NuScale US460 Plant
Standard Design Approval Application

Chapter Nine
# Auxiliary Systems

**Final Safety Analysis Report**

Revision 1

# TABLE OF CONTENTS

**CHAPTER 9 AUXILIARY SYSTEMS . . . . . . . . . . 9.1-1**

**9.1 Fuel Storage and Handling . . . . . . . . . . 9.1-1**

9.1.1 Criticality Safety of Fresh and Spent Fuel Storage and Handling . . . . . . 9.1-1

9.1.2 New and Spent Fuel Storage . . . . . . . . . . 9.1-3

9.1.3 Pool Cooling and Cleanup System. . . . . . . . . . 9.1-11

9.1.4 Fuel Handling Equipment . . . . . . . . . . 9.1-31

9.1.5 Overhead Heavy Load Handling Systems . . . . . . . . . . 9.1-41

**9.2 Water Systems . . . . . . . . . . 9.2-1**

9.2.1 Station Service Water System . . . . . . . . . . 9.2-1

9.2.2 Reactor Component Cooling Water System . . . . . . . . . . 9.2-2

9.2.3 Demineralized Water System. . . . . . . . . . 9.2-6

9.2.4 Potable and Sanitary Water Systems. . . . . . . . . . 9.2-8

9.2.5 Ultimate Heat Sink . . . . . . . . . . 9.2-10

9.2.6 Condensate Storage Facilities . . . . . . . . . . 9.2-22

9.2.7 Site Cooling Water System . . . . . . . . . . 9.2-24

9.2.8 Chilled Water System. . . . . . . . . . 9.2-27

9.2.9 Utility Water Systems . . . . . . . . . . 9.2-30

**9.3 Process Auxiliaries . . . . . . . . . . 9.3-1**

9.3.1 Compressed Air System. . . . . . . . . . 9.3-1

9.3.2 Process Sampling System . . . . . . . . . . 9.3-4

9.3.3 Equipment and Floor Drain Systems . . . . . . . . . . 9.3-15

9.3.4 Chemical and Volume Control System. . . . . . . . . . 9.3-23

9.3.5 Standby Liquid Control System . . . . . . . . . . 9.3-44

9.3.6 Containment Evacuation System . . . . . . . . . . 9.3-45

9.3.7 Containment Flooding and Drain System. . . . . . . . . . 9.3-51

**9.4 Air Conditioning, Heating, Cooling, and Ventilation Systems. . . . . . . . . . 9.4-1**

9.4.1 Control Room Area Ventilation System . . . . . . . . . . 9.4-1

9.4.2 Reactor Building and Spent Fuel Pool Area Ventilation System . . . . . . . 9.4-6

9.4.3 Radioactive Waste Building Ventilation System. . . . . . . . . . 9.4-13

9.4.4 Turbine Building Ventilation System. . . . . . . . . . 9.4-16

9.4.5 Engineered Safety Feature Ventilation System . . . . . . . . . . 9.4-19

# TABLE OF CONTENTS

**9.5 Other Auxiliary Systems . . . 9.5-1**

9.5.1 Fire Protection Program . . . 9.5-1

9.5.2 Communication System . . . 9.5-103

9.5.3 Lighting Systems . . . 9.5-108

**Appendix 9A Fire Hazards Analysis . . . 9A-1**

9A.1 General Information . . . 9A-1

9A.2 Fire Hazards Analysis Methodology . . . 9A-2

9A.3 Fire Hazards Analysis Description . . . 9A-2

9A.4 Conclusion . . . 9A-8

9A.5 Fire Hazards Analysis . . . 9A-9

9A.6 Fire Safe Shutdown Plan . . . 9A-412

9A.7 Multiple Spurious Operations - Expert Panel . . . 9A-415

# LIST OF TABLES

Table 9.1.3-1: Equipment Parameters for the Pool Cooling Subsystem . . . . . . . . . . . . . 9.1-24
Table 9.1.3-2: Equipment Parameters for the Pool Cleanup Subsystem . . . . . . . . . . . . . 9.1-25
Table 9.1.3-3: Equipment Parameters for the Pool Surge Control Subsystem . . . . . . . . . 9.1-26
Table 9.1.3-4: Water Chemistry Parameters Monitored for the Ultimate Heat Sink Pools . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.1-27
Table 9.1.3-5: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.1-28
Table 9.1.4-1: Fuel Handling Equipment Design Information . . . . . . . . . . . . . . . . . . . . . 9.1-39
Table 9.1.5-1: Heavy Load Handling Equipment Design Data . . . . . . . . . . . . . . . . . . . . 9.1-50
Table 9.2.2-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . . 9.2-5
Table 9.2.3-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . . 9.2-7
Table 9.2.4-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . . 9.2-9
Table 9.2.5-1: Relevant Ultimate Heat Sink Parameters . . . . . . . . . . . . . . . . . . . . . . . . 9.2-18
Table 9.2.5-2: Ultimate Heat Sink Heat Loads: Boil Off Analysis Results. . . . . . . . . . . . . 9.2-19
Table 9.2.5-3: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.2-20
Table 9.2.7-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.2-26
Table 9.2.8-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.2-28
Table 9.2.9-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.2-31
Table 9.3.1-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . . 9.3-3
Table 9.3.2-1: Primary Sampling System Normal Sample Points. . . . . . . . . . . . . . . . . . . 9.3-10
Table 9.3.2-2: Containment Sampling System Normal Sample Point. . . . . . . . . . . . . . . . 9.3-11
Table 9.3.2-3: Secondary Sampling System Normal Sample Points . . . . . . . . . . . . . . . . 9.3-12
Table 9.3.2-4: Local Sample Points . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.3-13
Table 9.3.2-5: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.3-14
Table 9.3.3-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.3-20
Table 9.3.4-1: Chemical and Volume Control System/Module Heatup System Major Equipment with Design Data and Parameters . . . . . . . . . . . . . . . . . 9.3-38
Table 9.3.4-2: Boron Addition System Major Equipment with Design Data and Parameters . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.3-40
Table 9.3.4-3: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.3-41
Table 9.3.6-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.3-49
Table 9.3.7-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.3-54
Table 9.4.1-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . . 9.4-4
Table 9.4.2-1: Reactor Building Ventilation System Indoor Design Conditions . . . . . . . . 9.4-11

# LIST OF TABLES

Table 9.4.2-2: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.4-12
Table 9.4.3-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.4-15
Table 9.4.4-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.4-18
Table 9.5.1-1: List of Applicable Codes, Standards and Regulatory Guidance for Fire Protection . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.5-20
Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 . . . . . . . . . . . 9.5-22
Table 9.5.1-3: Classification of Structures, Systems, and Components . . . . . . . . . . . . . . 9.5-96
Table 9.5.2-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . 9.5-107
Table 9.5.3-1: Classification of Structures, Systems, and Components . . . . . . . . . . . . . 9.5-110
Table 9A-1: Fire Hazards Analysis Elements and Attributes . . . . . . . . . . . . . . . . . . . . .9A-417
Table 9A-2: In-Situ Combustible Material Classification . . . . . . . . . . . . . . . . . . . . . . . .9A-419
Table 9A-3: In-Situ Ignition Sources . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-420
Table 9A-4: Typical Transient Combustibles . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-421
Table 9A-5: Transient Ignition Sources . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-422
Table 9A-6: Hazard Classifications . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-423
Table 9A-7: Safe Shutdown Plant Functions . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-424
Table 9A-8: Reactor Building Fire Areas . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-425
Table 9A-9: Radioactive Waste Building Fire Areas . . . . . . . . . . . . . . . . . . . . . . . . . .9A-430
Table 9A-10: Control Building Fire Areas . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .9A-432
Table 9A-11: Multiple Spurious Operations Challenging Safe Shutdown . . . . . . . . . . . .9A-434

## LIST OF FIGURES

Figure 9.1.2-1: Spent Fuel Pool Storage Facility General Arrangement . . . . . . . . . . . . . . 9.1-10
Figure 9.1.3-1: Pool Cooling and Cleanup System Diagram . . . . . . . . . . . . . . . . . . . . . . . 9.1-29
Figure 9.1.3-2: Ultimate Heat Sink Water Level and Plant Feature Elevations . . . . . . . . . 9.1-30
Figure 9.1.4-1: Refueling Floor Layout . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.1-40
Figure 9.1.5-1: Reactor Building Crane Safe Load Path . . . . . . . . . . . . . . . . . . . . . . . . . 9.1-51
Figure 9.1.5-2: Reactor Building Crane . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.1-52
Figure 9.1.5-3: Reactor Building Crane Lower Block Assembly Connection to the Top Support Structure . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.1-53
Figure 9.2.5-1: Ultimate Heat Sink Configuration . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.2-21
Figure 9.2.6-1: Condensate Storage Facility . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.2-23
Figure 9.2.8-1: Chilled Water System Diagram . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.2-29
Figure 9.3.3-1: Radioactive Waste Drain System Diagram . . . . . . . . . . . . . . . . . . . . . . . 9.3-21
Figure 9.3.3-2: Balance-of-Plant Drain System Diagram . . . . . . . . . . . . . . . . . . . . . . . . 9.3-22
Figure 9.3.4-1: Chemical and Volume Control System Diagram . . . . . . . . . . . . . . . . . . . 9.3-42
Figure 9.3.4-2: Boron Addition System Diagram . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9.3-43
Figure 9.3.6-1: Containment Evacuation System Diagram . . . . . . . . . . . . . . . . . . . . . . . 9.3-50
Figure 9.3.7-1: Containment Flooding and Drain System Diagram . . . . . . . . . . . . . . . . . 9.3-55
Figure 9.5.1-1: Fire Protection System Water Supplies and Fire Pumps . . . . . . . . . . . . . 9.5-98
Figure 9.5.1-2: Fire Protection System Yard Fire Main Loop . . . . . . . . . . . . . . . . . . . . . 9.5-99

# CHAPTER 9 AUXILIARY SYSTEMS

## 9.1 Fuel Storage and Handling

### 9.1.1 Criticality Safety of Fresh and Spent Fuel Storage and Handling

#### 9.1.1.1

The structures that form the fuel storage facility consist of the spent fuel pool, the stainless steel liner in the spent fuel pool, and the Reactor Building. General Design Criterion 62, American National Standards Institute/American Nuclear Society (ANSI/ANS) 57.1 (Reference 9.1.1-1), and ANSI/ANS 57.2 (Reference 9.1.1-2) are considered in the design of the new and spent fuel storage facility and handling equipment.

The design of the fuel storage facility and handling equipment prevents inadvertent criticality by using geometrically safe configurations during normal and credible abnormal storage and handling scenarios, and the use of plant programs and procedures for criticality control to demonstrate conformance to 10 CFR 50.68(b). Adequate spacing is provided between fuel assemblies to prevent criticality during earthquakes and other natural phenomena.

The protection of the fuel assemblies from natural phenomena is described in Section 9.1.2. The design and controls for operation of the fuel handling equipment to prevent an inadvertent criticality are described in Section 9.1.4.

#### 9.1.1.2 Facilities Description

New and spent fuel is stored in the spent fuel pool located in the Reactor Building. The design and layout of the fuel storage facility is described in Section 9.1.2.

Fuel handling, described in Section 9.1.4, shows that the designs of the fuel handling equipment allow each piece of equipment to move only a single fuel assembly at a time. Fuel handling procedures place controls on the movement of each fuel assembly.

COL Item 9.1-1: An applicant that references the NuScale Power Plant US460 standard design will develop plant programs and procedures for safe operations during handling and storage of new and spent fuel assemblies, including criticality control.

#### 9.1.1.3 Safety Evaluation

In accordance with General Design Criterion 62, the fuel handling equipment uses geometrically safe configurations to prevent criticality. The design of the fuel handling equipment limits the number of new or spent fuel assemblies in motion to a single assembly for each piece of equipment. Safety devices, such as interlocks on the fuel handling equipment, assist operators to prevent damage to an assembly and help minimize mishandling and movements not allowed by plant approved procedures (Section 9.1.4).

#### 9.1.1.4 References


9.1.1-1 American National Standards Institute, “Design Requirements for Light Water Reactor Fuel Handling Systems,” ANSI/ANS-57.1-1992, La Grange Park, IL.

9.1.1-2 American National Standards Institute, “Design Requirements for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Plants,” ANSI/ANS-57.2-1983, La Grange Park, IL.

## 9.1.2 New and Spent Fuel Storage

The fuel assemblies, which consist of new fuel assemblies (NFAs) and spent fuel assemblies (SFAs), are stored in the spent fuel pool (SFP) located in the Reactor Building (RXB). The structures that form the fuel storage facility consist of the SFP, the RXB pool liner, and the RXB. The RXB pool liner is located on the pool floor as described in Section 3.8.4.

### 9.1.2.1 Design Bases

The design for structures, systems, and components that support storage of fuel assemblies complies with the applicable regulatory requirements in 10 CFR 50, Appendix A; General Design Criteria (GDC) 2, 4, 5, 61, and 63; and 10 CFR 20.1101(b).

General Design Criterion 2 is considered in the design of the fuel storage facility. The RXB that contains the SFP and pool liner protects the fuel assemblies from the effects of natural phenomena hazards, including earthquakes, hurricanes, tornadoes, floods, tsunami, seiches, and external missiles, and meets the applicable guidance for protection from such hazards in Regulatory Guides 1.13, Revision 2; 1.29, Revision 6; and 1.117, Revision 2.

There is no dry storage vault for new fuel in the RXB.

General Design Criterion 4 is considered in the design of the SFP, pool liner, and RXB. These structures accommodate the effects of the environmental conditions during normal operation and postulated accidents. The design of these structures protects the stored fuel assemblies from dynamic effects that result from equipment failures in or outside of the RXB, including the effects of internal missiles, pipe whipping, and discharging fluids.

General Design Criterion 5 is considered in the design of the fuel storage facility. The SFP, pool liner, and RXB are shared among the NuScale Power Modules (NPMs). The sharing of these structures does not impair the performance of safety functions, including, in the event of an accident in one NPM, an orderly shutdown and cooldown of the remaining NPMs along with continued cooling and shielding of the fuel assemblies.

General Design Criterion 61 is considered in the design of the SFP, pool liner, and RXB for storage of the fuel assemblies. The design meets the following requirements:

- The SFP, pool liner, and RXB that form the fuel storage facility permit periodic inspection and testing.
- During normal and postulated accident conditions, the large water volume in the SFP, refueling pool (RFP), and reactor pool provides the water inventory that ensures adequate shielding for radiation protection for storage of the SFAs.

- The structures and systems for containment, confinement, and filtering of radioactive materials released from the SFAs minimize contamination of the plant and environment and help to maintain doses to workers and the public as low as reasonably achievable.
- During normal and postulated accident conditions, the large water volume in the SFP, RFP, and reactor pool provides the water inventory that ensures residual heat removal capability for storage of the SFAs.
- The SFP design prevents a significant reduction in the fuel storage coolant inventory under postulated accident conditions.

Related to meeting the above requirements, Section 9.1.3 describes the design of the systems for pool water cooling, purification, inventory control, and for pool leakage detection. Section 3.8 describes the design of the SFP structure and liner for retaining pool water inventory. Section 9.2.5 describes the ultimate heat sink (UHS).

General Design Criterion 63 is considered in the design of the instrumentation provided for SFP water level, SFP water temperature, and local area radiation monitoring.

Design of the fuel storage facility complies with the as low as reasonably achievable requirements in 10 CFR 20.1101(b). Leakage is collected to limit the spread of contaminated SFP water. Surfaces in contact with the pool water are smooth and nonporous to prevent the buildup of radioactive material. Water and the walls of the SFP are used to shield the SFAs in the SFP.

### 9.1.2.2 Facilities Description

#### 9.1.2.2.1 Overview of Fuel Storage Facility and Associated Systems

The new fuel staging area is located on the refueling floor of the RXB above the SFP (Figure 9.1.4-1). This area provides space for opening the shipping containers with new fuel. Section 9.1.4 describes NFA handling operations.

The fuel assemblies are stored in the SFP in the location shown in Figure 9.1.2-1. The SFP provides space for storage of NFAs before movement to an NPM during a refueling outage, including initial reactor loading, and for longer-term storage of the SFAs for cooling before transfer to onsite storage or off-site shipment. The SFP is designed for a maximum storage capacity of 600 fuel assemblies.

The RXB houses the SFP and the adjacent RFP, reactor pool, and dry dock as described in Section 9.2.5. A weir wall separates the SFP and RFP as shown in Figure 9.2.5-1. The water in the SFP above the top of the weir communicates with the water in the adjacent RFP and reactor pool. The dry dock has a gate to separate it from the RFP. The dry dock gate is designed to Seismic Category II requirements.

The floor of the RXB and SFP are reinforced concrete construction, while the walls are steel-plate composite construction. The pool floor liner is stainless steel as described in Section 3.8.4.

For normal conditions of operation, the SFAs and NPMs are cooled by the pool cooling and cleanup system (PCWS). The PCWS cools the total heat load in the UHS during normal operations (Section 9.1.3).

For an accident condition that disables the normal makeup supply and the active cooling systems, the large volume of water in the UHS is the backup cooling water source for the SFP. Since the UHS pools are connected, the pool inventory above the weir wall is available for SFP makeup. The flow rate available to the SFP through the weir exceeds what could be provided by a typical SFP makeup line. A permanently installed makeup line is also part of the UHS system. This supply line provides a second backup to the normal supply and is a separate and redundant flow path for adding makeup water to the SFP.

Section 9.1.4 describes the equipment used for movement of new and spent fuel assemblies. Section 9.1.5 describes the Reactor Building crane that moves NPMs. Section 9.4.2 describes the RXB heating and ventilation equipment that supports the environment above the SFP for personnel working in the area. Section 9.1.3 describes the pool leakage detection system. Section 3.4.2 describes the design features to prevent groundwater intrusion into the below-ground portions of the RXB.

#### 9.1.2.2.2 Fuel Storage Racks Design

COL Item 9.1-2: An applicant that references the NuScale Power Plant US460 standard design will provide the design of the spent fuel pool storage racks, including the structural dynamic and stress analyses, thermal hydraulic cooling analyses, criticality safety analysis, and material compatibility evaluation.

### 9.1.2.3 Safety Evaluation

The design of the SFP, liner, and RXB that form the fuel storage facility meets GDC 2 requirements and withstands the effects of natural phenomena hazards without the loss of capability to perform their safety functions. The design of the RXB withstands combinations of mechanical, hydraulic, and thermal loads and natural phenomena effects, including severe winds such as hurricanes and tornadoes (Section 3.3), floods (Section 3.4), external and turbine-generated missiles (Section 3.5), and a safe shutdown earthquake (SSE) (Section 3.7 and Section 3.8). The RXB protects the SFP and pool floor liner from these hazards. The UHS design removes heat through boiling and evaporation if the active cooling systems are unavailable. The RXB structure and pool liners containing the coolant withstand the maximum temperature and pressure for pool boiling. The pool floor liner is an RXB component classified as nonsafety-related and not risk-significant. The basis for this classification for accident conditions is provided in Section 9.2.5.

This classification for the liner is also appropriate for the protection provided by the liner for the concrete floor forming the SFP below the liner. In addition, the UHS contains a pool leakage detection system that collects, detects, and monitors leakage of UHS inventory. The pool leakage detection system ensures that operators take actions to determine the cause of leakage and implement repairs, which protects the pool floor and pool walls from degradation (Section 9.1.3).

Section 9.1.4 provides a description of the fuel handling equipment. The design of this equipment ensures that the fuel is not impacted by a collapse of this equipment during an SSE. Section 9.1.3 addresses a failure of the dry dock gate due to an SSE.

The design of the SFP, liner, and RXB meets GDC 4 requirements and accommodates normal and accident conditions including the dynamic effects of equipment failure. The design protects the stored fuel assemblies using the thick walls forming the SFP and the substantial depth of water above the fuel storage racks. These features provide protection from dynamic effects resulting from equipment failures in or outside of the RXB, including the effects of equipment collapse, pipe whipping, and discharging fluids.

The fuel handling equipment is designed to prevent the drop of a fuel assembly during fuel handling operations (Section 9.1.4).

The overhead heavy load handling system is designed to prevent drops of heavy loads (Section 9.1.5).

A stuck fuel assembly in the fuel storage racks could result in the fuel handling machine applying an uplift force greater than the weight of a fuel assembly plus control rod assembly. The fuel handling machine design has interlocks that prevent an excessive force from being applied to a fuel assembly or the fuel storage racks.

The design of the SFP, liner, and RXB that form the fuel storage facility meets GDC 5 requirements and allows the SFP to perform its spent fuel cooling and shielding functions while supporting the NPMs in a plant. The fuel storage facility can be shared by the NPMs for normal and accident conditions without impairing the performance of a safety function by the fuel storage facility or by the NPMs, even with a postulated accident in one NPM and allowing for the safe shutdown of the remaining NPMs.

The fuel storage facility provides adequate safety under normal and postulated accident conditions and conforms to GDC 61 requirements as described below. The design of the fuel storage facility permits inspections and testing as described in Section 9.1.2.4. The design of the fuel storage facility ensures radiation doses that comply with 10 CFR 20.1101(b).

#### 9.1.2.3.1 Containment, Confinement, and Filtering

The SFP liner, SFP, and RXB structures provide containment of the fuel assemblies and the water cooling the assemblies. The systems described below support confinement and filtering of the radionuclides.

Section 9.1.3 describes the pool support systems that pump the UHS water through the PCWS to remove radionuclides in the pool water and collect them on a filter or in a demineralizer vessel for subsequent handling as solid radioactive wastes.

The pool leakage detection system collects pool leakage that is routed to the liquid radioactive waste system for processing (Section 11.2).

Section 9.4.2 describes the RXB heating ventilation and air conditioning system filters and controls the release of airborne radioactive material from inside of the RXB, including from pool water evaporation for normal conditions and for loss of normal power supply.

#### 9.1.2.3.2 Residual Heat Removal Capability

Section 9.1.3 describes the minimum heat removal capacity of the active PCWS. This system is not designed to withstand accident conditions and, therefore, the RXB pool structures and the liner are designed to withstand coolant boiling.

The demineralized water system provides normal makeup to the SFP. The water inventory in the RFP and reactor pool above the top of the weir wall is contained within the RXB and provides a passive source of water to supply the SFP. The makeup line in the UHS system provides the redundant flow path for supply of makeup water to the SFP. Section 9.2.5 provides the safety and seismic classifications, and applicable quality assurance requirements for the UHS makeup line.

#### 9.1.2.3.3 Prevent Coolant Inventory Reduction for Accident Conditions

The SFP maintains an adequate water level above the fuel assemblies. Section 9.1.3 describes the supply of makeup water to the pools and that the UHS does not have penetrations, drains, or piping that could drain the water level in these pools below the top of the weir. The water in the SFP below the top of the weir is the inventory of water that provides 10 ft of water above the tops of the fuel assemblies for cooling and shielding of the SFAs.

An SSE event can generate waves in the UHS pools. An analysis of sloshing shows that an SSE generates an acceptable wave height as described in Section 9.2.5.

#### 9.1.2.3.4 Materials

The SFP liner is comprised of stainless steel and the walls are steel-plate composite. The structural components in the SFP liner and pool walls are protected from corrosion failure based on maintaining pool water chemistry as described in Section 9.1.3.

#### 9.1.2.3.5 Monitoring

The design of the fuel storage facility meets GDC 63 requirements and provides monitoring for the loss of decay heat removal capability using the temperature measuring instruments in the PCWS as described in Section 9.1.3. Monitoring for loss of water in the UHS pools is provided by the PCWS as described in Section 9.2.5. Radiation monitors are provided in the SFP area to detect both general area radiation levels and airborne contamination levels as described in Section 12.3. These instruments allow operators to initiate appropriate safety actions.

#### 9.1.2.3.6 Radiation, Shielding, and Maintaining Doses as Low as Reasonably Achievable

The fuel storage facility meets the regulations in 10 CFR 20.1101(b) to ensure radiation doses are as low as reasonably achievable. The design controls leakage, minimizes buildup of contamination, and provides adequate shielding as described below.

Section 9.1.3 describes the use of the pool leakage detection system to direct UHS pool leakage to sumps in the radioactive waste drain system in the RXB bottom floor. This system limits the spread of contamination from leakage.

The depth of the water above the SFAs and the thick walls of the SFP provide shielding for the assemblies. As described in Section 9.2.5, the large inventory of water in the UHS ensures shielding is adequate for postulated accident conditions. For a potential fuel handling accident, a minimum of 23 ft of water is provided above the damaged fuel rods to allow for iodine scrubbing.

#### 9.1.2.3.7 Maintaining Subcriticality

Conformance with 10 CFR 50.68 is described in Section 9.1.1.

### 9.1.2.4 Inspection and Testing

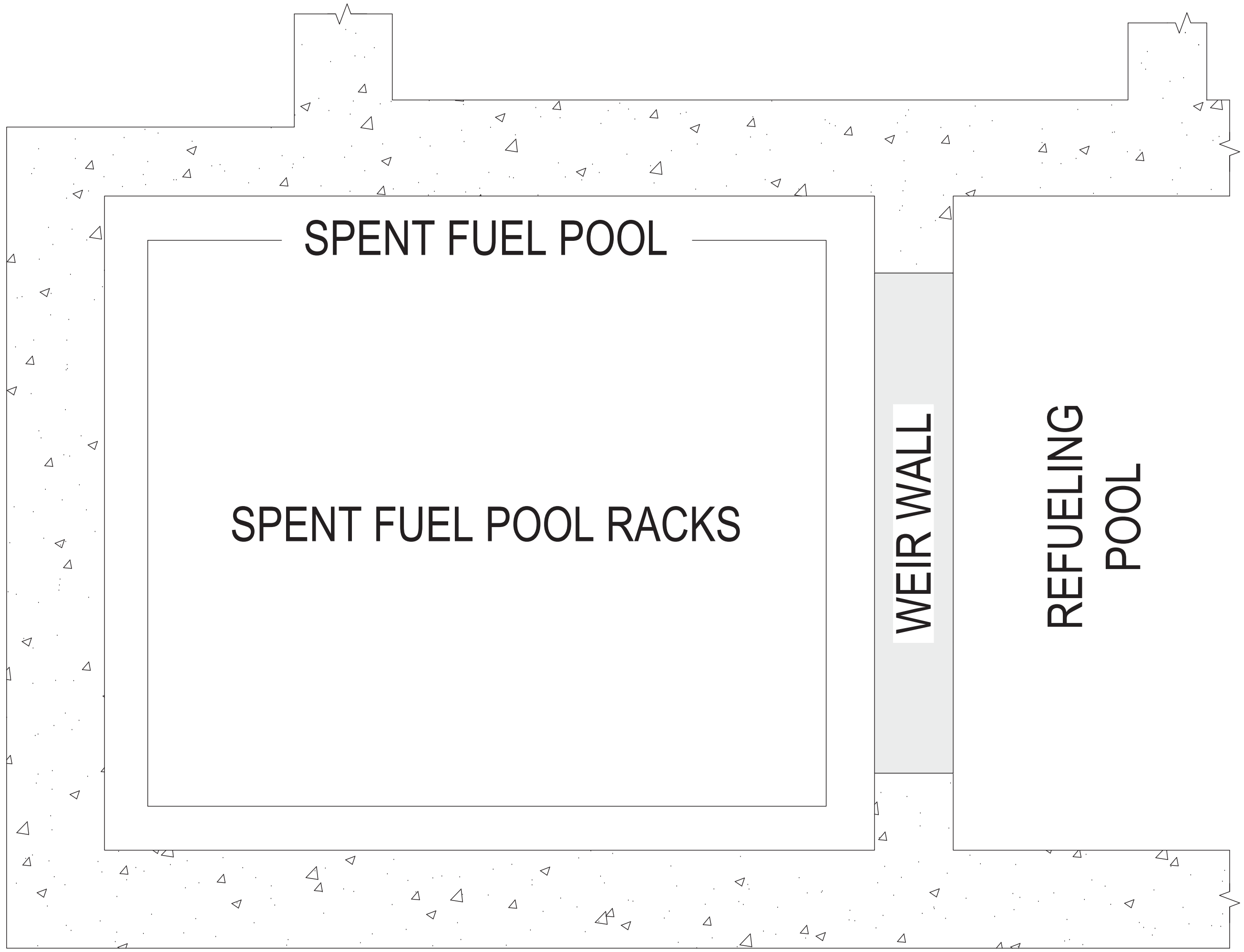
The design of the fuel storage facility facilitates inspections and testing. Most surfaces of the structures that make up the fuel storage facility are accessible for underwater inspection.

Section 14.3 provides information related to development of Inspections, Tests, Analyses, and Acceptance Criteria for the NuScale Power Plant US460 standard design.

### 9.1.2.5 Instrumentation

Section 9.1.3 describes the UHS water temperature instrumentation. Section 9.2.5 describes pool water level instrumentation. Section 12.3 describes radiation monitoring instrumentation.

**Figure 9.1.2-1: Spent Fuel Pool Storage Facility General Arrangement**



## 9.1.3 Pool Cooling and Cleanup System

During normal conditions of operation, the pool cooling and cleanup system (PCWS) provides for water level control and temperature maintenance of the reactor pool, the refueling pool (RFP) and the spent fuel pool (SFP). These three pools are interconnected and form the ultimate heat sink (UHS), as described in Section 9.2.5. For accident conditions, there is no credit for cooling by this active system and the design of the UHS allows for passive cooling of the stored spent fuel assemblies (SFAs) and the operating NuScale Power Modules (NPMs).

The PCWS consists of three subsystems: 1) the pool cooling subsystem, 2) the pool cleanup subsystem, and 3) the pool surge control subsystem.

### 9.1.3.1 Design Bases

The pool cooling and cleanup system is nonsafety-related and not risk-significant. Table 9.1.3-5 identifies SSC classifications for the PCWS. During normal operations the PCWS performs the following principal functions:

- remove heat generated by the SFAs and NPMs
- maintain water level in the UHS during normal operations
- maintain water quality
- drain or refill the dry dock by transferring the water to or from the surge control storage tank
- provide radiological effluent instrumentation information signals to the plant control system (PCS)
- provide priming water source to the containment flood and drain (CFDS) pumps for containment vessel (CNV) flooding and draining operations
- provide a flow path for containment water during containment draining

The pool leakage detection system (PLDS) is nonsafety-related and not risk significant. Table 9.1.3-5 identifies SSC classifications for the PLDS. The PLDS provides collection, redirection, and measurement of leakage from the UHS and dry dock.

General Design Criterion (GDC) 2 is considered in the design of the PCWS. Except for the surge control storage tank and the surge control storage tank piping and valves, the PCWS is housed within the Seismic Category I portions of the Reactor Building (RXB). The RXB protects the structures, systems, and components (SSC) within from effects of natural phenomena and external hazards, such as tornado missiles. For the safe shutdown earthquake, the PCWS complies with GDC 2 and does not adversely affect Seismic Category I SSC. The PLDS conforms with Position C.1 of Regulatory Guide 1.29.

General Design Criterion 4 is considered in the design of the PCWS. The design of the PCWS is compatible with the environmental conditions for normal operations, maintenance, and testing. For accident conditions, these systems comply with GDC 4 and do not create flooding, internal missiles, or pipe whip hazards for safety-related SSC. The PLDS complies with GDC 4 because the PLDS is not an energized system and has only passive components. Failure of the PLDS cannot generate dynamic loads which could impact safety-related or risk-significant systems.

General Design Criterion 5 is considered in the design of the PCWS and the PLDS. Even though the PCWS and PLDS is shared among the NPMs, the sharing does not impair the ability of the modules to perform their safety functions. In the event of an accident in one NPM, the failure of these systems to perform their nonsafety-related functions does not prevent an orderly shutdown and cooldown of the remaining modules, and cooling and shielding of the stored SFAs.

General Design Criterion 61 is considered in the design of the PCWS and PLDS. The PCWS and PLDS designs ensure adequate safety under normal and accident conditions by providing for the capability to permit periodic inspections and testing, ensure adequate radiation shielding, provide appropriate containment and confinement of pool water, remove heat from the SFAs and NPMs, and prevent a significant reduction in UHS pool water inventory.

General Design Criterion 63 is considered in the design of the PCWS and PLDS. The PCWS provides monitoring for the loss of decay heat removal capability and for excessive radiation levels in the SFP area. The PLDS zones are isolated to determine leakage location if the total leakage rate reaches a predetermined setpoint. Inspections of leak channels and repairs of leaks limits the spread of contamination.

Design measures are used to maintain radiation doses as low as reasonably achievable (ALARA) by collecting and processing pool and system component leakage, and by using the PCWS to filter and demineralize the water in the UHS and dry dock. The PLDS supports ALARA operations by minimizing contamination and generation of radioactive waste.

### 9.1.3.2 System Description

The arrangement of the UHS pools allows them to share their large volume of water. The reactor pool and RFP share their body of water because there is not a wall separating these two pools. As shown in Figure 9.1.5-1, the NPM bays line two sides of the reactor pool and form a clear area in the center allowing movement of an NPM to and from the RFP. The RFP and SFP are separated by a weir wall and an open channel above the top of the weir wall. When the water level in the UHS pools is above the top of the weir wall, the water in the three pools is shared. The RFP and dry dock are separated by a wall with a gate. When the gate between the dry dock and the RFP is open, the dry dock and UHS pools share one large volume of water. The PCWS is shown in Figure 9.1.3-1.

The RXB heating and ventilation system is described in Section 9.4.2. The fixed area radiation monitoring system provides monitors in the SFP area as described in Section 12.3.4.

#### 9.1.3.2.1 Pool Cooling Subsystem

The pool cooling subsystem performs the following functions:

- maintains the water temperature of the UHS during normal operations by removing the heat from SFAs and NPMs
- maintains the water level of the UHS during normal operations to account for evaporation of pool water by providing makeup from the demineralized water system (DWS)
- provides a flow path for addition of borated water from the boron addition system (BAS), and for removal of boron from pool water by the liquid radioactive waste system (LRWS)
- provides pump priming water for the containment flooding and drain system (CFDS) and receives drain water from the CFDS
- provides effluent to the process sampling system to determine pool cleanliness

The major component trains have manual isolation valves. Table 9.1.3-1 provides design information for the major components.

During normal plant operation two PCWS pool cooling subsystem trains are in operation with one in standby. The PCWS pool cooling subsystem heat exchangers are cooled with water from the site cooling water system (SCWS).

The pool piping penetrations, by piping location or by anti-siphon protections, ensure the pool level cannot be siphoned below the 49.5 ft pool water level as shown in Figure 9.1.3-2.

The suction and discharge lines in the SFP are on opposite corners of the SFP to ensure cooling flow and mixing across the SFP. The pool cooling suction and discharge in the reactor pool and RFP are located in the RFP and the common discharge header is located at each module operating bay in the reactor pool. This configuration ensures proper mixing of the reactor pool and RFP.

The UHS system provides the pool water level instruments located in the reactor pool, SFP, and RFP as described in Section 9.2.5.

The PCWS provides pool water to the LRWS low conductivity collection tanks for processing if a reduction in boron concentration is needed in the UHS pools. The LRWS can also provide makeup water to the UHS from the low conductivity sample tank to allow recycling of cleaned radioactive waste streams.

#### 9.1.3.2.2 Pool Cleanup Subsystem

Table 9.1.3-2 provides design information for the major components of the pool cleanup subsystem. The pool cleanup subsystem is capable of cleanup of the combined volume of the UHS every two months.

The pool cleanup subsystem receives flow from the pool cooling and pool surge control subsystems. The pool cleanup subsystem provides cleanup of the dry dock water before adding the purified water to the pool surge control storage tank.

Operation of the pool cleanup subsystem maintains pool water chemistry within the expected range of values shown on Table 9.1.3-4. Filters remove particulates from the water upstream of the demineralizers. Demineralizers achieve ion reduction at or below the required limits.

#### 9.1.3.2.3 Pool Surge Control Subsystem

The pool surge control subsystem drains the dry dock using the evacuation pumps to support maintenance and refueling activities. The pool surge control subsystem also transfers and stores excess water volume from the UHS to maintain the required water level in the pools during surge events, such as when an NPM is added to the pools.

The pool surge control subsystem consists of two parallel dry dock evacuation pumps, a pool surge control storage tank, and a secondary containment tank. Each major component has manual isolation valves. Table 9.1.3-3 provides design information for the major components. The pool surge control tank is located at a higher elevation than the pool to allow passive, gravity driven flow into the pool or the dry dock. A bypass line allows dry dock water to be recirculated through the pool cleanup subsystem without sending water to the pool surge control storage tank.

The pool surge control storage tank is located outside of the RXB. The tank has sufficient volume to store the contents of the drained dry dock. The secondary containment tank around the surge control storage tank has sufficient volume to store the pool surge control storage tank volume plus the contents of related piping. The secondary containment tank is designed to prevent leakage to the environment. The secondary containment tank leads to a sump with valves and piping to direct collected fluids to the LRWS.

During refueling, the dry dock water level is equalized with the level in the UHS pools to allow the dry dock gate to be opened for movement of the upper section of the NPM into the dry dock for inspection while the NPM is being refueled. Once the dry dock gate is closed, the dry dock evacuation pumps remove the water from the dry dock down to the level that still covers and shields some of the upper section of the NPM and allows access for inspections. The water from the dry dock is routed to the pool cleanup subsystem to remove particulates and radionuclides before being sent to the pool surge control storage tank. A pipe connecting the dry dock and SFP contains an equalization valve that can be opened at the end of dry dock filling to equalize the water level in the dry dock and UHS pools. Once the water level in the dry dock equalizes with the level in the UHS pools, the dry dock gate can be reopened to allow removal of the upper section of the NPM.

The vent line on the pool surge control storage tank has a continuous air monitor with grab sample capabilities to monitor effluent releases from the tank. The radiation monitoring and sampling equipment for the tank vent are described in Section 11.5.1.

Guard pipe is provided where the surge control storage tank piping is embedded underground or in a yard area pipe chase. Leakage from a pipe into the guard pipe is detected with periodic surveillance of PCWS piping.

The surge control storage tank is equipped with a water level instrument that provides overflow protection. In addition to initiating an alarm locally and in the main control room, the instrumentation provides an automatic isolation of the water transfer line to the tank when the water level reaches the high level setpoint. The secondary containment tank drain sump has water level instrumentation to indicate if there are leaks of the surge control storage tank or the piping in the secondary containment tank.

#### 9.1.3.2.4 Pool Leakage Detection System

The PLDS provides for collection and measurement of water leaking from the UHS and dry dock, and directs the flow to sumps for detection of collected leakage for operator evaluation.

The PLDS consists of floor and wall leakage channels, perimeter leakage channels, drainage lines, small pool leakage detection sumps, leakage test lines, and valves. The valves are used to isolate channel drainage lines and leakage rate measuring lines. System components with the potential for contact with borated water are stainless steel. The floor leakage channels are embedded in the concrete beneath field welded seams of the pool floor liner plates in the UHS pools and dry dock. The wall leakage channels are attached to the surface of the steel-plate composite walls, over the horizontal and vertical wall welds seams. The channels collect leakage and direct it to a sump or to collection header piping leading to a sump in the radioactive waste drain system (RWDS). The leakage collected in the RWDS sumps is routed to the LRWS for further processing. The PLDS is accompanied by monitoring and surveillance by plant personnel.

Leakage within basemat and wall leak chases are directed to separate PLDS zones for isolation and inspection. Leakage is then drained to the nearest PLDS sump before flow into a RWDS sump.

As described in Section 9.3.3, the sumps in the RWDS are monitored for level. The RWDS supports the leakage detection function of the PLDS by providing local and control room indication and associated alarms when the leakage rate from the PLDS reaches a predetermined level.

### 9.1.3.3 Safety Evaluation

The PCWS has sufficient capacity to perform its intended function for normal operating conditions. The ability of the PCWS to transfer heat from the pool complex containing SFAs and NPMs during normal operations is described below. Shielding is maintained by design of the penetrations of the inlet and outlet piping. These components of the PCWS are designed and located to prevent draining and siphoning of the SFP water below a safe level. The ability of the DWS to provide normal makeup for pool water evaporation ensures sufficient shielding for the SFAs and NPMs for normal operations. As nonsafety-related systems, the continued performance of these active functions for cooling and shielding by these systems is not credited for accident conditions.

The UHS provides a cooling water source under accident conditions, assuming the PCWS is inoperable, as described in Section 9.2.5.

The PCWS considers GDC 2 and is classified as Seismic Category III. However, as described in Section 3.7.3, piping or structures with the potential for adverse interactions with Seismic Category I SSC, are designed as Seismic Category II. The piping, valves, and related components that are designed to handle radioactive fluids in the PCWS are classified as Quality Group D and comply with Position C.3 of Regulatory Guide 1.26. The PLDS design considers GDC 2 and no portion of the PLDS can cause failure of Seismic Category I structures, systems, or components.

The surge control storage tank is not required to meet Seismic Category I design requirements because the tank does not contain sufficient radionuclide inventory to result in a dose consequence of greater than 500 millirem at the protected area boundary. The water in the surge control storage tank is cleaned by the pool cleanup subsystem before being placed into the tank. Section 12.2.1 provides the radionuclide source term for this tank without credit for cleanup by the pool cleanup subsystem. Section 9.2.5 addresses the UHS pool boil-off radiological consequences that bound potential doses from a failure of the surge control storage tank due to the larger volume of water evaporated and the higher radionuclide concentrations in the water in the UHS pool boil-off event.

General Design Criterion 4 is considered in the design of the PCWS. These systems are compatible with the environmental conditions for normal operations, maintenance, and testing. Section 3.4.1 addresses the potential flooding impact on SSC in the RXB due to pipe breaks, equipment failures, and fire suppression water. Section 3.5 addresses potential dynamic effects associated with missile impacts, and Section 3.6 addresses potential pipe ruptures. These sections of Chapter 3 demonstrate that the PCWS does not result in floods, internal missiles, or pipe whip that adversely affect safety-related SSC. The PLDS design considers GDC 4 and consists of passive components that are not energized. Therefore, failure of the PLDS cannot generate dynamic loads that could impact any safety-related or risk significant systems.

General Design Criterion 5 is considered in the design of the PCWS and the PLDS. The PCWS and PLDS are shared among the NPMs and the sharing does not impair the performance of a safety-related function. The nonsafety-related cooling system for the UHS pools is designed such that no single failure during normal operations prevents the continued active removal of heat in the UHS by other trains in the PCWS. In the event of an accident in one NPM, the failure of the PCWS to perform its nonsafety-related functions does not prevent an orderly shutdown and cooldown of the remaining NPMs.

General Design Criterion 61 is considered in the design of the PCWS and PLDS. The provisions are addressed in a section below to demonstrate adequate safety.

The design of the PLDS considers GDC 63 by allowing leakage to be detected, isolated, and repaired. Inspections and repair of leak channels limit the spread of contamination.

#### 9.1.3.3.1 Design to Permit Inspection and Testing

The inspection and testing requirements of GDC 61 are considered in the design of the PCWS. For normal conditions, the PCWS is designed to permit appropriate inspection and functional testing of system components as described in Section 9.1.3.4.

#### 9.1.3.3.2 Shielding and Radiation Protection

The shielding and radiation protection requirements of GDC 61 are considered in the design of the PCWS.

The PCWS design reduces the dose rates for personnel exposed to pool water during operations near the UHS pool, such as refueling, by removing radionuclides in the pool water. The components of the pool cleanup subsystem-filters, demineralizers, resin traps, and resin transfer lines that contain a buildup of radioactive material- are located in close proximity to each other and are shielded. The other components in the PCWS are also designed to contain radioactive materials; therefore, access controls and precautions to determine the need for additional temporary shielding apply. Section 12.2 describes radionuclide source terms for this equipment, and Section 12.4 provides occupational radiation exposures for personnel including during refueling and maintenance activities.

An adequate water level is maintained in the SFP by the DWS via the PCWS. A low water level alarm in the main control room identifies to the operators that the UHS water level is low and that there is a need for adding makeup to the UHS. The alarm also alerts the operator of the potential for changes in boron concentration and to check that the proper concentration is being maintained in the UHS to meet the minimum boron concentration limit in technical specifications. Failure of the PCWS to perform active cooling functions results in passive cooling from the UHS inventory.

The normal pool makeup provided by the DWS provides a supply sufficient to maintain UHS pool water levels during normal conditions and accounts for pool evaporation and the potential for leakage from the UHS due to a dropped fuel assembly. The LRWS is also available to supply normal makeup water to the UHS pools from the low conductivity sample tank. The effect of losing 100 gpm from the UHS pools is addressed in Section 9.1.3.3.5. The PCWS components can fail and not reduce the pool water level below the safe level for shielding SFAs.

Leakage is detected by radiation or conductivity monitors at the outlet of the PCWS and SCWS heat exchangers. Process and effluent radiation monitoring instrumentation characteristics are defined in Table 11.5-1. Identification of leakage from the PCWS to the SCWS alerts operators to isolate the train with the heat exchanger leak.

#### 9.1.3.3.3 Containment, Confinement, and Filtering

The PCWS is designed to meet GDC 61 provisions for containment, confinement, and filtering of radioactive materials associated with storage of SFAs in the SFP as described below.

The PCWS is designed for confinement of radionuclides removed from the pool water. The PCWS removes radionuclides in the pool water and collects them on a filter or in a demineralizer vessel for subsequent handling as solid radioactive wastes.

Leakage from piping or components in the PCWS in the RXB is contained within local floor drains and RXB sumps and is then transferred by the RWDS for processing by the LRWS.

Leakage from the UHS is collected by the PLDS and directed to sumps in the RWDS. The RWDS provides local and control room indication and associated alarms when the leakage rate from the PLDS reaches a predetermined rate. This alarm alerts operators to identify the area of the pool with leakage using the leak chase system in the PLDS. The set of leakage channels or the individual channel that flows to one RWDS sump from a leak chase and allows pool leakage to be isolated to an individual zone. A leakage channel with flow can be determined from the sump collecting leakage. The flow rate for the leakage channel can be monitored by collecting and measuring the amount of water flowing from the channel. The leakage rate and location of the leakage channel provides the basis for further inspections from inside the pool.

The guard pipes for the supply and discharge lines between the RXB, surge control storage tank, and secondary containment tank allow for periodic inspections. Periodic surveillance of the guard pipes provides confirmation of the continued integrity of the PCWS piping.

The secondary containment tank that is placed around the surge control storage tank has leak detection capabilities. The secondary containment tank is capable of holding the contents of the surge control storage tank and related piping in the event of a tank failure. The secondary tank is covered and leak-proof and it leads to a sump that allows draining of the contents to the LRWS to prevent groundwater contamination.

As described in Section 9.4.2, the area around the SFP is serviced by the RXB heating and ventilation system that controls the release of airborne radionuclides from evaporating UHS pool water for normal conditions of operation, but is not credited for accident conditions.

##### 9.1.3.3.4 Residual Heat Removal Capability

The PCWS is designed to meet GDC 61 provisions for residual heat removal of decay heat from NPMs and SFAs.

During normal operation, the pool cooling subsystem can remove decay heat with any combination of two strainers, pool cooling pumps, and heat exchangers and maintain the reactor pool, RFP, and SFP at or below 100 degrees F while other pool cooling equipment is on standby. The heat exchangers are designed to remove the total heat load of 7.045 MMBtu/hr, based on a 10-year cumulative storage of the spent fuel pool and the heat load from six operating NPMs.

The heat exchangers are sized assuming the maximum water temperature for the SCWS and the design flowrates from Table 9.1.3-1. The heat exchangers are cross-connected with piping and valves to provide redundancy to ensure adequate cooling while allowing for normal equipment maintenance. The PCWS can withdraw water from either the SFP or the RFP, and can discharge cooled water to the spent fuel pool, refueling pool, or reactor pool.

