CHAPTER 9

AUXILIARY SYSTEMS

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CHAPTER 9

AUXILIARY SYSTEMS

9.1 FUEL STORAGE AND HANDLING

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

Add the following subsection after DCD Subsection 9.1.4.3.7.

9.1.4.3.8 Radiation Monitoring

STD COL 9.1-6 Plant procedures require that an operating radiation monitor is mounted on any machine when it is handling fuel. Refer to DCD Subsection 11.5.6.4 for a discussion of augmented radiation monitoring during fuel handling operations.

9.1.4.4 Inspection and Testing Requirements

Add the following paragraph at the end of DCD Subsection 9.1.4.4.

STD COL 9.1-5 The above requirements are part of the plant inspection program for the light load handling system, which is implemented through procedures. In addition to the above inspections, the procedures reflect the manufacturers' recommendations for inspection. The light load handling program, including system inspections, is implemented prior to receipt of fuel onsite.

9.1.5 OVERHEAD HEAVY LOAD HANDLING SYSTEMS

Add the following at the end of DCD Subsection 9.1.5.

STD SUP 9.1-2 The heavy loads handling program is based on NUREG 0612 and vendor recommendations. The key elements of the program are:

- Listing of heavy loads to be lifted during operation of the plant. This list will be provided once magnitudes have been accurately formalized but no later than three (3) months prior to fuel receipt.

- Listing of heavy load handling equipment as outlined in DCD Table 9.1-5 and whose characteristics are described in Subsection 9.1.5 of the DCD.

- Heavy load handling safe load paths and routing plans including descriptions of interlocks, (automatic and manual) safety devices and procedures to assure safe load path compliance. Anticipated heavy load movements are analyzed and safe load paths defined. Safe load path considerations are based on comparison with analyzed cases, previously defined safe movement areas, and previously defined restricted areas. The analyses are in accordance with Appendix A of NUREG 0612.

- Heavy load handling equipment maintenance manuals and procedures as described in Subsection 9.1.5.5.
- Heavy load handling equipment inspection and test plans, as outlined in Subsections 9.1.5.4 and 9.1.5.5.
- Heavy load handling personnel qualifications, training, and control procedures as described in Subsection 9.1.5.5.
- QA programs to monitor, implement, and ensure compliance with the heavy load-handling procedures as described in Subsection 9.1.5.5.

A quality assurance program, consistent with Paragraph 10 of NUREG-0554, is established and implemented for the procurement, design, fabrication, installation, inspection, testing, and operation of the crane. The program, as a minimum, includes the following elements:

- design and procurement document control
- instructions, procedures, and drawings
- control of purchased material, equipment, and services
- inspection
- testing and test control
- non-conforming items
- corrective action
- records

9.1.5.3 Safety Evaluation

Add the following information at the end of DCD Subsection 9.1.5.3.

STD SUP 9.1-1

There are no planned heavy load lifts outside those already described in the DCD. However, over the plant life there may be occasions when heavy loads not presently addressed need to be lifted (i.e., in support of special maintenance/

repairs). For these occasions, special procedures are generated that address, as a minimum, the following:

- The special procedure complies with NUREG-0612.
- A safe load path is determined. Mechanical and/or electrical stops are incorporated in the hardware design to prohibit travel outside the safe load path. Maximum lift heights are specified to minimize the impact of an unlikely load drop.
- Where a load drop could occur over irradiated fuel or safe shutdown equipment, the consequence of the load drop is evaluated. If the evaluation concludes that the load drop is not acceptable, an alternate path is evaluated, or the lift is prohibited.
- The lifting equipment is in compliance with applicable ANSI standards and has factors of safety that meet or exceed the requirements of the applicable standards.
- Operator training is provided prior to actual lifts.
- Inspection of crane components is performed in accordance with the manufacturer recommendations.

STD COL 9.1-6

Plant procedures require that an operating radiation monitor is mounted on any crane when it is handling fuel. Refer to DCD Subsection 11.5.6.4 for a discussion of augmented radiation monitoring during fuel handling operations.

9.1.5.4 Inservice Inspection/Inservice Testing

Add the following paragraph at the end of DCD Subsection 9.1.5.4.

STD COL 9.1-5

The above requirements are part of the plant inspection program for the overhead heavy load handling system, which is implemented through procedures. In addition to the above inspections, the procedures reflect the manufacturers' recommendations for inspection and the NUREG-0612 recommendations.

The overhead heavy load handling equipment inservice inspection procedures, as a minimum, address the following:

- Identification of components to be examined
- Examination techniques

- Inspection intervals
- Examination categories and requirements
- Evaluation of examination results

The overhead heavy load handling program, including system inspections, is implemented prior to receipt of fuel onsite.

9.1.5.5 Load Handling Procedures

STD SUP 9.1-3

Load handling operations for heavy loads that are handled over, could be handled over or are in the proximity of irradiated fuel or safe shutdown equipment are controlled by written procedures. As a minimum, procedures are used for handling loads with the spent fuel cask bridge and polar cranes, and for those loads listed in Table 3.1-1 of NUREG 0612. The procedures include and address the following elements:

- The specific equipment required to handle load (e.g., special lifting devices, slings, shackles, turnbuckles, clevises, load cells, etc.).
- Qualification and training of crane operators and riggers in accordance with chapter 2-3.1 of ASME B30.2, “Overhead and Gantry Cranes.”
- The requirements for inspection and acceptance criteria prior to load movement.
- The defined safe load path and provisions to provide visual reference to the crane operator and/or signal person of the safe load path envelope.
- Specific steps and proper sequence to be followed for handling load.
- Precautions, limitations, prerequisites, and/or initial conditions associated with movement of heavy loads.
- The testing, inspection, acceptance criteria and maintenance of overhead heavy load handling systems. These procedures are in accordance with the manufacturer recommendations and are consistent with ANSI B30.2 or with other appropriate and applicable ANSI standards.

Safe load paths are defined for movement of heavy loads to minimize the potential for a load drop on irradiated fuel in the reactor vessel, spent fuel pool or safe shutdown equipment. Paths are defined clearly in procedures and equipment layout drawings. Equipment layout drawings showing the safe load path are used to define safe load paths in load handling procedures. Deviation from defined safe load paths requires a written alternative procedure approved by a plant safety review committee.

9.1.6 COMBINED LICENSE INFORMATION FOR FUEL STORAGE AND HANDLING

STD COL 9.1-5

This COL Item is addressed in Subsections 9.1.4.4 and 9.1.5.4.

STD COL 9.1-6

This COL Item is addressed in Subsections 9.1.4.3.8 and 9.1.5.3.

STD COL 9.1-7

A spent fuel rack Metamic coupon monitoring program will be implemented when the plant is placed into commercial operation. This program will include tests to monitor bubbling, blistering, cracking, or flaking; and a test to monitor for corrosion, such as weight loss measurements and / or visual examination. The program will also include testing to monitor changes in physical properties of the absorber material, including neutron attenuation and thickness measurements.

The program will include the methodology and acceptance criteria for the tests listed and provide corrective action requirements based on vendor recommendations and industry operating experience. The program will be implemented through plant procedures.

Metamic Monitoring Acceptance Criteria:

- Verification of continued presence of the boron is performed by neutron attenuation measurement. A decrease of no more than 5% in Boron-10 content, as determined by neutron attenuation, is acceptable. This is equivalent to a requirement for no loss in boron within the accuracy of the measurement.
- Coupons are monitored for unacceptable swelling by measuring coupon thickness. An increase in coupon thickness at any point of no more than 10% of the initial thickness at that point is acceptable.

Changes in excess of either of the above two acceptance criteria are investigated under the corrective action program and may require early retrieval and measurement of one or more of the remaining coupons to provide validation that the indicated changes are real. If the deviation is determined to be real, an engineering evaluation is performed to identify further testing or any corrective action that may be necessary.

Additional parameters are examined for early indications of the potential onset of Metamic degradation that would suggest a need for further attention and possibly a change in the coupon withdrawal schedule. These include visual inspection for surface pitting, blistering, cracking, corrosion or edge deterioration, or unaccountable weight loss in excess of the measurement accuracy.

9.2 WATER SYSTEMS

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.2.1.2.2 Component Description

Add the following paragraph at the end of DCD Subsection 9.2.1.2.2, Component Description, Cooling Tower Subsection:

HAR SUP 9.2-2

The SWS cooling tower was evaluated for potential impacts from interference and air restriction effects due to yard equipment layout and tower operation on an adjacent unit. Based on unit spacing, yard equipment layout, and the margins inherent in the performance requirements of the SWS cooling towers, no adverse impacts were determined.

9.2.5.2.1 General Description

Replace the first and third sentences of the second paragraph of DCD Subsection 9.2.5.2.1 with the following information.

HAR COL 9.2-1

The source of water for the potable water system is the raw water system (Subsection 9.2.11).

9.2.5.3 System Operation

Replace the first and second paragraphs of DCD Subsection 9.2.5.3 with the following information.

HAR COL 9.2-1

Filtered water is supplied from Harris Reservoir via the raw water system (RWS) for the potable water distribution system (Subsection 9.2.11).

The pumps of the potable water supply system maintain the required pressure throughout the potable water distribution system. The biocide for the potable water system is sodium hypochlorite.

9.2.6.2.1 General Description

Add the following text to the end of DCD Subsection 9.2.6.2.1.

HAR SUP 9.2-1 Sanitary waste is treated on-site. A 30,000 gallon per day capacity sewage treatment plant is located near the existing HNP sanitary waste treatment plant southwest of HNP. The plant has the capacity to treat the waste from HAR 2 and 3.

9.2.6.2.2 Component Description

Replace the text under Trunk Line in DCD Subsection 9.2.6.2.2 (to remove the reference to the “site” treatment plant) with:

HAR SUP 9.2-1 The trunk line is the primary line that the sanitary drainage system piping connects into for the transport of the sanitary drainage to the treatment plant

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Replace the last sentence under Manholes in DCD Subsection 9.2.6.2.2 (to remove the reference to the “site specific”) with:

HAR SUP 9.2-1 Quantity and locations of the manholes are determined by these criteria.

Replace the last sentence under Lift Stations in DCD Subsection 9.2.6.2.2 (to remove the reference to the “site specific”) with:

HAR SUP 9.2-1 Quantity and locations of the lift stations are determined by these criteria.

9.2.6.2.4 Test and Inspection

Replace the last sentence in DCD Subsection 9.2.6.4 (to remove the reference to the “site” specific governing codes) with:

HAR SUP 9.2-1 System inspection is performed in compliance with the Uniform Plumbing Code Section 103.5.

9.2.6.2.5 Instrument Application

Replace the text under DCD Subsection 9.2.6.5 (to remove the reference to the “site” treatment plant) with:

HAR SUP 9.2-1 Sufficient instrumentation for operation is provided to monitor the treatment plant.

DCD Subsection 9.2.8 is modified using full text incorporation to provide site-specific information to replace the DCD conceptual design information (CDI).

9.2.8 TURBINE BUILDING CLOSED COOLING WATER SYSTEM

HAR CDI

The turbine building closed cooling water system (TCS) provides chemically treated, demineralized cooling water for the removal of heat from nonsafety-related heat exchangers in the turbine building and rejects the heat to the circulating water system.

9.2.8.1 Design Basis

9.2.8.1.1 Safety Design Basis

DCD

The turbine building closed cooling water system has no safety-related function and therefore has no nuclear safety design basis.

9.2.8.1.2 Power Generation Design Basis

The turbine building closed cooling water system provides corrosion-inhibited, demineralized cooling water to the equipment shown in Table 9.2.8-1 during normal plant operation.

HAR CDI

During power operation, the turbine building closed cooling water system provides a continuous supply of cooling water to turbine building equipment at a temperature of 105°F or less assuming a circulating water temperature of 100°F or less.

