FINAL SAFETY ANALYSIS REPORT

CHAPTER 9

AUXILIARY SYSTEMS

9.0 AUXILIARY SYSTEMS

This chapter of the U.S. EPR Final Safety Analysis Report (FSAR) is incorporated by reference with supplements and departures as identified in the following sections.

9.1 FUEL STORAGE AND HANDLING

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

9.1.1 Criticality Safety of New and Spent Fuel Storage and Handling

No departures or supplements.

9.1.2 New and Spent Fuel Storage

No departures or supplements.

9.1.3 Spent Fuel Pool Cooling and Purification System

No departures or supplements.

9.1.4 Fuel Handling System

The U.S. EPR FSAR included the following COL Item in Section 9.1.4:

> A COL applicant that references the U.S. EPR design certification will provide a cask design acceptable for interfacing with the SFCTF prior to initial cask loading operations. The design of the spent fuel cask must meet the following interface requirements:
>
> - The mating surface of the cask maintains a leak-tight connection with the penetration assembly when the cask is connected to the penetration.
> - The dose rates from a loaded cask during cask handling operations do not exceed those identified in Section 12.3.
> - A structural and seismic analysis of the SFCTM and cask demonstrates that the fluid boundary between the penetration assembly and connected cask is maintained to preclude the loss of significant inventory in the spent fuel pool during cask loading operations, including safe shutdown earthquake (SSE), and the postulated drop of a fuel assembly from the maximum handling height in the cask loading pit onto a connected cask.

The COL Item is addressed as follows:

Prior to initial cask loading operations, a cask design that satisfies the requirements in U. S. EPR FSAR Section 9.1.4 for interfacing with the SFCTF will be provided.

9.1.5 Overhead Heavy Load Handling System

No departures or supplements.

9.1.5.1 Design Basis

No departures or supplements.

9.1.5.2 System Description

9.1.5.2.1 General Description

No departures or supplements.

9.1.5.2.2 Reactor Building Polar Crane

No departures or supplements.

9.1.5.2.3 Fuel Building Auxiliary Crane

No departures or supplements.

9.1.5.2.4 Other Overhead Load Handling Systems

No departures or supplements.

9.1.5.2.5 System Operation

The U. S. EPR FSAR includes the following COL Item in Section 9.1.5.2.5:

> A COL applicant that references the U.S. EPR design certification will provide site-specific information on the heavy load handling program, including a commitment to procedures for heavy load lifts in the vicinity of irradiated fuel or safe shutdown equipment, and crane operator training and qualification.

This COL Item is addressed as follows:

Procedures

Administrative procedures to control heavy loads shall be developed prior to fuel load to allow sufficient time for plant staff familiarization, to allow NRC staff adequate time to review the procedures, and to develop operator licensing examinations. Heavy loads handling procedures address the following:

- Identification of any heavy loads and heavy load handling equipment outside the scope of loads described in the U.S. EPR FSAR and the associated heavy load attributes (load weight and typical load path).
- Equipment identification.
- Required equipment inspections and acceptance criteria prior to performing lift and movement operations.
- Approved safe load paths and exclusion areas.
- Safety precautions and limitations.
- Special tools, rigging hardware, and equipment required for the heavy load lift.
- Rigging arrangement for the load.
- Adequate job steps and proper sequence for handling the load.

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 or spent fuel pool or on safe shutdown equipment. Paths are defined in procedures and equipment layout drawings. Safe load path procedures address the following general requirements.

- When heavy loads must be carried directly over the spent fuel pool, reactor vessel or safe shutdown equipment, procedures will limit the height of the load and the time the load is carried.
- When heavy loads could be carried (i.e., no physical means to prevent) but are not required to be carried directly over the spent fuel pool, reactor vessel or safe

shutdown equipment, procedures will define an area over which loads shall not be carried so that if the load is dropped, it will not result in damage to spent fuel or operable safe shutdown equipment or compromise reactor vessel integrity.

- Where intervening structures are shown to provide protection, no load travel path is required.
- Defined safe load paths will follow, to the extent practical, structural floor members.
- When heavy loads movement is restricted by design or operational limitation, no safe load path is required.
- Supervision is present during heavy load lifts to enforce procedural requirements.

Inspection and Testing

Cranes addressed in U.S. EPR FSAR Section 9.1.5 are inspected, tested, and maintained in accordance with ASME B30.2 (ASME, 2005). Prior to making a heavy load lift, an inspection of the crane is made in accordance with the above applicable standards.

Training and Qualification

Training and qualification of operators of cranes addressed in U.S. EPR FSAR Section 9.1.5 meet the requirements of ASME B30.2 (ASME, 2005), and include the following:

- Knowledge testing of the crane to be operated in accordance with the applicable ANSI crane standard.
- Practical testing for the type of crane to be operated.
- Supervisor signatory authority on the practical operating examination.
- Applicable physical requirements for crane operators as defined in the applicable crane standard.

Quality Assurance

Procedures for control of heavy loads are developed in accordance with Section 13.5. In accordance with Section 17.5, other specific quality program controls are applied to the heavy loads handling program, targeted at those characteristics or critical attributes that render the equipment a significant contributor to plant safety.

9.1.5.3 Safety Evaluation

No departures or supplements.

9.1.5.4 Inspection and Testing Requirements

No departures or supplements.

9.1.5.5 Instrumentation Requirements

No departures or supplements.

9.1.5.6 References

{**ASME, 2005.** Overhead and Gantry Cranes – Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist, ASME B30.2, American Society of Mechanical Engineers, 2005.}

9.2 WATER SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

9.2.1 Essential Service Water System

No departures or supplements.

9.2.1.1 Design Bases

{No departures or supplements.}

9.2.1.2 System Description

No departures or supplements.

9.2.1.3 Component Description

9.2.1.3.1 Safety-Related Essential Service Water Pumps

No departures or supplements.

9.2.1.3.2 Dedicated Essential Service Water Pumps

No departures or supplements.

9.2.1.3.3 Debris Filters - Safety Divisions

No departures or supplements.

9.2.1.3.4 Debris Filter - Dedicated Division

No departures or supplements.

9.2.1.3.5 Piping, Valves, and Fittings

The U.S. EPR includes the following COL item in Section 9.2.1.3.5:

> A COL applicant that references the U.S. EPR design certification will provide a description of materials that will be used for the essential service water system (ESWS) at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.

This COL item is addressed as follows:

> {The ESWS piping, valves and fittings are made of carbon steel. This is compatible with the water chemistry in the ESWS tower basin. Buried piping is coated and wrapped and provided with appropriate cathodic protection. The Cathodic Protection (CP) system for underground pipe is described in Section 8.3.1.1.15. The ESWS cooling towers are constructed of reinforced concrete, tower fill is constructed of ceramic tile, spray piping and nozzles are fabricated of corrosion resistant materials (e.g., stainless steel, bronze), and the cooling tower basin is made of concrete. Appropriate chemical treatment as described in Section 9.2.5.2.4, is used to maintain the quality of water in the basin at an acceptable level to reduce corrosion, scaling etc, of ESWS components during normal operation.}

9.2.1.4 Operation

No departures or supplements.

9.2.1.5 Safety Evaluation

No departures or supplements.

9.2.1.6 Inspection and Testing Requirements

No departures or supplements.

9.2.1.7 Instrumentation Requirements

No departures or supplements.

9.2.1.8 References

{No departures or supplements.}

9.2.2 Component Cooling Water System

No departures or supplements.

9.2.3 Demineralized Water Distribution System

No departures or supplements.

9.2.4 Potable and Sanitary Water Systems (PSWS)

{The U.S. EPR FSAR describes the Potable and Sanitary Water System as a single system. While the function will remain the same, BBNPP classifies the system as two systems: the Potable Water System; and the Sanitary Waste Water System.

The Potable Water System delivers drinking quality water to various points throughout the plant, to individual components and for use as process water in other systems. Potable water is used for human consumption, sanitation and cleaning, and other domestic and process purposes inside the Nuclear Island (NI) and the Conventional Island (CI).

The Sanitary Waste Water System collects water discharged from water closets, urinals, showers, sinks and other sources of sanitary water and, with the exception of that from sources within the radiologically controlled area (RCA), directs it to a large sewer main. The sanitary water from sources within the RCA is directed to the Liquid Radwaste System by the NI vents and drains.

9.2.4.1 Design Basis

The Potable Water System supplies potable water for human consumption, cleaning and other domestic purposes, plus process water to other systems, during periods of normal operation, shutdown, maintenance and construction. The Potable Water System provides potable water at a flow rate sufficient to meet demand and keep potable water pressure above connected equipment's or systems' pressures. Potable water supplied to, and equipment provided for, emergency eyewash stations and emergency showers complies with the requirements of ANSI Z358.1, Emergency Eyewash and Shower Equipment (ANSI, 2004).

The Sanitary Waste Water System conveys sanitary wastes from their point of origin, south to a large sewer main owned by Luzerne County. The sanitary waste water is treated in the county treatment facility. Where piping for the Sanitary Waste Water System is buried, provisions are made to assure adequate separation from Potable Water System piping. Where local conditions prevent this separation, controls on layout and installation provide similar assurance of protection of potable water from contamination.}

9.2.4.2 System Description

9.2.4.2.1 General Description

The U.S. EPR FSAR includes the following COL Item in Section 9.2.4.2.1:

> A COL applicant that references the U.S. EPR design certification will provide site-specific details related to the sources and treatment of makeup to the PSWS along with a simplified piping and instrumentation diagram.

This COL Item is addressed as follows:

{Potable Water System

The Potable Water System is shown schematically in Figure 9.2-1.

The source of potable water is city water provided by Pennsylvania American Water Company (PAW) which provides water throughout the plant, for human consumption, cleaning and sanitation, and other domestic and selected process purposes. PAW supplies water that meets the requirements of local, State and Federal codes and specifications regarding potability. The system is designed to satisfy peak anticipated demand for potable water, including hot water, during all phases of plant operation.

The Potable Water System consists of distribution piping and valves, water heaters, and instrumentation for system monitoring, operation and control.

Sanitary Waste Water System

The Sanitary Waste Water System is shown schematically in Figure 9.2-2.

Sanitary waste water or sanitary water is the term applied to the drainage from water closets, urinals, showers, bathroom/washroom sinks, kitchen and janitorial sinks, clothes washing and dish washing machines. Sanitary waste loading usually includes biological waste (including fecal matter), soaps, cooking grease and food scraps. However, at the BBNPP, the sanitary waste stream is processed in two different ways depending on the source, due to differing contaminants.

The following locations within the NI have sanitary waste streams that have the potential to contain radioactive material. However, because these particular waste streams do not contain biological waste, cooking grease or food scraps, it is acceptable to collect them in the NI vents and drains system and direct them to the Liquid Waste Management System for processing as potentially radioactive waste:

- ♦ Personnel decon showers and decon sinks in the Access Building.
- ♦ Contaminated laundry facility in the Radioactive Waste Processing Building.

U.S. EPR FSAR Section 9.3.3 provides a discussion of the NI vents and drains system. The Liquid Waste Management System is discussed in U.S. EPR FSAR Section 11.2.

The following locations within the NI have sanitary waste water streams that are directed to the sewer main, because they have no connections to systems with the potential to carry radioactive materials:

- Water closets, urinals, hand wash sinks and personnel showers in the following areas:
    - Non-radiologically controlled area (non-RCA) in the Access Building.
    - Non-RCA in the Safeguards Buildings.
- Sink and dishwasher in the kitchen in Safeguards Building 2.
- Hand wash sinks in the Emergency Power Generating Buildings 1 through 4.

The waste stream from each of these locations/components is collected by the Sanitary Waste Water System and flows to collection pits or tanks, from which it drains by gravity and use of lift stations to the sewer main. The sanitary wastewater is treated in the county treatment plant.

9.2.4.2.2 Component Description

Potable Water System

Piping and Valves

Branch connections to equipment, including hose bibs, or to other systems are individually isolable and are equipped with backflow preventers to prevent backflow and potential contamination of the Potable Water System. Connections to sinks or showers do not require backflow preventers, because there is an air gap between the potable water and the receiving drains. However, siphon breakers are installed where needed. The Potable Water System uses high density polyethylene (HDPE) piping and steel valves.

Water Heaters

Water heaters are provided for showers, wash and janitorial sinks, lunchroom, kitchen, laundry, and eyewash stations, and are sized, installed and controlled in such fashion as to supply on-demand hot water. Eyewash stations and emergency showers also include pre-set temperature control valves to deliver tepid water, per OSHA requirements.

Pressurizer Skid

A small, pre-engineered pressurizer skid consisting of two pumps, a pneumatic surge tank, and associated instrumentation is installed in the header upstream of the plant buildings located adjacent to the power block. The use of a booster unit is required to maintain adequate system pressure for the multi-story buildings and buildings located at higher plant elevations.

Sanitary Waste Water System

Piping and Valves

Sanitary waste water piping is sized for peak anticipated loading during outage periods and as required to meet national and local plumbing code requirements. The Sanitary Waste Water System uses polyvinyl chloride (PVC) piping.

Collection Pits and Tanks

Sanitary waste collection pits are concrete lined with steel. Tanks are constructed of steel.

Lift Stations

Steel wet well with associated control panel, valves, pumps, and level switches.

9.2.4.2.3 Operations

No departures or supplements.

9.2.4.3 Safety Evaluation

Potable Water System

The Potable Water System is not a safety-related system. Therefore, it does not require a safety evaluation with respect to plant design basis events.

With respect to compliance with Criterion 60 of Appendix A to 10 CFR 50, the Potable Water System is not connected to any components or other systems that have the potential to carry radiological material, nor do any systems discharge to it with the exception of the city water provided by PAW that supplies makeup. Further, under normal operating conditions, system pressure is maintained above the pressure of supplied components or systems, thus preventing backflow from that supplied component / system.

In addition, a backflow preventer and isolation valve are provided at "hard" connections to supplied components or systems, including hose bibs. These devices are on the potable water side of the connection to prevent backflow under abnormal, reversed differential pressure conditions.

At sinks or showers, an air gap between the potable water supply and the receiving drain prevents possible contamination from backflow. There are also siphon breakers where necessary on supply risers.

With respect to flooding concerns, failure of potable water piping would not threaten the functionality of safety-related SSCs. The Potable Water System outdoor piping is located below grade. Buildings that house safety-related SSCs are constructed with ground floor slabs elevated above grade and intervening topography and site drainage configuration that would direct released water away from areas where it might otherwise cause damage (refer to Section 2.4.10). Inside buildings, flooding from failure of potable water piping will be effectively controlled by building floor drain systems that are designed to handle larger flows (e.g., the Fire Protection System (refer to Section 9.3.3 for discussion of floor drains)).

Sanitary Waste Water System

The Sanitary Waste Water System provides no safety-related function. Therefore, it does not require a safety evaluation with respect to design basis events.

Sanitary waste water from decon showers, decon sinks and the laundry in the Access Building is directed to the Liquid Waste Management System, through the NI vents and drains system. Although drainage from showers, sinks and laundry is typically classified as sanitary water, the decon showers and sinks are used exclusively for radiological decontamination of personnel, and the laundry is used for personnel anti-contamination clothing and equipment (e.g., respirators). This does not result in biological waste loading, and is acceptable for forwarding to the Liquid Waste Management System.

With respect to compliance with Criterion 60 of Appendix A to 10 CFR 50 (CFR, 2008), sanitary waste piping in the Access Building leads from the non-RCA through the portion of the Sanitary Waste Water System that collects domestic waste water. This sanitary waste piping is completely separate from the NI vents and drains. Further, the portion of the Sanitary Waste Water System that collects domestic waste water in the Access Building, the Safeguards Buildings, and outside (underground) areas in the NI is not connected to any other system, so there is no potential for inadvertent introduction of radioactive material. The remainder of the Sanitary Waste Water System is outside the NI portion of the plant, and does not connect to any system or equipment that has the potential to carry/contain radiological contamination.

With respect to flood protection:

- The sanitary waste water collection pits, tanks, and lift stations are located at or below grade and in areas that are separated from safety-related SSCs. The drain lines from these pits or tanks are embedded in floor slabs and run underground outside the buildings. Inside the buildings, flooding from pits, tanks or broken sanitary lines will be effectively controlled by building floor drain systems that are designed to handle larger flows from, for example, the Fire Protection System (refer to U.S. EPR FSAR Section 9.3.3 for discussion of floor drains). Therefore, failures of the Sanitary Waste Water System, including failures of collection pits, tanks, or lift stations will not jeopardize safety functions by flooding.

9.2.4.4 Inspection and Testing Requirements

Potable Water System

Once the system is placed in service, periodic routine sampling of the water provides ongoing verification of potability.

Sanitary Waste Water System

The Sanitary Waste Water System is visually inspected to verify installation in accordance with design drawings and documents, and functionally tested to demonstrate proper system operation.

9.2.4.5 Instrumentation Requirements

Instrumentation includes pressure and flow as required for process automation, and for the visual and audible indication and alarms necessary for monitoring of system performance.

9.2.4.6 References

This section is added as a supplement to the U. S. EPR FSAR.

ANSI, 2004. Emergency Eyewash and Shower Equipment, ANSI Z358.1, American National Standards Institute, 2004.

CFR, 2008. Control of Releases of Radioactive Materials to the Environment, Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 60, U. S. Nuclear Regulatory Commission, 2008.}

9.2.5 Ultimate Heat Sink

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements and departure as described in the following sections.

9.2.5.1 Design Basis

A COL Applicant that references the U.S. EPR FSAR design certification will provide site specific design information corresponding to U.S. EPR FSAR Figure 9.2.5-2 [[Conceptual Site Specific UHS Systems]].

The conceptual design information is addressed as follows:

{For BBNPP, the ESWEMS performs the function of the Ultimate Heat Sink (UHS) Makeup System. The ESWEMS is schematically represented in Figure 9.2-3.

Normal essential service water makeup provides up to 856 gpm (3,240 lpm) of water to each operating ESWS cooling tower basin to replenish ESWS inventory losses due to evaporation, blowdown, and drift during normal operations and shutdown/cooldown. ESWS cooling tower blowdown discharges up to 285 gpm (1,079 lpm) of water from each operating ESWS cooling tower basin to the Combined Waste Water Retention Pond to maintain ESWS chemistry. This quantity is based on maintaining three cycles of concentration in the cooling tower basin with 81° F (27° C) ambient wet bulb temperature. Based on Susquehanna River chemistry, three cycles of concentration were conservatively selected for cooling tower operation. Estimated maximum cooling tower blowdown and makeup rates are based on three cycles of concentration. This is consistent with typical cooling tower operation of 3 to 5 cycles of concentration when using surface water makeup.

The ESWEMS, schematically represented in Figure 9.2-3, provides up to 400 gpm (1,515 lpm) of water to each operating ESWS cooling tower basin to replenish ESWS inventory losses due to evaporation, drift, and incidental system leakage starting 72 hours after an accident. 72 hours after a Design Basis Accident, the losses due to evaporation are 200 gpm (757 lpm) and intermittent strainer backwash flows are 110 gpm (416 lpm). The maximum evaporative loss requires a makeup flow rate of 200 gpm (757 lpm) to the UHS cooling tower basins vice the 300 gpm (1,136 lpm) identified in the U.S. EPR Tier 1 Section 2.7.11.8 and Tier 2 FSAR Table 9.2.5-2 and U.S. EPR FSAR Chapter 16, Generic Technical Specifications. This different required flow rate is also identified in BBNPP FSAR Chapter 16 and BBNPP COLA Part 4, Technical Specifications. The departure from Tier 2 information and the exemption request from Tier 1 information are discussed in BBNPP COLA Part 7, Departures and Exemption Requests. Drift, UHS cooling tower basin seepage and leakage flow rates are negligible with respect to pump capacity. This quantity is based on maximum evaporative losses 72 hours post-accident, with the ambient conditions matching the historical worst case consecutive 27-day period. The worst case 27-day period for evaporation is based on the worst consecutive 27 day period of meteorological data from the Wilkes-Barre/Scranton National Weather Service site from 1965 to 2001. The water supply for the ESWEMS is contained in a safety-related retention pond that is sized using the worst case 30-day period, as described in FSAR Section 9.2.5.3, and accounts for seepage and pond evaporation or ice cover. The maximum emergency makeup water supply temperature is 95°F and the minimum is 32°F. The maximum operating pressure for the ESWEMS is approximately 43 psig.

During a design basis accident, the ESWS Cooling Tower for one train has an evaporative loss of 571 gpm (2,160 lpm), and blowdown is secured.

The ESWS makeup chemical treatment system provides a means for adding chemicals to the normal ESWS makeup system. This is done to limit corrosion, scaling, and biological contaminants in order to minimize component fouling. Normal makeup water to the ESWEMS Retention Pond is from the Raw Water Supply System (RWSS), which supplies filtered water from the Susquehanna River. The chemical treatment details for the ESWS are discussed in BBNPP ER Sections 3.3 and 3.6.}

9.2.5.2 System Description

The U. S. EPR FSAR includes the following COL Items in Section 9.2.5.2:

> A COL applicant that references the U.S. EPR design certification will provide site-specific information for the UHS support systems such as makeup water, blowdown and chemical treatment (to control biofouling).

> A COL applicant that references the U.S. EPR design certification will compare site-specific chemistry data for normal and emergency makeup water to the parameters in Table 9.2.5-5. If the specific data for the site fall within the assumed design parameters in Table 9.2.5-5, then the U.S. EPR standard design is bounding for the site. For site-specific normal and emergency makeup water data or characteristics that are outside the bounds of the assumptions presented in Table 9.2.5-5, the COL applicant will provide an analysis to confirm that the U.S. EPR UHS cooling towers are capable of removing the design basis heat load for a minimum of 30 days without exceeding the maximum specified temperature limit of the ESWS and minimum required basin water level.

> A COL applicant that references the U.S. EPR design certification will provide a description of materials that will be used for the UHS at their site location, including the basis for determining that the materials being used are appropriate for the site location and for the fluid properties that apply.

The COL Items are addressed as follows:

{Section 9.2.5.2.1 through Section 9.2.5.2.4 are added as a supplement to the U. S. EPR FSAR.}

9.2.5.2.1 Normal ESWS Makeup

{Normal ESWS makeup water is provided to the ESWS cooling tower basins using filtered water from the Susquehanna River. FSAR Section 9.2.9 provides additional discussion of the Raw Water Supply System (RWSS) that supplies water for the initial fill and makeup water for the ESWS under normal operation. Normal ESWS makeup water is delivered from the BBNPP Intake Structure to the power block area in a single header from which four branch lines feeds each of the four ESWS divisions. Each ESWS division's normal makeup line ties into its ESWS emergency makeup line (i.e., UHS makeup water line) through a safety-related motor operated valve (MOV) in the ESWS pumphouse at the ESWS cooling tower basin. The tie-in point is inboard of (or downstream of) the ESWEMS isolation MOV. The normal makeup water isolation valves and the ESWEMS isolation MOVs are in the certified design scope and are addressed herein for additional clarity.

Heat tracing will be used as necessary for freeze protection of normal ESWS makeup piping to ensure its availability during low temperature conditions.}

9.2.5.2.2 Blowdown

{Blowdown from the ESWS cooling tower basins is a non safety-related function. The site-specific blowdown arrangement for each ESWS cooling tower basin is a line that runs from the ESWS pump's discharge piping to a header in the yard area where all four blowdown lines join. The header then runs to the Combined Waste Water Retention Pond.

The connection at the ESWS pump discharge is made through a safety-related MOV that closes automatically in the event of a DBA to ensure ESWS integrity. The normal blowdown isolation MOVs are in the certified design scope and are discussed herein for additional clarity.

An alternate blowdown path is provided from the same pump discharge connection through a second safety-related MOV in case the normal path is unavailable. The alternate blowdown isolation MOVs are in the certified design scope and are discussed herein for additional clarity.

Heat tracing will be used as necessary for freeze protection of site-specific blowdown piping to ensure its availability during low temperature conditions.

Under normal operating conditions and shutdown/cooldown conditions, the normal blowdown valves automatically modulate blowdown flow from their ESWS trains to the Combined Waste Water Retention Pond to help ensure cooling water chemistry remains within established limits.}

9.2.5.2.3 {Essential Service Water Emergency Makeup System

Emergency makeup water for the ESWS is provided by the site-specific, safety-related Essential Service Water Emergency Makeup System (ESWEMS) that draws water from a site specific retention pond. Makeup water enters the ESWEMS Pumphouse through bar screens that remove large debris and trash that may be entrained in the flow.

The ESWEMS Pumphouse is shown in Figure 9.2-4 (Floor Plan) with the section views provided in Figure 9.2-5, Figure 9.2-6, Figure 9.2-7 and plan views of the pump well (Figure 9.2-8), the Mezzanine (Figure 9.2-9) and the roof (Figure 9.2-10). The intake design and height of the pump inlet from the bottom of the intake are based on the recommendations of ANSI/HI 9.8-1998 (ANSI/HI, 1998) to minimize the likelihood of vortex formation.

There are four independent ESWEMS trains, one for each ESWS division. Each parallel and identical train is structurally isolated by adjacent concrete walls within the ESWEMS Pumphouse. Each train consists of one vertical wet pit pump, a discharge check valve, a self-cleaning automatic strainer, a pump discharge isolation valve (all housed in the ESWEMS Pumphouse), and the underground piping running up to and into the ESWS Pumphouse at the ESWS cooling tower basin. The ESWEMS isolation MOV is located inside the ESWS pumphouse at the connection to the ESWS cooling tower basin. The ESWEMS isolation MOVs are in the certified design scope and are discussed herein for additional clarity.

In addition, each train has a recirculation line that runs from just upstream of the isolation MOV at the ESWS cooling tower basin, through a safety-related MOV, back to the ESWEMS Retention Pond. After 72 hours have elapsed under accident conditions, the safety-related recirculation isolation MOVs operate in conjunction with the ESWEMS isolation MOVs to allow the ESWEMS pumps to operate within their optimum range by modulating the flow of water back to the ESWEMS Retention Pond, based on control inputs from the ESWS Cooling Tower basin water level control systems. The ESWS Cooling Tower basin level control system is in the certified design scope and is discussed herein for additional clarity.

Instrumentation and controls are provided for monitoring and controlling individual components and system functions.

Heat tracing will be used as necessary for freeze protection of ESWEMS piping to ensure its availability during low temperature conditions.

The pump, check valve, and strainer for each train are located in one of four separate pump bays in the ESWEMS pumphouse. The associated electrical switchgear and equipment for each train's pump and MOV is similarly housed in the same pump bay as its corresponding train.}

9.2.5.2.4 ESWS Makeup Water Chemical Treatment

{Chemical additives are used in the ESWS cooling towers to reduce scaling and corrosion, and to treat potential biological contaminants, which are added via the ESWS normal makeup water piping. The ESW makeup chemical treatment system provides the chemistry control to the ESWS cooling tower basins. Chemicals can be added to the ESWEMS Retention Pond through the Raw Water Supply System.

The treatment system consists of multiple skid-mounted arrangements, one for each ESWS cooling tower. Each skid contains the equipment, instrumentation and controls to fulfill the system's function of both monitoring and adjusting water chemistry. The root valves at the connections of sample lines to the ESWS piping are safety-related as necessary to ensure the integrity of ESWS piping during and following a DBA.

The specific chemicals and addition rates are determined by periodic water chemistry analyses. The cooling system water will be chemically treated to adjust pH and to control deposits, corrosion, and biological growth. Specific chemicals and concentrations are discussed in detail in BBNPP ER Section 3.3 and 3.6.

Heat tracing will be used as necessary for freeze protection of the Chemical Treatment System to ensure its availability during low temperature conditions.

Additions to the ESWS cooling towers are made as necessary on a periodic or continuing basis.

The Susquehanna River is the source of water supplied by the RWSS. This water is characterized as moderately hard, alkaline water with a low dissolved solids content averaging 143 mg/l.

An oxidizing biocide is selected to control microbiological growth in service water piping to control fouling, microbiological deposits, and microbiological related corrosion in service water piping. Sodium hypochlorite solution is injected intermittently in the RWSS makeup line to the ESWEMS Retention Pond to minimize fouling in the makeup line. Facilities for sodium hypochlorite storage and injection also will be located near the river intake structure and chemicals will be injected near the RWSS pumps.

All components of the RWSS chemical treatment system are constructed of materials compatible with the chemicals utilized in the treatment system.

(TBD) - Site-specific chemistry comparison for normal and emergency makeup water.}

9.2.5.3 Component Description

9.2.5.3.1 Mechanical Draft Cooling Towers

The U.S. EPR FSAR includes the following COL Items in Section 9.2.5.3.1:

> A COL applicant that references the U.S. EPR design certification will confirm that the site characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor does not exceed the value provided in Table 9.2.5-2. If the value in Table 9.2.5-2 is exceeded, the maximum UHS cold-water return temperature of 95°F is to be confirmed by analysis (see Section 9.2.5.3.3).

> A COL applicant that references the U.S. EPR design certification will perform an evaluation of the interference effects of the UHS cooling tower on nearby safety-related air intakes. This evaluation will confirm that potential UHS cooling tower interference effects on the safety related air intakes does not result in air intake inlet conditions that exceed the U.S. EPR Site Design Parameters for Air Temperature as specified in Table 2.1-1.

The COL Items are addressed as follows:

Confirmation that the site characteristic sum of 0% exceedance maximum non-coincident wet bulb temperature and the site-specific wet bulb correction factor do not exceed the value provided in U.S. EPR FSAR Table 9.2.5-2, or an analysis that the maximum UHS cold-water return temperature does not exceed 95°F, if applicable, is provided in Section 9.2.5.3.3.

Confirmation that potential UHS cooling tower interference effects on the safety-related air intakes does not result in air intake inlet conditions that exceed the U.S. EPR FSAR Table 2.1-1, Site Design Envelope Parameters for Air Temperature, is provided in Section 9.2.5.3.3.

9.2.5.3.2 Piping, Valves, and Fittings

No departures or supplements.

{The following sections are added as a supplement to the U.S. EPR FSAR.

ESWEMS Pumphouse Bar Screens

The ESWEMS Pumphouse includes four bar screens, one in each pump bay. These screens are designed to Seismic Category II requirements. They prevent debris from passing into the ESWEMS pumps, and subsequently into the Component Cooling Water System heat exchangers, as well as the intercoolers, lube oil coolers, and water jackets of the emergency diesel generators. The influent flow past the bar screens (less than one foot per minute) is not sufficient enough to warrant an automatic screen wash system. The screens can be cleaned at regular maintenance intervals. The bar screens have a large enough face area that potential blockage to the point of preventing the minimum required flow through them is not a concern. The screens are sufficiently submerged approximately 30 ft (9 m) below the nominal surface grade that frazil ice blockage is not a concern.

ESWEMS Pumps

There are four vertical turbine pumps, each rated at 400 gpm (approximately 1,515 l/min) minimum, with a minimum developed head of 100 feet. Each pump is driven by an electric motor, and is equipped with intake screens to protect the pump suctions from debris and a discharge check valve. They are designed to ASME Section III, Class 3 requirements, and constructed of materials compatible with the ESWS makeup water.

The system pressure loss calculation includes 20% margin to account for aging and fouling and a 5 psi drop across the automatic strainer. The 400 gpm capacity of the ESWEMS pumps results in 29% margin over the required flow rate of 310 gpm.

The minimum allowable head of the ESWEMS pump provides 107% margin over the 48 ft required head of the system, which includes the 20% aging and fouling factor.

ESWEMS Recirculation Valves

The ESWEMS recirculation isolation valves are safety-related MOVs designed to ASME Section III, Class 3 requirements, and are made of materials compatible with the emergency makeup water.

ESWEMS Self Cleaning Strainers

There are four ESWEMS self-cleaning strainers, one on the discharge side of each ESWEMS pump. They are designed to ASME Section III, Class 3 requirements, and constructed of materials compatible with the makeup water.

The strainers remove debris from the process flow that could cause sedimentation buildup in the ESWS Cooling Tower basins. The pressure relief backflush process of the strainer is initiated by either the signal of the differential pressure measuring transmitter or via manual operator initiation. The strainer setpoint will be based on limiting the differential pressure across the strainer to the value assumed in the ESWEMS pump sizing basis calculation. Effluent from the strainers is returned to the ESWEMS Retention Pond through the ESWEMS recirculation/bypass line.

ESWEMS Piping

The ESWEMS piping is sized to provide sufficient flow rates of makeup water to replenish losses from evaporation, drift, leakage and UHS cooling tower basin seepage under DBA conditions and the worst anticipated environmental conditions while maintaining flow velocity less than 10 feet per second.

The ESWEMS piping and fittings are designed to ASME Section III, Class 3 requirements, including normal operation and anticipated transient conditions. They are constructed of materials compatible with the makeup water. There is also non-ASME Section III piping meeting the requirements of ASME B31.1. Failure of the B31.1 piping will not degrade the safety function of the ESWEMS; therefore, it is classified as Seismic Category II or Non-Seismic. The ESWEMS ASME Section III, Class 3 piping design will be reviewed for water hammer susceptibility during detailed design.

ESWEMS Instrumentation and Alarms

ESWEMS instrumentation indications as shown in Figure 9.2-3 are available locally and in the main control room. A list of ESWEMS alarms is provided in Table 9.2-1.

ESWEMS Retention Pond

The ESWEMS Retention Pond is an excavation in existing soils. Embankments are provided for additional freeboard and as required to match higher topography, but are not necessary to maintain the required volume of water for emergency makeup. The total volume of the Retention Pond includes the evaporation and drift makeup requirements of the UHS cooling towers, 30 days of Retention Pond seepage loss, and the greater of either 30 days of pond evaporation or the volume of water lost to ice cover. No additional volume is needed for the ESWEMS pump NPSH requirements.

The approximate dimensions of the pond at grade 700 ft (213 m) North American Vertical Datum, 1988 (NAVD 88) are 700 ft (213 m) by 400 ft (122 m). The bottom of the pond elevation is 678 ft (207 m) NAVD 88, and the side slopes are 3 horizontal to 1 vertical. The side slopes are protected by riprap from the surrounding grade elevation to 688 ft (210 m) NAVD 88. The normal water level in the pond is elevation 695 ft (212 m) NAVD 88. A reinforced concrete outlet structure is provided for outflow from the pond.

Approximately 76.6 acre-ft of water is maintained below the normal operational water level of 17 ft (5 m), elevation 695 ft (212 m) NAVD 88. The minimum required level 12 ft (4 m), elevation 689.5 ft (210.2 m) NAVD 88, which maintains a volume of approximately 50.3 acre-ft. The ESWEMS Retention Pond was sized for the design basis LOCA in accordance with NRC Regulatory Guide 1.27 (NRC, 1976) assuming the ESWEMS does not start up until 72 hours post-accident with two ESWS trains running. The total inventory loss from the ESWEMS retention pond during the 30 day period under the most limiting meteorological conditions (maximum evaporation conditions) was conservatively calculated to be 46.4 acre-ft. The worst case environmental conditions are based on 30 years of historical meteorological data for the area as required by Regulatory Guide (RG) 1.27 (NRC, 1976). The lowest day of average relative humidity is combined with the highest average monthly insolation and the 1% exceedance extreme annual wind speed to create a synthetic day for single day worst case pond evaporation. This synthetic day is then repeated for 30 consecutive days to create a conservative 30 day period. This inventory loss consists of the following calculated losses and design allowances: (1) 34.2 acre-ft for cooling tower evaporation; (2) 9.8 acre-ft for loss to an ice cover; (3) 2.4 acre-ft for pond seepage. The total water remaining after 30 days is 3.9 acre-ft. All of the remaining water is usable, which provides a margin greater than 8% of the total volume requirement.

Degradation due to siltation will not occur because of the normally quiet state of the pond and the composition of the in situ clay materials.

Structural design of the ESWEMS Retention Pond is discussed in Section 3.8.4.

A non seismic makeup line provides normal makeup water for the pond. The source of the makeup water is the RWSS. Plant procedures control makeup to the ESWEMS Retention Pond.

ESWS Cooling Tower Blowdown System Piping, Valves and Fittings

The ESWS Cooling Tower Blowdown System components downstream of the safety-related MOV are non-safety-related. They are made of carbon steel material.

Chemical Treatment System Components

The components of the chemical treatment system are non-safety-related. The components include metering pumps, pipes, chemical storage tanks, control valves, and sampling valves and lines.

All of these components are constructed of materials compatible with the chemicals utilized in the treatment system.}

9.2.5.3.3 Cooling Tower Basin

The U.S. EPR FSAR includes the following COL Items in Section 9.2.5.3.3:

> A COL applicant that references the U.S. EPR design certification will confirm by analysis of the highest average site-specific wet bulb and dry bulb temperatures over a 72-hour period from a 30-year hourly regional climatological data set that the site-specific evaporative and drift losses for the UHS are bounded by the values presented in Table 9.2.5-3.

> A COL applicant that references the U.S. EPR design certification will confirm that the maximum UHS cold-water return temperature of 95°F is met by an analysis that confirms that the worst combination of site-specific wet bulb and dry bulb temperatures over a 24-hour period from a 30-year hourly regional climatological data set are bounded by the values presented in Table 9.2.5-4.

> A COL applicant that references the U.S. EPR design certification will confirm that the site-specific UHS makeup capacity is sufficient to meet the maximum evaporative and drift water loss after 72 hours through the remainder of the 30-day period consistent with RG 1.27.