The heat exchangers are sized to have two sets of pool cooling equipment remove the required heat load at off-normal heat load conditions. During a full core offload, the heat load increases to 12.94 MMBtu/hr and two pool cooling sets of equipment are required to maintain the pools at or below 120 degrees F.

As described in Section 9.1.2, when cooling of just the SFP is considered, a single heat exchanger can keep a full SFP, including a recent core offload from one NPM, at or below the normal operating pool water temperature of 100 degrees F.

##### 9.1.3.3.5 Prevent Coolant Inventory Reduction for Accident Conditions

The requirements of GDC 61 to prevent loss of SFP coolant for accident conditions are considered in the design of the structures and systems supporting spent fuel cooling and shielding. The design provides the makeup water and prevents draining, siphoning, or other loss of water.

Preventing a reduction of the SFP coolant inventory below the top of the weir wall for accident conditions is accomplished by the large inventory of water in the UHS pools and by an emergency makeup line in the UHS system as described in Section 9.2.5.

The capacity of each flow path exceeds the required makeup supply to account for the evaporation rate or the pool leakage rate from a dropped fuel assembly. The water in the UHS automatically feeds into the lower portion of the SFP without the need for operator action to initiate the flow because the open channel above the top of the weir wall allows unrestricted flow between pools and there is not a gate in the wall that can block flow. As described in Section 9.2.5, the large quantity of water in the UHS provides a supply of water that takes weeks to evaporate to the level of the top of the weir wall. The large volume of water also allows time for operators to connect a water supply to the emergency makeup line outside of the RXB. The emergency makeup line for the UHS, as shown in Figure 9.2.5-1, has a 4 inch diameter and slopes from outside of the RXB to the SFP. This line has the capability of providing several times the needed capacity and permits operators to make the connections and flow alignments from a location remote from the operating floor near the SFP.

In addition to the capability to add makeup, the design prevents the loss of pool water inventory. The large inventory of water in the UHS increases the time needed for leaking, draining, or siphoning to impact the water level in the pools. Assuming a leakage rate of 100 gpm, a leak without makeup for 72 hours results in a 7.3 ft decrease in the UHS pool level. The large amount of water to be lost and the time needed ensures that operators are alerted to stop the loss of water. Sufficient time is available to preclude a loss of pool water that creates an unsafe water level in the UHS pools.

The design of the UHS pools has no drains, piping, or other systems that would allow pool water to drain below the minimum level needed to support plant safety analyses and is above the level needed for adequate shielding of the SFAs. A failure of the piping in the PCWS does not drain the water to adversely affect the inventory of water available for cooling and shielding the NPMs or SFAs.

Identifying leakage from components in the PCWS prevents a loss of pool inventory and is another means to ensure an adequate water level in the SFP for cooling and shielding the stored spent fuel. Leakage from piping or components in the PCWS in the RXB is collected by local floor drains that flow to sumps monitored by level instrumentation.

The PLDS collects leakage from the UHS and directs it to the floor sumps in the RWDS. The RWDS supports the leakage detection function of the PLDS by providing local and control room indication and associated alarms. When the leakage rate reaches a predetermined value, operators perform inspections and repairs to support reduced radiation exposure and minimize contamination.

Pool water in the dry dock is not included in the inventory of water in the UHS because the dry dock gate may be closed at the time of an accident. The dry dock gate, classified as Seismic Category II, is not ensured to function following a safe shutdown earthquake. An empty dry dock at the time of an accident and a safe shutdown earthquake is assumed to cause the gate to fail and open. For this condition, water in the UHS pools reenters the dry dock until an equalization level is reached and the UHS pool water level remains above the minimum pool level for cooling and shielding the SFAs.

#### 9.1.3.3.6 Monitoring Cooling Capability and Area Radiation Levels

The requirements in GDC 63 is considered in the design of the pool cooling and cleanup related structures and systems. Monitoring for the loss of decay heat removal capability is provided for both normal and accident conditions. Radiation monitors are provided for detecting excessive radiation levels in the reactor pool and SFP as described in Section 12.3.4.

The temperature detectors on the inlets and outlets of the heat exchangers provide operators with information on the cooling performance of the heat exchangers. The outlet temperature detectors have a high setpoint to alert operators to determine the cause and ensure adequate active cooling system performance.

The PLDS collects leakage from the UHS and directs it to the RWDS sumps for detection. Radiation monitors on the SCWS heat exchanger discharge lines identify leakage to the SCWS. The design of the PLDS considers GDC 63 by ensuring leakage can be detected, isolated, and repaired.

For normal and accident conditions, the UHS system provides redundant pool water level instruments as described in Section 9.2.5.

#### 9.1.3.3.7 Monitoring Radioactivity Releases

Radiation monitoring is described in Section 11.5.1.

#### 9.1.3.3.8 Maintaining Doses as Low as Reasonably Achievable

The design of the structures for the PCWS and other system interfaces meets 10 CFR 20.1101(b) to achieve doses that are ALARA. The PCWS is designed to reduce radiation exposure and achieve contamination minimization. Information on compliance with the 10 CFR 20.1406 requirements for minimization of contamination is provided in Section 12.3.

The PCWS is designed with equipment drains that connect to the RWDS and with piping connections for flushing system piping and components. The pumps, strainers, and heat exchanges are located within curbed areas in the RXB that are drained to RWDS sumps. These features reduce crud accumulations in system components, minimize the spread of contamination, and provide drainage control for contaminated fluids. The PCWS pool cooling subsystem operates with a higher water pressure in the SCWS side of the heat exchangers. Potential heat exchanger leaks result in flow from the SCWS to the PCWS preventing contaminated water from entering the nonradioactive SCWS.

The pool cleanup subsystem filters and demineralizes the water it receives from the pool cooling subsystem. This process supports ALARA operations and minimizes contamination by reducing the radionuclide concentration in the pool water.

The pool cleanup subsystem has demineralizer vessels that are designed for sluicing spent resins to the solid radioactive waste system. The resin traps downstream of the demineralizer vessels are designed for back flushing accumulated resins from the traps to the spent resin discharge piping. To minimize the use of clean water and the generation of liquid radioactive waste, spent resin sluicing can be performed with water cleaned by the LRWS. As described in Section 11.2.2, the clean-in-place subsystem of the LRWS provides clean demineralized water for flushing the resin sluice lines.

The surge control tank bypass line allows the water in the dry dock to be cleaned and returned to the dry dock without sending water to the surge control storage tank. The surge control tank bypass line allows the dry dock water to be cleaned to maintain water quality during an outage with water staged at the inspection height or with a full dry dock before maintenance. The surge control storage tank level instrumentation provides overflow protection with an automatic control to stop the flow of water into the tank when a high level setpoint is reached.

The PLDS is designed with access for inspection and flushing of leakage channels, channel drainage lines, and leak collection headers. The PLDS provides a means to contain and remove contamination buildup created by pool leakage. Operators can remove contamination buildup from the leakage and keep occupational exposures ALARA by removing radiation sources.

The BAS provides borated water and the DWS and LRWS provide makeup water sources for adding to the SFP. The lines from the BAS and DWS include isolation valves that prevent the flow of contaminated water to the nonradioactive BAS and DWS.

#### 9.1.3.4 Inspection and Testing

The pre-operational testing of the PCWS is performed as part of the initial test program as described in Section 14.2.

The major trains or pieces of equipment in the PCWS are provided with isolation valves that are located to allow for systematic inservice inspections, periodic maintenance, repairs, and functional testing. Adequate laydown space is provided for pump and heat exchanger disassembly and maintenance. Pull spaces are also provided for the heat exchanger tube bundles and head removal. The leakage channels in the PLDS are accessible for inspection.

Section 14.3 provides information related to development of Inspections, Tests, Analyses, and Acceptance Criteria.

### 9.1.3.5 Instrumentation

The PCWS includes instruments to monitor the following process conditions:

- temperature and conductivity at the outlet of heat exchangers
- temperature of the SFP, RFP, and pool cooling water suction
- pressure drop across strainers
- pressure upstream and downstream of pumps
- discharge flow rate of pumps
- temperature at the inlet of filters
- pressure drop across filters, demineralizers, and resin traps
- conductivity and temperature at the outlet of demineralizers
- pressure downstream of pool surge control storage tank pumps
- water level in the dry dock, the pool surge control storage tank, and the pool surge control storage tank containment sump
- radiation level in the vent line of the pool surge control storage tank

The PLDS uses the level indicators in the RWDS collection sumps for detecting leakage from the pool.

The PCWS is controlled and monitored remotely by the plant control system from the main control room. Section 9.2.5 describes the SFP water level instruments.

### 9.1.3.6 Reference

9.1.3-1 American National Standards Institute/American Nuclear Society, "Decay Heat Power in Light Water Reactors," ANSI/ANS-5.1-2014, La Grange Park, IL.

## Table 9.1.3-1: Equipment Parameters for the Pool Cooling Subsystem

| | |
|---|---|
| **PCWS Cooling Water Pumps** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Flow capacity | 1600 gpm |
| **PCWS Heat Exchangers** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Type | Shell and Tube |
| Heat removal capacity | 4.5 MMBtu/hr |
| Flow capacity | 1600 gpm |
| **PCWS Strainers** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Flow capacity | 1600 gpm |

## Table 9.1.3-2: Equipment Parameters for the Pool Cleanup Subsystem

| | |
|---|---|
| **PCWS Filters** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Flow capacity | 1600 gpm |
| **PCWS Demineralizers** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Flow capacity | 800 gpm |
| **PCWS Resin Traps** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless steel |
| Flow capacity | 800 gpm |

# Table 9.1.3-3: Equipment Parameters for the Pool Surge Control Subsystem

| | |
|---|---|
| **PCWS Storage Tank** | |
| Design pressure | Atmospheric |
| Design temperature | 240°F |
| Material | Stainless Steel |
| Capacity | 661,000 gallons |
| **PCWS Dry Dock Evacuation Pumps** | |
| Design pressure | 220 psig |
| Design temperature | 240°F |
| Material | Stainless Steel |
| Flow capacity | 880 gpm |

## Table 9.1.3-4: Water Chemistry Parameters Monitored for the Ultimate Heat Sink Pools

| Parameter | Expected Value |
|---|---|
| Conductivity | Trend for unexpected changes |
| pH | Trend for unexpected changes |
| Boron | ≥ 2000 ppm |
| Chloride | < 0.15 ppm |
| Fluoride | < 0.15 ppm |
| Sulfate | < 0.15 ppm |
| Silica | < 1.5 ppm |
| Total suspended solids | ≤ 1.0 ppm |
| Gamma isotopic activity | < 0.001 μCi/gram |

## Table 9.1.3-5: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **PCWS, Pool Cooling and Cleanup System** | | | | | |
| All components (except as listed below): | RXB/yard | B2 | None | D | II/III |
| Operating bay return FCV | RXB | B2 | None | D | I |
| Instrumentation | RXB | B2 | None | N/A | III |
| **PLDS, Pool Leakage Detection System** | | | | | |
| All components | RXB | B2 | None | D | III |

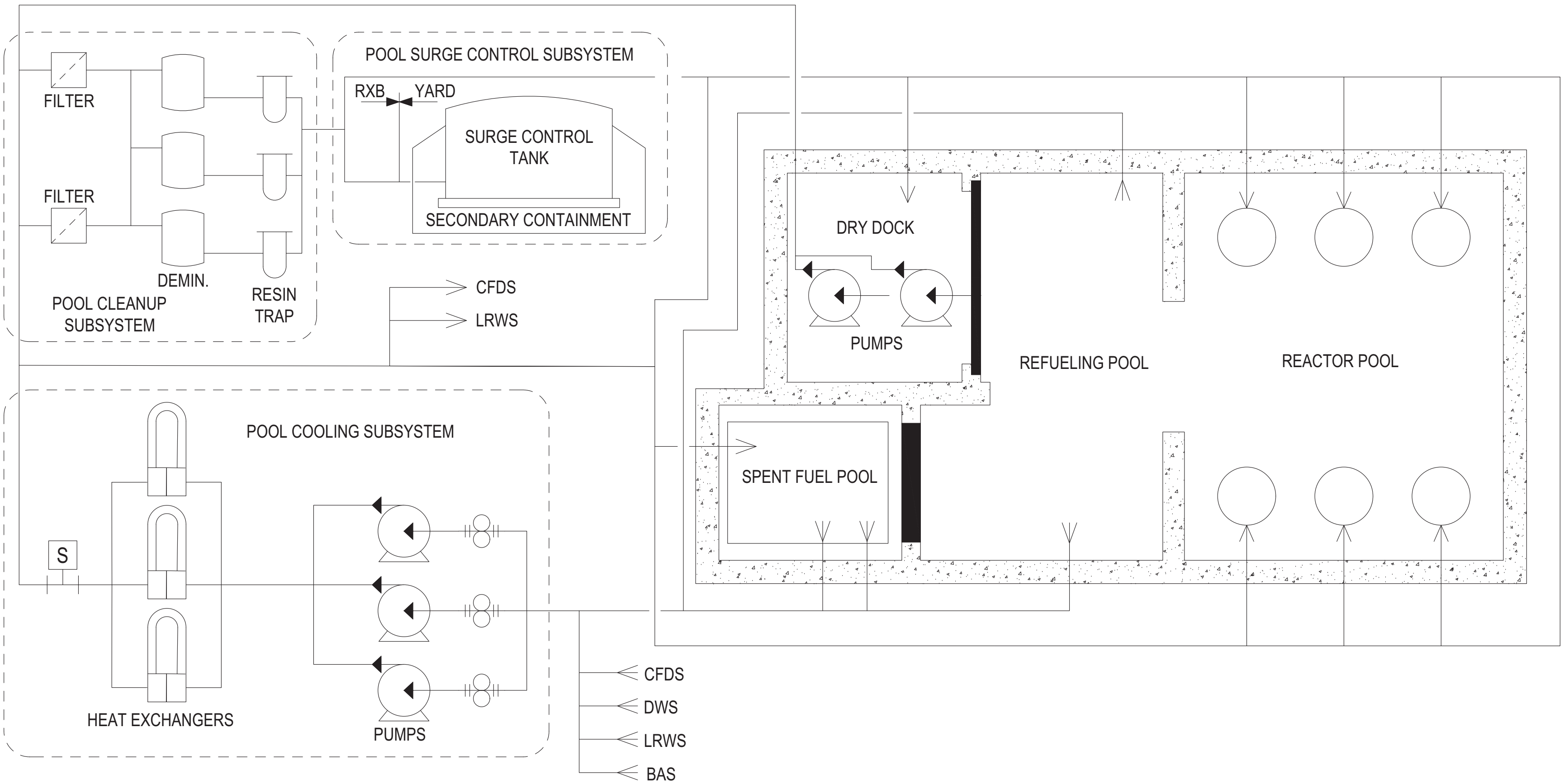
Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## Figure 9.1.3-1: Pool Cooling and Cleanup System Diagram



## Figure 9.1.3-2: Ultimate Heat Sink Water Level and Plant Feature Elevations

{{ Withheld - See Part 9 }}

## 9.1.4 Fuel Handling Equipment

The fuel handling equipment consists of the components and equipment used to handle new fuel upon receipt on site, refueling operation, and to the loading of spent fuel into a cask. The fuel handling equipment (FHE) includes the following:

- fuel handling machine (FHM)
- new fuel jib crane (NFJC)
- new fuel elevator (NFE)

The FHE is nonsafety-related and not risk-significant.

### 9.1.4.1 Design Bases

The FHE is designed to support the periodic refueling of the reactor as well as movement of control rods and other radioactive components within the reactor core, refueling pool (RFP), and spent fuel pool (SFP).

General Design Criteria (GDC) 2 is considered in the design of the FHE. The areas of the facility associated with the FHE are the SFP and RFP in the Reactor Building (RXB). The design and analysis criteria associated with establishing the ability of structures housing the FHE and supporting systems to withstand the effects of natural phenomena, such as the safe shutdown earthquake, are described in Section 3.7 and Section 3.8. Seismic classifications and primary design standards for the FHE are defined in Table 9.1.4-1.

General Design Criterion 5 is considered in the design of the FHE. The design of the FHE allows for the performance of fueling activities on one module without affecting the operation of the other modules including potential shutdown and cooldown.

Consistent with GDC 61, the design of the FHE provides reasonable assurance that release of radioactive materials and unacceptable personnel radiation exposures from damage to irradiated fuel is avoided. Potential damage to fuel and release of radioactivity is addressed through meeting requirements of American National Standards Institute / American Nuclear Society 57.1-1992 (Reference 9.1.4-1).

Consistent with GDC 62, the FHE is designed such that it does not cause, or contribute to, a criticality accident. Protection from a criticality event is provided by designing the FHE to meet the requirements of Reference 9.1.4-1.

The FHE design information is presented in Table 9.1.4-1.

### 9.1.4.2 System Description

#### 9.1.4.2.1 General Description

The FHE is designed to transport a fuel assembly from the time it is removed from a shipping container and lowered into the SFP until it is removed from the reactor and placed in a cask. The design of the FHE limits motion to a single assembly at a time for each component.

Structures, components, and equipment required to function underwater are constructed of stainless steel or comparable corrosion resistant alloys.

The FHE includes interlocks as discussed in Section 9.1.4.5.

#### 9.1.4.2.2 Major Component Description

**Fuel Handling Machine**

The FHM performs fuel handling operations in the SFP and RFP. It provides a means of tool support and operator access for tools used in various services and handling functions. The FHM consists of the bridge, trolley, mast, and grapple. Section 9.1.4.5 describes the instrumentation and controls associated with the FHM.

The FHM bridge rides on rails with hard stops to prevent bridge wheels from moving past the end of the rails. The bridge is equipped with a main walkway for operator access to the trolley and end trucks. A means for manually moving the bridge is provided.

Seismic restraints prevent the FHM bridge from overturning or coming off its rails during a seismic event. The bridge structure and end trucks are welded construction and designed to the requirements of American Welding Society D1.1 (Reference 9.1.4-2), and American Welding Society D14.1 (Reference 9.1.4-3) as required by ASME NOG-I (Reference 9.1.4-4).

The trolley is mounted to the bridge with full range of motion perpendicular to the bridge. A means for manually moving the trolley is provided.

The FHM has a telescoping mast attached to the trolley with the inner most mast section containing the fuel grapple. Fuel assemblies are drawn completely into the outermost mast for protection during transport. Cameras are positioned to visually monitor the latching and unlatching of fuel assemblies and to assist in fuel grapple operation.

Mechanical and electrical interlocks ensure a shielding water depth of at least 10 feet.

The mast is pre-programmed to ensure the grapple operates only when the fuel assembly is safely seated. The grapple release mechanism incorporates mechanical and electrical lockouts. Operator action or control failure cannot open the grapple when loaded.

The FHM has an auxiliary hoist that handles a special lifting device to move control rod assemblies during refueling operations. The FHM is equipped with a control system providing interlock protection for:

- bridge, trolley, and hoist position and motion
- hoist loads
- slow zones
- grapple elevation.

**New Fuel Jib Crane**

The NFJC is used to remove new fuel assemblies (NFAs) from their shipping containers, support the NFAs during inspection, and move the NFAs to the NFE. The NFJC is used to transport new control rod assemblies and other light load components that are placed in the SFP. The NFJC is mounted to the refueling floor and has a hoist that moves across a jib beam that rotates around the stationary base of the crane. The NFJC does not operate below the pool water level and therefore does not require the level of corrosion resistance required of the FHM and NFE.

An underhung, motor-driven trolley runs on the bottom flange of the jib beam. The NFJC permits manual operation of the hoist system, the boom, and trolley.

**New Fuel Elevator**

The NFE receives NFAs from the NFJC and transports NFAs to the bottom of the SFP for handling by the FHM. The NFE has fixed rails that are mounted to the side of the SFP that carry a removable basket vertically. The NFE has a drive system that provides load feedback. The NFE can be manually manipulated to move the basket. The NFE can handle SFAs for inspection and repairs. Vertical travel limit controls ensures adequate shielding of SFAs. Mechanical stops and limit switches stop the basket at its upper and lower limits.

The NFE basket is designed with the ability to drain or fill if the basket is removed from the water.

The NFE load is measured with a load cell that allows for load limits and load display.

#### 9.1.4.2.3 System Operation

The FHE system provides the capability to perform light-load handling operations associated with new fuel receipt, initial reactor fueling, reactor refueling and cask loading. Figure 9.1.4-1 shows the arrangement of the fuel handling equipment within the RXB.

The NFJC operates in normal or emergency mode. Normal mode of operation is limited to manual control with boundary monitoring to ensure a safe travel zone. The NFJC design includes the capability for manual operation via hand wheel operation, or equivalent, in the event of an emergency.

The NFE operates in new fuel mode, spent fuel mode, interlock override mode, or emergency mode. The new fuel mode allows the NFE to transport new fuel assemblies down to where the FHM can access them while restricting the ability to raise the NFE when it is loaded. Boundary controls prevent damage to NFE components.

The NFE has the ability to lift irradiated fuel assemblies for inspection and repairs with the spent fuel operating mode. A vertical travel limit ensures adequate shielding is maintained. Radiation monitoring and boundary controls remain active while operating the NFE in spent fuel mode.

The NFE interlock override mode is to be used only if a system failure occurs and the fuel needs to be placed in a safe condition. Interlock override mode allows for manual operation of the NFE at a reduced speed. Normal machine interlocks and boundary zone controls are not functional in interlock override mode.

The NFE operates manually via hand wheel in the emergency operation mode.

The FHM design includes the following modes of operation:

- Automatic mode positions the FHM automatically with the control system using a sequence from a pre-approved movement plan.
- Semi-automatic mode positions the FHM automatically with the control system to a location selected by the operator.
- Manual mode allows for the operator to position the FHM using the control system operator input devices. Interlocks and boundary zone monitoring must remain functional for the FHM to operate in manual mode.
- Interlock override mode allows the control system to operate motor drives manually at a reduced speed while ignoring boundary zones or other interlocks. Interlock override mode is used to place a fuel assembly in a safe condition following major system malfunction.
- Emergency mode allows the FHM to be positioned with manual hand wheels.

The FHM moves spent fuel assemblies to casks for on-site storage or off-site shipping.

### 9.1.4.3 Safety Evaluation

The FHE supports the periodic refueling of the reactor as well as movement of control rods and other radioactive components within the reactor core, RFP and SFP. The FHE maintains fuel integrity and prevents criticality during fuel handling activities.

The FHE is located within the confines of the RXB that protects the FHE from the effects of natural phenomenon. Electrical power to FHE is interrupted if a seismic event it detected. The FHE is designed to stop operation and safely prevent fuel assembly travel if an event occurs. Manual operation capability is provided for subsequent recovery.

The FHM is provided with seismic restraints to prevent the bridge and trolley from overturning or coming off rails during a seismic event. This design feature is consistent with the requirements of Regulatory Guide 1.29 and precludes adverse interactions with Seismic Category I structures, systems, and components.

The design of the FHM ensures that the FHM is able to withstand the highest expected seismic excitation. Large components, such as electrical cabinets, winches, and masts are analyzed to ensure these components do not come loose during a seismic event and become missiles potentially damaging other equipment. Manual methods of releasing brakes and performing the various functions are available to place a suspended fuel assembly in a safe condition after a seismic event or loss of power.

The NFJC is designed to the standards in Table 9.1.4-1.

The design of the NFE ensures that the components of the NFE are able to withstand the seismic loading without coming loose and becoming missiles during a seismic event. A fuel assembly remains restrained and contained within the NFE during and after a seismic event. The NFE is designed to the requirements in Table 9.1.4-1.

Dynamic effects associated with missile impact are provided in Section 3.5. Zoning control interlocks ensure the RXB crane does not travel near the FHE when it is in operation to prevent impacts as described in Section 9.1.5.

The FHE provides fuel handling for each of the NPMs. Fuel handling for each module is a planned activity. Each module, in turn, is shut down, disconnected, and brought to the RFP where the FHM can access it. The NFJC and NFE are used to move NFAs from the shipping containers to the SFP. The design of the FHE allows for the performance of fueling activities on one module without affecting the operation of the other modules including potential shutdown and cooldown. Neither the NFJC nor the NFE interfaces directly with the modules.

The design of the FHE precludes system malfunctions or failures that could cause criticality accidents, a release of radioactivity, or excessive personnel radiation exposures. The following attributes contribute to the prevention of criticality events, release of radioactivity, or excessive personnel radiation exposures.

- The FHE is designed such that probability of dropping a fuel assembly during or following a safe shutdown earthquake is minimized.
- The FHE is designed with the capability to permit periodic inspection and testing of components.
- The speed of the FHM, trolley, and hoist motions are limited such that the inertial loads imparted to fuel assemblies and control components during handling operations do not exceed the allowable limits for which the fuel assemblies and components are designed.
- Protection from a criticality event is provided by designing the FHE to meet the requirements of Reference 9.1.4-1.
- Shielding for radiation protection is maintained by designing the FHE to meet the requirements of Reference 9.1.4-1. Underwater transfer of SFAs provides radiation shielding. The FHE has provisions to limit maximum height to maintain sufficient water inventory above the top of the fuel assembly.
- The FHE includes controls and interlocks that impose limits upon system operations, ensuring clearance among structures, systems, and components, thereby preventing mechanical damage to fuel during fuel transfer operations. Application of interlock protection meets the applicable requirements of Table 1 of Reference 9.1.4-1. A description of relevant interlocks associated with the FHE is provided in Section 9.1.4.5.

Section 12.3 and Section 12.4 provide information pertaining to occupational radiation exposures and ensuring that radiation exposure during fuel handling is as low as reasonably achievable.

#### 9.1.4.4 Inspection and Testing

Preoperational testing of the FHE is addressed in Section 14.2. The development methodology for the Inspections, Tests, Analyses, and Acceptance Criteria is described in Section 14.3.

COL Item 9.1-3: An applicant that references the NuScale Power Plant US460 standard design will provide the periodic testing plan for fuel handling equipment.

#### 9.1.4.5 Instrumentation and Control

The FHE controls are designed using human factors engineering guidelines as presented in Chapter 18.

The NFJC is designed to monitor elevation using a resolver. The hoist load is monitored using a load cell. The NFJC controls include the operator control panel, boundary zone monitoring, and load display.

The NFE basket elevation is monitored with a resolver. The NFE design includes a mechanical stop and radiation monitor interlock to limit vertical movement of

SFAs above exposure limits while operating in spent fuel mode. In new fuel mode, a load sensing interlock prevents motion in the raise direction when the basket is loaded.

The FHM is equipped with an operator control station providing a means for monitoring and control of the system. Instruments and interlocks are provided to ensure proper positioning and operation of the FHM equipment (i.e., encoders, load cells, and limit switches).

Lifting a fuel assembly above the maximum lift height (Section 9.1.2) is prevented by a mechanical stop. The FHM design includes the following capabilities for safe handling of the fuel assemblies.

- The under-load interlock prevents hoist motion in the down direction with a fuel assembly if a specified weight loss occurs except when the hoist is positioned in a known insert or set down location and the hoist elevation is below a value defined for that specific location.
- Load sensing allows the operator to change overload or underload safety limits depending on whether the fuel assembly has a control rod in it.
- The FHM hoist slow zones protect the fuel assembly from collision in bridge-trolley traversal and hoisting motion. A hoist interlock prevents the telescoping mast from vertically extending unless the FHM is positioned in a defined area such as the reactor core, spent fuel pool, or new fuel elevator.
- An interlock limits bridge and trolley motion to an indexing speed when hoist elevation is above the lower slow zone but below the elevation that requires a disengaged grapple to be inside the outer mast. This interlock is active when the hoist is unloaded.
- The FHM hoist up or down over-travel interlocks are provided to prevent the mast from jamming in the up position and to prevent the hoist cable from completely unwrapping from the hoist drum.
- An interlock prevents bridge and trolley motion into the refueling pool area when the Reactor Building crane is active in that region. Zone boundary monitoring allows speed to be controlled automatically based on positioning of the machine. Slow and stop zones are monitored with laser position feedback.
- Interlocks prevent full speed horizontal motion while the hoist is loaded unless the mast in the full up position.
- Interlocks prevent the simultaneous vertical and horizontal motion of the hoist, bridge, and trolley while fuel assemblies or other tools or components are being moved in proximity of the reactor core or spent fuel storage racks.
- The grapple design includes an interlock based on fuel assembly elevation that precludes release of the fuel assembly in the reactor core if the elevation is above the safe limit to place a fuel assembly in the reactor core.
- The grapple engagement interlocks ensure that the grapple is properly located on the fuel assembly, does not lift until the grapple is fully closed and locked, and does not open with a suspended load. The grapple design precludes the possibility of partial engagement.

### 9.1.4.6 References


9.1.4-1 American National Standards Institute/American Nuclear Society, "Design Requirements for Light Water Reactor Fuel Handling Systems," ANSI/ANS 57.1, 1992 (R2005), La Grange Park, IL.

9.1.4-2 American Welding Society, "Structural Welding Code - Steel," D1.1-2010 Miami, FL.

9.1.4-3 American Welding Society, "Specification for Welding of Industrial and Mill Cranes and Other material Handling Equipment," D14.1-2010 Miami, FL.

9.1.4-4 American Society of Mechanical Engineers, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder),” NOG-1, 2020, New York, NY.

9.1.4-5 American Society of Mechanical Engineers, “Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type),” ASME NUM-1-2016, New York, NY.

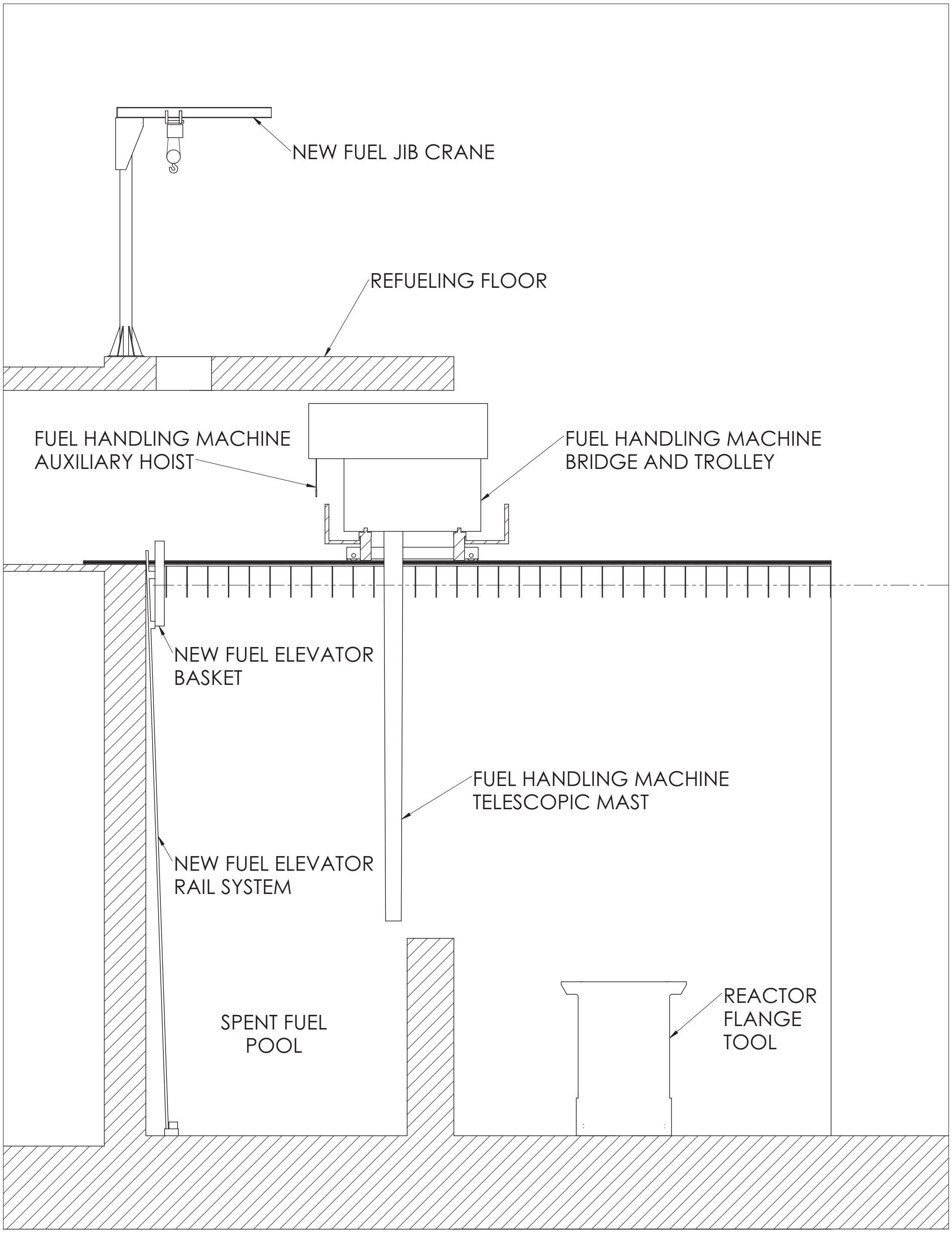
9.1.4-6 American Society of Mechanical Engineers, “Design of Below-the-Hook Lifting Devices,” BTH-1-2017, New York, NY.

9.1.4-7 American Institute of Steel Construction, Inc. (AISC), “Manual of Steel Construction, Allowable Stress Design,” 9th Edition, Chicago, IL.

## Table 9.1.4-1: Fuel Handling Equipment Design Information

| System | | Primary Design Code | Seismic Category | Capacity (lbs) |
|---|---|---|---|---|
| Fuel handling machine | Bridge | ASME NOG-1 Type I | I | 1200 |
| | Trolley | | | |
| | Mast rotate and hoist | | | |
| | Auxiliary hoist | ASME NUM-1 Type IA | I | 1000 |
| New fuel jib crane | | ASME NUM-1 Type IA | II | 1200 |
| New fuel elevator | Hoist | ASME NUM-1 Type IA | I | 1200 |
| | Basket | ASME BTH-1 | | |
| | Rails | AISC, SC-I | | |

**Figure 9.1.4-1: Refueling Floor Layout**



### 9.1.5 Overhead Heavy Load Handling Systems

The overhead heavy load handling system (OHLHS) consists of equipment that lifts loads whose weight is greater than the combined weight of a single fuel assembly and control rod assembly. Loads weighing more than 900 lbs are defined as heavy loads. The primary purpose of the OHLHS is to support movement of a NuScale Power Module (NPM) for refueling.

The principal equipment of the OHLHS consists of the Reactor Building crane (RBC), and various hoists and heavy load handling devices used in the Reactor Building (RXB):

- Reactor Building crane
- traveling jib crane (TJC)
- articulating traveling jib crane (ATJC)
- dry dock jib crane
- module access platform (MAP) jib crane
- auxiliary wet hoist (AWH)

Additional equipment used to inspect, assemble, and disassemble the NPM for refueling is also discussed in this section:

- NPM top support structure (TSS)
- lower riser lifting and torque tool (LRLTT)
- other refueling devices:
  - reactor flange tool (RFT)
  - containment flange tool (CFT)
  - module inspection rack

The OHLHS also includes instrumentation, physical stops, electrical interlocks, and associated administrative controls.

The RBC is classified as nonsafety-related, risk-significant.

The remaining components of the OHLHS are classified as nonsafety-related and not risk-significant.

Critical load handling is defined as the handling of a heavy load where inadvertent operations or equipment malfunctions, separately or in combination, could cause a release of radioactivity, a criticality accident, the inability to cool fuel within the reactor vessel or spent fuel pool, or prevent safe shutdown of the reactor.

COL Item 9.1-4: An applicant that references the NuScale Power Plant US460 standard design will describe the process for handling and receipt of critical loads including NPMs.

### 9.1.5.1 Design Bases

Consistent with General Design Criterion 1, OHLHS components are designed, fabricated, erected, and tested to appropriate quality standards such that their failure does not impact the function of other safety-related or risk-significant systems.

General Design Criterion 2 is considered in the design of the OHLHS, including the ability of structures, systems, and components (SSC) in the RXB and OHLHS to withstand the effects of earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches. The OHLHS is located in the Seismic Category I portion of the RXB.

General Design Criterion 4 is considered in the design of the OHLHS. No safety-related or risk-significant SSC are affected by load drops because the individual components of the OHLHS are designed to meet the American Society of Mechanical Engineers (ASME) codes and standards specified in Table 9.1.5-1. In addition, the OHLHS is protected from the effects of external missile hazards by being located inside the RXB.

General Design Criterion 5 is considered in the design of the OHLHS. The RBC is used to move each NPM for refueling. However, only one NPM can be moved at a time. The CFT, RFT, and module inspection rack are designed to hold a single NPM at a time.

### 9.1.5.2 System Description

#### 9.1.5.2.1 General Description

The OHLHS includes equipment designed to handle critical loads in areas containing safety-related equipment that could be potentially impacted by the drops of such loads. The design of the OHLHS equipment, in conjunction with procedures and safe load paths, ensures safe movement of critical loads. Safe load paths for NPM movement minimize the potential for a load drop on irradiated fuel in a reactor vessel or spent fuel pool (SFP), or on safe shutdown equipment. The safe load path for the movement of the OHLHS is shown in Figure 9.1.5-1.

The largest load handled is the fully-assembled NPM, with the maximum water height in the containment vessel (CNV), and fully flooded in the reactor pressure vessel (RPV). The RBC is designed to handle this load with no credit taken for buoyancy.

#### 9.1.5.2.2 Component Descriptions

**Reactor Building Crane**

The RBC is designed for critical load handling and consists of a bridge, trolley, main hoist, and two auxiliary hoists as shown in Figure 9.1.5-2.

The RBC bridge is supported by runway rails anchored to the RXB, more than 5.5 inches from the edge, and provides traveling motion across the length of the reactor pool, refueling pool, and dry dock. The RBC trolley is supported by the bridge and travels across the width of the pool on the bridge rails. The trolley supports and transfers the lifted load to the bridge via the main hoist.

The RBC main hoist is designed with a reeving system. Failure of any single rope in the reeving system can be tolerated without loss of control of the load. The rope reeving system is designed to transfer the load to the remaining ropes without excessive shock in case of a failed rope.

The hoist drive system includes dual gearboxes, a power braking control system, and redundant holding brakes. There are four hoist motor brakes, two on each gearcase input shaft. The hoisting brakes are automatically set when electrical power is off or mechanically tripped by overspeed or overload devices.

The RBC main hoist includes a load-weighing assembly to monitor the tension on the rope for slack rope when a load is lowered, for high loads due to too heavy of a load or hang up, and for a broken rope. The design of the assembly ensures a structural failure does not result in a dropped load. The main hoist monitors hook height and hard-wired limit switches as upper limit constraints.

The lower block assembly (LBA), located at the bottom of the main hoist, provides the connection method for the RBC to lift and carry the NPM from the operating bay to the refueling bay and dry dock, as shown in Figure 9.1.5-3. The LBA is designed with load paths consisting of lifting arms that interface with the lifting lugs on the TSS of the NPM. The pins that engage the TSS lifting lugs are engaged with actuators. The engagement is confirmed by travel limit switches and visual indication. Design and capacity requirements for the RBC main hoist and LBA are specified in Table 9.1.5-1.

A removable sister hook is connected to the LBA by a single, large-diameter pin. Design and capacity requirements for the sister hook are specified in Table 9.1.5-1.

Two auxiliary hoists mounted on the RBC provide low-capacity lifting for equipment in the RXB. The RBC auxiliary hoists are underhung-monorail type hoists. The auxiliary hoist rail is mounted off the outer surface of each bridge girder. The auxiliary hoists ensure a failure of the load path component does not result in an uncontrolled load. The auxiliary hoists also contain a load-weighing assembly that monitors for slack rope, high loads, and broken ropes. Design and capacity requirements associated with the RBC auxiliary hoists are specified in Table 9.1.5-1.

**Traveling Jib Crane**

A fixed boom, traveling, wall-mounted jib crane traverses the wall of the refueling pool along a rail system, between the operating bays and the dry dock. The TJC provides heavy load material handling capability to the dry dock area. Design and capacity requirements associated with the TJC are specified in Table 9.1.5-1.

**Articulating Traveling Jib Crane**

An articulating boom, traveling, wall-mounted jib crane traverses the wall of the refueling pool along a rail system, between the operating bays and the spent fuel pool. The ATJC provides heavy load material handling capability to the RFT and the CFT during refueling. Design and capacity requirements associated with the ATJC are specified in Table 9.1.5-1.

**Dry Dock Jib Crane**

The dry dock jib crane is mounted to the top of the wall located between the dry dock and the refueling pool. The dry dock jib crane provides heavy load material handling capability to the dry dock area. Design and capacity requirements associated with the dry dock jib crane are specified in Table 9.1.5-1.

**Module Access Platform Jib Crane**

The MAP is a movable personnel support structure employed during disassembly and assembly of the NPM in the operating bay for refueling. The MAP is equipped with an overhead jib crane that manipulates the NPM connecting spool pieces between the NPM and the laydown area. Design and capacity requirements associated with MAP jib crane are specified in Table 9.1.5-1.

**Auxiliary Wet Hoist**

The AWH is an intermediate hoist that attaches to either the RBC main hoist via the sister hook or to one of the RBC auxiliary hoists. The AWH is used for operations that require the hook to be lowered into the reactor building pool water. Design and capacity requirements associated with the AWH are specified in Table 9.1.5-1.

**NuScale Power Module Top Support Structure**

The welded structure composed of the NPM lifting lugs and diagonal lifting braces constitutes the permanently installed NPM top support structure. The NPM top support structure is attached to the CNV upper head and provides the primary lifting structure for the NPM. The NPM top support structure is classified as nonsafety-related and risk-significant.

**Lower Riser Lifting and Torque Tool**

The LRLTT is used for assembly and disassembly of the lower riser assembly (LRA) in the lower RPV, and for lifting and removing the lower riser from the lower RPV. The LRLTT is classified as nonsafety-related, non-risk-significant.

The LRLTT is operated attached to the RBC with the AWH to remotely unbolt and remove the LRA from the RPV, and place the LRA on a stand located on the RXB pool floor. Following the refueling operations, the LRLTT is used to reinstall the LRA onto the lower RPV.

The LRLTT is designed to the applicable requirements of ASME BTH-1 (Reference 9.1.5-1). Additionally, the LRLTT is designed to the requirements of ASME NML-1 (Reference 9.1.5-2) for lifting devices for critical lifts.

**Other Refueling Devices**

The CFT is located at the bottom of the refueling pool adjacent to the SFP in the RXB. The CFT is used to assemble and disassemble the lower parting flange on the CNV. The RBC is used to place the NPM in the CNV support stand and remains connected to the NPM. The lower CNV remains in the CFT once unbolted. The upper NPM including the reactor vessel is then moved to the RFT.

The RFT is located at the bottom of the refueling pool adjacent to the CFT. The RBC moves the NPM from the CFT to the RFT and remains connected to the NPM. The RFT supports the lower portion of the reactor vessel containing the core during refueling operations. The RFT performs closure bolt installation and tensioning for assembly and disassembly of the RPV lower parting flange.

The module inspection rack is a permanently-mounted work platform located in the dry dock of the RXB used to support the NPM for inspection and maintenance. It supports the NPM in the vertical orientation. The RBC moves the upper CNV with the upper reactor vessel from the RFT to the module inspection rack.

#### 9.1.5.2.3 System Operation

**Reactor Building Crane Operation**

The RBC is used to lift and move equipment within the RXB to support normal operations, maintenance, receipt of new equipment, and to assist in refueling operations. The crane is designed to withstand the RXB environmental conditions and to operate during all modes of plant operations.

The RBC transfers an NPM from its installed operating position in the reactor pool to the refueling pool and back. Travel paths are determined and attributes are entered into the RBC control system. Each task is specified and scheduled by the crane operator.

Heavy load exclusion zones and safe load paths are defined in operating procedures and equipment drawings. This restriction reduces the probability of a heavy load drop that could result in safe shutdown equipment damage or result in a release of radioactive material that could cause unacceptable radiation exposures.

The position control system assists in aligning the RBC with the NPM for engagement before performing lifting operations. Heavy load exclusion zones are dependent on the load on the RBC hoist. The travel path is chosen to accommodate this information. Repeatability, proper load path, and proper locations are ensured by semi-automatic crane operation.

**Refueling Operations**

Refueling operations for an individual NPM are independent of the operating status of the remaining NPMs because only one NPM can be moved at a time. This section presents the process of moving an NPM from the operating bay to the refueling pool and preparing the vessel for fuel movement. Section 9.1.4 presents the process of moving fuel assemblies into an open reactor vessel.

The RBC is moved to the operating bay containing the NPM that is shutdown for refueling. When the RBC is within a predefined position, the lower block assembly is lowered over the NPM lifting lugs. The LBA is manipulated until its lugs are fully engaged with the NPM lifting lugs. Verification of pin position is achieved by sensor feedback on the LBA and visual indicators. The LBA is raised until the load sensing system detects load, indicating NPM lifting lugs are fully engaged with the LBA. The NPM is raised to a pre-defined elevation and moved through the predefined path to the CFT in the refueling pool.

Once the RBC is aligned over the CFT, the NPM is lowered onto the stand of the CFT. With the LBA still attached to the NPM, the CFT de-tensions and removes the CNV flange closure bolts. The RBC lifts the upper CNV, with the RPV attached, from the lower CNV and transfers it into location over the RFT. The lower CNV remains in the CFT during the remaining refueling process. The RBC lowers the upper CNV with the RPV onto the stand in the RFT. With the LBA still attached to the upper CNV, the RFT de-tensions and removes the RPV flange closure bolts. Once the bolts are removed, the RBC lifts the upper CNV with the upper RPV and transports it to the module inspection rack in the flooded dry dock. The RBC lowers the upper NPM into the module inspection rack. The NPM is confirmed to be properly seated in the module inspection rack and the LBA is disconnected from the module.

The process is performed in reverse to reassemble the NPM and move it back into the operating bay.

### 9.1.5.3 Safety Evaluation

The heavy load handling system includes features to minimize the potential for a load drop and for the safe handling of heavy loads. The design includes enhanced safety handling systems, mechanical stops, electrical interlocks, safe load paths, established load handling procedures, and a plant configuration that provides redundancy to minimize the probability of a load drop. The components designed to handle critical loads support the load during and after a safe shutdown earthquake (SSE).

The RBC design conforms to the ASME standard specified in Table 9.1.5-1 so a credible failure of a single component does not result in the loss of capability to stop and hold a critical load. The use of this standard precludes the need to perform load drop evaluations, and as a result, accident analysis is not required to assess radiological consequences of an NPM drop accident.

The design of the RBC main hoist and the seismic analysis ensures SSC are able to withstand the SSE and not drop the load. Large components are analyzed to ensure they do not come loose during a seismic event and potentially damage other equipment.

The RBC is designed to ensure the system retains its load throughout an SSE. At the onset of an earthquake, a seismic switch disconnects power. The trolley, bridge, and hoist stop, and the brakes set. Earthquake restraints keep the trolley on the bridge and the bridge on the runway. If power cannot be restored, the brakes can be released manually, and the crane and suspended load can be safely positioned.

The CFT and the module inspection rack are designed to ensure their structural failure or interaction cannot degrade the functioning of Seismic Category I SSC during or after an SSE.

Other plant cranes are designed in accordance the applicable design codes for each crane specified in Table 9.1.5-1. Cranes are designated as Type I, II, or III based on their requirement to handle critical loads and their seismic design criteria.