DCD

The cooling water is treated with a corrosion inhibitor and uses demineralized water for makeup. The system is equipped with a chemical addition tank to add chemicals to the system.

HAR CDI

The heat sink for the turbine building closed cooling water system is the circulating water system. The heat is transferred to the circulating water through plate type heat exchangers which are components of the turbine building closed cooling water system.

DCD

A surge tank is sized to accommodate thermal expansion and contraction of the fluid due to temperature changes in the system.

One of the turbine building closed cooling system pumps or heat exchangers may be unavailable for operation or isolated for maintenance without impairing the function of the system.

The turbine closed cooling water pumps are provided ac power from the 6900V switchgear bus. The pumps are not required during a loss of normal ac power.

9.2.8.2 System Description

9.2.8.2.1 General Description

HAR CDI

Classification of equipment and components is given in Section 3.2. The system consists of two 100-percent capacity pumps, three 50-percent capacity heat exchangers (connected in parallel), one surge tank, one chemical addition tank and associated piping, valves, controls, and instrumentation. Heat is removed from the turbine building closed cooling water system by the circulating water system via the heat exchangers.

DCD

The pumps take suction from a single return header. Either of the two pumps can operate in conjunction with any two of the three heat exchangers. Discharge flows from the heat exchangers combine into a single supply header. Branch lines then distribute the cooling water to the various coolers in the turbine building. The flow rates to the individual coolers are controlled either by flow restricting orifices or by control valves, according to the requirements of the cooled systems. Individual coolers can be locally isolated, where required, to permit maintenance of the cooler while supplying the remaining components with cooling water. A bypass line with a manual valve is provided around the turbine building closed cooling water system heat exchangers to help avoid overcooling of components during startup/low-load conditions or cold weather operation.

The system is kept full of demineralized water by a surge tank which is located at the highest point in the system. The surge tank connects to the system return header upstream of the pumps. The surge tank accommodates thermal expansion and contraction of cooling water resulting from temperature changes in the system. It also accommodates a minor leakage into or out of the system. Water makeup to the surge tank, for initial system filling or to accommodate leakage from the system, is provided by the demineralized water transfer and storage system. The surge tank is vented to the atmosphere.

A line from the pump discharge header bank to the pump suction header contains valves and a chemical addition tank to facilitate mixing chemicals into the closed loop system to inhibit corrosion in piping and components.

A turbine building closed cooling water sample is periodically taken and analyzed to verify that water quality is maintained.

9.2.8.2.2 Component Description

Surge Tank

A surge tank accommodates changes in the cooling water volume due to changes in operating temperature. The tank also temporarily accommodates leakage into or out of the system. The tank is constructed of carbon steel.

Chemical Addition Tank

The chemical addition tank is constructed of carbon steel. The tank is normally isolated from the system and is provided with a hinged closure for addition of chemicals.

Pumps

Two pumps are provided. Either pump provides the pumping capacity for circulation of cooling water throughout the system. The pumps are single stage, horizontal, centrifugal pumps, are constructed of carbon steel, and have flanged suction and discharge nozzles. Each pump is driven by an ac powered induction motor.

Heat Exchangers

Three heat exchangers are arranged in a parallel configuration. Two of the heat exchangers are in use during normal power operation and turbine building closed cooling water flow divides between them.

HAR CDI

The heat exchangers are plate type heat exchangers. Turbine building closed cooling water circulates through one side of the heat exchangers while circulating water flows through the other side. During system operation, the turbine building closed cooling water in the heat exchangers is maintained at a higher pressure than the circulating water so leakage of circulating water into the closed cooling water system does not occur. The heat exchangers are constructed of titanium plates with a carbon steel frame.

Valves

DCD

Manual isolation valves are provided upstream and downstream of each pump. The pump isolation valves are normally open but may be closed to isolate the non-operating pump and allow maintenance during system operation. Manual isolation valves are provided upstream and downstream of each turbine building closed cooling water heat exchanger. One heat exchanger is isolated from system flow during normal power operation. A manual bypass valve can be opened to bypass flow around the turbine building closed cooling water heat exchanger when necessary to avoid low cooling water supply temperatures.

Flow control valves are provided to restrict or shut off cooling water flow to those cooled components whose function could be impaired by overcooling. The flow control valves are air operated and fail open upon loss of control air or electrical power. An air operated valve is provided to control demineralized makeup water to the surge tank for system filling and for accommodating leakage from the system. The makeup valve fails closed upon loss of control air or electrical power.

A TCS heat exchanger can be taken out of service by closing the inlet isolation valve. Water chemistry in the isolated heat exchanger train is maintained by a continuous flow of circulating water through a small bypass valve around the inlet isolation valve.

Backwashable strainers are provided upstream of each TCS heat exchanger. They are actuated by a timer and have a backup starting sequence initiated by a high differential pressure across each individual strainer. The backwash can be manually activated.

Piping

System piping is made of carbon steel. Piping joints and connections are welded, except where flanged connections are used for accessibility and maintenance of components. Nonmetallic piping may also be used.

9.2.8.2.3 System Operation

The turbine building closed cooling water system operates during normal power operation. The system does not operate with a loss of normal ac power.

Startup

HAR CDI

The turbine building closed cooling water system is placed in operation during the plant startup sequence after the circulating water system is in operation but prior to the operation of systems that require turbine building closed cooling water flow. The system is filled by the demineralized water transfer and storage system through a fill line to the surge tank. The system is placed in operation by starting one of the pumps.

DCD

Normal Operation

During normal operation, one turbine building closed cooling water system pump and two heat exchangers provide cooling to the components listed in Table 9.2.8-1. The other pump is on standby and aligned to start automatically upon low discharge header pressure.

During normal operation, leakage from the system will be replaced by makeup from the demineralized water transfer and storage system through the automatic makeup valve. Makeup can be controlled either manually or automatically upon reaching low level in the surge tank.

Shutdown

The system is taken out of service during plant shutdown when no longer needed by the components being cooled. The standby pump is taken out of automatic control, and the operating pump is stopped.

9.2.8.3 Safety Evaluation

The turbine building closed cooling water system has no safety-related function and therefore requires no nuclear safety evaluation.

9.2.8.4 Tests and Inspections

Pre-operational testing is described in Chapter 14. The performance, structural, and leaktight integrity of system components is demonstrated by operation of the system.

9.2.8.5 Instrument Applications

Parameters important to system operation are monitored in the main control room. Flow indication is provided for individual cooled components as well as for the total system flow.

Temperature indication is provided for locations upstream and downstream of the turbine building closed cooling water system heat exchangers. High temperature of the cooling water supply alarms in the main control room. Temperature test points are provided at locations to facilitate thermal performance testing.

Pressure indication is provided for the pump suction and discharge headers. Low pressure at the discharge header automatically starts the standby pump.

Level instrumentation on the surge tank provides level indication and both low- and high-level alarms in the main control room. On low tank level, a valve in the makeup water line automatically actuates to provide makeup flow from the demineralized water transfer and storage system.

9.2.9 WASTE WATER SYSTEM

9.2.9.2.1 General Description

Add the following text to the end of DCD Subsection 9.2.9.2.1.

HAR COL 9.2-2

The wastewater treatment system is located on the HAR site and shared by HAR 2 and 3. This system neutralizes caustic and acidic wastewater in the neutralization basins and allow wastewater sediment to settle at the bottom of a settling basin before the water is discharged to Harris Reservoir through the circulating water system (CWS) blowdown.

9.2.9.2.2 Component Description

Add the following paragraphs at the end of the text under the heading "Waste Water Retention Basin" in DCD Subsection 9.2.9.2.2.

HAR COL 9.2-2 The neutralization and settling basins for the waste water treatment system are located west of the HAR 2 and 3 reactor buildings and east of the railroad tracks, at an equal distance between HAR 2 and 3. There are two neutralization basins, one for each unit. There is one settling basin shared by both units. Waste water is initially transferred to the neutralization basins for sampling and treatment as necessary to obtain a releasable effluent. The waste water is then routed to the settling basin to remove particulates. From there the waste water is pumped to the cooling tower blowdown line where it is ultimately released to the Harris Lake. The neutralization basins can be shared between units. Each neutralization basin is sized to intake the maximum possible flow from two units if one basin is out of service. The neutralization basins and the settling basin are lined and constructed such that the contents, dissolved or suspended, do not penetrate the liner and leach into the ground. The basins are constructed of reinforced concrete walls and continuously poured base mats with no construction joints in the mats or any exterior walls (except a construction joint with a waterstop may be used at the exterior wall/mat junction) and waterstops at all construction joints to further minimize seepage. The size of the settling basin provides retention time for settling of solids larger than 10 microns that may be suspended in the wastewater system.

Basin Transfer Pumps

Two 100% pumps are provided to transfer water from the neutralization basins to the settling basin. Only one of the pumps will operate at any given time. In addition, two 100% pumps are provided to transfer water from the settling basin to the CWS blowdown line. Like the neutralizing basin transfer pumps, only one of the settling basin pumps will operate at any given time. Both sets of pumps will have separate feeds from the 480VAC distribution system. In the event of a LOOP, power will not be supplied to the neutralization and settling basin transfer pumps.

9.2.9.5 Instrumentation Applications

Add the following information after the last paragraph of DCD Subsection 9.2.9.5:

HAR COL 9.2-2 Level indication is provided for each of the neutralization basins and high level alarms alert operators to take action. A level indicator and level transmitter are provided for the settling basin to automatically control flow out of the settling basin.

Radiation monitors are also provided between the neutralization basin and the settling basin and in the common discharge line of the settling basin transfer pumps (upstream of CWS blowdown line). A high radiation signal at either of these locations will trip both the neutralization basin transfer pumps and the settling basin transfer pumps.

STD DEP 1.1-1 Add the following subsections after DCD Subsection 9.2.10. DCD Subsections 9.2.11 and 9.2.12 are renumbered as Subsections 9.2.13 and 9.2.14.

9.2.11 RAW WATER SYSTEM

HAR SUP 9.2-1 The raw water system (RWS) provides strained water from the Harris Reservoir for makeup to the circulating water system (CWS) natural draft cooling tower basins and strained and filtered water from the Harris Reservoir for makeup to service water system (SWS) mechanical draft cooling tower basins, to the demineralized water treatment system (DTS), to the potable water storage tank, to the fire protection system (FPS) fire water storage tanks, and to the yard fire water systems (YFS's).

9.2.11.1 Design Basis

9.2.11.1.1 Safety Design Basis

The RWS does not serve a safety-related function and therefore does not have a nuclear safety design basis.

Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function.

The RWS does not have the potential to be a flow path for radioactive fluids.

9.2.11.1.2 Power Generation Design Basis

9.2.11.1.2.1 Normal Operation

The RWS provides a continuous supply of water from the Harris Reservoir for the following services:

- CWS cooling tower fill, make-up, and blowdown;
- SWS cooling tower fill, make-up, and blowdown;
- DTS feed; and
- Potable water storage tank feed.

In addition, the RWS performs the following functions:

- Filling and makeup of the FPS fire water storage tanks;
- Normal filling and makeup to the YFS fire water storage tanks; and
- Providing the water for the main raw water and ancillary raw water pump discharge strainer back washes and for the screen back wash pump suction.

9.2.11.1.2.2 Outage Mode Operation

During plant outages, RWS provides the same continuous supplies as during normal operation with the exception of CWS cooling tower makeup.

The RWS provides inventory and SWS make-up flow to support normal plant cooldown. During this operational sequence, the component cooling water system reduces the temperature of the reactor coolant system from 350°F at approximately 4 hours after reactor shutdown to 125°F within 96 hours after shutdown by providing cooling to the normal residual heat removal system (RNS) heat exchangers.

9.2.11.2 System Description

The RWS is shown in Figures 10.4-201 and 10.4-202.

The source of water for the RWS is the Harris Reservoir.