The COL Items are addressed as follows:

{Conditions for Maximum Evaporation in the Ultimate Heat Sink

In accordance with Regulatory Guide 1.27 Section C.1 (NRC, 1976), the meteorological conditions resulting in maximum evaporation and drift loss should be the worst 30-day average combination of controlling parameters (wet bulb and dry bulb temperatures). Monthly design wet bulb and mean coincident dry bulb temperature values were determined by the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) using 30 years (1972-2001) of meteorological data from Wilkes- Barre/Scranton, Pennsylvania (ASHRAE, 2005). The highest monthly design wet bulb and mean coincident dry bulb temperature values reported were for the month of July. The 0.4% design values (the values that would be exceeded 0.4% of the time in the month of July or roughly 3 hours out of 744) are 77.4°F (25.2°C) and 87.6°F (30.9°C) for the wet and coincident dry bulb temperature values, respectively. The 1% design values are 76.2°F (24.6°C) and 85.8°F (29.9°C) for the wet and coincident dry bulb temperature values, respectively. The 2% design values are 75.1°F (23.9°C) and 84.1°F (28.9°C) for the wet and coincident dry bulb temperature values, respectively.

The National Climatic Data Center identifies both the BBNPP site and Wilkes- Barre/Scranton as being within the same climate division. A climate division represents a region within a state that is as climatically homogeneous as possible. As such, it is deemed acceptable to use Wilkes-Barre/Scranton high temperature statistics to characterize the BBNPP site.

Another meteorological condition to consider is the maximum one-hour dry bulb temperature. The maximum one-hour dry bulb temperature determined for Wilkes- Barre/ Scranton over the period 1950-2000 is 101°F (38.3°C). The maximum one-hour dry bulb temperature determined for Berwick, PA, over the period 1944-1978 is 103°F (39.4°C). While the Berwick data are not as recent as the Wilkes-Barre/Scranton data, the maximum hourly temperature for Berwick is provided since Berwick is approximately 4 miles (6.4 km) from the BBNPP site, while the Wilkes-Barre/Scranton International Airport in Avoca, PA, is located approximately 40 miles from the BBNPP site.

The meteorological conditions resulting in minimum cooling due to evaporation of water should be periods of high wet bulb temperature values. Using 30 years (1972-2001) of meteorological data from Wilkes-Barre/Scranton, Pennsylvania, the annual average wet bulb temperature that is exceeded only 0.4% of the time per year is 74.6°F (23.7°C) (ASHRAE, 2005). The annual average wet bulb temperature that is exceeded only 1% of the time per year is 73.0°F (22.8°C). The annual average wet bulb temperature that is exceeded only 2% of the time per year is 71.5°F (21.9°C).

According to information from ASHRAE (ASHRAE, 2005), the 100-year return period values of maximum and minimum dry bulb temperature are 101.4°F (38.6°C) and - 23.7°F (-30.9°C), respectively. The 100-year return period value of maximum wet bulb temperature coincident with the 100-year return period value of maximum dry bulb temperature is 80.6°F (27.0°C). The 100-year return period value of maximum wet bulb temperature (non-coincident) is 91.5°F (33.1°C).

(TBD) – U.S. EPR FSAR Table 9.2.5-2, 0% exceedance value confirmed UHS coldwater return temperature maximum of 95°F not exceeded.

(TBD) - Cooling tower interference on safety-related intakes.

(TBD) - U.S. EPR FSAR Table 9.2.5-3 values bounded for 72 hour period evaporative and drift losses.

(TBD) – U.S. EPR FSAR Table 9.2.5-4 values bounded for 24 hour period for 95°F UHS cold-water return temperature.

(TBD) – UHS Makeup capacity sufficient for maximum evaporative and drift water losses 72 hours through 30 days.}

9.2.5.3.4 Coarse and Fine Screens

No departures or supplements.

9.2.5.4 System Operation

9.2.5.4.1 Normal Operating Conditions

{The normal ESWS makeup is supplied by the RWSS from the Susquehanna River. The RWSS provides filtered water from the media filter beds located in the Water Treatment Building to each of the ESWS cooling tower basins. The two operating ESWS divisions have the normal makeup MOVs open, while the two standby divisions' normal makeup MOVs are closed.

Blowdown from each train is aligned to the Combined Waste Water Retention Pond, with flow rate controlled by manual adjustment of the safety-related motor operated blowdown isolation valve.

The ESWEMS for each division is in standby, with the ESWEMS isolation MOV at the ESWS cooling tower basin closed. The recirculation line's MOV is also closed. The ESWS normal makeup MOVs, blowdown isolation MOVs and ESWEMS isolation MOVs are in the certified design scope and are discussed herein for additional clarity.

Periodic surveillance testing is conducted to demonstrate ESWEMS operability.}

9.2.5.4.2 Abnormal Operating Conditions

{On receipt of an accident signal, the normal ESWS Makeup Water System isolation MOVs that are open will close; those that are closed will remain closed. In addition, the ESWS cooling tower blowdown isolation valves will close. None of these safety-related valves can be opened until the accident signal is cleared. For the first 72 hours after a DBA, the ESWS relies on the cooling tower basin inventory to make up for system losses due to evaporation. Subsequent action is manually initiated from the main control room or locally, based on operators' judgment resulting from prevailing conditions and indications. This includes initiating the ESWEMS makeup flow to two of the four ESWS cooling tower basins. The safety-related recirculation isolation MOVs operate in conjunction with the ESWEMS isolation MOVs to allow the ESWEMS pumps to operate within their optimum range by modulating the flow of water back to the ESWEMS Retention Pond, based on control inputs from the ESWS Cooling Tower basin water level control systems. The ESWS normal makeup MOVs, blowdown isolation MOVs, ESWEMS isolation MOVs and ESWS cooling tower basin level control systems are in the certified design scope and are discussed herein for additional clarity.}

9.2.5.5 Safety Evaluation

{This section of the U.S. EPR FSAR is incorporated by reference with the following supplemental information.

> Section 9.2.5.5 of the U.S. EPR FSAR discusses the need to verify that the makeup water supply is sufficient for the site-specific ambient conditions. Per the U.S. EPR FSAR, this is addressed as part of COL Item 2.0-1. BBNPP utilizes Table 2.0-1 in order to respond to COL Item 2.0-1. Table 2.0-1 refers to FSAR Section 9.2.1 with respect to the acceptability of site-specific temperature characteristics for the U.S. EPR FSAR, UHS Design.

Normal ESWS makeup is a non-safety-related function, and thus requires no safety evaluation with respect to design basis events. Similarly, both cooling tower blowdown and chemical treatment are non safety-related functions and require no safety evaluation. However, the connections to safety-related piping through which the blowdown function is made and the accompanying isolation valves are safety-related, which ensures the integrity of the safety-related piping in the event of a DBA. The safety-related blowdown isolation valves are in the certified design scope and are discussed herein for additional clarity.

The ESWEMS function is to provide reliable makeup to the ESWS cooling tower basins, starting no later than 72 hours after receipt of an accident signal, to ensure that sufficient makeup flow is provided so the ESWS can fulfill its design requirement of shutdown decay heat removal for a minimum of 30 days following a DBA.

This function is assured because the ESWEMS:

- Is designed, procured, constructed and operated in accordance with the criteria for ASME Section III, Class 3 safety-related systems, structures and components, and Seismic Category 1 requirements.

- Has four equivalent and completely independent trains, each capable of providing the worst case makeup flow to each ESWS train,

- Pumphouse meets the requirements of GDC 2. It has been designed for protection against seismic events, tornados, externally generated missile hazards and internal flooding. The maximum elevation of the Probable Maximum Flood (PMF) with wave run-up is below the top of the finished slab elevation, which eliminates the need to perform an external flood analysis. The effect of the maximum water level is localized to the pumpwell structure which has been analyzed for the effect of the water surge and the wave force.

- Has seismically qualified and installed (buried) piping runs from the ESWEMS pumphouse to the individual ESWS cooling tower basins,

- Is periodically performance tested and sampled to confirm operability, and

- Has bar screens large enough to preclude the occurrence of their being blocked to the extent that minimum required flow of water cannot be maintained.

Grading around the ESWEMS Retention Pond is sloped to keep surface stormwater from entering the pond. To prevent an overflow caused by malfunction of the makeup system or by rainfall accumulation in the ESWEMS Retention Pond, an outlet structure and spillway are provided to drain excess storage when the water surface in the pond exceeds the designed outlet crest elevation of 672 ft (204.8 m). Additional information related to potential flooding from the ESWEMS Retention Pond is provided in Section 2.4.8.

Internal flooding of the ESWEMS Pumphouse is discussed in Section 3.4.3.1.

In addition, reconciliation of the site-specific climatology data has demonstrated that the ESWS cooling tower performance maintains the ESWS temperature below the required 95°F (35°C).}

9.2.5.6 Inspection and Testing Requirements

{The ESWEMS components, including the safety-related makeup recirculation isolation valves, are procured and fabricated in accordance with the quality requirements for safety-related ASME Section III, Class 3 systems, structures and components to ensure compliance with approved specifications and design documents.

Installation of individual components and overall system construction are inspected to verify the as-built condition is in accordance with approved drawings. Performance testing upon completion of construction verifies the system's ability to perform its design safety function.

Finally, periodic surveillance testing of the system, including the safety-related recirculation isolation valves, provides continuing assurance of the system's ongoing capability to perform its design function. Surveillance testing includes system performance tests and inspection of individual components, as appropriate to their importance to system function and their tendency to degrade due to their operational conditions and environment.

The ESWEMS inspection and maintenance program complies with Generic Letter 89-13 (NRC, 1989) Actions I and III for open-cycle cooling water systems.

The design and installation of the ESWEMS provides accessibility for the performance of periodic inservice inspection and testing. Periodic inspection and testing of safety-related equipment (including pumps, valves, strainers, intake bay and bar screens, and associated piping) verifies its structural and leak tight integrity and its ability to fulfill its functions. Inservice inspection and testing requirements are in accordance with Section XI of the ASME Boiler and Pressure Vessel Code (BPV) (ASME, 2004a) and the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM) Code (ASME, 2004b).

A review of industry experience with ESW makeup water system design will be conducted during detailed design. Design issues identified will be considered and incorporated into the BBNPP design, as appropriate.}

9.2.5.7 Instrumentation Applications

{Instrumentation is applied to the ESWS Normal Makeup Water System, ESWEMS and blowdown, to the extent necessary to monitor essential component conditions and verify real time system performance. This includes limit switches that provide remote position indication for valves. It also includes pressure, temperature and differential pressure sensors that provide local and remote display of system pressure, temperature and flow. In addition, temperature and amperage sensors can be used for indirect flow indication and direct indication of component status. ESWEMS Retention Pond level indication and temperature is provided in each pump bay.

System performance can also be assessed using level indication on the ESWS cooling tower basins.

9.2.5.8 References

ANSI/HI, 1998. ANSI/HI 9.8, Centrifugal/Vertical Pump Intake Design, American National Standards Institute/Hydraulics Institute, 1998.

ASHRAE, 2005. American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Inc, Weather Viewer version 3.0, 2005.

ASME 2004a. Rules for Inservice Inspection of Nuclear Power Plant Components, ASME Boiler and Pressure Vessel Code, BPV Code Section XI, The American Society of Mechanical Engineers, 2004 edition.

ASME 2004b. Code for Operation and Maintenance of Nuclear Power Plants, ASME OM Code, The American Society of Mechanical Engineers, 2004 edition.

NRC, 1976. Ultimate Heat Sink for Nuclear Power Plants, Regulatory Guide 1.27, U.S. Nuclear Regulatory Commission, January, 1976.

NRC, 1989. Service Water System Problems Affecting Safety-Related Equipment, Generic Letter 89-13, U.S. Nuclear Regulatory Commission, July 18, 1989.}

9.2.6 Condensate Storage Facilities

No departures or supplements.

9.2.7 Seal Water Supply System

No departures or supplements.

9.2.8 Safety Chilled Water System

No departures or supplements.

9.2.9 Raw Water Supply System

The U. S. EPR FSAR includes the following conceptual information and COL Item in Section 9.2.9:

> [[The RWSS contains water received from a site-specific natural source and supplies it directly to the points of use where it may be further processed by the receiving plant systems. The raw water for demineralized water, potable water, fire protection, and ultimate heat sink (UHS) normal makeup is preprocessed as required by filtration, reverse osmosis, chemical treatment, and desalinization of brackish raw water sources prior to use.]] The conceptual design of the RWSS is shown in Figure 9.2.9 -1—[[Conceptual Site-Specific Raw Water Supply System]].
>
> [[The RWSS does not provide any safety-related function. There is no connection between raw water and the components of other systems that have the potential to contain radiological contamination.]]
>
> [[Non-safety-related normal makeup water is provided to the UHS cooling tower basins as clean (desalinated) water.]]

> The RWSS and the design requirements of the RWSS are site-specific and will be addressed by the COL applicant.

The conceptual information and COL Item are addressed as follows:

{Raw water is the term usually applied to untreated water. At BBNPP, the Raw Water Supply System (RWSS) supplies raw water drawn from the Susquehanna River directly to the points of use, which comprise the floor wash header, plant demineralized water, essential service water, and fire protection systems. The municipal water supply provides water to the potable and sanitary water systems as described in Section 9.2.4. Raw water pumped from the Susquehanna River passes through strainers before being delivered to the plant site. The strained raw water passes through media filters before being supplied to the demineralized water treatment system, fire protection system water storage tank, floor wash header, and ESWS Cooling Tower basins. It also supplies the initial fill for the ESWEMS Retention Pond and as needed for makeup. This encompasses the plant water demands, with the exception of potable and sanitary water Circulating Water System makeup and ESWS makeup, during emergency conditions.

Section 9.2.9.1 through Section 9.2.9.7 are added as a supplement to the U. S. EPR FSAR.

9.2.9.1 Design Basis

No cross connections exist between raw Susquehanna water supplied to the usage points and any system with the potential to carry radioactive material. This design requirement satisfies Criterion 60 of Appendix A to 10 CFR 50 (CFR, 2008).

Raw water from the Susquehanna River passes through strainers before it is delivered to the media filters. After filtration, the water is supplied to the demineralized water treatment system, the fire protection system water storage tanks, floor wash header, the essential service water system and ESWEMS Retention Pond (except under emergency operating conditions) during periods of normal power operation, shutdown, maintenance and construction. The emergency makeup to essential service water is provided by a dedicated, safety-related system. The ESWEMS is discussed in Section 9.2.5.

9.2.9.2 System Description

Raw water is distributed to the connected systems through a non-safety-related piping. The raw water supply system is a non-safety-related, non-seismic system that provides all of the water for plant use, with the exception of Circulating Water System Makeup, potable and sanitary and under emergency conditions, ESWS makeup.

The Raw Water Supply System supplies water for initial fill and makeup to the following systems:

- Essential Service Water during all but emergency conditions.
- ESWEMS Retention Pond.
- Demineralized water.
- Fire protection.

The raw water supply system is schematically represented in Figure 9.2-11.

The raw water supply system pumps provide the motive force to pump water from the Susquehanna River through the strainers and media filters and distribute it to the demineralized water, fire protection, and essential service water systems, and the ESWEMS Retention Pond, for their initial fill, and as needed for makeup. A tap is provided on the makeup line to the ESWEMS Retention Pond for injection of water treatment chemicals. Sodium hypochlorite will be injected into the piping for control of microbiological fouling. Emergency makeup to the ESWS is provided by the dedicated ESWEMS, described in Section 9.2.5. Makeup to the potable and sanitary water systems is provided by the municipal water supply as described in Section 9.2.4.

The required makeup flow to the demineralized water treatment system is 107 gpm (405 lpm) during all modes of operation. The normal and maximum RWSS makeup flows to the ESWS cooling towers are 1,713 gpm (6,484 lpm) and 3,426 gpm (12,969 lpm), respectively. During normal operation, raw water demand is approximately 1,820 gpm (6,889 lpm) (1,713 + 107 gpm). Peak demand of approximately 3,533 gpm (13,374 lpm) (3,426 + 107 gpm) occurs for approximately 4 to 6 hours during normal plant shutdown/cooldown operations, and is driven by additional makeup to the ESWS. The RWSS normal and maximum flowrates are provided in Table 9.2-2

9.2.9.3 Component Descriptions

Raw Water Piping and Valves

Raw water flows from the BBNPP Intake Structure to the Water Treatment Building and supplied systems through non-safety-related underground piping. The piping and valves which connect the system components to each other and to the supplied systems are made of carbon steel and materials compatible with the river water. The RWSS design and maximum operating temperatures are 95 °F (35 °C) and 85 °F (29.4 °C), respectively. The RWSS design and maximum operating pressures are 410 psig (2,827 kPa-gauge) and 239 psig (1,648 kPa-gauge), respectively.

Raw Water Pumps

These are vertical wet pit pumps located in the BBNPP Intake Structure. Each pump is equipped with a discharge check valve and discharge isolation valve. The combined flow from three pumps provides enough flow to supply the continuous makeup requirements for the ESWS and demineralized water, plus the single largest intermittent flow which is for a media filter backwash cycle. Each of the three pumps is sized for 2,900 gpm (10,978 lpm) and 552 ft (168 m) of total developed head.

Raw Water Strainers

An automatic, self-cleaning strainer is located at the discharge of each raw water pump. The strainers remove large particulate material from the raw water before it is pumped to the media filters and ESWEMS Retention Pond. The backwash flows from the strainers discharge to the Susquehanna River.

Raw Water Media Filters

The media filters reduce the suspended solids concentration of the raw water before it is distributed to the demineralized water treatment, fire protection, essential service water system, and ESWEMS Retention Pond. Each media filter bed is sized to filter the water required to supply two essential service water cooling towers and the demineralized water system. Discharge from the media filters provides the filtered water required to backwash the adjacent filter beds. Compressed air is used to scour the filter media in conjunction with the backwash water to improve particulate removal from the filter beds. The media filters are located in the Water Treatment Building, and the filter backwash water is discharged to the Combined Waste Water Retention Pond.

9.2.9.4 Safety Evaluation

The raw water supply system provides no safety-related function. Therefore, no safety evaluation is required with respect to plant design basis events.

There is no connection between raw water and the components or other systems that have the potential to carry radiological contamination. This complies with Criterion 60 of Appendix A to 10 CFR 50 (CFR, 2008).

With respect to potential flooding caused by failures of piping or components, the raw water piping is located remote from any safety-related systems or equipment, except for the lines connecting to the ESWS cooling tower basins and the ESWEMS Retention Pond. Failures other than at the cooling tower basin and ESWEMS Retention Pond connections will not adversely impact safety functions because the plant storm water controls are designed to divert surface water flow. The connections to the tower basins are made through safety-related motor operated valves, thereby assuring basin integrity under accident conditions. Potential leakage from the raw water lines in the essential service water pump houses is controlled, collected, and routed away by the floor drains in those structures. These floor drain lines include check valves where necessary to prevent possible backflow from causing flooding that could adversely affect the safety-related equipment. The RWSS makeup to the ESWEMS Retention Pond will discharge above the ESWEMS Retention Pond water level, through a line that runs over the top of the ESWEMS Retention Pond dike. This will minimize the potential for draining or siphoning of the pond. It will also minimize the potential for damage to the dike caused by a rupture of the RWSS makeup line. Provision is made for draining the above ground portion of the makeup line to prevent the line from freezing.

9.2.9.5 Inspection and Testing Requirements

Visual inspections are conducted during construction to verify that the as-built condition is in accordance with design documents. Pressure testing and functional testing are conducted during post-construction pre-commissioning and startup, as necessary to confirm system integrity and proper operation of individual components and the total system. Portions of the system are demonstrated with in-service leak testing where such method does not jeopardize other systems/equipment and is sufficient to demonstrate proper operation.

Ongoing system operation provides continuing demonstration of the system's functionality.

9.2.9.7 Instrumentation Requirements

Instrumentation includes sensing and display of various parameters as necessary to automate system function, and to provide for local and remote system monitoring, including alarms. These parameters include essential service water makeup flows, demineralized water system feed flow, strainer and media filter differential pressures, and pump discharge pressures. Valve position indication for selected valves and pump power on/off indication are also provided.

9.2.9.8 References

CFR, 2008. Control of Releases of Radioactive Materials to the Environment, Title 10, Code of Federal Regulations, Part 50, Appendix A, General Design Criterion 60, U. S. Nuclear Regulatory Commission, 2008.}

9.2.10 Turbine Building Closed Cooling Water System

No departures or supplements.

Table 9.2-1— {ESWEMS Alarms}

Alarm Description	Equipment and/or Process Conditions for Alarm
Pump Discharge Pressure High	Pump Discharge Pressure > LATER
Pump Discharge Pressure Low	Pump Running AND Pump Discharge Pressure < LATER
Automatic Strainer Differential Pressure High	Automatic Strainer Differential Pressure > LATER
Pump Motor, Fan Motor, Motor Operated Valve or Motor Operated Damper Overload	Control Power Available at MCC AND Overload Heaters Open at MCC
Pump or Fan Motor Failure	Start/Stop Command Sent more than LATER seconds earlier AND No Running/Stopped Feedback
Motor Operated Valve or Motor Operated Damper Travel Failure	Open/Close Command Sent more than LATER seconds earlier AND No Open/Close Valve Position Feedback
Control Power Not Available	Open or Tripped MCC Breaker
Transformer Temperature High	Transformer Temperature > LATER
Pond Temperature High	Pond Temperature > LATER
Pond Level Low	Pond Level < LATER
Pond Level Low-Low	Pond Level < LATER
Fan Tripped	Fan supposed to be running
Air Conditioning Unit Tripped	Demand for Air Conditioning Unit Operation AND No Running Feedback
Computer Room Ambient Air Temperature High	Computer Room Ambient Temperature > LATER
Computer Room Ambient Air Temperature Low	Computer Room Ambient Temperature < LATER
Pump Room Ambient Air Temperature High	Pump Room Ambient Temperature > LATER
Pump Room Ambient Air Temperature Low	Pump Room Ambient Temperature < LATER
Normal Air Filter Differential Pressure High	Normal Air Filter Differential Pressure > LATER
Emergency Air Filter Differential Pressure High	Emergency Air Filter Differential Pressure > LATER
Normal Fan Discharge Temperature High	Normal Fan Discharge Temperature > LATER
Normal Fan Discharge Temperature Low	Normal Fan Discharge Temperature < LATER
Smoke Detected	Smoke Detector Detects Smoke

Table 9.2-2— Table 9.2-2 RWSS Flowrates

RWSS Flowrates	Normal gpm (lpm)	Maximum gpm (lpm)
Media Filter Backwash to Combined Waste Water Retention Pond*	0 (0)	4,368 (16,535)
ESWEMS Retention Pond*	0 (0)	1,820 (6,889)
Demineralized Water Treatment System Tanks (DWTS)	107 (405)	107 (405)
Floor Wash	5 (19)	5 (19)
Fire Protection Water Storage Tank*	5 (19)	625 (2,366)
ESWS Cooling Tower Basins	1,713 (6,484)	3,426 (12,969)
* Intermittent flows		

Figure 9.2-1— {Potable Water}

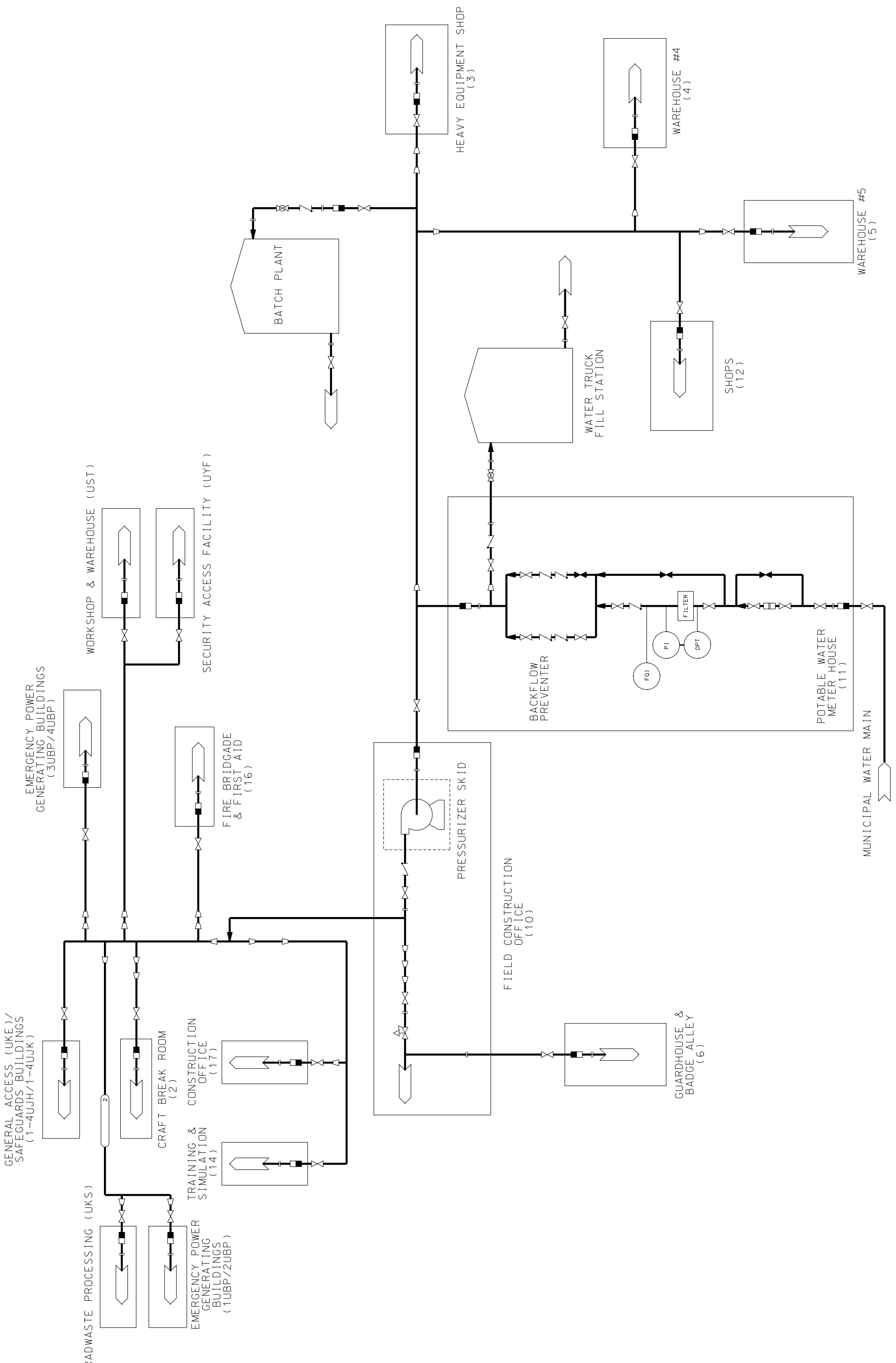


Figure 9.2-2— {Sanitary Waste Water System}

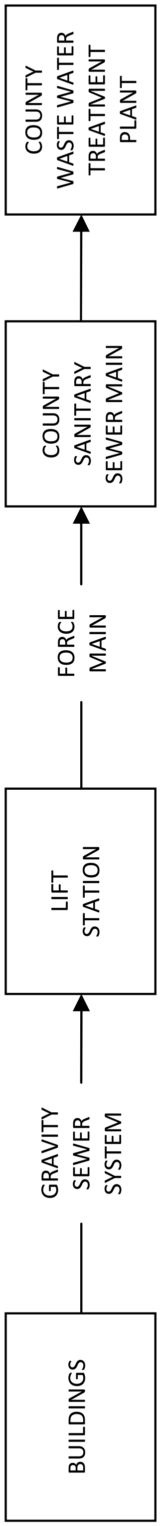


Figure 9.2-3— {ESWEMS Schematic}

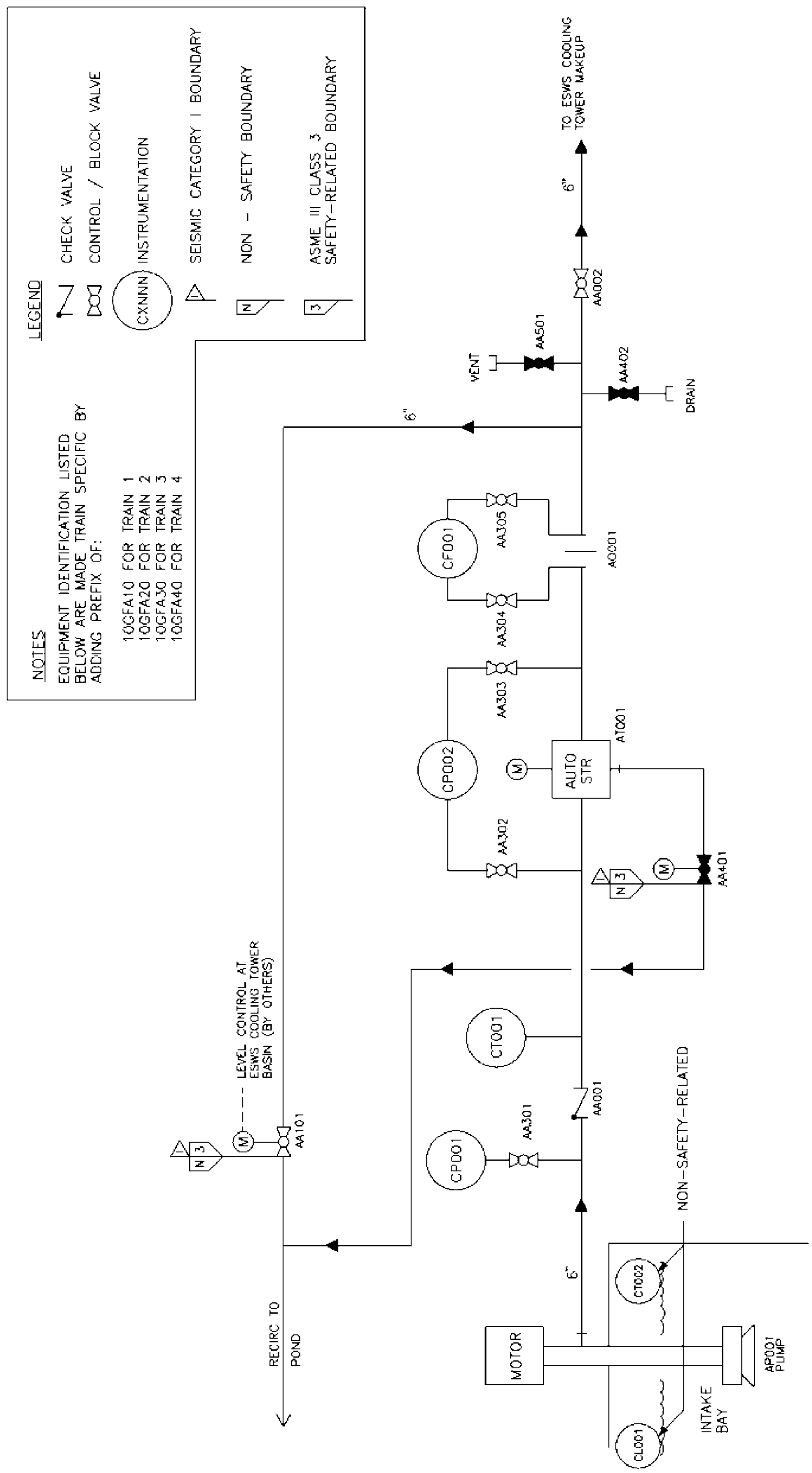


Figure 9.2-4— {Plant Arrangement - ESWEMS Pumphouse Floor Plan}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

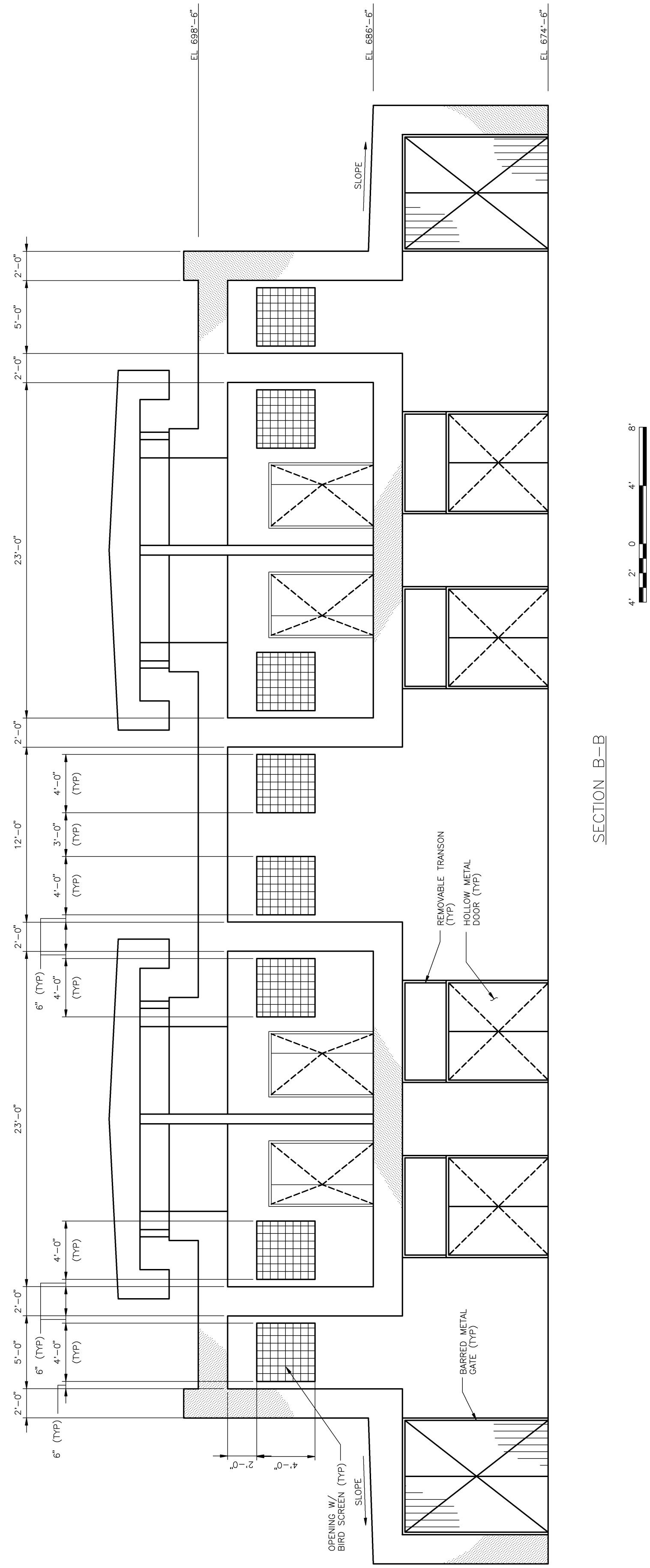
See Part 9 of the COLA Application

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9.2-5— {Plant Arrangement - ESWEMS Pumphouse Section A-A}