The OHLHS is protected from the effects of external missile hazards by being located inside the RXB. Dynamic effects associated with missile impact are provided in Section 3.5. In addition to being designed as an enhanced safety handling system, the cranes are designed with a system of interlocks that prevents movement in heavy load exclusion zones to prevent impacts.

The heavy load exclusion zones represent areas where heavy loads cannot travel without additional measures because a heavy load drop in the exclusion zones could potentially impact safe shutdown equipment, cause a release of radioactive materials, or a criticality accident that could cause unacceptable radiation exposures.

Physical limits and administrative controls are included to ensure safe handling of critical loads. Thus, the design of the OHLHS, in conjunction with safe load paths and heavy load exclusion zones, allows for moving an NPM or other equipment without impacting the operation of the other NPMs, including safe shutdown and cooldown.

The process of accepting and receiving a new NPM into the dry dock while the plant is operating is performed using the module assembly equipment discussed in Section 3.8. The module inspection rack is part of the module assembly equipment used, not only in initial receipt of the NPM, but also during refueling. In addition, the RBC is used during initial delivery of an NPM. Because only one

NPM can be moved at a time, the receipt of a new NPM cannot occur when the RBC is being used for other lifting or during an NPM refueling. In addition, the safe load paths apply to the initial delivery of an NPM. Therefore, the operation of other NPMs is not affected by the receipt and delivery of a new NPM.

COL Item 9.1-5: An applicant that references the NuScale Power Plant US460 standard design will provide a description of the program governing heavy loads handling. The program should address

- operating and maintenance procedures.
- inspection and test plans.
- personnel qualification and operator training.
- detailed description of the safe load paths for movement of heavy loads.

### 9.1.5.4 Inspection and Testing

The RBC is inspected and tested in accordance with ASME NOG-1 (Reference 9.1.5-3). Tests include operational testing with 100 percent load to demonstrate function and speed controls for bridge, trolley, and hoist drives, and proper functioning of limit switches, locking, and safety devices. A rated load test is performed with a 125 percent load.

In-process inspection and testing of the auxiliary wet hoist, the ATJC, the dry dock jib crane, and the TJC is performed in accordance with ASME NUM-1 (Reference 9.1.5-4).

Testing of the permanently installed NPM top support structure is conducted per ANSI N14.6 requirements for dual-load-path devices (Reference 9.1.5-5). A rated load test is performed with a 150 percent load, and includes non-destructive examination and dimensional checks.

The methodology and approach utilized to develop related Inspections, Tests, Analyses, and Acceptance Criteria is addressed in Section 14.3.

Preoperational testing of the RBC is addressed in Section 14.2.

### 9.1.5.5 Instrumentation and Control

Positioning and weighing capability ensures the RBC does not travel within heavy load exclusion zones.

The RBC limit switches and interlocks include:

- End of travel limit switches, including slow limit switches, are used for bridge, trolley, and LBA rotate motions.
- Geared limit switches are used for hoist travel. Geared limit switches includes raise-stop, raise-slow, lower-slow, and lower-stop controls.

- Hoist mis-spooling limit switches detects improper threading of the hoist rope in the hoist drum grooves. This limit switch removes power from the hoist motor and applies hoist motor brakes.
- Temperature switches monitor for high temperature inside the crane drive power panels.
- Overload detection using a load sensing system discontinues hoisting operation to prevent lifting more than the rated load.
- An external seismic switch de-energizes the crane power supply in the event of an SSE.

The RBC also has limit switches for the main hoist equalizer and brakes.

The ATJC includes the following interlocks:

- The hoist interlock prevents hoist operation while boom or trolley is operating.
- The trolley or boom interlock prevents the trolley or boom from operating while the hoist is operating.
- A CFT or RFT keep-out zone interlock prevents movement of a load into a restricted zone for the CFT or RFT.
- A CFT or RFT keep-out zone interlock-override function allows movement to a CFT or RFT restricted zone when the upper NPM is not present.
- A fuel handling machine interlock prevents moving a load into the path of the fuel handling machine while the fuel handling machine is present.

### 9.1.5.6 References


9.1.5-1 American Society of Mechanical Engineers, “Design of Below-the-Hook Lifting Devices,” ASME BTH-1-2017, New York, NY.

9.1.5-2 American Society of Mechanical Engineers, “Rules for Movement of Loads Using Overhead Handling Equipment in NuClear Facilities,” ASME NML-1-2019, New York, NY.

9.1.5-3 American Society of Mechanical Engineers, “Rules for Construction of Overhead and Gantry Cranes (Top Running Bridge, Multiple Girder),” ASME NOG-1-2020, New York, NY.

9.1.5-4 American Society of Mechanical Engineers, “Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type),” ASME NUM-1-2016, New York, NY.

9.1.5-5 American National Standards Institute, “American National Standard for Radioactive Materials - Special Lifting Devices for Shipping Containers Weighing 10 000 Pounds (4500 kg) or More,” ANSI N14.6-1993, La Grange Park, IL.

## Table 9.1.5-1: Heavy Load Handling Equipment Design Data

| Equipment | Rated Capacity (Tons) | Design Code | Seismic Category |
|---|---|---|---|
| RBC main hoist and lower block assembly | 950 | ASME NOG-1, Type I (Note 1) | I |
| RBC sister hook | 250 | ASME NOG-1, Type I | I |
| RBC auxiliary hoists | 40 | ASME NUM-1, Type IA | I |
| Traveling jib crane hoist | 7.5 | ASME NUM-1, Type IA | II |
| Articulating traveling jib crane | 7.5 | ASME NUM-1, Type IA | II |
| Dry dock jib crane | 7.5 | ASME NUM-1, Type IA | II |
| Module access platform jib crane | 7.5 | ASME NUM-1, Type II | II |
| Auxiliary wet hoist | 35 | ASME NUM-1, Type IA | II |

Notes:
1. With the following exceptions:
- 4332: Use of 1.11 for the design factor in plate buckling for extreme environmental loads.
- 4334: Alternate methodology for spacing of transverse stiffeners.
- 4461: Runway and bridge rails conform to DIN 536-1.

# Figure 9.1.5-1: Reactor Building Crane Safe Load Path

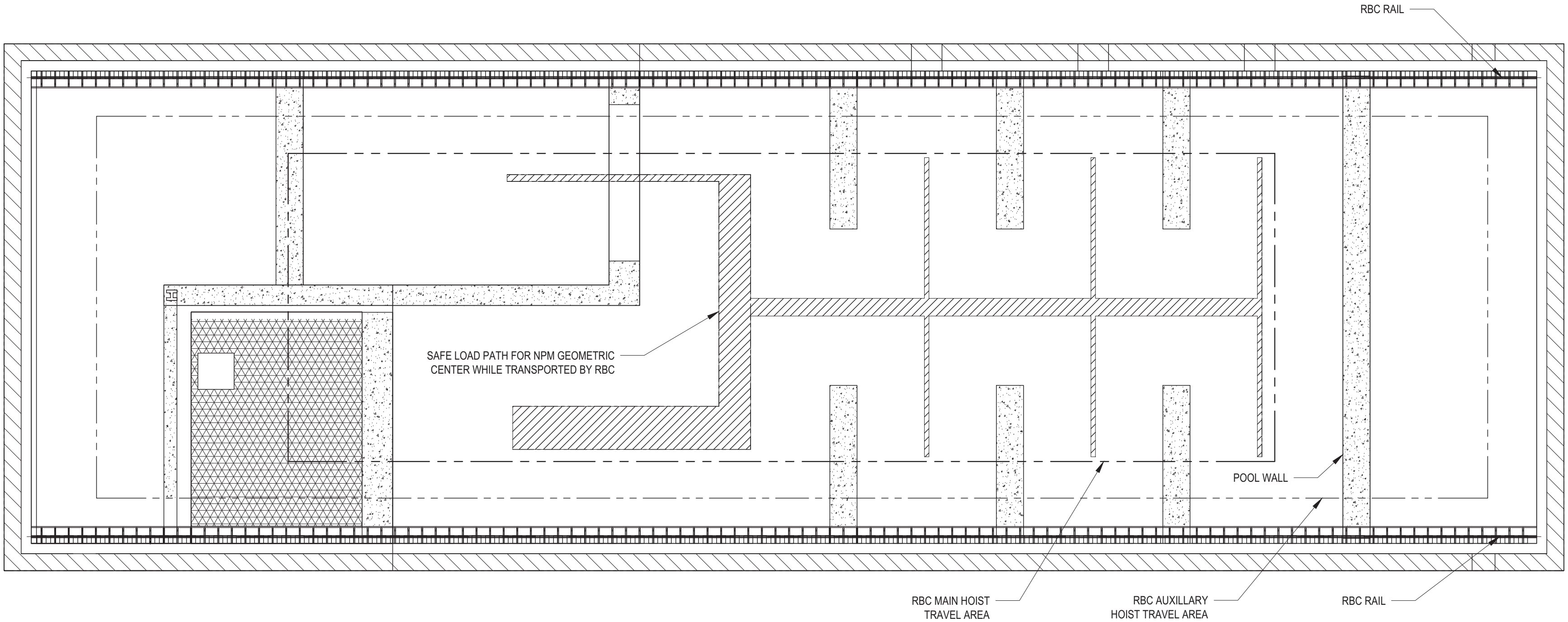


**Figure 9.1.5-2: Reactor Building Crane**

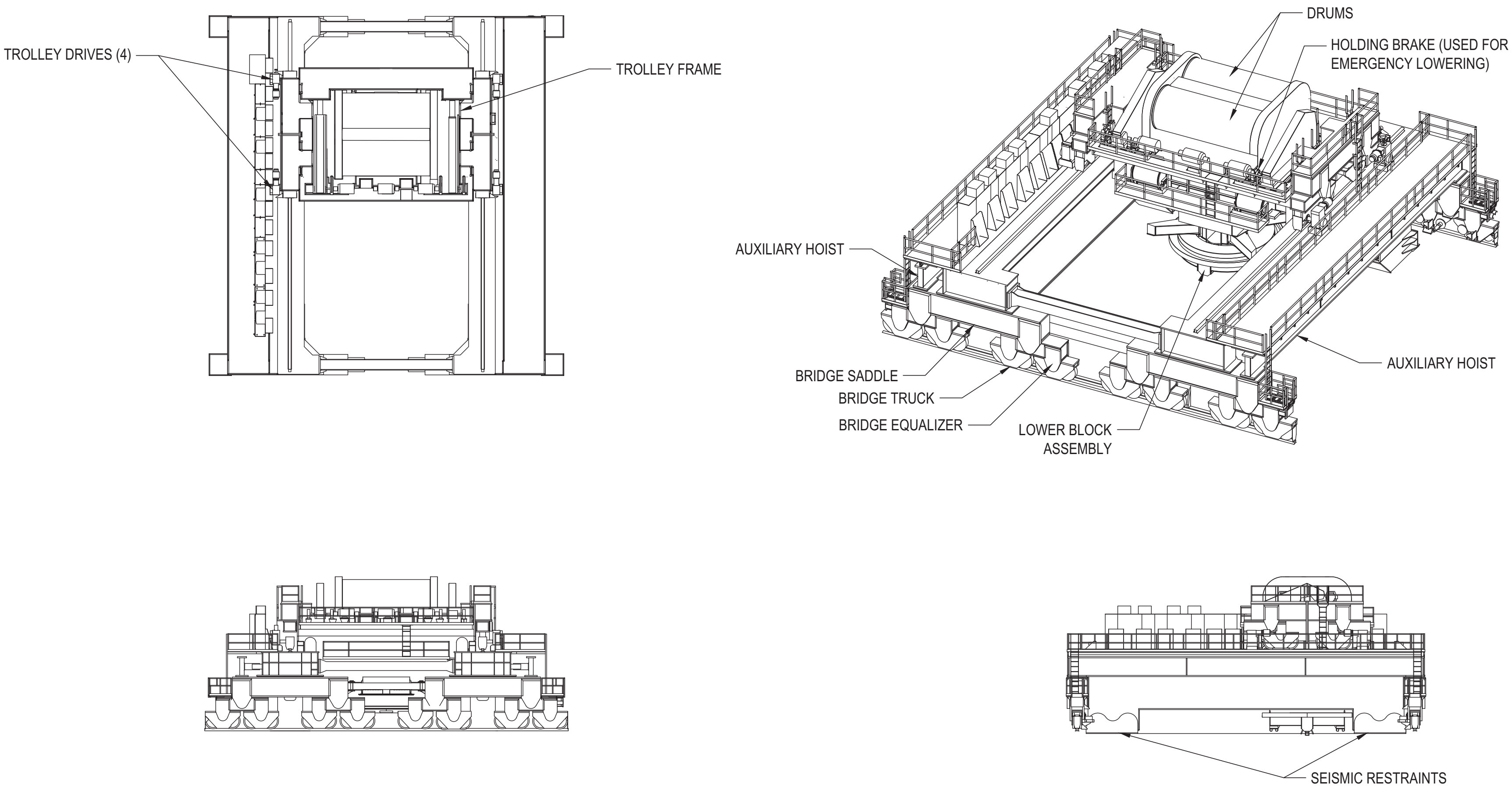
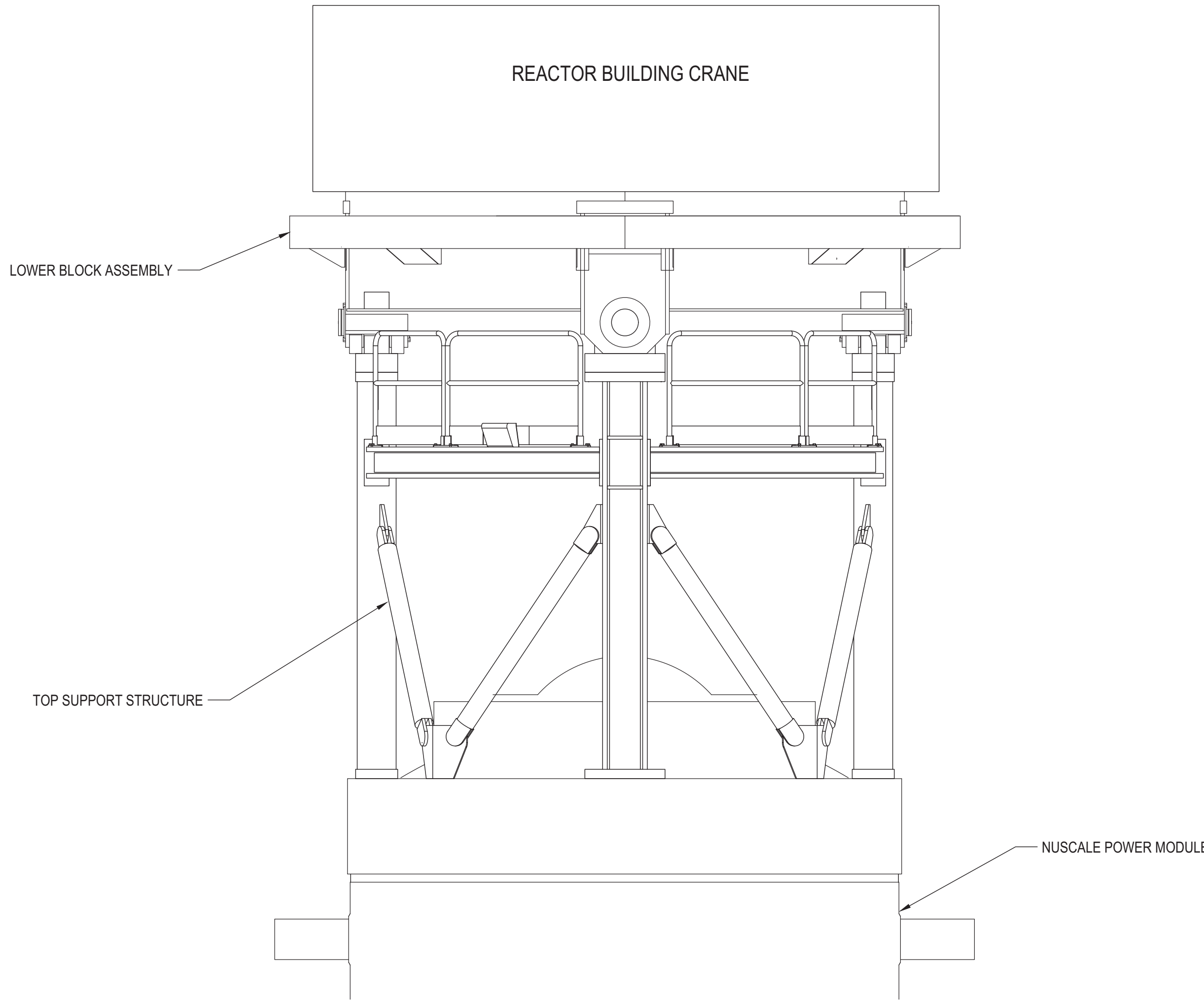


**Figure 9.1.5-3: Reactor Building Crane Lower Block Assembly Connection to the Top Support Structure**



## 9.2 Water Systems

### 9.2.1 Station Service Water System

This section is relevant to light water reactor (LWR) active designs that incorporate a service water system serving as the final heat transfer loop between various heat sources and the plant ultimate heat sink (UHS). The NuScale Power Plant design does not have a service water system.

A typical LWR service water system provides essential cooling to safety-related equipment and can also cool nonsafety-related auxiliary components used for normal plant operation. The NuScale Power Plant US460 passive design does not rely on active systems such as a service water system to provide cooling to essential equipment. The NuScale Power Modules are partially immersed in the reactor pool portion of the plant UHS. This design configuration ensures passive heat transfer from essential systems and components directly to the UHS, with no intermediate heat transfer loop such as that provided by a typical LWR essential service water system.

## 9.2.2 Reactor Component Cooling Water System

The reactor component cooling water system (RCCWS) is a nonsafety-related, closed loop cooling system.

The RCCWS provides cooling to the following:

- control rod drive mechanism (CRDM) electromagnetic coils housing
- chemical and volume control system non-regenerative heat exchangers
- containment evacuation system condensers and vacuum pumps
- process sampling system primary sampling panel temperature control units

The RCCWS transfers the heat from these loads to the site cooling water system. The RCCWS is an intermediate system between radioactive systems and the non-radioactive site cooling water system.

The system boundary for the RCCWS ends outside of containment. The containment isolation valves are part of the containment system. Section 6.2, Containment Systems, describes containment isolation valves.

### 9.2.2.1 Design Bases

The RCCWS provides no safety-related function, is not credited for mitigation of design-basis accidents, and has no safe shutdown functions. No safety-related or risk-significant components require RCCWS cooling to perform their functions. Table 9.2.2-1 identifies SSC classifications for RCCWS. General Design Criteria (GDC) 2, 4, 5, 60, and 64, and 10 CFR 20.1406 are considered in the design of the RCCWS.

### 9.2.2.2 System Description

The RCCWS design ensures that no single failure can cause the loss of RCCWS heat removal from more than one NuScale Power Module (NPM). If system demand rises above the capacity of one pump, a second pump automatically starts to provide the required cooling to the system loads. Upon indication of a leak in the system, operators use procedures to locate and isolate the source of the leakage.

An expansion tank accommodates expansions and contractions of the RCCWS volume. The demineralized water system provides makeup to the RCCWS into this expansion tank.

A chemical feed pot allows injection of chemical corrosion inhibitors into the RCCWS to prevent corrosion in the piping, valves, pumps, and heat exchangers.

Remote instrument indication and alarms allow the RCCWS to be monitored from the main control room. In the event of leakage out of the RCCWS, an alarm notifies operators of low expansion tank level. After acknowledging the alarm, the operators can open the makeup valve to the expansion tank. In the event the expansion tank level is high, the makeup valve to the tank closes.

In the event an NPM is shut down for maintenance or refueling, or if an NPM experiences a design-basis event, the RCCWS continues to operate under normal conditions for the other NPMs with the isolation valves closed to the CRDMs for the shutdown module.

#### 9.2.2.3 Safety Evaluation

The RCCWS is designed to the standards of Regulatory Guide 1.26, Quality Group D.

Consistent with GDC 2, components whose failure could adversely impact Seismic Category I components are designed to Seismic Category II standards. Due to its proximity to the containment vessel, the RCCWS piping from the NPM disconnect flange to the module bay wall is designed to Seismic Category II standards. The RCCWS components beyond the pipe gallery wall are designed to Seismic Category III standards.

Consistent with GDC 4, the RCCWS is not required to function following an event that results in the generation of missiles, pipe whipping, or discharging fluids. The RCCWS design ensures that its failure does not adversely affect the functional performance capabilities of safety-related and other non safety-related, augmented quality systems or components.

Consistent with GDC 5, the RCCWS and the loads it cools do not perform safety-related functions or function to shut down the NPM or maintain the NPM in a shutdown condition. Therefore, the RCCWS does not impair the ability of NPMs to perform their safety functions including the ability to mitigate the consequences of an accident on one NPM and shutdown and cooldown the remaining NPMs.

The RCCWS design meets GDC 60 and GDC 64 as they relate to the control of radiological effluents and monitoring of releases. The systems cooled by the RCCWS, with the exception of the CRDMs, contain fluid that has the potential to contaminate the RCCWS with radioactivity. For these potentially contaminated loads, radiation monitors are located in the RCCWS piping downstream of the cooled components to alert the control room if there is a radioactive fluid leak into the RCCWS. Section 11.5, Radiation Monitoring, provides additional information on these radiation monitors. Manual isolation valves are provided on coolers and condensers to isolate leaks.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the RCCWS that demonstrate compliance with 10 CFR 20.1406.

In the event of a CRDM cooling line pipe break inside containment, the volume of RCCWS fluid is limited by the available inventory in the RCCWS because makeup to the system requires operator action. A variety of alarms help identify RCCWS leaks in containment, including RCCWS to CRDM flow low, RCCWS to CRDM outlet temperature high, RCCWS pump suction pressure low, RCCWS pump flow high or low, and RCCWS heat exchanger inlet temperature high. Section 9.3.6, Containment Evacuation System, provides information on the reactor coolant system leakage detection system.

## Table 9.2.2-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **RCCWS, Reactor Component Cooling Water System** | | | | | |
| All components (except as listed below): | RXB | B2 | None | D | III |
| • Inline CRDM cone filter<br>• CRDM supply & return flexible hose | RXB | B2 | None | D | II |
| • RCCW radioactivity instrumentation CE vacuum pumps and condensers<br>• CE condenser outlet flow & temperature instrumentation<br>• CE vacuum pump outlet flow & temperature instrumentation<br>• CRDM outlet flow & temperature instrumentation | RXB | B2 | None | N/A | II |
| • RCCW radioactivity instrumentation for CVC NRHXs and PSS coolers<br>• All other instrumentation | RXB | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that do not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.2.3 Demineralized Water System

The demineralized water system (DWS) treats water from the utility water system and provides and distributes demineralized water to systems and areas throughout the plant.

### 9.2.3.1 Design Bases

The DWS does not perform safety-related functions, is not credited for mitigation of design-basis accidents, and has no safe shutdown functions. Table 9.2.3-1 identifies SSC classifications for DWS. General Design Criteria 2 and 5, and 10 CFR 20.1406 are considered in the design of the DWS.

### 9.2.3.2 System Description

The DWS major components consist of the demineralized water treatment skid, demineralized water storage tank, and demineralized water pumps. If a demineralized water pump trips, the plant control system starts a non-running pump and sends an alarm to the main control room.

Section 11.5, Radiation Monitoring, provides information on the DWS radiation monitors.

### 9.2.3.3 Safety Evaluation

The design and layout of the DWS include provisions that ensure a failure of the system does not adversely affect the functional performance of safety-related systems or components, consistent with General Design Criterion 2. Portions of the system that are in proximity to Seismic Category I structures, systems, and components are designed to Seismic Category II standards.

General Design Criterion 5 is considered in the design of the DWS. The DWS has no safety-related or risk-significant functions, and therefore the DWS has no functions that are impacted if there is an accident in one module coincident with the shutdown and cooldown of the remaining modules.

The DWS is a nonsafety-related system that performs no safety-related functions. However, the DWS does interface with safety-related CVCS isolation valves. Section 9.3.4, Chemical and Volume Control System and Section 7.1, Fundamental Design Principles provide more information about the DWS isolation.

The DWS is designed to the standards of Regulatory Guide 1.26, Quality Group D.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the DWS that demonstrate compliance with 10 CFR 20.1406.

**Table 9.2.3-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **DWS, Demineralized Water System** | | | | | |
| All components | All Buildings | B2 | None | D | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications for SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that do not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

Note 5: IEEE Std 497-2016 as endorsed by RG 1.97 and implemented as described in Table 1.9-2

## 9.2.4 Potable and Sanitary Water Systems

The potable water system (PWS) provides potable water for human use. The sanitary waste system (SWS) provides sanitary waste water collection throughout the plant for treatment.

### 9.2.4.1 Design Bases

The PWS and SWS serve no safety-related functions, are not credited for mitigation of design-basis accidents, and have no safe shutdown functions. Table 9.2.4-1 identifies SSC classifications for PWS. General Design Criteria (GDC) 2, 5, and 60, and 10 CFR 20.1406 are considered in the design of the PWS and SWS.

### 9.2.4.2 System Description

The PWS and SWS provide water to, and accept waste water from, the control room envelope (CRE). Each PWS and SWS supply and return line that penetrates the CRE includes a passive isolation device (loop seal) located inside the CRE. These loops seals are designated as Seismic Category I per Regulatory Guide 1.29. If a line is damaged by a seismic event, the loop seal isolates the line to protect the control room from inleakage of atmospheric radioactive contaminants. Potable water system piping larger than 1 inch in diameter in the main control room break room and toilet areas is designated as Seismic Category I to prevent flooding due to a pipe rupture after a seismic event.

### 9.2.4.3 Safety Evaluation

Consistent with GDC 2, portions of the PWS and SWS in proximity to safety-related structures, systems, and components that could render the safety-related structures, systems, and components inoperable are designed to Seismic Category II standards.

Section 3.4, Water Level (Flood) Design, provides information pertaining to the impact of environmental effects associated with flooding.

The design of the PWS and SWS satisfies GDC 60 and 10 CFR 20.1406 with provisions to prevent radioactive materials from contaminating and being released to the environment from the PWS or SWS. The PWS and SWS piping is not interconnected with other system piping that conveys radioactive materials. Backflow prevention measures, such as backflow preventers and air gaps, separate the PWS and SWS from interfacing water systems to prevent cross-contamination.

## Table 9.2.4-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **PWS, Potable Water System** | | | | | |
| All components (except as listed below): | All buildings | B2 | None | N/A | III |
| PW and SWS piping (including loop seals) penetrating CRE | CRB | B2 | Environmentally Qualified | N/A | I |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.2.5 Ultimate Heat Sink

The ultimate heat sink (UHS) is a set of safety-related pools of borated water that comprise the combined water volume of the reactor pool, refueling pool (RFP), and spent fuel pool (SFP). The UHS pools are located below grade in the Reactor Building (RXB). The NuScale Power Modules (NPMs) are located in the reactor pool during power operations and share the combined volume of water. The RFP provides a location for refueling of an NPM, allows the transfer of spent fuel assemblies to the fuel storage area in the SFP, and allows loading of spent fuel storage casks. Because of the size of the UHS, active cooling systems are not required for accident conditions; the combined volume of water in the UHS pools provides sufficient cooling for greater than 72 hours without additional makeup water. The UHS includes redundant water level instrumentation and a qualified makeup line that can provide additional water to the UHS.

Figure 9.2.5-1 provides the basic layout of UHS pools, including the qualified makeup line. Table 9.2.5-1 provides UHS parameter values.

### 9.2.5.1 Design Bases

The UHS serves several safety functions that include the following: removing heat from the NPMs; removing decay heat from spent fuel assemblies; providing borated water for reactivity control during refueling; and providing iodine scrubbing in the event of a fuel handling accident. General Design Criteria (GDC) 2, 4, 5, 45, 46, 61, and Principal Design Criterion 44 are considered in the design of the UHS.

### 9.2.5.2 System Description

#### 9.2.5.2.1 General Description

The pools that comprise the UHS are open to each other with a weir wall partially separating the SFP from the RFP area. The dry dock area is not considered in this volume; the dry dock gate is assumed closed and no credit is taken for the water volume.

The structural components forming the reactor pool, RFP, and SFP, including the base, structural walls, and weir wall, are part of the RXB structure. Section 3.8, Design of Category I Structures, describes the RXB. The pool liner for the UHS is part of the Reactor Building components, and Table 3.8.4-5 identifies SSC classifications.

The UHS removes the decay heat from each NPM, provides sufficient cooling to the stored spent fuel assemblies in the SFP, and maintains the spent fuel assemblies covered by water under operational scenarios. The UHS accommodates the combined heat loads from NPMs, refueling activities, and spent fuel during normal and accident conditions assuming a single failure for at least 72 hours without operator actions or electrical power, either alternating current (AC) or direct current (DC).

The UHS pool liner prevents potential pool inventory leakage from the SFP, reactor pool, and RFP. Section 3.8 describes the pool liner.

The UHS has a makeup line that meets Regulatory Guide (RG) 1.26, Quality Group D standards, RG 1.29 Seismic Category I standards, and American Society of Mechanical Engineers B31.1 requirements, and is protected from external natural phenomena. The UHS makeup line includes a fire protection connector that facilitates hookup of emergency sources of water for the water supply. Table 9.2.5-3 identifies SSC classifications for UHS.

The UHS removes the heat generated within the NPM during normal, refueling, and accident conditions. The pool cooling and cleanup system (PCWS) cools the UHS during normal and refueling conditions. Section 3.8 and Section 6.2, Containment Systems, provide information on the containment vessel. Section 5.4, Reactor Coolant System Component and Subsystem Design, provides information on the decay heat removal system (DHRS).

The PCWS maintains the UHS pool water level, temperature, and quality within an operational control band to ensure water is available to provide personnel and public safety during normal plant operation. The pool leakage detection system (PLDS) collects water leaking from the UHS. Section 9.1.3, Pool Cooling and Cleanup System, describes these two systems.

The SFP weir wall maintains a minimum of 10 feet of water over the spent fuel in storage.

The process sampling system monitors the concentration of radionuclides in the UHS water. Section 9.3.2, Process Sampling System, provides additional information on process sampling.

#### 9.2.5.2.2 System Operation

Over-pressurization vents prevent over-pressurization in the UHS area of the RXB during abnormal conditions. Until the building pressure reaches the setpoint of the over-pressurization vents, the Reactor Building HVAC system filters and controls the release of airborne radioactive material from inside the RXB, including from pool water evaporation for loss of normal power supply. Section 15.0, Transient and Accident Analyses, addresses the radiological consequences of the UHS pool boiling.

Before refueling operations commence, personnel verify that the boron concentration in the UHS is at or above the minimum required to prevent core criticality during refueling operations. Personnel monitor the boron concentration in the UHS to verify that it remains above this minimum when the reactor vessel is open to the pool. Section 9.1.3 describes how the PCWS can increase or decrease the boron concentration in the UHS, as needed.

### 9.2.5.3 Safety Evaluation

The UHS is a passive system and does not require electric power (AC or DC) to remove heat. Following a postulated accident and the assumed onset of a station blackout, personnel can add makeup water through the qualified UHS makeup line from outside of the RXB using nonsafety-related equipment to stabilize pool water inventory. However, pool water additions are not needed for more than 30 days, as shown by the analysis of the boil off of the initial UHS pool water inventory in a six-module plant.

The analysis assumes that an accident resulting in the shutdown of one NPM happens concurrently with a loss of AC power that results in the shutdown of the remaining NPMs. For these conditions, the six NPMs isolate from their feedwater and main steam systems, and transfer all heat to the UHS. The analysis of UHS pool water boil off does not credit the active pool cooling systems nor the RXB ventilation, except for passive steam release, allowing energy from the NPMs and spent fuel to heat up and boil the water in the UHS.

Without the addition of makeup water, an extended unavailability of the PCWS (e.g., due to an extended loss of AC power) results in a reduction in UHS water level. The analysis evaluates the boiling of the water in the UHS pools assuming a prolonged unavailability of the PCWS. With these conditions, UHS water temperature increases, and UHS water level initially increases from thermal expansion, then decreases as a result of evaporation and boiling.

The analysis assumes that before the initiating events, the UHS level and temperature are at their normal operating values, which are given in Table 9.2.5-1. Table 9.2.5-1 includes the total volume of the water in the UHS used in the analysis.

The NPMs and the stored spent fuel assemblies are the heat loads used in the analysis. No other heat loads or systems are cooled by the UHS.

At the start of the analysis of UHS water boiling, six NPMs are operating at full power. Based on a conservative approach to modeling the transfer of sensible heat from the metal and the water in an NPM to the UHS water, the total heat rejected from the NPM with the assumed accident is limiting for any type of accident. That is, the analysis addresses the sensible heat in the NPM by converting the energy associated with the cooling of the metal and water from the maximum allowed reactor operating temperature down to boiling, and adding this energy to the UHS pool water at the start of the analysis. The analysis conservatively assumes that all of the metal in the module is at this maximum allowed reactor operating temperature at the start of the analysis. Consistent with the inadvertent main steam isolation valve (MSIV) closure event analyzed in Section 15.2.4, Closure of MSIVs, the analysis assumes the containment system isolation valves close immediately at the start of the accident, and no energy transfers from the water in the reactor coolant system to the steam generators while the MSIVs close. Accident sequences in Chapter 15, Transient and Accident Analyses, without closure of the MSIVs would lose even more energy to the secondary side and are not limiting for UHS pool cooling capacity.

Use of this approach for cooling of sensible heat also applies to the remaining NPMs assumed to shut down at the start of the accident due to a loss of electric power. The sensible heat load for each of the remaining NPMs is the same as the NPM with the accident because there is the same assumed transfer of metal and water sensible heat from each shutdown NPM to the UHS water. With the above assumptions, the sensible heat from each NPM enters the UHS water through the DHRS or the emergency core cooling system, and is not cooled by the secondary side of the plant.

In addition to the sensible heat, the decay heat load from each NPM enters the UHS water through the DHRS or containment vessel walls via the emergency core cooling system. The heat load to the UHS from each NPM is based on the rate of decay heat generation determined using American National Standards Institute/American Nuclear Society 5.1 (Reference 9.2.5-1).

The heat input from the NPMs to the UHS for the conditions described above is the maximum that occurs during plant operations. For a plant with one NPM in refueling operations at the time of an accident, the total heat load to the UHS is less than the limiting case of six NPMs in operation. Once the NPM to be refueled starts the normal shutdown sequence, the NPM continually cools down and has less energy available to transfer to the UHS at the start of the assumed accident.

For the analysis of the pool water boil off, the heat load to the UHS includes the heat added by the stored spent fuel assemblies. The analysis assumes that the SFP contains 10 years of spent fuel and five additional failed fuel assemblies, and that the analyzed conditions occur at a point in the refueling schedule that maximizes the heat load contributed by the spent fuel assemblies. The assumed refueling schedule consists of three modules refueled in succession every 9 months.

The analysis uses the following conservative assumptions. As the pool heats up and boils, evaporated water does not return to the pool. No heat dissipates into the surrounding pool liner, walls, and building. There is no evaporation from the pools to the RXB atmosphere before the pool reaches the boiling temperature.

The conclusion of the analysis is that after 30 days, in each NPM, the reactor pressure vessel pressure is low and stable, and the reactor core remains covered during the entire event with sufficient margin. Table 9.2.5-2 provides the times for the UHS to start boiling and to boil down to various levels, including the top of the weir wall, at which level there is greater than 10 feet of water over the spent fuel. The results of the analysis demonstrate that the large UHS water volume provides sufficient time for actions to restore UHS water level using defense-in-depth design provisions. When resources allow, personnel can add water to the pool with the qualified makeup line. The makeup line fills the UHS at the SFP, ensuring that if level is below the top of the weir wall, the spent fuel is covered before adding water to the other pools.

The UHS design ensures heat transfer from the containment vessels and spent fuel to the UHS under normal operating and accident conditions as an inherent consequence of the UHS physical configuration. Each containment vessel is partially immersed in the UHS, and each spent fuel assembly is submerged. Thus, the UHS provides passive cooling to transfer heat from components without reliance on active components or reliance upon AC or DC electrical power. There are no components that require alignment or isolation for the UHS to perform its safety functions.

During accident conditions, the large volume of water in the UHS cools the NPMs and the stored spent fuel. The pool structure and liner are designed to withstand coolant boiling conditions. The UHS deviates from the guidance of RG 1.13, Regulatory Position C.9, in its makeup system design. The PCWS provides normal cooling and makeup for the UHS, and is not designated Seismic Category I or Quality Group C. The large volume of water already present in the UHS is the SFP makeup source required by RG 1.13. In the event that pool cooling is lost, the pool boil off analysis shows that there is sufficient time for personnel to provide additional makeup, if needed before the UHS level lowers below the weir wall. Table 9.2.5-2 provides the timeline for a pool boil off event. The unique design of the UHS as a makeup source for the SFP ensures that the SFP has makeup for greater than 30 days following a loss of the PCWS without operator action.

The UHS relies upon the RXB structural walls, the pool liner, and the weir wall to prevent a significant reduction in coolant inventory and to ensure sufficient water level is maintained for radiation protection shielding of the spent fuel in storage and reactor core in the RFP during refueling operations. The pool liner and structural walls, which are monitored for leaks by the PLDS, contain the water volume in the UHS.

The SFP liner is a nonsafety-related component. The classification is based on Section 15.0, which addresses the treatment of nonsafety-related systems in design-basis events. Events in Chapter 15 may assume that nonsafety-related systems or components are operable when a detectable and nonconsequential random and independent failure must occur to disable the system. As described in Section 9.1.3, a failure of the liner due to leakage results in collection of the flow by the PLDS. Such a failure is detectable, random, and does not result in an initiating event for an accident described in Chapter 15. No initiating events in Chapter 15 cause the liner to start leaking. Therefore, continued function of the pool liner and RXB to maintain this inventory is assumed during a design-basis event. Section 9.1.3 describes that sufficient time is available to preclude a loss of pool water that would create an unsafe water level in the UHS pools.

Consistent with GDC 2, the UHS is protected against natural phenomena and conforms to the guidance of Regulatory Positions C.1, C.2, and C.6 of RG 1.13. The UHS cooling water is contained within RXB structures designed to withstand design-basis seismic forces and other external natural phenomena. Section 3.4, Water Level (Flood) Design, discusses flooding of the RXB. Section 3.7, Seismic Design, and Section 3.8 discuss the design approach to resist geological forces such as earthquakes.

Consistent with GDC 4, the UHS is contained within RXB structures protected from the effects of turbine missiles, in accordance with RG 1.13, Regulatory

Position C.3, without loss of the UHS safety functions. Section 3.5, Missile Protection, provides additional detail on protection from turbine missiles. These RXB structures are designed to withstand environmental and dynamic effects, including the effects of postulated missiles, pipe whip, and discharging fluids that may result from equipment failures and from events and conditions that may occur within the RXB but outside the UHS boundary. Additionally, the physical location of the UHS within the RXB ensures that the effects of equipment failures and events, and conditions that may occur outside the NPM have no reasonable likelihood of adversely impacting UHS safety functions.

The Reactor Building HVAC system controls the environment in the RXB. The resident heat sources in the UHS, the fact that it is below grade, and the controlled environment within the RXB prevent the UHS from reaching freezing temperatures.

A safe shutdown earthquake (SSE) event can generate waves in the UHS. An analysis of sloshing shows that an SSE generates a maximum wave height of less than 2 feet. The walls that form the pools containing the UHS have sufficient freeboard to contain these waves at the normal operating level listed in Table 9.2.5-1. At the upper limit of the normal operating level range, the maximum generated wave overtops the pool edge on the west end of the RFP into an adjacent room. The adjacent room does not contain safety-related or risk-significant structures, systems, or components, and the sloshing does not impact the safety functions of the UHS.

The design of the dry dock gate meets Seismic Category II design requirements consistent with the design guidance of RG 1.29. A failure of the gate during an SSE does not reduce the functioning of a Seismic Category I pool liner or RXB walls that form the UHS pools. For an SSE, the failure of the dry dock gate with an empty dry dock results in lowering the water level in the UHS pools by approximately 8 feet.

Consistent with GDC 5, the UHS supports the NPMs with no impairment of its ability to perform required safety functions. The UHS has sufficient capacity to remove the heat energy from a design-basis accident and decay heat in one NPM and to achieve an orderly shutdown and cooldown of the remaining NPMs. Water makeup to the UHS is not required to achieve the UHS safety functions.

Because the NPMs and the spent fuel assemblies are located within the UHS, heat transfer to the UHS does not require an intermediate system. To meet the intent of Principal Design Criterion 44, its requirements are applied to the UHS and the systems that ensure that the UHS is able to perform its safety function.

The reactor building provides a seismically qualified enclosure that contains the water in the UHS. The PLDS provides indication of leakage from the pool walls and the pool liner on the floor of the UHS. Redundant level instrumentation provides another indication of leakage.

The PCWS maintains UHS level and temperature during normal operation. The UHS maintains the core temperature at acceptably low levels following an accident, including a loss-of-coolant accident, that results in the initiation of the emergency core cooling system. The passive cooling feature provided by the UHS does not include active components and does not rely on electrical power to perform its safety function.

Consistent with GDC 45, the pools that comprise the UHS are accessible for inspections. Consistent with GDC 46, no periodic pressure or functional testing is necessary to ensure the structural and leaktight integrity of UHS components or the operability and performance of the UHS. Verification of structural leak tight integrity is accomplished by maintaining pool level and monitoring for leaks with the PLDS. These inspections and tests verify system integrity and operability. Table 9.2.5-1 lists the minimum water levels. Preoperational testing of the UHS is performed in accordance with the information presented in Section 14.2, Initial Plant Test Program.

Consistent with GDC 61, the UHS design ensures adequate safety under normal and postulated accident conditions and has the capability to permit appropriate periodic inspections and testing of components, provides suitable radiation shielding for the contents of the reactor pool, RFP, and SFP, provides appropriate containment, confinement and filtering capabilities, provides for the removal of residual heat of components, and provides for the prevention of a significant reduction in the pool water inventory under accident conditions.

### 9.2.5.4 Instrumentation Requirements

#### 9.2.5.4.1 Temperature Instrumentation

Section 9.1.3 describes the PCWS temperature instruments that monitor UHS temperature.

#### 9.2.5.4.2 Level Instrumentation

Water level instrumentation in the SFP is capable of monitoring water level from the normal UHS level to the top of the stored spent fuel in the SFP. The reactor pool and RFP also contain water level instrumentation. The UHS level instrumentation and mounting are designated Seismic Category I per RG 1.29.

The plant lighting system provides power to the water level instrumentation in the UHS. Each level instrument has a dedicated battery backup power supply capable of providing power to the instrument for at least 14 days.

The UHS level instrumentation is qualified to operate in SFP water at saturation conditions for an extended period.

The UHS pool level instrumentation mounting protects it from natural phenomena. To ensure redundancy, instruments are physically separated and mounted at opposite ends of the pools. Since the UHS communicates with pool areas while the water is above the weir wall, this provides multiple areas to monitor pool level. The location for each of the instruments ensures a single event does not cause damage to all of the level instruments.

The UHS level information is displayed in the main control room. Alarms alert the operator of these parameters during both normal and post-accident conditions. The UHS level instrumentation provides level information for post-accident monitoring.

Figure 9.2.5-1 shows the relative location of the level instrumentation.

Level instrumentation meets the Fukushima recommendations for separation and redundancy. The design of the UHS level instruments meets the guidance of Nuclear Energy Institute 12-02 (Reference 9.2.5-2).

#### 9.2.5.5 References

9.2.5-1 American National Standards Institute/American Nuclear Society, “Decay Heat Power in Light Water Reactors,” ANSI/ANS 5.1-2014, LaGrange Park, IL.

9.2.5-2 Nuclear Energy Institute, “Industry Guidance for Compliance with NRC Order EA-12-051, ‘To Modify Licenses with Regard to Reliable Spent Fuel Pool Instrumentation,’” NEI 12-02 Rev. 1, August 2012.

**Table 9.2.5-1: Relevant Ultimate Heat Sink Parameters**

| UHS Parameter | |
|---|---|
| **Level** | **Pool Level (ft)** |
| Normal operating level | 53 |
| Normal operating level range | 52-54 |
| Minimum level for 72 hour coverage for DHRS[1] | 48.2 |
| Minimum level for PCWS suction penetrations[2] | 49.5 |
| Minimum level for fuel handling accident scrub[3] | 49.5 |
| Spent fuel pool weir wall | 19 |
| Minimum level to support radiation shielding[4] | 19 |
| Top of spent fuel | 9 |
| Reactor pool and SFP floor | 0 |
| **Temperature** | **Temperature (°F)** |
| Minimum operating | 65 |
| Normal operating | 100 |
| Maximum operating | 120 |
| **Volume** | **Volume ($ft^3$)** |
| Normal operating level | 406,000 |

Notes:

[1] ANSI/ANS 5.1-1973 with Appendix K is used to calculate decay heat for the NPMs and stored spent fuel assemblies with a pool water starting temperature of 120 degrees F.

[2] Penetration height for PCWS suction piping in the SFP and RFP level ensures suction capability for coolant pumps.