The raw water pump house for the RWS pumps is located on the Thomas Creek branch of the Harris Reservoir, east of HAR 2 and 3. This structure is common to HAR 2 and 3. The intake structure is equipped with trash racks and traveling screens. The RWS equipment located in the raw water pump house for each unit consists of three RWS pumps and automatic strainers and their drivers, two diesel-backed ancillary raw water pumps and strainers and their drivers, screen wash pumps and drivers for the traveling screens, electrical power feed equipment, and appropriate instrumentation and controls for the system to allow remote operation from the main control room. Each RWS pump is located in a separate intake bay and has the capacity to provide 50% of the maximum raw water demand for a single unit. The RWS pumps can also be used during outages to provide alternate dilution flow for Liquid Radwaste System (WLS) discharge if dilution flow requirements are high. Each ancillary raw water pump is located in a separate intake bay. The ancillary raw water pumps are each sized to provide maximum design flow during outage conditions. The ancillary pumps also provide an alternate dilution flow for WLS discharges if dilution flow requirements are low.

The underground RWS piping will be high-density polyethylene (HDPE) which is not susceptible to corrosion. The RWS piping is designed to ASME Standard B31.1.

The flowpath for the functions described in the power generation design basis is from the Harris Reservoir, through the trash racks and intake screens and into the raw water supply pumps. The pumps discharge through strainers into a common header for each unit. The common discharge header provides suction for the RWS and ancillary raw water screen wash pumps.

Four media filters are upstream of the distribution headers for the SWS cooling tower makeup, the DTS feed, the fire water storage tanks, and the potable water storage tank. Each is sized to pass 50% of the maximum demand from those systems.

9.2.11.3 Component Description

Intake

The raw water intake structure supports the pumps and related equipment (i.e., intake screens, screen wash pumps, etc.) for the RWS. The intake structure has five (5) separate intake bays for each unit, one for each RWS pump and ancillary raw water pump. Each of the intake bays is equipped with a traveling screen and one steel bar/trash rack assembly.

As discussed in FSAR Subsection 2.4.7, historical temperature measurements indicate that ice formation on large bodies of water in Central North Carolina is expected to be limited to minor freezing along shorelines. Harris Lake is also a protected body of water. Therefore, the potential that ice jams, frazil ice formation, or floating debris would prevent the RWS makeup to SWS is remote.

Trash Racks

Trash racks are installed on the inlet to each intake bay, upstream of the traveling screens, to prevent large debris in the reservoir from entering the intake bay.

Traveling Screens

Traveling screens are located upstream of the main and ancillary raw water pumps in each intake bay. Buildup of debris on the screens is washed off with low pressure spray water sluiced to the Harris Reservoir. Each traveling screen is powered by an electric motor fed from the normal ac power system. The traveling screen assemblies for the ancillary raw water pumps have backup power feed from the diesel generators.

RWS Pumps

Three 50% capacity RWS pumps draw water from the Harris Reservoir to supply the required flow for the services and functions listed in Subsection 9.2.11.1.2. The pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The length of each pump barrel is sized to meet the minimum submergence and net positive suction head requirements for the pump during low water level conditions in Harris Reservoir. The standby pumps are normally isolated from the discharge header by a motor-operated valve. On a loss of normal ac power, the motor-operated valves can be manually opened or closed as required. Each pump is equipped with a pressure transmitter on the discharge piping that alarms in the control room on a low pressure condition. To start the standby pump, the operator opens the isolation valve and starts the pump. During plant outages, one RWS pump may be used to provide dilution flow for WLS discharge if the dilution flow requirements are high.

Ancillary Raw Water Pumps

Two 100% capacity ancillary raw water pumps are provided to draw water from the Harris Reservoir. One pump provides normal makeup requirements for the services and functions listed in Subsection 9.2.11.1.2 with the exception of CWS cooling tower makeup. One ancillary pump is on standby. The ancillary RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The diesel generators provide backup power for these pumps and their discharge valves. The length of each pump barrel is sized to meet the minimum submergence and net positive suction head requirements for the pump during low water level conditions in Harris Reservoir. The standby pump is normally isolated from the discharge header by a motor-operated valve. The motor operated valves can be manually opened or closed as required. Each pump is equipped with a pressure transmitter on the discharge piping that alarms in the control room on a low pressure condition. To start the standby pump, the operator opens the isolation valve and starts the pump. During plant outages, one ancillary raw water pump may be used to provide dilution flow for WLS discharge if the dilution flow requirements are low.

Screen Wash Pumps

Two screen wash pumps per unit draw strained water from the RWS pump discharge flow and provide spray water to remove debris and fish from the traveling screens for the main raw water pumps. Two screen wash pumps per unit perform the same function for the screens for each pair of ancillary raw water pumps. Both sets of screen wash pumps are powered by electric motors fed from the normal ac power system. The screen wash pumps for the traveling screens supporting the ancillary raw water pumps have backup power feeds from the diesel generators.

Automatic Strainers

The automatic strainers are located in the RWS pump discharge lines and in the discharge lines of the ancillary raw water pumps. These strainers can handle 100% of the pump discharge flow. Automatic valves facilitate cleaning the strainers by backwashing the strainer. The wash water from the cleaning sequence is discharged to the reservoir. Power for the strainers is provided from the normal ac power system. The strainers for the ancillary raw water pumps have a backup power feed from the diesel generators.

Media Filters

Four 50% capacity media filters are located upstream of the supply feeds to the SWS cooling towers, the DTS, the fire water storage tanks, and the potable water storage tank. Flow transmitters in the supply piping detect plugging and timers control backwash. The valves for normal and backwash flow fail in a normal flow position to maintain flow through the system.

Piping

The discharges of the RWS pumps and ancillary raw water pumps are routed to a common header for each unit. Discharge check valves on the RWS pumps and ancillary raw water pumps limit reverse flow in the piping if pumps are tripped and restarted and the subsequent transient effects. A check valve between the RWS pump discharge header and the ancillary raw water pump discharge header prevents backflow to the CWS cooling tower basin when an ancillary raw water pump is operating. A normally closed, manual bypass valve is provided around the check valve for operational flexibility. The piping is designed to accommodate transient effects that may be generated by normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system is designed so that high points do not lead to the formation of vapor voids upon loss of system pumping. Air release valves are provided in the piping at the pump discharges to vent air on pump start.

Valves

Motor operated valves are located on the discharge of each RWS and ancillary raw water pump. They are supplied from the normal ac power system in each unit. The discharge valves for the ancillary raw water pumps have backup power feed from the diesel generators. The RWS pump valves are motor-operated and are designed to fail "as-is" during a loss of normal ac power condition. Handwheels on the valve operators allow positioning of the valves locally.

9.2.11.4 System Operation

The RWS operates during normal modes of plant operation, including startup, power operation (full and partial loads), cooldown, shutdown and refueling. Makeup flow to the CWS is not normally required after the plant is shutdown. The RWS pumps are not available during a loss of normal ac power but the ancillary raw water pumps have a backup power supply from the diesel generators and provide normal system interface makeup requirements with the exception of CWS cooling tower makeup. The RWS is used to fill the CWS and SWS cooling tower basins.

Chemical injection points are provided to treat the raw water system supply to the FPS fire water storage tanks with sodium hypochlorite. Effectiveness of the treatment is monitored by periodic sample inspections of the wetted portions of the FPS headers.

9.2.11.4.1 Plant Startup

During plant startup, one ancillary raw water pump supplies strained water to the CWS cooling tower basin to fill the CWS piping and to replace evaporative losses as the CWS cooling tower is placed into operation. The ancillary raw water pump also provides strained water to the media filters for treatment before being directed to the potable water storage tank, to the fire water storage tank, to the DTS, and to the SWS cooling tower basin.

9.2.11.4.2 Power Operation

During normal operation, two RWS pumps normally supply strained water to the CWS cooling tower basin and to the media filters with one RWS pump remaining in standby. After filtration, the raw water is directed to the SWS cooling tower basin, to the DTS, to the potable water storage tank, and to the fire water storage tanks on an as-needed basis.

9.2.11.4.3 Plant Cooldown/Shutdown

The plant cooldown/shutdown operation uses the same system alignment as with normal power operation. As the plant approaches cold shutdown and the heat rejection from the CWS cooling tower decreases, one RWS pump will be stopped and placed in standby. System operation will be transferred to one of the ancillary raw water pumps when system demand has decreased sufficiently. The other ancillary raw water pump will remain in standby.

9.2.11.4.4 Refueling

During refueling, one ancillary raw water pump provides the required RWS supply with one ancillary raw water pump in standby. A higher capacity RWS raw water pump may be used for dilution of WLS discharge if the dilution capacity requirement is high.

9.2.11.4.5 Loss of Normal AC Power Operation

In the event of a loss of normal ac power, the ancillary raw water pumps, valves, strainers, backwash pumps, traveling screens, and the instrumentation associated with pump discharge pressure indication, intake bay level, and screen wash pump discharge pressure are loaded onto their assigned diesel buses. The pumps, strainers, and traveling screens are restarted from the control room. The valves for the media filters fail in the position that maintains the discharge flow, so the condition does not affect the position of automatic valves.

The flow control valve on the make-up line to the service water cooling towers, which is scoped within the service water system, isolates on a loss of normal ac power. The major piping runs are underground which, together with the check valves on the discharge of the RWS and ancillary raw water pumps, prevents the formation of voids in the make-up line and transient water hammer conditions when the pumps are restarted.

9.2.11.5 Safety Evaluation

The RWS does not have a safety-related function and, therefore, does not require a nuclear safety evaluation.

The RWS does not have the potential to be a flow path for radioactive fluids. The RWS operates at a higher system pressure than those systems with which it directly interfaces (at the point of interface) and, therefore, in-leakage is not feasible. The WLS discharge effluent is connected to the CWS cooling tower blowdown pipe downstream of the RWS interface. Per DCD Subsection 11.2.3.3, the WLS effluent is released off-site through a dilution flow stream. Dilution flow is routed from RWS to the CWS cooling tower blowdown during shutdown conditions. During normal power operation, the CWS circulating water pumps provide dilution flow to the cooling tower blowdown pipe. Contamination of the RWS is not possible since the WLS effluent enters the blowdown pipe downstream of the RWS interface.

9.2.11.6 Tests and Inspections

Initial test requirements for the RWS are described in Subsection 14.2.9.4.24. System performance and structural and pressure integrity of system components are demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspection.

9.2.11.7 Instrumentation Applications

The traveling screens and strainers are equipped with level transmitters to identify malfunctions. Trouble alarms are used by the control room to identify component failures and initiate actions.

Power actuated valves in the RWS are provided with valve position indication instrumentation.

A pressure transmitter, with high and low level alarms, is provided for the discharge of each RWS and ancillary raw water pump. Information is used by the control room to identify component failures and initiate actions.

Flow instrumentation is provided on the inlet to the media filters to identify conditions affecting the operation of the components.

STD DEP 1.1-1

9.2.12 HARRIS LAKE MAKEUP WATER SYSTEM

HAR SUP 9.2-1

The Harris Lake makeup water system (HLMWS) provides the ability to maintain the required lake level for normal operation of HAR 2 and 3 and to aid in maintaining the tritium concentrations in the reservoir below the Environmental Protection Agency (EPA) limits for drinking water (The lake water is used by Shearon Harris Nuclear Power Plant, Unit 1 (HNP) and HAR 2 and 3 for drinking water.).

9.2.12.1 Design Basis

9.2.12.1.1 Safety Design Basis

The HLMWS does not serve a safety-related function and therefore, does not have a nuclear safety design basis.

Failure of the HLMWS or its components does not affect the ability of safety-related systems to perform their intended function.

No interconnections exist between the HLMWS and any potentially radioactive system.

9.2.12.1.2 Power Generation Design Basis

The HLMWS provides water from the Cape Fear River to the Harris Reservoir, to maintain the level of the reservoir for the normal operation of HAR 2 and 3 and to maintain the tritium concentration in the reservoir below the EPA limits for drinking water.