Figure 9.2-6— {Plant Arrangement - ESWEMS Pumphouse Section B-B}



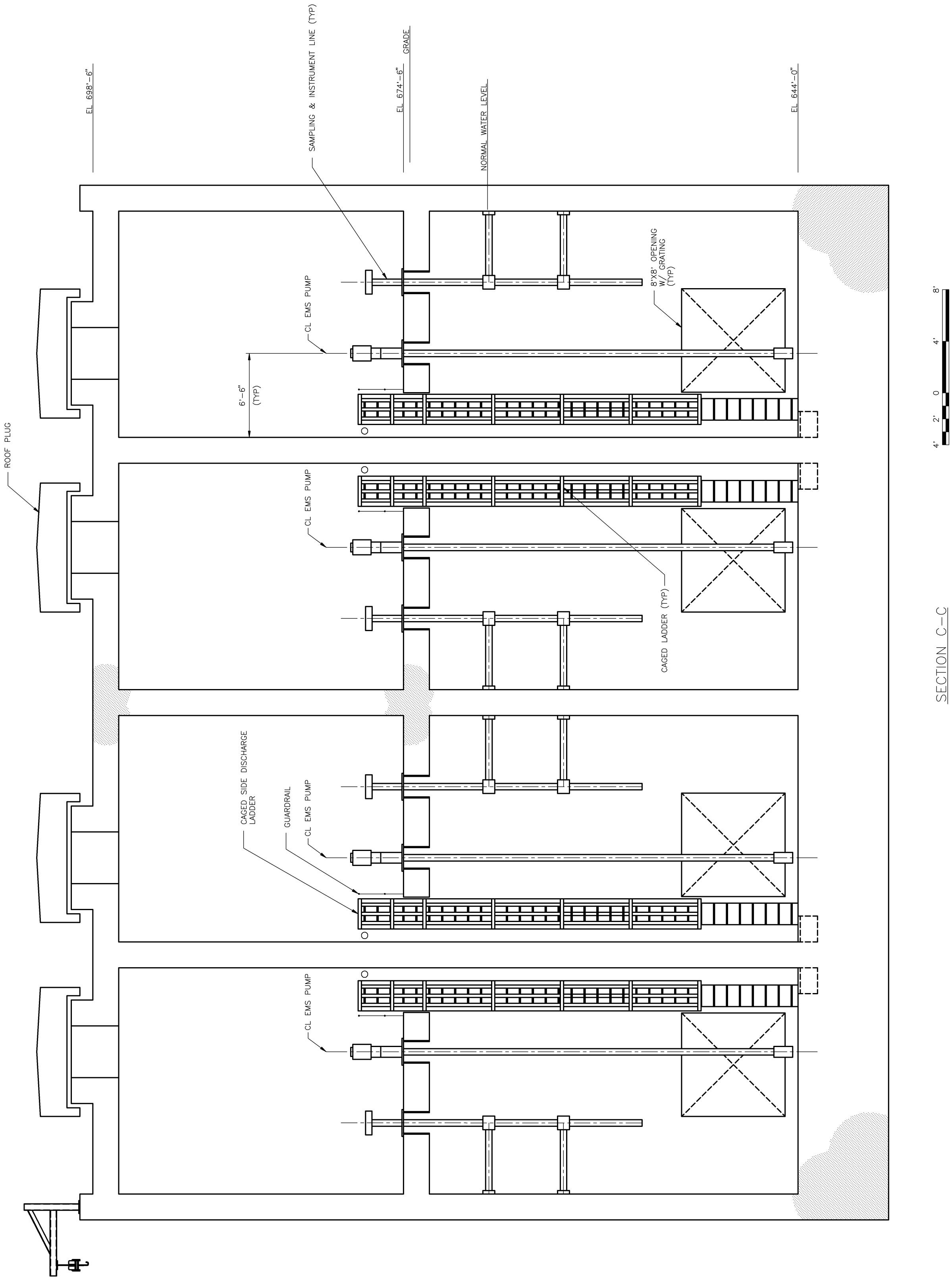


Figure 9.2-7— {Plant Arrangement - ESWEMS Pumphouse Section C-C}

Figure 9.2-8— {Plant Arrangement - ESWEMS Pumphouse Pumpwell Plan}

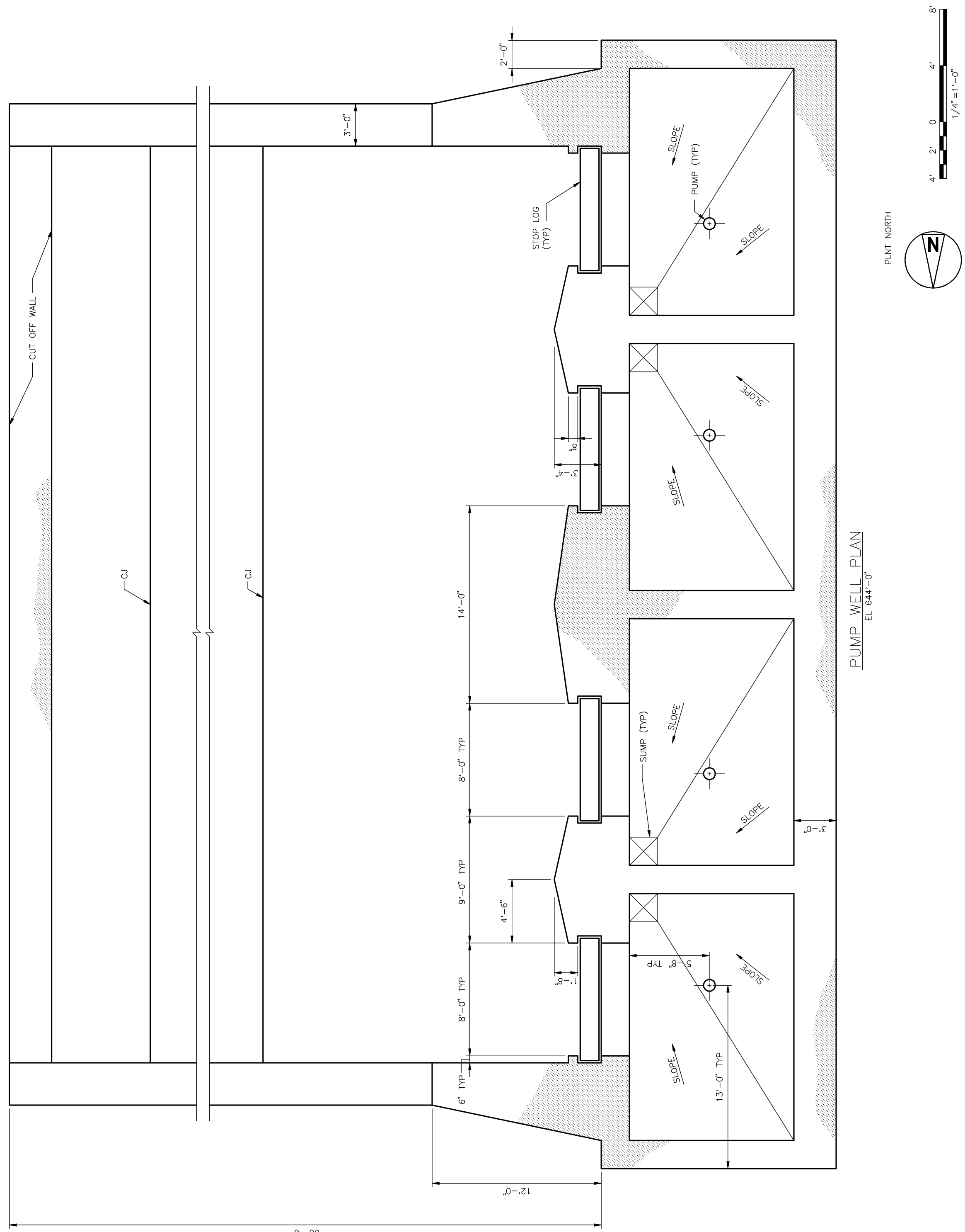
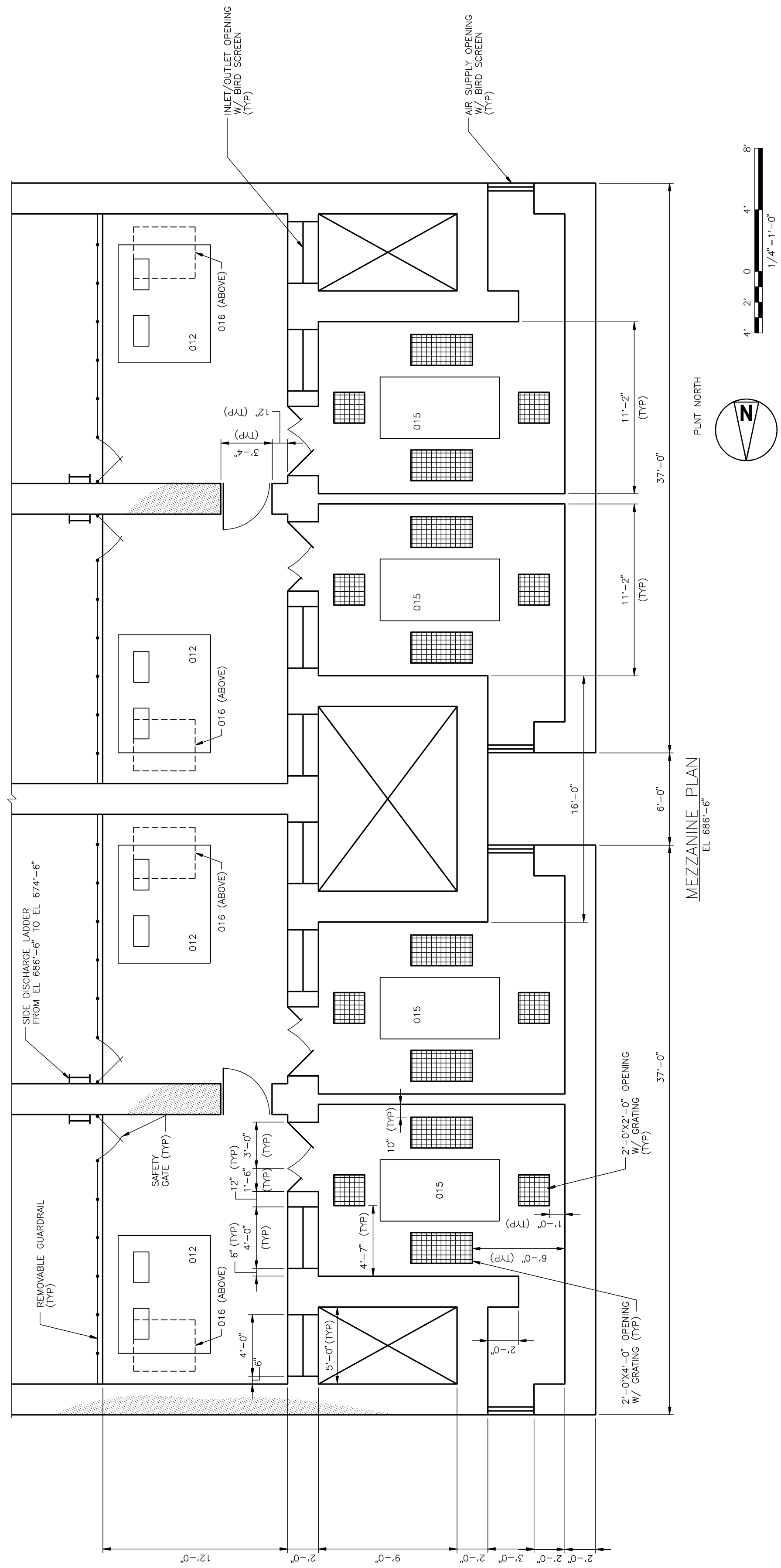


Figure 9.2-9— {Plant Arrangement - ESWEMS Pumphouse Mezzanine Plan}



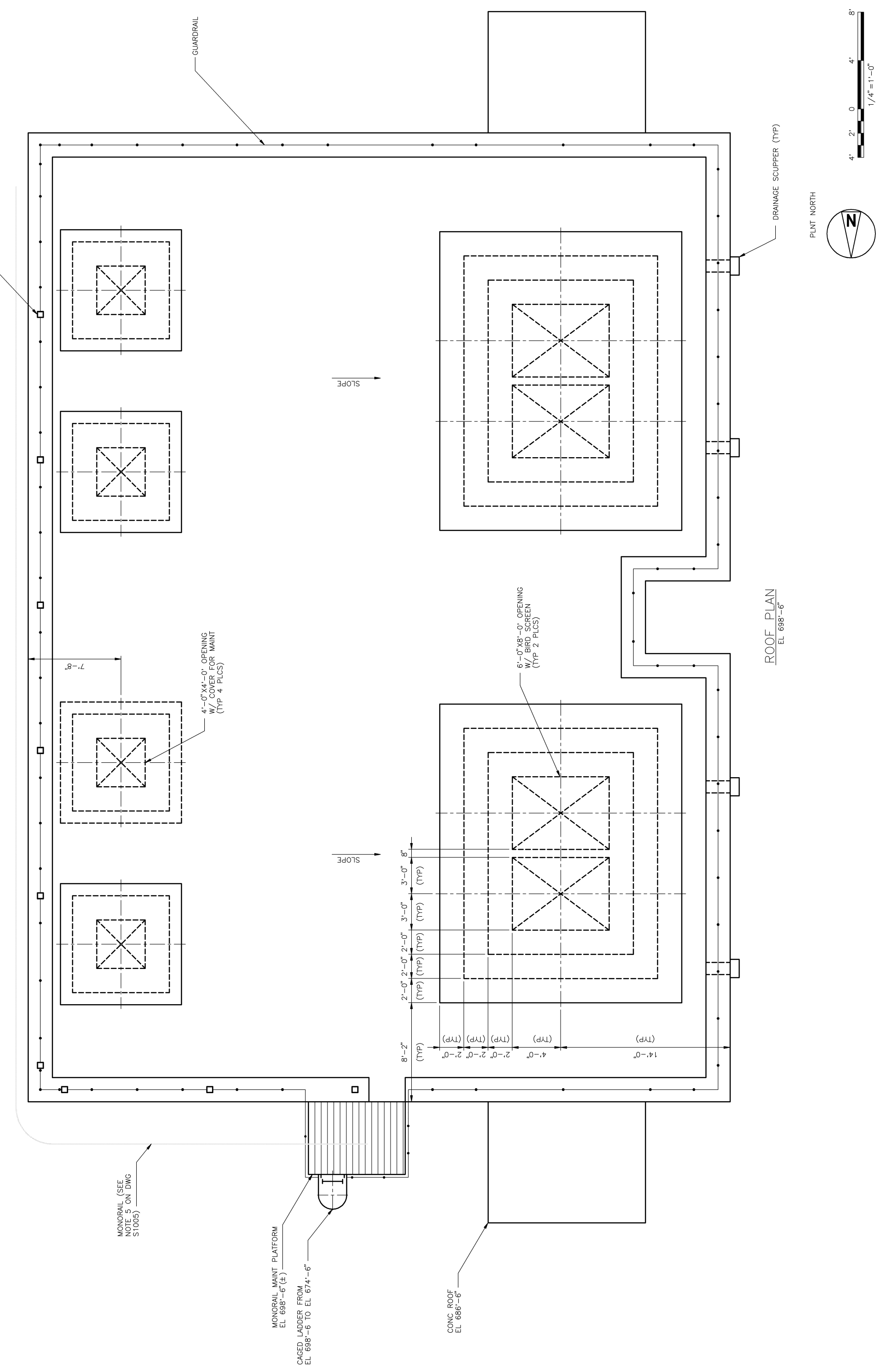
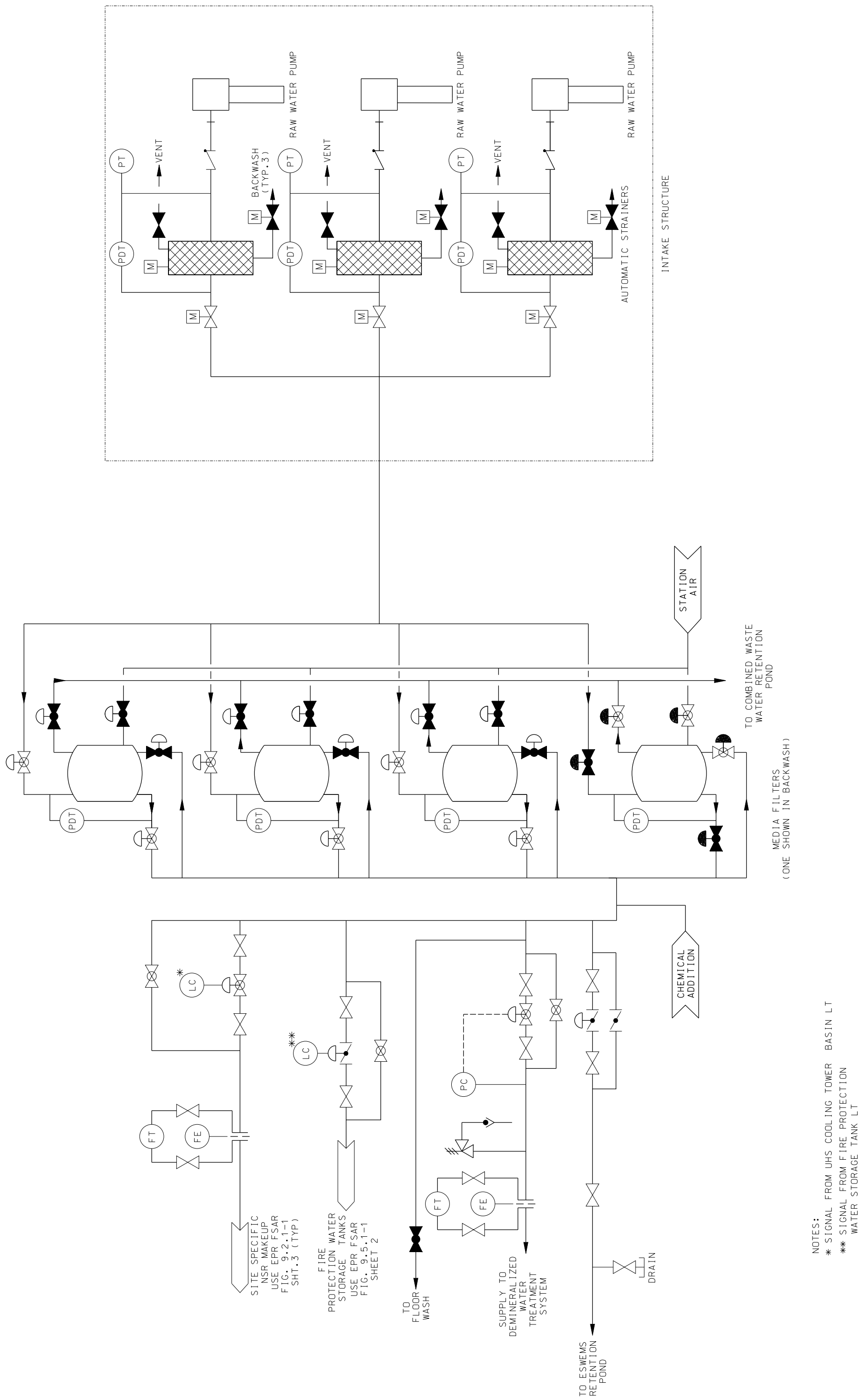


Figure 9.2-10— {Plant Arrangement - ESWEMS Pumphouse Roof Plan}

Figure 9.2-11— {Raw Water Supply System}



9.3 PROCESS AUXILIARIES

This section of the U.S. EPR FSAR is incorporated by reference.

9.4 AIR CONDITIONING, HEATING, COOLING AND VENTILATION SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

9.4.1 Main Control Room Air Conditioning System

No departures or supplements.

9.4.2 Fuel Building Ventilation System

No departures or supplements.

9.4.3 Nuclear Auxiliary Building Ventilation System

No departures or supplements.

9.4.4 Turbine Island Ventilation System

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

The U.S. EPR FSAR includes the following COL Items in Section 9.4.4:

> A COL applicant that references the U.S. EPR design certification will provide site-specific design information for the turbine building design information for the turbine building ventilation system (TBVS).
>
> A COL applicant that references the U.S. EPR design certification will provide site-specific design information for the switchgear building ventilation system (SGBVS).

The COL Items are addressed as follows:

The site-specific design information for the turbine building ventilation system is provided in sections 9.4.4.1 through 9.4.4.6.

{The SGBVS information will be included when the detailed design is sufficiently complete. The information and conclusions are expected to be similar to that provided for the TBVS in Sections 9.4.4.1 through 9.4.4.6.}

9.4.4.1 Design Basis

The turbine building does not contain safety-related equipment. Therefore, the Turbine Building Ventilation System does not serve any safety-related function, has no safety design basis, and is not required to operate during or following a design basis accident. As such, single failure, environmental qualification and redundancy are not applicable to the Turbine Building Ventilation System.

The Turbine Building Ventilation System operates during startup, shutdown, and normal plant operations to maintain acceptable air temperatures in the Turbine Building for equipment operation and for personnel working in the building. The system is not relied upon during Station Blackout and Abnormal (e.g. Loss of Off-Site Power) operation.

The Turbine Building Ventilation system is sized to provide the heating, ventilation, and cooling requirements during startup, shutdown, and normal plant operations. The system is designed to maintain a positive pressure to mitigate intrusion of dust and dirt into the Turbine Building.

The ambient outside design conditions for the Turbine Building Ventilation System are established as -10°F for the minimum temperature and 100°F for maximum temperature. The Turbine Building Ventilation System maintains the bulk average temperature within the Turbine Building during normal plant operation at or above 50°F during winter design conditions and at or below 115°F during summer design conditions.

The rate of ventilation is based on maintaining permissible temperatures in areas with appreciable heat gains. For areas with no appreciable heat gains, the rate of ventilation is based on the number of air changes per hour, depending on the specific area being ventilated.

The Turbine Building Ventilation System provides the following functions:

- Maintain personnel comfort in normally occupied areas of the building
- Maintain closed space ambient conditions for proper equipment operation within the Turbine Building
- Remove heat generated by equipment
- Provide fire dampers to separate the different fire zones
- Smoke venting of the turbine hall
- Availability of system operation with manual or automatic actuation for essential system functions

9.4.4.2 System Description

The Turbine Building Ventilation System is shown in Figure 9.4-3.

Outside air is supplied to the Turbine Building by fans via intake louvers and exhausted to the atmosphere by roof exhaust ventilators. During normal operation outside air is mixed with recirculated air to maintain a positive pressure in the Turbine Building.

The Turbine Building Ventilation System removes heat generated by equipment and from the environment to maintain acceptable indoor ambient conditions. Unit heaters are used to maintain the minimum room temperatures within the Turbine Building.

An air conditioning unit in the sampling room located on the basement floor maintains the sample lab equipment at a design minimum temperature of 50°F, and a design maximum temperature of 95°F.

There are no radiation or safety actuation signals associated with the Turbine Building Ventilation System. No Turbine Building Ventilation System realignment or operator action is required in response to plant radiation or safety actuation signals.

The Turbine Building Ventilation System is designed as a non seismic system since there are no seismic Category I SSCs inside the Turbine Building.

9.4.4.2.1 Component Description

The following components are designed to the codes and standards identified below.

Air Conditioning Unit

The air conditioning unit for the sampling room is located on the basement floor of the Turbine Building. The cooling and heating coils are designed per ASME AG-1-2003 (ASME, 2003).

Ventilation Fans

Two basic types of ventilation fans are used for air supply, exhaust, and recirculation. These are propeller fans for low pressure, and axial fans for higher pressure (ducted) applications. Fan performance is rated to Air Moving and Conditioning Association ANSI/AMCA 210 (ANSI, 1999), ANSI/AMCA 211 (ANSI, 1987), and ANSI/AMCA 300 (ANSI, 1985).

Roof Exhaust Fans

To maintain acceptable pressures within the building, roof exhaust fans are provided which work in conjunction with the relief vents. Fan performance is rated to Air Moving and Conditioning Association ANSI/AMCA 210 (ANSI, 1999), ANSI/AMCA 211 (ANSI, 1987), and ANSI/AMCA 300 (ANSI, 1985).

Relief Vents

Supply fans that are associated with relief vents are capable of recirculating the air as well as providing air to a room. The relief vents provide a flow out of the room. The relief vents are designed per ASME AG-1-2003 (ASME, 2003).

Electric and Hot Water Space Heaters

To maintain the minimum room temperatures within the Turbine Building, electric unit heaters or hot water space heaters are provided. Hot water space heaters are supplied from the space heating system with either the secondary steam or auxiliary boiler. Heaters are designed to commercial standards.

Air Filters

Air filters are provided for various fans to reduce the amount of dust within the ventilated area. The air conditioning unit contains a high efficiency air filter to reduce the amount of dust on the cooling coils. The remaining filters use moderate efficiency filters. The filters are replaceable modular filter elements. The filters are designed per ASME AG-12003 (ASME, 2003).

Louvers

Outside air is supplied by fans via intake louvers. The louvers are designed per ASME AG-1-2003 (ASME, 2003).

Dampers (manual, pneumatic, motor-operated, fire)

Manual dampers are used in the ducted system to balance airflow.

Pneumatic dampers are used to control the flow of the air through the various ductwork branches and to maintain a slight positive pressure in the building. In cases where the dampers modulate (i.e., variable intake/recirculation supplies), the dampers are of opposed blade design. Dampers used for shut-off are of parallel blade design. Motor operated dampers fail "as-is" in the case of power loss. Dampers in ductwork that exceed certain higher flow rates use airfoil shaped blades. This minimizes the pressure drop across the damper.

When ductwork passes through a fire barrier wall, fire dampers are installed in the wall with the ductwork mounted on either side. Duct access is provided for inspecting and replacing fire damper fusible links. The fire dampers have a fire rating consistent with the associated fire barrier wall rating. The dampers are designed per ASME AG-1-2003 (ASME, 2003) and UL 555-2006 (UL, 2006).

9.4.4.2.2 System Operation

The Turbine Building Ventilation System is manually controlled. Roof exhaust fans and supply fans are manually started and stopped as required to satisfy space temperature conditions and to maintain a positive pressure in the Turbine Building.

Electric unit heaters and hot water space heaters are controlled automatically or manually. In the automatic mode, the electric unit heater fan motors are thermostatically controlled by their respective space thermostats. The space heating system supplies hot water to the hot water space heaters from either the secondary steam or auxiliary boiler.

9.4.4.3 Safety Evaluation

The Turbine Building Ventilation System performs no safety-related functions; therefore a systems failure analysis is not required. The Turbine Building Ventilation System is not required to operate during or following a design basis accident.

There are no safety-related SSCs or important to safety SSCs in the Turbine Building; therefore GDC 2 is not applicable to the Turbine Building Ventilation System.

The non-safety Turbine Building Ventilation System shares no SSCs between units, therefore this does not adversely impair any safety-related system, as required by GDC 5.

The Turbine Building Ventilation System is not exposed to any radiological contamination; therefore the requirements of GDC 60 are not applicable.

9.4.4.4 Inspection and Testing Requirements

Shop inspection and testing are performed by the manufacturer for major components, including heating and cooling coils and controls.

The Turbine Building Ventilation System is designed to permit periodic inspection of system components during normal plant operation.

Fans are rated and tested in accordance with the standards of Air Moving and Conditioning Association (ANSI/AMCA 210 (ANSI, 1999), ANSI/AMCA 211 (ANSI, 1987), and ANSI/AMCA 300 (ANSI, 1985).

The performance and testing requirements of the dampers are per ASME AG-1-2003 (ASME, 2003).

The filters meet the specifications of ANSI/ASHRAE Standard 52.2 (ANSI/ASHRAE, 1999).

The ductwork meets the design, construction, and testing requirements of ASME AG-1-2003 (ASME, 2003).

9.4.4.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of remote operated dampers, instrument indications and alarms are provided in the Main Control Room (MCR). Fans, motor-operated dampers, and electric unit heaters are manual and auto-operable from the MCR.

9.4.4.6 References

ANSI, 1985. Air Moving and Conditioning Association (ANSI/AMCA) 300, Reverberant Room Method of Testing Fans for Rating Purpose, American National Standards Institute, 1985.

ANSI, 1987. Air Moving and Conditioning Association (ANSI/AMCA) 211, Certified Ratings Program-Air Performance, American National Standards Institute, 1987.

ANSI, 1999. Air Moving and Conditioning Association (ANSI/AMCA) 210, Laboratory Methods of Testing Fans of Aerodynamics Performance Rating, American National Standards Institute, 1999.

ANSI/ASHRAE, 1999. Standard 52.2, Method of Testing General Ventilation Air Cleaning Devices for Removal Efficiency by Particle Size, American National Standards Institute, 1999.

ASME, 2003. ASME AG-1-2003, Code of Nuclear Air and Gas Treatment, American Society of Mechanical Engineers, 2003.

UL, 2006. Underwriters Laboratories' Standard UL 555, Standard for Safety Fire Dampers, 2006.

9.4.5 Safeguard Building Controlled-Area Ventilation System

No departures or supplements.

9.4.6 Electrical Division of Safeguard Building Ventilation System (SBVSE)

No departures or supplements.

9.4.7 Containment Building Ventilation System

No departures or supplements.

9.4.8 Radioactive Waste Building Ventilation System

No departures or supplements.

9.4.9 Emergency Power Generating Building Ventilation System

No departures or supplements.

9.4.10 Station Blackout Room Ventilation System

No departures or supplements.

9.4.11 Essential Service Water Pump Building Ventilation System

No departures or supplements.

9.4.12 Main Steam and Feedwater Valve Room Ventilation System

No departures or supplements.

9.4.13 Smoke Confinement System

No departures or supplements.

9.4.14 Access Building Ventilation System

No departures or supplements.

9.4.15 {ESWEMS Pumphouse HVAC System

This section was added as a supplement to the U.S. EPR FSAR.

The ESWEMS Pumphouse consists of four independent ESWEMS pump bays. Each bay houses an ESWEMS pump and the associated equipment and components. The ESWEMS Pumphouse HVAC (heating, ventilation and air conditioning) System is comprised of four independent heating,ventilation and air conditioning systems, one for each ESWEMS pump bay. Each ESWEMS pump bay's HVAC system is independent and is not connected to any of the other ESWEMS pump bay's HVAC system. The ESWEMS Pumphouse HVAC System provides an environment suitable for the operation of that division's ESWEMS pump (refer to Section 9.2.5).

9.4.15.1 Design Bases

The ESWEMS Pumphouse HVAC System includes both Normal (i.e., non safety-related) and Emergency (i.e., safety-related) components, which are described further below. The ESWEMS Pumphouse HVAC Subsystem is safety-related and operates both during normal and the accident conditions to provide suitable environment for personnel access and the pump, pump motor and the associated equipment that are required to operate during the accident conditions. The ESWEMS Pumphouse HVAC Subsystem complies with the general design criteria (GDC) indicated below:

- The ESWEMS Pumphouse HVAC Subsystem maintains acceptable temperature limits to support the operation of the ESWEMS pumps that are required to operate during the design basis accident conditions. The ESWEMS Pumphouse HVAC Subsystem maintains a minimum temperature of 41°F (5°C) and a maximum temperature of 104°F (40°C). This temperature range maintains a mild environment in this building, as defined in U.S. EPR FSAR Section 3.11.

- The ESWEMS Pumphouse HVAC Subsystem and its components are located either outside within the attached missile protected air intake structure, or inside the ESWEMS Pumphouse that is designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods and external missiles (GDC 2) (CFR, 2008a).

- The ESWEMS Pumphouse HVAC Subsystem and its components are appropriately protected against the dynamic effects and designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing and postulated accidents. The components of the ESWEMS Pumphouse HVAC Subsystem remain functional and perform their intended safety functions following a postulated hazard, such as fire, internal missile, or pipe break (GDC 3 and GDC 4) (CFR, 2008b and CFR, 2008c).

- ESWEMS Pumphouse HVAC Subsystem can perform the safety functions, assuming a single active component failure coincident with the loss of offsite power.
- The active components of the ESWEMS Pumphouse HVAC Subsystem are capable of being tested during plant operations.
- The quality group classification of the components of the ESWEMS Pumphouse HVAC System is in accordance with the Regulatory Guide 1.26 (NRC, 2007a) and seismic design of the system components meets the guidance of Regulatory Guide 1.29 (NRC, 2007b).
- The power supply and control functions of the ESWEMS Pumphouse HVAC System are designed in accordance with Regulatory Guide 1.32 (NRC, 2004).

9.4.15.2 System Description

9.4.15.2.1 General Description

The ESWEMS Pumphouse HVAC System is depicted on Figure 9.4-1.

Each division of the ESWEMS Pumphouse HVAC System functions to maintain the temperature in its associated ESWEMS pump bay within the range of minimum and maximum design temperatures during plant normal, abnormal, and accident conditions. Each division of the ESWEMS Pumphouse HVAC System provides the capability to supply outside air to and exhaust from the rooms. Each division also includes four recirculating unit heaters and an Emergency Air Conditioning System. The normal supply air flow path includes a missile protected outside air intake, a safety-related intake damper, a non safety-related recirculation air control damper, a normal supply fan, ductwork, duct accessories and instrumentation and controls. The exhaust air flow path consists of a safety-related exhaust air backdraft damper and a missile protected exhaust air outlet. The Emergency Air Conditioning System consists of an Emergency Air Conditioning (AC) Unit, ductwork, duct accessories and instrumentation and controls.

The cooling loads in the ESWEMS Pumphouse are calculated using methods described in the American Society of Heating Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook - Fundamentals (ASHRAE, 2009). This handbook is an industry accepted reference for HVAC design methodology. The calculations will be performed using maximum expected heat rejection loads during the most severe mode of operation from equipment, lights, and other internal heat rejection loads. Building envelope loads and outside air loads will be calculated based on the design outdoor air conditions (temperature and humidity). The calculated loads will be summed and appropriate margins will be added to ensure adequate capacity.

9.4.15.2.2 Components Description

Each division of the ESWEMS Pumphouse HVAC System contains the following components.

Emergency Air Conditioning (AC) Units

The AC units are safety-related split-system units. The condenser section (i.e., condenser fans, condenser coils, and compressor) is located outdoors inside a missile protected enclosure. The evaporator section (i.e., filters, evaporator coils, and cooling fan) is located inside the pump bay. The AC unit capacities are based on the environmental conditions and the required room temperature range. Fan performance is rated in accordance with ANSI/AMCA-210-1999 (ANSI, 1999), ANSI/AMCA-211-1987 (ANSI, 1987), and ANSI/AMCA-300-1985 (ANSI, 1985).

Ductwork and Accessories

The supply and exhaust air ducts, and the ductwork associated with the Emergency AC Units, are constructed of galvanized steel and are structurally designed for the fan shutoff pressure. The ductwork meets the design, construction, and testing requirements of the applicable portions of ASME AG-1-2003 (ASME, 2003).

Emergency AC Unit Condensation Drain Line

Each AC unit has a drain line installed to collect the condensation that forms in the AC unit and direct the condensation to its respective ESWEMS pumpwell.

Normal Supply Fan

The normal supply fans, which are integral to the air handling units, are centrifugal or axial type with an electrical motor driver. Fan performance is rated in accordance with ANSI/AMCA-210-1999 (ANSI, 1999), ANSI/AMCA-211-1987 (ANSI, 1987), and ANSI/AMCA-300-1985 (ANSI, 1985).

Unit Heaters

Unit Heaters, consisting of fans, thermostats, and electric heating coils, are provided to maintain minimum room temperatures in the ESWEMS Pumphouse rooms at or above the lower design temperature limit of 41°F (5°C) assuming a minimum outside ambient temperature of -21°F (-29 °C). The 4 x 25 kw heaters per room (two safety-related, and two non safety-related) meet the design, construction, and testing requirements of ASME AG-1-2003.

Dampers

A safety-related motor-operated outside air flow control damper and a non safety-related motor-operated flow control recirculation air damper are provided on the suction side of the normal supply fan. A safety-related gravity-actuated exhaust air damper is provided that permits pressurized room air to exhaust to the outside. The dampers meet the design, construction, and testing requirements of the applicable portions of ASME AG-1-2003.

9.4.15.2.3 System Operation

Normal Plant Operation

During normal plant operation, the ESWEMS pumps are not in operation, except for the performance of periodic surveillance tests. Each division of the ESWEMS Pumphouse HVAC System functions to maintain the temperature in its associated ESWEMS pump bay within the design limit for starting and operating the ESWEMS pump. Each ESWEMS pump bay temperature is monitored and is indicated locally in the pumphouse. The high and low temperature for each ESWEMS pump bay is annunciated in the main control room.

Abnormal Operating Conditions

The ESWEMS is comprised of four function independent divisions and generally two out four are required for the ESWEMS to perform its funciton. If one division of the ESWEMS Pumphouse HVAC Subsystem fails, the other three divisions of the ESWEMS Pumphouse HVAC Subsystem remain available to support the operation of their associated divisions of the ESWEMS.

Loss of Off-Site Power

In the event of loss of offsite power (LOOP), the ESWEMS Pumphouse HVAC Subsystem will continue to operate as needed. The power to safety-related equipment is supplied from the Class 1E emergency power supply system (EPSS).

Plant Accident Conditions

The ESWEMS Pumphouse HVAC Subsystem is safety-related and is required to operate during design basis accident conditions. The ESWEMS Pumphouse HVAC Subsystem maintains design temperature in each division's ESWEMS pump bay during plant accident conditions.

Smoke Conditions

Smoke detection in the outside air intake or in the Pump Room will automatically trip the normal supply fan and result in closure of both outside air dampers. The Emergency AC Unit is not affected by smoke or fire detection and will operate as required to support operation of the associated makeup pump. The normal supply fan can be used to purge the Pump Room of smoke after a fire by supplying outside air, to be exhausted through the gravity actuated backdraft exhaust damper.

9.4.15.3 Safety Evaluation

Below are the safety evaluations that correspond to the safety design bases:

- The ESWEMS Pumphouse HVAC Subsystem has sufficient cooling and heating capacity to maintain each of the ESWEMS pump bays within the design temperature range of 41°F (5°C) to 104°F (40°C) when the outside design temperatures for winter and summer are -21 °F (-6 °C) and 100 °F (38 °C), respectively.
- The ESWEMS Pumphouse HVAC Subsystem is safety-related Seismic Category I and is located inside the ESWEMS Pumphouse that is designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, external missiles and other appropriate natural events.
- If a division of the ESWEMS Pumphouse HVAC Subsystem is not available due to fire, internal missile, or the pipe break then the other three divisions of the ESWEMS Pumphouse HVAC Subsystem remain available to support their division of the ESWEMS.
- If a division of the ESWEMS Pumphouse HVAC Subsystem is inoperable due to failure of an active component coincident with the loss of offsite power, then the other divisions of the ESWEMS Pumphouse HVAC Subsystem remain available to support their division of the ESWEMS. Each division of the ESWEMS Pumphouse HVAC Subsystem is backed up by Class 1E Diesel Power and is available if required.
- The ESWEMS Pumphouse HVAC Systems are initially tested per the program given in Section 14.2.

- The ESWEMS Pumphouse HVAC Subsystem is safety-related. The safety-related components quality group classification, electrical classification and the seismic category are provided in Chapter 3.

- The power supplies to electrical components and the controls for the ESWEMS Pumphouse HVAC Subsystem is from a Class 1E system.

9.4.15.4 Inspection and Testing Requirements

Refer to Section 14.2 for initial plant startup test program. Initial in-place testing of components of the ESWEMS Pumphouse HVAC Subsystem is performed in accordance with ASME AG-1-2003 (ASME, 2003) .

9.4.15.5 Instrumentation Requirements

Instrumentation includes sensing and display of various parameters as necessary to automate system function, and to provide for local and remote system monitoring in the main control room including alarms. These parameters include pumphouse normal supply fan discharge temperature and pumphouse high and low temperature alarms.

9.4.15.6 References

ANSI, 1985. Reverberant Room Method for Sound Testing of Fans, ANSI/AMCA-300-1985, American National Standards Institute/Air Movement and Control Association International, Inc.,1985.