[3] Level for iodine scrubbing includes: weir wall height + 7.5 ft damaged fuel + 23 ft scrub

[4] ANSI/ANS 57.2-1983 maximum radiation dose of 2.5 mrem/hr

## Table 9.2.5-2: Ultimate Heat Sink Heat Loads: Boil Off Analysis Results

| Description | Cumulative Time (Days) | Pool Level (ft) |
|---|---|---|
| Onset of UHS boiling | 2.3 | 54.7 |
| Boil off to top of DHRS | 13.5 | 44.4 |
| Boil off to top of SFP weir wall | 59.6 | 19.0 |
| Boil off to top of spent fuel | 66.5 | 9.0 |

Notes:
Initial conditions and assumptions are described in Section 9.2.5.3

**Table 9.2.5-3: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **UHS, Ultimate Heat Sink** | | | | | |
| UHS pool (water only; also see RXB and RBCM below) | RXB | A1 | None | N/A | N/A |
| Water M/U line | RXB/Yard | B2 | None | D | I |
| Pool level instruments | RXB | B2 | • 10 CFR 50.155<br>• Protected from Natural Phenomena per GDC 2<br>• IEEE 497-2016 (Note 5) | N/A | I |

Note 1: Acronyms used in this table are listed in Table 1.1-1

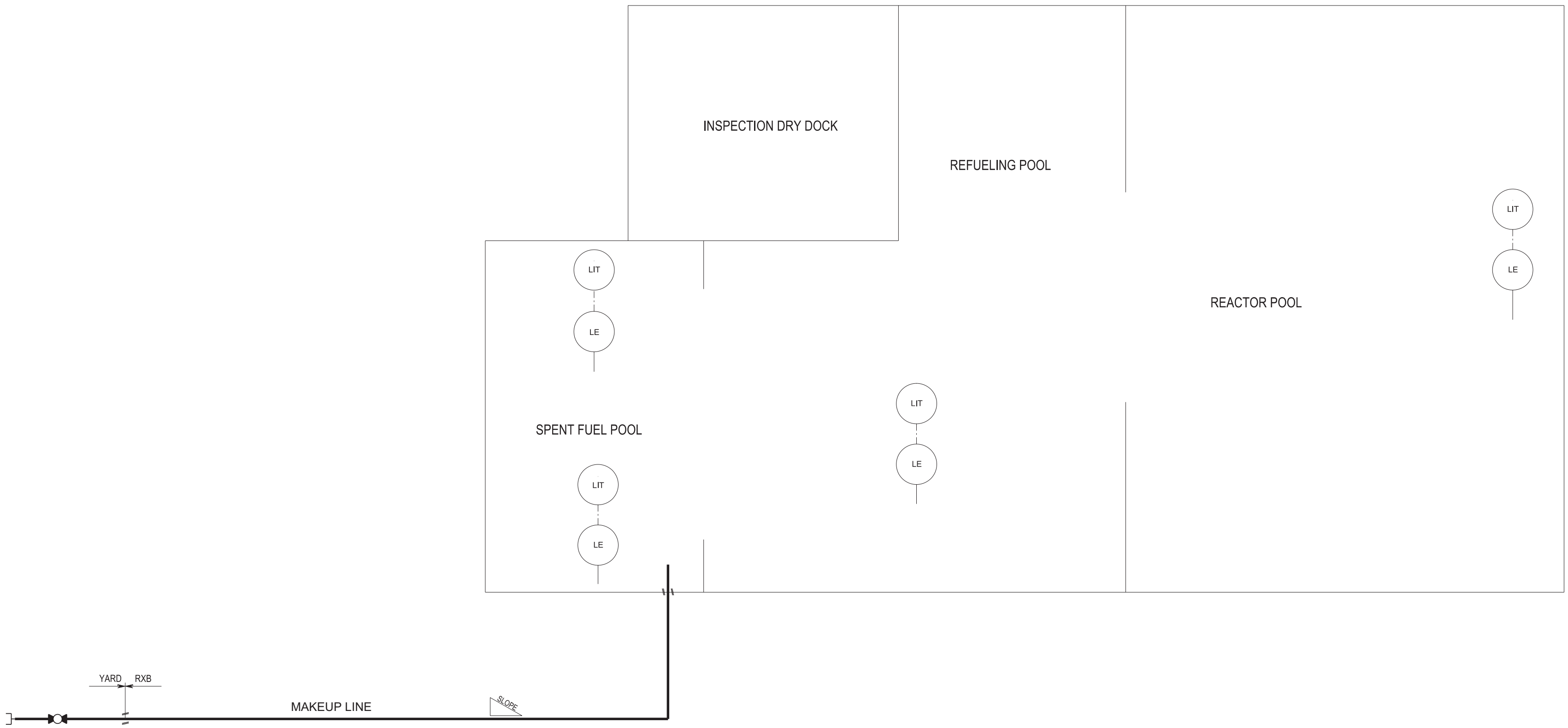
Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that do not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

Note 5: IEEE Std 497-2016 as endorsed by RG 1.97 and implemented in Table 1.9-2

## Figure 9.2.5-1: Ultimate Heat Sink Configuration



### 9.2.6 Condensate Storage Facilities

Each NuScale Power Module's condensate and feedwater system is supported by a condensate storage facility, which comprises a condensate storage tank (CST), tank level instrumentation, vents, drains, valves, piping, and connections to the condensate collection tank and the condensate header. The demineralized water system provides automatic makeup water to the CST. The CST provides automatic makeup water to the condensate collection tank via gravity feed. Excess water in the condensate collection tank is transferred to the CST. Figure 9.2.6-1 is a simplified system drawing of a condensate storage facility.

The CST does not serve a safety function, is not risk-significant, and does not interface with other systems that could adversely affect safety-related systems. The CST is not an essential source of cooling water to prevent or mitigate the consequences of accidents or to shut down the reactor and maintain it in a safe-shutdown condition. The CST does not provide makeup water to systems that remove heat from the reactor if normal heat removal methods are unavailable.

The CSTs are constructed in accordance with American Petroleum Institute 620 (Reference 9.2.6-1). Each CST is located outside of the Turbine Generator Building. There are no nearby safety-related or risk-significant structures, systems, or components. Therefore, failure of a CST does not result in damage to structures, systems, or components that are important to safety.

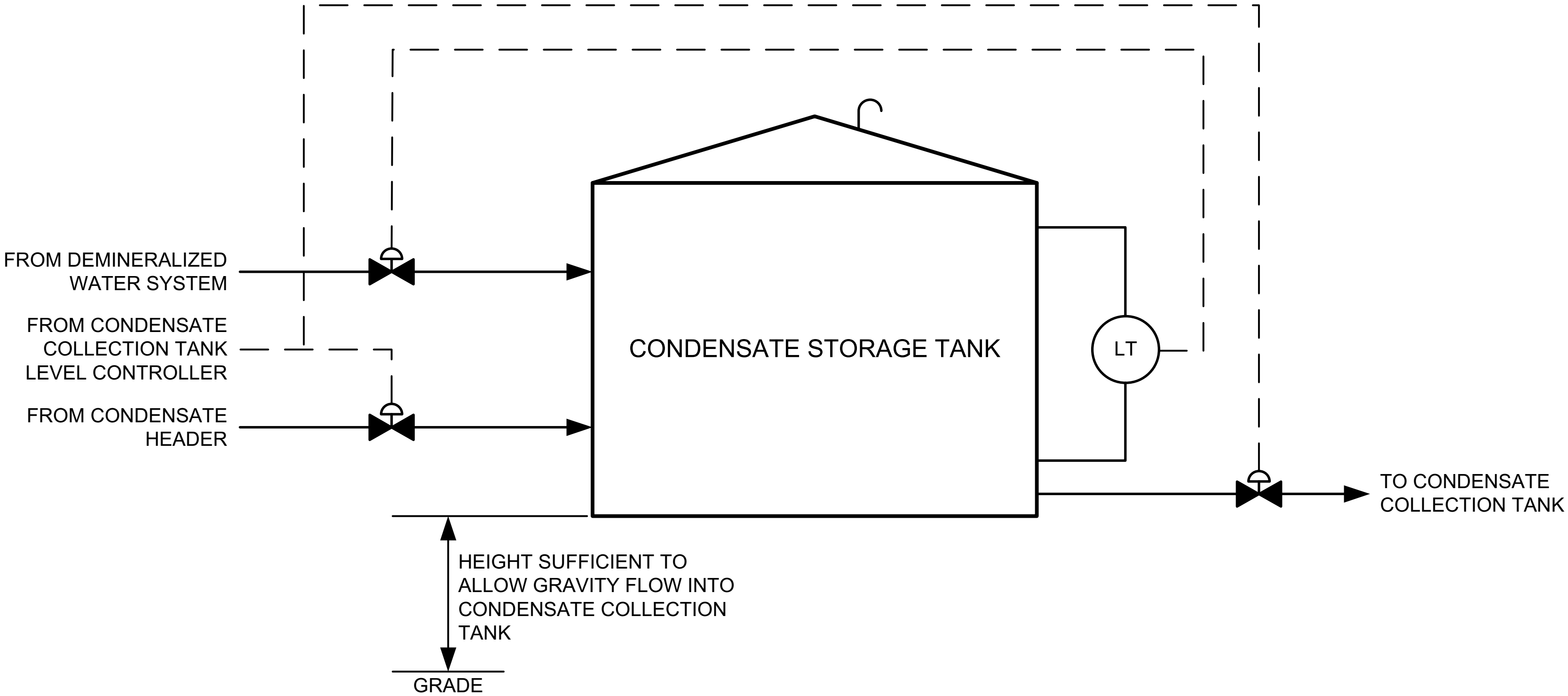
The CST instrumentation includes a high level alarm, in accordance with Regulatory Guide 1.143, and a low level alarm. These alarms give indication of a tank overfill or of a tank leak. These design features assist in minimizing the spread of contamination in accordance with Regulatory Guide 4.21.

Section 10.4.6 provides information on the condensate and feedwater system.

#### 9.2.6.1 References

9.2.6-1 American Petroleum Institute, “Design and Construction of Large Welded Low Pressure Storage Tanks,” API 620, 12th edition, November 2014, Washington, D.C.

**Figure 9.2.6-1: Condensate Storage Facility**



## 9.2.7 Site Cooling Water System

The function of the site cooling water system (SCWS) is to transfer heat from plant auxiliary systems to the SCWS cooling towers.

### 9.2.7.1 Design Bases

The SCWS is not a safety-related or risk-significant system and has no system functions that support engineered safety features. Table 9.2.7-1 identifies SSC classifications for SCWS. The SCWS is not required to operate during or after a design-basis event. The SCWS does not provide cooling to safety-related or risk-significant components. General Design Criteria (GDC) 2, 4, 5, 60, and 10 CFR 20.1406 are considered in the design of the SCWS.

### 9.2.7.2 System Description

The SCWS is a two-loop system comprising a closed-loop subsystem that interfaces with plant loads, and an open-loop subsystem that rejects heat to the environment. The major components of the closed-loop subsystem include the closed-loop pumps, heat exchangers, and a pressurized tank. The major components of the open-loop subsystem include the cooling tower pumps, the cooling towers and associated basin, stationary screens, and the water treatment skid. Both subsystems include a standby pump that automatically starts when a low pressure condition is detected in its associated system.

The SCWS includes pressure and flow instrumentation that helps identify leaks in the system, and valves that operators can close to isolate leaks that could impact safety-related equipment.

### 9.2.7.3 Safety Evaluation

The SCWS is classified as Quality Group D.

Consistent with GDC 2, the portions of the SCWS whose structural failure could adversely affect the function of Seismic Category I structures, systems, and components are designed to Seismic Category II standards. Failure of the SCWS due to the effects of natural phenomena such as tornadoes, hurricanes, floods, and externally generated missiles do not adversely impact safety-related or risk-significant functions.

Consistent with GDC 4, the SCWS has the ability to identify and isolate leaks that could impact safety-related equipment. Section 3.4, Water Level (Flood) Design, provides information pertaining to the impact of environmental effects associated with flooding.

Consistent with GDC 5, the SCWS does not have safety-related or risk-significant functions that are shared between modules. The components in the SCWS that are shared among modules do not impair other systems' ability to perform their safety functions, including, in the event of an accident in one module, an orderly shutdown and cooldown of the remaining modules. Failed SCWS components can be isolated and do not affect the operation of other modules.

Consistent with GDC 60, the design of the SCWS reduces the potential for radioactive effluent release by maintaining the process fluid at a higher pressure than potentially contaminated interfacing systems. System drains for components that interface with potentially contaminated systems drain to the liquid radioactive waste system. Section 11.5, Radiation Monitoring, provides information on the radiation monitors in the SCWS.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the SCWS that demonstrate compliance with 10 CFR 20.1406.

## Table 9.2.7-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **SCWS, Site Cooling Water System** | | | | | |
| All components (except as listed below): | RXB/YARD<br>CUB/TGB | B2 | None | D | III |
| Instrumentation | RXB/YARD<br>CUB/TGB | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.2.8 Chilled Water System

The chilled water system (CHWS) is a closed loop cooling system that distributes chilled water to heating, ventilation, and air conditioning (HVAC) equipment chilled water coils, and equipment in the liquid radioactive waste system (LRWS) and the gaseous radioactive waste system (GRWS).

A normal control room HVAC system (CRVS) standby CHWS subsystem, powered by the backup power supply system, provides chilled water to the CRVS chilled water coils in the event of a loss of power.

### 9.2.8.1 Design Bases

The CHWS serves no safety-related functions, is not risk-significant, is not credited for mitigation of design-basis accidents, and has no safe shutdown functions. The CHWS does not provide cooling to safety-related or risk-significant components. Table 9.2.8-1 identifies SSC classifications for CHWS. General Design Criteria (GDC) 2 and 4, and 10 CFR 20.1406 are considered in the design of the CHWS.

### 9.2.8.2 System Description

The major components of the CHWS include main CHWS pumps, a standby CRVS pump, main CHWS chillers, a standby CRVS chiller, expansion tanks, and air separators. The CHWS provides cooling for the CRVS, Radioactive Waste Building HVAC system (RWBVS), and Reactor Building HVAC system (RBVS). Figure 9.2.8-1 shows the CHWS process piping and components.

### 9.2.8.3 Safety Evaluation

Consistent with GDC 2, the portions of the CHWS whose structural failure could adversely affect the function of Seismic Category I structures, systems, and components are classified as Seismic Category II. The remaining CHWS equipment is classified as Seismic Category III.

Consistent with GDC 4, the CHWS is not required to function during or after a natural phenomenon event or other events that result in the generation of missiles, pipe whipping, or discharging fluids.

Operation of the CHWS does not interfere with the ability to operate or shut down a module. The CHWS provides cooling to HVAC systems and to radioactive waste systems, but does not provide cooling to individual nuclear power modules.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the CHWS that demonstrate compliance with 10 CFR 20.1406.

**Table 9.2.8-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **CHWS, Chilled Water System** | | | | | |
| All components | CUB/CRB | B2 | None | N/A | III |

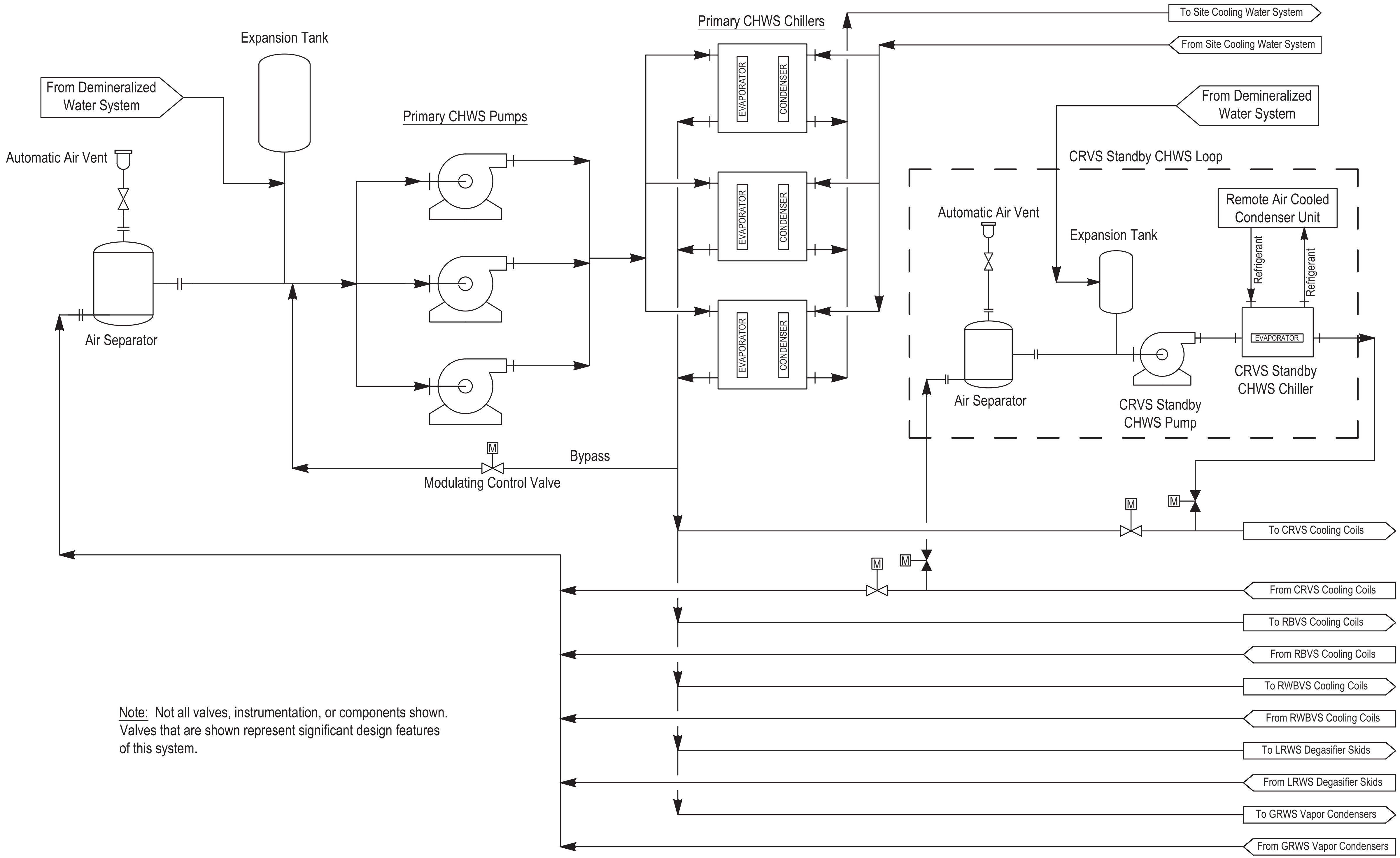
Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

**Figure 9.2.8-1: Chilled Water System Diagram**




Note: Not all valves, instrumentation, or components shown. Valves that are shown represent significant design features of this system.

### 9.2.9 Utility Water Systems

The utility water system (UWS) provides distribution of raw water and clarified water for various plant uses and provides the single point liquid effluent release to the environment.

#### 9.2.9.1 Design Bases

The UWS serves no safety-related or risk-significant functions, is not credited for mitigation of design-basis accidents, and has no safe shutdown functions. Table 9.2.9-1 identifies SSC classifications for UWS. General Design Criteria (GDC) 5, 60, and 64, and 10 CFR 20.1406 are considered in the design of the UWS.

#### 9.2.9.2 System Description

The UWS comprises raw water pumps, a utility water treatment skid, a utility water storage tank, and utility water supply pumps. The source of water for the UWS and the required chemical treatment is site-specific. Water from the UWS supplies maintenance activities such as general wash downs in areas including the Reactor Building, the Radioactive Waste Building, and the Turbine Generator Building.

#### 9.2.9.3 Safety Evaluation

The portion of the UWS that receives radioactive water and discharges it to the environment is classified as Quality Group D per Regulatory Guide 1.26.

General Design Criterion 5 is considered in the design of the UWS. The UWS pumps and storage tank are shared by the Nuclear Power Modules. The UWS has no safety-related or risk-significant functions, and the UWS has no functions that are impacted if there is an accident in one module coincident with the shutdown and cooldown of the remaining modules.

The design of the UWS satisfies GDC 60 and GDC 64 with provisions to control and monitor the release of radioactive liquid effluent to the environment through the single point liquid effluent release point. The UWS includes an off-line radiation monitor in the discharge line to the environment with the capability to take samples that are representative of the liquid effluent stream. Section 11.5, Radiation Monitoring, provides additional information on this radiation monitor. The supply portion of the UWS piping is not interconnected with other system piping that conveys radioactive materials. The collection portion of the UWS is the discharge basin, where potentially radioactive effluent is mixed with non-radioactive effluent before discharge to the environment.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the UWS that demonstrate compliance with 10 CFR 20.1406.

### Table 9.2.9-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **UWS, Utility Water System** | | | | | |
| All components (except as listed below): | All Buildings | B2 | None | N/A | III |
| • Wastewater effluent discharge portions of UWS<br>• Discharge basin letdown line sampler<br>• Local grab sample line<br>• Letdown line | Yard | B2 | None | D | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.3 Process Auxiliaries

### 9.3.1 Compressed Air System

The compressed air system (CAS) includes the instrument and control air system (IAS), service air system (SAS), and the nitrogen distribution system (NDS).

#### 9.3.1.1 Design Bases

The CAS is nonsafety-related, not risk-significant, and not required to perform a safety-related function. The CAS does not support safety-related pneumatic components, or provide compressed air to actuate or control equipment that performs safety-related functions during normal operations, transients, or accidents. Table 9.3.1-1 identifies SSC classifications for CAS.

General Design Criteria 1, 2, and 5, and 10 CFR 50.63 are considered in the design of the CAS.

Design of the IAS is based on compliance with the criteria specified in American National Standards Institute/Instrument Society of America S7.3-R1981 (Reference 9.3.1-1) related to minimum instrument air quality standards. A dryer subsystem removes entrained moisture from the air stream in accordance with the quality standards of Reference 9.3.1-1.

#### 9.3.1.2 System Description

The IAS comprises air compressors, air dryers, air receivers, and a distribution subsystem. The IAS supplies and distributes dry, filtered, oil-free compressed air to air-operated valves throughout the plant and to the SAS.

The SAS comprises an accumulator and a distribution header. The SAS provides dry, filtered, oil-free compressed air for various loads for maintenance and testing purposes, as well as for supporting the operation of radioactive waste processing equipment and containment drain down.

The NDS comprises a bulk liquid nitrogen storage system and a distribution header. The NDS provides a continuously available supply of nitrogen to the entire plant, including the NuScale Power Modules (NPMs).

#### 9.3.1.3 Safety Evaluation

General Design Criterion 1 is considered in the design of the CAS. The CAS is designed, fabricated, and tested to quality standards commensurate with its nonsafety-related design functions. Design of the IAS and SAS is based on compliance with the criteria, specified in Reference 9.3.1-1, related to minimum instrument air quality standards.

General Design Criterion 2 is considered in the design of the CAS. Portions of the CAS whose structural failure could adversely affect the function of Seismic Category I structures, systems, or components are designed to

Seismic Category II standards. The remaining CAS equipment is classified as Seismic Category III.

General Design Criterion 5 is considered in the design of the CAS. The CAS is designed such that there is no compromise of the ability of systems and components to perform their safety-related functions for each NPM regardless of CAS equipment failures or other events that may occur in other NPMs. Unacceptable effects of equipment failures or other events occurring in the NPM will not propagate to unaffected NPMs.

Compressed air is not required to achieve or maintain safe shutdown after loss of offsite power or station blackout. The CAS does not support safety-related functions pertaining to actuation or equipment control necessary for core cooling, decay heat removal, or maintaining containment integrity following station blackout. Section 8.4, Station Blackout, provides information on the station blackout coping analysis (10 CFR 50.63).

The IAS and SAS provide air and the NDS provides nitrogen in support of radioactive waste management system operations. The radioactive waste management systems include double isolation valves where they interface with the CAS to preclude contamination.

### 9.3.1.4 References

9.3.1-1 American National Standards Institute/Instrument Society of America, "Quality Standard for Instrument Air," ANSI/ISA-S7.3-1976, Reaffirmed 1981, Research Triangle Park, North Carolina.

**Table 9.3.1-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **CAS, Compressed Air System** | | | | | |
| All components | CUB/Yard RWB/RXB/TGB/ANB | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.3.2 Process Sampling System

The process sampling system (PSS) provides the means to obtain representative liquid and gaseous samples from various primary and secondary process streams and components for monitoring and analyzing the chemical and radiochemical conditions.

### 9.3.2.1 Design Bases

The PSS has no safety-related or risk-significant functions and is not required to prevent or mitigate the consequences of a design-basis accident, to shut down the reactor and maintain safe shutdown conditions, or to maintain the integrity of the reactor coolant pressure boundary (RCPB). Table 9.3.2-5 identifies SSC classifications for PSS. General Design Criteria (GDC) 1, 2, 13, 14, 26, 60, 63, and 64 are considered in the design of the PSS.

COL Item 9.3-1: An applicant that references the NuScale Power Plant US460 standard design will submit a leakage control program for systems outside containment that contain (or might contain) accident source term radioactive materials following an accident. The leakage control program will include an initial test program, a schedule for re-testing these systems, and the actions to be taken for minimizing leakage from such systems to as low as practical.

### 9.3.2.2 System Description

#### 9.3.2.2.1 General Description

The PSS collects representative liquid and gaseous samples from various plant systems using the following sampling systems:

- the primary sampling system
- the containment sampling system (CSS)
- the secondary sampling system (SSS)

The PSS is operable during normal operations, including at power, shutdown, and startup. The system has the ability to obtain samples at the normal system operating temperatures and pressures from various locations. The PSS obtains samples that are representative of the process under evaluation. For sampling of liquid process streams, sample points are located in a turbulent flow zone, which minimizes particulate dropout and re-entrainment in sample piping. For sampling of tanks, the sample points are located in the tank recirculation loop to ensure sediments or solid particulates are distributed uniformly in the fluid mixture. The PSS design criteria ensure representative samples from gaseous process streams and tanks are in accordance with American National Standards Institute/Health Physics Society N13.1-2011 (Reference 9.3.2-1).

**Primary Sampling System**

Reactor coolant sample lines are connected to the chemical and volume control system (CVCS) process piping located outside of the containment vessel (CNV). A primary sampling system for each NuScale Power Module monitors and collects reactor coolant samples from its CVCS to verify primary chemistry.

Table 9.3.2-1 summarizes the primary sampling system sample points and the analysis capability of the installed continuous sample panels.

**Containment Sampling System**

From a sample point downstream of the discharge of the containment evacuation system (CES) vacuum pumps condenser for each CNV, the CSS sample pump draws the sample gasto a hydrogen and oxygen analyzer and returns the sample gas to the CES. The hydrogen and oxygen analyzer provide continuous gas concentration indication to the main control room. The analysis of grab samples from the radiation monitor on the same line provides an independent indication of process hydrogen and oxygen content to validate analyzer indication and serves as a redundant means to determine process gas concentration in the event that the analyzer is unavailable.

Table 9.3.2-2 summarizes the CSS sample point and the analysis capability of the CSS.

**Secondary Sampling System**

The SSS provides a means for monitoring and collecting process samples in the steam cycle systems. The systems serviced by the SSS are the condensate and feedwater system (FWS) and the main steam system (MSS). The SSS includes grab sample capability.

Table 9.3.2-3 summarizes the SSS sample points and the analysis capability of the installed continuous sample panels.

**Local Sample Points**

For systems not being serviced by equipment of the primary sampling system, CSS, or SSS, local sample points are provided. Local sample points employ locally-installed sampling equipment such as an in-line sampler for grab sample collection, local analyzers for continuous sampling and analysis, and local sample panels. Table 9.3.2-4 lists selected local sample points for auxiliary process systems. Some radiation monitors provide grab sample capability; Section 11.5, Radiation Monitoring, provides information on systems with such monitors. Local sampling equipment is considered to be a component of the system to which it is connected.

#### 9.3.2.2.2 Component Descriptions

**Sample Coolers**

Sample coolers in the primary and secondary sampling systems provide cooling to samples that require temperature conditioning before analysis.

**Sample Panels**

The PSS has sample panels to support sampling activity. Some sample panels have provisions to permit safe collection of grab samples from plant fluids for laboratory analysis. The sample panels used for grab sample collection of reactor coolant are equipped with a vent hood and enclosure due to potential for exposure to airborne radiologically contaminated materials and the potential chemical hazards of these samples. The vent hood exhaust connects to the ventilation duct of the Reactor Building heating, ventilation, and air conditioning system. Sample sinks accommodate potential spills and drain excess grab samples. Before samples are taken, personnel purge sample lines for enough time to ensure a representative sample is procured from the process or component. After purging, personnel are able to direct the sample stream to the grab sample line above the sink for collection in a container. Personnel are able to route pressurized reactor coolant samples to the pressurized sample collector, which allows grab samples to be collected in pressurized sample vessels and taken for further analysis in the laboratory.

The sample panels of the SSS have the capability to perform online analysis, and some panels have the capability to collect grab samples. The SSS sample panels with grab sampling capability have sinks. The secondary system samples are expected to be non-radioactive during normal operation; therefore, a vent hood enclosure is not required for the secondary system grab sample panel.

**Primary Sample Return Pump**

A primary sample return pump on the common return line returns purged samples and samples from the primary sampling system analyzers to the CVCS process loop.

**Valves**

The PSS includes remotely operated sample line isolation valves.

#### 9.3.2.2.3 System Operation

**Normal Operations**

For normal sampling at power, the primary sampling system performs continuous and semi-continuous sampling and analysis of reactor coolant discharge from the reactor coolant system (RCS). Personnel collect grab samples from various sample locations in the CVCS process loop.

During normal operation, the CSS monitors gas discharged from the containment evacuation system for hydrogen and oxygen gas concentration.

Normal operation of the SSS includes continuous monitoring of the condensate pump discharge, condensate polisher effluents, feedwater, and main steam.

The frequency for sample collection and required analyses for local process sample points are addressed in the primary, secondary, and ancillary chemistry program and procedures.

**Off-Normal Operations**

The US460 standard plant design supports an exemption from 10 CFR 50.34(f)(2)(viii) that requires capability for obtaining and analyzing post-accident samples of reactor coolant and containment atmosphere for the purpose of assessing the presence and extent of core damage. The NuScale design also supports an exemption from 10 CFR 50.44(c)(4) and 10 CFR 50.34(f)(2)(xvii)(c).

### 9.3.2.3 Safety Evaluation

Consistent with GDC 1, PSS structures, systems, and components (SSC) are designed, fabricated, erected, and tested to appropriate quality standards such that their failure does not impact the function of safety-related or risk-significant systems. The SSC in the PSS are designed to Quality Group D standards, per Regulatory Guide 1.26. PSS piping conforms to American Society of Mechanical Engineers (ASME) B31.1 (Reference 9.3.2-2).

General Design Criterion 2 is considered in the design of the PSS. The primary sampling system and the CSS components are located inside the Reactor Building (RXB), and are protected from earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches to the extent that the RXB is protected from such events. The PSS does not connect to Seismic Category I piping. The SSC in the PSS are designated as Seismic Category III.

The PSS does not employ sample lines that penetrate the CNV and the reactor pressure vessel; therefore, there is no containment isolation function associated with the system. There is no physical interaction of process sampling system SSC with safety-related SSC. Process sampling system failure does not adversely affect the integrity of safety-related systems.

The PSS design supports conformance to GDC 13 in that sampling of reactor coolant enables the PSS to provide information on variables that can affect the fission process, the integrity of the reactor core, and the RCPB during normal modes of operation. The PSS collects water and gaseous samples from the RCS and associated auxiliary systems during normal modes of operation.

The PSS design supports conformance to GDC 14 as it relates to ensuring integrity of the RCPB by sampling reactor coolant for chemicals that can affect the

RCPB. Sampling and analysis of reactor coolant samples verify that key chemistry parameters, such as chloride, hydrogen, and oxygen concentrations, are within prescribed limits and that impurities are properly controlled, ensuring many mechanisms for corrosive attack are mitigated and do not adversely affect the RCPB.

The PSS design supports conformance to GDC 26 by allowing verification of the boron concentration necessary for the control of core reactivity changes by sampling the reactor coolant and the contents of the storage tanks in the boron addition system (BAS).

The PSS design supports conformance to GDC 60, as it provides the capability to control the release of radioactive materials to the environment by sampling effluents. Systems that have effluent release paths to the environment have local grab sample points, permitting effluent sample analysis before release.

The PSS routes samples back to the system of origin or to the applicable radioactive waste system as appropriate to control the release of radioactive material.

The PSS design limits the potential reactor coolant loss from the rupture of a sample line. A failure of a sample line results in a loss of flow to either a continuous analyzer or a grab sample panel that can be detected via instrument indication. In addition, a break in a sample line results in activity release that might actuate the fixed area radiation monitors located in the containment sampling system equipment area and the primary sampling system equipment area, as described in Section 12.3, Radiation Protection Design Features. The CVCS sample lines include isolation valves that fail closed to control the potential release of radioactive materials to the environment. These isolation valves are downstream of the CVCS discharge line containment isolation valves and the CVCS module isolation valves. The small PSS line sizes restrict the break flow of a sample line outside containment.

The US460 standard plant design supports conformance to GDC 63 by allowing the detection of conditions that may result in excessive radiation levels in the fuel storage and radioactive waste systems. The pool cooling and cleanup system (PCWS) includes grab sampling capability of the spent fuel pool and reactor pool water. The liquid and gaseous radioactive waste systems (LRWS and GRWS) include local sample points that enable analyses to detect conditions in the fuel storage and radioactive waste systems that could result in excessive radiation levels and excessive personnel exposure.

The US460 standard plant design supports conformance to GDC 64 as it provides the capability to sample and analyze for radioactivity that may be released during normal operations and anticipated operational occurrences.

The PSS design satisfies 10 CFR 50.34(f)(2)(xxvi) (Item III.D.1.1 in NUREG-0737), as it relates to including provisions for leakage control and detection to levels as low as practical to prevent exposures to workers and the public. The PSS design includes provisions for leakage control and detection.

Radiation monitoring can detect excessive radiation level resulting from system leakage. Section 11.5 provides information on the radiation monitors that provide leakage detection in the CVCS and CES. Excessive radiation level detected by the fixed area radiation monitor located in the primary sampling system or the containment sampling system equipment areas provides indication of system leakage that warrants system isolation for leakage control.

The PSS design features and configuration support As Low As Reasonably Achievable Program goals and objectives with regard to minimizing dose and contamination. The PSS design ensures that the as low as reasonably achievable requirements of 10 CFR 20.1101(b) are addressed.

The PSS primary sampling system and CSS components are located in areas classified as low radiation zones.

Sampling components that contain potentially radioactive fluids, such as sample coolers, isolation valves, and associated piping, are located in shielded compartments or away from the sample panel to the extent practical to minimize the source volume exposed at the sample panel. The use of vent hoods, valve arrangement, sample vessel connections, and control of the sample pressure during operation by proper valve lineup minimize personnel exposure to radioactive fluids. Maintaining air flow through vent hoods minimizes personnel exposure to radioactive gases. The PSS is designed for high, continuous purge flow for quick, accurate sample collection to minimize personnel exposure at the operating location.

Reactor coolant samples during normal operations flow to sample stations located in the centralized hot lab for grab sample collection and analysis. This design feature minimizes potential spills of samples while transporting the grab samples to the lab. A counting room next to the hot lab allows personnel to perform routine radiochemical analyses on samples containing radioactive material collected from air, water, surfaces, and other sources within the plant and the surrounding environment. Local sample points associated with potentially radioactive systems are minimized to the extent practical to reduce manual operations in radiological work areas, and subsequently reduce dose and minimize contamination.

Section 12.3 provides information on the design features of the PSS that demonstrate compliance with 10 CFR 20.1406.

### 9.3.2.4 References

9.3.2-1 American National Standards Institute/Health Physics Society, "Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities," ANSI/HPS N13.1-2011, Washington, D.C.

9.3.2-2 American Society of Mechanical Engineers, *Power Piping*, ASME Code for Pressure Piping, B31, ASME B31.1, New York, NY, 2018.

## Table 9.3.2-1: Primary Sampling System Normal Sample Points

| Sample Points | System | Process Fluid Type | Sampling Methods | Analysis(1) |
|---|---|---|---|---|
| CVCS suction line from RCS, upstream of CVCS purification equipment | CVCS | liquid | continuous<br><br>semi-continuous(2)<br><br>grab | dissolved hydrogen, conductivity<br><br>chloride, fluoride, sulfate, lithium, ammonia, zinc, nickel, iron, boron |
| CVCS sample point downstream of purification equipment | CVCS | liquid | grab | |
| CVCS injection line to RCS | CVCS | liquid | grab | |

Notes:
1. Specific analyses, limits, and monitoring frequencies will be specified in plant chemistry procedures.
2. Semi-continuous (i.e., intermittent) analyses are performed by the applicable ion chromatography analysis unit provided in the hot lab.

### Table 9.3.2-2: Containment Sampling System Normal Sample Point

| Sample Point | System | Process Fluid Type | Sampling Methods | Analysis[(1)] |
|---|---|---|---|---|
| CES gas discharge (downstream of the CES condenser outlet) | CES | gas | continuous | hydrogen and oxygen |

Note:
1. Specific analyses, limits, and monitoring frequencies will be specified in plant chemistry procedures.

### Table 9.3.2-3: Secondary Sampling System Normal Sample Points

| Sample Point | System | Process Fluid Type | Sampling Method | Analysis[1] |
|---|---|---|---|---|
| Feedwater pump discharge | FWS | liquid | continuous<br><br><br>grab | specific conductivity, cation conductivity, pH, hydrazine, silica, sodium |
| Condensate pump discharge | FWS | liquid | continuous | specific conductivity, cation conductivity, pH, sodium |
| Condensate polisher skid outlets of lead cation and mixed bed demineralizers | FWS | liquid | continuous<br><br><br>semi-continuous[2] | specific conductivity, cation conductivity, sodium, dissolved oxygen<br><br>chloride, sulfate, sodium, ammonia |
| MSS line from steam generator (SG) 1 | MSS | steam | continuous<br><br>grab | cation conductivity, specific conductivity |
| MSS line from SG 2 | MSS | steam | continuous<br><br>grab | cation conductivity, specific conductivity |
| Main steam bypass line from SG 1 [3] | MSS | liquid | continuous<br><br>grab | cation conductivity, specific conductivity |
| Main steam bypass line from SG 2 [3] | MSS | liquid | continuous<br><br>grab | cation conductivity, specific conductivity |

Notes:
1. Specific analyses, limits, and monitoring frequencies will be specified in plant chemistry procedures.
2. Semi-continuous sampling is performed by the applicable ion chromatography analysis unit provided as part of the SSS.
3. Main steam bypass line sample points are intended to be used when the SG is in wet layup.

## Table 9.3.2-4: Local Sample Points

| Sample Point | System | Fluid Type | Sampling Method | Analysis(1) |
|---|---|---|---|---|
| BAS batch tank | BAS | liquid | grab | boron |
| BAS storage tank | BAS | liquid | grab | boron |
| CES sample vessel | CES | liquid | grab | radionuclides |
| Chilled water return lines | CHWS | liquid | grab | radionuclides |
| GRWS inlet gas | GRWS | gas | continuous, grab | iodine |
| PCWS cleanup loop (including SFP) | PCWS | liquid | grab | |
| Pool leakage detection system drain lines | Pool leakage detection system | liquid | grab | |

Notes:
1. Specific analyses, limits, and monitoring frequencies are specified in plant chemistry procedures.

## Table 9.3.2-5: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **PSS, Process Sampling System** | | | | | |
| All components | RXB | B2 | None | D | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provide the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.3.3 Equipment and Floor Drain Systems

The equipment and floor drain systems collect waste liquids, valve and pump leak-offs, and plant system drains and direct them to the correct drain system components for processing or disposal, and limit excessive water accumulation and flooding. The equipment and floor drainage systems comprise two separate, unconnected systems: the radioactive waste drain system (RWDS) and the balance-of-plant drain system (BPDS).

### 9.3.3.1 Design Bases

The RWDS and BPDS serve no safety-related or risk-significant functions, are not credited for mitigation of a design-basis accident, and have no safe shutdown functions. Table 9.3.3-1 identifies SSC classifications for RWDS and BPDS. General Design Criteria 2, 4, 5, 60, and 64, and 10 CFR 20.1406 are considered in the design of the RWDS and BPDS.

### 9.3.3.2 System Description

#### 9.3.3.2.1 General Description

The RWDS collects, accumulates, and samples liquid wastes in the radiologically controlled area (RCA), and transfers the liquids to the liquid radioactive waste system (LRWS) for processing. The BPDS collects and segregates normally non-radioactive liquid waste from areas associated with power-related or process-related functions outside the RCA. Figures 9.3.3-1 and 9.3.3-2 show the simplified layouts of the RWDS and the BPDS.

The RWDS serves the RCA, which includes the Reactor Building (RXB) and the Radioactive Waste Building (RWB), and comprises five subsystems:

- The equipment drain subsystem collects RXB and RWB equipment drainage and pool leak detection drainage, and transfers it to the low conductivity waste collection tanks in the LRWS.
- The floor drain subsystem collects RXB and RWB floor drainage and transfers it to the high conductivity waste (HCW) collection tanks in the LRWS.
- The chemical waste drain subsystem collects chemical waste from the containment evacuation system, the primary sample system sample panels, the chemical count room, and the hot lab, and transfers it to the HCW collection tanks in the LRWS.
- The reactor component cooling water system (RCCWS) drain subsystem collects and stores potentially contaminated drainage from the RCCWS, then either returns it to the RCCWS, or sends it to the HCW collection tanks in the LRWS if sampling determines the waste is contaminated.
- The detergent waste drain subsystem collects detergent waste from the decontamination room showers and sinks, and transfers it to the detergent waste collection tank in the LRWS.

The BPDS collects water from floor and equipment drains and routes it to the appropriate tank. The wastewater collection tank receives effluent from locations that may contain oily waste. The chemical waste collection tank collects high chemical concentration effluents.

The BPDS includes surge capacity to support periodic maintenance activities as well as other volume increases due to other than routine operations (e.g., forced outages, runoff from firefighting activities, and decontamination activities).

The RWDS transfer pump discharge lines include check valves to prevent backflow from another sump or tank.

The RCCWS drain tank is sized to accommodate the single largest piece of equipment in the RCCWS. The chemical drain tank is sized to accommodate the combined volume of the containment evacuation system tanks.

The RCA drainage, with the exception of detergent waste, collects in various RWDS sumps and tanks, each having redundant pumps. Each sump has one pump ready for operation (the 'primary' pump) and one pump on standby (the 'alternate' pump). The pumps automatically start and stop based on level indication. The primary pump starts upon the tank reaching high level and the alternate pump starts upon reaching high-high level. This arrangement provides automatic backup if one pump fails or inflow exceeds the capacity of one pump. The detergent waste drain subsystem drains to the detergent waste collection tank in the LRWS.

Floor and equipment drain piping from the upper floors of the RXB and RWB penetrate the floor slabs and direct flow below the floor to common downcomers that drain to the various sump tanks, preventing drain water from backing up to higher floors. In the event of an actuation of a fire suppression system, the affected area floods. The RWDS has the capacity to remove fire suppression water, but at flow rates that are lower than fire suppression flow rates.

The wastewater collection tank has a primary and an alternate pump as well as a fire water removal pump rated at the maximum expected fire suppression system flow rate. The chemical waste collection tank has two pumps that do not start automatically.

#### 9.3.3.2.2 System Operation

The RWDS and BPDS operate during normal operation, maintenance, plant shutdowns, refueling, plant startup operations, and during anticipated operational occurrences.

The RCCWS drain tank and chemical drain tank receive waste, but transfer to the LRWS requires operator action after sampling, analysis, and adjustment if necessary. The liquids contained in the RCCWS drain tank are normally not radiologically contaminated but contain various treatment chemicals, including corrosion inhibitors, that are typical of closed loop cooling water systems, including chemicals that could react exothermically with ion exchange resins. A radiation monitor on the RCCWS drain tank provides indication of an off-normal condition in that tank. Grab sampling provides the capability to analyze the RCCWS drain tank contents and ensure no radioactivity is present before return to the RCCWS, and provides a secondary method of initial detection, if the related radiation monitor is not available. Non-contaminated liquid is recycled back to the RCCWS. If contamination is detected greater than pre-established thresholds, the liquid is transferred to the HCW collection tanks for treatment, storage, and disposal.

The pool leakage detection system (PLDS) works in cooperation with the RWDS equipment drain subsystem. Because inputs to the RXB equipment drain sumps are typically from planned evolutions, an unexpected rise in an equipment drain sump level could indicate input to that sump from the PLDS. The plant control system monitors the equipment drain sump levels for a high rate of increase and alarms in the main control room to alert the operators to the potential of pool leakage.

A chemical waste collection tank high level sends an alarm to the plant control system. This alarm requires operator action to transfer the liquid waste to the BPDS collection tanks or LRWS for treatment, which allows a controlled metering of chemical waste into the discharge stream. Pumping oily waste from the wastewater collection tank requires personnel action. The BPDS non-radioactive liquid wastes transfer from the collection tanks to the discharge basin of the utility water system. Once started, continuous availability of the RWDS and BPDS is expected for the 60-year design life of the plant.

Off-normal RWDS operation involves a high inflow rate into the sump tanks. The high inflow rate can be indicative of equipment draining operations, a ruptured pipe or piece of equipment, an abnormally high reactor pool leak, or activation of the fire suppression system. High level alarms for RWDS tanks and sump tanks, and high rate of level increase alarms for sump tanks alert operators to abnormal conditions.

Off-normal BPDS operation involves higher than normal drain flow rate, such as from a fire suppression actuation in the Control Building or the Turbine Generator Building. In the event of higher than normal drain flow rates, the wastewater collection tank pumps cycle on and off more frequently. The fire water removal pump starts on a high-high-high level signal and stops when level falls below the low level setpoint. High level alarms for BPDS collection tanks alert operators to abnormal conditions. The two BPDS collection tank levels require monitoring as the tanks are filled.

### 9.3.3.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the RWDS and BPDS. The BPDS piping that penetrates the control room envelope includes Seismic Category I loop seal isolation devices at each penetration. The RWDS and the remainder of the BPDS are designed as Seismic Category III. However, in areas where portions of these systems could interact adversely with Seismic Category I SSC during a safe shutdown earthquake, the RWDS and BPDS are designed as Seismic Category II. The RWDS is classified as Quality Group D. Portions of the BPDS that could contain radioactive fluid are classified as Quality Group D.

The RWDS sump tanks are double walled stainless steel tanks embedded in the bottom floor slabs of the RXB and RWB. The RXB and RWB retain the liquid waste from failure of the sump tanks in the event of an earthquake because of the buildings' seismic qualifications.

The RWDS and BPDS do not require protection against external flooding as the plant site selection criteria place the maximum external flood level at one foot below grade.

General Design Criterion 4 is considered in the design of the RWDS and BPDS. Section 3.4, Water Level (Flood) Design, discusses the potential flooding impact on SSC due to pipe breaks, equipment failures, and fire suppression water. The flood analyses for the RXB and Control Building take no credit for water removal by the RWDS or BPDS. However, the RWDS and BPDS can help mitigate the consequences of such flooding by providing waste collection and transfer capability.

Consistent with General Design Criterion 5, although the RWDS and BPDS are shared by NuScale Power Modules (NPMs), in the event of an accident in one NPM, the failure of these systems to perform their nonsafety-related functions does not prevent an orderly shutdown and cooldown of the remaining NPMs.

General Design Criterion 60 is considered in the design of the RWDS and BPDS. The RWDS and BPDS designs include additional tank capacity to support maintenance activities and runoff from firefighting and decontamination activities. Section 11.5, Radiation Monitoring, provides information on the radiation monitors in the RWDS and BPDS and their features that control the release of radioactive materials in effluents during normal operation, including anticipated operational occurrences.

The RWDS is designed to preclude the transfer of contaminated fluids to a non-contaminated drainage system for disposal.

General Design Criterion 64 is considered in the design of the RWDS and BPDS. Radiation monitors monitor source streams into the BPDS that have the potential to contain radioactive material. System sampling provisions located on the discharge of the BPDS pumps allow the process fluid to be recirculated to ensure a representative sample. Process sampling permits the determination of process radionuclide content and serves as a redundant means of detecting process radioactivity in the event that radiological monitoring is unavailable. A tank sample determines the proper disposition of the waste, and if required, the system can transfer the liquids to the LRWS. Upon completion of the transfer, the BPDS and the inflow lines have provisions for decontamination and can be placed back into normal service.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the RWDS and BPDS that demonstrate compliance with 10 CFR 20.1406.

#### 9.3.3.4 Inspection and Testing

The RWDS and BPDS are designed to permit periodic inspection and testing of important components to verify their integrity and capability. The RWDS and BPDS functionality are demonstrated by use during normal plant operation. Section 14.2, Initial Plant Test Program, discusses testing to verify component installation and initial operation as well as integrated system testing.

