institute

TABLE 9-20

DESIGN DATA FOR FIRE PROTECTION SYSTEM COMPONENTS

Piping, Fittings and Valves

	Underground	**Aboveground**
Material	Cast Iron	Carbon Steel[a]
Design Pressure	150 psig	175 psig
Design Temperature	100°F	100°F
Construction	Mechanical Joint	Welded and Screwed
Valves	Cast Iron	Cast Iron[a][c]
	Mechanical Joint	Flanged[b]
	175 psi	175 psi
	UL Label	UL Label

(a) For 3-1/2" and smaller size fittings, and for 2" and smaller size valves, alternate materials can be used.

(b) 2" and smaller valves are screw type.

(c) For 2-1/2" and greater size gate valves, material may be Ductile Iron and have a pressure class of up to 250 psi.