ANSI, 1987. Certified Ratings Program-Product Rating Manual for Fan Air Performance, ANSI/AMCA-211-1987, American National Standards Institute/Air Movement and Control Association International, Inc.,1987.

ANSI, 1999. Laboratory Methods of Testing Fans for Aerodynamic Performance Rating, ANSI/AMCA-210-1999, American National Standards Institute/Air Movement and Control Association International, Inc.,1999.

ASME, 2003. Code on Nuclear Air and Gas Treatment, ASME AG-1, American Society of Mechanical Engineers, 2003.

ASME, 2004. ASME Boiler and Pressure Vessel Code, Section III, Class 3, 2004 Edition, no Addenda, American Society of Mechanical Engineers, 2004.

ASHRAE, 2009.ASHRAE Handbook - Fundamentals, American Society of Heating, Refrigeration and Air Conditioning Engineers, 2009.

CFR, 2008a. Title 10, Part 50, Appendix A, General Design Criterion 2, Design Bases for Protection Against Natural Phenomena, Code of Federal Regulations, 2008.

CFR, 2008b. Title 10, Part 50, Appendix A, General Design Criterion 3, Fire Protection, Code of Federal Regulations, 2008.

CFR, 2008c. Title 10, Part 50, Appendix A, General Design Criterion 4, Environmental and Dynamic Effects Design Bases, Code of Federal Regulations, 2008.

NRC, 2004. Regulatory Guide 1.32, Revision 3, Criteria for Power Systems for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, March 2004.

NRC, 2007a. Regulatory Guide 1.26, Revision 4, Quality Group Classifications and Standards for Water, Steam, and Radioactive Waste Containing Components of Nuclear Power Plants, U.S. Nuclear Regulatory Commission, March 2007.

NRC, 2007b. Regulatory Guide 1.29, Revision 4, Seismic Design Classification, U.S. Nuclear Regulatory Commission, March 2007.}

9.4.16 FIRE PROTECTION BUILDING VENTILATION SYSTEM

{The Fire Protection Building Ventilation System provides an environment suitable for the operation of the Fire Protection System pumps. This system provides an ambient air flow quantity to maintain a safe and satisfactory indoor environment for the operation of the fire protection pumps as well as to support personnel access to the three pump rooms.

9.4.16.1 Design Bases

The Fire Protection Building Ventilation System, located in the two, 100% capacity diesel engine driven pump rooms, is an augmented quality system designed to meet Seismic Category II-SSE requirements. The ventilation system in the electric motor driven pump room is a non-seismic, augmented quality system.

The Fire Protection Building Ventilation System maintains acceptable ambient conditions for the fire protection system diesel engine driven pumps, diesel fuel oil tanks, electric motor driven pump, jockey pump, pump drivers and controllers. The diesel engine driven pumps and associated equipment are required to operate after a seismic event.

The Fire Protection Building Ventilation System maintains a minimum temperature of 40°F, based on an ambient temperature of -10°F, and a maximum temperature of 120°F, based on an outside ambient temperature of 100°F. This system will support operation of the Fire Protection System pumps and drivers, as well as to support personnel access to these spaces.

Components of the Fire Protection Building Ventilation System are located inside the two diesel engine driven pump rooms and one electric motor driven pump room. Each pump room contains components of the ventilation system to modulate the temperature in there respective rooms.

9.4.16.2 System Description

9.4.16.2.1 General Description

The Fire Protection Building Ventilation System ventilates the two diesel engine driven pump rooms and the electric motor driven pump room, using outside air as the cooling medium. Wall mounted outside air intake louvers with motor operated dampers, electric unit heaters and exhaust fans service the Fire Protection Building. Each pump room has a separate and independent heating and ventilation system.

The heating and ventilation systems for each of the diesel engine driven pump rooms are identical. Each diesel pump room is supplied with wall mounted outside air intake louvers, with motor operated dampers, electric unit heaters, exhaust fans, engine combustion air inlet ductwork with air intake filter, and combustion gas exhaust ductwork for proper pump performance.

The electric motor driven pump room is supplied with wall mounted outside air intake louvers with motor operated dampers, electric unit heaters and an exhaust fan.

Ventilation of the Diesel Engine Driven Pump Rooms

During normal operating conditions the diesel engine driven pump rooms' ventilation system will use two 50% wall mounted intake air louvers for room ventilation air and ventilation air shall be exhausted by one 100% exhaust fan. The intake air louvers and exhaust fan are supplied with motor operated dampers. Both intake louvers and the exhaust fan are interlocked to modulate air flow based on the required minimum and maximum design temperatures.

During winter conditions, when the diesel engine driven pumps are not in operation, the air in the diesel engine driven pump room is heated by two electric unit heaters. These heaters are controlled by local thermostats to maintain the required minimum temperature.

Combustion air for the diesel engine driven pumps is supplied through duct located in each diesel engine driven pump room. Each combustion air inlet is supplied with an air intake filter, and each diesel pump supplied with a combustion gas exhaust duct for proper pump performance.

Ventilation of the Electric Motor Driven Pump Room

During normal operating conditions the electric motor driven pump room ventilation system uses two 50% wall mounted intake air louvers for room ventilation air. Ventilation air is exhausted by one 100% exhaust fan. The intake air louvers and exhaust fan are supplied with motor operated dampers. Both intake louvers and the exhaust fan are interlocked to modulate air flow based on the required minimum and maximum design temperatures.

During winter conditions the air in the electric motor driven pump room is heated by two electric unit heaters. These heaters are controlled by local thermostats to maintain the required minimum temperature.

9.4.16.2.2 Component Description

The major components for the Fire Protection Building Ventilation System are listed in the following paragraphs, along with the applicable codes and standards. Refer to Section 3.2 for more discussion of seismic and system quality group classifications.

Ductwork and Accessories

The supply air and exhaust gas ducts are constructed of galvanized sheet steel and are structurally designed for fan shutoff pressure. The ductwork meets the design, construction and testing requirements of ASME AG-1a- 2004 (ASME, 2004).

Fans

The exhaust fans are centrifugal or propeller type with an electrical motor driver. Fan performance is rated in accordance with ANSI/AMCA 210-99 (ANSI, 1999), ANSI/AMCA-211-05 (ANSI, 2005a), and ANSI/AMCA-300-05 (ANSI, 2005b).

Electric Heater

Each electric heater is factory assembled with a fan, electric heating coil, adjustable air defectors and hanger support bracket. The unit heaters are provided with a local thermostat and control switch accessible from the floor area to maintain minimum room temperature.

Louver

Louver performance data shall be rated under the AMCA Certified Rating Program and shall bear the AMCA certified rating seal. The certified performance data shall include air flow pressure loss and water penetration (ANSI, 1995).

Motor Operated Dampers

The motor-operated dampers fail to the "open" position in the case of power loss. The performance and testing requirements of the dampers are in accordance with ASME AG-1a-2004 (ASME, 2004).

9.4.16.2.3 System Operation

Normal Plant Operation

During normal plant operation, the fire protection system pumps are not in operation, except for the jockey pump and periodic performance surveillance tests. The Fire Protection Building Ventilation System functions to maintain acceptable room temperatures for starting and operating the fire pumps. The room temperature is monitored by temperature sensors located in each pump room.

Abnormal Operating Conditions

Failure of Diesel Engine Driven Pump Room Air Supply

If one or more components for the ventilation system of a diesel engine driven pump room fails, the ventilation system for that room is unable to maintain the required ambient conditions. Since there are two redundant diesel engine driven pump rooms, with a separate ventilation system and air supply, the failure of the air supply in one diesel engine driven pump room does not affect the other diesel engine driven pump room.

Failure of Pump Room Electric Heating Coils

Each fire protection pump room has two electric unit heaters. In the case of failure of one electric heater, the other electric heater is able to maintain the required temperature in the pump room.

Failure of Electric Motor Driven Pump Room Air Supply

In the case of failure of a component on the ventilation system for the electric motor driven pump room, the required ambient conditions may not be maintained in the electric motor driven pump room. However, the diesel engine driven pumps are available to provide necessary fire protection if an event should occur.

Failure of Exhaust Components

In the case of failure of any of the Fire Protection Building Ventilation System exhaust components, proper ambient conditions may not be maintained. However, components in the other unaffected pump rooms are available to provide necessary ventilation for the unaffected pump rooms during an event.

Loss of Offsite Power

In the event of Loss of Offsite Power, the emergency power system is supplied to the Fire Protection Building Ventilation System diesel engine driven pump room components. Emergency power supply to the system enables it to maintain normal room design temperature conditions.

Station Blackout

In the event of Station Blackout, the emergency power system is supplied to the Fire Protection Building Ventilation System components. Emergency power supply to the system enables it to maintain normal room design temperature conditions.

9.4.16.3 Safety Evaluation

The Fire Protection Building Ventilation System is designed to maintain ambient conditions inside the Fire Protection Building to allow safe and reliable operation of the fire pumps. The maximum temperature of 120°F in the pump rooms is the design temperature based on an outside ambient temperature of 100°F and room equipment heat loads. The equipment inside the pump rooms is designed to withstand a temperature of 120°F. A minimum temperature of 40°F will be maintained in the building based on a minimum ambient temperature of -10°F.

The Fire Protection Building Ventilation System is located inside each pump room of the Fire Protection Building, which is designed to withstand the effects of a safe shutdown earthquake (SSE). Chapter 3 provides the bases for adequacy of the structural design of the Fire Protection Building.

The diesel engine pump rooms’ ventilation systems remain functional after an SSE event. Chapter 3.2 provides additional discussion of the seismic requirements for the Fire Protection System.

The two identical diesel engine driven pumps and diesel pump room ventilation systems provides redundancy to the ventilation system. Therefore, no single failure of the ventilation system compromises the safety function of the system. Vital power is supplied from onsite or offsite power systems.

9.4.16.4 Inspection and Testing Requirements

Acceptance testing of the Fire Protection Building Ventilation System components is performed in accordance with ASME AG-1a-2004 (ASME, 2004) and ASME N510-1989 (ASME, 1995).

9.4.16.5 Instrumentation Requirements

Indication of the operational status of the equipment, position of dampers, instrument indications and alarms are provided in the Main Control Room (MCR). Fans, motor-operated dampers, and electric unit heaters can be operated from the MCR. The fire detection and sensor information is delivered to the fire detection system.

9.4.16.6 References

ASME, 2004. Code on Nuclear Air and Gas Treatment, ASME AG-1a-2004, American Society of Mechanical Engineers, 2004.

ASME, 1995. Testing of Nuclear Air-Treatment Systems, ASME N510-1989, American Society of Mechanical Engineers, 1995.

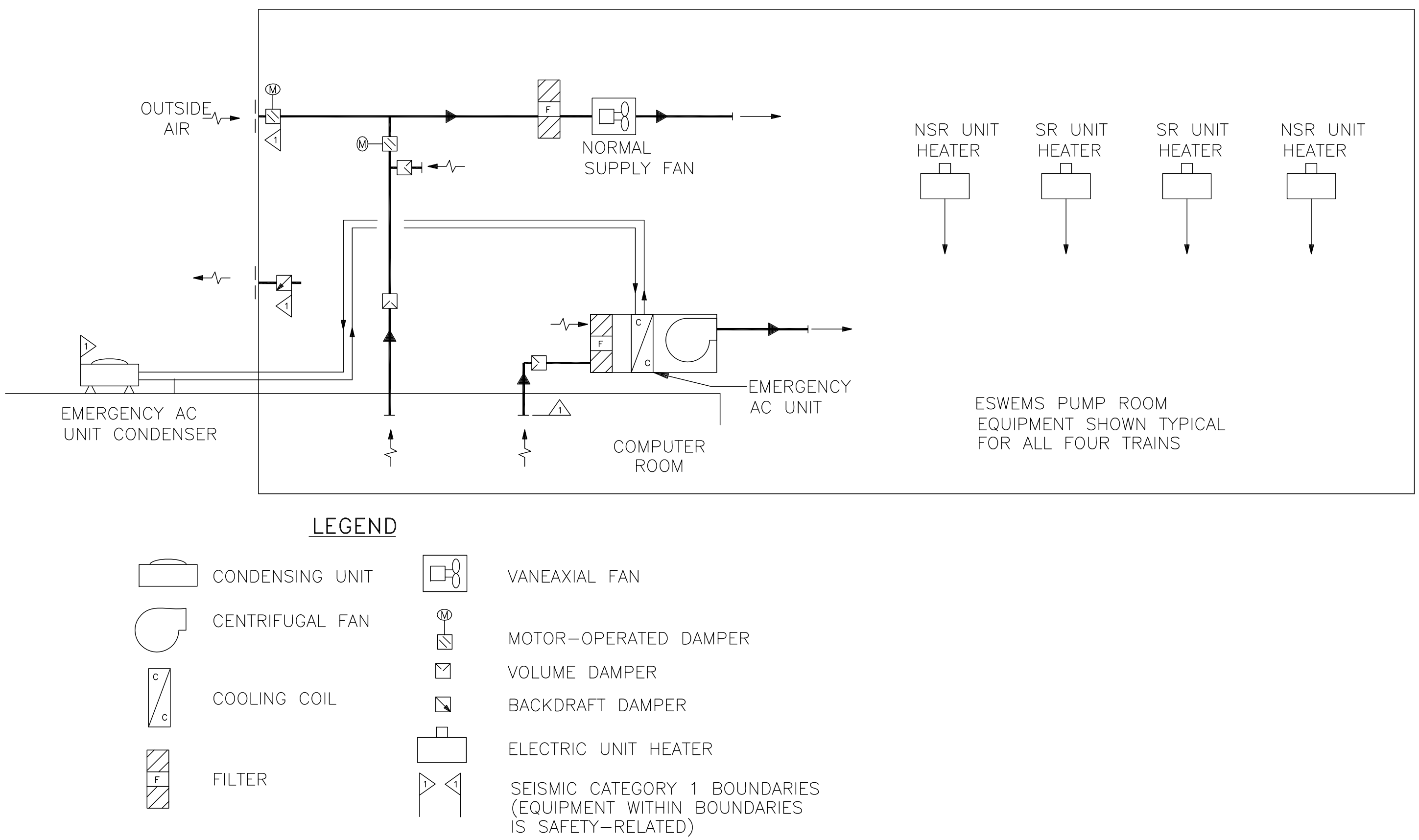
ANSI, 1999. Laboratory Methods of Testing Fans for Aerodynamic Performance Rating, ANSI/AMCA-210-99, American National Standards Institute/Air Movement and Control Association International, December 1999.

ANSI, 2005a. Certified Ratings Program-Air Performance, ANSI/AMCA-211- 05, American National Standards Institute/Air Movement and Control Association International, 2005.

ANSI, 2005b. Reverberant Room Method of Testing Fans for Rating Purposes, ANSI/AMCA-300-05, American National Standards Institute/Air Movement and Control Association International, Inc., 2005.

ANSI, 1995. Laboratory Methods of Testing Fans for Rating Purposes, ANSI/AMCA 500-L, American National Standards Institute/Air Movement and Control Association International, Inc., 1995.}

Figure 9.4-1— {ESWEMS Pumphouse HVAC}



NOTES

1. ESWEMS PUMP START AUTO STARTS AIR CONDITIONING UNIT AND SECURES NORMAL VENTILATION.
2. MISSILE PROTECTION IS PROVIDED FOR THE ROOM AIR INTAKE & EXHAUST, AND CONDENSER AC002 LOCATED EXTERNALLY.
3. NSR = NONSAFETY RELATED
   SR = SAFETY RELATED
   AC = AIR CONDITIONING

Figure 9.4-2— {ESWEMS Pumphouse HVAC Duct and Instrumentation Diagram}

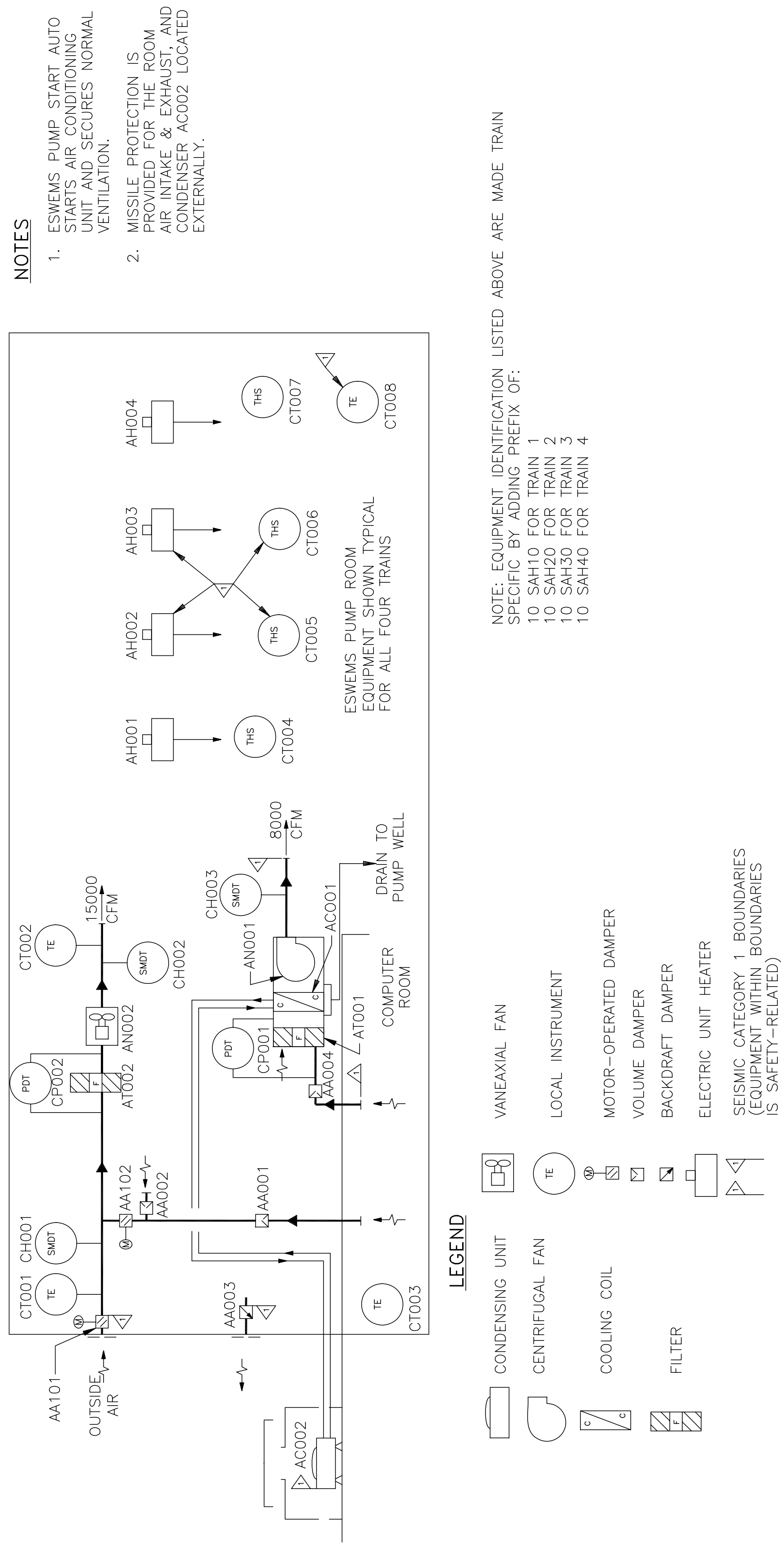
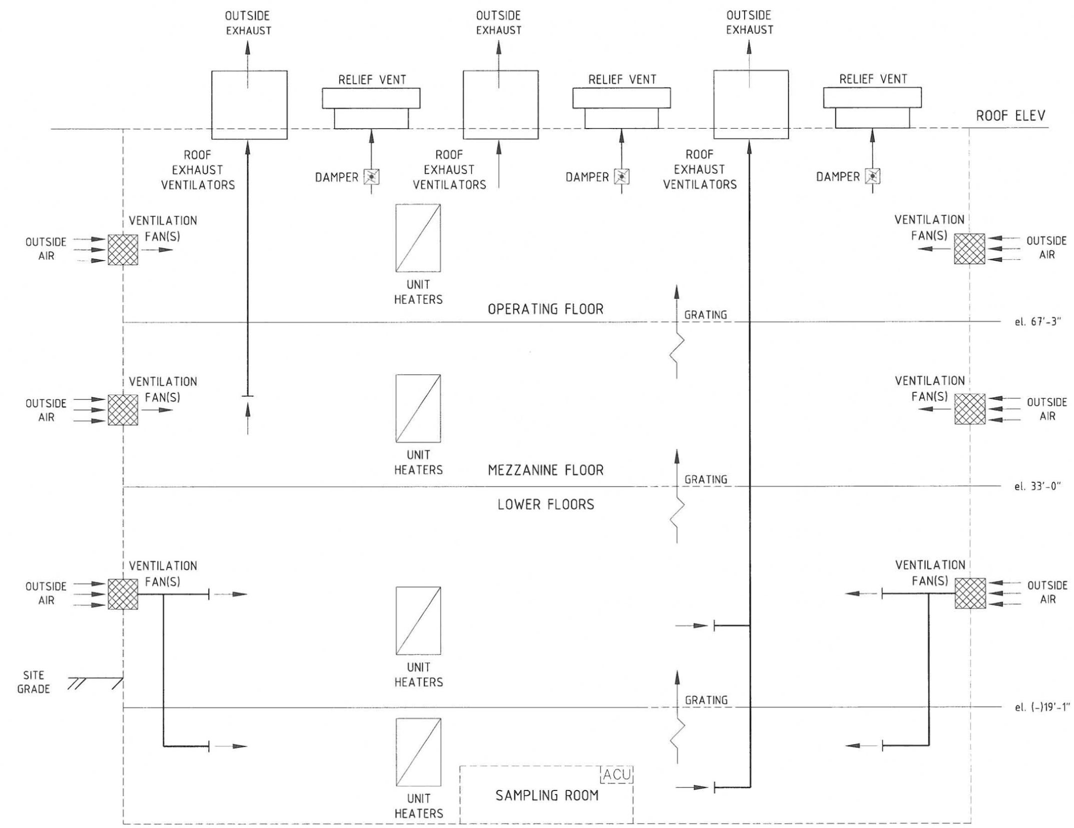


Figure 9.4-3— {Turbine Building Ventilation System}



NOTES:

ACU - AIR CONDITIONING UNIT

DRAWING IS A GENERAL SCHEMATIC OF THE TURBINE BUILDING VENTILATION SYSTEM

9.5 OTHER AUXILIARY SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

9.5.1 Fire Protection

No departures or supplements.

9.5.1.1 Design Basis

Appendix 9B of this COL FSAR supplements Appendix 9A of the U.S. EPR FSAR.

9.5.1.2 Program Description

9.5.1.2.1 General Description

For all aspects of the site specific Fire Protection Program (FPP), the same codes and standards and applicable edition years apply for fire protection as listed in Section 9.5.1.7 of the U.S. EPR FSAR.

Table 9.5-1 provides supplemental information for select items/statements in U.S. EPR FSAR Table 9.5.1-1 identified as requiring COL Applicant input. The supplemental information is in a column headed {"BBNPP Supplement"} and addresses {BBNPP} conformance to the identified requirement of Regulatory Guide 1.189 (NRC, 2007).

The U.S. EPR includes the following COL item in Section 9.5.1.2.1:

> A COL applicant that references the U.S. EPR design certification will provide a description and simplified Fire Protection System piping and instrumentation diagrams for site-specific systems.

This COL item is addressed as follows:

{In accordance with U.S. EPR FSAR, Section 9.5.1.2.1, General Description, "Outside fire hydrants are provided approximately every 250 feet on the main yard loop. Additional hydrants are located near the entrances to the Essential Service Water Pump Building (ESWPB) and the Circulating Water Pump Building ... Hose houses equipped with fire hose and combination nozzle and other equipment specified by Reference 7 are provided at intervals not exceeding 1000 feet, or alternatively... " Based on this requirement and the current design, a ring header is provided around the perimeter of the CWS cooling tower area to provide manual fire fighting capability. Furthermore, sectional valves are provided, such that no more than one-half of the hydrants would be out of service due to a portion of the underground supply line being taken out of service. In addition, given the proximity of the Water Treatment building to this cooling tower ring header, a supply line is provided that also allows for two water supply sources to this facility, as the possibility of various hazardous chemicals, that may require fire suppression, could be stored in or around this building.

The Circulating Water System Makeup at the BBNPP Intake Structure has fire detection provided as well as portable fire extinguishers.

Fire hose stations are designed for the Essential Service Water Emergency Makeup System pumphouse. Therefore, a firewater supply line is provided to this facility.

A diagram of the fire water distribution system for BBNPP is provided in Figure 9.5-2.}

Plant Fire Prevention and Control Features

Plant Arrangement

{The site building layout is shown in Figure 2.1-1. An enlargement of the power block area is provided in Figure 2.1-5.} Details of the arrangement of the Turbine Building, Switchgear Building, Auxiliary Power Transformer Area, Generator Transformer Area (the remaining power block structures) and non-power block structures are provided in Appendix 9B of this COL application.

Architectural and Structural Features

The U.S. EPR includes the following COL item in Section 9.5.1.2.1:

> A COL applicant that references the U.S. EPR design certification will submit site-specific information to address the Regulatory Guide 1.189, Regulatory Position C.6.2.6, Cooling Towers.

This COL item is addressed as follows:

{The Circulating Water Cooling Tower (CWCT) is located such that a fire will not adversely affect any systems or equipment important to safety.

Fire protection features provided to protect the CWCT include a dedicated, undergraound, fire protection yard loop which surrounds the CWCT, and supplies yard hydrants, located in accordance with NFPA 24. The CWCT yard loop is supplied from two independent supply lines from the main fire water distribution system undergraound yard loop. Other fire protection features provided include automatic fire detection, manual fire alarms and protable fire extinguishers.}

Details of the architectural/structural design features for the remainder of the power block and balance of plant structures/areas are provided in Appendix 9B of this COL application.

Electrical System Design and Electrical Separation

Details of the electrical system design/separation for the remainder of the power block and balance of plant structures/areas are provided in Appendix 9B of this COL application.

Fire Safe Shutdown Capability

The U.S. EPR FSAR includes the following COL Item in Section 9.5.1.2.1:

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

This COL Item is addressed as follows:

{PPL Bell Bend, LLC} shall perform an as-built, post-fire Safe Shutdown Analysis, including final plant cable routing, fire barrier ratings, purchased equipment, equipment arrangement and a review against the assumptions and requirements contained in the Fire Protection Analysis. The post-fire Safe Shutdown Analysis will demonstrate that safe shutdown performance objectives are met prior to fuel loading and will include a post-fire safe shutdown circuit analysis based on the methodology described in NEI 00-01 (NEI, 2001).

The remainder of the plant is separated from portions of the facility containing fire safe shutdown systems or components by appropriately rated fire barriers and/or distance in accordance with RG 1.189 (NRC, 2007). These remaining areas do not contain fire safe shutdown systems or components. This is detailed in Appendix 9B of this COL application.

Communications

No departures or supplements.

Emergency Lighting

No departures or supplements.

Ventilation System Design Considerations

Details of the ventilation system for the remainder of the power block and balance of plant structures are provided in Appendix 9B of this COL application.

Control of Smoke, Hot gases, and Fire Suppressant

Smoke confinement/smoke control is not provided in other structures/areas of the plant.

Fire Detection and Alarm System

Details of the fire detection and alarm system for the remainder of the power block and balance of plant structures are provided in Appendix 9B of this COL application.

Fire Water Supply System

The U.S. EPR includes the following COL item in Section 9.5.1.2.1:

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

This COL item is addressed as follows:

The fire protection water supply quality program will ensure the criteria in Regulatory Guide 1.189, Section 3.2.1, are met as follows:

{Suction storage tank makeup is supplied from the Raw Water Supply System which ultimately draws suction from the Susquehanna River. The fire protection water supply is treated to potable quality to help prevent occurrence of biological fouling or corrosion.} The rate of makeup flow to the fire water storage tanks is sufficient to refill the minimum fire protection volume in one tank within eight hours. In addition to water treatment, the fire water storage tanks are inspected periodically for biological growth and subsequent corrosion; fire service mains, fire hydrants and fire suppression systems are also flow tested and/or drained periodically to verify treatment success and to confirm system functionality. The rate of makeup flow to the fire water storage tanks is sufficient to refill the minimum fire protection volume in one tank within eight hours.

In addition, the highest sprinkler system demand is for the Turbine Building and is {2,400 gpm at 161 psig}. The highest standpipe system demand is for the Containment Building and is {1,250 gpm at 176 psig.}.

Automatic Fire Suppression Systems

Details of the automatic fire suppression systems for the remainder of the power block and balance of plant structures are provided in Appendix 9B of this COL application.

In addition, automatic sprinkler systems, designed and installed in accordance with National Fire Protection Association (NFPA) 13 (NFPA, 2007b), are provided for the following buildings:

- {Turbine Building under operating deck and skirt areas
- SBO Diesel Tank Rooms
- SBO Auxiliary Equipment Rooms
- Switchgear Building Diesel Engine Rooms
- Auxiliary Boiler Equipment Room
- Warehouse Building
- Central Gas Supply Building
- Fire Protection Building}

Automatic single or double interlock preaction sprinkler systems designed and installed in accordance with NFPA 13 (NFPA, 2007b) are provided in the following areas:

- Turbine Generator and Exciter bearings
- Switchgear Building Cable Spreading Rooms
- Switchgear Building Low- and Medium-Voltage Distribution Board Rooms
- Switchgear Building Cable Distribution Division Rooms
- Switchgear Building Battery Rooms
- Switchgear Building Battery Charger Rooms
- Switchgear Building I&C Control / Protection Panel Rooms

Fixed deluge water spray systems designed and installed in accordance with NFPA 15 are provided for the following hazards.

- Hydrogen seal oil unit
- Turbine Building Lube oil drain trenches

- Auxiliary Power Transformers
- Generator Transformers

Manual Fire Suppression Systems

Details of the manual fire suppression systems for the remainder of the power block and balance of plant structures are provided in Appendix 9B of this COL application.

9.5.1.3 Safety Evaluation – Fire Protection Analysis

The U.S. EPR FSAR includes the following COL Item in Section 9.5.1.3:

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

This COL Item is addressed as follows:

{ PPL Bell Bend, LLC}shall evaluate the differences between the as-designed and as-built plant configuration to confirm the Fire Protection Analysis remains bounding. This evaluation will consider the final plant cable routing, fire barrier ratings, combustible loading, ignition sources, purchased equipment, equipment arrangement and includes a review against the assumptions and requirements contained in the Fire Protection Analysis. The evaluation will address fire areas (identified with Footnote 15 in U.S. EPR Table 9A-2) which have the potential for the presence of radiological sources. A summary of the results of the evaluation, including any identified deviations from the FSAR and confirmation that the Fire Protection Analysis remains bounding, will be provided prior to fuel load.

The U.S. EPR includes the following COL item in Section 9.5.1.3:

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

This COL item is addressed as follows:

Appendix 9B addresses the fire protection analysis for the remaining power block and balance of plant structures.

In addition, the plant will maintain an integrated fire hazards analysis (FHA) and supporting evaluations that demonstrate that the plant can:

- achieve and maintain post-fire safe shutdown conditions for a fire in any fire area of the plant, including alternative shutdown fire areas,
- maintain safe plant conditions and minimize potential release of radioactive material in the event of a fire during any plant operating mode,

- detail the plant fire prevention, detection, suppression, and containment features, for each fire area containing structures, systems and components (SSCs) important to safety, and
- achieve and maintain these safe conditions with due consideration of plant fire risk as characterized in the plant-specific fire probabilistic risk assessment (Fire PRA).

9.5.1.4 Inspection and Testing Requirements

The FPP includes procedures for testing fire protection features and systems and includes criteria to ensure design and system readiness. This includes installation and acceptance testing, periodic testing, quality assurance oversight of testing, and proper test documentation.

All fire protection features and systems will be surveilled, inspected, tested, and maintained in accordance with applicable codes and standards of the NFPA including start-up and acceptance tests. The frequency of follow-up inspections and tests will also follow NFPA requirements and ALARA guidelines.

All surveillance, inspection, testing and maintenance is conducted and documented in accordance with approved plant procedures and is performed by qualified personnel.

9.5.1.5 Fire Probabilistic Risk Assessment

No departures or supplements.

9.5.1.6 Fire Protection Program

No departures or supplements.

9.5.1.6.1 Fire Prevention

Governance and control of FPP attributes is provided through policies, procedures, and the Quality Assurance Program Description. Procedures are in place for FPP impacting activities including:

- In-situ and transient combustibles.
- Ignition sources.
- Hot Work.
- Annunciator response and pre-fire plans.
- Surveillance, inspection, testing, and maintenance (as applicable) of:
  - Passive fire barriers including opening protectives (i.e., fire doors, fire dampers, and through penetration seal systems).
  - Fire protection water supply system.
  - Automatic and manual fire suppression systems and equipment.
  - Automatic and manual fire detection/fire alarm system equipment.
  - Fire brigade and fire response equipment.

9.5.1.6.2 Fire Protection Program

{The FPP organization is shown in Figure 9.5-1. The ultimate responsibility for the FPP rests with the Chief Nuclear Officer. The responsibilities, lines of authority, training and qualifications by title/position are detailed in administrative procedures and the Quality Assurance Program Description. Key positions are described below. The qualifications required for key positions are provided in Section 9.5.1.6.3.

The Onsite Engineering Manager has the overall responsibility for development and ongoing assessment of the FPP. A qualified fire protection engineer (FPE) is delegated the responsibility to administer and implement the FPP through procedures governing fire prevention, combustible material control, ignition source control, automatic and manual fire suppression systems, manual fire response equipment, evaluation of work for impact on the FPP, pre-fire planning, and identification of fire protection training requirements for plant personnel including general employees, fire brigade, and contract employees/contractors. The FPE is assisted through the assignment of responsibility for individual portions of the FPP to various departments as defined in administrative procedures.

The Operations Shift Supervisor has the responsibility for ensuring that fire safety and administration of applicable fire protection controls are maintained for all modes of plant operation. In the event of a fire in the plant, the Operations Shift Supervisor is the incident command authority for coordinating fire response and plant operational/shutdown activities unless and until relieved under the Emergency Plan.

Quality assurance oversight of the FPP rests with the Quality and Performance Improvement organization in accordance with the Quality Assurance Program Description.}

9.5.1.6.3 Fire Protection Training and Personnel Qualifications

Fire Protection Engineer

No departures or supplements.

Fire Brigade Members

No departures or supplements.

Fire Protection System Operation, Testing, and Maintenance

Personnel who perform operation of or surveillance, inspection, test, and/or maintenance activities on fire-protection related structures, systems, or components are trained in the specific activities they are required to perform. Training is conducted through one or more of the following: factory or shop training on individual equipment, recognized apprentice and/or journeyman training courses, training coursework on equipment of similar type or experience-based training and qualification on fire systems in general. All personnel who perform fire protection related maintenance will be trained in conformance to plant procedures and in fire protection feature/system impairment procedures.

Training of the Fire Brigade

No departures or supplements.

General Employee Training

This training is required for all personnel who are granted unescorted plant access. General employee training curriculum provides an overview of the requirements of the FPP including: general fire hazards within the plant, the defense-in-depth objectives of the FPP, and an introduction to the FPP procedures that govern employee actions including appropriate steps to be taken upon discovering a significant fire hazard, actions to be taken upon discovering a fire or hearing/seeing a fire alarm, and combustible material and ignition source controls.

Fire Watch Training

Fire Watch – Hot Work

This training is required for all plant and/or contract personnel assigned duties as a fire watch for hot work. Hot work fire watch training provides instruction on fire watch duties and responsibilies, including the identification of conditions or activites that present potential fire hazards, as well as the use of fire extinguishers, including hands-on training on a practice fire with the extinguishing equipment to be used while on fire watch, and the proper fire notification procedures, and required actions for both one-hour roving and continuous fire watches. It also includes instruction on responsibilites, actions, and recordkeeping requirements, the identification of conditions or activities that present potential fire hazards, as well as the use of fire extinguishers, including hands-on training on a practice fire with the extinguishing equipment to be used while on fire watch, and the proper fire notification procedures when serving as a compensatory measure for a degraded fire protection feature. All hot work fire watches are trained in the selection, limitations, and use/application of hand portable fire extinguishers.

Fire Watch – Compensatory Measures

This training is required for all plant and/or contract personnel assigned duties as either a one-hour roving or continuous fire watch compensating for the inoperability or impairment of a given fire protection system or feature. Compensatory measure fire watch training includes instruction on responsibilites, actions, and recordkeeping requirements, the identification of conditions or activities that present potential fire hazards, as well as the use of fire extinguishers, including hands-on training on a practice fire with the extinguishing equipment to be used while on fire watch, and the proper fire notification procedures, when serving as a compensatory measure for a degraded fire protection feature. All compensatory measure fire watches are trained in the selection, limitations, and use/application of hand portable fire extinguishers.

9.5.1.6.4 Fire Brigade Organization, Training, and Records

Fire Brigade equipment including personal protective equipment for structural firefighting is provided for the plant fire brigade. Each fire brigade member is equipped with a helmet (with face shield), turnout coat, turnout pants, footwear, gloves, protective hood, personal alert safety system (PASS) device, and self-contained breathing apparatus (SCBA). All equipment will conform to appropriate NFPA standards. The plant maintains an adequate inventory of firefighting equipment to ensure outfitting of a full complement of brigade members with consideration of the possibility of sustained fire response operations (multiple crews).