**Table 9.3.3-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **RWDS, Radioactive Waste Drain System** | | | | | |
| All components (except those listed below): | RWB/RXB | B2 | None | D | III |
| Instrumentation | RWB/RXB | B2 | None | N/A | III |
| **BPDS, Balance of Plant Drain System** | | | | | |
| All components (except those listed below): | Yard/TGB | B2 | None | N/A | III |
| • Sump pumps<br>• Wastewater collection tank (and associated valves)<br>• Chemical waste collection tank (and associated valves) | Yard | B2 | None | D | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that does not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## Figure 9.3.3-1: Radioactive Waste Drain System Diagram

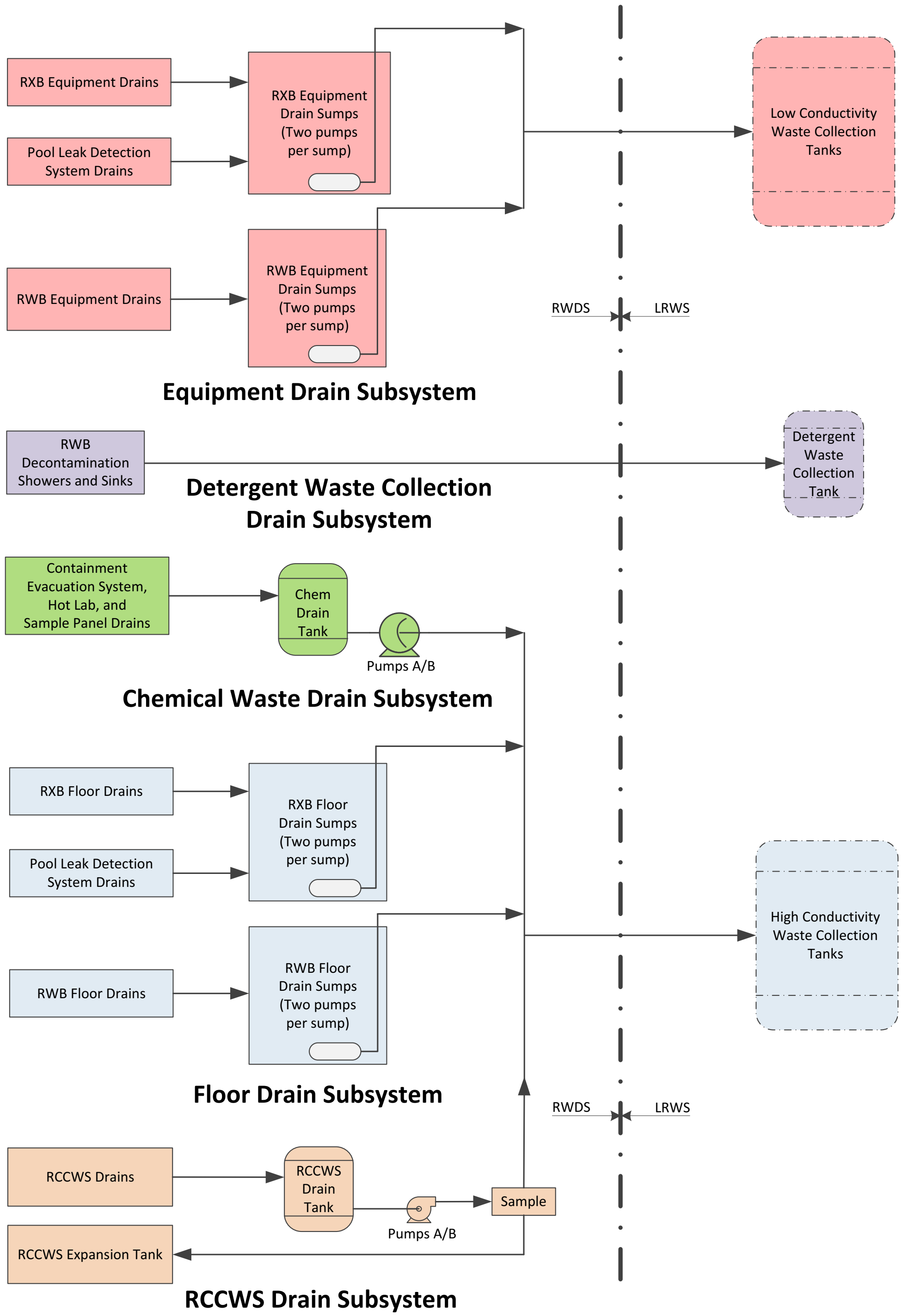
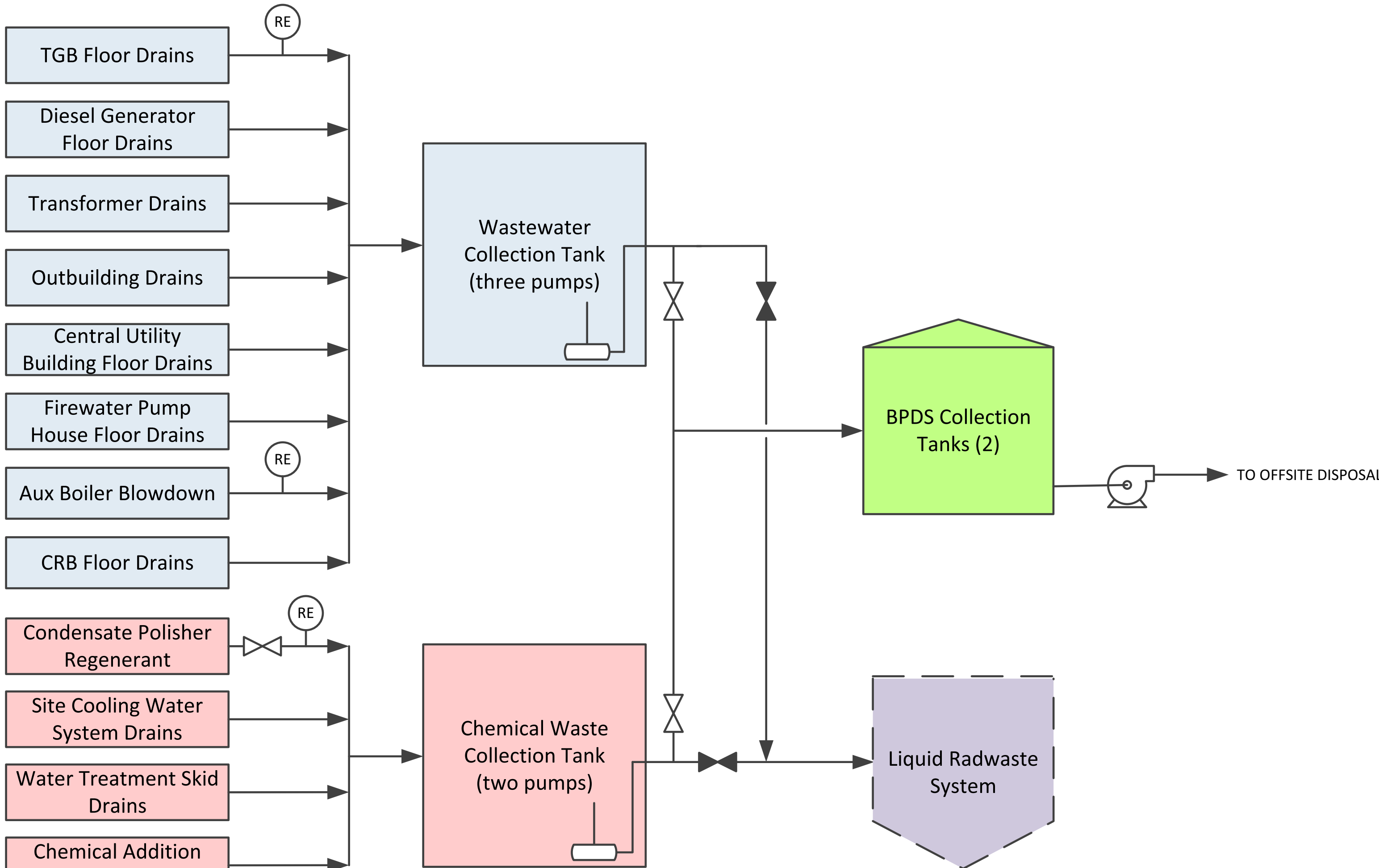


**Figure 9.3.3-2: Balance-of-Plant Drain System Diagram**



## 9.3.4 Chemical and Volume Control System

Each NuScale Power Module (NPM) includes a chemical and volume control system (CVCS). The system purifies reactor coolant, manages chemistry of the coolant (including boron concentration), provides reactor coolant inventory makeup and letdown, and supplies spray flow to the pressurizer to reduce the reactor coolant system (RCS) pressure. The CVCS includes a reactor pressure vessel (RPV) high point degasification line, separate from the primary CVCS circulation flow path, to remove noncondensable gases that collect in the pressurizer vapor space. A nitrogen distribution system connection supplies nitrogen to the RPV to support module startup activities.

The CVCS is used in combination with the module heatup system (MHS) during startup to raise reactor coolant temperature and to generate natural circulation flow in the RCS before nuclear heat addition. The MHS is also used during shutdown to maintain RCS flow if decay heat is insufficient. Figure 9.3.4-1 provides a simplified diagram of the CVCS and MHS during normal operation.

The boron addition system (BAS) is a shared system. The system prepares, stores, and transfers borated water for use by the CVCS or by the pool cooling and cleanup system (PCWS) for adding boron to the ultimate heat sink as needed. Figure 9.3.4-2 provides a system flow diagram of the BAS.

### 9.3.4.1 Design Bases

The CVCS, MHS, and BAS are not safety-related systems. However the CVCS includes two automatic, safety-related, fail-closed, demineralized water isolation valves to ensure CVCS operation does not inadvertently cause a dilution of the RCS boron concentration. Other functions of the CVCS include providing the means for controlling RCS chemistry, monitoring for RCS leakage, and providing flow paths to the process sampling system (PSS) for normal sampling. Table 9.3.4-3 identifies SSC classifications for CVCS and BAS.

General Design Criteria (GDC) 1, 2, 4, 5, 14, 29, 33, 60, and 61, 10 CFR 20.1406, and 10 CFR 50.34(f)(2)(xxvi) are considered in the design of the CVCS.

### 9.3.4.2 System Description

#### 9.3.4.2.1 General Description

**Chemical and Volume Control System**

Table 9.3.4-1 provides major CVCS and MHS components and design parameter values.

Reactor coolant flow to the CVCS is discharged from the RCS downcomer. The coolant then flows to the CVCS regenerative heat exchanger (RHX) where the temperature is reduced. Flow continues to the CVCS non-regenerative heat exchanger (NRHX) where the temperature is further reduced to a level compatible with the resin temperature requirements for the ion exchangers. After cooling in the NRHX, the flow continues to the ion exchangers and reactor coolant filters for cleanup. After it exits the purification leg, flow may be partially diverted for sampling by the PSS, sent to the liquid radioactive waste system (LRWS) for letdown of RCS inventory, or directed to the CVCS recirculation pumps for return to the RCS.

The CVCS makeup pumps provide makeup to the RCS. The desired boron concentration of makeup is achieved based on the flow proportions of the demineralized water system (DWS) and BAS supply lines with known boron concentrations. The CVCS makeup pumps discharge into the CVCS injection line downstream of the recirculation pumps. The injection line is routed to the RHX where the makeup and recirculation flow recovers heat from the letdown stream before being supplied to the RPV. The CVCS injection line is routed to the RCS riser, upstream of the steam generators, and to the pressurizer spray line.

Section 1.2, General Plant Description, provides drawings depicting the locations of CVCS equipment within the Reactor Building (RXB).

**Module Heatup System**

The major components of the MHS are the module heatup heater and the MHS booster pump. During RCS heating, RCS injection flow downstream of the RHX flows through the booster pump and heater. The MHS provides heat to one NPM at a time. The MHS can be used during shutdown to maintain RCS flow if decay heat is insufficient. The plant control system (PCS) provides monitoring, alarms, controls, and instrumentation power for MHS equipment.

**Boron Addition System**

The BAS mixes and stores borated water batches for use as reactor coolant makeup by the CVCS, or as makeup pool water by the PCWS. The BAS equipment and valves are located in the RXB. The BAS piping extends from the supply pumps to each CVCS. Table 9.3.4-2 provides major BAS components and design parameter values.

The BAS provides borated water to the CVCS over the fuel cycle and during shutdown and startup operations. The BAS storage capacity supports a shutdown of all NPMs to an RCS pressure and temperature of 250 psia and 100 degrees F, including one NPM with the control rod assembly with the highest reactivity worth held in the fully withdrawn position. The system capacity calculation assumes that the remaining NPMs have all rods inserted and do not require an increase in boron concentration, and that the NPMs are conservatively distributed through fuel cycles.

The BAS includes one batch tank and one storage tank. There is no safety requirement to maintain a specific quantity of borated water in reserve, but the minimum boron concentrations in the boric acid storage tank and batch tank, listed in Table 9.3.4-2, support shutdown of the NPMs within the described limitations.

The BAS stores and transports borated water mixtures with a boron concentration of approximately 4370 ppm, which is soluble in water down to 32 degrees F. The minimum ambient temperature of the RXB, where the BAS equipment is located, is 50 degrees F, so the BAS does not require additional heating to prevent precipitation.

#### 9.3.4.2.2 Component Descriptions

**Chemical and Volume Control System Makeup Pumps**

Each CVCS includes two makeup pumps that supply the RCS with makeup coolant and control RCS boron concentration by injecting borated water or demineralized water. Check valves and relief valves on the discharge of each pump prevent reverse flow and protect against over-pressurization. Pulsation dampeners on the discharge of each makeup pump reduce pressure pulsation effects of the positive displacement pumps.

**Chemical and Volume Control System Recirculation Pumps**

Each CVCS includes two recirculation pumps that circulate reactor coolant through the purification equipment, and to the MHS heater during startup. The pumps operate at full RCS pressure and normally at lower temperatures than the RCS due to NRHX cooling. During normal recirculation, a single pump provides recirculation flow with the other pump in standby. The standby recirculation pump starts automatically if the running pump trips on high discharge pressure. Check valves at the pump outlets prevent coolant back flow to the purification equipment. The pumps drain to the radioactive waste drain system (RWDS).

**Chemical and Volume Control System Regenerative Heat Exchanger**

Each CVCS includes an RHX assembly. The RHX is sized to maximize thermal efficiency of the CVCS during normal purification conditions. The RHX has vent and drain connections to the RWDS.

**Chemical and Volume Control System Non-Regenerative Heat Exchanger**

Each CVCS includes an NRHX that provides the second stage of cooling by decreasing the temperature of coolant entering the purification equipment to a level compatible with the ion exchange resin. The reactor component cooling water system (RCCWS) provides cooling for the NRHX. To minimize reactor coolant heat loss, a control valve adjusts RCCWS supply to the NRHX based on the outlet temperature of the CVCS. A pressure relief valve on the cooling side of the heat exchanger protects against over-pressurization and discharges to the RWDS.

**Chemical and Volume Control System Ion Exchangers and Purification Equipment**

Four ion exchanger vessels (two mixed bed, one auxiliary, and one cation bed) provide for CVCS purification and chemistry control of reactor coolant. The CVCS mixed bed ion exchangers are redundant vessels that are normally filled with resin saturated with lithium and boron. One mixed bed ion exchanger is normally in service and the other is in standby. These ion exchangers can be operated one at a time or in parallel, but not in series. The CVCS flow can be routed through the cation bed ion exchanger, to remove lithium for pH reduction, as needed. The auxiliary ion exchanger provides flexibility to maximize resin use and to function as an alternate method of boron removal near the end of the fuel cycle. A bypass line provides a flow path to divert flow around the ion exchangers on a high temperature signal from NRHX outlet instrumentation to protect the ion exchanger resins from damage. The ion exchangers reside in concrete shielded cubicles.

Piping and valves allow sluicing and flushing of the resin in the CVCS ion exchangers. Each of the CVCS ion exchangers and resin traps includes differential pressure measurement to identify the need for maintenance or operator action.

**Chemical and Volume Control System Reactor Coolant Filters**

Reactor coolant filters downstream of the resin traps further purify the reactor coolant. Only one filter is normally in service, and each filter has differential pressure measurement to identify the need to swap to a standby filter. The filters reside in concrete shielded cubicles.

**Chemical and Volume Control System Chemical Addition Tank**

Each CVCS includes a chemical addition tank upstream of the makeup pumps for adding chemical solutions to the RCS.

**Chemical and Volume Control System Expansion Tank**

The CVCS expansion tank provides pressure control during operation of the CVCS in recirculation mode, when it is isolated from the NPM. The expansion tank has a relief valve to protect against over-pressurization. The expansion tank connection to the CVCS piping has double isolation valves with pressure indication and a drain valve in between.

**Chemical and Volume Control System Makeup and Module Isolation Valves**

The common DWS and LRWS supply line to the CVCS makeup pumps includes two CVCS demineralized water supply isolation valves in series. These valves are designated as Seismic Category I per Regulatory

Guide (RG) 1.29. The valves close on a module protection system signal to prevent or terminate an inadvertent boron dilution event.

The CVCS includes module isolation valves on the injection line to the RCS and the discharge line from the RCS. These valves close to allow bypass of the NPM and place the CVCS in the recirculation mode of operation.

**Module Heatup Heater**

The NPMs share a module heatup heater for the heatup of reactor coolant at startup. The MHS heat addition develops natural circulation in the NPM at startup due to the CVCS injection location in the RPV main riser and suction and discharge location in the downcomer. In order to detect CVCS to MHS inter-system leakage, each interface between a module's CVCS and the MHS includes double isolation valves, with pressure indication and a drain valve between the valves.

**Boron Addition System Boric Acid Hopper**

The BAS boric acid hopper, a skid-mounted assembly, receives boric acid powder and delivers it into the top of the batch tank. Instrumentation and controls provide for measuring the correct amount for the desired solution.

**Boron Addition System Boric Acid Batch Tank**

The BAS boric acid batch tank produces borated water from demineralized water and dry boric acid powder delivered by the hopper. The tank has a tank mixer to facilitate dissolution of the acid, and instrumentation for control and monitoring of tank level.

**Boron Addition System Boric Acid Transfer Pump**

The BAS boric acid transfer pump recirculates the solution of borated water in the batch tank to facilitate mixing and accurate sampling and transfers the contents of the batch tank to the storage tank.

**Boron Addition System Boric Acid Storage Tank**

The BAS includes one boric acid storage tank (BAST) to store borated water for use by the CVCS and PCWS. The tank has instrumentation to monitor level locally and in the main control room (MCR).

**Boron Addition System Boric Acid Supply Pumps**

Boric acid supply pumps supply borated water to the CVCS and PCWS. The pumps normally supply borated water from the BAST, though the pumps can draw from either the BAST or the batch tank.

#### 9.3.4.2.3 System Operation

The CVCS is used during normal operations except for refueling when the NPM is disconnected from the CVCS. The CVCS establishes the boron concentration necessary to make mode changes and to modulate reactor power. The CVCS has sufficient makeup and letdown capacity to supply borated water to the RCS and maintain RCS water inventory within the allowable pressurizer level range for normal modes of operation.

The normal operating mode of the MHS is RCS heating. During times when the MHS is not required for service the system is isolated from the CVCS by the two isolation valves on each supply and return line. The fail-closed double isolation valves between each MHS to CVCS interface are de-energized when the MHS is not in use for an NPM.

Borated water supply from the BAS to the CVCS, then into the RCS, is used to add negative reactivity to the core during normal operations. The boron concentration is increased by discharging reactor coolant to the LRWS while making up coolant with borated water from the BAS.

**Chemical and Volume Control System Normal Operations**

The normal modes of operation for the CVCS are as follows:

- RCS heating using MHS
- coolant purification
- chemistry control
- chemical shim adjustment
- volume control
- pressurizer spray
- pressurizer venting

These CVCS normal operating modes can be summarized as RCS heating mode and chemical and volume control mode. RCS heating mode using the CVCS and MHS is utilized when the decay heat from the core is inadequate to heat the coolant to startup temperatures or inadequate to generate the minimum required RCS flow. The chemical and volume control mode is responsible for purifying the reactor coolant, adjusting reactor coolant chemistry (including boron concentration), providing makeup and letdown for coolant volume changes, and providing pressurizer spray flow.

<u>Reactor Coolant System Heating Using Module Heatup System</u>

The MHS heats the RCS to assist in developing natural circulation through the core before nuclear heat addition. The action of injecting high temperature water into the riser compared to the cooler water in the downcomer of the RPV initiates RCS flow. The heat addition of the MHS heater is also sufficient to initiate heat removal via feedwater in the steam generators and maintain the required RCS flow needed to transition to nuclear heat.

During the heatup, operators draw a steam bubble in the pressurizer to replace the nitrogen gas used to pressurize the RCS. The RPV high point degasification line provides a vent path for the nitrogen to the LRWS along with some amount of vaporized reactor coolant.

During startup, the CVCS develops the required differential pressure to close the emergency core cooling system valves. Section 6.3, Emergency Core Cooling System, provides additional information on the emergency core cooling system.

Coolant Purification

Reactor coolant system purification is achieved by ion exchangers and reactor coolant filters in the CVCS. A single CVCS recirculation pump operates for normal continuous reactor coolant purification in the chemical and volume control mode. Normally the purification line is configured with one mixed bed ion exchanger, one resin trap and one reactor coolant filter in service. Inlet isolation valves block flow to other standby purification components, but the components are kept filled and pressurized so that they are ready for service, if needed. The standby mixed bed ion exchanger may be placed in service if the operating ion exchanger resin is exhausted or to address other operational conditions. The cation bed ion exchanger is typically bypassed, but may be placed in service to remove lithium and control the concentrations of cesium-137 and other isotopes generated by potential fuel leaks. Purification performance is determined through grab sample analysis. High differential pressures across purification components or reduced purification performance indicates the need to place the standby purification components into service.

Chemistry Control

The pH of the reactor coolant is increased by adding solutions of lithium hydroxide to the chemical addition tank in the makeup line. The desired amount of lithium hydroxide is placed in the tank, the tank is filled with demineralized water, and makeup flow is initiated to inject the solution. The pH of the reactor coolant is decreased by removing lithium ions, which is achieved by routing purification flow temporarily through the cation bed ion exchanger.

Personnel add hydrazine to the RCS early in the startup process to scavenge dissolved oxygen to below the levels described in Section 5.2.3, Reactor Coolant Pressure Boundary Materials. Personnel prepare hydrazine solutions in the chemical addition tank and inject them with the makeup pumps according to the same procedure described for pH control. For oxygen control during normal reactor operation, personnel introduce gaseous hydrogen from a compressed hydrogen source. Hydrogen addition quantities are verified by monitoring pressure of the compressed hydrogen source. The hydrogen injection pressure regulating valve ensures an appropriate rate of hydrogen addition. Personnel can add argon from a compressed source to support primary-to-secondary leak rate determinations.

To reduce radiation fields and reduce stress corrosion crack initiation rates, personnel add zinc using the chemical addition tank at the beginning of the fuel cycle. Continuous zinc injection or further additions to replace the zinc that is removed by the ion exchangers maintains the desired zinc concentration. Personnel add zinc before high temperatures are reached during the startup of the reactor to ensure that it is well incorporated into the oxide films of the wetted surfaces.

Reactor coolant chemistry is monitored through continuous analysis by the PSS or grab sample. Reactor coolant chemistry levels may decrease throughout the fuel cycle due to sampling or makeup and letdown required for routine boron dilutions. Periodic chemical additions may be required throughout the fuel cycle.

Mechanical degasification of reactor coolant is achieved by letting down reactor coolant through the normal LRWS letdown path, then LRWS and GRWS removes the unwanted gases. Makeup of the reactor coolant from the DWS, BAS or degassed LRWS recycle supply maintains reactor coolant inventory. This process reduces the hydrogen concentration of reactor coolant at shutdown before NPM disassembly. The RPV high point degasification line aids in mechanical gas removal, and is the primary method for removing noncondensable gases that accumulate in the pressurizer gas/vapor space.

Chemical Shim Adjustment

The CVCS adjusts the boron concentration in the RCS to compensate for changes in reactivity over the fuel cycle. The CVCS also provides the required boration for normal shutdown. To increase the boron concentration, the makeup pumps inject borated water from the BAS and letdown flow is discharged to the LRWS.

The boron concentration of the RCS is decreased by adding demineralized water from the DWS with the makeup pumps while discharging coolant to the LRWS. Routine incremental boron concentration dilution of the RCS by the CVCS is performed by operator action or permission. Operators or the module control system (MCS) propose a dilution rate and quantity, which is calculated and shown to preserve shutdown margin, to achieve a final RCS boron concentration in a reasonable time period based on the initial concentration. Near the end of the fuel cycle, a CVCS ion exchanger filled with resin that is not saturated with boron can lower the RCS boron concentration. This capability reduces the need for RCS dilutions that require increasingly greater volumes of makeup and letdown fluid near the end of the fuel cycle.

Volume Control

During normal reactor operation, the CVCS maintains the required volume of coolant in the NPM as indicated by the pressurizer liquid level instrumentation.

The pressurizer level is maintained in its operating band by operator permissive action or manual operator action to initiate makeup or letdown to the LRWS. Automatic letdown to LRWS is also provided but automatic makeup is not provided to avoid the masking of leaks. If letdown flow is higher than a predetermined setpoint, letdown automatically isolates.

Pressurizer Spray

The CVCS supplies flow to the pressurizer spray nozzles to decrease pressurizer pressure. If pressurizer pressure rises beyond the normal operating band, the spray valve opens to supply the spray nozzles with subcooled coolant.

Pressurizer Venting

During normal operations, pressurizer venting using the RPV high point degasification line may be performed periodically if noncondensable gas build-up is significant enough to reduce the effectiveness of pressurizer spray or if required for RCS chemistry control. Pressurizer venting is also used during NPM shutdown to remove noncondensable gases and accelerate hydrogen removal from the RCS.

**Boron Addition System Normal Operations**

The BAS performs multiple functions during normal operations including batching, mixture transfer, storage, supply, and tank sampling.

Batching

An operator uses the PCS to place the batch tank in batch mode, which allows the operator to perform the steps necessary to prepare a batch of borated water. Personnel sample contents of the batch tank to ensure boron concentration is acceptable before release for plant usage.

Mixture Transfer and Storage

An operator uses the PCS to place the batch tank in transfer mode to transfer borated water from the batch tank to the BAST, or supply it to the BAS supply pumps.

Supply

An operator uses the PCS to place the boric acid supply pumps into an automatic supply mode to supply borated water to the CVCS.

Tank Sampling

The discharge of the boric acid transfer pump and the boric acid supply pumps include a sample port to facilitate sampling of the mixture in the BAS batch and storage tanks.

**Chemical and Volume Control System Off-Normal Operations**

Features in the CVCS provide monitoring for system leakage. The cubicles that house the ion exchangers, filters, and resin traps have level switches to detect leakage from those components. The expansion tank has a level transmitter to provide indication of system leakage. The CVCS discharge, injection, makeup, and letdown lines have flow, temperature, and pressure indication for obtaining mass flow rates, which can be used to detect system leakage.

The containment isolation valves (CIVs) on CVCS lines close when specified setpoints for critical parameters are exceeded. Section 6.2, Containment Systems, provides information on the containment isolation function.

The CVCS has automated features that limit the amount and rate of reactivity increase due to an inadvertent boron dilution event. To limit and mitigate inadvertent dilution events, the CVCS incorporates safety-related demineralized water supply isolation valves. Section 7.1, Fundamental Design Principles, describes this safety function.

A radiation monitor on the CVCS discharge line from the RCS, upstream of the RHX, provides CVCS process monitoring and worker protection. Section 11.5, Radiation Monitoring, provides additional information on this radiation monitor.

### 9.3.4.3 Safety Evaluation

Consistent with GDC 1, CVCS structures, systems, and components (SSC) are designed, fabricated, erected, and tested to appropriate quality standards such that their failure does not impact the function of other safety-related or risk-significant systems. The CVCS is classified as Quality Group D per RG 1.26.

Consistent with GDC 2, safety-related CVCS components are not adversely affected by natural phenomena such as earthquakes or floods. The safety-related CVCS components are housed in the RXB. The demineralized water supply isolation valves are located below grade in the RXB. The RXB protects against natural phenomena such as tornadoes, seismic events and floods, including the probable maximum flood as described in Section 3.4, Flood Design. The CVCS piping and components located in the module bay are designated as Seismic Category II because of their proximity to safety-related components. The MHS and BAS piping and components, and the remainder of piping and components in the CVCS, with the exception of the demineralized water supply isolation valves, are Seismic Category III, but are upgraded to Seismic Category II using the design guidance of RG 1.29 if the routing of piping or the location of components could adversely interact with Seismic Category I SSC during or after a safe shutdown earthquake.

Consistent with GDC 4, the safety-related CVCS components (demineralized water isolation valves) are designed to accommodate normal and abnormal expected and postulated accident scenarios. The CVCS is isolated from the RCS for loss-of-coolant accidents.

General Design Criterion 5 is considered in the design of the CVCS, MHS and BAS. There is no sharing of the CVCS among NPMs. The MHS is shared among NPMs and, when in service for heating a given module, could represent an inadvertent dilution source for other modules operating at a higher boron concentration than the module being heated. There is a potential for leakage between individual CVCS sharing a single MHS, so the CVCS of operating modules not being heated by MHS are isolated from the MHS by two closed valves, with a drain valve and alarmed pressure indication between the valves. An alarm condition results in MCR notification of the need to check the isolation valves for leakage. The BAS is shared among NPMs and is sized and configured to ensure the sharing among NPMs does not preclude the supply of boron, when desired, to any individual NPM. Thus, sharing of the MHS and BAS among NPMs does not impair their ability to perform their intended functions. If an accident occurs in one NPM, sharing of the MHS and BAS does not adversely affect an orderly shutdown and cooldown of the remaining NPMs.

General Design Criterion 14 is considered in the design of the CVCS. The CVCS maintains acceptable purity levels in the reactor coolant through the removal of insoluble corrosion products and dissolved ionic material by filtration and ion exchange. The CVCS provides an interface with the PSS to permit analysis of the chemistry conditions in the RCS. The CVCS is able to correct out of specification chemistry conditions that may over time challenge the material properties of the reactor coolant pressure boundary. Out of specification chemistry in the RCS does not typically require immediate corrective actions except for severe out of specification chemistry conditions (Action Level 3) in the Electric Power Research Institute (EPRI) 3002000505 Pressurized Water Reactor Primary Water Chemistry Guidelines, Reference 9.3.4-1. The EPRI Action Level 2 and Action Level 1 conditions require correction within 24 hours and 7 days, respectively. A CVCS purification flow of 22 gpm allows correction of chemistry impurities from Action Level 2 concentrations to below the Action Level 2 threshold within the 24 hour EPRI guidelines requirement, which is the limiting scenario for correcting a chemical condition.

General Design Criterion 29 is considered in the design of the CVCS and BAS. There is no anticipated operational occurrence or accident for which the CVCS is relied upon to add boron to the RCS and the CVCS is isolated during accident conditions. However, an inadvertent dilution of the RCS by the CVCS is considered an anticipated operational occurrence. The module protection system and the redundant, safety-related demineralized water isolation valves provide a high probability of accomplishing their safety function to prevent or terminate an inadvertent dilution event.

The NuScale design supports an exemption from GDC 33, as described in Section 3.1, Conformance with GDC. The NPM design preserves reactor coolant inventory by isolating containment (including CVCS) at safety setpoints.

Consistent with GDC 60, the CVCS is designed with appropriate interfaces with the PSS, RWDS, GRWS, LRWS, and solid radioactive waste system (SRWS) to control the release of radioactive materials in gaseous and liquid effluents and to handle radioactive solid wastes produced during normal reactor operation. Section 9.3.2, Process Sampling System, Section 9.3.3, Equipment and Floor Drain Systems, and Chapter 11, Radioactive Waste Management System, provide additional information on these interfacing systems.

Vent and drain lines are provided for CVCS and MHS major equipment. The CVCS and MHS vents and drains discharge to the RWDS for collection and processing by the GRWS, LRWS, and SRWS. The BAS does not normally contain radioactive material. The BAS is connected to systems that contain contaminated water during normal operation and, because of the potential for cross contamination, check valves are provided to minimize the potential for cross contamination from connected systems. The BAS discharge paths are to systems that are compatible with receiving contaminated water. The BAS has sample ports if cross contamination is suspected or if testing is desired.

The CVCS and MHS contain radioactive fluid and, consistent with GDC 61, are designed to ensure adequate safety. The CVCS piping is shielded where necessary to minimize radiation levels and system design features ensure that radioactive ion exchange resins are retained in the ion exchange vessels pending controlled transfer of spent resins to the SRWS. Design provisions allow flushing and draining the ion exchangers and transfer lines to the LRWS and RWDS.

The CVCS design includes provisions to maintain occupational radiation exposure as low as reasonably achievable (ALARA) and to comply with 10 CFR 20.1406. The CVCS processes radioactive reactor coolant and is therefore subject to a radiation control program. The CVCS components that have elevated levels of radiation are the ion exchangers, the reactor coolant filters, the resin traps, the RHX, the NRHX, and the module discharge piping. Concrete cubicles provide shielding for the CVCS ion exchanger vessels, reactor coolant filters, and resin traps. The RHX and NRHX are located in shielded rooms. The bioshield above the module and pipe chase enclosures provide shielding for the module discharge piping. The CVCS has several features to reduce radiation exposure to ALARA levels.

- Steel alloys with low cobalt content are specified for materials of construction for components containing reactor coolant to minimize the generation of Cobalt-60.
- Sluicing of ion exchanger resin is done remotely (outside of the cubicles), to remove resins and flush the vessels.
- Control panels and valve stations for CVCS equipment have permanent shielding to limit worker exposure.
- Manual valves on pipes filled with reactor coolant have valve operators extending outside of shielded barriers to minimize dose for manual actions.

- Components that are not radiological sources (hydrogen bottles, makeup pumps, and chemical addition tanks) that require periodic access are separated from radiological sources.

Section 12.1, Ensuring that Occupational Exposures are ALARA, provides additional information on design features that support keeping occupational exposures ALARA. Section 12.3, Radiation Protection Design Features, provides information on the design features of the CVCS that demonstrate compliance with 10 CFR 20.1406.

The DWS supplies the BAS through a direct connection to the BAS batch tank and a hose connection in the storage tank area that supplies demineralized water for recirculation and flushing of the tanks and piping. The water used for recirculation and flushing is discharged to the LRWS or RWDS, as appropriate.

With respect to 10 CFR 50.34(f)(2)(xxvi) (Item III.D.1.1 in NUREG-0737), the CVCS is designed to be as leak free as practical. The system is in continuous use during normal operation and is provided with leakage detection instrumentation. During accident conditions, the CVCS is isolated from the RCS by the CIVs and is not needed to circulate primary coolant outside of containment. In addition, there are no safety systems that circulate reactor coolant outside of containment.

Consistent with SECY-93-087, Item I.F, the design of the CVCS reduces the possibility of a loss-of-coolant accident (LOCA) outside containment. The CVCS is the only system with connections to the RCS and piping that runs outside containment. Therefore, the CVCS is the total scope for intersystem LOCA consideration in the design. The CVCS containment isolation valves meet the SECY-93-087 recommendations for pressure isolation valves; position indication is provided to the control room and they have the capability for leak testing and are periodically leak tested as part of the Inservice Testing Program, which is discussed in Section 3.9.6. Although intersystem LOCAs are prevented by the CVCS containment isolation valves, the CVCS recirculation loop, including the purification bypass line, are designed to withstand RCS design pressure. The CVCS letdown line and CVCS reactor vessel high point degasification line connections to the liquid radwaste system are designed to withstand RCS design pressure up to the degasifier tank where design pressure is reduced and overpressure protection is provided. The PSS lines connected to the CVCS are designed to withstand RCS design pressure. The makeup line and components upstream of the CVCS makeup pumps are the only portion of the CVCS that is not designed to withstand RCS design pressure. However, the CVCS makeup pumps are positive displacement type with integral check valves; in addition, a check valve between the makeup pumps' discharge and the injection tee into the recirculation loop minimizes potential reactor coolant leak back to the low pressure portion of the CVCS makeup line. The CVCS design incorporates pressure and level alarms that provide the control room with indication of adverse conditions.

### 9.3.4.4 Instrumentation Requirements

**Chemical and Volume Control System Controls**

The MCS provides monitoring and control for the CVCS and receives input from CVCS nonsafety instrumentation.

The CVCS design provides controls to keep reactor coolant within required chemistry limits. The CVCS makeup and letdown controls are used to maintain the RCS inventory within the prescribed operating range as indicated by pressurizer liquid level instrumentation.

The primary CVCS controls for continuous purification of reactor coolant are speed control of the recirculation pumps and heat removal regulation of the NRHX, provided through CVCS temperature feedback to the RCCWS control valve.

The MCS provides automatic pressurizer spray actuation in response to high pressurizer pressure indication. Operators can also manually control pressurizer spray to lower reactor vessel pressure or to perform a chemistry adjustment of the RCS that requires increased flow through the pressurizer to mix with the rest of the RCS fluid.

The design of the CVCS provides controls to manage reactor coolant chemistry other than boron concentration. The CVCS chemistry controls include addition of lithium hydroxide, zinc acetate dihydrate, hydrazine, gaseous hydrogen, and hydrogen peroxide.

The CVCS design provides controls to bypass some or all flow around the NRHX, and purification equipment. Remote manual control of a control valve allows for a range of bypass flow rates. This bypass is primarily used during startup to divert some of the flow around the NRHX to provide constant flow to the recirculation pump suctions, while still purifying a portion of the flow and letting down to LRWS. This bypass is used when necessary to keep CVCS injection temperatures above a defined threshold to limit thermal stresses on NPM components.

The CVCS design provides controls to vent noncondensable gases from the pressurizer through a pressure regulating valve to the LRWS. The normally closed RPV high point degasification line CIVs are opened for this operation.

**Chemical and Volume Control and Module Heatup System Alarms**

The MCS provides CVCS and MHS alarms to the MCR. The CVCS has alarms associated with flow, temperature, pressure, RCS leakage, and radioactivity. There are alarms for high differential pressure across each ion exchanger, resin trap, and reactor coolant filter. Module heatup system pressure and temperature instrumentation in the heat exchanger outlet alarms when coolant temperature approaches saturated conditions. There are no safety-related CVCS or MHS instrumentation indications and therefore, there are no CVCS or MHS generated safety-related alarms.

### 9.3.4.5 Reference

9.3.4-1 Electric Power Research Institute "Pressurized Water Reactor Primary Water Chemistry Guidelines," EPRI #3002000505, EPRI, Palo Alto, CA, 2014.

## Table 9.3.4-1: Chemical and Volume Control System/Module Heatup System Major Equipment with Design Data and Parameters

| Component Description | Design Parameter | Value | I&C Interface |
|---|---|---|---|
| CVCS Makeup Pumps | | | Yes |
| | Type | Positive displacement | |
| | Design pressure | 2185 psig | |
| | Design temperature | 155 °F | |
| | Capacity | 20 gpm | |
| | Variable speed | Yes | |
| | Material | Stainless steel | |
| CVCS Recirculation Pumps | | | Yes |
| | Type | Centrifugal | |
| | Design pressure | 2505 psig | |
| | Design temperature | 575 °F | |
| | Capacity | 25 gpm (with MHS aligned) | |
| | Variable speed | Yes | |
| | Material | Stainless steel | |
| MHS Booster Pump | | | Yes |
| | Type | Centrifugal | |
| | Design pressure | 2835 psig | |
| | Design temperature | 575 °F | |
| | Capacity | 99 gpm | |
| | Variable speed | No | |
| | Material | Stainless steel | |
| CVCS Reactor Coolant Filters | | | No |
| | Design pressure | 2188 psig | |
| | Design temperature | 200 °F | |
| | Material | Stainless steel | |
| CVCS Resin Traps | | | No |
| | Design pressure | 2188 psig | |
| | Design temperature | 200 °F | |
| | Material | Stainless steel | |
| CVCS Regenerative Heat Exchanger | | | No |
| | Type | Shell and tube (six vessels in series) | |
| | Tube/shell design pressure | 2505 psig / 2505 psig | |
| | Material | Stainless steel | |
| CVCS Non-Regenerative Heat Exchanger | | | No |
| | Type | Shell and tube (two vessels in series) | |
| | Tube/shell design pressure | 2188 psig / 230 psig | |
| | Tube/shell design temperature | 575 °F / 200 °F | |
| | Material | Stainless steel | |
| MHS Module Heatup Heater | | | Yes |
| | Type | Electric | |
| | Design duty | 3 MW (variable) | |
| | Design Pressure | 2835 psig | |
| | Design temperature | 575 °F | |
| | Material | Stainless steel | |

**Table 9.3.4-1: Chemical and Volume Control System/Module Heatup System Major Equipment with Design Data and Parameters (Continued)**

| Component Description | Design Parameter | Value | I&C Interface |
|---|---|---|---|
| CVCS Expansion Tank | | | No |
| | Design pressure | 2188 psig | |
| | Design temperature | 200 °F | |
| | Capacity | 100 gal | |
| | Material | Stainless steel | |
| CVCS Ion Exchangers (Mixed Bed, Cation Bed, Auxiliary) | | | No |
| | Design pressure | 2188 psig | |
| | Design temperature | 200 °F | |
| | Required resin volume | 8.8 $ft^3$ | |
| | Material | Stainless steel | |

## Table 9.3.4-2: Boron Addition System Major Equipment with Design Data and Parameters

| Component Description | Design Parameter | Value |
|---|---|---|
| Boric Acid Batch Tank | | |
| | Design pressure | Atmospheric |
| | Design temperature | 155 °F |
| | Capacity | 6000 gallons |
| | Minimum boron concentration | 4000 ppm |
| Boric Acid Transfer Pump | | |
| | Design pressure | 230 psig |
| | Design temperature | 155 °F |
| | Capacity | 145 gpm |
| | Variable speed | No |
| Boric Acid Storage Tank | | |
| | Design pressure | Atmospheric |
| | Design temperature | 155 °F |
| | Capacity | 19,000 gallons |
| | Minimum boron concentration | 4000 ppm |
| Boric Acid Supply Pumps | | |
| | Design pressure | 230 psig |
| | Design temperature | 155 °F |
| | Capacity | 66 gpm |
| | Variable speed | Yes |

## Table 9.3.4-3: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| CVCS, Chemical and Volume Control System | | | | | |
| All components (except those listed below): | RXB | B2 | None | D | III |
| Demineralized water supply isolation valves | RXB | A2 | None | D | I |
| Hydrogen bottle | RXB | B2 | RG 1.189 | D | II |
| • Spool piece vent valves<br>• Instrument root valves<br>• CVC degasification line flexible hose<br>• Instrumentation and mechanical ball joints (in module bay) | RXB | B2 | None | D | II |
| BAS, Boron Addition System | | | | | |
| All components | RXB | B2 | None | D | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

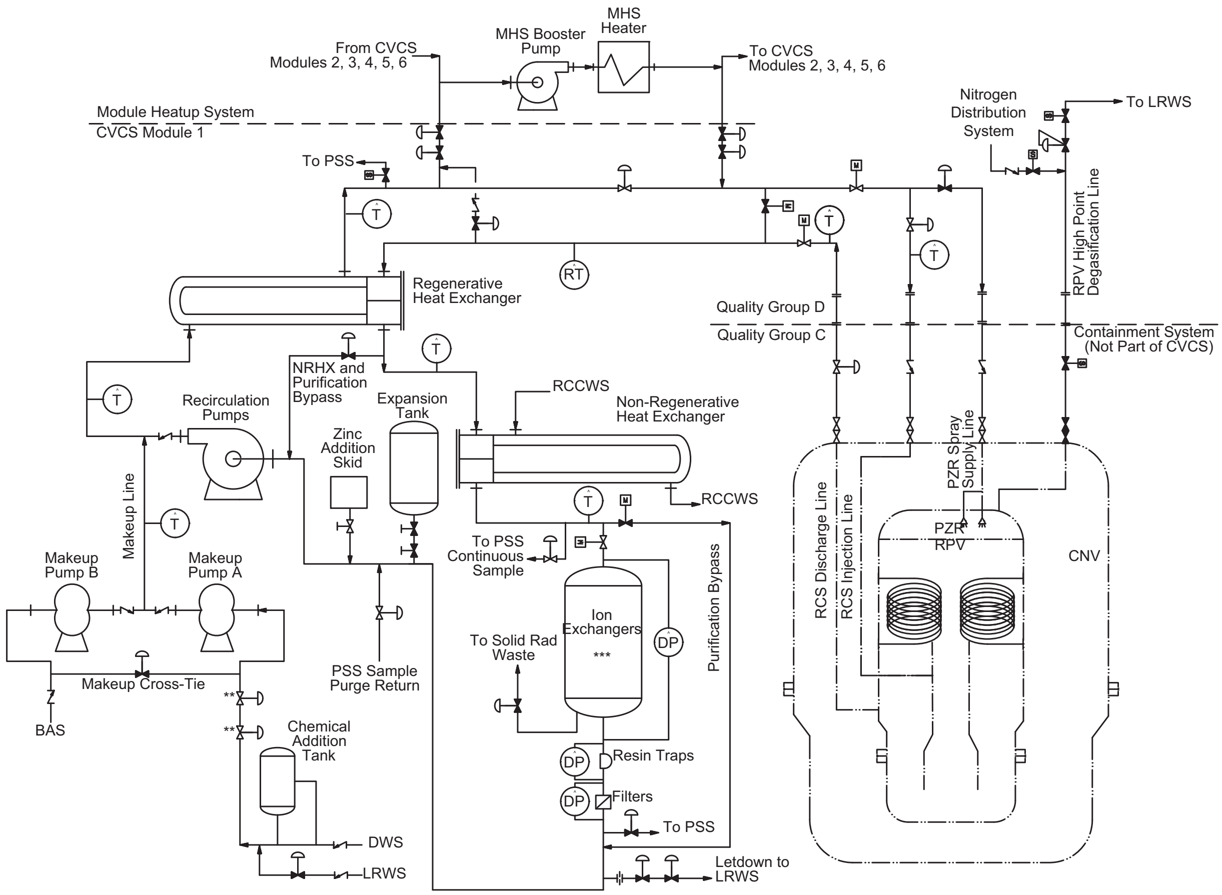
Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that do not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

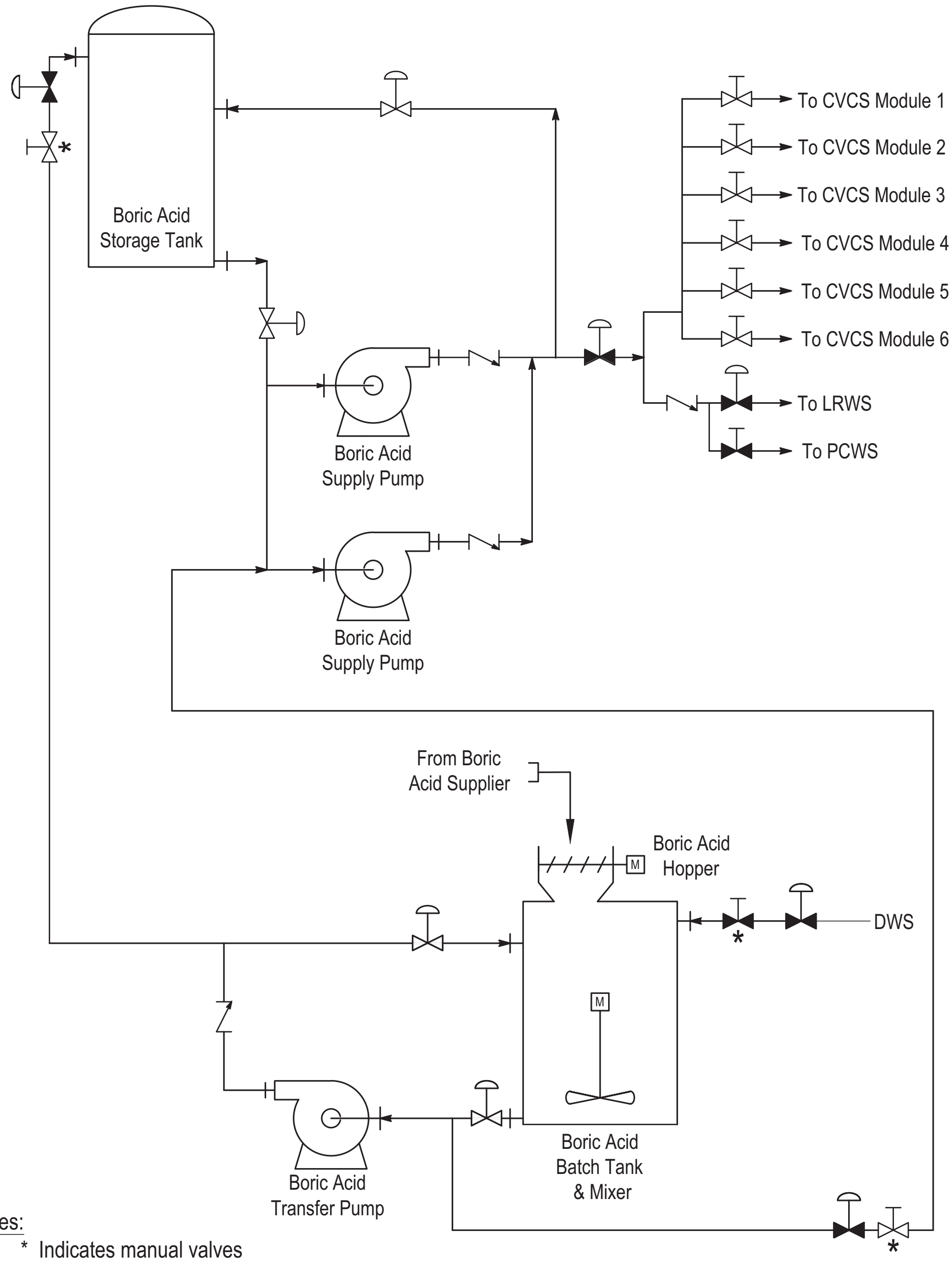
# Figure 9.3.4-1: Chemical and Volume Control System Diagram

(Chemical and Volume Control System Module 1 with Module Heatup System Shown)




NOTES:
1.) ** Safety Related Demineralized Water isolation valve.
2.) *** Quantity four ion exchangers as follows: 2 mixed bed, 1 auxiliary, 1 cation.
3.) Simplified diagram - not all equipment shown.