9.2.12.2 System Description

9.2.12.2.1 General Description

Classification for components and equipment for the HLMWS is given in Section 3.2.

The source of water is the Cape Fear River.

The Harris Lake makeup water system pump house and intake structure are located on a cove of the Cape Fear River. The cove is also the exit point for the discharge canal that transports water discharged from the Cape Fear (Coal) Power Plant. The HLMWS consists of three pumps, piping to transport the water from the Cape Fear River to the Harris Reservoir, a discharge structure on the Harris Reservoir, trash racks, traveling water screens, and spray wash pumps.

9.2.12.2.2 Component Description

Trash Racks

Trash racks are installed at the entrance of each pump bay to prevent large debris from entering the pump bays.

Traveling Water Screens

Each pump house bay includes two through-flow traveling water screens with associated screen wash pumps. The screens are sized to provide compliance with the EPA Rule 316(b) which requires the flow velocity through the screen be less than or equal to 0.15 m/sec (0.5 ft/sec). Two traveling water screens per pump bay are necessary to meet the EPA 316(b) through-screen flow velocity at the low water level with the Buckhorn Dam removed.

Harris Lake Makeup Water System Pumps

There are three HLMWS pumps. These pumps are vertical wet pit pumps. The pumps are powered from a nearby substation.

Spray Wash Pumps

There are six screen wash pumps. The spray wash pumps are vertical wet pit pumps. The pumps are powered from a nearby substation.

Piping

The pump discharge piping connects to a common discharge header that is routed to follow the Progress Energy transmission line corridor to Harris Lake. The location of the discharge was picked to be at the fourth estuary (finger) from the west end of the dam on Harris Lake to provide lake makeup water upstream of the cooling tower blowdown discharge. This allows the dilution to reduce the tritium buildup in the lake.

Because of the elevation changes in the routing, vacuum breaker/air release valves are provided at each peak in elevation (the top of the hills) and a Howell Bunger type valve is provided at the pipe discharge, both for energy dissipation and to allow flow control.

Discharge Structure

A discharge structure is located at the terminating end of the HLMWS piping and consists of a reinforced concrete structure composed of a stilling basin, followed by a sloped discharge chute and a second stilling basin terminating with a riprap apron. The configuration of the discharge structure ensures dissipation of water energy so that erosion of the surrounding area is prevented, as well as re-suspension of lake bottom sediments. In addition, a Howell-Bunger valve is installed in the discharge structure to keep the line filled and aid in energy dissipation.

9.2.12.3 System Operation

The HLMWS operates to maintain the level of the Harris Reservoir.

9.2.12.4 Safety Evaluation

The HLMWS does not have a safety-related function and, therefore, does not require a nuclear safety evaluation. It is not connected with any system that contains radioactive fluids.

9.2.12.5 Tests and Inspections

System performance and structural and pressure integrity of system components is demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspections.

9.2.12.6 Instrumentation Applications

9.2.12.6.1 Instrumentation

Flow metering of the lake make-up water to the Harris Lake is provided; input to the supervisory controls is described below.

9.2.12.6.2 Controls

Supervisory controls are included at the HLMWS pump house to provide main control room (MCR) control and monitoring capabilities for the following equipment:

- HLMWS Water Pumps

  Three pumps are fed from 4.16 kV switchgear breakers. The MCR has manual start/stop capabilities and pump operating status indications and alarms.

- HLMWS Pump Discharge Valves

  Pump discharge butterfly valves are provided to allow pump starting and stopping without runout or reverse spinning. Each valve is controlled in tandem with the associated pump, sequenced as required by the pump manufacturer. The MCR has valve operating status indications and alarms. The valves will normally be automatically controlled as required for pump operation, but manual valve open/close capabilities are also provided.

- Traveling Screen

  The traveling screen is a package system with local controls provided. The MCR has supervisory monitoring capabilities of screen operating status and alarms.

- HLMWS Water Control Valve

  The MCR is provided with manual valve positioning capability to adjust the make-up water flow rate.

- HLMWS Pump house Equipment Monitoring

  Available status and alarm indications are provided to the MCR for pump house equipment, including power distribution equipment and HVAC.

STD DEP 1.1-1

9.2.13 COMBINED LICENSE INFORMATION

9.2.13.1 Potable Water

HAR COL 9.2-1

This COL Item is addressed in Subsections 9.2.5.2.1 and 9.2.5.3.

9.2.13.2 Waste Water Retention Basins

HAR COL 9.2-2

This COL Item is addressed in Subsections 9.2.9.2.1, 9.2.9.2.2, and 9.2.9.5.

STD DEP 1.1-1

9.2.14 REFERENCES

9.3 PROCESS AUXILIARIES

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements:

9.3.7 COMBINED LICENSE INFORMATION

STD COL 9.3-1 This COL Item is addressed below.

Generic Issue 43, and the concerns of Generic Letter 88-14 and NUREG-1275 regarding degradation or malfunction of instrument air supply and safety-related valve failure, are addressed by the training and procedures for operations and maintenance of the instrument air subsystem and air-operated valves.

Plant systems, including the compressed and instrument air system, are maintained in accordance with procedures . Maintenance procedures are discussed in Subsection 13.5.2.2.6. The instrument air supply subsystem components are maintained and tested in accordance with manufacturers' recommendations and procedures. The safety-related air-operated valves are maintained in accordance with manufacturers' recommendations and tested in accordance with plant procedures to allow proper function on loss of air. The instrument air is periodically sampled and tested for compliance with the quality requirements of ANSI/ISA-S7.3-1981.

Operators are provided training on loss of instrument air in accordance with abnormal operating procedures. Plant systems, including the compressed and instrument air system, are operated in accordance with system operating procedures, abnormal operating procedures, and alarm response procedures which are written in accordance with Subsection 13.5.2. The training program for operations and maintenance personnel is discussed in Section 13.2.

9.4 AIR-CONDITIONING, HEATING, COOLING, AND VENTILATION SYSTEM

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.4.1.4 Tests and Inspection

Add the following text at the end of DCD Subsection 9.4.1.4.

STD COL 9.4-1a The main control room/control support area HVAC subsystem of the nuclear island nonradioactive ventilation system (VBS) is tested and inspected in accordance with ASME/ANSI AG-1-1997 and Addenda AG-1a-2000 (Reference 201), ASME N509-1989, ASME N510-1989, and Regulatory Guide 1.140.

The VBS is tested as separate components and as an integrated system. Surveillance tests are performed to monitor the condition of the system. Testing methods include:

- Visual inspection
- Duct and housing leak tests
- Airflow capacity and distribution tests
- Air-aerosol mixing uniformity test
- HEPA filter bank and adsorber bank in-place leak tests
- Duct damper bypass tests
- System bypass tests
- Air heater performance tests
- Laboratory testing of adsorbers
- Ductwork inleakage test

Testing is performed at the frequency provided in Table 1 of ASME N510-1989.

9.4.7.4 Tests and Inspections

Add the following text at the end of DCD Subsection 9.4.7.4.

STD COL 9.4-1a

The exhaust subsystem of the containment air filtration system (VFS) is tested and inspected in accordance with ASME/ANSI AG-1-1997 and Addenda AG-1a-2000 (Reference 201), ASME N509-1989, ASME N510-1989, and Regulatory Guide 1.140.

The VFS is tested as separate components and as an integrated system. Surveillance tests are performed to monitor the condition of the system. Testing methods include:

- Visual inspection
- Airflow capacity and distribution tests
- HEPA filter bank and adsorber bank in-place leak tests
- System bypass tests
- Air heater performance tests
- Laboratory testing of adsorbers
- Ductwork inleakage test

Testing is performed at the frequency provided in Table 1 of ASME N510-1989.

9.4.12 COMBINED LICENSE INFORMATION

STD COL 9.4-1a

This COL Item is addressed in Subsections 9.4.1.4 and 9.4.7.4.

HAR COL 9.4-1b

Section 6.4 does not identify any toxic emergencies that require the main control room/technical support center area HVAC to enter recirculation mode.

9.4.13 REFERENCES

Add the following information to the end of DCD Subsection 9.4.13:

201. ASME/ANSI AG-1a-2000, Addenda to ASME AG-1-1997 Code on Nuclear Air and Gas Treatment, Section HA, “Housings.”

9.5 OTHER AUXILIARY SYSTEMS

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9.5.1.2.1.3 Fire Water Supply System

Add the following paragraph at the end of DCD Subsection 9.5.1.2.1.3.

STD SUP 9.5-1 Threads compatible with those used by the off-site fire department are provided on all hydrants, hose couplings and standpipe risers, or a sufficient number of thread adapters compatible with the off-site fire department are provided.

9.5.1.6 Personnel Qualification and Training

Add the following paragraph at the end of DCD Subsection 9.5.1.6.

STD COL 9.5-1 Subsections 9.5.1.8.2 and 9.5.1.8.7 summarize the qualification and training programs that are established and implemented for the Fire Protection Program.

STD DEP 1.1-1 Insert the following subsections after DCD Subsection 9.5.1.7. DCD Subsection 9.5.1.8 is renumbered as Subsection 9.5.1.9

STD COL 9.5-1

9.5.1.8 Fire Protection Program

The fire protection program is established such that a fire does not prevent safe shutdown of the plant and does not endanger the health and safety of the public. Fire protection at the plant uses a defense-in-depth concept that includes fire prevention, detection, control and extinguishing systems and equipment, administrative controls and procedures, and trained personnel. These defense-in-depth principles are achieved by meeting the following objectives:

- Prevent fires from starting.
- Detect rapidly, control, and extinguish promptly those fires that do occur.
- Provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities does not prevent the safe shutdown of the plant.
- Minimize the potential for radiological releases.

9.5.1.8.1 Fire Protection Program Implementation

As indicated in Table 13.4-201, the required elements of the fire protection program are fully operational prior to receipt of new fuel for buildings storing new fuel and adjacent fire areas that could affect the fuel storage area in that reactor unit. Other required elements of the fire protection program described in this section are fully operational prior to initial fuel loading in that reactor unit.

Elements of the fire protection program are reviewed on a frequency established by procedures and updated as necessary.

9.5.1.8.1.1 Fire Protection Program Criteria

STD COL 9.5-3 The fire protection program is based on the criteria of several industry and regulatory documents referenced in FSAR Subsection 9.5.5 and DCD Subsection 9.5.5, and also based on the guidance provided in Regulatory Guide 1.189. DCD Tables 9.5.1-1 and FSAR Table 9.5-201 provide a cross-reference to information addressing compliance with BTP CMEB 9.5-1.
STD COL 9.5-4 Exceptions to the National Fire Protection Association (NFPA) Standards beyond those included in DCD Table 9.5.1-3, and exceptions taken to the NFPA Standards listed in FSAR Subsection 9.5.5, are identified in FSAR Table 9.5-202.

9.5.1.8.1.2 Organization and Responsibilities

STD COL 9.5-1 The organizational structure of the fire protection personnel is discussed in Subsection 13.1.1.2.10.

The site executive in charge of the fire protection program, through the engineer in charge of fire protection, is responsible for the following:

a. Programs and periodic inspections are implemented to:

   1. Minimize the amount of combustibles in safety-related areas.

   2. Determine the effectiveness of housekeeping practices.

   3. Provide for availability and acceptability of the following:

      i. Fire protection system and components.

      ii. Manual firefighting equipment.

      iii. Emergency breathing apparatus.

      iv. Emergency lighting.

      v. Portable communication equipment.

STD COL 9.5-8

STD COL 9.5-1

vi. Fire barriers including fire rated walls, floors and ceilings, fire rated doors, dampers, etc., fire stops and wraps, and fire retardant coating. Procedures address the administrative controls in place, including fire watches, when a fire area is breached for maintenance.