SCBAs are required to be worn for interior fire response activities and at similar times when fire/response activities may involve a risk of chemical, particulate, and/or radiological material inhalation exposure.

Other types of fire response equipment are distributed and/or cached at various locations throughout the plant to support response by the plant fire brigade and/or off-site response agencies. The types of equipment provided include fire hose (2-1/2 and 1-1/2 inch diameter), combination and specialty hose nozzles, portable smoke removal equipment, spill control and absorbent materials, supplemental hand portable fire extinguishers, aqueous film-forming foam (AFFF) supply and foam eductors, and other specialty tools.

The plant has procedural controls in place to govern the response to fires. This includes fire annunciator response procedures and pre-fire plans which provide direction for the Control Room to determine: the need to initiate plant safe shutdown, the actions to take to effect shutdown, the mobilization and response of Control Room operators, and the mobilization and response of the plant Fire Brigade to effect fire-fighting activities. These procedures are utilized, in conjunction with the Emergency Plan, to determine when conditions necessitate:

- Requesting support of off-site emergency response resources.
- The declaration and escalation of the fire occurrence as a plant emergency.
- The notification of local, state, and federal governmental agencies.

9.5.1.6.5 Quality Assurance

This section of the U.S. EPR FSAR is incorporated by reference with the following supplemental information.

Section 9 .5.1.6.5 of the U.S. EPR FSAR refers to U.S. EPR FSAR, Section 17.2 and its requirement that the COL applicant provide the Quality Assurance Programs associated with the construction and operations phase, which should include a description of the fire protection system quality assurance program to be applied during fabrication , erection, installation and operations.

The Quality Assurance Program Description has appropriate provisions to govern the quality attributes of the FPP. The FPP conforms to the applicable provisions of 10 CFR 50, Appendix B (CFR, 2008) and with the quality assurance guidance in Regulatory Guide 1.189 (NRC, 2007).

Audits of the FPP will be performed at the recommended frequencies by an audit team staffed and led by qualified QA and technical auditors.

Additional details of the quality assurance program are provided in Section 17.5.

9.5.1.7 References

{**CFR, 2008a**. Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, Title 10, Code of Federal Regulations, Part 50, Appendix B, U.S. Nuclear Regulatory Commission, 2008.

NEI, 2001. NEI 00-01, Revision 1, ”Guidance for Post-Fire Safe Shutdown Circuit Analysis,” Nuclear Energy Institute, 2001.

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

NFPA, 2007b. Standard for the Installation of Sprinkler Systems, NFPA 13, National Fire Protection Association, 2007.

NRC, 2007. Fire Protection for Nuclear Power Plants, Revision 1, Regulatory Guide 1.189, Revision 1, U. S. Nuclear Regulatory Commission, March 2007.}

9.5.2 Communication System

No departures or supplements.

9.5.2.1 Design Basis

This section of the U.S. EPR FSAR is incorporated by reference with supplements as identified in the following section.

9.5.2.1.1 10 CFR 50 Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities

The U. S. EPR FSAR includes the following COL Item in Section 9.5.2.1.1:

> A COL applicant that references the U.S. EPR design certification will provide a description of the offsite communication system that interfaces with the onsite communication system, including type of connectivity, radio frequency, normal and backup power supplies, and plant security system interface.

This COL item is addressed as follows:

{The emergency off-site communication system provides interface between the on-site and off-site communication systems to allow dedicated communication access to EOF, NRC, and federal and state/local agencies. This system is designed to be compatible with on-site communication systems. The emergency off-site communication system is powered from a Class 1E UPS system. Any interfaces to the plant security system are addressed in the Physical Security Plan. The design ensures frequency compatibility between the COL applicant systems and non COL applicant controlled communication networks. The Emergency Notification System (ENS) is powered locally from either a safety-related or non safety-related power source with a UPS, having either battery or generator backup. The ENS is routed through the site PBX to provide access to multiple outbound call paths. The long distance portion of the system is provided by the NRC using direct access lines (DALs) to the federal long distance service directed through a toll-free (800/888) exchange.}

9.5.2.1.2 10 CFR 50.34 (f)(2)(xxv), Emergency Response Facilities

No departures or supplements.

9.5.2.1.3 10 CFR 50.47(b)(8), Equipment and Facilities to Support Emergency

No departures or supplements.

9.5.2.1.4 10 CFR 50.55 (a), Codes and Standards

No departures or supplements.

9.5.2.1.5 10 CFR 50 Appendix A - General Design Criteria

No departures or supplements.

9.5.2.1.6 10 CFR 73.45(e)(2)(iii), Performance Capabilities for Fixed Site Physical Protection Systems - Communications Subsystems, and 10 CFR 73.45(g)(4)(i), Provide Communications Networks

No departures or supplements.

9.5.2.1.7 10 CFR 73.55(e), Requirements for Physical Protection of Licensed Activities in Nuclear Power Reactors Against Radiological Sabotage Detection Aids, 10 CFR 73.55(f), Communications Subsystems, and 10 CFR 73.46(f), Fixed site Physical Protection Systems, Subsystems, Components and Procedures - Communications Subsystems

No departures or supplements.

9.5.2.2 System Description

No departures or supplements.

9.5.2.3 System Operation Communications Stations

The U. S. EPR FSAR includes the following COL Item in Section 9.5.2.3:

> The COL applicant referencing the U.S. EPR certified design will identify additional site-specific communication locations necessary to support effective communication between plant personnel in all vital areas of the plant during normal operation, as well as during accident conditions.

This COL Item is addressed as follows:

{The ESWEMS Pumphouse contains safety-related equipment and is a site-specific vital area of the plant. Communication equipment will be provided in this area to support effective communication between plant personnel during normal operation, as well as during accident conditions. This location will contain equipment to allow use of the plant digital telephone system, PA and alarm system, and sound powered system. A portable wireless communication system will also be provided for use by fire brigade and other operations personnel required to achieve safe plant shutdown.

All the communication subsystems are available for use during normal operation of the plant. Except for the sound-powered system, the communication subsystems are powered from the Class 1E Emergency Uninterruptible Power Supply System (EUPS) or the Class 1E Emergency Power Supply System (EPSS), which are supported by the emergency and station blackout diesel generators to provide backup power. Hence all the communication subsystems are expected to be available for use during all accident conditions. However, all communications equipment is categorized as non safety-related, and is not relied upon to mitigate an accident. The sound-powered system does not require an external power source.}

9.5.2.4 Inspection and Testing Requirements

No departures or supplements.

9.5.2.5 References

No departures or supplements.

9.5.3 Lighting System

No departures or supplements.

9.5.4 Diesel Generator Fuel Oil Storage and Transfer System

9.5.4.1 Design Basis

No departures or supplements.

9.5.4.2 System Description

No departures or supplements.

9.5.4.3 System Operation

No departures or supplements.

9.5.4.4 Safety Evaluation

The U.S. EPR includes the following COL item in Section 9.5.4.4:

> A COL applicant that references the U.S. EPR design certification will describe the site-specific sources of acceptable fuel oil available for refilling the EDG fuel oil storage tanks within seven days, including the means of transporting and refilling the fuel storage tanks, following a design basis event to enable each diesel generator system to supply uninterrupted emergency power.

This COL item is addressed as follows:

> {PPL Bell Bend, LLC has multiple sources of fuel oil that may be brought in by truck, barge, or air. Relationships or points of contact with the entities which are the sources of the fuel oil and the means for its transportation are well established. Multiple sources and means of transportation allow for the flexibility necessary in order to best respond to an event, and provides assurance of the ability to deliver fuel oil to the site.}

9.5.4.5 Inspection and Testing Requirements

No departures or supplements.

9.5.4.6 Instrumentation Requirements

No departures or supplements.

9.5.4.7 References

No departures or supplements.

9.5.5 Diesel Generator Cooling Water System

No departures or supplements.

9.5.6 Diesel Generator Starting Air System

No departures or supplements.

9.5.7 Diesel Generator Lubricating System

No departures or supplements.

9.5.8 Diesel Generator Air Intake and Exhaust System

No departures or supplements.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 1 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.1	Fire Protection Program	Compliance		The Fire Protection Program (FPP) is consistent with the requirements of Regulatory Guide 1.189 and SRP 9.5-1. Details of the FPP are provided in this COL application.
C.1.1	Organization, Staffing, and Responsibilities	Compliance		The FPP organization is shown in Figure 9.5-1. The responsibilities, lines of authority, training and qualifications by title/position are detailed in administrative procedures and the Quality Assurance Program Description.
C.1.2	Fire Hazards Analysis	Compliance	See Fire Protection Analysis Appendix 9A	Appendix 9A of the U.S. EPR FSAR provides the technical analysis for the nuclear island and demonstrates that the EPR has the ability to achieve and maintain safe-shutdown and to minimize the release of radioactive materials to the environment. Appendix 9B is an analysis detailing fire hazards and fire protection attributes for the remainder of the plant. Other structures not listed will be confirmed as not posing fire/explosion risk to the plant using NFPA 80A criteria.
C1.3	Safe Shutdown Analysis	Compliance		The plant will develop and maintain an integrated, detailed site-specific FHA and will have detailed procedures and training to ensure fire-safe shutdown and other fire safe conditions required to minimize radioactive material release are achieved and maintained.
C.1.4	Fire Test Reports and Fire Data	Compliance		If untested barrier configurations are determined necessary during detailed design, they will be evaluated consistent with RG 1.189 requirements.
C.1.5	Compensatory Measures	Compliance		The FPP will apply compensatory measures consistent with RG 1.189 recommendations and standard industry practice whenever fire protection features are degraded and/or inoperable. Compensatory measures will be applied when necessary to accomplish repair or modification or as a result of findings during inspection or surveillance. Fire watches, temporary fire barriers, or backup suppression capability will be implemented, as applicable. Where an uncommon type of compensatory measure is warranted, an evaluation of the alternative will be conducted prior to implementation. Such evaluation will incorporate fire risk insights as applicable.
C.1.6	Fire Protection Training and Qualifications	Compliance		The FPP Organization is shown in Figure 9.5-1.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 2 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.1.6.1	Fire Protection Staff Training and Qualifications	Compliance		The responsibilities, lines of authority, training and qualifications by title/position are detailed in administrative procedures and the Quality Assurance Program Description.
C.1.6.2	General Employee Training	Compliance		General employee training includes instruction on actions to take upon discovery of a fire, hearing a fire alarm, and proper fire preventative and protective administrative controls and actions.
C.1.6.3	Fire Watch Training	Compliance		Fire watch training includes instruction on responsibilities, actions, and records for oversight of hot work and when serving as compensatory measure for degraded fire protection feature.
C.1.6.4	Fire Brigade Training and Qualifications	Compliance		The fire brigade will have at least five members available on each shift above the minimum shift complement for safe operation/shutdown. The brigade is trained and equipped to respond to fire-related emergencies.
C.1.6.4.1	Qualifications	Compliance		The fire brigade will be under the direction of the Shift Supervisor. A Fire Brigade Leader is assigned and qualified to command response to fire emergencies. A minimum of three operations staff members including one licensed operator will be assigned to the shift fire brigade. Fire brigade members are required to be physically fit and undergo an annual physical examination for initial and continuing brigade membership.
C.1.6.4.2	Instruction	Compliance		Fire brigade members are trained in nuclear facility fire response strategy and tactics by qualified trainers using both classroom and hands-on instruction. The training curriculum is detailed in an administrative procedure. Refresher training is structured to ensure that the entire curriculum is repeated every two years.
C.1.6.4.3	Fire Brigade Practice	Compliance		Brigade practice sessions are scheduled to ensure that each member attends at least one session per year.
C.1.6.4.4	Fire Brigade Training Records	Compliance		Brigade training records will be retained for a minimum of three years.
C.1.7	Quality Assurance	Compliance		The Quality Assurance Program Description has appropriate provisions to govern the quality attributes of the fire protection program. The FPP conforms to the applicable provisions of 10 CFR 50, Appendix B and with the quality assurance guidance in RG 1.189.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 3 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.1.7.1	Design and Procurement Document Control	COL Applicant	Note 3	Design and Procurement Document Control shall be in accordance with the Quality Assurance Program Description. Fire protection quality requirements are included in plant configuration control processes.
C.1.7.2	Instructions, Procedures, and Drawings	COL Applicant	Note 3	The FPP provides instruction and procedures to control fire prevention and firefighting; design, installation, inspection, test, maintenance and modification of fire protection features/systems; and appropriate administrative controls in accordance with the Quality Assurance Program Description.
C.1.7.3	Control of Purchased Material, Equipment, and Services	COL Applicant	Note 3	The FPP provides procedures to control procurement of fire protection related items to ensure proper evidence of quality in accordance with the Quality Assurance Program Description.
C.1.7.4	Inspection	Compliance		The FPP includes procedures for independent inspection of fire protection-related activities including installation and/or maintenance of features including FP systems, emergency lighting and communication, cable routing, and fire barriers and opening protectives in accordance with the Quality Assurance Program Description.
C.1.7.5	Test and Test Control	Compliance		The FPP includes procedures for testing fire protection features and systems and includes criteria to ensure design and system readiness. This includes installation and acceptance testing, periodic testing, quality assurance oversight of testing, and proper test documentation in accordance with the Quality Assurance Program Description.
C.1.7.6	Inspection, Test, and Operating Status	Compliance		Fire protection features and systems are provided with suitable marking and labeling to indicate acceptance and readiness for operation in accordance with the Quality Assurance Program Description.
C.1.7.7	Non-conforming Items	Compliance		The FPP includes procedures for identification and control of items that do not conform to specified requirements, are inoperable or otherwise unsuitable. This includes tagging or labeling, notification and dispositioning of the nonconforming item in accordance with the Quality Assurance Program Description.
C.1.7.8	Corrective Action	Compliance		The plant has an administrative procedure to ensure that proper corrective actions are taken for conditions adverse to fire protection including root cause analysis when appropriate in accordance with the Quality Assurance Program Description.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 4 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.1.7.9	Records	Compliance		The FPP includes provisions for preparing and maintaining retrievable records that demonstrate conformance to fire protection requirements in accordance with the Quality Assurance Program Description.
C.1.7.10	Audits	Compliance		The FPP requires that audits be performed at the appropriate periodicity by qualified fire protection and QA personnel to verify that the program is being properly implemented and that compliance to fire protection requirements is being met in accordance with of the Quality Assurance Program Description.
C.1.7.10.1	Annual Fire Protection Audit	Compliance		An annual audit will be performed consistent with R.G. 1.189.
C.1.7.10.2	24-Month Fire Protection Audit	Compliance		A biennial audit will be performed consistent with R.G. 1.189 and of the Quality Assurance Program Description.
C.1.7.10.3	Triennial Fire Protection Audit	Compliance		A triennial audit will be performed consistent with R.G. 1.189 and of the Quality Assurance Program Description. Independent auditors will be used to perform triennial audits.
C.1.8	Fire Protection Program Changes/ Code Deviations	COL Applicant	Note 3	Compliance - If program changes or deviations are required, the plant will use risk-informed, performance-based methodologies consistent with R.G. 1.174 to evaluate and justify changes/ deviations.
C.1.8.1	Change Evaluations	COL Applicant	Note 3	Compliance - FPP program changes will be evaluated consistent with 10 CFR 50.59 and the applicable change processes in 10 CFR 52.
C.1.8.5	10 CFR 50.72 Notification and 10 CFR 50.73 Report	COL Applicant	Note 3	Compliance - the plant will report fire events and any fire protection program deficiencies consistent with 10 CFR 50.72 and 10 CFR 50.73.
C.1.8.7	Fire Modeling	COL Applicant	Note 3	Compliance - If fire models are used to evaluate changes, the plant will apply models consistent with R.G. 1.189 including limitations on their use and adequate verification and validation (as required).
C.2	Fire Prevention	Compliance		The FPP includes procedures to ensure minimization of fire hazards in areas important to safety for anticipated operating conditions and to ensure fire safety as part of facility modifications.
C.2.1	Control of Combustibles	Compliance		The FPP includes procedures to control transient combustibles consistent with the Fire Hazards Analysis and good fire prevention practices.
C.2.1.1	Transient Fire Hazards	Compliance		The FPP includes procedures to control transient combustibles consistent with the Fire Hazards Analysis and good fire prevention practices.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 5 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.2.1.2	Modifications	Compliance		The FPP includes procedures to ensure that fire prevention and fire safety practices are maintained and that the facility fire safety design basis is not negatively impacted.
C.2.1.3	Flammable and Combustible Liquids and Gases	Compliance		The FPP includes procedures to ensure flammable and combustible liquids and gases are handled properly and consistent with the facility design basis.
C.2.1.4	External/Exposure Fire Hazards	Compliance		The FPP includes procedures to ensure that any adjacent or external facilities to areas important to safety are evaluated consistent with NFPA 80A and for impact on the facility Fire Hazards Analysis.
C.2.2	Control of Ignition Sources	Compliance		The FPP includes procedures for control of ignition sources. The facility design follows recognized codes, standards, and practices to minimize ignition hazards.
C.2.2.1	Open Flame, Welding, Cutting, and Grinding (Hot Work)	Compliance		The FPP includes procedures for issuance of hot work permits and to control the designation of fixed weld shop areas or similar.
C.2.2.2	Temporary Electrical Installations	Compliance		The FPP includes procedures to monitor and control the use of temporary electrical installations for routine and outage related maintenance consistent with recognized standards and practices.
C.2.2.3	Other Sources	Compliance		The FPP includes procedures to monitor and control other non-routine ignition hazards such as temporary heating, leak testing, tar kettles, heat guns, and similar devices/operations.
C.2.3	Housekeeping	Compliance		The FPP includes procedures for routine housekeeping and monitoring areas important to safety for prompt removal of combustibles.
C.2.4	Fire Protection System Maintenance and Impairments	Compliance		The FPP includes procedures to ensure fire protection features and systems are maintained in accordance with applicable reference standards and other regulatory guidance. Fire system and feature impairments are controlled by a permit system authorized by a qualified individual.
C.3.5	Manual Firefighting Capabilities	Compliance		See below
C.3.5.1	Fire Brigade	Compliance		The Fire Brigade consists of at least five members available on each shift above the minimum shift complement for safe operation/ shutdown. The brigade is trained and equipped to respond to fire-related emergencies.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 6 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.3.5.1.1	Fire Brigade Staffing	Compliance		The Fire Brigade consists of at least five members available on each shift above the minimum shift complement for safe operation/ shutdown. The on-duty Shift Supervisor is not a member of the fire brigade.
C.3.5.1.2	Equipment	Compliance		The Fire Brigade is suitably outfitted and equipped for interior structural firefighting activities. PPE and related fire brigade equipment conforms with and is maintained per recognized standards. This includes turnout gear and self-contained breathing apparatus and equipment including hoses, nozzles, smoke ejectors, and other specialized equipment. Equipment maintenance and inspection is performed per plant procedure.
C.3.5.1.3	Procedures and Prefire Plans	Compliance		The Fire Brigade and fire response activities are conducted in accordance with annunciator response procedures, pre-fire plans, and related fire response procedures which address strategies and tactics typical to nuclear power plant fire response.
C.3.5.1.4	Performance Assessment/Drill Criteria	Compliance		The Fire Brigade will drill at least quarterly. At least one annual drill will be unannounced and one drill will be on a back shift. Drills will be scheduled to ensure that all brigade members participate in minimum of two drills per year. Drills are based on prepared drill and tabletop guides and will be critiqued by knowledgeable plant staff to ensure that fire response objectives are being met. An independent reviewer will be included at least once every three years.
C.3.5.2	Offsite Manual Firefighting Resources	Compliance		Offsite fire department response is governed through a mutual aid agreement with offsite fire departments. The offsite fire departments are included in pertinent training on the hazards of the facility and participate in a minimum of one drill per year on-site.
C.3.5.2.1	Capabilities	Compliance		The offsite fire department equipment is compatible with the plant equipment and/or adapters are provided and available when required.
C.3.5.2.2	Training	Compliance		The offsite fire departments are included in pertinent training on the hazards of and response within the facility including radiological and operational hazards; site access/security; and roles, responsibilities and authorities including command and response structure.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 7 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.3.5.2.3	Agreement/Plant Exercise	Compliance		The plant will establish written mutual aid agreements with off-site fire departments to provide response support to the fire brigade. Said agreements will address authorities and command responsibilities and will provide for periodic participation/joint training including annual drills and participation in radiological emergency response plan exercises.
C.4.1.7	Communications	Compliance		The Fire Brigade will utilize portable radios for communications during fire response. This system is arranged to not conflict with other site radio communications and to provide reliable, comprehensive coverage for the site. The radio system is the primary means of communication for fire brigade operations. Secondary communications are available to the fire brigade via the plant primary and wireless telephone systems and by the plant public address system.
C.5.5	Post-Fire Safe-Shutdown Procedures	COL Applicant	Note 3	Compliance - The plant will have detailed procedures and training to ensure fire-safe shutdown and other fire-safe conditions required to minimize radioactive material release are achieved and maintained.
C.5.5.1	Safe-Shutdown Procedures	COL Applicant	Note 3	Compliance - See C.5.5
C.5.5.2	Alternative/Dedicated Shutdown Procedures	COL Applicant	Note 3	Compliance - See C.5.5
C.5.5.3	Repair Procedures	COL Applicant	Note 3	Compliance - Consistent with the U.S. EPR FSAR, the plant does not permit repairs to achieve hot or cold shutdown conditions; procedures are not required.
C.6.1.6	Alternative/Dedicated Shutdown Panels	Compliance		The FPP includes procedures to control transient combustibles consistent with the Fire Hazards Analysis and good fire prevention practices.
C.6.2.4	Independent Spent Fuel Storage Areas	COL Applicant	Note 3	Compliance – No Independent Spent Fuel Storage Areas are planned for the plant at this time and are not included in this COL application.
C.6.2.6	Cooling Towers	Compliance		Essential Service Water Cooling Towers are addressed in Appendix 9A.
		COL Applicant	Note 3	The Cooling Tower Structures are addressed in Appendix 9B.

Table 9.5-1— {Fire Protection Program Compliance with Regulatory Guide 1.189}
(Page 8 of 8)

R.G. Section	Regulatory Guide 1.189 "C. Regulatory Position"[1]	Compliance[2]	U.S. EPR Comment	BBNPP
C.7.6	Nearby Facilities	COL Applicant	Note 3	Compliance - Appendix 9A of the U.S. EPR FSAR provides the technical analysis for the nuclear island and related power block structures and demonstrates that the EPR has the ability to achieve and maintain safe-shutdown and to minimize the release of radioactive materials to the environment. FSAR Appendix 9B of this COL application provides an analysis of fire hazards and details fire protection attributes for the remainder of the plant.
C.8.4	Applicable Industry Codes and Standards	Compliance		The FPP will conform to the codes and standards and applicable edition years listed in Section 9.5.1.7 of the U.S. EPR FSAR.
C.8.6	Fire Protection Program Implementation Schedule	Compliance		The required elements of the FPP are fully operational prior to receipt of new fuel for buildings storing new fuel and adjacent areas that could affect the fuel storage area at the plant. Other required elements of the FPP described in FSAR Section 9.5.1 are fully operational prior to initial fuel loading at.

Notes:

1. The scope of the Regulatory Position presented in this compliance comparison table is abbreviated, due to the depth of detail contained within the Regulatory Position Appendix C itself. The user should refer to Regulatory Guide 1.189 directly for the text portion of each section addressed by the table.
2. The U.S. EPR compliance to the regulatory positions delineated in Regulatory Guide 1.189, "Fire Protection for Nuclear Power Plants," is as indicated by the following definitions:
   - COL Applicant – The COL Applicant will address the subject regulatory position.
   - Compliance – The U.S. EPR design supports compliance with the subject regulatory position.
3. A COL Applicant that references the U.S. EPR design certification will submit site specific information to address the Regulatory Position.

Figure 9.5-1— {Fire Protection Organization}

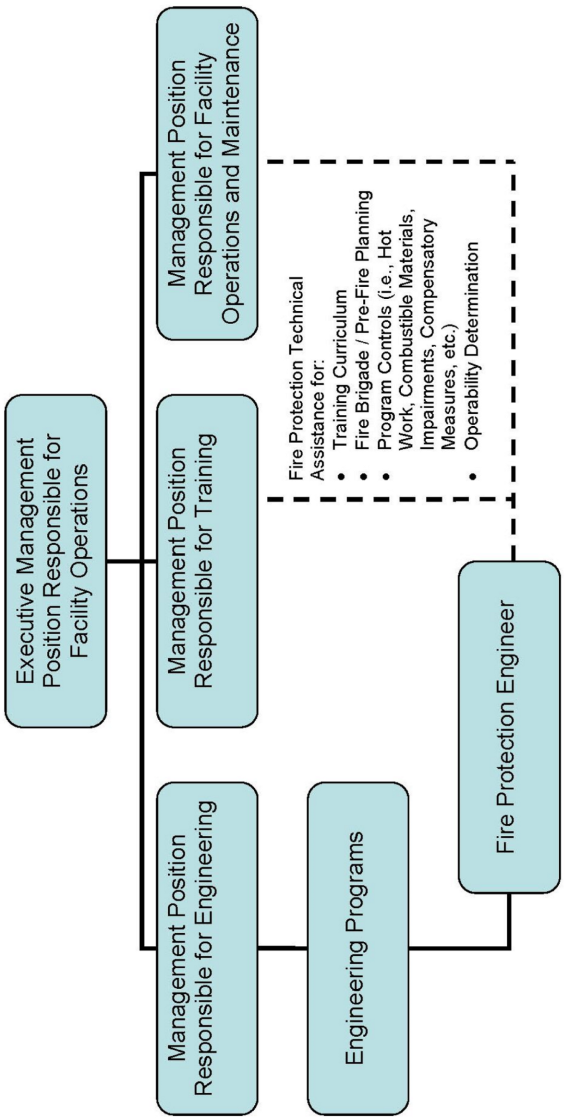
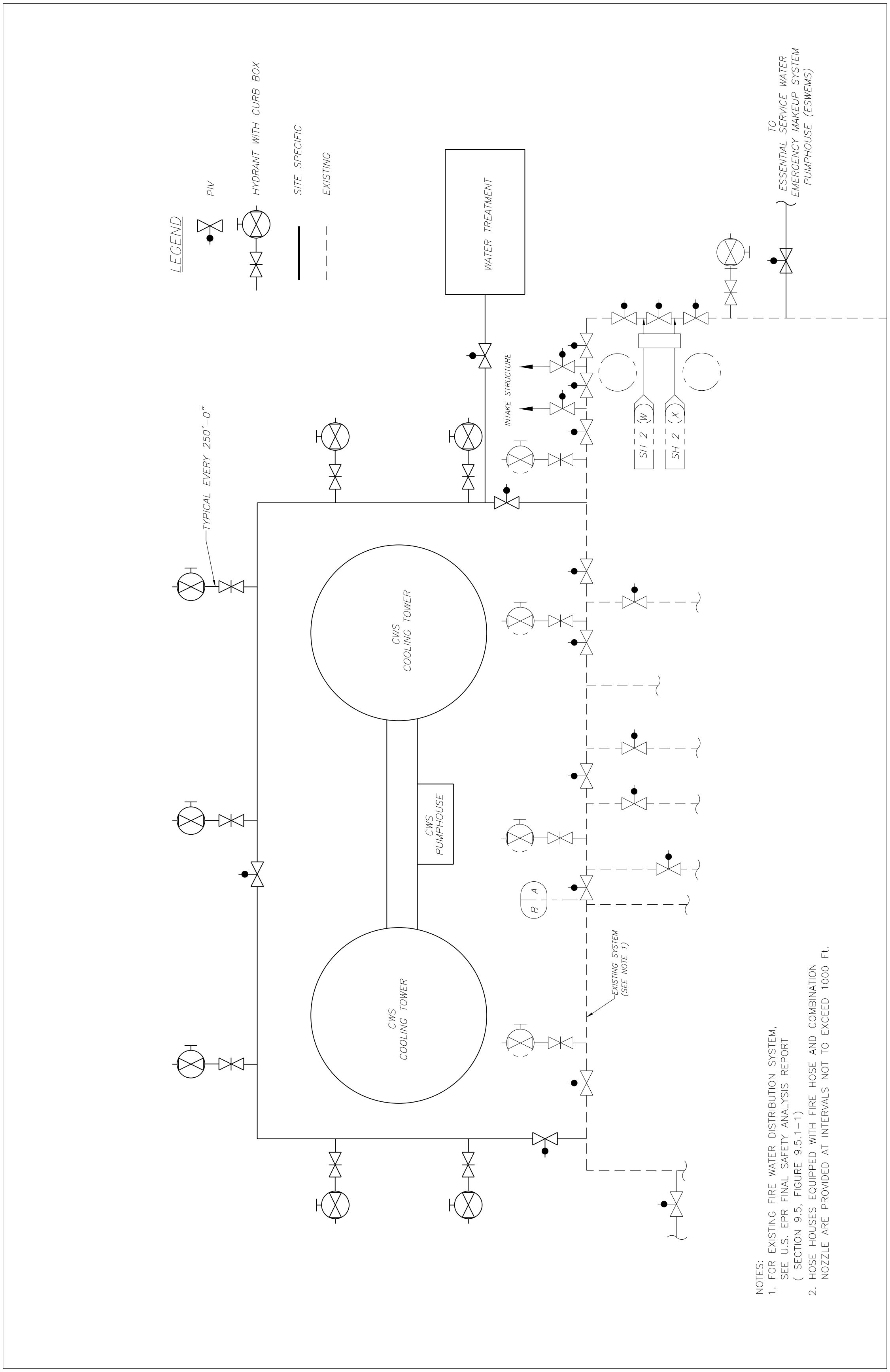


Figure 9.5-2— {Fire Water Distribution System - Site Specific Facilities}



9A FIRE PROTECTION ANALYSIS

Appendix 9A of the U.S. EPR FSAR is incorporated by reference with the following supplement.

The information in U.S. EPR FSAR Appendix 9A – the fire protection analysis of the nuclear island – is supported by additional information provided in Appendix 9B. Appendix 9B provides the fire protection analysis of the remaining power block and balance of plant structures.

Figures 9A-98 through 106 in the U.S. EPR FSAR are identified as conceptual information for the Access Building. These figures and the corresponding fire area parameters in Table 9A-2 of the U.S. EPR FSAR for the Access Building are applicable to the plant.

9B FIRE PROTECTION ANALYSIS - PLANT SPECIFIC SUPPLEMENT

9B.1 INTRODUCTION

The Fire Protection Analysis (FPA) evaluates the potential for occurrence of fires within the plant, documents the capabilities of the fire protection system, and provides reasonable assurance of the capability to safely shut down the plant. The FPA is an integral part of the process of selecting fire prevention, detection, and suppression methods, and provides a design basis for the fire protection system. The design of the fire protection system is described in Section 9.5.1 and U.S. EPR FSAR Section 9.5.1.

This FPA is performed for the remaining power block and balance of plant structures that were not addressed in Appendix 9A. The FPA is performed for each fire area using the methodology addressed in Section 9B.2. The methodology follows the guidance of Regulatory Guide 1.189 (NRC, 2007a). The results of the analysis are provided in Section 9B.3.

Fires are expected to occur over the life of a nuclear power plant and should be treated as anticipated operational occurrences as defined in Appendix A to 10 CFR Part 50. Requirements for protection against radiation during normal operations appear in 10 CFR Part 20. Anticipated operational occurrences of fires should not result in unacceptable radiological consequences applying the exposure criteria of 10 CFR Part 20. Prevention of a radiological release that could result in a radiological hazard to the public, environment, or plant personnel becomes the primary objective during plant shutdown and decommissioning.

9B.1.1 Regulatory Bases

The regulatory bases and requirements applicable to the U.S. EPR design certification and {BBNPP} have been previously established, and are only restated in this FPA for completeness. 10 CFR 52.48 (CFR, 2008a) specifies, in part, that applications filed under this subpart will be reviewed for compliance with the standards set out in 10 CFR Part 50 and its appendices.

GDC 3 of Appendix A to 10 CFR Part 50 states:

"Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components."

Additionally, 10 CFR 50.34(h) (CFR, 2008b) requires new reactor license applications to include an evaluation of the facility against the current Standard Review Plan (SRP) guidance. The applicable SRP guidance is specified in Section 9.5.1 of NUREG-0800 (NRC, 2007b). NUREG-0800 describes the areas of review, acceptance criteria and review procedure for NRC review of nuclear power plant fire protection programs. NUREG-0800 in turn invokes Regulatory Guide 1.189, for methods acceptable to the NRC to demonstrate compliance with the SRP review criteria. In addition to the guidance specified in Regulatory Guide 1.189, Section 9.5.1 of NUREG-0800 also invokes SECY-90-016 (NRC, 1990) for additional NRC fire protection requirements applicable to evolutionary reactor designs.

9B.1.2 Defense-in-depth

The objective of the overall Fire Protection Program is to implement a defense-in-depth strategy to achieve and maintain a high degree of plant safety. This strategy is accomplished by achieving and maintaining a balance between the following:

- Prevent fires from occurring.
- The capability to rapidly detect, control, and promptly extinguish those fires that do occur.
- Adequate protection for structures, systems, and components (SSC) important to safety so that a fire that is not promptly extinguished by fire suppression activities will not prevent safe shutdown of the plant or result in release of radioactive materials to the environment.

The programmatic elements used by the FPA to implement the defense-in-depth strategy are:

- Document and assess the impact of in situ and transient fire hazards on a fire area basis throughout the facility, including potential effects on safe shutdown capability, effects of fire suppression activities, and applicable risk insights from the probabilistic fire risk assessment.
- Specify measures for fire prevention, fire detection, fire suppression, and fire confinement.
- Minimize the potential for a fire or fire-related event to place the plant in an unrecoverable condition, cause a release of radioactive materials, or result in radiological exposure to onsite and offsite personnel.
- Specify measures that will provide reasonable assurance that one success path of safe shutdown capability will be available under credible post fire conditions.

9B.1.3 Scope

The scope of the FPA consists of the comprehensive assessment of the fire or explosion hazards for the plant structures in the following list, including a description of the fire protection defense-in-depth features provided to minimize the consequences of such an event.

- Turbine Building (UMA)
- Switchgear Building (UBA)
- Auxiliary Power Transformer Area (UBE)
- Generator Transformer Area (UBF)
- {Warehouse Building (UST)}
- Security Access Building (UYF)
- Central Gas Supply Building (UTG)
- {Grid Systems Control Building (UAC)}

- Fire Protection Building (USG)
- {Circulating Water System Cooling Tower Structures (URA)}
- {Circulating Water System Pumphouse (UQA)}
- {Essential Service Water Emergency Makeup System Pumphouse (UPF)}
- {BBNPP Intake Structure (UPE)}

9B.2 FIRE PROTECTION ANALYSIS METHODOLOGY

9B.2.1 General Design Criteria

As described in Section 9B.1, the fire protection performance objectives are:

- Provide reasonable assurance that one success path of SSC will remain free of fire damage so that hot standby and cold shutdown conditions can be achieved without crediting plant or system repair activities.

- Minimize and control the release of radioactivity to the environment.

To meet these performance objectives, SECY-90-016 (NRC, 1990) specifies the following design criteria:

"Therefore, the evolutionary ALWR designers must ensure the safe shutdown can be achieved, assuming all equipment in any one fire area is rendered inoperable by fire and that re-entry into the fire area for repairs and operator actions is not possible. Because of its physical configuration, the control room is excluded from this approach, provided an independent alternative shutdown capability that is physically and electrically independent of the control room is included in the design. Evolutionary ALWR designers must provide fire protection for redundant shutdown systems in the reactor containment building that will ensure, to the extent practicable, that one shutdown division will be free of fire damage. Additionally, the evolutionary ALWR designers must ensure that smoke, hot gases or the fire suppressant will not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator manual actions."

Based on the previously mentioned criteria, for the U.S. EPR, redundant divisions of safe shutdown systems, components, and cables, including associated circuits (e.g., safety-related, non-safety-related, Class 1E and non-Class 1E), whose failure could affect or prevent post fire safe shutdown capability, should not be located within the same fire area. The exceptions are the control room, because of provision of physically and electrically independent alternative shutdown capability, and the Reactor Building, because of provision of fire protection defense-in-depth features that provide reasonable assurance, to the extent practicable, that one success path of SSC necessary to achieve safe shutdown will remain free of fire damage.

9B.2.2 Specific Elements

To meet this design criterion, the following methodology is employed.

1. In accordance with GDC 3, structures, systems, and components important to safety must be designed and located to minimize the probability and effect of fires and explosions. The requirements of GDC 3 are met, in part, by compartmentation of the plant into separate fire areas. Specifically, based on the hazards present and the need for physical separation of SSC important to safety, the plant is segregated into separate fire areas by passive, fire-rated structural barriers (e.g., walls, floors, and ceilings). In some instances (e.g., Reactor Building), a fire area is sub-divided into fire zones based on physical separation, location of plant equipment, or for FPA purposes. These fire areas and zones serve the primary purpose of confining the effects of fires to a single compartment or area, thereby minimizing the potential for adverse effects from fires on redundant SSC important to safety. Outside of the control room and the Reactor Building, each of the redundant divisions of emergency core cooling are separated by three hour rated structural fire barriers.

2. Materials used in plant construction are noncombustible or heat resistant to the extent practicable in accordance with GDC 3. Walls, floors, roofs, including structural materials, suspended ceilings, thermal insulation, radiation shielding materials, and soundproofing and interior finish are noncombustible or meet applicable qualification test acceptance criteria unless otherwise justified. Concealed spaces are devoid of combustibles unless otherwise justified.