**Figure 9.3.4-2: Boron Addition System Diagram**




Notes:

1.) * Indicates manual valves under administrative control to minimize inadvertent dilution risk.

2.) Simplified diagram - not all equipment shown

### 9.3.5 Standby Liquid Control System

The standby liquid control system is applicable only to boiling water reactor designs. The design is a pressurized water reactor, and therefore, this section is not applicable.

## 9.3.6 Containment Evacuation System

The containment evacuation system (CES) removes and analyzes noncondensable gases and water vapor from the containment vessel (CNV) free volume.

The functions of the CES include

- establishing and maintaining a vacuum in the CNV during NuScale Power Module (NPM) operation by removing noncondensable gases from the CNV.
- measuring CNV pressure during NPM operation with pressure instruments on the CES vacuum pump suction line to monitor leakage into the CNV.
- monitoring radioactivity levels in the noncondensable gas removed from the CNV and, depending on the radioactivity level in the gas, either filtering and discharging the gas through the Reactor Building HVAC system (RBVS) plant exhaust stack or transferring the gas to the gaseous radioactive waste system (GRWS).
- supporting the process sampling system (PSS), as described in Section 9.3.2, Process Sampling System, by providing a suction and return path for monitoring of hydrogen and oxygen concentration in the containment atmosphere during normal operations.
- removing water vapor from the CNV during NPM startup and operation and providing a method to condense, collect, and sample the water removed from the CNV before the water is discharged to the radioactive waste drain system (RWDS).
- removing noncondensable gases from the reactor coolant system (RCS), before containment flooding and drain system pump-down of the CNV.
- providing a path for pressurization of the CNV in support of refueling and maintenance operations.

Figure 9.3.6-1 is a system diagram of the CES. Piping from the CES connection flange to the CNV nozzle, including the containment isolation valves, is considered part of the containment system. The containment isolation function is also considered part of the containment system. Section 6.2, Containment Systems, provides information on the containment isolation valves and the containment isolation function.

### 9.3.6.1 Design Bases

The CES does not have safety-related functions and is not required to operate during or after any design-basis accident. The CES does not have safety-related or risk-significant structures, systems, or components. Table 9.3.6-1 identifies SSC classifications for CES.

General Design Criteria 2, 5, and 60 are considered in the design of the CES. The NuScale design supports exemption from 10 CFR 50.34(f)(2)(xiv)(E) as applied to the CES.

### 9.3.6.2 System Description

#### 9.3.6.2.1 General Description

Each NPM is supported by a dedicated CES. The CES establishes and maintains a vacuum in the CNV by removing water vapor and noncondensable gases from the CNV using a vacuum pump that draws gases from the top of the CNV and discharges the gases to the CES condenser. Condensate from the CES condenser gravity drains to a sample vessel before gravity draining to the RWDS. Samples of the noncondensable gases are directed to the PSS for analysis. Operators control the CES from the main control room using the module control system (MCS).

#### 9.3.6.2.2 Component Descriptions

**Vacuum Pump**

To support NPM startup, a CES vacuum pump establishes a vacuum below the saturation pressure of the water inside the CNV during NPM heat up. This action removes residual water left in the CNV following draining. The CES vacuum pumps are capable of maintaining the CNV vacuum at a pressure within specified limits when the reactor is at power, with the maximum leak rate through the reactor recirculation valves, reactor vent valves, and reactor safety valves.

The CES vacuum pumps have remotely-operated suction and discharge valves. The MCS monitors the CES for abnormal conditions, such as high pump suction pressure, high pump discharge temperature, high condenser pressure, and high sample vessel level, and trips the running CES vacuum pump and closes its suction and discharge valves if an abnormal condition is detected.

**Condenser**

The CES for each NPM includes a condenser. Noncondensable gases removed from the CNV and vacuum pump purge gas flow from the condenser past radiation monitors and then continue to either the RBVS plant exhaust stack, after passing through charcoal and high-efficiency particulate air filters, or to the GRWS for processing if CES gaseous process radiation levels exceed specified limits. The CES condenser includes a pressure relief valve that discharges to the RWDS.

**Sample Vessel**

The CES for each NPM includes a containment evacuation sample vessel. The sample vessel includes pressure, temperature, and radiation monitoring instrumentation. The sample vessel is configured to allow grab samples to be collected before the condensate is drained to the RWDS. Grab samples and sample vessel radiation instrumentation provide an indication of the leakage source. A relief valve on the sample vessel relieves to the RWDS.

#### 9.3.6.2.3 System Operation

Containment Draining following Refueling

Operators align the CES to the service air system to pressurize the CNV through the CES containment penetration to provide additional net positive suction head for the containment flooding and drain system pump during CNV draining.

Containment Evacuation and Drying

The CES evacuates the CNV to remove the water that remains after the draining process and to establish the CNV normal operating condition. During initial operation of the CES, the GRWS discharge path is not used because the quantity of air in the CES gaseous process flow exceeds the GRWS capacity. While the CES is operating in this high flow condition, an interlock prevents the automatic transfer to the GRWS due to a gaseous process high radiation condition, using high vacuum pump suction pressure as indication of the high flow condition. As a result, a gaseous process high radiation condition during the initial establishment of CNV vacuum results in a CES isolation.

Containment Vacuum and Reactor Coolant System Leak Detection During Operation

During normal power operation, the CES maintains the CNV below the specified maximum operating pressure by removing water vapor generated by leaks from systems and components inside the CNV. Removing noncondensable gases and water vapor from leaks into the CNV reduces heat transfer from the reactor pressure vessel to the CNV and the reactor pool, and prevents water vapor from condensing and collecting at the bottom of the CNV.

During normal operation, the CES supports three separate methods that can detect leakage into the CNV: CNV pressure, CES sample vessel level detection, and sample vessel radiation monitoring. Two of these methods, CNV pressure and CES sample vessel level detection, can quantify leakage into the CNV.

The CES inlet pressure instrumentation detects changes in containment pressure and correlates that pressure change with an RCS leak rate. The minimum pressure accuracy of the CES inlet pressure instrumentation allows for accurate trending of leakage data and can detect an RCS leak rate of one gpm within one hour with a minimum detectable leak rate of less than 0.05 gpm.

The CES sample vessel level change timing method is based on collecting and quantifying the water vapor removed from the CNV by the CES. The CES vacuum pump removes water vapor from the CNV and discharges the water vapor into the CES condenser, where it condenses and drains to the CES sample vessel. The MCS uses the level instruments on the vessel to calculate and trend the leak rate into the CNV. The MCS applies a correction factor to account for water vapor bypass of the condenser. This method can detect an RCS leak rate of one gpm within one hour with a minimum detectable leak rate of less than 0.05 gpm. If the leak rate exceeds the baseline leak rate, the MCS generates an alarm in the main control room. The sample vessel has the capability to draw grab samples and is equipped to detect radioactivity and actuate an alarm for radioactivity levels that may be an indication of RCS leakage.

Leakage detected and quantified using CES sample vessel level change timing is conservatively treated as unidentified leakage. Leakage detection and quantification using both CNV pressure monitoring and CES sample vessel level change timing assumes the CES vacuum pump removes all water vapor resulting from leaks inside the containment. Limiting plant operation to the domain wherein the combination of CNV pressure and ultimate heat sink temperature preclude condensation inside the CNV prevents condensation and accumulation of water vapor in the bottom of the CNV.

Section 5.2.5, Reactor Coolant Pressure Boundary Leakage Detection, discusses how the design of the CES conforms to Regulatory Guide 1.45.

### 9.3.6.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the CES. The Reactor Building protects the CES from external natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches. The CES inlet pressure instrumentation and its connecting piping, up to and including isolation valves, are designed to Seismic Category I standards, which ensures that these components maintain capability to perform their function during and after a safe shutdown earthquake.

General Design Criterion 5 is considered in the design of the CES. Each NPM is supported by a dedicated CES, and no CES equipment is shared among NPMs.

Consistent with General Design Criterion 60, the CES has the capability to control the release of radioactive materials to the environment during normal operation. Section 11.5, Radiation Monitoring, provides information on the CES radiation monitors.

## Table 9.3.6-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **CES, Containment Evacuation System** | | | | | |
| All components (except as listed below): | RXB | B2 | None | D | II |
| • Containment service air supply valve<br>• Vacuum pump suction and bypass valves<br>• Nitrogen connection isolation valve<br>• Leak test connection valve<br>• Mechanical ball joints (in module bay) | RXB | B2 | None | D | I |
| CE vacuum pump suction pressure transmitter | RXB | B2 | None | N/A | I |
| CE instrumentation (except sample vessel radiation transmitter) | RXB | B2 | None | N/A | II |
| Sample vessel radiation transmitter | RXB | B2 | None | N/A | III |

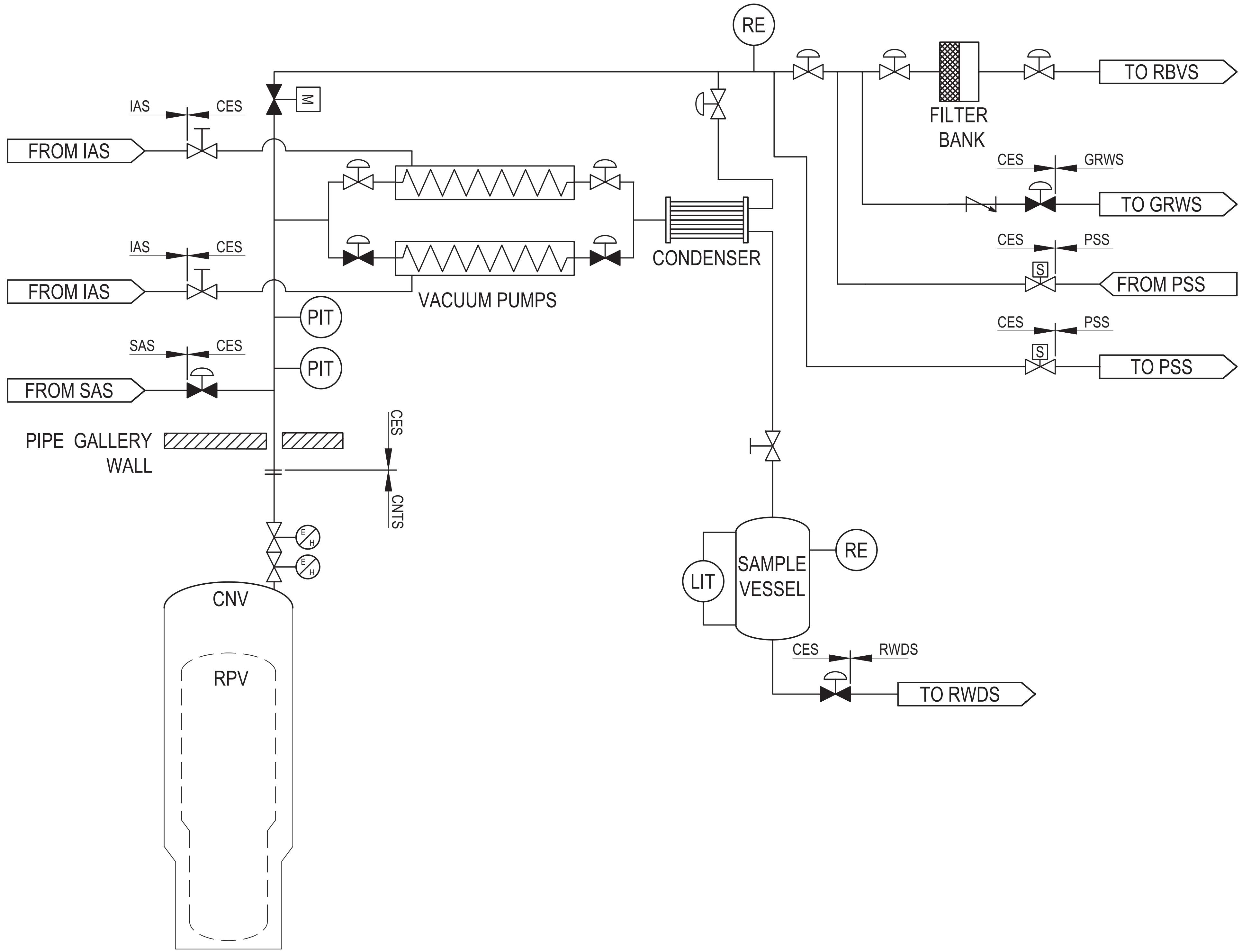
Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

**Figure 9.3.6-1: Containment Evacuation System Diagram**



## 9.3.7 Containment Flooding and Drain System

The containment flooding and drain system (CFDS) transfers liquids between the containment vessel (CNV) free volume and other plant systems.

The functions of the CFDS include

- flooding the CNV with reactor pool water during NuScale Power Module (NPM) cooldown in preparation for refueling operations.
- draining the CNV during NPM startup operations and routing water removed from the CNV to the reactor pool through the pool cooling and cleanup system (PCWS).
- routing noncondensable gases removed from the CNV during NPM startup operations through a high-efficiency particulate air filter to the Reactor Building HVAC system (RBVS) plant exhaust stack for release to the environment, if radioactivity levels are below specified limits.
- providing the capability to add borated water from the reactor pool to the CNV to remove decay heat during a beyond-design-basis accident.

Figure 9.3.7-1 is a system diagram of the CFDS. Piping from the CFDS connection flange to the CNV nozzle, including the containment isolation valves, is considered part of the containment system. The containment isolation function is also considered part of the containment system. Section 6.2, Containment Systems, provides information on the containment isolation valves and the containment isolation function.

### 9.3.7.1 Design Bases

The CFDS does not have safety-related functions, is not risk-significant, and is not required to operate during or after a design-basis accident. Table 9.3.7-1 identifies SSC classifications for CFDS. General Design Criteria 2, 5, and 60 are considered in the design of the CFDS.

### 9.3.7.2 System Description

The CFDS floods a CNV with borated reactor pool water after shutdown in preparation for NPM refueling and drains water back to the reactor pool in preparation for NPM startup. The CFDS can add water to a CNV during a beyond-design-basis event.

The CFDS is shared among the NPMs and includes pumps that can be aligned to either flood or drain the selected NPM.

Flooding and draining an individual CNV uses the same CNV penetration, which is isolated from the CFDS by a CFDS interface valve. An interlock prevents aligning the CFDS to a module and starting a CFDS pump if reactor coolant system wide range hot leg temperature is greater than 350 degrees F. If more than one CFDS interface valve is open, an interlock stops the CFDS pump if one is running, and prevents the CFDS pumps from starting. These features, coupled with administrative controls in plant procedures, prevent inadvertent CFDS makeup to an operating NPM.

The CFDS pump discharges water removed from the CNV during draining to the containment drain separator tank, which allows entrained gases to be vented before the water is returned to the reactor pool. The drain separator tank vents gases to the RBVS exhaust system through a radiation monitor and a high-efficiency particulate air filter.

The CFDS suction line includes an anti-siphon hole above the minimum level for a fuel handling accident listed in Table 9.2.5-1, to prevent siphoning of the ultimate heat sink below this level.

#### 9.3.7.2.1 System Operation

Containment Draining following Refueling

The CFDS drains a CNV following refueling. To facilitate CNV draining, the service air system pressurizes the CNV to provide additional net positive suction head for the CFDS pump.

Containment Flooding in Preparation for Refueling

To flood a CNV, an operator aligns a CFDS pump to take suction from the reactor pool and discharge to the selected NPM. To minimize thermal stress on NPM components, an operator initiates flooding only after reactor pool bulk temperature is above a specified minimum temperature. If an off-normal condition requires flooding a CNV with elevated reactor pressure vessel temperatures, personnel connect a temporary skid-mounted heater to the CFDS flow path using provided connections.

Addition of Coolant Inventory into a Containment Vessel during a Beyond-Design-Basis Event

During a beyond-design-basis event, the CFDS can inject water from the reactor pool into an NPM. When not in operation, the CFDS pump suction lines are normally full and vented to facilitate readiness for emergency containment flooding operations. Before initiating emergency containment flooding, CNV pressure must be low enough for the CFDS pumps to inject into the CNV.

### 9.3.7.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the CFDS. The Reactor Building protects the CFDS from external natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches. The structures, systems, and components that could adversely affect Seismic Category I components are designed to Seismic Category II standards per Regulatory Guide 1.29.

General Design Criterion 5 is considered in the design of the CFDS. The CFDS is not a safety-related system and does not impair the ability of NPMs to perform their safety functions including the ability to mitigate the consequences of an accident on one module and shut down and cool down the remaining modules.

Consistent with General Design Criterion 60, the CFDS has the capability to monitor and control the release of radioactive materials to the environment during normal operation. Liquid removed from the containment returns to the reactor pool through the PCWS, or drains to the radioactive waste drain system, when appropriate. Section 11.5, Radiation Monitoring, provides information on the CFDS radiation monitor on the gaseous discharge line of the CFDS containment drain separator tank.

## Table 9.3.7-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **CFDS, Containment Flooding and Drain System** | | | | | |
| All components (except as listed below): | RXB | B2 | None | D | III |
| • CFD module post accident monitoring return valves<br>• Module vacuum breaker<br>• Reactor pool flow to CFD pump check valve<br>• High point vent isolation valves<br>• Flood and drain interface valve<br>• Interface relief valve<br>• Spool piece vent valve<br>• Mechanical ball joints in the module bay | RXB | B2 | None | D | II |
| Radiation Transmitter | RXB | B2 | None | N/A | III |

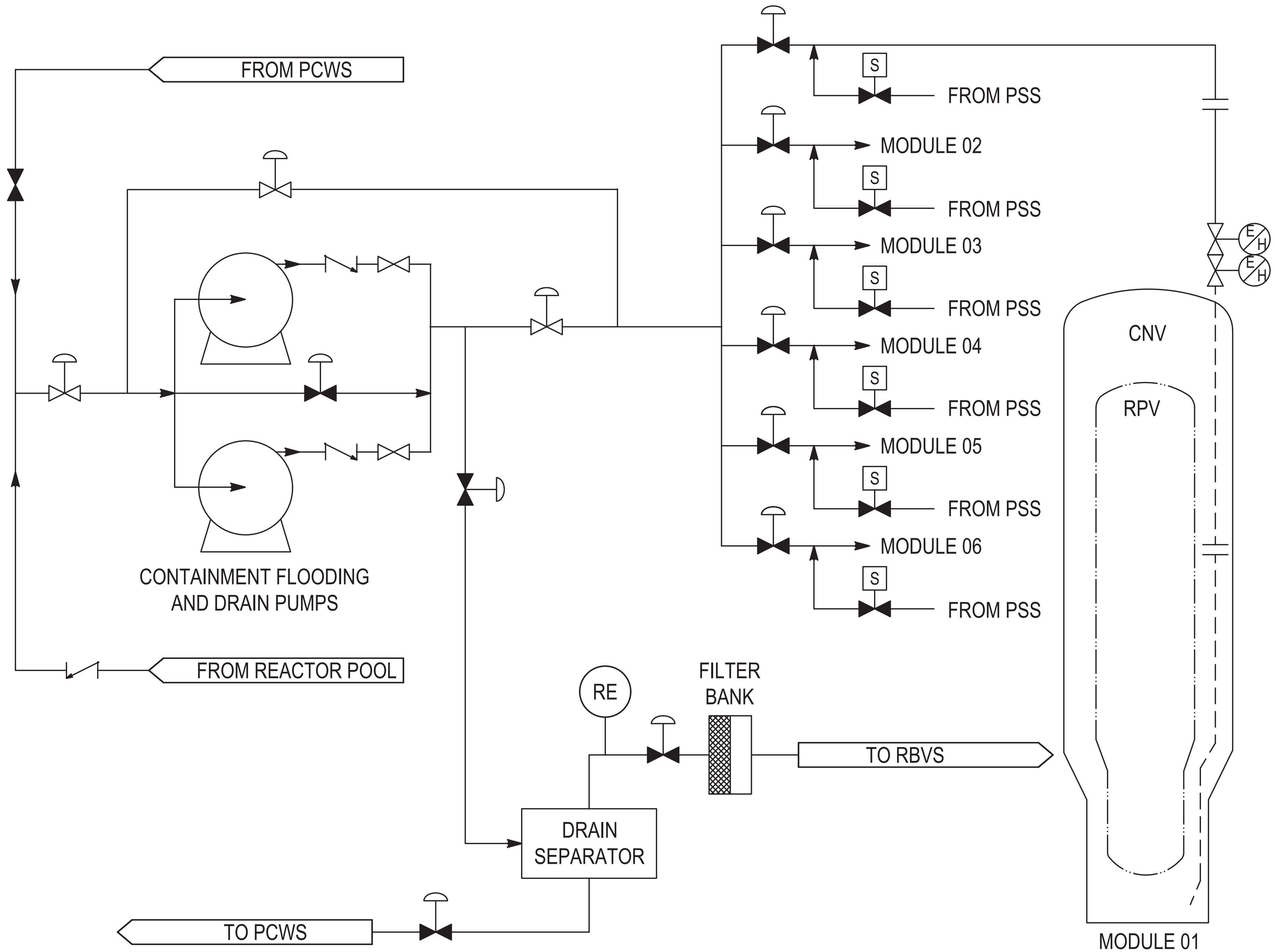
Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation that do not serve a pressure boundary function. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

**Figure 9.3.7-1: Containment Flooding and Drain System Diagram**



# 9.4 Air Conditioning, Heating, Cooling, and Ventilation Systems

## 9.4.1 Control Room Area Ventilation System

The normal control room HVAC system (CRVS) serves the entire Control Building (CRB). The CRVS boundary begins at the air intake on the outside of the CRB and extends to the points of discharge from the CRB.

Under certain postulated conditions the plant protection system (PPS) isolates the control room envelope (CRE) and the control room habitability system (CRHS) provides breathing air to the CRE. Section 6.4, Control Room Habitability, provides additional information on the CRHS.

### 9.4.1.1 Design Bases

The CRVS serves no safety-related functions, is not risk-significant, is not credited for mitigation of design-basis accidents, and has no safe-shutdown functions. Table 9.4.1-1 identifies SSC classifications for CRVS. General Design Criteria 2, 4, and 5, and Principal Design Criterion 19 are considered in the design of the CRVS.

The CRVS maintains the CRE within the temperature and humidity limits needed to support personnel and maintains equipment during normal conditions. The CRHS maintains the environment in the CRE habitable for personnel during abnormal and station blackout conditions when CRVS is unavailable.

### 9.4.1.2 System Description

During normal operation, the CRVS maintains temperature and humidity control within ranges suitable for the comfort of personnel and to prevent degradation of equipment. Because the CRVS has two 100 percent capacity air handling units (AHUs), loss of one AHU does not result in degraded system performance. The standby AHU starts automatically if the operating AHU fails.

Section 3.7.2, Seismic System Analysis, provides information on the seismic classification of the CRB with regard to elevation.

Fire dampers at CRVS duct penetrations through fire barriers maintain the fire-resistance ratings of the barriers. Smoke dampers provide smoke isolation of areas. Combination fire and smoke dampers provide both functions at duct penetrations that require both. A portable fan vents smoke after a fire event, using a connection provided in the common return air ductwork upstream of the AHUs.

The supply, return, and general exhaust ductwork serving the CRE are the only heating, ventilation, and air conditioning penetrations through the CRE. These penetrations include redundant isolation dampers that are located within the CRE to protect CRE occupants from hazardous conditions. These dampers can be closed to isolate the CRE, allowing the CRHS to pressurize and provide breathable air to the CRE. The CRE isolation dampers are qualified to shut tight against CRE pressure in support of the CRHS for maintaining main control room

(MCR) habitability. There are no single active failures that would prevent isolation of the CRE.

The CRVS is normally powered by the low voltage alternating current (AC) electrical distribution system. During a loss of normal AC power, the backup power supply system provides power so that the CRVS can continue to operate.

The air filtration unit (AFU) is used to filter outside air when radioactivity is detected. The AFU includes a charcoal adsorber that is designed, constructed, and tested in accordance with Regulatory Guide 1.140. The charcoal filter bank has a deluge sprinkler connection, which is activated manually. Drains from the AFU are routed to the balance-of-plant drain system.

The CRE isolation dampers are located at the boundary of the CRE. The CRE is located within a portion of the CRB classified as Seismic Category I.

**System Operation**

During normal operation, one AHU operates continuously to provide room temperature, humidity, and pressure control. The general exhaust fan operates continuously. A battery room exhaust fan also operates continuously to prevent the buildup of hydrogen gas in the battery rooms, limiting hydrogen concentration to less than 1 percent by volume.

The CRVS supply air is continuously monitored for smoke by redundant smoke detectors located in the outside air intake duct and a smoke detector downstream of each supply AHU. Redundant radiation monitors in both the outside air intake duct and the CRE supply duct monitor outside air and CRE supply air for airborne radioactivity. Section 11.5, Radiation Monitoring, provides additional information on these radiation monitors.

If high levels of radiation are detected in the CRE supply duct, the PPS isolates the CRE from the outside air intake and surrounding areas (e.g., the technical support center) and initiates the CRHS.

Upon detection of smoke within a specific area served by the CRVS, the fire detection system receives an alarm in the MCR. A main supply AHU fan automatically stops if smoke is detected by the downstream smoke detector.

On a loss of power to both CRVS air handler units or loss of power to the common augmented direct current power system battery chargers, after a ten-minute delay the CRVS isolates the CRE and the PPS actuates the CRHS. System operation following loss of normal AC power does not affect the safety of MCR personnel or performance of equipment needed to safely operate the plant.

### 9.4.1.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the CRVS. The CRE isolation dampers and position switches, and the radiation detectors that initiate the closure of the CRE isolation dampers are classified as Seismic Category I per

Regulatory Guide 1.29. Other portions of the CRVS whose failure in an earthquake could adversely impact MCR equipment are designed to Seismic Category II standards. The CRE isolation dampers are protected from earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches to the extent that the CRB is protected from such events.

General Design Criterion 4 is considered in the design of the CRVS. The CRE isolation dampers perform a required function because they form a portion of the CRE boundary, which allows the CRHS to pressurize the CRE. The CRE isolation dampers are protected from the effects of missiles that may result from equipment failures or tornadoes. The CRB is a mild environment with no potential of a credible missile source as the result of equipment failure. There is no credible source of a high-energy pipe failure within the CRB that could cause loss of function of the CRE isolation dampers. The radiation monitors and smoke detectors located in the outside air intake and downstream ductwork allow the PPS or plant control system to isolate the CRE and the outside air intake as needed in the event of fires, failures, malfunctions, or high radiation.

General Design Criterion 5 is considered in the design of the CRVS. The CRVS serves the MCR, which provides services for all NuScale Power Modules. However, the CRVS does not have a function relative to shutting down a module or maintaining it in a safe shutdown condition. Operation of the CRVS does not interfere with the ability to operate or shut down a module.

Principal Design Criterion 19 is considered in the design of the CRVS. Upon detection of smoke in the outside air duct, the plant control system closes the outside air isolation dampers to isolate the CRB from the environment. The CRVS is then operated in recirculation mode to provide conditioned air to the occupied areas of the CRB, with no outside air being introduced into the building. The CRB is not pressurized in this mode.

In normal operation, the CRVS maintains the MCR at a positive pressure relative to the outside environment (at least 1/8 in. wg). In off-normal conditions, the redundant CRE isolation dampers provide a barrier against the surrounding environment. Section 6.4 addresses compliance with Regulatory Guide 1.78.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the CRVS that demonstrate compliance with 10 CFR 20.1406.

In a station blackout event, the CRE isolation dampers close to form part of the CRE boundary. Section 6.4 describes the CRHS response to a station blackout event.

**Table 9.4.1-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **CRVS, Normal Control Room HVAC** | | | | | |
| All components (except those listed below): | CRB | B2 | None | N/A | III |
| CRE supply and return isolation dampers | CRB | B2 | • RG 1.140<br>• Environmentally Qualified<br>• IEEE 497-2016 (Note 5) | N/A | I |
| Radiation detection instrumentation and associated isolation valves (downstream of charcoal filter unit) | CRB | B2 | • RG 1.140<br>• Environmentally Qualified | N/A | I |
| CRE isolation damper position indicator | CRB | B2 | None | N/A | I |
| Fire dampers MFD-0025 and MFD-0094 | CRB | B2 | • RG 1.189<br>• RG 1.140<br>• Environmentally Qualified | N/A | I |
| Fire damper MFD-0040 | CRB | B2 | • RG 1.189 | N/A | I |
| • Fire and smoke dampers supporting the MCR and fire dampers 00-CRV-MFD-0228 and 00-CRV-MFD-0229<br>• CRV supply air handling units discharge flow elements | CRB | B2 | • RG 1.189<br>• RG 1.140 | N/A | II or III |
| CRV supply air handling unit A/B | CRB | B2 | • RG 1.140<br>• RG 1.189 | N/A | III |
| CRE toilet exhaust bubble tight isolation dampers | CRB | B2 | • Environmentally Qualified<br>• IEEE 497-2016 (Note 5) | N/A | I |
| • CRV supply air handling units A and B discharge smoke detectors<br>• MCR exhaust fire damper | CRB | B2 | RG 1.189 | N/A | III |

**Table 9.4.1-1: Classification of Structures, Systems, and Components (Continued)**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| • Outside supply air, general exhaust, battery exhaust, return air isolation dampers and damper position instrumentation<br>• Outside air isolation dampers<br>• Ductwork (including components associated with outside air intake up to radiation monitors downstream of filter unit)<br>• Radiation monitors (upstream of charcoal filter unit)<br>• CRV air filtration unit<br>• Isolation dampers for CRV filter unit and filter unit bypass<br>• Reheat coil<br>• Supply, return, and makeup balancing dampers<br>• Refrigerant ventilation damper<br>• Mechanical equipment room and corridor differential pressure instrumentation (00-CRV-PDT-1012 and 1085) as well as their root valves<br>• Mechanical equipment room supply, return, and exhaust isolation dampers<br>• Transfer air fire dampers<br>• Spring actuated supply and return fire dampers<br>• CRV supply air handling unit discharge flow transmitters | CRB | B2 | RG 1.140 | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

Note 5: IEEE Std 497-2016 as endorsed by RG 1.97 and implemented as described in Table 1.9-2.

## 9.4.2 Reactor Building and Spent Fuel Pool Area Ventilation System

The Reactor Building HVAC system (RBVS) serves the Reactor Building (RXB), including the pool hall, which contains the reactor pool, refueling pool, spent fuel pool (SFP), dry dock, new fuel storage, and the NuScale Power Modules (NPMs) and their handling equipment. The Reactor Building HVAC system (RBVS) maintains acceptable ambient conditions in the RXB to support personnel and equipment, and controls airborne radioactivity in the area during normal operation and following events that have the potential to release radioactivity in the RXB, such as a fuel handling accident.

The RBVS includes four subsystems: the supply subsystem, the general area exhaust subsystem, the SFP exhaust subsystem, and the module-specific battery room, charger room, instrumentation and control room, and reserved area air handling units subsystem. During normal operation, the supply subsystem provides conditioned and filtered outside air to the RXB. The two exhaust subsystems deliver air to the plant exhaust stack for discharge from the plant. The SFP exhaust flows through a high-efficiency particulate air (HEPA) filter. In addition to air from the RXB, the RBVS general area exhaust subsystem receives exhaust air from the Radioactive Waste Building HVAC system (RWBVS).

### 9.4.2.1 Design Bases

The RBVS is nonsafety-related, not risk-significant, does not perform a function to prevent a design-basis accident, and is not credited to mitigate the consequences of a fuel handling accident or other design-basis accident. Table 9.4.2-2 identifies SSC classifications for RBVS. General Design Criteria (GDC) 2, 5, 60, 61, and 64, and 10 CFR 20.1406 are considered in the design of the RBVS.

To maintain the radiation exposure to operating and maintenance personnel as low as reasonably achievable, the RBVS facilitates maintenance, inspection, and testing in accordance with the guidance in Regulatory Guide (RG) 8.8.

### 9.4.2.2 System Description

The RBVS is generally a once-through system utilizing 100 percent outside air. Exceptions to the once-through air flow path include rooms determined to be radiologically clean and are not designed with once-through flow because they are maintained at positive pressure relative to the surrounding spaces. The main RBVS supply subsystem provides pressurization air for these rooms, which ensures continuous airflow from these areas to areas of potential contamination. The pressurization air provides for a moderate air exchange. The system moves air from areas that are not contaminated or are expected to have low levels of contamination to areas that are likely to be more contaminated. The RBVS maintains air pressure in the RXB below that of the outside environment. Table 9.4.2-1 presents the design conditions for areas in the RXB.

The general area exhaust subsystem collects exhaust air from each level of the RXB, including the battery rooms. The exhaust ducts connect to a main general area exhaust duct. Exhaust from the RWBVS (Section 9.4.3) then joins exhaust from the RBVS. Radiation monitoring is provided in the exhaust ductworks of the RBVS and the RWBVS upstream of the point at which the RWBVS ties into the RBVS exhaust ductwork. The combined exhaust from the RBVS and the RWBVS is distributed to the general area exhaust fans. The general area exhaust fans discharge to the plant exhaust stack. The general area exhaust subsystem includes a standby fan, and each fan can be isolated from the others with dampers to allow inspection, testing, and maintenance with the remaining fans in operation.

The SFP exhaust filter units utilize HEPA filters and charcoal adsorbers to minimize radioactivity contained in the SFP exhaust. The exhaust is normally filtered through the HEPA filters, but also passes though charcoal adsorbers if high radiation is detected upstream of the SFP filter unit. The SFP exhaust subsystem filters the exhaust air to reduce radioactive release to the environment. The SFP exhaust combines with the general area exhaust downstream of the general area exhaust fans, before entering the plant exhaust stack. The SFP exhaust subsystem is designed for continuous operation. The SFP exhaust subsystem includes a standby fan and filter set, and each fan and filter set has isolation dampers that can be closed to isolate the equipment for inspection, testing, and maintenance with the remaining set in operation. Provisions for maintaining the SFP exhaust filter units are in accordance with RG 1.140.

Each NPM bay has an exhaust air vent with a fire damper.

#### 9.4.2.2.1 Component Descriptions

Outdoor air intake openings are equipped with louvers, bird screens, and security barriers to minimize the effects of high winds, rain, snow, ice, and trash on the operation of the system.

Air handling units and selected fan coil units in the RBVS have standby units that automatically start when a running unit trips.

The filtration unit configurations, including housing, internal components, ductwork, dampers, fans, and controls, are designed, constructed, and tested to meet the applicable performance requirements of American Society of Mechanical Engineers (ASME) N509, N510, and AG-1 (Reference 9.4.2-1, Reference 9.4.2-2, and Reference 9.4.2-3) to satisfy the guidelines of RG 1.140. The filtration unit housings are designed so that maximum leakage rates do not exceed the leakage requirements of Section SA of ASME AG-1.

Per RG 1.140, the SFP exhaust filter units include medium efficiency and HEPA prefilters to protect the charcoal filter modules, and final HEPA filters to remove carbon fines before air passes to the exhaust fans and discharges to the plant exhaust stack. The SFP exhaust air filtration units include heating coils to maintain the entering air relative humidity below 70 percent to prevent excessive moisture from degrading the adsorption capacity of the charcoal, per RG 1.140.

The SFP exhaust subsystem exhaust duct and exhaust filter housing are designed to exhibit, on a test, a maximum total leakage rate as defined in Article SA-4500 of ASME AG-1.

Fire dampers at duct penetrations through fire barriers maintain the fire resistance ratings of the barriers. The fire dampers meet the design and installation requirements of Underwriters Laboratories 555 (Reference 9.4.2-7), are in compliance with National Fire Protection Association (NFPA) 90A (Reference 9.4.2-5), and are tested and inspected in accordance with NFPA 80 (Reference 9.4.2-4) and RG 1.189. Smoke dampers are provided for smoke isolation of air handling units, and are tested and inspected in accordance with NFPA 105 (Reference 9.4.2-6). Blast dampers protect safety-related equipment from pressurized fires resulting from aircraft impact. High-energy line break dampers at defined barriers prevent the propagation of released steam to mild environmental areas of the building.

##### 9.4.2.2.2 System Operation

The general area exhaust subsystem maintains hydrogen concentrations in the battery rooms less than 1 percent by volume.

A high radiation signal from the sensor in the plant exhaust stack provides an alarm in the main control room (MCR), but results in no automatic actions. The operating staff takes action to determine the source of the contamination and isolate it. In general, this does not include shutting down RBVS supply and exhaust fans, as these provide control of air flow direction through the RXB and out a monitored release path.

Upon detection of radiation within the SFP exhaust ductwork exceeding the high limit, the SFP exhaust air is diverted through both the HEPA filters and the charcoal adsorbers, and the isolation dampers of the RXB general exhaust from the pool hall and module enclosures are closed.

Temperature sensors and smoke detectors provide alarms in the MCR to alert operators of a possible fire in the SFP exhaust charcoal filter units. Once an evaluation has confirmed the need for activation, personnel manually activate the charcoal filter deluge sprinkler system, in accordance with the requirements of ASME N509, Section 4.11, RG 1.140, and ASME AG-1, Section FE-4600 and Table IA-C-1000.

#### 9.4.2.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the RBVS. Structures, systems, and components, including isolation dampers, that support the protection of mild environmental areas from high-energy line break events are designed to Seismic Category I standards. In accordance with RG 1.29, portions of the RBVS, in which structural failure could adversely affect the operability of Seismic Category I structures, systems, and components, are designed to Seismic Category II standards.

General Design Criterion 5 is considered in the design of the RBVS. The RBVS does not have a function relative to shutting down an NPM or maintaining it in a safe shutdown condition. Operation of the RBVS does not interfere with the ability to operate or shut down an NPM.

The SFP exhaust filter units use HEPA filters and charcoal adsorbers to clean gaseous effluents. Radioactive process systems that discharge to the RBVS exhaust contain local filtration as required to control release. Section 11.5, Radiation Monitoring, provides information on the RBVS radiation monitors and their features that support controlling the release of radioactive materials. After a loss of alternating current power, the backup power supply system provides power to the RBVS equipment necessary to maintain the RXB at a negative pressure and air flow within the building from typically lower contamination areas to areas that may be more contaminated. This design controls release of radioactive contaminants to the environment, satisfying GDC 60.

The SFP is located within the RXB, which is a controlled-leakage building. Exhaust from the SFP area passes through the RBVS exhaust charcoal and HEPA filter units. The exhaust normally bypasses the charcoal filter, but passes through the charcoal when a high radiation level is detected in the ductwork downstream of the SFP area. In this condition, the general area exhaust fans reduce capacity and maintain the design exhaust airflow for the RWB. The RBVS supply subsystem reduces its capacity to provide ventilation air while maintaining the RXB at negative pressure relative to the atmosphere. Based on these design considerations, the RBVS satisfies GDC 61.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the RBVS that demonstrate compliance with 10 CFR 20.1406.

### 9.4.2.4 References

9.4.2-1 American Society of Mechanical Engineers, *Nuclear Power Plant Air-Cleaning Units and Components*, ASME N509-2002, New York, NY.

9.4.2-2 American Society of Mechanical Engineers, *Testing of Nuclear Air Treatment Systems*, ASME N510-2007, New York, NY.

9.4.2-3 American Society of Mechanical Engineers, *Code on Nuclear Air and Gas Treatment*, AG-1, 2019 Edition, New York, NY.

9.4.2-4 National Fire Protection Association, “Standard for Fire Doors and Other Opening Protectives,” NFPA 80, 2019 Edition, Quincy, MA.

9.4.2-5 National Fire Protection Association, “Standard for the Installation of Air-Conditioning and Ventilating Systems,” NFPA 90A, 2021 Edition, Quincy, MA.

9.4.2-6 National Fire Protection Association, “Standard for Smoke Door Assemblies and Other Opening Protectives,” NFPA 105, 2019 Edition, Quincy, MA.

9.4.2-7 Underwriters Laboratories, Inc. (UL), “Standard for Fire Dampers,” UL 555, 7th edition, July 2006, Northbrook, IL.

**Table 9.4.2-1: Reactor Building Ventilation System Indoor Design Conditions**

| Area | Temperature | Relative Humidity |
|---|---|---|
| Office areas | 73°F to 78°F | 35% to 50% |
| Shops, maintenance facilities | 65°F to 85°F | 35% to 60% |
| Inaccessible areas (without sensitive electronic equipment) | 50°F to 130°F | Not controlled |
| Areas with frequent inspections or maintenance (gallery areas) | 50°F to 105°F | Not controlled |
| Areas with sensitive electronic equipment | 65°F to 85°F | Not controlled |
| RXB pool hall | 65°F to 85°F | Not controlled |
| Battery rooms | 60°F to 77°F | 30% to 55% |
| Telecom rooms | 65°F to 80°F | 30% to 55% |
| Battery charger rooms | 65°F to 85°F | 30% to 55% |

### Table 9.4.2-2: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **RBVS, Reactor Building HVAC System** | | | | | |
| All components (except those listed below): | RXB | B2 | None | N/A | III |
| SSC supporting the protection of mild environmental areas for HELBs (including isolation dampers and instrumentation) | RXB | B2 | None (Note 2) | N/A | I |
| • Rx pool area temperature, relative humidity and pressure instrumentation<br>• Module I&C equipment, battery and charger room temperature instrumentation<br>• Module area smoke instrumentation<br>• Module I&C equipment, battery and charger room reheat coils | RXB | B2 | None | N/A | II |
| • Exhaust stack flow and radiation instrumentation<br>• Exhaust stack flow and radiation instrumentation root valves | RWB | B2 | IEEE 497-2016 (Note 5) | N/A | III |
| Fire and smoke dampers | RXB | B2 | RG 1.189 | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

Note 5: IEEE Std 497-2016 as endorsed by RG 1.97 and implemented as described in Table 1.9-2

## 9.4.3 Radioactive Waste Building Ventilation System

The Radioactive Waste Building HVAC system (RWBVS) supports personnel access and equipment functions by maintaining a suitable operating environment in the Radioactive Waste Building (RWB), including the waste management control room.

### 9.4.3.1 Design Bases

The RWBVS serves no safety-related functions, is not risk-significant, is not credited for the mitigation of design-basis accidents, and has no safe shutdown functions. There are no safety-related components in the RWB, and failure of the RWBVS to operate does not prevent structures, systems, or components from performing safety-related functions. Table 9.4.3-1 identifies SSC classifications for the RWBVS. General Design Criteria 2, 5, and 60 are considered in the design of the RWBVS.

### 9.4.3.2 System Description

During normal operation, the RWBVS maintains temperature and humidity within ranges suitable for the comfort of personnel and to prevent degradation of equipment. The system directs airflow from areas of lower potential contamination to areas of higher potential contamination.

The RWBVS supply air handling units (AHUs) provide filtered and heated or cooled air to various areas of the RWB. Dedicated units provide heating, ventilation, and air conditioning service to specific areas of the RWB, including the waste management control room, battery and battery charger rooms, and radiologically controlled area access control and hot shop areas. The AHUs and select fan coil units in the RWBVS have redundant units that automatically start if the running unit trips.

Exhaust from the RWBVS flows into the Reactor Building HVAC system (RBVS) general area exhaust subsystem. Section 9.4.2, Reactor Building Ventilation, provides additional information on the RBVS.

Smoke dampers provide smoke isolation of the supply AHUs. Fire dampers at duct penetrations through fire barriers maintain the fire resistance ratings of the barriers. Smoke detectors monitor the ductwork in the RWBVS and shut down the associated HVAC equipment if smoke is detected. The main AHUs and the AHUs servicing the radiologically controlled area access control and hot shop areas include isolation dampers that close when smoke is detected.

During normal operation, air enters the RWBVS through an intake located in an exterior wall of the RWB and then proceeds through a main supply AHU. The RWBVS main AHU supply airflow modulates to maintain the RWB at a negative pressure with respect to the outside air. Pressurization air ensures that air flows from clean spaces to potentially contaminated spaces. The RWBVS maintains the hydrogen concentration levels in the battery rooms below 1 percent by volume.

### 9.4.3.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the RWBVS. The RWBVS is fully contained in the RWB, and there is no safety-related or Seismic Category I equipment in the RWB; therefore, the failure of the RWBVS does not affect the performance of safety-related functions. The RWBVS is Seismic Category III.

General Design Criterion 5 is considered in the design of the RWBVS. Operation of the RWBVS does not affect the safe and orderly shutdown and cooldown of the NuScale Power Modules. The RWBVS does not have a function relative to shutting a module down or maintaining a module in a safe shutdown condition.

General Design Criterion 60 is considered in the design of the RWBVS. Section 9.4.2 provides information on the monitoring of the exhaust of the RWBVS upstream of its connection to the RBVS, controlling the release of radioactive materials from the RWB.

Section 12.3, Radiation Protection Design Features, provides information on the design features of the RWBVS that demonstrate compliance with 10 CFR 20.1406.

**Table 9.4.3-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **RWBVS, Radioactive Waste Building HVAC System** | | | | | |
| All components | RWB/yard | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.4.4 Turbine Building Ventilation System

The Turbine Building HVAC system (TBVS) provides heating, cooling, and ventilation service to the Turbine Generator Building (TGB). The TBVS maintains environmental conditions within ranges suitable for personnel occupancy and equipment reliability.

### 9.4.4.1 Design Bases

The TBVS serves no safety-related functions, is not risk-significant, is not credited for mitigation of design-basis accidents, and has no safe shutdown functions. Table 9.4.4-1 identifies SSC classifications for TBVS. General Design Criteria 2, 5, and 60 are considered in the design of the TBVS.