STD COL 9.5-1

4. Confirm prompt and effective corrective actions are taken to correct conditions adverse to fire protection and preclude their recurrence.

b. Conducting periodic maintenance and testing of fire protection systems, components, and manual firefighting equipment, evaluating test results, and determining the acceptability of systems under test in accordance with established plant procedures.

c. Designing and selecting equipment related to fire protection.

d. Reviewing and evaluating proposed work activities to identify potential transient fire loads.

e. Managing the plant fire brigade, including:

1. Developing, implementing, and administering the fire brigade training program.

2. Scheduling and conducting fire brigade drills.

3. Critiquing fire drills to determine if training objectives are met.

4. Performing a periodic review of the fire brigade roster and initiating changes as needed.

5. Maintaining the fire training program records for members of the fire brigade and other personnel.

6. Maintaining a sufficient number of qualified fire brigade personnel to respond to fire emergencies for each shift.

f. Developing and conducting the fire extinguisher training program.

g. Implementing a program for indoctrination of personnel gaining unescorted access to the protected area in appropriate procedures which implement the fire protection program, such as fire prevention and fire reporting procedures, plant emergency alarms, including evacuation.

h. Implementing a program for instruction of personnel on the proper handling of accidental events such as leaks or spills of flammable materials.

i. Preparing procedures to meet possible fire situations in the plant and for ensuring assistance is available for fighting fires in radiological areas.

j. Implementing a program that uses a permit system that controls and documents inoperability of fire protection systems and equipment. This program initiates proper notifications and compensatory actions, such as fire watches, when inoperability of any fire protection system or component is identified.

k. Developing and implementing preventive maintenance, corrective maintenance, and surveillance test fire protection procedures.

l. Confirming that plant modifications, new procedures and revisions to procedures associated with fire protection equipment and systems that have significant impact on the fire protection program, are reviewed by an individual who possesses the qualifications of a fire protection engineer.

m. Continuing evaluation of fire hazards during construction or modification of other units on the site. Special considerations, such as fire barriers, fire protection capability, and administrative controls are provided as necessary to protect the operating unit(s) from construction or modification activities.

n. Establishing a fire prevention surveillance plan and training plant personnel on that plan.

o. Developing prefire plans and making them available to the fire brigade and control room.

HAR COL 9.5-1 The responsibilities of the engineer in charge of fire protection and his staff are discussed in Subsection 13.1.2.1.3.9.

9.5.1.8.2 Fire Brigade

9.5.1.8.2.1 General

HAR COL 9.5-1 The organization of the fire brigade is discussed in Subsection 13.1.2.1.6.

STD COL 9.5-1 To qualify as a member of the fire brigade, an individual must meet the following criteria:

a. Has attended the required training sessions for the position occupied on the fire brigade.

b. Has passed an annual physical exam including demonstrating the ability for performing strenuous activity and the use of respiratory protection.

9.5.1.8.2.2 Fire Brigade Training

A training program is established so that the capability to fight fires is developed and documented. The program consists of classroom instruction supplemented with periodic classroom retraining, practice in firefighting, and fire drills. Classroom instruction and training is conducted by qualified individuals knowledgeable in fighting the types of fires that could occur within the plant and its environs and using onsite firefighting equipment. Individual records of training provided to each fire brigade member, including drill critiques, are maintained as part of the permanent plant files for at least three years to document that each member receives the required training.

The fire brigade leader and at least two brigade members per shift have sufficient training and knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability. The brigade leader is competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator’s license or equivalent knowledge of plant systems.

Personnel assigned as fire brigade members receive formal training prior to assuming brigade duties. The course subject matter is selected to satisfy the requirements of Regulatory Guide 1.189. Course material selection also includes guidance from NFPA 600 (Reference 204) and 1500 (Reference 210) as appropriate. Additional training may also include material selected from NFPA 1404 (Reference 208) and 1410 (Reference 209).

The minimum equipment provided for the fire brigade consists of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self-contained breathing apparatus (SCBA) approved by NIOSH, using full face positive pressure masks, and providing an operating life of at least 30 minutes, are provided for selected fire brigade, emergency repair, and control room personnel. At least ten masks are provided for fire brigade personnel. At least two extra air bottles, each with at least 30 minutes of operating life, are located onsite for each SCBA. An additional onsite 6-hour supply of reserve air is provided to permit quick and complete replenishment of exhausted supply air bottles. DCD Subsection 6.4.2.3 discusses the portable breathing apparatus for control room personnel. Additional SCBAs are provided near the personnel containment entrance for the exclusive use of the fire brigade. The fire brigade leader has ready access to keys for any locked fire doors.

The on-duty shift manager has responsibility for taking certain actions based on an assessment of the magnitude of the fire emergency. These actions include safely shutting down the plant, making recommendations for implementing the Emergency Plan, notification of emergency personnel, and requesting assistance from off-duty personnel, if necessary. Emergency Plan consideration of fire emergencies includes the guidance of Regulatory Guide 1.101.

9.5.1.8.2.2.1 Classroom Instruction

Fire brigade members receive classroom instruction in fire protection and firefighting techniques prior to qualifying as members of the fire brigade. This instruction includes:

a. Identification of the types of fire hazards along with their location within the plant and its environs.

b. Identification of the types of fires that could occur within the plant and its environs.

c. Identification of the location of onsite fire fighting equipment and familiarization with the layout of the plant including ingress and egress routes to each area.

d. The proper use of onsite fire fighting equipment and the correct method of fighting various types of fires including at least the following:

  - fires involving radioactive materials
  - fires in energized electrical equipment
  - fires in cables and cable trays
  - fires involving hydrogen
  - fires involving flammable and combustible liquids or hazardous process chemicals
  - fires resulting from construction or modifications (welding)
  - fires involving record files.

e. Review of each individual's responsibilities under the Fire Protection Program.

f. Proper use of communication, lighting, ventilation, and emergency breathing equipment.

g. Fire brigade leader direction and coordination of firefighting activities.

h. Toxic and radiological characteristics of expected combustion products.

i. Proper methods of fighting fires inside buildings and confined spaces.

j. Detailed review of firefighting strategies, procedures and procedure changes.

k. Indoctrination of the plant firefighting plans, identification of each individual's responsibilities, and review of changes in the firefighting plans resulting from fire protection-related plant modifications.

l. Coordination between the fire brigade and offsite fire departments that have agreed to assist during a major fire onsite is provided to establish responsibilities and duties. Educating the offsite organization in operational precautions when fighting fires on nuclear power plant sites, and awareness of special hazards and the need of radiological protection of personnel.

9.5.1.8.2.2.2 Retraining

Classroom refresher training is scheduled on a biennial basis to supplement retention of the initial training. These sessions may be concurrent with the regular planned meetings.

9.5.1.8.2.2.3 Practice

Practice sessions are held for each fire brigade and for each fire brigade member on the proper method of fighting various types of fires which might occur in the plant. These sessions are scheduled on an annual basis and provide brigade members with team experience in actual fire fighting and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting.

9.5.1.8.2.2.4 Drills

Fire brigade drills are conducted at least once per calendar quarter for each shift. Each fire brigade member participates in at least two drills annually. Drills are either announced or unannounced. At least one unannounced drill is held annually for each shift fire brigade. At least one drill is performed annually on a "back shift" for each shift's fire brigade. The drills provide for offsite fire department participation at least annually. Triennially, a randomly selected, unannounced drill shall be conducted and critiqued by qualified individuals independent of the plant staff. Training objectives are established prior to each drill and reviewed by plant management. Drills are critiqued on the following points:

a. Assessment of fire alarm effectiveness.

b. Assessment of time required to notify and assemble the fire brigade.

c. Assessment of the selection, placement, and use of equipment.

d. Assessment of the fire brigade leader's effectiveness in directing the firefighting effort.

e. Assessment of each fire brigade member's knowledge of firefighting strategy, procedures, and simulated use of equipment.

f. Assessment of the fire brigade's performance as a team.

Performance deficiencies identified, based on these assessments, are used as the basis for additional training and repeat drills. Unsatisfactory drill performance is followed by a repeat drill within 30 days.

9.5.1.8.2.2.5 Meetings

Regular planned meetings are held at least quarterly for the fire brigade members to review changes in the Fire Protection Program and other subjects as necessary.

9.5.1.8.3 Administrative Controls

Administrative controls for the Fire Protection Program are implemented through plant administrative procedures. Applicable industry publications are used as guidance in developing those procedures.

Administrative controls include procedures to:

a. Control actions to be taken by an individual discovering a fire, such as notification of the control room, attempting to extinguish the fire, and actuation of local fire suppression systems.

b. Control actions to be taken by the control room operator, such as sounding fire alarms, and notifying the shift manager of the type, size, and location of the fire.

c. Control actions to be taken by the fire brigade after notification of a fire, including location to assemble, directions given by the fire brigade leader, the responsibilities of brigade members, such as selection of firefighting and protective equipment, and use of preplanned strategies for fighting fires in specific areas.

d. Control actions to be taken by the security force upon notification of a fire.

e. Define the strategies established for fighting fires in safety-related areas and areas presenting a hazard to safety-related equipment, including the designation of the:

1. Fire hazards in each plant area/zone covered by a firefighting procedure (prefire plan). Prefire plans use the guidance of NFPA 1620 (Reference 205).

2. Fire extinguishers best suited for controlling fires with the combustible loadings of each zone and the nearest location of these extinguishers.

3. Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station or elevation for fighting the fire. Access and egress routes that involve locked doors are specifically identified in the procedure with the appropriate precautions and methods for access specified.

4. Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g., any hydraulic or electrical system in the zone covered by the specific firefighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).

5. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles that need cooling are designated.

6. Potential radiological and toxic hazards in fire zones.

7. Ventilation system operation that provides desired plant air distribution when the ventilation flow is modified for fire containment or smoke clearing operations.

8. Operations requiring control room and shift manager coordination or authorization.

9. Instructions for plant operators and other plant personnel during a fire.

f. Organize the fire brigade and assign special duties according to job title so that the firefighting functions are covered for each shift by personnel trained and qualified to perform these functions. These duties include command control of the brigade, transporting fire suppression, and support equipment to the fire scenes, applying the extinguishing agent to the fire, communication with the control room, and coordination with offsite fire departments.

9.5.1.8.4 Control of Combustible Materials, Hazardous Materials, and Ignition Sources

The control of combustible materials is defined by administrative procedures. These procedures impose the following controls:

a. Prohibit the storage of combustible materials (including unused ion exchange resins) in areas that contain or expose safety-related equipment.

b. Govern the handling of and limit transient fire loads such as flammable liquids, wood, and plastic materials in buildings containing safety-related systems or equipment.

c. Assign responsibility to the appropriate supervisor for reviewing work activities to identify transient fire loads.

d. Govern the use of ignition sources by use of a flame permit system to control welding, flame cutting, grinding, brazing and soldering operations, and temporary electrical power cables. A separate permit is issued for each area where such work is done. If work continues over more than one shift, the permit is valid for not more than 24 hours when the plant is operating or for the duration of a particular job during plant shutdown. NFPA 51B (Reference 202) and 241 (Reference 203) are used as guidance.

e. Minimize waste, debris, scrap, and oil spills or other combustibles resulting from a work activity in the safety-related area while work is in progress, and remove the same upon completion of the activity or at the end of each work shift.

f. Govern periodic inspections for accumulation of combustibles for continued compliance with these administrative controls.

g. Prohibit the storage of acetylene-oxygen and other compressed gasses in areas that contain or expose safety-related equipment or the fire protection system that serves those areas. A permit system is required to control the use of this equipment in safety-related areas of the plant.

h. Govern the use and storage of hazardous chemicals in areas that contain or expose safety-related equipment.

i. Control the use of specific combustibles in safety-related areas. Wood used in safety-related areas during maintenance, modification, or refueling operation (such as lay-down blocks or scaffolding) is treated with a flame retardant in accordance with NFPA 703 (Reference 207). Use of wood inside buildings containing systems or equipment important to safety is only permitted when suitable noncombustible substitutes are not available. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers are unpacked in safety-related areas if required for valid operating reasons. However, combustible materials are removed from the area immediately following unpacking. Such transient combustible material, unless stored in approved containers, is not left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material, such as wood or paper excelsior, or polyethylene sheeting, is placed in metal containers with tight-fitting self-closing metal covers. Only noncombustible panels or flame-retardant tarpaulins or approved materials of equivalent fire-retardant characteristics are used. Any other fabrics or plastic films used are certified to conform to the large-scale fire test described in NFPA 701 (Reference 206).

j. Govern the control of electrical appliances in areas that contain or expose safety-related equipment.