3. The plant layout also provides reasonable assurance that adequate means of access to all plant areas is provided for manual fire suppression activities and allow safe access and egress for personnel. The layout and travel distances of access and egress routes meet the intent of NFPA 101 (NFPA, 2006) to the extent practicable, unless otherwise justified. Potential delays in plant access or egress due to security locking systems are considered.

4. The in situ plant equipment and components, including electrical cables, housed within each fire area are considered. Any SSC important to safety located within the fire area are considered.

5. In situ fire and explosion hazards associated with plant operations, maintenance, and refueling activities within the fire area are identified (e.g., cables, lube oil, diesel fuel oil, flammable gases, chemicals, building materials, and interior finish). In developing postulated fire scenarios for each fire area, the FPA considers the continuity of combustible materials, susceptibility of the materials to ignition, heat of combustion, heat release rates (HRR), and potential for fire spread.

   In the event that a fire area could be subject to potentially explosive environments from flammable gases or other potentially energetic sources (e.g., chemical treatment systems, ion exchange columns), explosion-prevention features and measures are provided.

   External exposure hazards are identified (e.g., flammable and combustible liquid or gas storage, auxiliary boiler units, natural vegetation) that could potentially expose SSC important to safety to fire effects (i.e., heat, flame, smoke). Wildfire hazards are addressed if the potential for damage to SSC important to safety exists.

6. The credible in situ ignition sources within the fire area are identified. The FPA classifies ignition sources as common or atypical and assign potential fire severity levels on a generic basis using predefined guidance. Most in situ ignition sources are of the common type, which include electrical switchgear cabinets, general electrical and control cabinets, electric motors, pumps (i.e., reactor coolant pumps, feedwater pumps, and other pumps), diesel generators, air compressors, battery banks, boiler heating units, electric dryers, heating, ventilation, air conditioning (HVAC) subsystem components, and others.

   Atypical sources of ignition include arcing electrical faults, hydrogen storage tanks, hydrogen piping, turbine generator exciter hydrogen, outdoor oil-filled transformers, and liquid fuels (i.e., spills). Because of their nature, fires associated with atypical ignition sources are not assigned a generic intensity level.

   Most anticipated fires will involve the common in situ ignition sources as represented by the equipment and components typically found in nuclear power plants. Such fires can be assessed using a fixed fire intensity (i.e., HRR) level for the given fire ignition source. However, consideration of a fixed fire intensity level for a given ignition source may not adequately consider the potential for low-likelihood, high intensity fires. NUREG/CR-6850 (NRC, 2005) addressed this concern by assigning a ranking of two HRR values. The first value assigned is the 75th percentile fire intensity. This means that 75 percent of the fires involving a given ignition source would reach an intensity no greater than the cited fire intensity (absent the fire propagating to any secondary combustibles). The second HRR value is the 98th percentile value, which is intended to represent a high-confidence fire intensity value, which based on the industry guidance cited, is expected to bound the vast majority of fires involving a given ignition source. Table 9B-1-Predefined Severities for Common Plant Ignition Source Fires provides the predefined HRR values associated with common plant ignition sources.

Based on the in situ fire or explosion hazards and sources of ignition present within the fire area under consideration, postulated fire scenarios are developed and assessed. The FPA then assigns a hazard classification to each fire area. This classification is used as a broad characterization of the overall hazard assessment of each fire area. The classification system uses the same category and naming hierarchy as the NFPA 13 (NFPA, 2007) for classification of building occupancies. However, as used herein, these classifications are only intended to be a simplified reflection of the positive correlation between fire severity and the quantity of fuel available to support combustion and the thermal properties (e.g., HRR) of the fuel. The HRR values shown for each fire area hazard classification are only intended to represent the level of intensity that would generally be expected for a fire of this type. These HRR values are not used as a basis for determining worst-case fire scenarios. The classifications used are defined as follows:

-Light Hazard - areas where, in combination or separately, the quantity or combustibility of materials are generally low, and fires with relatively low rates of heat release (e.g., 70 kW) are expected.

-Ordinary Hazard (OH) (Group 1) - areas where the combustibility of materials is generally low, the quantity of materials is moderate (without large concentrations), and fires with moderate rates of heat release (e.g., 200 kW) are expected.

-Ordinary Hazard (OH) (Group 2) - areas where the quantity and combustibility of materials are moderate to high (segregated large concentrations may exist), and fires with moderate to high rates of heat release (e.g., 650 kW) are expected.

-Extra Hazard (EH) (Group 1) - areas where the quantity and combustibility of materials are very high, with materials present that have the potential to result in rapidly developing fires with high rates of heat release (e.g., 2 MW), but with little or no combustible or flammable liquids present.

-Extra Hazard (EH) (Group 2) - areas with moderate to substantial amounts of combustible or flammable liquids present, which would result in fires having very high rates of heat release (e.g., 10 MW).

The predefined higher and lower HRR values associated with common ignition source fires and the corresponding FPA hazard classifications are provided in Table 9B-1.

7. Based on the type and nature of the plant equipment located in the area, the plant activities normally performed in the area, and the frequency of those activities, the FPA provides a transient hazard level (THL) assessment of transient fire hazards into

the fire area analysis. A THL-1 determination generally reflects no need for detailed assessment of transient fire hazards. Depending on the type and quantity of in situ hazards within the area and its FPA hazard classification, a THL-2 determination may or may not reflect the need for detailed assessment of transient fire hazards. A THL-3 determination generally reflects the need for detailed assessment of transient fire hazards within the area analysis. In such cases, the material type, quantity, and associated thermal properties comprising the transient hazard package is evaluated. More than one type of transient hazard source may apply to a given fire area. Section 9B.2.3.3 provides additional information regarding the transient fire hazard determination process.

Based on compartmentation of the plant by three hour rated structural fire barriers, additional fire protection features (e.g., fire detection system capability, fixed fire suppression system capability, electrical raceway fire barrier systems) are generally not required in order to provide adequate separation of redundant trains of safe shutdown systems, components, and cables. However, for provision of fire protection features, regulatory requirements and regulatory guidance takeprecedence.

Risk-informed, performance based methods, or other quantitative / computational methods or tools are not utilized to determine where fire detectionn and suppression systems will or will not be installed. However, where fire detection and suppression systems are provided in accordance with regulatory gUidance, recognized fire protection engineering practices, methods, and analytical tools, such as those promulgated by NUREG-1805 (NRC, 2004) and NUREG-1824 (NRC, 2007c) may be used to assess the performance capability of such systems.

8. Based on the previously mentioned considerations, suitable fire protection defense-in-depth features are specified for all plant fire areas.

   The fire protection features provided (e.g., fire barriers and closure devices, fire detection systems, fire suppression systems and equipment) are designed and installed in accordance with applicable regulatory guidance, codes and NFPA standards. Deviations from the above requirements are justified. See U.S. EPR FSAR Section 9.5.1 for further information regarding fire protection features.

9. Appropriate manual fire suppression capability (i.e., hydrants, standpipe and hose systems, and portable fire extinguishers) are specified and described for each plant fire area.

10. Pursuant to GDC 3, the potentially disabling effects of fire suppression systems, due to normal or inadvertent operation, on SSC important to safety are described for each fire area.

11. The FPA describes the means provided to ventilate, exhaust, or isolate each fire area. Additionally, in accordance with SECY-90-016 (NRC, 1990), the ventilation system design provides reasonable assurance that smoke, hot gases, and fire suppressants do not migrate into other fire areas to the extent that they could adversely affect safe shutdown capabilities, including operator manual actions. See U.S. EPR FSAR Section 9.5.1 for further information regarding the ventilation system design.

12. For each fire area, the capability to protect SSC important to safety from flooding associated with automatic and manual fire suppression activities, including inadvertent operation or fire suppression system failure, is considered. The effects of

floor drains on the ability of total flooding gaseous fire suppression systems to achieve and maintain agent concentration upon discharge is considered for applicable fire areas.

In fire areas containing flammable or combustible liquids, the measures are provided to minimize the potential for fire propagation via the drainage system.

13. Emergency lighting required to support fire suppression activities and post fire safe shutdown operations, including access and egress routes to such locations, is described.

14. Plant communication systems, including hardwired and radio systems to provide effective communications between plant personnel performing safe shutdown operations, fire brigade personnel, and the main control room (MCR) or alternative shutdown location, are described.

9B.2.3 Assumptions

9B.2.3.1 General

1. The loss of function of systems used to mitigate the consequences of design basis accidents under post fire conditions does not necessarily impact public safety. The need to limit fire damage to systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents.

2. The systems used for alternative shutdown do not need to be designed to Seismic Category I criteria, single failure criteria, or other design basis accident criteria, except the portions of these systems that interface with or impact safety systems.

3. Fire damage to safe shutdown equipment or fires with the potential to result in release of radioactive materials to the environment is assessed on the basis of a single fire, including an exposure fire. An exposure fire is a fire in a given area that involves either in situ or transient combustibles and has the potential to affect SSC important to safety or radioactive materials located in or adjacent to that same area. The effects of such fire (e.g., smoke, heat, and ignition) can adversely affect those SSC important to safety. Thus, if safe shutdown equipment associated with multiple success paths were located in the same fire area, a fire involving one success path of safe shutdown equipment could constitute an exposure fire to the remaining success paths. A fire involving combustibles other than a redundant success path may constitute an exposure fire to redundant success paths located in the same area.

4. Redundant systems required for design basis accident consequence mitigation, but not required for fire safe shutdown may be damaged by a single exposure fire. The most stringent limitation for fire damage applies toward those systems that are required for both safe shutdown and design basis accident mitigation.

5. The fire event considered for alternative shutdown is a postulated fire in a specific fire area containing redundant safe shutdown cables or equipment where it has been determined that fire protection systems and features can not be provided to provide reasonable assurance that safe shutdown capability will be preserved. For the U.S. EPR, areas requiring alternative shutdown are limited to the control room.

6. It is assumed that a fire may occur at any time, but is not postulated to occur simultaneously with plant accidents or with severe natural phenomena (e.g., floods or

high winds). However, severe natural phenomena (e.g., earthquakes) may initiate a fire event and are considered in evaluating the design capability of fire protection systems and features.

7. In evaluating the capability to accomplish post fire safe shutdown, offsite power may or may not be available and consideration is given to both cases. However, loss of offsite power need not be considered for a fire in non-alternative shutdown areas (i.e., outside of the control room) if it can be shown that offsite power can not be lost because of a fire in that area.

8. Alternative shutdown capability accommodates post fire conditions where offsite power is available and where offsite power is not available for 72 hours. In evaluating safe shutdown circuits, including associated circuits, the availability of uninterrupted power (i.e., offsite power available) may impact the ability to control the safe shutdown of the plant by increasing the potential for associated circuit interactions resulting from fire damage to energized power and control circuits.

9. Intentional station blackout (SBO) is not relied upon to mitigate potential fire damage to safe shutdown systems or associated circuits.

9B.2.3.2 Ignition Sources

1. Self-ignition of electrical cables that are qualified in accordance with a nationally recognized standard fire test methodology, such as IEEE Standard 1202 (IEEE, 2006) is not considered credible due to the protective devices (e.g., fuses, circuit breakers) provided and analyzed to be properly sized. On this basis, qualified electrical cables are considered as potential damage targets, but not ignition sources. Accordingly, any type of electrical cabling routed within metal conduit is considered as potential damage targets, but do not contribute to fire growth and spread. Therefore, they are not considered as ignition sources.

2. Hot work is only considered as a transient ignition source where performance of hot work is consistent with the plant equipment and normal activities to be performed within the fire area.

9B.2.3.3 Transient Fire Hazards

1. THL-1 applies to fire areas that are normally closed to any type of traffic, are not visited often (e.g., not more than once per week), are not occupied during normal plant operations, and where maintenance activities would generally be disallowed during at-power modes of plant operation. Such fire areas should also be subject to administrative controls that disallow leaving or storing unattended transient combustible materials. Examples of THL-1 areas include:

    - Areas where the exposed combustibles are limited to qualified cables, access is strictly controlled, and administrative controls prevent unattended transient combustibles.

    - Cable vaults and other areas having controlled access.

    - MCR (Exception: continuous occupancy of the MCR is not taken as indicative of a higher transient fire likelihood because extraordinary vigilance is expected for this area).

    - Reactor Building.

2. THL-2 applies to fire areas that either have occasional to frequent foot traffic (e.g., not more than once per shift and the area is not a regular access transit pathway) or are occasionally, but not continuously occupied during normal plant operations. Modest storage of transient combustible materials may be allowed. THL-2 would also apply to a fire area where maintenance activities are allowed at-power modes of plant operation, but such maintenance activities are subject to administrative controls (e.g., activity-specific permit process or other combustible controls program measures) and are a relatively rare occurrence (e.g., once per operating year). Examples of THL-2 areas or processes include:

   - Areas not normally locked but are not used as a passage to other areas of the plant (e.g., a DC power distribution panel room at the end of a corridor).
   - Normally unlocked areas that only a few plant personnel may enter once or twice per shift.
   - Areas that normal plant operations may infrequently involve personnel occupation for up to several hours.
   - Areas where the predominate exposed combustibles are qualified cables, but may contain other plant components.
   - Areas where materials may be stored on a temporary basis (e.g., to perform a maintenance or repair activity on nearby equipment). However, such storage should be infrequent rather than routine.
   - Areas where routine maintenance or repair activities (e.g., pump lube oil change-out or motor bearing maintenance) may result in the introduction of transient combustibles or ignition sources on a relatively common basis (e.g., two or more times per year) while the plant is at-power.
   - Most pump rooms and areas within the Nuclear Auxiliary Building.
   - Most switchgear areas and battery rooms, depending on the frequency of maintenance activities.

3. THL-3 generally applies to fire areas that have heavy foot traffic, are frequently or continuously occupied, where transient combustibles are typically stored, where plant refuse is routinely gathered in substantive quantities for collection, where ignition sources are frequently brought into the area, and where maintenance activities are common during normal plant operation. Examples of THL-3 areas include:

   - Plant areas where personnel are present for a large fraction of the time. Paper-based items (e.g., letters, reports, computer printouts) are brought in and maintained in the area. Small electrical tools or appliances (e.g., hot plates, portable heaters, microwave ovens, and coffee pots) may frequently be used in the area. Also included are health physics access control areas, break room areas, any area used for food preparation, and security stations. While not applicable to the MCR, portions of the control room complex, such as kitchen or security areas may be THL-3.
   - Areas where smoking is not prohibited, or where there is evidence of smoking.

- Areas with open trash cans that routinely contain substantive quantities of general trash.
- Areas where radiation protection gear (e.g., jump suits, gloves, boots) are stored or collected including turn-out and change-out areas.
- Areas used for storage (permanent or temporary) of flammable or combustible liquids or gases.
- Staging areas where items are repaired or constructed before they are taken to other parts of the plant for use or installation.
- Areas where materials are prestaged in anticipation of a planned outage.
- Truck loading and unloading bays.
- Areas where hot work is relatively common during at-power plant operations.
- Areas within the diesel generator areas, intake structures, and the Radiation Waste Building.

9B.3 FIRE AREA-BY-FIRE AREA EVALUATION

The FPA is performed on a fire area by fire area basis for the following plant structures:

- Turbine Building (UMA)
- Switchgear Building (UBA)
- Auxiliary Power Transformer Area (UBE)
- Generator Transformer Area (UBF)
- {Warehouse Building (UST)}
- Security Access Building (UYF)
- Central Gas Supply Building (UTG)
- {Grid Systems Control Building (UAC)}
- Fire Protection Building (USG)
- {Circulating Water System Cooling Tower Structures (URA)}
- {Circulating Water Pumphouse (UQA)}
- {Essential Service Water Emergency Makeup System Pumphouse (UPF)}
- {BBNPP Intake Structure (UPE)}

9B.3.1 Turbine Building

9B.3.1.1 Fire Area FA-UMA-01 (Table 9B-2, Column 1)

Fire area FA-UMA-01 is the Turbine Building. It consists of all floor elevations from (-)23 ft to 65 ft, but also includes the condenser pits located at (-)43 ft below grade elevation. Due to its vast size, fire area FA-UMA-01 is divided into the following fire zones:

Zone Number	Zone Name
FZ-UMA-01	Turbine Building, Floor Elev. (-)23’0”, Plant South
FZ-UMA-02	Turbine Building, Floor Elev. (-)23’0”, Plant North
FZ-UMA-03	Turbine Building, Floor Elev. 0’0”, Plant South
FZ-UMA-04	Turbine Building, Floor Elev. 0’0”, Plant North
FZ-UMA-05	Turbine Building, Floor Elev. 38’0”, Plant South
FZ-UMA-06	Turbine Building, Floor Elev. 38’0”, Plant North
FZ-UMA-07	Turbine Building, Floor Elev. 65’0”

Note: The condenser pits located at (-)43 ft are each included in FZ-UMA-01 and FZ-UMA-02, respectively.

The following areas contained in FA-UMA-01 are specifically cited for their hazards. Their locations are represented by the following descriptions:

Hazard Location	Hazard Name
UMA03-001	Hydrogen Seal Oil Unit
UMA05-001	Lube Oil Drainage Trench 1
UMA05-002	Lube Oil Lines 1
UMA05-003	Turbine-Generator/Exciter Bearings
UMA05-004	Lube Oil Lines 2
UMA05-005	Lube Oil Drainage Trench 2

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-01 from affecting adjacent fire areas.

This fire area is frequently occupied during normal plant operations. The egress route from this area in the event of a fire is via grade level exits provided from each room.

9B.3.1.2 Fire Area FA-UMA-02 (Table 9B-2, Column 2)

Fire area FA-UMA-02 is the Stairwell located in the southeast (plant southeast) corner of the Turbine Building that serves those elevations from (-)23 ft to 115 ft.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-02 from affecting adjacent fire areas.

This fire area is one of four egress routes/exits from the Turbine Building. If this exit becomes obstructed due to fire conditions, three other exit stairwells are available.

9B.3.1.3 Fire Area FA-UMA-03 (Table 9B-2, Column 3)

[Security-Related Information - Withheld Under 10 CFR 2.390(d)(1) - See Part 9 of this COL Application]

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-03 from affecting adjacent fire areas.

This fire area is one of four egress routes/exits from the Turbine Building. If this exit becomes obstructed due to fire conditions, three other exit stairwells are available.

9B.3.1.4 Fire Area FA-UMA-04 (Table 9B-2, Column 4)

Fire area FA-UMA-04 is the Stairwell located in the northeast (plant northeast) corner of the Turbine Building that serves those elevations from (-)23 ft to 115 ft.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-04 from affecting adjacent fire areas.

This fire area is one of four egress routes/exits from the Turbine Building. If this exit becomes obstructed due to fire conditions, three other exit stairwells are available.

9B.3.1.5 Fire Area FA-UMA-05 (Table 9B-2, Column 5)

[Security-Related Information - Withheld Under 10 CFR 2.390(d)(1) - See Part 9 of this COL Application]

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-05 from affecting adjacent fire areas.

This fire area is one of four egress routes/exits from the Turbine Building. If this exit becomes obstructed due to fire conditions, three other exit stairwells are available.

9B.3.1.6 Fire Area FA-UMA-06 (Table 9B-2, Column 6)

Fire area FA-UMA-06 is the Elevator shaft located in the southeast (plant southeast) corner of the Turbine Building from elevation (-)23 ft to 65 ft.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-06 from affecting adjacent fire areas.

This fire area is not used as an egress component and occupants are protected from the effects of fire by rated construction and by elevator control and recall features.

9B.3.1.7 Fire Area FA-UMA-07 (Table 9B-2, Column 7)

Fire area FA-UMA-07 is the Oil Discharge Tank Room located at grade elevation within FZ-UMA-04.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-07 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is through one of multiple doors provided from the room with continuing egress to the exterior of the structure.

9B.3.1.8 Fire Area FA-UMA-08 (Table 9B-2, Column 8)

Fire area FA-UMA-08 is the the Lube Oil Room located 38 ft above grade elevation. It includes the Main Lube Oil Tank, Filter and Cooler and is located within FZ-UMA-06.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UMA-08 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is through one of multiple doors provided from the room with continuing egress to the exterior of the structure.

9B.3.2 Switchgear Building

9B.3.2.1 Fire Area FA-UBA-01 (Table 9B-2, Column 9)

Fire area FA-UBA-01 is the Switchgear Building floor located 13 ft below grade elevation. Fire area FA-UBA-01 is comprised of the following rooms:

Room Number	Room Name
UBA01-001	Cable Spreading Room 1

Room Number	Room Name
UBA01-002	Cable Spreading Room 2
UBA01-003	SBO Diesel Tank Room 1
UBA01-004	SBO Cable Spreading Room 1
UBA01-005	SBO Cable Spreading Room 2
UBA01-006	SBO Diesel Tank Room 2
UBA01-007	SBO Aux. Equipment Room 1
UBA01-008	SBO Aux. Equipment Room 2
UBA01-009	Corridor

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBA-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. [Security-Related Information - Withheld Under 10 CFR 2.390(d)(1) - See Part 9 of this COL Application]

9B.3.2.2 Fire Area FA-UBA-02 (Table 9B-2, Column 10)

Fire area FA-UBA-02 is the Switchgear Building floor located 0 ft (grade) elevation. Fire area FA-UBA-02 is comprised of the following rooms:

Room Number	Room Name
UBA02-001	MV Distribution Board Room 1
UBA02-002	480V LV Main Distribution Room 1
UBA02-003	480V LV Main Distribution Room 2
UBA02-004	MV Distribution Board Room 2
UBA02-005	Engine Room 1
UBA02-006	SBO Control Room 1
UBA02-007	SBO Control Room 2
UBA02-008	Engine Room 2
UBA02-009	Auxiliary Boiler Equipment Room
UBA02-010	Corridor

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBA-02 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations.

[Security-Related Information - Withheld Under 10 CFR 2.390(d)(1) - See Part 9 of this COL Application]

9B.3.2.3 Fire Area FA-UBA-03 (Table 9B-2, Column 11)

Fire area FA-UBA-03 is the Switchgear Building floor located 13 ft above grade elevation. Fire area FA-UBA-03 is comprised of the following rooms:

Room Number	Room Name
UBA03-001	Cable Distribution Division Room 1
UBA03-002	Cable Distribution Division Room 2
UBA03-003	Corridor

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBA-03 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations.

The egress route from this area in the event of a fire is via Turbine Building exit stairwells FA-UMA-03 and FA-UMA-05.

9B.3.2.4 Fire Area FA-UBA-04 (Table 9B-2, Column 12)

Fire area FA-UBA-04 is the Switchgear Building floor located 24.5 ft above grade elevation. Fire area FA-UBA-04 is comprised of the following rooms:

Room Number	Room Name
UBA04-001	Battery Room 1
UBA04-002	Battery Charger Room 1
UBA04-003	I&C Control & Protection Panel Room 1
UBA04-004	I&C Control & Protection Panel Room 2
UBA04-005	Battery Charger Room 2
UBA04-006	Battery Room 2
UBA04-007	Air Handling Room 1
UBA04-008	Air Handling Room 2
UBA04-009	Corridor

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBA-04 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. [Security-Related Information - Withheld Under 10 CFR 2.390(d)(1) - See Part 9 of this COL Application]

9B.3.3 Auxiliary Power Transformer Area

9B.3.3.1 Fire Area FA-UBE-01 (Table 9B-2, Column 13)

Fire area FA-UBE-01 is the area that houses the Emergency Auxiliary Power Transformer number 1 (EAT 1) and associated equipment in structure 31UBE. Fire area FA-UBE-01 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBE-01	Cubicle housing the EAT 1 Transformer (30BDT01)

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBE-01 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.3.2 Fire Area FA-UBE-02 (Table 9B-2, Column 14)

Fire area FA-UBE-02 is the area that houses the Normal Auxiliary Power Transformer number 1 (NAT 1) and associated equipment in structure 32UBE. Fire area FA-UBE-02 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBE-02	Cubicle housing the NAT 1 Transformer (30BBT01)

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBE-02 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.3.3 Fire Area FA-UBE-03 (Table 9B-2, Column 15)

Fire area FA-UBE-03 is the area that houses the Normal Auxiliary Power Transformer number 2 (NAT 2) and associated equipment in structure 33UBE. Fire area FA-UBE-03 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBE-03	Cubicle housing the NAT 2 Transformer (30BBT02)

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBE-03 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.3.4 Fire Area FA-UBE-04 (Table 9B-2, Column 16)

Fire area FA-UBE-04 is the area that houses the Normal Auxiliary Power Transformer number 3 (NAT 3) and associated equipment in structure 34UBE. Fire area FA-UBE-04 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBE-04	Cubicle housing the NAT 3 Transformer (30BBT03)

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBE-04 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.3.5 Fire Area FA-UBE-05 (Table 9B-2, Column 17)

Fire area FA-UBE-05 is the area that houses the Emergency Auxiliary Power Transformer number 2 (EAT 2) and associated equipment in structure 35UBE. Fire area FA-UBE-05 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBE-05	Cubicle housing the EAT 2 Transformer (30BDT02)

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBE-04 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.4 Generator Transformer Area

9B.3.4.1 Fire Area FA-UBF-01 (Table 9B-2, Column 18)

Fire area FA-UBF-01 is the area that houses the Main Step-Up (MSU) Transformer 30BAT01 and associated equipment in structure 31UBF. Fire area FA-UBF-01 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBF-01	Cubicle housing the MSU Transformer 30BAT01

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBF-01 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.4.2 Fire Area FA-UBF-02 (Table 9B-2, Column 19)

Fire area FA-UBF-02 is the area that houses the Main Step-Up (MSU) Transformer 30BAT02 and associated equipment in structure 33UBF. Fire area FA-UBF-02 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBF-02	Cubicle housing the MSU Transformer 30BAT02

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBF-02 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.4.3 Fire Area FA-UBF-03 (Table 9B-2, Column 20)

Fire area FA-UBF-03 is the area that houses the Main Step-Up (MSU) Transformer 30BAT03 and associated equipment in structure 33UBF. Fire area FA-UBF-03 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBF-03	Cubicle housing the MSU Transformer 30BAT03

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBF-03 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.4.4 Fire Area FA-UBF-04 (Table 9B-2, Column 21)

Fire area FA-UBF-04 is the area that houses the spare Main Step-Up (MSU) Transformer 30BAT04 and associated equipment in structure 34UBF. Fire area FA-UBF-04 is comprised of the following zones:

Zone Number	Fire Zone Description
FZ-UBF-04	Cubicle housing the spare MSU Transformer 30BAT04

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UBF-04 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. This exterior area is not enclosed by significant egress impediments/obstructions.

9B.3.5 {Warehouse Building

9B.3.5.1 Fire Area FA-UST-01 (Table 9B-2, Column 22)

Fire area FA-UST-01 is the Warehouse Building. It consists of the following rooms:

Room Number	Room Name
UST-01-001	Office
UST-01-002	Storage Area

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UST-01 from affecting adjacent fire areas.

This fire area is frequently occupied during normal plant operations. The egress route from this area in the event of a fire is via the stair enclosures located at each corner of the Warehouse Building.}

9B.3.6 Security Access Facility

9B.3.6.1 Fire Area FA-UYF-01 (Table 9B-2, Column 23)

Fire area FA-UYF-01 is the Security Access Facility.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UYF-01 from affecting adjacent fire areas.

This fire area is frequently occupied during normal plant operations. The egress route from this area in the event of a fire is via grade level exits.

9B.3.7 Central Gas Supply Building

9B.3.7.1 Fire Area FA-UTG-01 (Table 9B-2, Column 24)

Fire area FA-UTG-01 is the oxygen cylinder storage room.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UTG-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via multiple exits to the exterior located at grade elevation.

9B.3.7.2 Fire Area FA-UTG-02 (Table 9B-2, Column 25)

Fire area FA-UTG-02 is the miscellaneous gas cylinder storage room. Gases stored in this area include argon, nitrogen, and argon-methane (flammable – 90% argon, 10% methane).

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UTG-02 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via multiple exits to the exterior located at grade elevation.

9B.3.7.3 Fire Area FA-UTG-03 (Table 9B-2, Column 26)

Fire area FA-UTG-03 is the hydrogen cylinder storage room. Only hydrogen gas is stored in this area.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UTG-03 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via multiple exits to the exterior located at grade elevation.

9B.3.8 {Grid Systems Control Building

9B.3.8.1 Fire Area FA-UAC-01 (Table 9B-2, Column 27)

Fire area FA-UAC-01 is one of two switchyard control rooms and is designated as Switchyard Control Room 1.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UAC-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via multiple exits to the exterior located at grade elevation.

9B.3.8.2 Fire Area FA-UAC-02 (Table 9B-2, Column 28)

Fire area FA-UAC-02 is one of two switchyard control rooms and is designated as Switchyard Control Room 2.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UAC-02 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via multiple exits to the exterior located at grade elevation.}

9B.3.9 Fire Protection Building

9B.3.9.1 Fire Area FA-USG-01 (Table 9B-2, Column 29)

Fire area FA-USG-01 is one of two diesel fire pump rooms and is designated as Diesel Fire Pump Room 1.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-USG-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via a single exit to the exterior.

9B.3.9.2 Fire Area FA-USG-02 (Table 9B-2, Column 30)

Fire area FA-USG-02 is one of two diesel fire pump rooms and is designated as Diesel Fire Pump Room 2.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-USG-02 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via a single exit to the exterior.

9B.3.9.3 Fire Area FA-USG-03 (Table 9B-2, Column 31)

Fire area FA-USG-03 is the electric and jockey fire pump room.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-USG-03 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of a fire is via a single exit to the exterior.

9B.3.10 {Circulating Water System Cooling Tower Structures

9B.3.10.1 Fire Area FA-URA-01 (Table 9B-2, Column 32)

Fire area FA-URA-01 is the west Circulating Water System Cooling Tower Structure.

The adequacy of the fire protection features provided are sufficient to prevent a fire originating within fire area FA-URA-01 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations.

9B.3.10.2 Fire Area FA-URA-02 (Table 9B-2, Column 33)

Fire area FA-URA-02 is the east Circulating Water System Cooling Tower Structure.

The adequacy of the fire protection features provided are sufficient to prevent a fire originating within fire area FA-URA-02 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations.

9B.3.11 Circulating Water System Pumphouse

9B.3.11.1 Fire Area FA-UQA-01 (Table 9B-2, Column 34)

Fire area FA-UQA-01 is the upper floor level of the building that houses electrical equipment and the four circulating water system pumps.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within Fire Area FA-UQA-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via the three exits to the exterior.

9B.3.12 Essential Service Water Emergency Makeup System Pumphouse

9B.3.12.1 Fire Area FA-UPF-01 (Table 9B-2, Column 35)

Fire area FA-UPF-01 is the corridor which serves the ESWEMS pump rooms.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UPF-01 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via two exits to the exterior.

9B.3.12.2 Fire Area FA-UPF-02 (Table 9B-2, Column 36)

Fire area FA-UPF-02 is one of the ESWEMS pump rooms and is designated as ESWEMS Pump Room 1.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UPF-02 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via a single grade level exit to fire area FA-UPF-01, a single mezzanine level exit to fire area FA-UPF-03, and via multiple ladders from below grade and the mezzanine.

9B.3.12.3 Fire Area FA-UPF-03 (Table 9B-2, Column 37)

Fire area FA-UPF-03 is one of the four ESWEMS pump rooms and is designated ESWEMS Pump Room 2.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UPF-03 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via a single grade level exit to the fire area FA-UPF-01, a single mezzanine level exit to fire area FA-UPF-02, and via multiple ladders from below grade and the mezzanine.

9B.3.12.4 Fire Area FA-UPF-04 (Table 9B-2, Column 38)

Fire area FA-UPF-04 is one of the four ESWEMS pump rooms and is designated as ESWEMS Pump Room 3.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UPF-04 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via a single grade level exit to the fire area FA-UPF-01, a single mezzanine level exit to fire area FA-UPF-05, and via multiple ladders from below grade and the mezzanine.

9B.3.12.5 Fire Area FA-UPF-05 (Table 9B-2, Column 39)

Fire area FA-UPF-05 is one of the four ESWEMS pump rooms and is designated as ESWEMS Pump Room 4.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within fire area FA-UPF-05 from affecting adjacent fire areas.

This fire area is occasionally occupied during normal plant operations. The egress route from this area in the event of fire is via a single grade level exit to the fire area FA-UPF-01, a single mezzanine level exit to fire area FA-UPF-04, and via multiple ladders from below grade and the mezzanine.

9B.3.13 BBNPP Intake Structure

9B.3.13.1 Fire Area FA-UPE-01 (Table 9B-2, Column 40)

Fire Area FA-UPE-01 is an open area on the upper level of the building. Electrical control equipment, three circulating water system makeup pumps, three RWS makeup pumps, and three screen-wash pumps are in this area.

The adequacy of the fire protection features provided is sufficient to prevent a fire originating within Fire Area FA-UPE-01 from affecting adjacent fire areas.