### 9.4.4.2 System Description

The TBVS serves the TGB including the turbine hall, battery room, battery charger room, and maintenance room.

Combination fire and smoke dampers at duct penetrations through fire barriers maintain the fire resistance ratings of the barriers, and provide isolation of smoke. Smoke detectors in heating, ventilation, and air conditioning (HVAC) ductwork shut down the respective HVAC equipment and close the associated dampers upon detection of smoke.

An exhaust fan in the battery room maintains hydrogen concentration in the room to less than 1 percent by volume.

The Turbine Building is not directly connected to the Reactor Building, the Radioactive Waste Building, or any other areas that may contain radioactive contaminants. The TBVS is independent of other HVAC systems and is not directly connected to other structures, systems, and components (SSC) that may contain radioactive contaminants.

### 9.4.4.3 Safety Evaluation

General Design Criterion 2 is considered in the design of the TBVS. There are no safety-related SSC in the TGB; therefore, no safety-related SSC are affected by natural phenomena such as earthquakes. Failure of the TBVS will not affect safety-related SSC. The TBVS is Seismic Category III.

General Design Criterion 5 is considered in the design of the TBVS. The TBVS does not have any function relative to shutting a NuScale Power Module down or maintaining a NuScale Power Module in a safe shutdown condition.

General Design Criterion 60 is considered in the design of the TBVS. During normal operation, radioactive material is not expected to be present in the TGB; therefore, the TBVS does not include radioactivity monitoring or filtration. The only potential source of radioactive material in the TGB is from a postulated steam generator tube failure. Section 11.5 provides information on radiation monitors in the main steam system and the condensate polisher resin regeneration system that monitor the secondary system, and therefore the TGB, for contamination.

## Table 9.4.4-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **TBVS, Turbine Building HVAC System** | | | | | |
| All components | TGB | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

### 9.4.5 Engineered Safety Feature Ventilation System

The NuScale Power Plant does not use engineered safety features for ventilation systems to mitigate the consequences of a design-basis accident.

## 9.5 Other Auxiliary Systems

### 9.5.1 Fire Protection Program

The primary objectives of the Fire Protection Programs (FPP) are to minimize both the probability of occurrence and the consequences of fire. To meet these objectives, the FPP is designed to provide reasonable assurance, through defense-in-depth, that a fire will not prevent the necessary safe-shutdown functions from being performed and that radioactive releases or hazardous chemical exposure, to personnel and to the environment are minimized. The Fire Protection Program (FPP) consists of the integrated effort involving components, procedures, analyses, and personnel used in defining and performing activities of fire protection. It includes system and facility design, fire prevention, fire detection, annunciation, confinement, suppression, administrative controls, fire brigade organization, inspection and maintenance, training, quality assurance, and testing.

The fire protection system (FPS) and fire detection system (FDS) are part of the FPP and includes the fire detection, notification, and suppression systems, as designed, installed, and maintained in accordance with applicable codes and standards.

Chapter 13, Conduct of Operations, identifies the FPP as an Operational Program. An applicant that references the NuScale Power Plant US460 standard design is responsible for addressing site-specific requirements pertaining to the FPP.

Plant technical specifications require a licensee to maintain written procedures covering the FPP implementation.

Appendix 9A presents the fire hazards analysis (FHA) and the fire safe shutdown plan.

Section 3.4 evaluates the internal flood analysis evaluating the impact of inadvertent actuation or breaks in the FPS water supply piping. This evaluation took no credit for the floor drains of the radioactive waste drain system or the balance of plant drain system of Section 9.3.3 in removing fire water.

Section 9.4.1, Section 9.4.2, and Section 9.4.3 describe the heating, ventilation, and air conditioning systems design, respectively, as related to fire protection.

Section 9.5.2 presents the communication system design with respect to fire protection activities.

Section 9.5.3 presents the emergency lighting system design with respect to fire protection activities.

Section 11.3 describes the fire protection features provided to prevent explosion of a potential hydrogen-oxygen mixture in the gaseous radwaste system (GRWS).

### 9.5.1.1 Design Basis

The structures, systems, and components (SSC) associated with the FPS are not safety-related, and do not have a Quality Group Classification.

The FPS classification is Seismic Category III but has unique seismic requirements. Portions of the fire protection water supply standpipe systems in the Reactor Building remain functional following a safe shutdown earthquake (SSE). The standpipe system piping in the Reactor Building (RXB) up to and including the isolation valves supplying the sprinklers conform to the American Society of Mechanical Engineers (ASME) B31.1 and are seismically analyzed under SSE inputs (i.e., Seismic Category I). Additionally, components and associated supports with failures that could prevent a safety-related function from being performed conform, as a minimum, to Seismic Category II standards. Table 9.5.1-3 identifies SSC classifications for FPS.

As required by 10 CFR 50.48(a)(1), the FPP conforms to General Design Criterion (GDC) 3 in minimizing the probability and effect of fires and explosions. The design uses noncombustible and heat resistant materials to the extent practical. The RXB, Control Building (CRB), and Radioactive Waste Building (RWB) floors, walls and ceilings are made almost entirely of reinforced concrete or steel composite (SC) walls. The steel-composite and steel-framed walls are designed as three-hour barriers. The interior walls of enclosed stairwells in the RXB are three-hour barriers. This type of wall is not limited to stairwells. Steel-composite walls form the external perimeter of the building up to a certain elevation as well as most of the internal walls. The FPS, through detection and suppression, minimizes adverse effects of fires on SSC. The design considers rupture or inadvertent operation of firefighting systems to ensure it does not significantly impair the safety capability of SSC.

The FPS design considers GDC 5. The modules are in the RXB, which is serviced by a common, shared FPS. Redundant divisions of safe shutdown equipment for the modules are in separate fire areas where practicable so that fires or a spurious discharge or a failure of the FPS can only affect one division of safe shutdown equipment per module. There are fire areas in the RXB where one fire could affect multiple modules, although only one division per module would be affected leaving an alternative division. One success path of safe shutdown equipment available for each module ensures performance of safe shutdown functions for all modules and therefore the effectiveness of the FPS is not compromised because of sharing. Figure 1.2-8 through Figure 1.2-15 indicate the fire barriers and ratings provided in the RXB.

Consistent with Principal Design Criteria (PDC) 19, the FPS provides control room fire protection with manual suppression. The FPS protects the CRB, and where the main control room (MCR) is located; therefore, isolating the MCR from fire. By protecting the building, the FPS protects the cables, switching and transmitting type equipment, and display components from fire damage, allowing the control room to function. In the RXB, the FPS protects sensing, switching, and transmitting type equipment, and cabling, that contributes to the functionality of the MCR in the case of fire in the RXB. Figure 1.2-18 and Figure 1.2-19 indicate the fire barriers and ratings provided in the CRB.

Consistent with GDC 23, functional requirements imposed on the design of the module protection system (MPS) address safe failure states when exposed to the effects of fire and water. Section 7.1 discusses this in detail.

Section 14.3 presents 10 CFR 52.47(b)(1) information pertaining to the methodology for the development of ITAAC.

#### 9.5.1.2 System Description

Regulatory Guide 1.189, Revision 4, “Fire Protection for Nuclear Power Plants,” uses the concept of defense-in-depth to achieve the required degree of reactor safety by using administrative controls, FPS and features, and safe shutdown capability.

These defense-in-depth principles achieve the following objectives:

- Prevent fires from starting.
- Rapidly detect, control, and extinguish promptly those fires that do occur.
- Provide protection for safety-related and risk-significant SSC so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

The FPS principally relates to the second bullet above and performs the following functions.

- Detect fires and provide indication of the location.
- Provide the capability to extinguish fires in plant areas, protect site personnel, limit the impact of fires, and protect safe shutdown capabilities.
- Provide a suppression water volume sufficient to meet the largest hydraulic demand of the automatic sprinkler or spray system with an additional 500 gpm for fire hose use for a minimum of two hours.
- Maintain 100 percent fire pump design capability assuming a failure of the largest fire pump or a loss of offsite power.
- Provide water to hose stations for firefighting activities in areas containing safe shutdown equipment, following a SSE as specified in the FHA.
- Provide automatic fire suppression in plant areas where the FHA or fire safe shutdown analysis of Appendix 9A determine a single fire area could prevent the plant from achieving and maintaining a safe shutdown condition. Appendix 9A addresses special cases involving the containment and the fire areas enclosed by the bioshields of each NuScale Power Module (NPM).
- Provide automatic fire suppression systems and manual firefighting support.

- A sufficient number of fire hydrants installed on the yard main provide two streams for every part of the interior of the buildings not covered by standpipe protection.
- Each fire hydrant has its own isolation valve.
- Installed fire suppression systems protect ventilation filters that collect combustible material and are potential exposure fire hazards, as determined by the FHA.
- Automatic fire detection systems installed in areas that present an exposure fire hazard to safety-related or risk-significant SSC are capable of operating with or without offsite power.
- Two or more fire pumps ensure 100 percent of design fire protection design flows, assuming failure of the largest pump or loss of offsite power. Diesel-driven fire pump(s) supply at least 100 percent of design fire protection design flows.
- Fire pumps start automatically to maintain fire main pressure. Shutdown of the fire pumps is by manual stop.
- Fire detection and alarm systems give audible and visible alarms and annunciation in the MCR. Where zoned detection systems are used in a given fire area, local means identify what detector zone has actuated.
- Provide the appropriate fire detection and annunciation for selected areas of the plant as required by the FHA for personnel safety and fire brigade notification to extinguish fires promptly.

The design of the FPS uses National Fire Protection Association (NFPA) 804 and other applicable codes and standards included in Table 9.5.1-1.

Figure 9.5.1-1 and Figure 9.5.1-2 provide simplified drawings of the fire water supply and fire pump arrangement and the fire main loop in the yard.

The following FPP goals and functions include the FPS functions:

- Maintain the ability to safely shut down the reactor and keep it shut down by providing one train of redundant shutdown systems, to the extent practical, free from fire damage by use of fire protection features.
- Maintain the ability to minimize the probability of the spread of fire by the use of fire barriers between fire areas to isolate combustible materials.
- Prevent fires by controlling, separating and limiting combustible materials and sources of ignition.
- Maintain the ability to minimize the potential for radioactive releases to the environment in the event of a fire.
- Provide protection for SSC with safety-related or risk-significant functions so that a fire that is not promptly extinguished by the fire suppression activities does not prevent the safe shutdown of the plant.
- Maintain the ability to safely shut down the reactor and keep it shut down by providing one success path of SSC needed to achieve safe shutdown

conditions free of fire damage, assuming that equipment in one fire area is rendered inoperable by fire and that post-fire reentry for repair work into the affected fire area is not possible (see discussion under safe shutdown capability for exceptions).

- Provide separation between redundant trains of safety-related equipment used to mitigate the consequences of a design-basis accident (but not required for safe shutdown following a fire). This separation ensures that at least one train is free of fire damage.
- Prevent inadvertent operation of the FPS from jeopardizing the capability to achieve safe shutdown of the plant.
- Provide design features to prevent smoke, hot gases, or fire suppression agents from migrating to other fire areas to the extent that there is an adverse impact on safe shutdown including operator actions.
- Ensure failure or inadvertent operation of FPS does not adversely impact the ability of the safety-related or risk-significant SSC to perform their safety functions.
- Provide personnel with access and escape routes for each fire area.
- Provide emergency lighting to facilitate safe shutdown, evacuation activities, and firefighting activities following a fire.
- Provide communications to facilitate safe shutdown, evacuation activities, and firefighting activities following a fire.
- Limit the radiological release due to direct effects of fire suppression activities to as low as reasonably achievable and do not exceed regulatory limits.

**Codes and Standards**

Table 9.5.1-1 provides a list of industry codes and standards considered in the development of the FPP.

**Fire Protection Program**

The FPP follows the guidance of RG 1.189, "Fire Protection for Nuclear Power Plants," and as stipulated in RG 1.189, the requirements of NFPA 804, "Standard for Fire Protection for Advanced Light-Water Reactor Electric Generating Plants."

Table 9.5.1-2, "Fire Protection Program Conformance with Regulatory Guide 1.189," is a point-by-point description of the conformance of the FPP with the guidelines of RG 1.189, including alternative designs.

The requirements of NFPA 804 and other applicable codes and standards inform the design of the FPS. For cases where no guidance is given or the guidance conflicts with RG 1.189, guidance from RG 1.189 prevails.

The FPP consists of the FPS, the fire protection organization, administrative policies, fire prevention controls, administrative operations, maintenance and emergency procedures, quality assurance, access controls for firefighting, and fire brigade and emergency response capability.

The primary objectives of the FPP are to minimize the probability of occurrence and the consequences of fire. To meet these objectives, the FPP provides reasonable assurance, through defense-in-depth, that a fire does not prevent the performance of necessary safe shutdown functions and will minimize radioactive releases to the environment in the event of a fire.

#### 9.5.1.2.1 Fire Prevention

**Plant Design and Modification Procedures**

In accordance with RG 1.189 Regulatory Position 2.1.2, the plant design and modification procedures contain provisions that evaluate the impacts of modifications on the FPS, safe shutdown capabilities, fire-induced radioactivity releases, and increases to the fire hazards in fire areas of the plant. These procedures and practices provide reasonable assurance that the modification process does not have adverse impacts on the fire protection of the plant and that there is an adequate fire protection impairment program.

**Combustible Control Procedures**

Administrative procedures control and limit combustible materials in areas where there are SSC with safety-related or risk-significant functions. There is no storage of bulk combustible materials and hazardous materials inside buildings or adjacent to SSC with safety-related or risk-significant functions. Administrative controls and procedures control transient combustibles and hazardous materials.

Combustible materials in the MCR are controlled and limited to materials necessary for operation.

Cable insulation materials are the only in-situ combustibles enclosed by the bioshield. The area is inaccessible during operation and transient combustibles cannot be introduced until the NPM is in safe shutdown and the bioshields removed. Requirements for operation and maintenance activities control and limit combustible materials in the area around the containment penetrations and isolation valves.

Flammable and combustible liquids are stored in accordance with NFPA 30. Flammable gases are stored in accordance with the applicable NFPA codes. The plant procedures clearly define the use, handling and storage requirements for flammable liquids and gases.

The storage and use of hydrogen are in accordance with NFPA 55. The design does not require bulk hydrogen storage. Local hydrogen cylinders used for chemistry control conform to RG 1.189 Regulatory Position 4.1.8 as described in Table 9.5.1-2. Gas sensors and ventilation systems are provided in the CVCS equipment rooms where hydrogen additions are made.

Ventilation systems maintain the hydrogen concentration in the battery rooms below one percent by volume. The plant design uses valve regulated lead-acid batteries, that significantly reduce the hydrogen and oxygen liberated by the batteries.

The Turbine Building contains no safe shutdown equipment and is not a radiological hazard area. Therefore, the FHA of Appendix 9A does not include the Turbine Building.

Transformers installed inside the buildings containing SSC that perform safety-related or risk-significant functions are dry type or insulated and cooled with non-combustible liquids to prevent fires from adversely impacting the ability to safely shut down the plant.

Outside transformers are either 50 ft from plant buildings, or a three-hour fire barrier with no openings separates outside transformers from the plant buildings. The fire barriers used for the outside transformers conform with NFPA 804. The transformer area provides oil spill confinement and confines used fire water suppression.

The SSC with safety-related or risk-significant functions are separated from diesel fuel oil storage tanks by either physical separation or a three-hour fire barrier. Confinement of oil spills from the tanks isolates in areas surrounding the tanks that accommodates more than the inventory of the tanks. Oil spills from the tanks are confined to the area surrounding the tanks which is designed to hold more inventory than that of the tanks.

**Control of Radioactive Material**

The guidance in RG 1.189 governs protection and storage of materials, liquids, or gases that contain radioactivity. The FHA for the RWB is in Appendix 9A and describes the fire protection features provided to reduce the potential for radioactive materials to be spread by fire. Figure 1.2-22 through Figure 1.2-25 indicate the three-hour rated fire barriers provided in the RWB.

Section 11.2, Section 11.3, and Section 11.4, respectively, describe the liquid, gaseous, and solid radioactive waste processing and storage systems. These systems rely almost exclusively on metal tanks or containers. Exceptions include, for example, storage of radioactive wastes that are packaged for shipping in approved (nonmetal) high-integrity containers. Table 11.4-3 provides the estimated annual volume of wet solid waste.

Section 9.3.3 describes the radioactive drain waste system that provides for the containment and sampling of manual or automatic fire suppression water in areas with radioactive materials.

Section 9.4 describes the features and operation of ventilation systems and fire dampers to prevent the spread of radioactivity are described in Section 9.4.

**Ignition Source Control**

Potential ignition sources in the plant include welding, flame cutting, grinding, and smoking. Administrative procedures specifically prohibit the use of open flame or combustion generated smoke for leak testing or air flow determination and restrict smoking to designated areas.

**Plant Cleanliness Practices**

Administrative controls and practices control the cleanliness of the plant with regards to fire hazards. Routine inspections ensure the plant does not have unnecessary fire hazards and maintain safe access and egress pathways from areas containing equipment with safety-related or risk-significant functions. Such hazards include overfilled trash cans, litter on the floor, blocked doorways, and others. Operational and maintenance practices provide for timely cleanup activities for chemical and flammable liquid spills, waste removal, and inspection of fire equipment egress and access lighting and equipment, ensuring that they are in proper working condition.

#### 9.5.1.2.2 Fire Protection Program Organizational Structure

The FPP addresses implementation plans to establish an organizational structure, train, and equip the site fire brigade to ensure adequate manual firefighting capability for areas with SSC with safety-related or risk-significant functions in accordance with RG 1.189. The organizational structure includes training, qualification, and documentation and maintenance of training and qualification records.

#### 9.5.1.2.3 Quality Assurance

The plant Quality Assurance Program (QAP) includes the QAP for fire protection. This program provides assurance that the FPS design, fabrication, erection, testing, maintenance, and operation ensures that the system performs its intended functions. The plant QAP implementation is in accordance with RG 1.189 Regulatory Position 1.7. Section 17.2 addresses the plant QAP including the site-specific QAP, for construction and operations.

#### 9.5.1.2.4 Plant Arrangement

**Building Compartmentalization**

In accordance with GDC 3, SSC design and locations minimize the impacts from fire. One method used is compartmentalizing of the buildings that contain equipment with safety-related or risk-significant functions. Buildings divisions and subdivisions ensure adequate equipment and cable separation to meet the enhanced fire protection criteria. Compartmentalization is achieved by using properly-rated fire barriers, fire doors, fire dampers and penetration seals to prevent the spread of fire to other areas.

The FHA defines the locations of fire areas and fire barriers. Fire areas can be sub-divided into fire zones.

The plant layout provides means of access and egress to rooms and areas for manual firefighting and emergency escape. The maximum expected occupant load during maintenance, refueling, and testing determine the number and arrangement of exits.

Stairwells serving as access or egress routes are enclosed in masonry or concrete with a minimum fire rating of two hours (Table 9.5.1-2, NuScale Fire Protection Design Compliance with RG 1.189, Section 4.1.2 provides certain exceptions). Doors in egress stairwells swing in the direction of egress travel and have a minimum fire rating of 1-1/2 hours. Egress routes are clearly marked. The layout and travel distances of access and egress routes meet the requirements of NFPA 101.

Section 9.5.3 describes emergency lighting illuminates means of access and egress.

**Inside Containment**

As described in Appendix 9A, fire suppression or detection is not provided inside containment. The containment interior remains inaccessible while operating. During operations, the containment for each NPM is partially immersed in the ultimate heat sink (UHS) pool and maintained at vacuum conditions by the containment evacuation system. Section 9.3.6 describes the containment evacuation system. The evacuated state provides insufficient oxygen to sustain combustion in the unlikely event that combustion initiation conditions occur. The inability to maintain a high state of vacuum during operations results in a reactor trip and containment isolation as defined in Table 7.1-3 and Table 7.1-4. Electrical conductors within the containment vessel are noncombustible or routed in conduit, and result in no intervening combustible loading for an exposure fire impacting other cable or components in the containment. The reactor coolant system relies on natural circulation, and therefore there are no pumps with associated lube oil systems located inside containment.

Fire suppression or detection is not necessary during refueling outages. During a plant shutdown for refueling, the containment floods at the same time containment pressure increases to atmospheric. The reactor core separates from the containment and moves to the refueling area of the pool. Significant maintenance, including hotwork inside a containment vessel, cannot occur without removal of the reactor core; significant maintenance requires the reactor to be already shutdown, cooled down, and submerged for passive decay heat removal to the UHS pool.

The guidance in RG 1.189 recognizes the area inside containment as one where divisional separation of safe shutdown components is not practicable and thus is a special case in the FHA in Appendix 9A.

**Containment Dome Enclosed by the Bioshield**

The Reactor Building houses the NPMs and maintains them partially immersed in the same UHS pool.

Three-hour rated fire barriers enclose the exposed dome of each NPM containment vessel, or other means at the back by the structural pool wall; at either side by the integral, structural "wing" walls; and at the front and over the top by non-structural, removable bioshields eliminate the spread of fire to or from the area. This configuration creates a separate fire area enclosing the top of each module, thereby providing separation from other modules.

The fire area enclosed by the bioshield is a small area that cannot be practicably divided into multiple fire areas. This area must accommodate the mechanical and electrical penetrations, containment isolation valves, and other valves required for safe shutdown. This area is therefore similar to the annulus area of a conventional reactor building in that it contains safe shutdown equipment for more than a single division. The arrangement of plant equipment and routing of conductors is such that redundant safe shutdown equipment cannot be divisionally separated by a three-hour rated fire barrier. Practicable measures taken under the bioshield ensure that one division of safe shutdown equipment remains available to perform safe shutdown functions. Measures taken include:

- Divisional separation is provided to the extent practicable given the physical restraints of the area. Safe shutdown SSC are safety-related; as a minimum, the design follows the separation guidance of RG 1.75.
- Minimal combustibles and no intervening combustibles are used. Cable is in suitable conduit or is of noncombustible construction.
- The use of redundant, hydraulically operated valves for safe shutdown are not dependent on power cables in the bioshield fire area.
- Divisionally separated hydraulic control units for the hydraulic valves are outside of the bioshield fire area in separate three-hour rated structural fire areas. The hydraulic fluid utilized is noncombustible.
- Smoke detection in the ventilation exhaust from each individual fire area enclosed by the bioshield alerts operators of the potential need for conservative actions.
- Use of a passive decay heat removal system allows safe shutdown before removal of bioshields for maintenance or refueling.
- Introduction of transient combustibles cannot occur until removal of the bioshields. Manual fire suppression is available after bioshields are removed, if necessary.
- The distance between NPMs in their operating bays eliminates the spread of fire from one NPM to another upon removal of a bioshield.

Appendix 9A evaluates the fire area enclosed by the bioshield as a special case like the area inside containment.

**Control Room Complex**

The control room complex is a single fire area, separated from adjacent areas by minimum three-hour fire rated barriers. The control room complex includes the control room itself, a break room, a lavoratory, and an airlock. The control room complex has an area-wide smoke detection system.

Ventilation openings between peripheral rooms and the control room complex have smoke dampers that automatically close upon operation of the fire detection or fire suppression system. There is a three-hour fire rated duct shaft within the control room boundary. Combination fire and smoke dampers are at duct shaft penetrations (where required) to allow control room ventilation system isolation upon fire or smoke detection (see Section 9.4.1).

Manual fire suppression capability is in or adjacent to the control room as described in Table 9.5.1-2 for RG 1.189 Regulatory Position 6.1.2.1.

Automatic fire detection is in the control room, cabinets, and consoles as described in Table 9.5.1-2 for RG 1.189 Regulatory Position 6.1.2.2.

Smoke is ventilated from the control room as described in Table 9.5.1-2 for RG 1.189 Regulatory Position 6.1.2.3.

**Structural Fire Barriers**

Structural fire barriers separate redundant cables and equipment required for safe shutdown following a fire. Structural fire barriers include walls, floors, and supports as well as beams, joists, columns, penetration seals, fire doors, and fire dampers that independent laboratories rate for the hourly resistance rating desired.

Walls, floors, and ceiling assemblies are non-combustible and conform to the requirements of NFPA 221, "Standard for High-Challenge Fire Walls, Fire Wall, and Fire Barrier Walls."

**Structural Steel Fire Protection**

Structural steel forming part of or supporting fire barriers conforms to RG 1.189 Regulatory Position 4.2.2 as listed in Table 9.5.1-2.

#### 9.5.1.2.5 Electrical System Design

The electrical system design conforms to RG 1.189 Regulatory Position 4.1.3 as listed in Table 9.5.1-2.

**Control Room**

Energized electrical equipment and cabling in the control room necessary for control room functions and low voltage control and instrumentation are the only energized electrical equipment and cabling in the control room. Cabling in the control room complex terminates within the complex. Cabling is not routed through the control room complex from one area to another.

**Cable Spreading Rooms**

The design does not provide for cable spreading rooms as described in RG 1.189 Regulatory Position 6.1.3. Table 9.5.1-2 addresses further details.

**Switchgear Rooms**

Switchgear rooms containing equipment with safety-related or risk-significant functions are separated from the remainder of the plant by barriers having a three-hour fire rating. Redundant switchgear safety divisions are separated from each other by three-hour fire rated barriers.

Automatic fire suppression for switchgear rooms is based on the FHA. Fire hose stations and portable fire extinguishers are outside the area and are readily available. Adequate floor drainage removes water from firefighting activities and suppression system actuation.

**Battery Rooms**

Battery rooms associated with the redundant separation trains are separated from each other and other areas of the plant by fire barriers having a minimum three-hour fire rating. Battery rooms housing batteries that produce flammable off-gases have ventilation systems designed to maintain the concentration of the gas as defined in Table 9.5.1-2, RG 1.189 Regulatory Position 6.1.7. Automatic fire detection alarms annunciate in the control room and alarm locally. Loss of ventilation alarms in the control room.

Battery rooms do not contain direct current (DC) switchgear or inverters. Standpipes, hose stations, and portable extinguishers are readily available outside the room.

#### 9.5.1.2.6 Fire Protection System Design Features

**Fire Detection and Suppression**

The FHA identifies the extent to which there is a requirement for fire detection and fixed manual and automatic fire suppression. Installation of fire detection and suppression systems are in accordance with applicable industry codes and standards.

**Fire Detection**

Areas that contain or present a fire exposure to equipment with safety-related or risk-significant functions have fire detection that alarms in the MCR. The following areas are provided with automatic detection.

- plant computer rooms
- switchgear rooms
- battery rooms
- diesel generator areas
- pump rooms
- new and spent fuel areas
- radioactive waste and decontamination areas

Fire detection and alarm systems comply with the requirements of Class A systems, as defined in NFPA 72, "National Fire Alarm Code" and Class I circuits as defined in NFPA 70, "National Electrical Code."

The fire detectors location and installation is in accordance with NFPA 72, NFPA 804, RG 1.189, and the requirements of the FHA. The type of detection used and the location of the detectors are the most suitable for the particular type of fire hazard identified by the FHA.

Primary and secondary power supplies exist for the fire detection and alarm system as well as electrically operated valves in the fire suppression system. The primary and secondary power supplies comply with NFPA 72.

Control room fire detection and alarms are in accordance with the guidance in Regulatory Position 6.1.2 of RG 1.189.

**Fire Suppression**

The FHA describes the fire suppression system agent selected for areas. Selection of several available fire suppression agents depends on the hazard requiring protection.

Figure 9.5.1-1 provides a basic schematic of the FPS. A water-based system requires a water supply, fire pumps, piping, valves, and automatic fire sprinklers. Table 9.5.1-2 describes compliance with RG 1.189 Regulatory Position 3.2, Regulatory Position 3.3, and Regulatory Position 3.4.

**Water Supply - Storage Tanks**

The water supply system is in accordance with NFPA 22, "Standard for Water Tanks for Private Fire Protection," and NFPA 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances." The water supply meets the following criteria.

- Two separate fresh water supplies are available.
- The water supplies provide the largest expected flow rate for a minimum of two hours. The size of the supplies are at least 300,000 gallons. The flow rate is the largest flow demand from a single fire suppression system or

multiple systems that have the potential for operating simultaneously, plus 500 gpm for hose streams.

- Two 100 percent capacity tanks are installed and interconnected so that the fire pumps can take suction from either or both tanks. A failure in one tank does not cause both tanks to drain. The tanks connect to a water supply capable of refilling the tank in eight-hours or less.
- Prevention and control of bio-fouling or microbiologically induced corrosion of the fire water systems requires filtering and treatment as necessary of fire water supplies.

**Fire Pumps**

Fire pump installation conforms to NFPA 20, “Standard for the Installation of Stationary Pumps for Fire Protection” and meets the criteria described in Regulatory Position 3.2.2 of RG 1.189 as described in Table 9.5.1-2.

There are two 100 percent capacity fire pumps. The pumps' sizes conform to NFPA 20. The lead pump is electric motor-driven, and the second pump is diesel engine driven. The pumps and their controllers are Underwriters Laboratory (UL)-listed. Fire pump status alarms are in the MCR. The motor-driven fire pump has 480 VAC power from the low-voltage alternating current electrical distribution system. The fuel tank for the diesel engine-driven pump holds enough fuel to operate the pump for at least eight hours. A motor-driven jockey pump keeps the firewater system full of water and pressurized when the main pumps are not operating. The jockey pump design and operation is in accordance with the NFPA 20 guidance for pressure maintenance pumps.

**Valves**

Valves in the FPS are of an approved type for fire protection service. The design uses pressure reducing valves where system pressure has the potential to exceed the system design pressure, such as in the below grade elevations of the RXB. The design uses pressure regulating devices for hose stations where system pressure has the potential to exceed 100 psig for 1-1/2 in hose stations and 175 psig for 2-1/2 in hose stations, per NFPA 14. Sectionalizing valves ensure that the pumps are separated for maintenance and testing.

**Pipes and Fittings**

An underground yard fire main loop installation in accordance with NFPA 24 and appropriate referenced codes and standards meets the criteria described in Regulatory Position 3.2.3 of RG 1.189 as described in Table 9.5.1-2.

**Fire Hydrants**

Fire hydrants in the FPS are of an approved type for FPS. Hydrants allow for pressurization of the fire main from an external source. There are hydrants every 250 feet along the yard main system. One hydrant on each of the four RXB sides is at least 300 feet from the RXB to satisfy the loss of large area requirements.

**Automatic and Manual Suppression Systems**

The FPS utilizes a combination of both automatic and manual fire suppression systems. Outside fire hydrants are isolated from the fire main, while sprinkler systems and manual hose stations have connections to the yard main such that an active failure does not impair both the primary and backup fire suppression systems. The automatic fire suppression systems are sprinklers and deluge systems. Manual fire suppression systems include manual charcoal deluge systems, standpipe hose connections, fire hoses, fire extinguishers, and exterior fire hydrants. The fire hydrant fittings are compatible with local fire department equipment.

Automatic fire suppression systems detect fires and provide the capability to extinguish them using fixed automatic suppression systems and meet the criteria described in Regulatory Position 3.3 of RG 1.189 as described in Table 9.5.1-2.

The fire protection analysis in Appendix 9A determines the suppression systems for the fire areas.

Automatic fixed water suppression protection over the fire area is provided for equipment identified by the fire hazard analysis as containing a sufficient quantity of combustible material to warrant an automatic fire suppression system.

The fire protection analysis in Appendix 9A describes the suppression systems provided for the fire areas.

Manual firefighting is in accordance with Regulatory Position 3.4, as described in Table 9.5.1-2.

There are at least two standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of an SSE. The piping is sufficient for SSE loading and has supports to ensure system pressure integrity. The piping and valves for these seismically analyzed standpipes satisfy ASME B31.1. There are fire protection water supply systems in accordance with Regulatory Position 3.2, as described in Table 9.5.1-2. Regulatory Position 3.2.1.j describes standpipe design for manual firefighting in areas containing safe shutdown equipment.

Passive fire-resistive features, including fire doors, fire dampers, and penetration seals, are contained in RG 1.189 Regulatory Position 4.2, as described in Table 9.5.1-2.

**Ventilation System Design**

The design of the plant and ventilation systems is such that smoke, hot gases, and fire suppressant in a single fire area does not migrate into other fire areas and adversely impact safe shutdown capability. Section 9.4.1, Section 9.4.2, and Section 9.4.3 describe performance of the ventilation systems.

Fire suppression systems protect ventilation filters that collect combustible material and are potential exposure fire hazards, as determined by the FHA. Selection and protection of filters is in accordance with RG 1.189 Regulatory Position 4.1.4.1, as described in Table 9.5.1-2.

Refer to Section 9.4 for information related to fire hazards provisions for ventilation systems.

**Floor Drains**

Floor drains design is in accordance with RG 1.189 Regulatory Position 4.1.5 as described in Table 9.5.1-2. Section 3.4.1 discusses flood protection for equipment required to perform a safety function.

#### 9.5.1.2.7 Multi-Module Fire Protection

The design of the FPP and the FHA are for the entire facility and provide fire protection for the installed modules.

#### 9.5.1.2.8 Post-Fire Design functions

Post-fire safe shutdown performance goals applicable to the design are as follows:

- The reactivity control function is capable of achieving and maintaining the passive plant shutdown conditions.
- The process monitoring function is capable of providing direct readings of the process variables necessary to perform and control safe shutdown functions.
- The supporting functions are capable of providing the process cooling, lubrication, and other activities necessary to permit the operation of the equipment used for safe shutdown functions.

**Post-Fire Safe Shutdown Analysis**

An analysis of the capability to safely shut down the plant after a fire evaluates the effects of a fire in the fire areas of the plant and identifies a safe shutdown success path that is free of fire damage. The analysis identifies fire-induced circuit failures that could directly or indirectly prevent safe shutdown.

Local operator manual actions are not required for safe shutdown. The enhanced fire protection criteria assume that entry into the fire area for repairs and operator manual actions is not possible.

**Alternative Shutdown Capability**

Alternative shutdown capability is not required for the fire protection design in accordance with RG 1.189, regulatory position 8.1. In the unlikely event that a fire grew large enough to require an evacuation of the MCR, the operators in the control room trip the reactor and isolate containment before evacuation. The circuit logic for the MPS is designed such that disconnect (or isolation) switches are not required outside of the control room in order to isolate control signals and prevent spurious operations due to fire.

Alternative shutdown capability is provided at the I&C equipment rooms in the RXB. Safe shutdown can be achieved from the I&C equipment rooms, even accounting for spurious operations that occur as a result of a fire in the MCR. However, this functionality is not required in the safe shutdown analysis as described above. Therefore, use of the I&C equipment rooms supports achieving safe shutdown following control room evacuation, but is not required or credited for safe shutdown as no operators actions are required outside of the MCR.

Because no local operator actions are required for post-fire safe shutdown activities, no eight-hour emergency lighting is required. Section 9.5.3 describes emergency lighting.

**Passive Plant Safe Shutdown Condition**

The passive DHRS achieves and maintains a safe shutdown condition for non-LOCA (loss-of-coolant accident) events. Demonstration of acceptable passive safety system performance predicates this safe shutdown condition. Based on SECY-94-084, the cold shutdown condition required by RG 1.139 (93.3 degrees Celsius or 200 degrees Fahrenheit) is not applicable to passive plant designs.

### 9.5.1.3 Safety Evaluation

The FPP and the FPS as described herein, taken together with the FHA and fire safe shutdown plan of Appendix 9A, establish the basis for concluding that a fire does not prevent the safe shutdown of any reactor in the plant and that radioactive releases to the environment are minimized in the event of a fire.

The FHA of Appendix 9A is performed for the buildings associated with safe shutdown equipment and radiological hazards (i.e., the RXB, the CRB, and the RWB). Other buildings and their locations do not contain safe shutdown equipment or do not represent radiological hazards and, therefore, the FHA does not include these buildings. The design conforms to RG 1.189 position 7.3 and 7.4 (Table 9.5.1-2, NuScale Fire Protection Design Compliance with RG 1.189), for fuel oil tanks and transformers and to NFPA 804 for transformers, fuel oil tanks, and building structures that have not been shown to have three-hour rated walls.

The ventilation systems for the RXB, CRB, and RWB have smoke detectors and design features to ensure that the outside air intakes do not admit smoke to the building interiors during a fire outside these structures.

### 9.5.1.4 Inspection and Testing Requirements

Section 14.2 describes preoperational inspection and testing requirements for the FPS. Periodic inspection and testing to ensure system functionality is in accordance with applicable codes and approved procedures.

### 9.5.1.5 Instrumentation and Control Requirements

**Instrumentation**

*Supervisory/Tamper Switches*

Supervisory switches primarily monitor the open position of valves in a fire sprinkler system. Supervisory switches send a signal if a valve is closed one-fifth of its total travel distance. Valves that can affect the flow of water in a fire sprinkler system are monitored.

*Pressure Switches*

There are two main types of pressure switches: alarm pressure switches and supervisory pressure switches. Alarm pressure switches are suitable for use in wet, dry, deluge, and pre-action automatic fire sprinkler systems to indicate a discharge of water from one or more sprinkler heads. Alarm pressure switches detect the flow of water in dry pipe, preaction, and deluge sprinkler systems.

Supervisory pressure switches monitor the status of system conditions, primarily the status of air pressure in dry pipe and pre-action systems.

*Alarm Bells and Horn Strobes*

The fire detection system provides audible and visual alarms and trouble annunciation in the MCR. Annunciation circuits connecting zone, main, and remote annunciation panels are electrically supervised.

**Controls**

*Fire Pump Controller*

Fire pumps are automatic starting with manual shutdown. The manual shutdown is at the pump controllers only. The fire pump controllers have a separate pressure switch (transducer) and sensing line that actuates the pump unit when pressure in the underground system drops to a preset level. The pump can only be manually stopped at the pump controller (provided the system pressure is above the cut out pressure adjustment).

### 9.5.1.6 Quality Assurance

The quality assurance requirements under which the FPP is executed are addressed in Chapter 17.

## Table 9.5.1-1: List of Applicable Codes, Standards and Regulatory Guidance for Fire Protection

| Item | Applicable Codes, Standards and Regulatory Guidance |
|---|---|
| 1 | American Society of Mechanical Engineers, ASME B31.1, “Power Piping,” ASME Code for Pressure Piping. ASME B31.1, 2018. |
| 2 | American Society of Testing and Materials, ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials, ASTM Standard E84, 2021. |
| 3 | American Society of Testing and Materials, ASTM E119, Standard Test Methods for Fire Tests of Building Construction and Materials, ASTM Standard E119, 2020. |
| 4 | Electric Power Research Institute, EPRI Utility Requirements Document URD, Approved Version 13, Tier 2, Electric Power Research Institute, Palo Alto, CA, 2014. |
| 5 | Institute of Electrical and Electronic Engineers, Inc, IEEE C2, National Electric Safety Code, 2012 Edition. |
| 6 | National Fire Protection Association, NFPA 10, Standard for Portable Fire Extinguishers, 2018 Edition, Quincy, MA. |
| 7 | National Fire Protection Association, NFPA 13, Standard for the Installation of Sprinkler Systems, 2019 Edition, Quincy, MA. |
| 8 | National Fire Protection Association, NFPA 14, Standard for the Installation of Standpipe and Hose Systems, 2019 Edition, Quincy, MA. |
| 9 | National Fire Protection Association, NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection, 2017 Edition, Quincy, MA. |
| 10 | National Fire Protection Association, NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, 2019 Edition, Quincy, MA. |
| 11 | National Fire Protection Association, NFPA 22, Standard for Water Tanks for Private Fire Protection, 2018 Edition, Quincy, MA. |
| 12 | National Fire Protection Association, NFPA 24, Standard for Installation of Private Fire Service Mains and Their Appurtenances, 2019 Edition, Quincy, MA. |
| 13 | National Fire Protection Association, NFPA 25, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2020 Edition, Quincy, MA. |
| 14 | National Fire Protection Association, NFPA 30, Flammable and Combustible Liquids Code, 2021 Edition, Quincy, MA. |
| 15 | National Fire Protection Association, NFPA 37, Standard for Installation and Use of Stationary Combustion Engines and Gas Turbines, 2021 Edition, Quincy, MA. |
| 16 | National Fire Protection Association, NFPA 55, Standard for the Storing, Use, and Handling of Compressed Gases and Cryogenic Fluids in Portable and Stationary Containers, Cylinders, and Tanks, 2020 Edition, Quincy, MA. |
| 17 | National Fire Protection Association, NFPA 70, National Electric Code, 2020 Edition, Quincy, MA. |
| 18 | National Fire Protection Association, NFPA 72, National Fire Alarm and Signaling Code, 2019 Edition, Quincy, MA. |
| 19 | National Fire Protection Association, NFPA 80, Standard for Fire Doors and Other Opening Protectives, 2019 Edition, Quincy, MA. |
| 20 | National Fire Protection Association, NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures, 2017 Edition, Quincy, MA. |
| 21 | National Fire Protection Association, NFPA 85, Boiler and Combustion Systems Hazard Code, 2019 Edition, Quincy, MA. |
| 22 | National Fire Protection Association, NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems, 2021 Edition, Quincy, MA. |
| 23 | National Fire Protection Association, NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems, 2021 Edition, Quincy, MA. |
| 24 | National Fire Protection Association, NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids, 2020 Edition, Quincy, MA. |
| 25 | National Fire Protection Association, NFPA 101, Life Safety Code, 2021 Edition, Quincy, MA. |
| 26 | National Fire Protection Association, NFPA 105, Standard for Smoke Door Assemblies and Other Opening Protectives, 2019 Edition, Quincy, MA. |
| 27 | National Fire Protection Association, NFPA 214, Standard on Water-Cooling Towers, 2021 Edition, Quincy, MA. |