9.5.1.8.5 Control of Radioactive Materials

The plant is designed with provisions for sampling of liquids resulting from fire emergencies that may contain radioactivity and may be released to the environment. Plant operating procedures require such liquids to be collected, sampled, and analyzed prior to discharge. Liquid discharges are required to be below activity limits prior to discharge.

9.5.1.8.6 Testing and Inspection

Testing and inspection requirements are imposed through administrative procedures. Maintenance or modifications to the fire protection system are subject to inspection for conformation to design requirements. Procedures governing the inspection, testing, and maintenance of fire protection alarm and detection systems, and water-based suppression and supply systems, use the guidance of NFPA 72 (DCD Reference 9.5.5.2) and NFPA 25 (Reference 212). Installation of portions of the system where performance cannot be verified through preoperational tests, such as penetration seals, fire-retardant coatings, cable routing, and fire barriers are inspected. Inspections are performed by individuals knowledgeable of fire protection design and installation requirements. Open flame or combustion-generated smoke is not used for leak testing or similar procedures such as air flow determination. Inspection and testing procedures address the identification of items to be tested or inspected, responsible organizations for the activity, acceptance criteria, documentation requirements and sign-off requirements.

Fire protection materials subject to degradation (such as fire stops, seals, and fire retardant coatings are visually inspected periodically for degradation or damage. Fire hoses are hydrostatically tested in accordance with NFPA 1962 (Reference 201). Hoses stored in outside hose stations are tested annually and interior standpipe hoses are tested every three years.

The fire protection system is periodically tested in accordance with plant procedures. Testing includes periodic operational tests and visual verification of damper and valve positions. Fire doors and their closing and latching mechanisms are also included in these procedures.

STD COL 9.5-6

The preoperational testing program describes the procedures for confirming that the as-installed configuration of fire barriers matches the tested configurations. The procedures describe the process for identifying and dispositioning deviations.

9.5.1.8.7 Personnel Qualification and Training

HAR COL 9.5-1

The engineer in charge of fire protection is responsible for the formulation and implementation of the fire protection program and meets the qualification requirements listed in Subsection 13.1.2.1.3.9.

STD COL 9.5-1

Qualification and training of other plant personnel involved in the fire protection program is governed by plant qualification procedures and is conducted by personnel qualified by training and experience in these areas. These classifications include training personnel, maintenance personnel assigned to work on the fire protection system, and operations personnel assigned to system operation and testing.

9.5.1.8.8 Fire Doors

STD COL 9.5-3

Fire doors separating safety-related areas are self-closing or provided with closing mechanisms and are inspected semiannually to verify that the automatic hold open, release and closing mechanisms and latches are operable. Watertight and missile resistant doors are not provided with closing mechanisms. Fire doors with automatic hold open and release mechanisms are inspected daily to verify that the doorways are free of obstructions.

Fire doors separating safety-related areas are normally closed and latched. Fire doors that are locked closed are inspected weekly to verify position. Fire doors that are closed and latched are inspected daily to ensure that they are in the closed position. Fire doors that are closed and electrically supervised at a continuously manned location are not inspected.

9.5.1.8.9 Emergency Planning

Emergency planning is described in Section 13.3.

STD DEP 1.1-1

9.5.1.9 Combined License Information

9.5.1.9.1 Qualification Requirements for Fire Protection Program

STD COL 9.5-1

This COL Item is addressed as follows:

Qualification requirements for individuals responsible for development of the Fire Protection Program are discussed in Subsections 9.5.1.6 and 9.5.1.8.7.

Training of firefighting personnel is discussed in Subsections 9.5.1.8, 9.5.1.8.2, and 9.5.1.8.7.

Administrative procedures and controls governing the Fire Protection Program during plant operation are discussed in Subsections 9.5.1.8.1.2, 9.5.1.8.3, 9.5.1.8.4, 9.5.1.8.5, and 9.5.1.8.6.

Fire protection system maintenance is discussed in Subsection 9.5.1.8.6.

9.5.1.9.2 Fire Protection Analysis Information

HAR COL 9.5-2

This COL Item is addressed in Subsection 9A.3.3.

9.5.1.9.3 Regulatory Conformance

STD COL 9.5-3

This COL Item is addressed in Subsections 9.5.1.8.1.1, 9.5.1.8.8, and 9.5.1.8.9 and in Table 9.5-201.

9.5.1.9.4 NFPA Exceptions

STD COL 9.5-4

This COL item is addressed in Subsection 9.5.1.8.1.1.

9.5.1.9.6 Verification of Field Installed Fire Barriers

STD COL 9.5-6

This COL Item is addressed in Subsection 9.5.1.8.6.

9.5.1.9.7 Establishment of Procedures to Minimize Risk for Fire Areas Breached During Maintenance

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STD COL 9.5-8 This COL item is addressed in Subsection 9.5.1.8.1.2.

Add the following subsections at the end of DCD Subsection 9.5.2.2.3.

HAR COL 9.5-9
HAR COL 18.2-2

9.5.2.2.3.1 Off-Site Interfaces

The off-site communications network is used to communicate with federal, state, and other supporting agencies to ensure reliable and timely exchange of information necessary to support effective emergency response. Communication with these agencies is provided through several redundant and diverse routes. This is achieved by, but not limited to:

- Diverse telephone networks (commercial and corporate).
- Tie lines and digital services.
- Privately owned and maintained microwave and fiber optic systems.

The off-site telecommunications network is designed to facilitate traffic in the most fail-safe manner to the emergency response organizations.

Telecommunications services are provided between the following locations in a redundant and diverse manner:

- Shearon Harris Nuclear Power Plant Units 2 and 3 (HAR 2 and 3) to State and County Emergency Operations Centers
- HAR 2 and 3 to State and County Warning Points.
- HAR 2 and 3 to NRC Operations Center.
- HAR 2 and 3 to Skaale Energy Control Center.
- HAR 2 and 3 to Emergency Operations Facility (EOF) (off-site).

In addition to the above listed emergency response organizations, the following emergency centers are also equipped with public telephone lines:

- Joint Information Center.
- Emergency Operations Centers.

Recommendations of Bulletin 80-15 regarding loss of the emergency notification system due to loss of off-site power are addressed in Subsection 9.5.2.2.3.2.3.

9.5.2.2.3.2 Emergency Off-Site Communications

HAR COL 9.5-10

The Technical Support Center (TSC) is the primary on-site communication center for the communications to the Main Control Room (MCR), the Operations Support Center (OSC), the EOF, and the NRC. In addition, provisions for communication with State and local operation centers are also provided in the TSC, MCR and EOF for early notification and recommendations to off-site authorities.

The communication interfaces to off-site locations consist of:

- Private Automatic Branch Exchange (PABX) Telephone System.
- Selective Signaling System.
- NRC supplied FTS 2001 Telephone Lines.
- Microwave Communication.
- Emergency Communications System:
  - Emergency UHF/VHF Radio (crisis management radio system).
  - Emergency Telephone.

The design conforms to NUREG-0696, Functional Criteria for Emergency Response Facilities, and the recommendations of Regulatory Issue Summary RIS 2000-11, NRC Emergency Telecommunications System.

9.5.2.2.3.2.1 Private Automatic Branch Exchange (PABX) Telephone System

The PABX telephone system provides off-site voice telephone communication during normal and emergency operation of the plant.

Direct extensions from the PABX locations exterior to the plant are as follows:

- Other Progress Energy site locations.
- Emergency Operations Facility (EOF).
- Joint Information Center (JIC).

During normal plant operation, the PABX is supplied from the Administration Building MCC 1-4A71. Upon loss of this supply, an automatic transfer switch is provided to reconnect the PABX and associated support equipment to a supply from a Motor Control Center in the Security Building, which is backed up by the auxiliary diesel generator in the Security Building (HNP FSAR, Subsection 9.5.2.5).

9.5.2.2.3.2.2 Selective Signaling System

Selective Signaling System (SSS) is the primary means of communication between HAR 2 and 3 and the State of North Carolina and nearby counties. SSS utilizes dedicated telephone lines (hotlines) to communicate with the following offsite locations:

- State of North Carolina warning points.
- Wake, Chatham, Harnett and Lee County warning points.
- State of North Carolina Emergency Operations Centers (EOCs).
- Wake, Chatham, Harnett and Lee County EOCs.

Selective Signaling System hotlines are powered from the Security Building MCC which is diesel generator backed.

9.5.2.2.3.2.3 NRC FTS 2001 Telephone Lines

The NRC Emergency Telecommunications System consists of dedicated Federal Telephone System circuits (FTS 2001) that provide direct communication with the NRC Operations Center. FTS 2001 lines are independent of the local public telephone network and can be activated through specific telephone units located at the MCR, TSC and EOF. The FTS lines will run directly from the NRC to HNP where they will terminate in the Administration Building, and be routed to appropriate locations within the plant. The following FTS 2001 dedicated circuits are utilized by HAR 2 and 3:

- The Emergency Notification System (ENS) is used to provide initial notification to and ongoing communication with the NRC personnel in an emergency. The ENS is available in the MCR, TSC and EOF.

  This design provides a functional ENS that is not connected through a local telephone company switch, and is backed up by a battery system and a security diesel generator. This complies with the requirements of NRC Bulletin 80-15 regarding loss of the ENS due to loss of off-site power.

- The Health Physics Network (HPN) is used to provide requested radiological and meteorological information to the NRC in an emergency. The HPN is available in the TSC and EOF.

- The Reactor Safety Counterpart Link (RSCL) is used by the NRC Site team and the NRC Base Team to conduct internal NRC discussions on plant parameters without interfering with exchange of information between the nuclear plant and the NRC. This link is used for discussions with the NRC Reactor Safety personnel and the nuclear plant management. The RSCL is available in the TSC and EOF.

- The Protective Measures Counterpart Link (PMCL) is used by the NRC Site team and the NRC Base Team to conduct internal discussions on radiological releases and meteorological conditions, and the need for protective actions without interfering with exchange of information between the nuclear plant and the NRC. This link may also be used for discussions with the NRC Protective Measures personnel and the nuclear plant management. The PMCL is available in the TSC and EOF.

- The Management Counterpart Link (MCL) is used for any internal discussions between the NRC Executive Team Director and the NRC Director of Site Operations or nuclear plant management. The MCL is available in the TSC and EOF.

- The Emergency Response Data System (ERDS) is an analog phone line, used to transmit reactor process variables and radiological and site meteorological data, from the nuclear plant computer systems to the NRC Operations Center. The ERDS is activated by the nuclear plant at an ‘Alert’ or higher declaration. The ERDS is available in the TSC and EOF.

- The Operations Center Local Area Network (LAN) line (OCL) is an analog phone line used by the NRC Base Team and the NRC Site Team to access products and services provided on the NRC Operations Center’s local area network. The OCL is available in the TSC and EOF.

Back-up power to the FTS 2001 lines is provided by a battery system and a security diesel generator.

9.5.2.2.3.2.4 Microwave Communications

A private microwave system is utilized by the Load Dispatcher Dedicated Telephone System which provides direct links between the MCR and the load dispatcher. Automatic ring-down lines are activated by pushing the appropriate button on a multi-button phone and identify Harris site as the caller to the load dispatcher. The microwave system provides a dial-through connection to the public telephone system.