This fire area is not normally occupied during normal plant operations. The egress route from this area is via two exits to the exterior.}

9B.4 REFERENCES

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Table 9B-1— Predefined Severities for Common Plant Ignition Source Fires

Fire Size (Hazard Classification)	Small Electrical Fire	Large Electrical Fire	Indoor Oil-Filled Transformers	Very Large Fire Sources	Engines and Heaters	Solid and Transient Combustibles
70 kW (Light)	75^{th} Percentile Fire				75^{th} Percentile Fire	75^{th} Percentile Fire
200 kW (OH-Group 1)	98^{th} Percentile Fire	75^{th} Percentile Fire			98^{th} Percentile Fire	98^{th} Percentile Fire
650 kW (OH Group 2)		98^{th} Percentile Fire	75^{th} Percentile Fire	75^{th} Percentile Fire		
2 MW (EH Group 1)			98^{th} Percentile Fire			
10 MW (EH Group 2)				98^{th} Percentile Fire		

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 1 of 15)

Column	1	2	3	4	5
Fire Area	FA-UMA-01	FA-UMA-02	FA-UMA-03	FA-UMA-04	FA-UMA-05
Building or Area	UMA	UMA	UMA	UMA	UMA
Figures	Figures 9B-1 through 9B-5, 7, 9	Figures 9B-1 through 9B-4, 6, 8	Figures 9B-1 through 9B-4, 6	Figures 9B-1 through 9B-4, 6	Figures 9B-1 through 9B-4, 6, 8
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, b, c, d, f, g, j	None	None	None	None
Transient Fire Loading	THL-3	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, c, d, e, m	a	a	a	a
Atypical Ignition Sources (Note 2b)	cc, dd, ee	None	None	None	None
Hazard Classification (Note 13)	OH Group-2	Light Hazard	Light Hazard	Light Hazard	Light Hazard
Automatic Fire Detection	Yes (Hazard specific) 05-003 T-G/Exciter Brgs 03-001 H2 Seal Oil Unit 05-001 LO Drain Trench 1 05-005 LO Drain Trench 2	No	No	No	No
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression	Yes (Hazard & Zone specific) Auto wet-pipe: Turbine underfloor zones & skirt, and Lube Oil lines 1 and 2 Auto pre-action: T-G/ Exciter Bearings Auto water spray: H2 Seal Oil Unit, and Lube Oil Drain Trenches	Yes	Yes	Yes	Yes
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	1	2	3	4	5
Radiological Affects	None	None	None	None	None
HVAC	Note 10 Smoke and heat vents	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	aa	aa	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	6	7	8	9	10
Fire Area	FA-UMA-06	FA-UMA-07	FA-UMA-08	FA-UBA-01	FA-UBA-02
Building or Area	UMA	UMA	UMA	UBA	UBA
Figures	Figures 9B-1 through 9B-4, 6	Figures 9B-2, 9	Figures 9B-3, 7, 8	Figures 9B-10,14	Figures 9B-11, 12, 14
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figures	See Figures	See Figures
SSC: important to safety	None	None	None	Yes	Yes
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, c, d, e, g, j	d	a, c, d, e, g, j	a, b, c, d, e, g, j, n	a, b, c, d, e, g, j, k, n, s
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, m	a	a, b, c, d, m	a, b, c, d, g, m	a, b, c, d, g, i, k, m, p
Atypical Ignition Sources (Note 2b)	None	ee	ee	aa, ee	aa, ee
Hazard Classification (Note 13)	OH Group-1	EH Group-2	EH Group-2	EH Group-2 EH Group-1 Light	EH Group-2 OH Group-1 Light
Automatic Fire Detection	No	No	No	Yes (Hazard specific) 01-001 Cable Spread Rm 1 01-002 Cable Spread Rm 2 01-004 SBO Cable Spread Rm 1 01-005 SBO Cable Spread Rm 2	Yes (Hazard specific) 02-001 MV Dist Bd Rm 1 02-002 LV Main Dist Rm 1 02-003 LV Main Dist Rm 2 02-004 MV Dist Bd Rm 2 02-006 SBO Control Rm 1 02-007 SBO Control Rm 2
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	6	7	8	9	10
Automatic Fixed Fire Suppression	Yes	Yes	Yes	Yes (Hazard specific) Auto wet-pipe: SBO Diesel Tank Rooms, SBO Aux. Equip. Rms, and Corridor Auto double interlock pre-action: Cable Spreading Rooms	Yes (Hazard specific) Auto wet-pipe: Engine Rooms, Aux. Boiler Equip. Rm and Corridor Auto double interlock pre-action: MV and LV Distrib Board Rms and SBO Control Rooms
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	aa	aa	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	11	12	13	14	15
Fire Area	FA-UBA-03	FA-UBA-04	FA-UBE-01	FA-UBE-02	FA-UBE-03
Building or Area	UBA	UBA	UBE	UBE	UBE
Figures	Figures 9B-12, 14	Figures 9B-13, 14	Figure 9B-15	Figure 9B-15	Figure 9B-15
Fire Barriers (Notes 3,4,5,6)	See Figures	See Figures	See Figure	See Figure	See Figures
SSC: important to safety	Yes	Yes	Yes	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, c, e, g, j	a, b, c, e, f, g, h, j, m	a, e, g, l	a, e, g, l	a, e, g, l
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, g, m	a, b, g, j, k, m	a, b, f	a, b, f	a, b, f
Atypical Ignition Sources (Note 2b)	aa	aa	aa, ee, ff	aa, ee, ff	aa, ee, ff
Hazard Classification (Note 13)	EH Group-1 Light	OH Group-2 OH Group-1 Light	EH Group-2	EH Group-2	EH Group-2
Automatic Fire Detection	Yes (Hazard specific) 03-001 Cable Dist Div., Rm 1 03-002 Cable Dist Div., Rm 2	Yes (Hazard specific) 04-001 Battery Rm 1 04-002 Battery Chgr Rm 1 04-003 I&C C&P Panel Rm 1 04-004 I&C C&P Panel Rm 2 04-005 Battery Chgr Rm 2 04-006 Battery Rm 2	Yes	Yes	Yes
Manual Fire Alarms	Yes	Yes	No	No	No

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	11	12	13	14	15
Automatic Fixed Fire Suppression	Yes (Hazard specific) Auto wet-pipe: Corridor Auto double interlock pre-action: Cable Distribution Division Rooms	Yes (Hazard specific) Auto wet-pipe: Air Handling Rms and Corridor Auto double interlock pre-action: Battery Rms, Battery Charger Rms, and I&C Control / Protection Panel Rms	Yes	Yes	Yes
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	Yes	Yes	No	No	No
Portable Fire Extinguishers (Note 8)	Yes	Yes	No	No	No
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	aa	None	None	None
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
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Column	16	17	18	19	20
Fire Area	FA-UBE-04	FA-UBE-05	FA-UBF-01	FA-UBF-02	FA-UBF-03
Building or Area	UBE	UBE	UBF	UBF	UBF
Figures	Figure 9B-15	Figure 9B-15	Figure 9B-15	Figure 9B-15	Figure 9B-15
Fire Barriers (Notes 3,4,5,6)	See Figure	See Figure	See Figure	See Figure	See Figure
SSC: important to safety	None	Yes	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, e, g, l	a, e, g, l	a, e, g, l	a, e, g, l	a, e, g, l
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, f	a, b, f	a, b, f	a, b, f	a, b, f
Atypical Ignition Sources (Note 2b)	aa, ee, ff	aa, ee, ff	aa, ee, ff	aa, ee, ff	aa, ee, ff
Hazard Classification (Note 13)	EH Group-2	EH Group-2	EH Group-2	EH Group-2	EH Group-2
Automatic Fire Detection	Yes	Yes	Yes	Yes	Yes
Manual Fire Alarms	No	No	No	No	No
Automatic Fixed Fire Suppression	Yes	Yes	Yes	Yes	Yes
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	No	No	No	No	No
Portable Fire Extinguishers (Note 8)	No	No	No	No	No
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	None	None	None	None	None
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 8 of 15)

Column	21	22	23	24	25
Fire Area	FA-UBF-04	FA-UST-01	FA-UYF-01	FA-UTG-01	FA-UTG-02
Building or Area	UBF	UST	UYF	UTG	UTG
Figures	Figure 9B-15	Figure 9B-16	Figure 9B-17	Figure 9B-18	Figure 9B-18
Fire Barriers (Notes 3,4,5,6)	See Figure	See Figure	See Figure	See Figure	See Figure
SSC: important to safety	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, e, g, l	a, b, c, d, r, s	a, b, c, r, s	a, c, g, j	a, c, g, j, u
Transient Fire Loading	THL-2	THL-3	THL-3	THL-1	THL-1
Common Ignition Source (Note 2a)	a, b, f	a, c	a	a, m	a, m
Atypical Ignition Sources (Note 2b)	aa, ee, ff	ee	None	None	None
Hazard Classification (Note 13)	EH Group-2	OH Group-2	Light Hazard	EH Group-2	OH Group-2
Automatic Fire Detection	Yes	No	Yes	No	No
Manual Fire Alarms	No	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression	Yes	Yes	No	Yes	Yes
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	No	Yes	No	No	No
Portable Fire Extinguishers (Note 8)	No	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	None	aa	aa	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 9 of 15)

Column	26	27	28	29	30
Fire Area	FA-UTG-03	FA-UAC-01	FA-UAC-02	FA-USG-01	FA-USG-02
Building or Area	UTG	UAC	UAC	USG	USG
Figures	Figure 9B-18	Figure 9B-19	Figure 9B-19	Figure 9B-20	Figure 9B-20
Fire Barriers (Notes 3,4,5,6)	See Figure	See Figure	See Figure	See Figure	See Figure
SSC: important to safety	None	None	None	Yes	Yes
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, c, f, g, j	a, b, c, d, e, f, g, j, m, r, s, v	a, b, c, d, e, f, g, j, m, r, s, v	a, c, d, g, j, n	a, c, d, g, j, n
Transient Fire Loading	THL-1	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, m	a, b, j, m	a, b, j, m	a, b, d, m	a, b, d, m
Atypical Ignition Sources (Note 2b)	bb	None	None	ee	ee
Hazard Classification (Note 13)	EH Group-2	OH Group-1	OH Group-1	EH Group-2	EH Group-2
Automatic Fire Detection	No (H2 gas detection w/ exhaust auto-start)	Yes	Yes	No	No
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression	Yes	No	No	Yes	Yes
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	No	No	No	No	No
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	aa	aa	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 10 of 15)

Column	31	32	33	34	35
Fire Area	FA-USG-03	FA-URA-01	FA-URA-02	FA-UQA-01	FA-UPF-01
Building or Area	USG	URA	URA	UQA	UPF
Figures	Figure 9B-20	Figure 9B-21	Figure 9B-21	Figure 9B-22	Figure 9B-23
Fire Barriers (Notes 3,4,5,6)	See Figure	See Figure	See Figure	See Figure	See Figure
SSC: important to safety	None	None	None	None	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, c, d, g, j	a, b, d, e, g, w	a, b, d, e, g, w	a, b, c, d, e, g, j	a, c, g
Transient Fire Loading	THL-2	THL-1	THL-1	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, c, d, m	a, b, c	a, b, c	a, b, c, d, m	a
Atypical Ignition Sources (Note 2b)	None	ee	ee	None	None
Hazard Classification (Note 13)	OH Group-1	OH Group-2	OH Group-2	OH Group-1	Light
Automatic Fire Detection	Yes	Yes	Yes	Yes	Yes
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression	No	No	No	No	No
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	No	No	No	No	Yes
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	None	None	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 11 of 15)

Column	36	37	38	39	40
Fire Area	FA-UPF-02	FA-UPF-03	FA-UPF-04	FA-UPF-05	FA-UPE-01
Building or Area	UPF	UPF	UPF	UPF	UPE
Figures	Figure 9B-23	Figure 9B-23	Figure 9B-23	Figure 9B-23	Figure 9B-24
Fire Barriers (Notes 3,4,5,6)	See Figure	See Figure	See Figure	See Figure	See Figure
SSC: important to safety	Yes	Yes	Yes	Yes	None
SCC: post-fire safe shutdown	None	None	None	None	None
In situ Loading (Note 1)	a, c, e, g, j, k, t	a, c, e, g, j, k, t	a, c, e, g, j, k, t	a, c, e, g, j, k, t	a, c, d, e, g, j
Transient Fire Loading	THL-2	THL-2	THL-2	THL-2	THL-2
Common Ignition Source (Note 2a)	a, b, c, d, m, o, p	a, b, c, d, m, o, p	a, b, c, d, m, o, p	a, b, c, d, m, o, p	a, b, c, d, m
Atypical Ignition Sources (Note 2b)	None	None	None	None	None
Hazard Classification (Note 13)	Light	Light	Light	Light	OH Group-1
Automatic Fire Detection	Yes	Yes	Yes	Yes	Yes
Manual Fire Alarms	Yes	Yes	Yes	Yes	Yes
Automatic Fixed Fire Suppression	No	No	No	No	No
Manual Fixed Fire Suppression	No	No	No	No	No
Standpipe and Hose System (Note 7)	Yes	Yes	Yes	Yes	No
Portable Fire Extinguishers (Note 8)	Yes	Yes	Yes	Yes	Yes
Suppression Affects	Note 14	Note 14	Note 14	Note 14	Note 14
Plant Drains	Note 9	Note 9	Note 9	Note 9	Note 9
Radiological Affects	None	None	None	None	None
HVAC	Note 10	Note 10	Note 10	Note 10	Note 10
Emergency Lighting (Note 11)	aa	aa	aa	aa	aa
Communication (Note 12)	Yes	Yes	Yes	Yes	Yes
Engineering Evaluations	None	None	None	None	None

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 12 of 15)

Column	36	37	38	39	40

Notes
1. In-situ Loading:

a. Miscellaneous Cable Insulation

b. Miscellaneous Plastic and Rubber

c. Miscellaneous Wire and Plastic Components (Panels)

d. Lubricants and Hydraulic Fluids

e. Electrical Cabinets

f. Flammable Gases (Hydrogen)

g. Electrical Cable Insulation (Cable Trays)

h. Charcoal (Filters)

i. Air Compressors

j. HVAC Subsystem Components

k. Transformers (Dry)

l. Transformers (Oil-filled)

m. Battery Cases

n. Diesel Fuel Oil

o. Paints, Solvents and Cleaning Fluids

p. Clothing (Cotton and Synthetic Blends)

q. Clothing (Rubber and Plastic)

r. Paper Records, Procedures and Files

s. Furniture and/or Appliances

t. Air Handling Units

u. Flammable Gases (Methane)

v. Battery Chargers

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 13 of 15)

Column	36	37	38	39	40
2a. Common Ignition Sources:					
a. Low to Medium Voltage Electrical Circuits					
b. General Electrical and Control Cabinets					
c. Electric Motors					
d. Pumps					
e. Air Compressors					
f. Indoor Oil-filled Transformers					
g. Electrical Switchgear Cabinets					
h. Reactor Protection System MG sets					
i. Diesel Generators					
j. Battery Banks					
k. Boiler Heating Units					
l. Electric Dryers					
m. HVAC subsystem components					
n. Low Voltage Electrical Circuits					
o. Air Handling Units					
p. Transformers (Dry)					

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 14 of 15)

Column	36	37	38	39	40
2b. Atypical Ignition Sources: aa. Arcing Electrical Faults bb. Hydrogen Storage Tanks cc. Hydrogen Piping dd. T/G Exciter / Hydrogen ee. Liquid Fuels (spills) ff. Outdoor Oil-filled Transformers 3 . Barrier Ratings: See "Fire Barrier Location" located on the Fire Area Layout Drawings 4. Doors: ♦ For 1 hour fire rated barriers, minimum 1 hour fire rated door assemblies are provided. ♦ For 2 hour fire rated barriers, minimum 1.5 hour fire rated door assemblies are provided. ♦ For 3 hour fire rated barriers, minimum 3 hour fire rated door assemblies are provided.					
5. Dampers: ♦ For 1 hour fire rated barriers, minimum 1 hour fire rated dampers are provided, except where through duct configuration is suitable to satisfy NFPA 90A (NFPA, 2002) requirements to allow for dampers to be omitted. ♦ For 2-hour fire rated barriers, minimum 1.5-hour fire rated dampers are provided. ♦ For 3-hour fire rated barriers, minimum 3-hour fire rated dampers are provided.					
6. Penetrations: Penetrations through fire rated walls, floors, and ceilings of each fire area are sealed or otherwise closed with rated penetration seal assemblies except where seal omission is permitted by NFPA code/standard. Any non-rated penetrations through rated barriers in this fire area will be justified by engineering evaluations. 7. Standpipe and Hose Stations: A Class II hose and standpipe system is available.					
8. Portable Fire Extinguishers: Portable fire extinguishers are available throughout the building to support manual fire fighting activities. 9. Plant Drains: Drainage to be determined during detailed design. Drains will be provided except where storage of hazardous materials and/or radiological contamination imposes requirements for confinement and/or secondary containment.					
10. HVAC: Duct smoke detection and fan interlock will be provided when required by NFPA 90A. 11. Emergency Lighting: aa. self-contained, battery backed fixtures installed throughout the fire area which provide minimum illumination for a 90 minute period to ensure a safe access/ egress path in the event of a loss of the normal lighting system.					

Table 9B-2— Table 9B-2 {Fire Area Parameters}
(Page 15 of 15)

Column	36	37	38	39	40

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

13. Hazard Classification:
See Section 9B.2.2 for definition of hazard classifications.

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

14. Suppression Affects:
No adverse affects from automatic suppression systems are anticipated based on selected suppression agents and systems, on the absence of important to safety SSCs in the area or room of concern, and/or on the absence of important to safety SSCs susceptible to damage in the area or room of concern. This will require confirmation after final room/area, suppression system and important to safety SSC configuration/layout.

Figure 9B-1— {Fire Barrier Location, Turbine Building Plan at Elevation (-)23 ft}

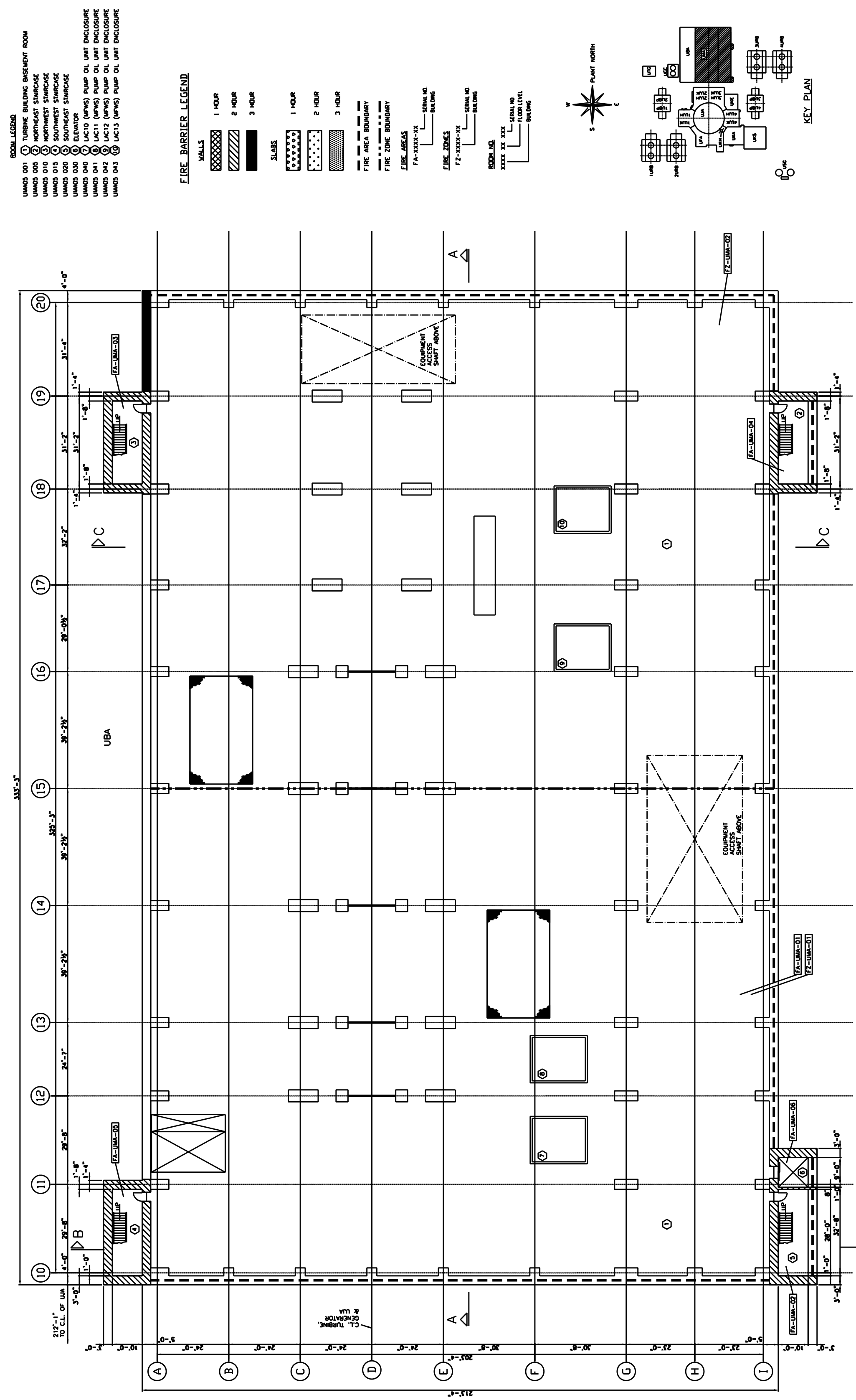


Figure 9B-2— {Fire Barrier Location, Turbine Building Plan at Elevation 0 ft}

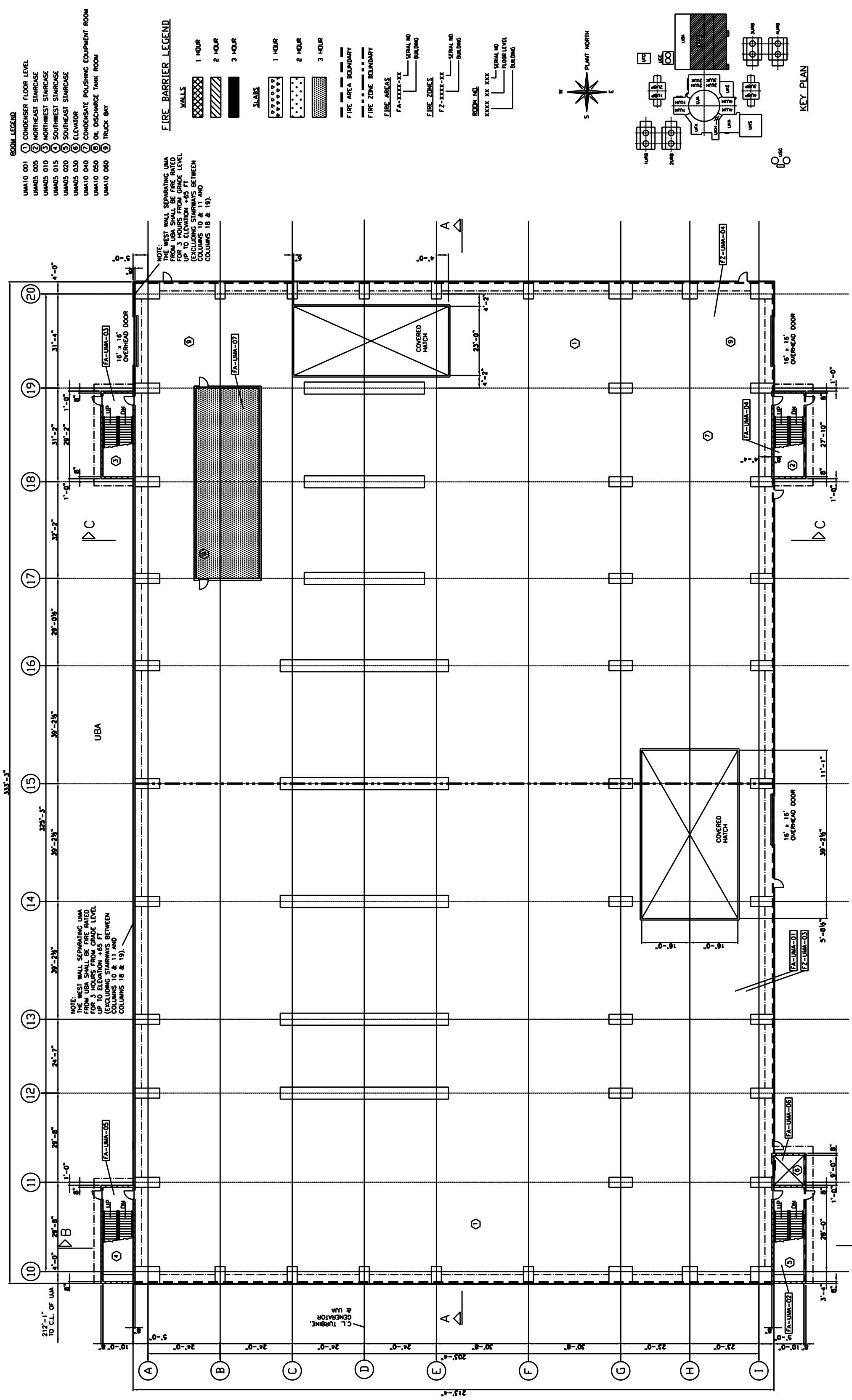


Figure 9B-3— {Fire Barrier Location, Turbine Building Plan at Elevation +38 ft}

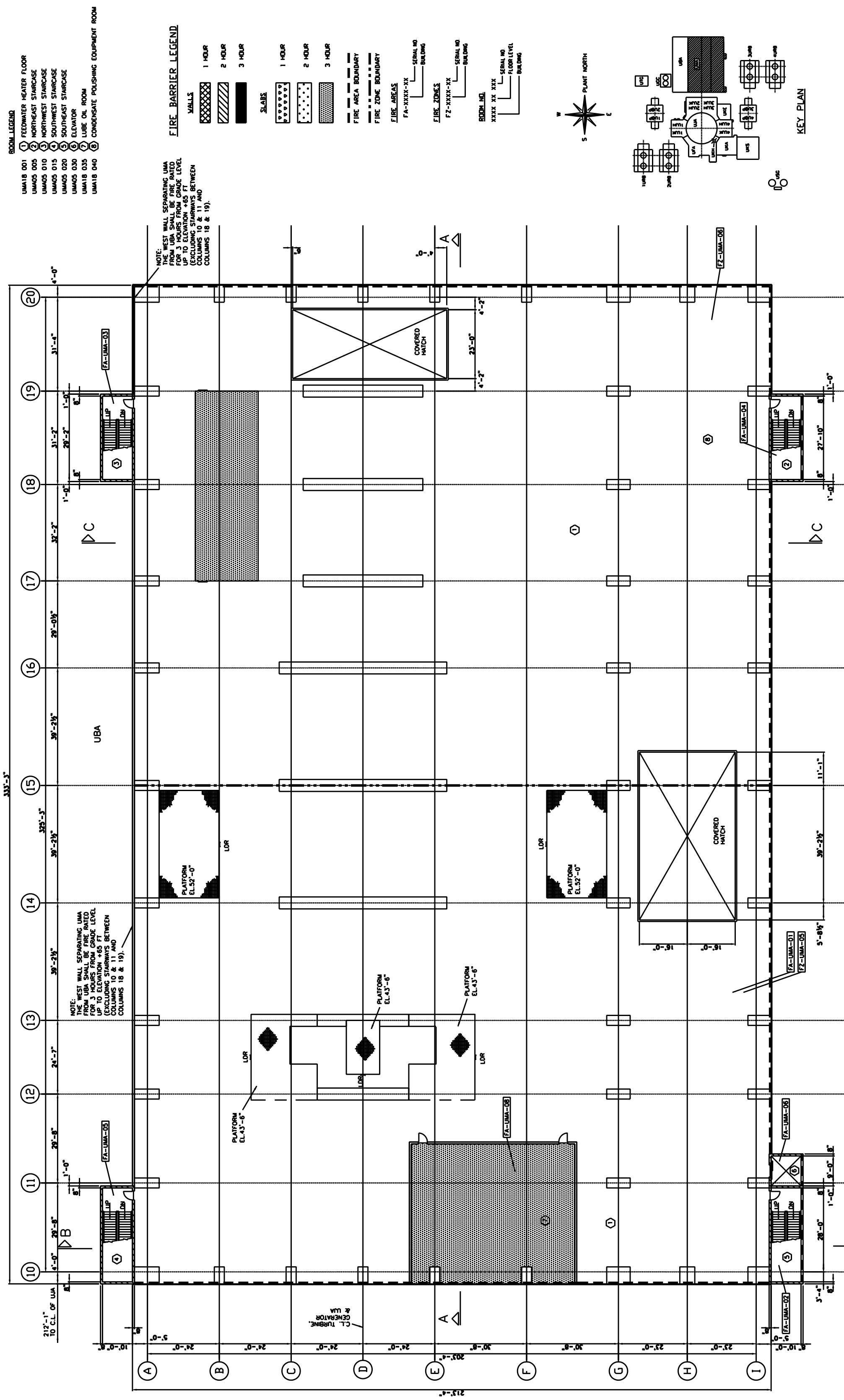
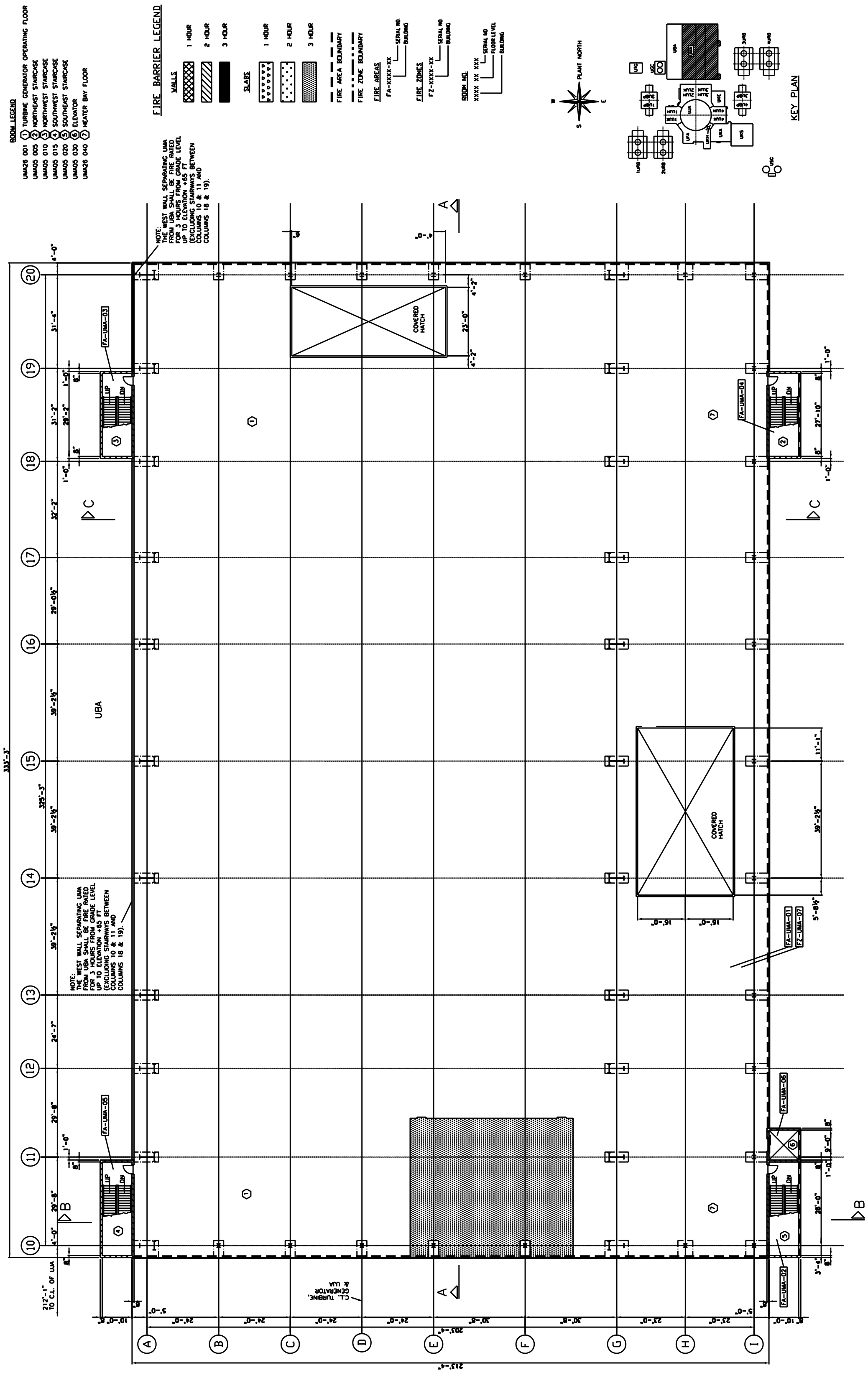


Figure 9B-4— {Fire Barrier Location, Turbine Building Plan at Elevation +65 ft}



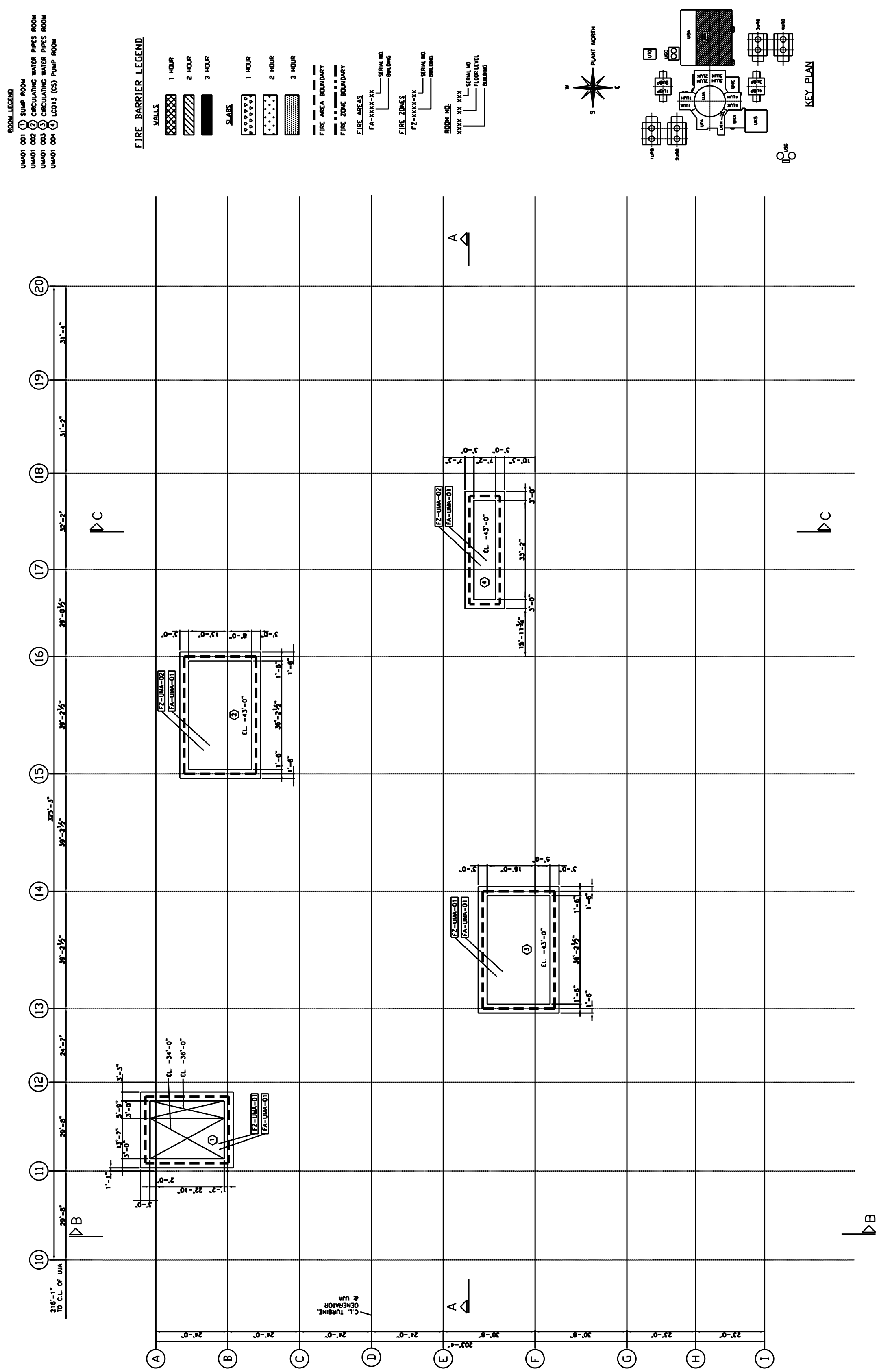


Figure 9B-5— {Fire Barrier Location, Turbine Building Plan at Elevation (-)43 ft}