Microwave equipment is powered from 120 volt service panel SPEB in the Administration Building (HNP FSAR, Subsection 9.5.2.5). SPEB is powered from the Security Building MCC, which is diesel generator backed.

9.5.2.2.3.2.5 Emergency Communications System

The Emergency Communications System (ECS) is provided to serve as back-up communications link between HAR 2 and 3 and other emergency facilities and environmental monitoring teams, in the event of an emergency condition. The

ECS functions independent of other off-site communication systems at HAR 2 and 3, and serves as a vital link between the site and the EOF, the State Emergency Response Team headquarters, the general office, the Skaale Energy Control Center as well as the Joint Information Center. The ECS includes emergency radios and telephones.

9.5.2.2.3.2.6 Emergency Radio (Crisis Management Radio) System

This two-way Emergency Radio System consists of a UHF emergency channel and a two-channel State Emergency VHF base station. Three UHF remote units are located in the TSC, EOF and MCR, and are utilized to enable the central and secondary alarm stations to communicate with the county in the event that normal commercial telephone service is lost. Two VHF State Emergency units are located in the TSC and EOF and enable communications with various State Agencies.

Power is supplied from the TSC distribution system (HNP FSAR, Subsection 9.5.2.2).

9.5.2.2.3.2.7 Emergency Telephone System

The Emergency Telephone System is an independent telephone system consisting of direct lines (underground fiber optic lines) between HAR 2 and 3 and the off-site EOF. Operations are carried through an emergency public branch exchange (PBX) that is independent of the site PABX, and consists of both microwave and normal telephone lines. Site emergency telephones are located in the TSC and are connected to four telephone key systems.

Normal power to the key systems is supplied from power panels fed from the plant UPS system. Back-up power is provided from emergency ac and dc back-up power sources.

The PBX in the EOF is powered from the EOF distribution system which is backed up by a battery system and a diesel generator (HNP FSAR, Subsection 9.5.2.2).

9.5.2.5 Combined License Information

9.5.2.5.1 Offsite Interfaces

HAR COL 9.5-9 This COL Item is addressed in Subsection 9.5.2.2.3.1.

9.5.2.5.2 Emergency Offsite Communications

HAR COL 9.5-10 This COL Item is addressed in Subsection 9.5.2.2.3.2.

9.5.2.5.3 Security Communications

STD COL 9.5-11 This COL Item is addressed in the Physical Security Plan.

Add the following subsection after DCD Subsection 9.5.4.5.1.

9.5.4.5.2 Fuel Oil Quality

STD COL 9.5-13 The diesel fuel oil testing program requires testing both new fuel oil and stored fuel oil. High fuel oil quality is provided by specifying the use of ASTM Grade 2D fuel oil with a sulfur content as specified by the engine manufacturer.

A fuel sample is analyzed prior to addition of ASTM Grade 2D fuel oil to the storage tanks. The sample moisture content and particulate or color is verified per ASTM D4176. In addition, kinematic viscosity is tested to be within the limits specified in Table 1 of ASTM D975. The remaining critical parameters per Table 1 of ASTM D975 are verified compliant within 7 days.

Fuel oil quality is verified by sample every 92 days to meet ASTM Grade 2D fuel oil criteria. The addition of fuel stabilizers and other conditioners is based on sample results.

The fuel oil storage tanks are inspected on a monthly basis for the presence of water. Any accumulated water is to be removed.

9.5.4.7 Combined License Information

9.5.4.7.2 Fuel Degradation Protection

STD COL 9.5-13 This COL Item is addressed in Subsection 9.5.4.5.2.

9.5.5 REFERENCES

201. National Fire Protection Association, “Standard for Inspection, Care, and Use of Fire Hose, Couplings, and Nozzles and the Service Testing of Fire Hose,” NFPA 1962, 2003.

202. National Fire Protection Association, “Standard for Fire Prevention During Welding, Cutting, and Other Hot Work,” NFPA 51B, 2003.

203. National Fire Protection Association, “Standard for Safeguarding Construction, Alteration, and Demolition Operations,” NFPA 241, 2004.

204. National Fire Protection Association, “Standard on Industrial Fire Brigades,” NFPA 600, 2005.

205. National Fire Protection Association, “Recommended Practice for Pre-incident Planning,” NFPA 1620, 2003.

206. National Fire Protection Association, “Standard Methods of Fire Tests for Flame Propagation of Textiles and Films,” NFPA 701, 2004.

207. National Fire Protection Association, “Standard for Fire-Retardant Treated Wood and Fire-Retardant Coatings for Building Materials,” NFPA 703, 2006.

208. National Fire Protection Association, “Standard for Fire Service Respiratory Protection Training,” NFPA 1404, 2006.

209. National Fire Protection Association, “Standard on Training for Initial Emergency Scene Operations,” NFPA 1410, 2005.

210. National Fire Protection Association, “Standard on Fire Department Occupational Safety and Health Program,” NFPA 1500, 2007.

211. National Fire Protection Association, “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants,” NFPA 804, 2001.

212. National Fire Protection Association, “Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems,” NFPA 25, 2008.

Table 9.5-201[a] (Sheet 1 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

	BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
	Fire Protection Program			
STD COL 9.5-3 STD COL 9.5-4	1. Direction of fire protection program; availability of personnel.	C.1.a(1)	C	Comply. Subsections 9.5.1.8.1.2 and 13.1.1.2.10 address this requirement.
	2. Defense-in-depth concept; objective of fire protection program.	C.1.a(2)	C	Comply. Subsections 9.5.1.8 and 9.5.1.8.1 address this requirement.
HAR COL 9.5-3 HAR COL 9.5-4	3. Management responsibility for overall fire protection program; delegation of responsibility to staff.	C.1.a(3)	C	Comply. Subsections 9.5.1.8.1.2, 13.1.2.1.3.9, and 13.1.1.2.10.
	4. The staff should be responsible for: a. Fire protection program requirements. b. Post-fire shutdown capability. c. Design, maintenance, surveillance, and quality assurance of fire protection features. d. Fire prevention activities. e. Fire brigade organization and training. f. Prefire planning.	C.1.a(3)	C	Comply. Subsection 13.1.2.1.3.9 addresses this requirement.

Table 9.5-201[(a)] (Sheet 2 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

		BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
HAR COL 9.5-3 HAR COL 9.5-4	5.	The organizational responsibilities and lines of communication pertaining to fire protection should be defined through the use of organizational charts and functional descriptions.	C.1.a(4)	C	Comply. Organization and lines of communication are addressed in Figure 13.1-201. Functional descriptions are addressed in Subsections 13.1.1.2.10, 13.1.1.3.1.3, 13.1.2.1.3.9, and 13.1.2.1.6.
	6.	Personnel qualification requirements for fire protection engineer, reporting to the position responsible for formulation and implementation of the fire protection program.	C.1.a(5)(a)	C	Comply. Subsection 13.1.2.1.3.9 addresses this requirement.
STD COL 9.5-3 STD COL 9.5-4	7.	The fire brigade members' qualifications should include a physical examination for performing strenuous activity, and the training described in Position C.3.d.	C.1.a(5)(b)	C	Comply. Subsections 9.5.1.8.2.1 and 9.5.1.8.2.2 addresses this requirement.
	8.	The personnel responsible for the maintenance and testing of the fire protection systems should be qualified by training and experience for such work.	C.1.a(5)(c)	C	Comply. Subsection 9.5.1.8.7 addresses this requirement.
	9.	The personnel responsible for the training of the fire brigade should be qualified by training and experience for such work.	C.1.a(5)(d)	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[a] (Sheet 3 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
10. The following NFPA publications should be used for guidance to develop the fire protection program: No. 4, No. 4A, No. 6, No. 7, No. 8, and No. 27.	C.1.a(6)	C	Alternate Compliance. The NFPA codes cited in BTP CMEB 9.5-1 are historical. Current NFPA codes are referenced for guidance for the fire protection program. Subsection 9.5.1.8.1.1 addresses this requirement.
11. On sites where there is an operating reactor, and construction or modification of other units is underway, the superintendent of the operating plant should have a lead responsibility for site fire protection.	C.1.a(7)	C	Comply. Subsection 13.1.1.2.10 addresses this requirement.
Fire Protection Analysis			
14. Fires involving facilities shared between units should be considered.	C.1.b	C	Comply. The FHA demonstrates the plant's ability to perform safe shutdown functions and minimize radioactive releases to the environment. Postulated fires in shared facilities that do not contain SSCs important to safety and do not contain radioactive materials do not affect these functions.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[(a)] (Sheet 4 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
15. Fires due to man-made site-related events that have a reasonable probability of occurring and affecting more than one reactor unit should be considered.	C.1.b	C	Comply. Subsections 2.2 and 3.5 establish that these events are not credible.
Fire Suppression System Design Basis			
22. Fire protection systems should retain their original design capability for potential man-made, site-related events that have a reasonable probability of occurring at a specific plant site.	C.1.c(4)	C	Comply. Subsections 2.2 and 3.5 establish that these events are not credible.
Fire Protection Program Implementation			
26. The fire protection program for buildings storing new reactor fuel and for adjacent fire areas that could affect the fuel storage area should be fully operational before fuel is received at the site.	C.1.e(1)	C	Comply. Subsection 9.5.1.8.1 addresses this requirement.
27. The fire protection program for an entire reactor unit should be fully operational prior to initial fuel loading in that unit.	C.1.e(2)	C	Comply. Subsection 9.5.1.8.1 addresses this requirement.
28. Special considerations for the fire protection program on reactor sites where there is an operating reactor and construction or modification of other units is under way.	C.1.e(3)	C	Comply. Subsection 9.5.1.8.1.2.m addresses this requirement.

Table 9.5-201[(a)] (Sheet 5 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

	BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
STD COL 9.5-3 STD COL 9.5-4	29. Establishing administrative controls to maintain the performance of the fire protection system and personnel.	C.2	C	Comply. Subsection 9.5.1.8.1.2 addresses this requirement.
	Fire Brigade			
HAR COL 9.5-3 HAR COL 9.5-4	30. The guidance in Regulatory Guide 1.101 should be followed as applicable.	C.3.a	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.
	31. Establishing site brigade: minimum number of fire brigade members on each shift; qualification of fire brigade members; competence of brigade leader.	C.3.b	C	Comply. Subsections 9.5.1.8.2.2 and 13.1.2.1.6 address this requirement.
STD COL 9.5-3 STD COL 9.5-4	32. The minimum equipment provided for the brigade should consist of turnout coats, boots, gloves, hard hats, emergency communications equipment, portable ventilation equipment, and portable extinguishers.	C.3.c	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.
	33. Recommendations for breathing apparatus for fire brigade, damage control, and control room personnel.	C.3.c	C	Comply. Subsection 9.5.1.8.2.2 and DCD Subsections 6.4.2.3 and 6.4.4 address these requirements.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[a] (Sheet 6 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
34. Recommendations for the fire brigade training program.	C.3.d	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.
Quality Assurance Program			
35. Establishing quality assurance (QA) programs by applicants and contractors for the fire protection systems for safety-related areas; identification of specific criteria for quality assurance programs.	C.4	C	Comply. DCD Subsection 9.5.1.7 and Chapter 17 address this requirement.
Building Design			
50. Fire doors should be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	C.5.a (5)	C	Comply. Subsection 9.5.1.8.8 addresses this requirement.
51. Alternative means for verifying that fire doors protect the door opening as required in case of fire.	C.5.a (5)	C	Comply. Subsection 9.5.1.8.8 addresses this requirement.
52. The fire brigade leader should have ready access to keys for any locked fire doors.	C.5.a (5)	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[(a)] (Sheet 7 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
55. Stairwells serving as escape routes, access routes for firefighting, or access routes to areas containing equipment necessary for safe shutdown should be enclosed in masonry or concrete towers with a minimum fire resistance rating of 2 hours and self-closing Class B fire doors.	C.5.a(6)	C	Comply. Subsection 9A.3.3 addresses this requirement for miscellaneous buildings located in the yard.
56. Fire exit routes should be clearly marked.	C.5.a (7)	C	Comply. DCD Subsection 9.5.1.2.1.1 addresses this requirement.
71. Water drainage from areas that may contain radioactivity should be collected, sampled, and analyzed before discharge to the environment.	C.5.a(14)	C	Comply. Capability is provided. Subsection 9.5.1.8.5 addresses this requirement.
Control of Combustibles			
80. Use of compressed gases inside buildings should be controlled.	C.5.d (2)	C	Comply. Subsection 9.5.1.8.4.g addresses this requirement.
Lighting and Communication			
111. A portable radio communications system should be provided for use by the fire brigade and other operations personnel required to achieve safe plant shutdown.	C.5.g (4)	C	Comply. Subsections 9.5.1.8.1.2.a.3.v, 9.5.1.8.2.2, and DCD Subsections 9.5.2 and 9.5.2.2.1 address this requirement.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[a] (Sheet 8 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
Water Sprinkler and Hose Standpipe Systems			
149. All valves in the fire protection system should be periodically checked to verify position.	C.6.c (2)	C	Comply. Subsection 9.5.1.8.6 addresses this requirement.
157. The fire hose should be hydrostatically tested in accordance with NFPA 1962. Hoses stored in outside hose houses should be tested annually. The interior standpipe hose should be tested every 3 years.	C.6.c (6)	C	Comply. Subsection 9.5.1.8.6 addresses this requirement.
Primary and Secondary Containment			
174. Self-contained breathing apparatus should be provided near the containment entrances for fire fighting and damage control personnel. These units should be independent of any breathing apparatus provided for general plant activities.	C.7.a (2)	C	Comply. Subsection 9.5.1.8.2.2 addresses this requirement.
Main Control Room Complex			
180. Breathing apparatus for main control room operators should be readily available.	C.7.b	C	Comply. DCD Subsection 6.4.2.3 addresses this requirement.

STD COL 9.5-3
STD COL 9.5-4

Table 9.5-201[(a)] (Sheet 9 of 9)
AP1000 Fire Protection Program Compliance with BTP CMEB 9.5-1

BTP CMEB 9.5-1 Guideline	Paragraph	Comp	Remarks
Cooling Towers			
225. Cooling towers should be of noncombustible construction or so located and protected that a fire will not adversely affect any safety-related systems or equipment.	C.7.q	C	Comply. Subsection 9A.3.3 addresses this requirement.
Storage of Acetylene-Oxygen Fuel Gases			
228. Gas cylinder storage locations should not be in areas that contain or expose safety-related equipment or the fire protection systems that serve those safety-related areas.	C.8.a	C	Comply. Subsection 9.5.1.8.4.g addresses this requirement.
229. A permit system should be required to use this equipment in safety-related areas of the plant.	C.8.a	C	Comply. Subsection 9.5.1.8.4.g addresses this requirement.
Storage Areas for Ion Exchange Resins			
230. Unused ion exchange resins should not be stored in areas that contain or expose safety-related equipment.	C.8.b	C	Comply. Subsection 9.5.1.8.4.a addresses this requirement.
Hazardous Chemicals			
231. Hazardous chemicals should not be stored in areas that contain or expose safety-related equipment.	C.8.c	C	Comply. Subsection 9.5.1.8.4.h addresses this requirement.

a) This table supplements DCD Table 9.5.1-1.

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Table 9.5-202[a]
Exceptions to NFPA Standard Requirements

Requirement	AP1000 Exception or Clarification
NFPA 804 (Reference 211) contains requirements specific to light water reactors.	Compliance with portions of this standard is as identified within DCD Section 9.5.1 and WCAP-15871. The intake structure is non-combustible construction, does not provide any safety function, and does not contain any equipment important to safety. Automatic sprinkler protection is not warranted and is not provided.

a) This table supplements DCD Table 9.5.1-3.

APPENDIX 9A FIRE PROTECTION ANALYSIS

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

9A.3.3 YARD AREA AND OUTLYING BUILDINGS

Replace the second sentence of DCD Subsection 9A.3.3 with the following information.

STD COL 9.5-3

Stairwells in miscellaneous buildings located in the yard serving as escape routes or access routes for firefighting, are enclosed in masonry or concrete towers with a minimum fire resistance rating of 2 hours and self-closing Class B fire doors. The two hour fire-resistance rating for the masonry or concrete material is based on testing conducted in accordance with ASTM E119 (Reference 201) and NFPA 251 (Reference 202).

Insert the following subsections after DCD Subsection 9A.3.3.

HAR COL 9.5-2

9A.3.3.1 Circulating Water Pump Intake Structures (Circulating Water Pumphouses)

Fire Detection and Suppression Features

- Fire detectors (Reference 209)
- Hose station(s) (Reference 205)
- Portable fire extinguishers (Reference 204)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in these areas is detected by a fire detector which produces an audible alarm locally with both visual and audible alarms in the main control room and security central alarm station. The fire is extinguished by operation of manual hose streams, portable extinguishers, and yard hydrants.

The combustible materials in this fire area are listed in DCD Table 9A-3 and primarily consist of the cable insulation for wiring associated with the water pumps and relevant equipment. There are no significant concentrations of combustible materials. This is a light hazard fire area and the rate of the fire growth is expected to be slow. Three-hour fire barriers provide adequate separation from adjacent fire areas for containment of a fire.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.2 Control (Switchyard) Building

Fire Detection and Suppression Features

- Fire detectors (Reference 209)
- Hose station(s) (Reference 205)
- Portable fire extinguishers (Reference 204)

Fire Protection Adequacy Evaluation

A fire in this area is detected by a fire detector which produces an audible alarm locally with both visual and audible alarms in the main control room and security central alarm station. The fire is extinguished by operation of a hose station or portable extinguishers.

Combustible materials in this fire area consist primarily of cable insulation and batteries. There is no significant concentration of a combustible material in the area. This is a low hazard fire area and the rate of fire growth is expected to be slow.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.3 Diesel Generator Fuel Oil Storage Tank Areas

Fire Detection and Suppression Features

- Portable fire extinguishers (Reference 204)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

This fire area shall meet the requirements of National Fire Protection Standard (NFPA) 30 (Reference 208).

The tanks are contained within a diked area, 30.5 m (100 ft) from permanent plant buildings. The fire is extinguished by operation of yard hydrants or portable extinguishers.

Combustible materials in this fire area are listed in DCD Table 9A-3 and consist primarily of the diesel fuel oil. This is a high hazard fire area and the rate of fire growth is expected to be fast. Concrete dike barriers provide adequate separation from adjacent fire areas/tank and the fire is contained within the fire area. The containment system is designed to hold the entire volume of oil, the fire hose, and the volume of water from a ten minute discharge.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.4 Hydrogen Storage Tank Area

Fire Detection and Suppression Features

- Portable fire extinguishers (Reference 204)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in this area is extinguished by operation of yard hydrants or portable fire extinguishers.

Flammable materials in this fire area are listed in DCD Table 9A-3 and consist primarily of hydrogen. This is a high hazard fire area and the rate of fire growth is expected to be fast, but localized to the trailer. The tube trailers are outside, 9.1 m (30 ft) from permanent plant buildings. Their location is also in accordance with the requirements of NFPA 55 (Reference 203), and the tube trailers therefore pose no threat to any adjacent buildings, structures, and components.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.5 Natural Draft Cooling Towers

Fire Detection and Suppression Features

- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in this area is extinguished by operation of yard hydrants.

The cooling towers are composed of non-combustible materials. There are no significant concentrations of combustible materials. These are light hazard fire areas and the rate of the fire growth is expected to be slow. The natural draft cooling towers are located outside and pose no threat to any adjacent buildings, structures, and components.

Final design of the cooling towers will determine the additional fire protection requirements as necessary per the requirements of NFPA 214 (Reference 210).

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.6 Raw Water Pump House

Fire Detection and Suppression Features

- Fire detectors (Reference 209)
- Hose station(s) (Reference 205)
- Portable fire extinguishers (Reference 204)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in this area is detected by a fire detector which produces an audible alarm locally with both visual and audible alarms in the main control room and security central alarm station. The fire is extinguished by operation of manual hose streams, portable extinguishers, and yard hydrants.

Combustible materials in this fire area primarily consist of the cable insulation for wiring associated with the raw water pumps and relevant equipment. There are no significant concentrations of combustible materials. This is a light hazard fire area and the rate of the fire growth is expected to be slow. Three-hour fire barriers provide adequate separation from adjacent fire areas for containment of a fire.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.7 Service Water System Cooling Towers

Fire Detection and Suppression Features

- Portable fire extinguishers (Reference 204)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in this area is extinguished by operation of yard hydrants or portable extinguishers.

Combustible materials in this fire area are listed in DCD Table 9A-3 and consist primarily of the cooling tower fans. This is a low hazard fire area and the rate of fire growth is expected to be slow. The mechanical draft cooling tower is located outside and poses no threat to any adjacent buildings, structures, and components.

Final design of the cooling towers will determine the additional fire protection requirements as necessary per the requirements of NFPA 214 (Reference 210).

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.8 Transformer Areas

Fire Detection and Suppression Features

- Fire detectors (Reference 209)
- Portable fire extinguishers (Reference 204)
- Water deluge (Reference 206)
- Yard hydrants (Reference 207)

Fire Protection Adequacy Evaluation

A fire in these areas is detected by a fire detector which produces an audible alarm locally with both visual and audible alarms in the main control room and security central alarm station. A linear heat fire detector system also actuates a deluge system design in accordance with NFPA 15 (Reference 206).

Combustible materials in these fire areas are listed in DCD Table 9A-3 and consist primarily of transformer oil. Each of these is a high hazard fire area and the rate of fire growth is expected to be fast. Three-hour fire barriers provide adequate separation from adjacent fire areas/transformers and the fire is contained within the fire area. The containment system is designed to hold the entire volume of oil, the fire hose, and the volume of water from a 10-min discharge of the water spray system.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system and the consequences of a break in a fire protection line is not required because there are no safety functional components in this fire zone.

Safe Shutdown Evaluation

There are no safe shutdown components in this fire area. No safe shutdown evaluation is required.

9A.3.3.9 Administration Building

The administrative building is located outside the protected area.

The building can be used during construction and later adopted for use during startup and operation.

The administrative building does not contain primary or secondary systems within, and is not essential in preserving the integrity of the plant operations in case of a fire.

9A.4 REFERENCES

Add the following information to the end of DCD Subsection 9A.4:

201. American Society of Mechanical Engineers, “Standard Test Methods for Fire Tests of Building Construction and Materials,” ASTM E119-08a.

202. National Fire Protection Association, “Standard Methods of Tests of Fire Resistance of Building Construction and Materials,” NFPA 251, 2006.

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

204. National Fire Protection Association, ”Standard for Portable Fire Extinguishers,” NFPA 10, 2007.

205. National Fire Protection Association, ”Standard for the Installation of Standpipe and Hose Systems,” NFPA 14, 2007.

206. National Fire Protection Association, ”Standard for Water Spray Fixed Systems for Fire Protection,” NFPA 15, 2007.

207. National Fire Protection Association, ”Standard for the Installation of Private Fire Service Mains and Their Appurtenances,” NFPA 24, 2007.

208. National Fire Protection Association, ”Flammable and Combustible Liquids Code,” NFPA 30, 2003.

209. National Fire Protection Association, ”National Fire Alarm Code,” NFPA 72, 2007.

210. National Fire Protection Association, ”Standard on Water-Cooling Towers,” NFPA 214, 2005.