Figure 9B-6— {Fire Barrier Location, Turbine Building Roof Plan}

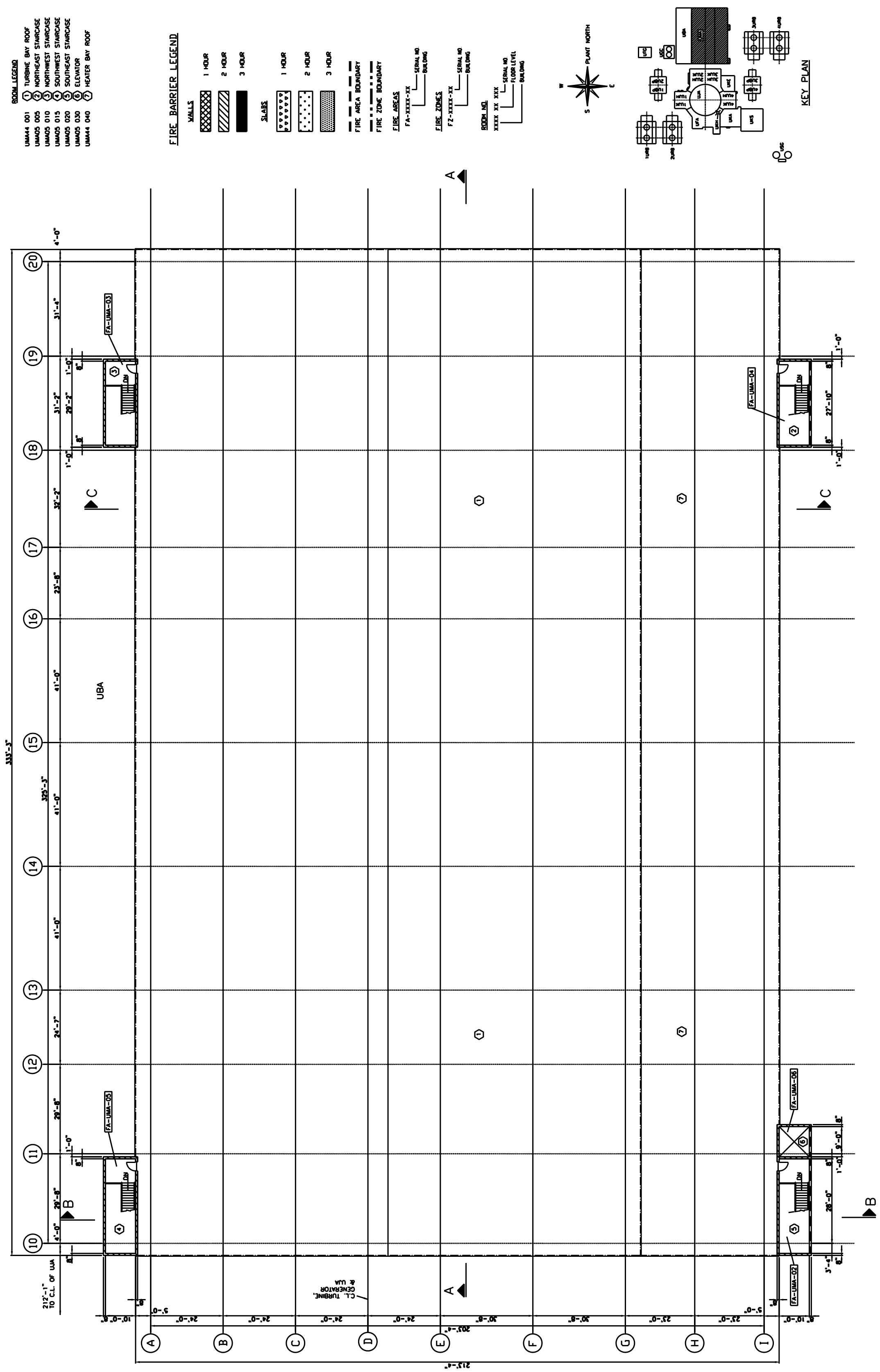


Figure 9B-7— {Fire Barrier Location, Turbine Building Section A-A}

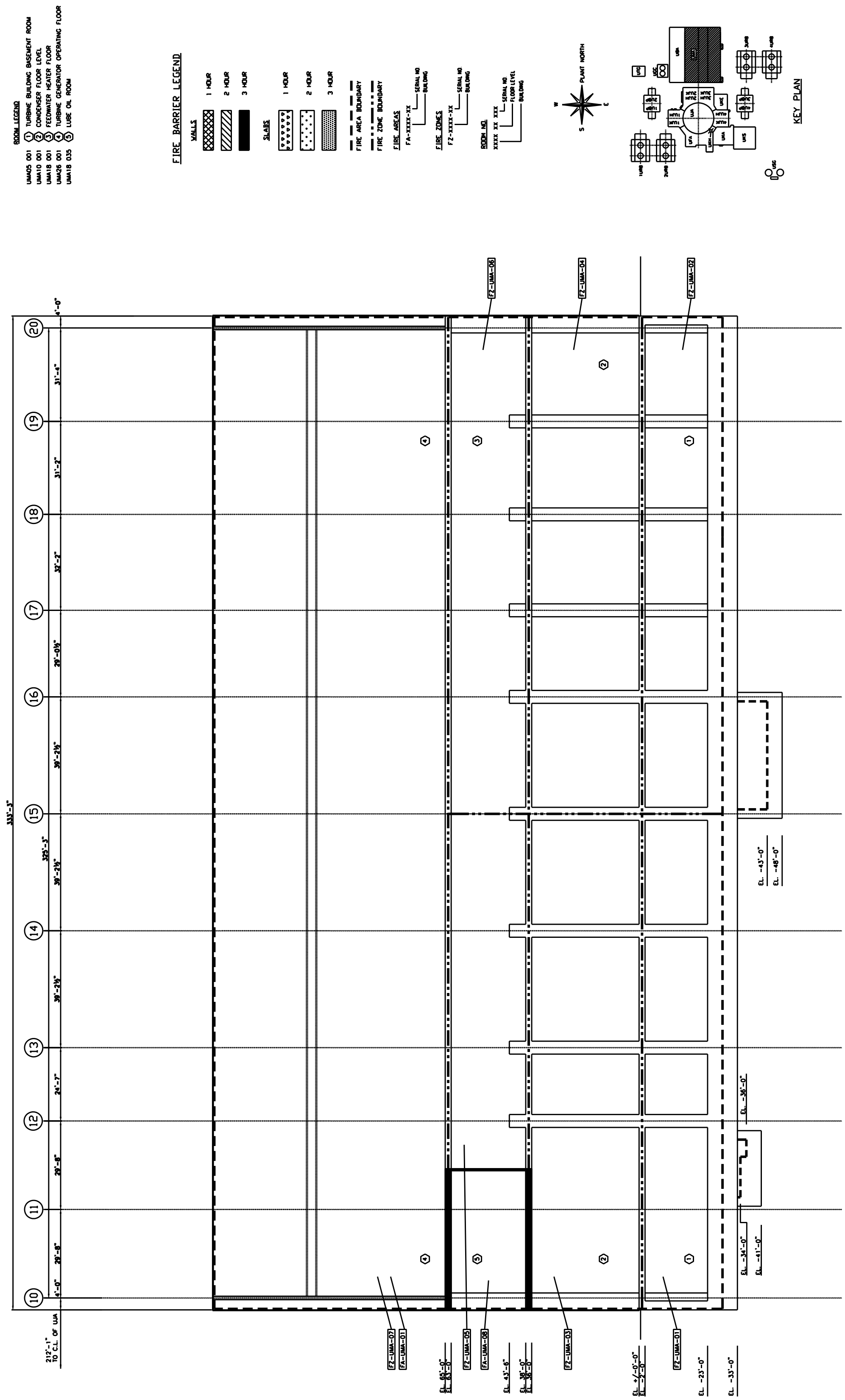
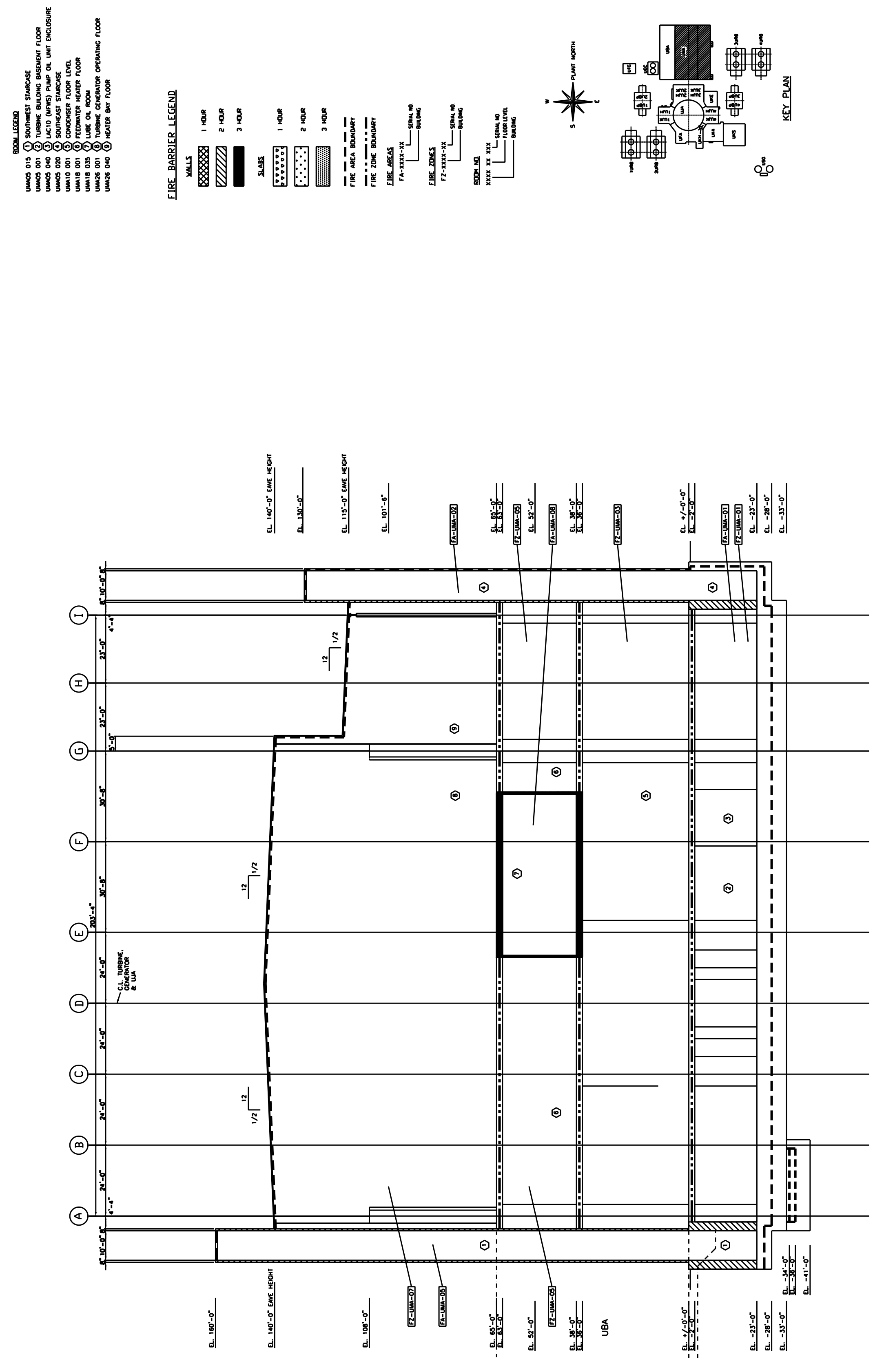


Figure 9B-8— {Fire Barrier Location, Turbine Building Section B-B}



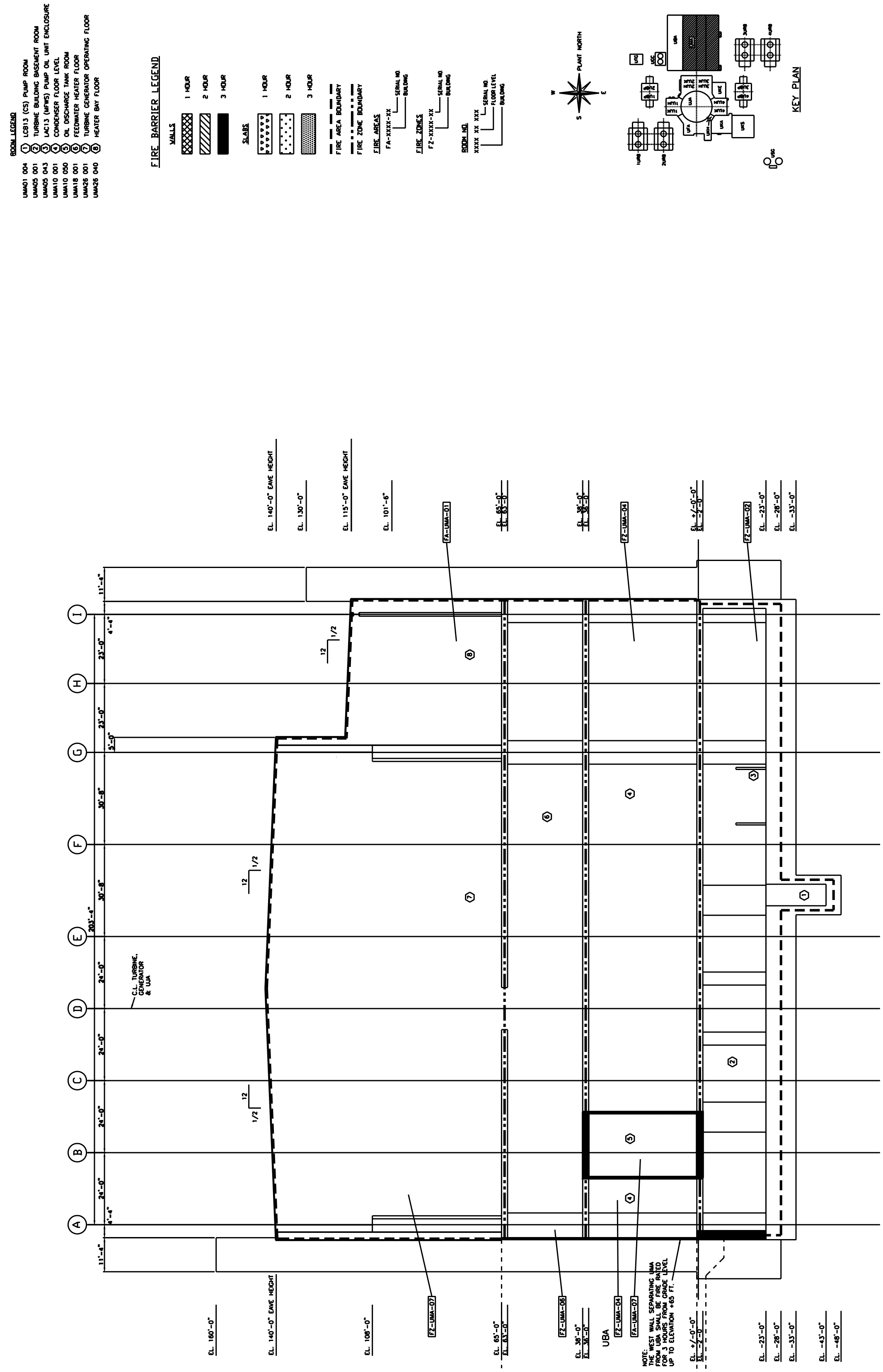


Figure 9B-9— {Fire Barrier Location, Turbine Building Section C-C}

Figure 9B-10— {Fire Barrier Location, SWGR-SBO Buildings Plan View at Elevation (-)13 ft}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-11— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 0 ft}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-12— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 13 ft}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-13— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View at Elevation 24.5 ft}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

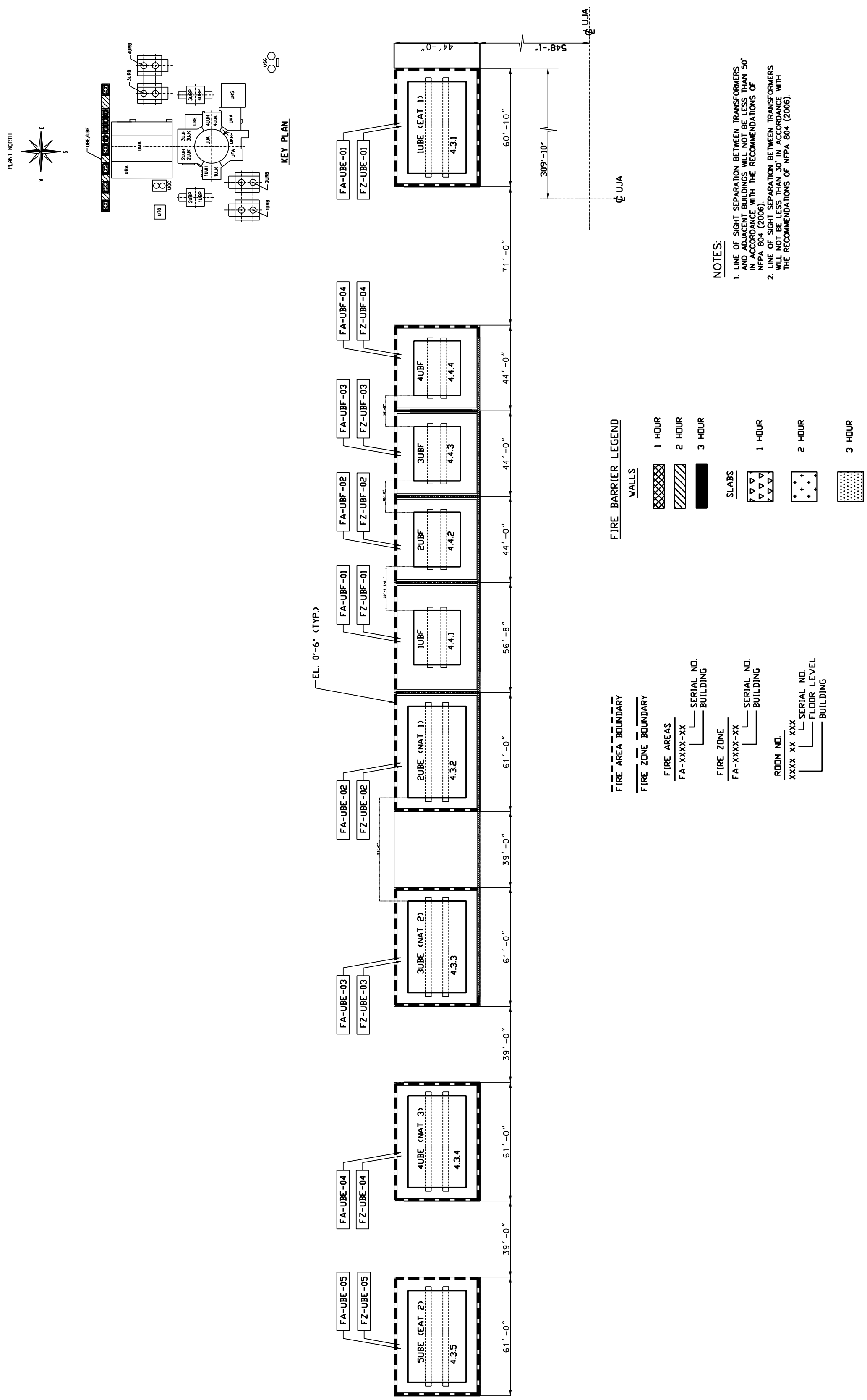
See Part 9 of the COLA Application

Figure 9B-14— {Fire Barrier Location, SWGR-SBO-AUX BLR Buildings Plan View Section A-A}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-15— {Fire Barrier Location, Transformer Area Plan View at Elevation 0 ft}



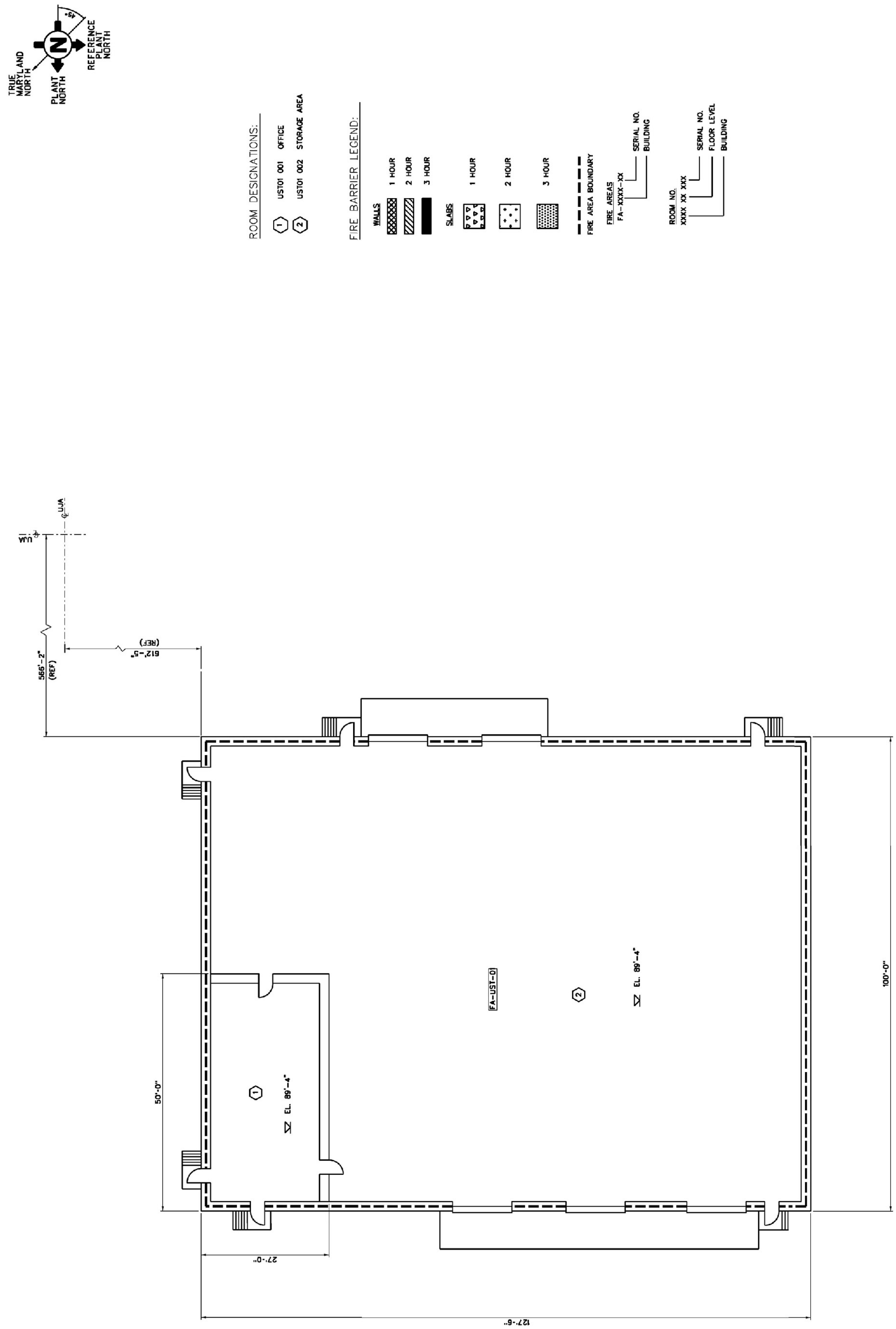


Figure 9B-16— {Fire Barrier Location, Warehouse Building Plan}

Figure 9B-17— {Fire Barrier Location, Security Access Facility Plan}

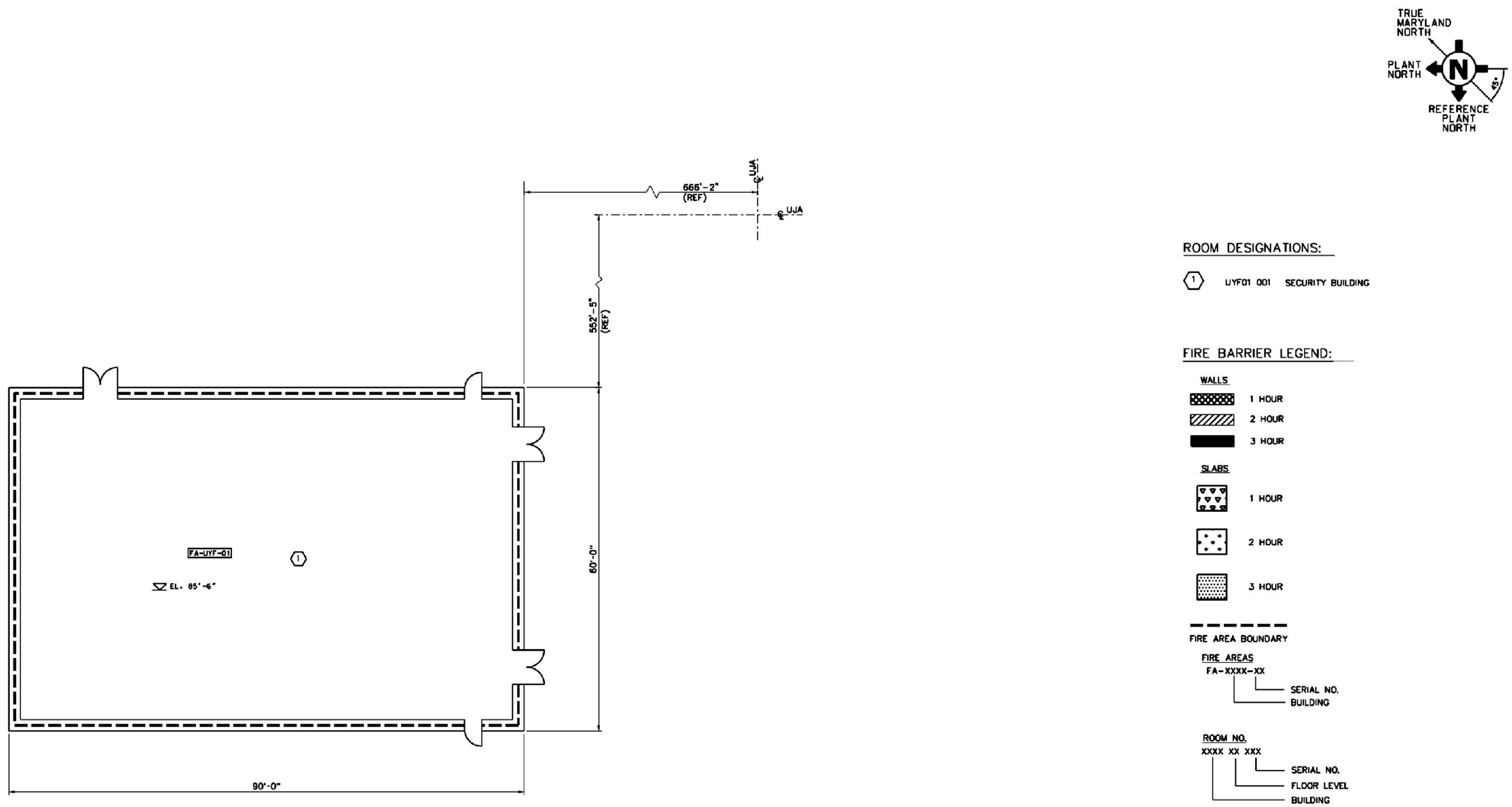


Figure 9B-18— {Fire Barrier Location, Central Gas Supply Building Plan View at Elevation 85'0"}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-19— {Fire Barrier Location, Grid Systems Control Building}

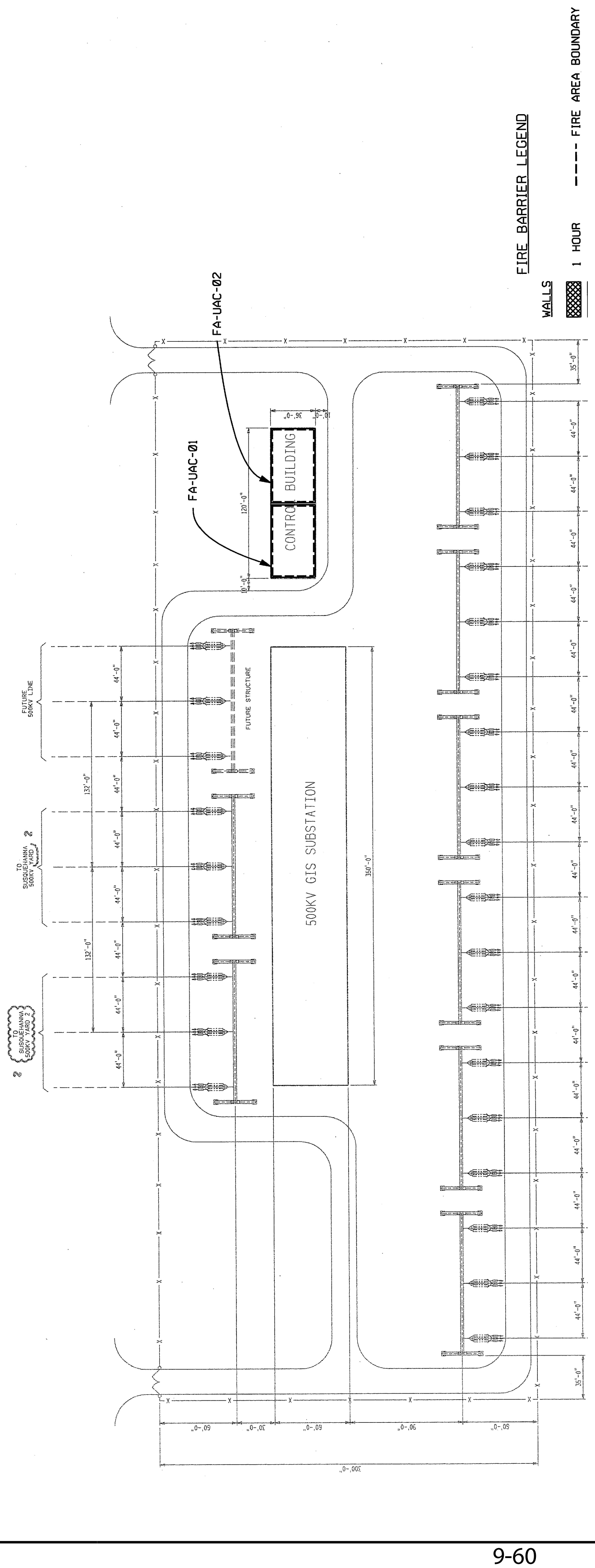


Figure 9B-20— {Fire Barrier Location, Fire Protection Building Plan View at Elevation 85'0"}

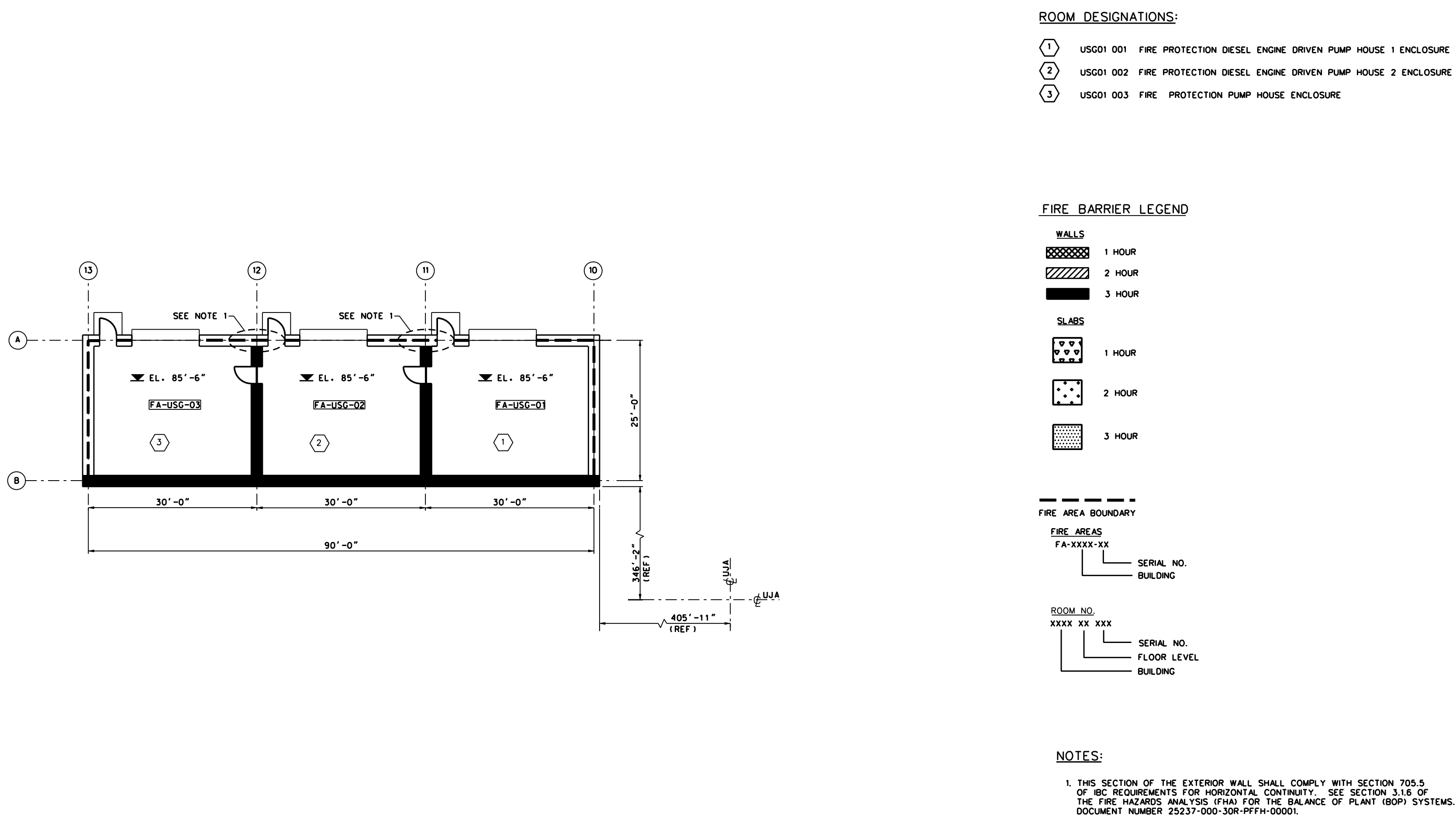


Figure 9B-21— {Fire Barrier Location, Cooling Tower Structure, Plan View and Section A-A}

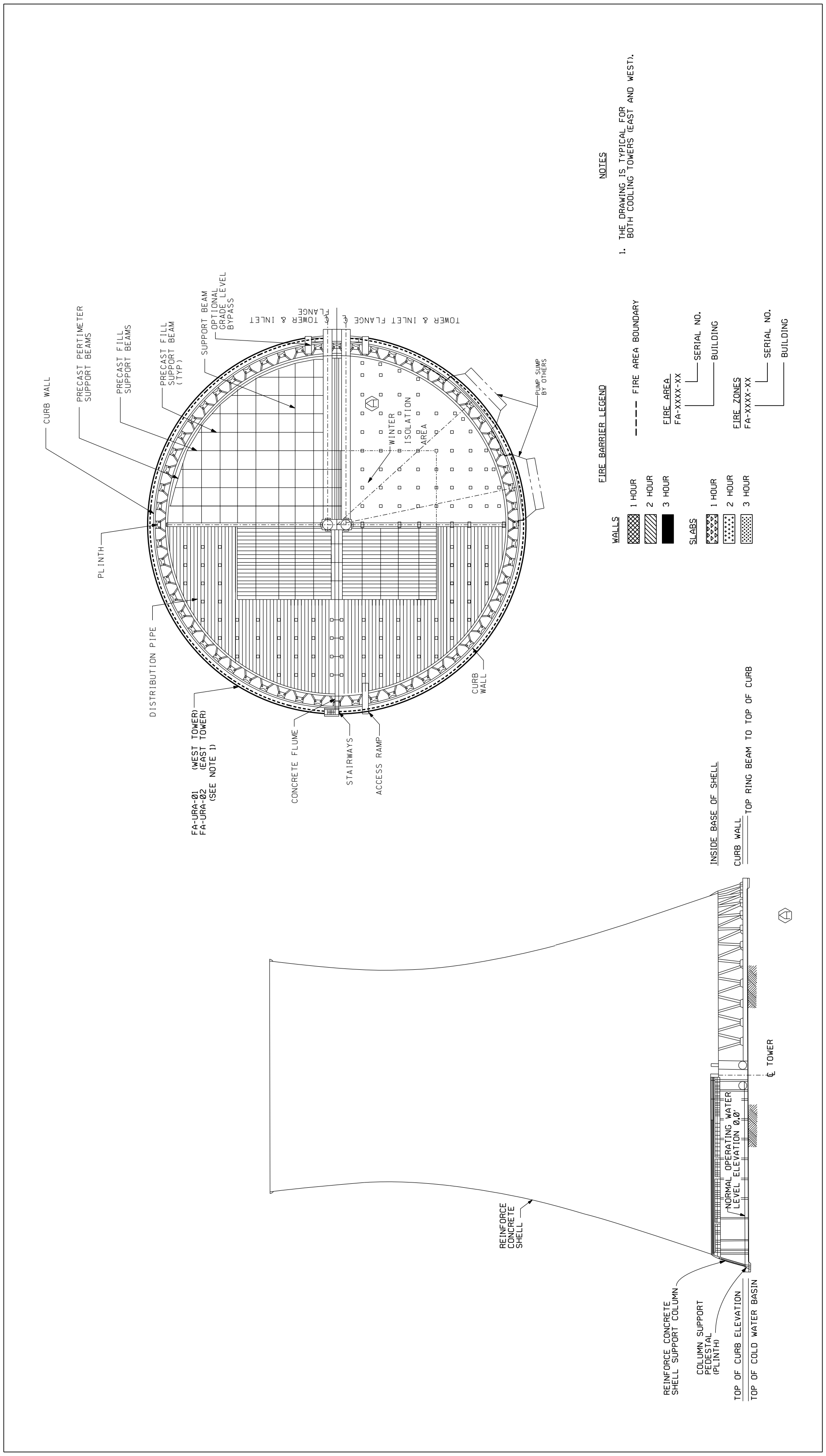


Figure 9B-22— {Fire Barrier Location, Circulating Water System Pumphouse}

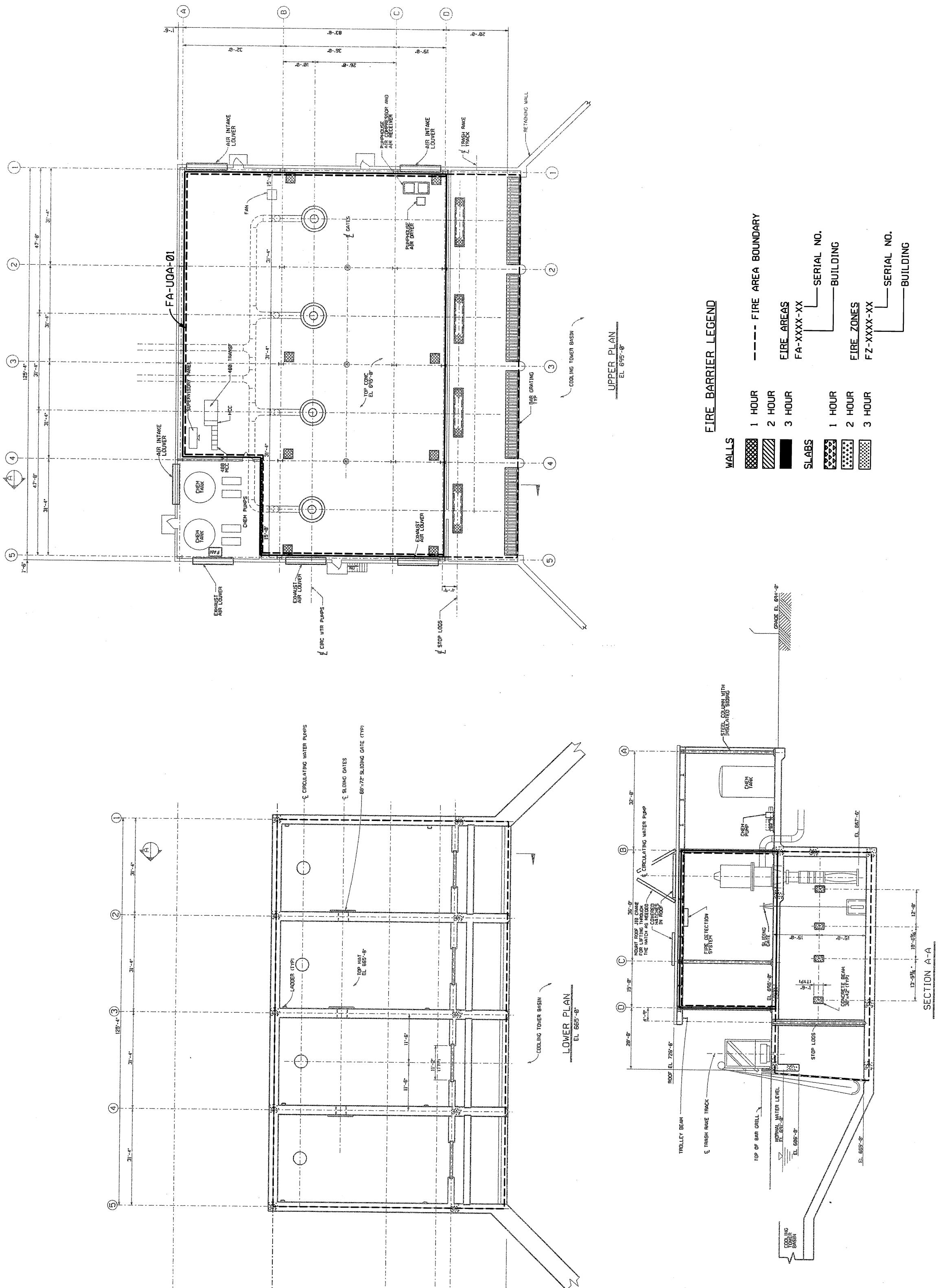


Figure 9B-23— {Fire Barrier Location, ESWEMS Ground Floor and Mezzanine Plan}

This figure contains security related information and has been withheld under 10 CFR 2.390 (d)(1)

See Part 9 of the COLA Application

Figure 9B-24— {Fire Barrier Location, BBNPP Intake Structure}