**Table 9.5.1-1: List of Applicable Codes, Standards and Regulatory Guidance for Fire Protection (Continued)**

| Item | Applicable Codes, Standards and Regulatory Guidance |
|---|---|
| 28 | National Fire Protection Association, NFPA 221, Standard for High Challenge Fire Walls, Fire Walls, and Fire Barrier Walls, 2021 Edition, Quincy, MA. |
| 29 | National Fire Protection Association, NFPA 251, Standard Methods of Tests of Fire Resistance of Building Construction and Materials, 2006 Edition, Quincy, MA. |
| 30 | National Fire Protection Association, NFPA 252, Standard Methods of Fire Tests of Door Assemblies, 2017 Edition, Quincy, MA. |
| 31 | National Fire Protection Association, NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants, 2019 Edition, Quincy, MA. |
| 32 | National Fire Protection Association, NFPA 804, Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants, 2020 Edition, Quincy, MA. |
| 33 | National Fire Protection Association, NFPA 1961, Standard on Fire Hose, 2020 Edition, Quincy, MA. |
| 34 | National Fire Protection Association, NFPA 1963, Standard on Fire Hose Connections, 2019 Edition, Quincy, MA. |
| 35 | Nuclear Energy Institute, NEI 00-01, Guidance for Post Fire Safe Shutdown Circuit Analysis, Rev. 2, May 2009. |
| 36 | Underwriter Laboratories, Inc., UL 555, Standard for Fire Dampers, 7th Edition. |
| 37 | Underwriter Laboratories, Inc., UL 555C, Standard for Smoke and Ceiling Dampers. |
| 38 | Underwriter Laboratories, Inc., UL 555S, Standard for Smoke Dampers, 5th Edition. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **1.** | **Fire Protection Program** In accordance with 10 CFR 50.48, each operating nuclear power plant must have a fire protection plan. The plan should establish the fire protection policy for the protection of SSCs important to safety at each plant and the procedures, equipment, and personnel required to implement the program at the plant site. | Conform | Applicant will be required to develop and maintain the site-specific elements of the FPP.<br>Note: NFPA 805 as referenced by 10 CFR 50.48(c) is not used in the development of the FPP. |
| **1.1** | **Organization, Staffing, and Responsibilities** The FPP should describe the organizational structure and responsibilities for its establishment and implementation. These responsibilities include FPP policy; program management (including program development, maintenance, updating, and compliance verification); fire protection staffing and qualifications; engineering and modification; inspection, testing, and maintenance of fire protection systems, features, and equipment; fire prevention; emergency response (e.g., fire brigades and offsite mutual aid); and general employee, operator, and fire brigade training. | Conform | Applicant |
| **1.2** | **Fire Hazards Analysis** A fire hazards analysis should be performed to demonstrate that the plant will maintain the ability to perform safe-shutdown functions and minimize radioactive material releases to the environment in the event of a fire. This analysis should be revised as necessary to reflect plant design and operational changes.<br>The fire hazards analysis has the following objectives:<br>a) to consider potential in situ and transient fire hazards;<br>b) to determine the effects of a fire in any location in the plant on the ability to safely shut down the reactor or to minimize and control the release of radioactivity to the environment; and<br>c) to specify measures for fire prevention, detection, suppression, and containment for each fire area containing SSCs important to safety, in accordance with NRC guidelines and regulations. The fire hazards analysis verifies that the FPP meets the applicable NRC regulatory requirements and guidance. The analysis lists applicable elements of the program, with explanatory statements, as needed, to identify location, type of system, and design criteria. The analysis should identify and justify any deviations from the regulatory guidelines. | Conform | Applicant<br>FHA is completed and maintained to reflect the as-built configuration of the plant. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 1.3 | **Safe-Shutdown Analysis** In accordance with 10 CFR 50.48, each operating nuclear power plant must provide the means to limit fire damage to SSCs important to safety, to ensure the ability to safely shut down the reactor.<br>Analysts assess fire damage to safe-shutdown equipment or fires with the potential to result in the release of radioactive materials to the environment on the basis of a single fire, including an exposure fire.<br>An exposure fire is a fire in a given area that involves either in situ or transient combustibles and has the potential to affect SSCs important to safety or the release of radioactive materials located in or adjacent to that same area. The effects of such a fire (e.g., smoke, heat, or ignition) can adversely affect those SSCs important to safety or the ability to prevent release of radioactive materials. Thus, a fire involving one safe-shutdown success path may constitute an exposure fire for the redundant success path located in the same area, and a fire involving combustibles not in either redundant success path may constitute an exposure fire for both redundant success paths located in the same area.<br>Licensees should develop a safe-shutdown analysis to demonstrate the ability of the plant to safely shut down for a fire in any given area. Regulatory Position 5.1 of this guide identifies the safe-shutdown performance goals. The licensee should demonstrate the ability of the selected systems to accomplish these performance goals.<br>The analysis should identify the safe-shutdown components and circuits for each fire area and demonstrate that the plant meets the guidelines in Regulatory Position 5.3 or that it provides an alternative or dedicated shutdown, in accordance with Regulatory Position 5.4 of this guide. For each plant, the combinations of systems that provide the shutdown functions may be unique for each area; however, the shutdown functions provided should ensure that the plant achieves its safe-shutdown performance objectives.<br>The licensee should also develop and implement procedures necessary to implement safe shutdown as appropriate. (See Regulatory Position 5.5 of this guide.) | Conform | Applicant<br>Fire safe shutdown analysis is completed and maintained to reflect the as-built configuration of the plant. |
| 1.4 | **Fire Test Reports and Fire Data** The licensee should evaluate fire reports and data (e.g., fire barrier testing results and cable derating data) that are used to demonstrate compliance with NRC fire protection requirements, to ensure that the information is applicable and representative of the conditions for which the information is being applied. | Conform | Applicant<br>Test Reports and Fire Data are evaluated for as-built materials |
| 1.5 | **Compensatory Measures** The licensee may implement compensatory measures for degraded and nonconforming conditions. In its evaluation of the impact of a degraded or nonconforming condition on plant and individual SSC operation, a licensee may decide to implement a compensatory measure as an interim step to restore operability or to otherwise enhance the capability of SSCs important to safety until the final corrective action is complete | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 1.6 | **Fire Protection Training and Qualifications** The FPP should be under the direction of an individual who has available staff personnel knowledgeable in both fire protection and nuclear safety. Plant personnel should be adequately trained in the administrative procedures that implement the FPP and the emergency procedures related to fire protection. | Conform | Applicant |
| 1.6.1 | **Fire Protection Staff Training and Qualifications** Fire protection staff should meet the following qualifications: | Conform | Applicant |
| 1.6.2 | **General Employee Training** Each nuclear plant employee has a responsibility to respond to plant fires. General site employee training should introduce all personnel to the elements of the site's FPP, including the responsibilities of the fire protection staff. Training should also include information on the types of fires and related extinguishing agents, specific fire hazards at the site, and actions in the event of a fire suppression system actuation. | Conform | Applicant |
| 1.6.3 | **Fire Watch Training** Fire watches provide for observation and control of fire hazards associated with hot work, and they may act as compensatory measures for degraded fire protection systems and features. Specific fire watch training should provide appropriate instruction on fire watch duties, responsibilities, and required actions for the different types of fire watches, such as continuous hot work fire watches, and hourly fire watches, etc. Fire watch qualifications should include hands-on training on a practice fire with the extinguishing equipment to be used while on fire watch, if applicable. If fire watches are to be used as compensatory actions, the fire watch training should include record keeping requirements. | Conform | Applicant |
| 1.6.4 | **Fire Brigade Training and Qualifications** The fire brigade training program should establish and maintain the capability to fight credible and challenging fires. The program should consist of initial classroom instruction followed by periodic classroom instruction, firefighting practice, and fire drills. (See Regulatory Position 3.5.1.4 for drill guidance.) Numerous NFPA standards provide guidelines applicable to the training of fire brigades. The NRC staff considers the training recommendations of NFPA 600, “Standard on Industrial Fire Brigades”, including the applicable NFPA publications referenced in NFPA 600, to be appropriate criteria for training the plant fire brigade. The licensee may also use NFPA 1410, “Standard on Training for Initial Emergency Scene Operations”, and NFPA 1500, “Standard on Fire Department Occupational Safety and Health Program”, as appropriate. The licensee may use the NFPA booklets and pamphlets listed in NFPA 600, as applicable, for training references and should use courses in fire prevention and fire suppression that are recognized or sponsored by the fire protection industry. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **1.6.4.1** | **Qualifications** The brigade leader and at least two brigade members should have sufficient training in or knowledge of plant systems to understand the effects of fire and fire suppressants on safe-shutdown capability. The brigade leader should be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant systems. Nuclear power plants staffed with a dedicated professional fire department may use a fire team advisor to assess the potential safety consequences of a fire and advise the control room and incident commander. The fire team advisor should possess an operator's license or equivalent knowledge of plant systems and be dedicated to supporting the fire incident commander during fire emergency events. The fire team advisor does not need to meet the qualifications of a fire brigade member, but if he or she does not, there should be five available qualified fire brigade members, in addition to the fire team advisor.<br>The qualification of fire brigade members should include an annual physical examination to determine their ability to perform strenuous firefighting activities. | Conform | Applicant |
| **1.6.4.2** | **Instruction** Instruction should be provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur and in using the types of equipment available in the nuclear power plant. The licensee should provide instruction to all fire brigade members and fire brigade leaders. | Conform | Applicant |
| **1.6.4.3** | **Fire Brigade Practice** The licensee should hold practice sessions for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions should provide brigade members with experience in actual fire extinguishment and the use of self-contained breathing apparatuses under the strenuous conditions encountered in firefighting. The licensee should provide these practice sessions at least once a year for each fire brigade member. | Conform | Applicant |
| **1.6.4.4** | **Fire Brigade Training Records** The licensee should maintain individual records of training provided to each fire brigade member, including drill critiques, for at least 3 years to ensure that each member receives training in all parts of the training program. These training records should be available for NRC inspection. | Conform | Applicant |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 1.7 | **Quality Assurance** The overall plant QA plan should include the QA program for fire protection. The licensee should maintain a QA program that provides assurance that the fire protection systems are designed, fabricated, erected, tested, maintained, and operated so that they will function as intended. Fire protection systems are not “safety-related” and, therefore, are not within the scope of Appendix B, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to 10 CFR Part 50, unless the licensee has committed to include these systems under the plant's Appendix B program. The NRC staff generally used guidance for an acceptable QA program for fire protection systems, previously given in Section C.4 of BTP CMEB 9.5-1, Revision 2, in the review and acceptance of approved FPPs for plants licensed after January 1, 1979. This RG incorporates that guidance, and the NRC staff will continue to use it in the review and acceptance of approved FPPs for new reactors. For plants licensed before January 1, 1979, APCSB 9.5-1, its Appendix A, and GL 77-02 contain similar guidance.<br>The plant's QA organization should manage the fire protection QA program. This control consists of (1) formulating the fire protection QA program and verifying that it incorporates suitable requirements and is acceptable to the management responsible for fire protection, and (2) verifying the effectiveness of the QA program for fire protection through review, surveillance, and audits. Personnel outside the QA organization may perform other QA program functions to meet the FPP requirements. Licensees have the option of either (1) including the fire protection QA program as part of the plant's overall QA program under Appendix B to 10 CFR Part 50, or (2) providing, for NRC inspection, a description of the fire protection QA program and its implementation measure.<br>The fire protection QA program should satisfy the specific criteria that apply to items within the scope of the FPP, such as fire protection systems and features, emergency lighting, communications equipment, self-contained breathing apparatuses, and the fire protection requirements of applicable equipment important to safety. | Conform | Applicant |
| 1.7.1 | **Design and Procurement Document Control** The licensee should establish measures to include the guidance presented in this RG in its design and procurement documents. | Conform | Applicant |
| 1.7.2 | **Instructions, Procedures, and Drawings** Documented instructions, procedures, or drawings should prescribe inspections, tests, administrative controls, fire drills, and training that govern the FPP, and the licensee should ensure that the following activities occur: | Conform | Applicant |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **1.7.3** | **Control of Purchased Material, Equipment, and Services** The licensee should establish the following measures to ensure that purchased material, equipment, and services conform to the procurement documents:<br>a) provisions, as appropriate, for source evaluation and selection, objective evidence of quality furnished by the contractor, inspections at suppliers, or receipt inspections, and<br>b) source or receipt inspection, for those items that, once installed, cannot have their quality verified. | Conform | Applicant |
| **1.7.4** | **Inspection** The licensee should establish and execute a program for independent inspection of activities affecting fire protection. The program should allow the organization performing the activity to verify conformance to documented installation drawings and test procedures. | Conform | Applicant |
| **1.7.5** | **Test and Test Control** The licensee should establish and implement a test program to ensure that testing is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. The tests should follow written test procedures; test results should be properly evaluated and corrective actions taken as necessary. | Conform | Applicant |
| **1.7.6** | **Inspection, Test, and Operating Status** The licensee should establish measures to document and identify items that have satisfactorily passed required tests and inspections. These measures should include identification by means of tags, labels, or similar temporary markings to indicate operating status and completion of required inspections and tests. | Conform | Applicant |
| **1.7.7** | **Nonconforming Items** The licensee should establish measures to control items that do not conform to specified requirements to prevent inadvertent use or installation. | Conform | Applicant |
| **1.7.8** | **Corrective Action** The licensee should establish measures to ensure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible materials, and nonconformances, are promptly identified, reported, and corrected. | Conform | Applicant |
| **1.7.9** | **Records** The licensee should prepare and maintain records to furnish evidence that the plant meets the criteria enumerated above for activities affecting the FPP, so that the following is true: | Conform | Applicant |
| **1.7.10** | **Audits** The licensee should conduct and document audits to verify compliance with the FPP. | Conform | Applicant |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **1.7.10.1** | **Annual Fire Protection Audit** For those licensees who have relocated audit requirements from their technical specifications to the QA program, the annual fire protection audit frequency may be changed if a performance-based schedule is used. American National Standards Institute/American Nuclear Society (ANSI/ANS) 3.2-2006, “Administrative Controls and Quality Assurance for the Operational Phase of Nuclear Power Plants”, should be used in establishing the audit frequency. | Conform | Applicant |
| **1.7.10.2** | **24-Month Fire Protection Audit** The 24-month audit of the FPP and implementing procedures should ensure that the requirements for design, procurement, fabrication, installation, testing, maintenance, and administrative controls for the respective programs are included in the plant QA program for fire protection and meet the criteria of the QA/QC program established by the licensee, consistent with this guide. Personnel from the licensee's QA organization, who do not have direct responsibility for the program being evaluated should perform these audits. These audits would normally include an evaluation of existing programmatic documents to verify continued adherence to NRC requirements. | Conform | Applicant |
| **1.7.10.3** | **Triennial Fire Protection Audit** The triennial audit is basically the same as the annual audit; the difference lies in the source of the auditors. Qualified utility personnel who are not directly responsible for the site FPP, or an outside independent fire protection consultant, may perform the annual audit. However, only an outside independent fire protection consultant should perform the triennial audit. The outside consultant should not be an employee of the licensee of the plant being audited. These audits would normally include evaluating existing documents (other than those addressed under the 24-month audit) and inspecting fire protection system operability or functionality, inspecting the integrity of fire barriers, and witnessing the performance of procedures to verify that the licensee has fully implemented the FPP and that the plan is adequate for the objects protected. Duplicate audits are not required (i.e., the 3-year audit replaces the annual audit for the year in which it is performed). | Conform | Applicant |
| **1.8** | **Fire Protection Program Changes/Code Deviations** This section provides guidance on the regulatory mechanisms for addressing changes, deviations, exemptions, and other issues affecting compliance with fire protection requirements. Risk- informed, performance-based methodologies may be used to evaluate the acceptability of FPP changes; however, for this approach, the licensee should use methodologies and acceptance criteria that the NRC has reviewed and approved. RG 1.174, includes guidance for risk-informed changes to a plant's current licensing basis. Appendix A to this guide provides guidance on probabilistic risk assessment. | Information Statement | No specific action required. |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **1.8.1** | **Change Evaluations** If an existing plant has adopted the standard license condition for fire protection and incorporated the FPP in the FSAR, the licensee may make changes to the approved FPP without the Commission's prior approval only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire. The FSAR should include or reference the evaluation that documents the change. In addition to planned changes, nonconforming conditions may also require an evaluation. An FPP change is any change to plant hardware or plant program documents and procedures that affects the FPP. In addition to changes directly related to fire protection, this type of change may include plant changes that are not directly associated with the fire protection system or procedures but could, for example, affect the results of the post-fire, safe-shutdown circuit analysis. Another example of an FPP change is an in-situ condition (physical or programmatic) that is an FPP regulatory noncompliance or a fire protection licensing-basis noncompliance and which the licensee does not intend to correct through a plant or programmatic modification.<br>The standard fire protection license condition recommended by GL 86-10 is not applicable to the FPP for new reactors that are licensed under 10 CFR Part 52. The change process for a combined license (COL) under 10 CFR Part 52 is described in 10 CFR 52.98, “Finality of combined licenses; information requests.” | Conform | Applicant change control procedures for the fire protection program. |
| **1.8.2** | **Exemptions to Appendix R to 10 CFR Part 50** For plants licensed before January 1, 1979, the NRC requires requests for exemption from the requirements of Appendix R for modifications or conditions that do not comply with the applicable sections of Appendix R. The exclusion of the applicability of sections of Appendix R other than Section III.G, Section III.J, and Section III.O (and Section III.L, as applicable) is limited to those features accepted by the NRC staff as satisfying the provisions of Appendix A to BTP APCSB 9.5-1 reflected in staff fire protection Safety Evaluation Reports issued before the effective date of the regulation. For these previously approved features, the NRC does not require an exemption request, except for proposed modifications that would alter previously approved features used to satisfy NRC requirements. | N/A | Applies to plants licensed before January 1, 1979 |
| **1.8.3** | **Appendix R Equivalency Evaluations** The NRC's interpretations of certain Appendix R requirements allow a licensee to choose not to seek prior NRC review and approval of, for example, a fire-area boundary, in which case a fire protection engineer (assisted by others, as needed) should perform an evaluation. The licensee should ensure that such evaluations are written and organized to facilitate review by a person not involved in the evaluation. The evaluation should include all supporting calculations and clearly state all assumptions at the outset. The licensee should retain these evaluations for subsequent NRC inspections. Item 1, Item 4, and Item 5 of Enclosure 1, “Interpretations of Appendix R,” to GL 86-10 provide examples of previously accepted equivalency evaluations. | N/A | 10 CFR 50 Appendix R does not apply. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **1.8.4** | **License Amendments** Plants licensed after January 1, 1979 that have committed to meet the requirements of Section III.G, Section III.J, and Section III.O of Appendix R to 10 CFR Part 50, 10 CFR Part 52, or NRC guidance (e.g., BTP CMEB 9.5-1), and are required to do so as a license condition, do not need to request exemptions for alternative configurations. However, the FSAR or fire hazards analysis should identify and justify deviations (i.e., departures from the approved FPP) from the requirements of Sections III.G, III.J, and III.O, or other applicable requirements or guidance, and these deviations may require a license amendment to change the license condition. Licensees should include a technical justification for the proposed alternative approach in any license amendment they submit to the NRC for review and approval. The technical justification should address the criteria described in Regulatory Position 1.8.1 for change evaluations and Regulatory Position 1.8.2 for exemptions. | N/A | Not applicable to new plant FPPs. |
| **1.8.5** | **10 CFR 50.72 Notification and 10 CFR 50.73 Reporting** The requirements of 10 CFR 50.72, “Immediate Notification Requirements for Operating Nuclear Power Reactors,” and 10 CFR 50.73, “Licensee Event Report System,” apply to reporting certain events and conditions related to fire protection at nuclear power plants. Licensees should report to the NRC fire events or fire protection deficiencies that meet the criteria of 10 CFR 50.72 and 10 CFR 50.73, as appropriate, and in accordance with the requirements of these regulations. NUREG-1022, “Event Reporting Guidelines: 10 CFR 50.72 and 10 CFR 50.73,” provides guidance for meeting the requirements of 10 CFR 50.72 and 10 CFR 50.73 and consolidates important NRC reporting guidelines into one reference document. The document is structured to assist licensees in promptly and completely reporting specified events and conditions. | Conform | Applicant will address reporting requirements. |
| **1.8.6** | **NFPA Code and Standard Deviation Evaluations** For those fire protection SSCs installed to satisfy the NRC requirements and designed to NFPA codes and standards, the code of record is the code edition in force at the time of the design or at the time the commitment is made to the NRC for a fire protection feature. The FSAR or the fire hazards analysis should identify and justify deviations from the codes. Deviations should not degrade the performance of fire protection systems or features. As stated in Safety Review Plan 9.5.1.1, Appendix A Section 3, the standards of record related to the design and installation of fire protection systems and features required to satisfy NRC requirements in all new reactor designs are those NFPA codes and standards in effect 180 days before the submittal of the application under 10 CFR Part 50 or 10 CFR Part 52. | Conform | Applicant will address for site-specific design. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **1.8.7** | **Fire Modeling** When the evaluation of an FPP change is based on fire modeling, licensees should document the fact that its fire models and methods meet the NRC requirements. The licensee should also document that the models and methods in the analyses were used within their limitations and with the rigor required by the nature and scope of the analyses. These analyses may use simple hand calculations or more complex computer models, depending on the specific conditions of the scenario being evaluated. | Conform | Applicant will address by their change process for the approved FPP. |
| **2.** | **Fire Prevention** Fire prevention is the first line of defense in depth for fire protection. The fire prevention attributes of the program are directly related to the fire protection objective to minimize the potential for fire to occur. These attributes involve design and administrative measures that provide a reasonable level of assurance that the plant is adequately protected against fire hazards, which are managed, and that fire consequences will be limited for those fires that do occur. | Information Statement | No specific action required. |
| **2.1** | **Control of Combustibles** Administrative controls for fire prevention should include procedures to control handling and use of combustibles, prohibit storage of combustibles in plant areas important to safety, establish designated storage areas with appropriate fire protection, and control use of specific combustibles (e.g., wood) in plant areas important to safety. | Conform | Applicant |
| **2.1.1** | **Transient Fire Hazards** Bulk storage of combustible materials should be prohibited inside or adjacent to buildings or systems important to safety during all modes of plant operation. Procedures should limit and govern the handling of transient fire hazards, such as combustible and flammable liquids, wood and plastic products, high-efficiency particulate air (HEPA) and charcoal filters, dry ion exchange resins, or other combustible materials in buildings containing systems or equipment important to safety during all phases of operation, particularly during maintenance, modification, or refueling operations. Licensees should control and provide suitable protection against transient fire hazards that cannot be eliminated. | Conform | Applicant |
| **2.1.2** | **Modifications** Fire prevention elements of the FPP should be maintained when plant modifications are made. The modification procedures should contain provisions that evaluate the impacts of modifications on the fire prevention design features and programs. In the design of plant modifications, the licensee should follow the guidelines of Regulatory Position 4.1.1. Personnel in the fire protection organization should review modifications of SSCs to ensure that fixed fire loadings are not increased beyond those accounted for in the fire hazards analysis, or if increased, suitable protection is provided and the fire hazards analysis is revised accordingly. | Conform | Applicant |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **2.1.3** | **Flammable and Combustible Liquids and Gases** Flammable and combustible liquids and gases are potentially significant fire hazards and procedures should clearly define their use, handling, and storage, which should comply with the provisions of NFPA 30, “Flammable and Combustible Liquids Code.” Miscellaneous storage and piping for flammable or combustible liquids or gases should not create a potential fire exposure hazard to systems important to safety. | Conform | Applicant |
| **2.1.4** | **External and Exposure Fire Hazards** When an SSC important to safety is near installations such as flammable liquid or gas storage, the licensee should evaluate the risk of exposure fires (originating in such installations) to the SSCs and take appropriate protective measures. NFPA 80A, “Recommended Practice for Protection of Buildings from Exterior Fire Exposures,” provides guidance on such exposure protection. NFPA 30 provides guidance on minimum separation distances from flammable and combustible liquid storage tanks. NFPA 55, “Compressed Gases and Cryogenic Fluids Code,” gives separation distances for gaseous and liquefied hydrogen. (See Regulatory Position 7.5 of this guide.) NFPA 58, “Liquefied Petroleum Gas Code,” contains guidance for liquefied petroleum gas. | Conform | Applicant |
| **2.2** | **Control of Ignition Sources** Electrical equipment (permanent and temporary), hot-work activities (e.g., open flame, welding, cutting, and grinding), high-temperature equipment and surfaces, heating equipment (permanent and temporary installation), reactive chemicals, static electricity, and smoking are all potential ignition sources. Design, installation, modification, maintenance, and operational procedures and practices should control potential ignition sources. | Conform | Applicant |
| **2.2.1** | **Open Flame, Welding, Cutting, and Grinding (Hot Work)** Work involving ignition sources such as welding and flame cutting should be carried out under closely controlled conditions. Persons performing such work should be trained and equipped to prevent and combat fires. In addition, a person qualified in performing hot-work fire watch duties should directly monitor the work and function as a fire watch. | Conform | Applicant |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **2.2.2** | **Temporary Electrical Installations** The use of temporary services at power reactor facilities is routine, especially to support maintenance and other activities during outages. In view of the magnitude and complexity of some temporary services, proper engineering and, once installed, maintenance of the design basis become significant. The temporary cables should be considered as transient combustibles and may represent ignition sources. Plant administrative controls should provide for an engineering review of temporary installations. These reviews should ensure that appropriate precautions, limitations, and maintenance practices are established for the term of such installations. The Institute of Electrical and Electronics Engineers (IEEE) Standard 835, "Standard Power Cable Ampacity Tables", and ANSI/IEEE C.2, "National Electrical Safety Code"®, contain guidance on temporary electrical installations, including derating closely spaced cables. | Conform | Applicant |
| **2.2.3** | **Other Sources** Leak testing and similar procedures, such as airflow determination, should not use open flames or combustion-generated smoke.<br>Administrative controls should provide for control of temporary heating devices. Use of space heaters and maintenance equipment (e.g., tar kettles for roofing operations) in plant areas should be strictly controlled and reviewed by the plant's fire protection staff. Engineering procedures and practices should ensure that temporary heating devices are properly installed according to the listing, including required separations from combustible materials and surfaces. Temporary heating devices should be placed so as to avoid overturning and installed in accordance with their listing, including clearance to combustible material, equipment, or construction. Asphalt and tar kettles should be located in a safe place or on a fire-resistive roof, at a point where they avoid ignition of combustible material below. Continuous supervision should be maintained while kettles are in operation, and metal kettle covers and fire extinguishers should be provided. | Conform | Applicant |
| **2.3** | **Housekeeping** The licensee should establish administrative controls to minimize fire hazards in areas containing SSCs important to safety. These controls should govern removal of waste, debris, scrap, oil spills, and other combustibles after completion of a work activity or at the end of the shift. Administrative controls should also include procedures for performing and maintaining periodic housekeeping inspections to ensure continued compliance with fire protection controls. Housekeeping practices should ensure that drainage systems, especially drain hub grills, in areas containing fixed water-based suppression systems, remain free of debris to minimize flooding if the systems discharge. RG 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants," provides guidance on housekeeping, including the disposal of combustible materials. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **2.4** | **Fire Protection System Maintenance and Impairments** The licensee should establish fire protection administrative controls to address the following issues.<br>a) Qualified personnel should maintain and test fire protection features (see Regulatory Position 1.6.1.c of this guide).<br>b) A permit system should control impairments to fire barriers, fire detection, and fire suppression systems. Compensatory measures (see Regulatory Position 1.5 of this guide) should be established in areas where systems are disarmed or impaired.<br>c) Successful fire protection requires inspection, testing, and maintenance of the fire protection equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire protection systems should be developed. The test plan should contain the types, frequency, and detailed procedures for testing. Frequency of testing should be based on the code of record for the applicable fire protection system. Procedures should also contain instructions on maintaining fire protection during those periods when the fire protection system is impaired or during periods of plant maintenance (e.g., fire watches).<br>d) Fire barriers, including dampers, doors, and penetration seals, should be routinely inspected. Penetration seals may be inspected on a frequency and relative sample basis that ensures that the seals are functional. Sample size and inspection frequency should be determined by the total number of penetrations and observed failure rates. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.** | **Fire Detection and Suppression** | | |
| **3.1** | **Fire Detection** In general, the fire hazards analysis and regulatory requirements determine the scope of fire detection and suppression in the plant, whereas the applicable industry codes and standards (generally NFPA codes, standards, and recommended practices) determine the design, installation, and testing requirements of the systems and components. The design of fire detection systems should minimize the adverse effects of fires on SSCs important to safety. Automatic fire detection systems should be installed in all areas of the plant that contain or present an exposure fire hazard to SSCs important to safety. These fire detection systems should be capable of operating with or without offsite power.<br>With regard to protection of safe-shutdown systems, Regulatory Position 5.3.1.1.b and Regulatory Position 5.3.1.1.d of this guide state, “In addition, fire detectors and an automatic fire suppression system should be installed in the fire area.” Where automatic fire detection is installed, it should provide complete protection throughout the fire area. For those areas where only partial coverage is installed, the fire hazards analysis should demonstrate the adequacy of the design to provide the necessary protection.<br>The fire detection and alarm system should be designed with the following objectives:<br>a) Detection systems are to be provided for all areas that contain or present a fire exposure to equipment important to safety.<br>b) Fire detection and alarm systems should comply with the requirements of Class A systems, as defined in NFPA 72, "National Fire Alarm Code," and Class I circuits, as defined in NFPA 70, “National Electrical Code.”<br>c) Fire detectors are selected and installed in accordance with NFPA 72. Preoperational and periodic testing of a pulsed-line type of heat detector demonstrates that the frequencies used will not affect the actuation of protective relays in other plant systems.<br>d) Fire detection and alarm systems give audible and visible alarms and annunciation in the control room. Where zoned detection systems are used in a given fire area, local means identify which detector zone has actuated.<br>e) Fire alarms are distinctive and unique to avoid confusion with any other plant system alarms. | Conform | The fire hazards analysis (Appendix 9A) establishes the basis for not providing fire detection in the containment as recommended by 3.1.i. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| | f) Primary and secondary power supplies are provided for the fire detection system and for electrically operated control valves for automatic suppression systems. Such primary and secondary power supplies should satisfy the provisions of NFPA 72. This can be accomplished by using normal offsite power as the primary supply, with a four-hour battery supply as a secondary supply, and by providing the capability for manual connection to the Class 1E emergency power bus within four hours of loss of offsite power. Such connection should follow the applicable guidance in RG 1.6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems"; RG 1.32, "Criteria for Power Systems for Nuclear Power Plants"; and RG 1.75, "Physical Independence of Electric Systems."<br>g) In areas of high seismic activity, licensees should consider the need to design the fire detection and alarm systems to function following a SSE.<br>h) The fire detection and alarm systems should retain their original design capability for (1) natural phenomena of less severity and greater frequency than the most severe natural phenomena (approximately once in 10 years), such as tornadoes, hurricanes, floods, ice storms, or small-intensity earthquakes that are characteristic of the geographic region, and (2) potential manmade site-related events, such as oil barge collisions or aircraft crashes, that have a reasonable probability of occurring at a specific plant site.<br>i) Noninerted containments should have fire detection systems, in accordance with the guidance in Regulatory Position 6.1.1.3 of this guide.<br>j) Control rooms should have fire detection systems and alarms, in accordance with the guidance in Regulatory Position 6.1.2 of this guide.<br>k) The following areas that contain equipment important to safety should have automatic fire detectors that alarm and annunciate in the control room: plant computer rooms, switchgear rooms, alternative or dedicated shutdown panels, battery rooms, diesel generator areas, pump rooms, new and spent fuel areas, and radwaste and decontamination areas. (See also Regulatory Position 6.1 and Regulatory Position 6.2 of this guide). | | |
| **3.2** | **Fire Protection Water Supply Systems** | | |
| **3.2.1** | **Fire Protection Water Supply** NFPA 22, “Standard for Water Tanks for Private Fire Protection,” and NFPA 24, “Standard for the Installation of Private Fire Service Mains and Their Appurtenances,” provide guidance on fire protection water supplies. The fire protection water supply system should meet the following criteria: | Conform | |
| **3.2.1, a** | Two separate, reliable freshwater supplies should be available. Saltwater or brackish water should not be used unless all freshwater supplies have been exhausted. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.2.1, b** | The fire-water supply should be calculated on the basis of the largest expected flow rate for a period of two hours, but not less than 1,136,000 liters (L) (300,000 gallons (gal)). This flow rate should be based (conservatively) on 1,900 liters per minute (L/min) (500 gal/min) for manual hose streams, plus the largest design demand of any sprinkler or deluge system, as determined in accordance with NFPA 13, “Standard for the Installation of Sprinkler Systems,” or NFPA 15, “Standard for Water Spray Fixed Systems for Fire Protection.” | Conform | |
| **3.2.1, c** | If tanks are used for water supply, two 100-percent system capacity tanks (minimum of 1,136,000 L (300,000 gal) each) should be installed. They should be interconnected to allow pumps to take suction from either or both. However, a failure in one tank or its piping should not cause both tanks to drain. Water supply capacity should be capable of refilling either tank in 8 hours or less. | Conform | |
| **3.2.1, d** | Common water supply tanks are acceptable for fire and sanitary or service water storage. When they are used, however, minimum fire-water storage requirements should be dedicated by passive means (for example, use of a vertical standpipe for other water services). Administrative controls, including locks for tank outlet valves, are unacceptable as the only means to ensure minimum water volume. | N/A | The FPS uses two 100-percent system capacity tanks that are independent of other water systems. |
| **3.2.1, e** | Freshwater lakes or ponds of sufficient size may qualify as the sole source of water for fire protection but require separate redundant suctions in one or more intake structures. These supplies should be separated, so that a failure of one supply will not result in a failure of the other supply. | N/A | The FPS uses two 100-percent system capacity tanks. |
| **3.2.1, f** | When a common water supply is permitted for fire protection and the ultimate heat sink, the following conditions should also be satisfied: | N/A | The FPS is not connected to the ultimate heat sink; therefore, Regulatory Position 3.2.1. f, Regulatory Position 3.2.1,f, i and Regulatory Position 3.2.1,f,ii do not apply. |
| **3.2.1, f, i** | The additional fire protection water requirements are designed into the total storage capacity. | N/A | No connection to the UHS exists. |
| **3.2.1, f, ii** | Failure of the fire protection system should not degrade the function of the ultimate heat sink. | N/A | No connection to the UHS exists. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.2.1, g** | Other water systems that may be used as one of the two fire-water supplies should be permanently connected to the fire main system and should be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems should satisfy the requirements for the main fire pumps. The use of other water systems for fire protection should be compatible with their safe-shutdown functions. Failure of the other system should not degrade the fire main system. | N/A | The FPS uses two 100-percent system capacity tanks that are aligned to the fire main system. No other water systems are design to be used as fire water supplies. |
| **3.2.1, h** | For multiunit nuclear power plant sites with a common yard fire main loop, common water supplies may be used. | N/A | The FPS is designed for a standalone plant that uses two 100-percent capacity tanks. If located on a site with a fire main loop that was common to other nuclear power plants, the FPS design does not prohibit connection to a common loop. |
| **3.2.1, i** | Fire-water supplies should be filtered and treated as necessary to prevent or control biofouling or microbiologically induced corrosion of fire-water systems. If the supply is raw service water, fire-water piping runs should be periodically flushed and flow-tested. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.2.1, j** | Provisions should be made to supply water to at least two standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of a safe-shutdown earthquake. The piping system serving such hose stations should be analyzed for safe-shutdown earthquake loading and should be provided with supports to ensure system pressure integrity. The piping and valves for the portion of the hose standpipe system affected by this functional requirement should satisfy ASME B31.1, “Power Piping”. The water supply for this condition may be obtained by manual operator actuation of valves in a connection to the hose standpipe header from a normal seismic Category I water system, such as the essential service water system. The cross-connection should be (1) capable of providing flow to at least two hose stations (approximately 284 L/min (75 gal/min) per hose station), and (2) designed to the same standards as the seismic Category I water system (i.e., it should not degrade the performance of the seismic Category I water system). | Alternate Conformance | The fire water storage tanks are designed in accordance with AWWA D100, as referenced by NFPA-22. The fire water yard piping is designed in accordance with ASME B31.1. There are at least two standpipes and hose connections for manual firefighting in areas containing equipment required for safe plant shutdown in the event of an SSE. The piping is sufficient for SSE loading and has supports to ensure system pressure integrity. The piping and valves for these seismically analyzed standpipes satisfy ASME B31.1. An external fire department connection is provided to feed the seismically designed (Category I) portion of the FP in the RXB. |
| **3.2.2** | **Fire Pumps** Fire pump installations should conform to NFPA 20, “Standard for the Installation of Stationary Pumps for Fire Protection,” and should meet the following criteria: | Conform | |
| **3.2.2, a** | If fire pumps are required to meet system pressure or flow requirements, a sufficient number of pumps is provided to ensure that 100-percent capacity will be available, assuming failure of the largest pump or loss of offsite power (e.g., three 50-percent pumps or two 100-percent pumps). This can be accomplished, for example, by providing either electric-motor-driven fire pumps and diesel-driven fire pumps or two or more seismic Category I Class 1E electric-motor-driven fire pumps connected to redundant Class 1E emergency power buses. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.2.2, b** | Individual fire pump connections to the yard fire main loop are separated with sectionalizing valves between connections. Each pump and its driver and controls are located in a room separated from the remaining fire pumps by a fire wall with a minimum rating of three hours. | Conform | |
| **3.2.2, c** | The fuel for the diesel fire pumps is separated so that it does not provide a fire source that exposes equipment important to safety. | Conform | |
| **3.2.2, d** | The control room contains alarms or annunciators to indicate pump running, driver availability, failure to start, and low fire main pressure. | Conform | |
| **3.2.3** | **Fire Mains** An underground yard fire main loop should be installed to furnish anticipated water requirements. NFPA 24 provides appropriate guidance for such an installation. NFPA 24 references other design codes and standards developed by such organizations as ANSI and the American Water Works Association. The following specific criteria should be addressed. | Conform | |
| **3.2.3, a** | The type of pipe and water treatment are design considerations, with tuberculation as one of the parameters. | Conform | |
| **3.2.3, b** | The means for inspecting and flushing the fire main are provided. | Conform | |
| **3.2.3, c** | Sectional control valves should be visually indicating (e.g., post indicator valves). | Conform | |
| **3.2.3, d** | Control and sectionalizing valves in fire mains and water-based fire suppression systems are electrically supervised or administratively controlled (e.g., locked valves with key control, tamper-proof seals). The electrical supervision signal indicates in the control room. All valves in the fire protection system are periodically checked to verify position. | Conform | |
| **3.2.3, e** | The fire main system piping is separate from service or sanitary water system piping, except as described in Regulatory Position 3.2.1 of this guide, with regard to providing a seismically designed water supply for standpipes and hose connections. | Conform | |
| **3.2.3, f** | A common yard fire main loop may serve multiunit nuclear power plant sites if cross-connected between units. Sectional control valves permit independence of the individual loop around each unit. For multiple-reactor sites with widely separated plants (approaching 1.6 kilometer [km] (one mile or more), separate yard fire main loops are used. | Conform | |
| **3.2.3, g** | Sectional control valves are provided to isolate portions of the fire main for maintenance or repair without shutting off the supply to primary and backup fire suppression systems serving areas that contain or expose equipment important to safety. | Conform | |
| **3.2.3, h** | Valves are installed to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems in any area containing or presenting a fire hazard to equipment important to safety. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.2.3, i** | Sprinkler systems and manual hose station standpipes have connections to the yard main system, so that a single active failure or a line break cannot impair both the primary and backup fire suppression systems. Alternatively, headers fed from each end are permitted inside buildings to supply both sprinkler and standpipe systems, provided that steel piping and fittings meeting the requirements of ASME B31.1 are used for the headers, up to and including the first valve supplying the sprinkler systems, when such headers are part of the seismically analyzed hose standpipe system. When provided, such headers are considered an extension of the yard main system. Each sprinkler and standpipe system should be equipped with an outside screw and yoke gate valve or other approved shutoff valve and water flow alarm. | Conform | |
| **3.3** | **Automatic Suppression Systems** Automatic suppression systems should be installed as determined by the fire hazards analysis and as necessary to protect redundant systems or components necessary for safe shutdown and SSCs important to safety (see Regulatory Position 5.3.1.1.b, Regulatory Position 5.3.1.1.d, and Regulatory Position 6 of this guide). In areas of high seismic activity, licensees should consider the need to design the fire suppression systems to be functional following a safe-shutdown earthquake.<br>The fire suppression systems should retain their original design capability for (1) natural phenomena of less severity and greater frequency than the most severe natural phenomena (approximately once in 10 years), such as tornadoes, hurricanes, floods, ice storms, or small-intensity earthquakes that are characteristic of the geographic region, and (2) potential manmade site-related events, such as oil barge collisions or aircraft crashes, that have a reasonable probability of occurring at a specific plant site.<br>For water suppression systems and fire detection systems that use metal plates for heat collection above individual sprinkler heads or detectors that are located well below the ceiling of a fire area (e.g., at some intermediate height in the room, below a ceiling-mounted pipe and cable tray), licensees should demonstrate that this design will ensure acceptable actuation times. In general, the use of such plates has not been shown to provide adequate heat collection to effectively activate the sprinkler head or detector and may impair system response. | Conform | Applicant |
| **3.3.1** | **Water-Based Systems** Equipment important to safety that does not itself require protection by water-based suppression systems, but is subject to unacceptable damage if wetted by suppression system discharge, should be appropriately protected (e.g., water shields or baffles). Drains should be provided as required to protect equipment important to safety from flooding damage. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **3.3.1.1** | **Sprinkler and Spray Systems** Water sprinkler and spray suppression systems are the most widely used means of implementing automatic water-based fire suppression. Sprinkler and spray systems should, at a minimum, conform to requirements of appropriate standards such as NFPA 13 and NFPA 15. | Conform | Applicant |
| **3.3.1.2** | **Water Mist Systems** Water mist suppression systems may be useful in specialized situations, particularly in those areas where the application of water needs to be restricted. Water mist systems should conform to appropriate standards, such as NFPA 750, "Standard on Water Mist Fire Protection Systems." | N/A | Water mist systems are not part of the standard plant design. Applicant will address as part of site-specific design if utilized. |
| **3.3.1.3** | **Foam-Water Sprinkler and Spray Systems** Certain fires, such as those involving flammable liquids, respond well to foam suppression. Licensees should consider the use of foam sprinkler and spray systems, which should conform to appropriate standards, such as NFPA 16, "Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems," and NFPA 11, "Standard for Low-, Medium-, and High- Expansion Foam." | N/A | Applicant |
| **3.3.2** | **Gaseous Fire Suppression** Gaseous systems should be evaluated for potential impacts on the habitability of areas containing equipment important to safety where operations personnel perform safe-shutdown actions or where firefighting activities may become necessary. Where gas suppression systems are installed, openings in the area should be adequately sealed or the suppression system should be sized to compensate for the loss of the suppression agent through floor drains and other openings. (See also Regulatory Position 4.1.5 of this guide.) | N/A | Gaseous fire suppression systems are not part of the design. |
| **3.3.2.1** | **Carbon Dioxide Systems** Carbon dioxide ($CO_2$) extinguishing systems should comply with the requirements in NFPA 12. Where automatic $CO_2$ systems are used, they should be equipped with a predischarge alarm system and a discharge delay to permit personnel egress. Provisions for locally disarming automatic $CO_2$ systems should be key locked and under strict administrative control. Automatic $CO_2$ extinguishing systems should not be disarmed unless controls, as described in Regulatory Position 2.4 of this guide, are provided.<br>In addition to the guidelines of NFPA 12, licensees should ensure preventive maintenance and testing of the systems, including verifying agent quantity of high-pressure $CO_2$ cylinders. | N/A | Gaseous fire suppression systems are not part of the design. |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.3.2.2** | **Halon** Halon fire extinguishing systems should comply with the requirements of NFPA 12A. When automatic Halon systems are used, they should be equipped with a predischarge alarm and a discharge delay to permit personnel to exit. Provisions for locally disarming automatic Halon systems should be key locked and under strict administrative control. Automatic Halon extinguishing systems should not be disarmed unless controls, as described in Regulatory Position 2.4 of this guide, are provided.<br>In addition to the guidelines of NFPA 12A, licensees should ensure preventive maintenance and testing of the systems, including verifying agent quantity of the Halon cylinders. | N/A | Gaseous fire suppression systems are not part of the design. |
| **3.3.2.3** | **Clean Agents** Halon alternative (or “clean agent”) fire extinguishing systems should comply with applicable standards, such as NFPA 2001. Only listed or approved agents should be used. Provisions for locally disarming automatic systems should be key locked and under strict administrative control. Automatic extinguishing systems should not be disarmed unless controls, as described in Regulatory Position 2.4 of this guide, are provided.<br>In addition to the guidelines of NFPA 2001, licensees should ensure preventive maintenance and testing of the systems, including verifying agent quantity of the clean agent cylinders or containers. | N/A | Gaseous fire suppression systems are not part of the design. |
| **3.4** | **Manual Suppression Systems and Equipment** The licensee should provide a manual firefighting capability throughout the plant to limit the extent of fire damage. Standpipes, hydrants, and portable equipment consisting of hoses, nozzles, and extinguishers should be provided for use by properly trained firefighting personnel. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.4.1** | **Standpipes and Hose Stations** Interior manual hose installations should be able to reach, with at least one effective hose stream, any location that contains, or could present, a fire exposure hazard to equipment important to safety. To accomplish this, all buildings on all floors should have standpipes with hose connections equipped with a maximum of 30.5 m (100 ft) of 38-mm (1.5-in) woven-jacket, lined fire hose and suitable nozzles. These systems should conform to NFPA 14, "Standard for the Installation of Standpipe and Hose Systems,", for sizing, spacing, and pipe support requirements for Class III standpipes. Water supply calculations should demonstrate that the water supply system can meet the standpipe pressure and flow requirements of NFPA 14.<br>Hose stations should be located as dictated by the fire hazards analysis to facilitate access and use for firefighting operations. Alternative hose stations should be provided for an area if the fire hazard could block access to a single hose station serving that area.<br>The proper type of hose nozzle to be supplied to each area should be based on the fire hazards analysis. The usual combination spray/straight-stream nozzle should not be used in areas where the straight stream can cause unacceptable mechanical damage. Fixed fog nozzles should be provided at locations where high-voltage shock hazards exist. All hose nozzles should have shutoff capability.<br>Volume II, Section 10, Chapter 1, of the 19th Edition of the NFPA *Fire Protection Handbook*, issued in 2003, provides guidance on safe distances for water application to live electrical equipment.<br>Fire hoses should meet the recommendations of NFPA 1961, "Standard on Fire Hose," and should be hydrostatically tested in accordance with the recommendations of NFPA 1962, "Standard for the Care, Use, Inspection, Service Testing and Replacement of Fire Hose Couplings, Nozzles, and Fire Hose Appliances." | Conform | Applicant |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| 3.4.2 | **Fire Hydrants and Hose Houses** Outside manual hose installations should be sufficient to provide an effective hose stream to any onsite location where fixed or transient combustibles could jeopardize equipment important to safety. Hydrants should be installed approximately every 76 m (250 ft) on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment recommended in NFPA 24 should be provided as needed, but at least every 305 m (1,000 ft). Alternatively, a mobile means of providing hose and associated equipment, such as hose carts or trucks, may be used. When provided, such mobile equipment should be equivalent to the equipment supplied by three hose houses. Mobile equipment should be maintained in good working order and should be readily available for firefighting activities.<br>Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings, and standpipe risers. Alternatively, a sufficient number of hose thread adapters may be provided.<br>Fire hoses should be hydrostatically tested in accordance with the recommendations of NFPA 1962. Fire hoses stored in outside hose houses should be tested annually. | Conform | Applicant |
| 3.4.3 | **Manual Foam** For flammable and combustible liquid fire hazards, licensees should consider the use of foam systems for manual fire suppression protection. These systems should comply with the requirements of NFPA 11. | Conform (when utilized) | Applicant (where specified by as-built FHA) |
| 3.4.4 | **Fire Extinguishers** Fire extinguishers should be provided in areas that contain or could present a fire exposure hazard to equipment important to safety. Extinguishers should be installed with due consideration given to possible adverse effects on equipment important to safety in the area. NFPA 10, “Standard for Portable Fire Extinguishers," provides guidance on the installation (including location and spacing) and the use and application of fire extinguishers. | Conform | Applicant |
| 3.4.5 | **Fixed Manual Fire Suppression Systems** Some fixed fire suppression systems may be manually actuated (e.g., fixed suppression systems provided in accordance with Section III.G.3 of Appendix R to 10 CFR Part 50). Manual actuation is generally limited to water spray systems and should not be used for gaseous suppression systems, except when the system provides backup to an automatic water suppression system. Fixed manual suppression systems should be designed in accordance with applicable guidance in the appropriate NFPA standards. A change from an automatic system to a manually actuated system should be supported by an appropriate evaluation. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **3.5** | **Manual Firefighting Capabilities** | | |
| **3.5.1** | **Fire Brigade** A site fire brigade, trained and equipped for firefighting, should be established and should be on site at all times to ensure adequate manual firefighting capability for all areas of the plant containing SSCs important to safety. The fire brigade leader should have ready access to keys for any locked doors. | Conform | Applicant |
| **3.5.1.1** | **Fire Brigade Staffing** The fire brigade should include at least five members on each shift. The shift supervisor should not be a member of the fire brigade. | Conform | Applicant |
| **3.5.1.2** | **Equipment** The equipment provided for the brigade should consist of personal protective equipment, such as turnout coats, bunker pants, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self-contained breathing apparatuses using full-face positive-pressure masks approved by the National Institute for Occupational Safety and Health (approval formerly given by the U.S. Bureau of Mines) should be provided for fire brigade, damage control, and control room personnel. At least 10 masks should be available for fire brigade personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir, if practical. Service or rated operating life should be at least 30 minutes for the self-contained units. NFPA 1404, “Standard for Fire Service Respiratory Protection Training," provides additional guidance.<br>Fire brigade equipment should be stored in accordance with manufacturers' recommendations (e.g., firefighter clothing should not be stored where it will be subjected to ultraviolet light from the sun, welding, or fluorescent lights).<br>At least a one-hour supply of breathing air in extra bottles should be located on the plant site for each self-contained breathing apparatus. In addition, an onsite six-hour supply of reserve air should be provided for the fire brigade personnel and arranged to permit quick and complete replenishment of exhausted air supply bottles as they are returned. If compressors serve as a source of breathing air, only units approved for breathing air should be used, and the compressors should be operable in the event of a loss of offsite power. Special care should be taken to locate the compressor in areas free of dust and contaminants. | Conform | Applicant |
| **3.5.1.3** | **Procedures and Prefire Plans** Procedures should be established to control actions by the fire brigade upon notification by the control room of a fire and to define firefighting strategies. | Conform | Applicant |
| **3.5.1.4** | **Performance Assessment and Drill Criteria** Fire brigade drills should be performed in the plant so that the fire brigade can practice as a team. Drills should be performed quarterly for each shift's fire brigade. Each fire brigade member should participate in at least two drills annually that are not in the same quarter. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 3.5.2 | **Offsite Manual Firefighting Resources** Onsite fire brigades typically fulfill the role of first responder but may not have sufficient personnel, equipment, and capability to handle all possible fire events. Arrangements with offsite fire services may be necessary to augment onsite firefighting capabilities, consistent with the fire hazards analysis and prefire planning documents. The FPP should describe the capabilities (e.g., equipment compatibility, training, drills, and command control) of offsite responders. | Conform | Applicant |
| 3.5.2.1 | **Capabilities** The local offsite fire departments that provide backup manual firefighting resources should have the following capabilities.<br>a) Personnel and equipment with capacities consistent with those assumed in the plant's fire hazards analysis and prefire plans.<br>b) Hose threads or adapters to connect with onsite hydrants, hose couplings, and standpipe risers. (Regulatory Position 3.4.2 states that onsite fire suppression water systems should have threads compatible with those used by local fire departments or a sufficient number of thread adapters available.) If adapters are used, they should be available and readily accessible to the offsite fire department. | Conform | Applicant |
| 3.5.2.2 | **Training** Local offsite fire department personnel who provide backup manual firefighting resources should be trained in the following. | Conform | Applicant |
| 3.5.2.3 | **Agreements and Plant Exercises** The licensee should establish written mutual aid agreements between the utility and the offsite fire departments that are listed in the fire hazards analysis and prefire plans as providing a support response to a plant fire. These agreements should delineate fire protection authorities, responsibilities, and accountabilities with regard to responding to plant fire or emergency events, including the fire event command structure between the plant fire brigade and offsite responders. | Conform | Applicant |
| 4. | **Building Design and Passive Features** | | |
| 4.1 | **General Building and Building System Design** This section provides guidance on building layout (e.g., fire areas and zones), materials of construction, and building system design (e.g., heating, ventilating, and air conditioning, electrical, lighting, and communication systems) important to effective fire prevention and protection. Regulatory Position 4.2 provides guidance for passive fire barriers. | Information Statement | No specific action required. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.1** | **Combustibility of Building Components and Features** According to GDC 3 in Appendix A to 10 CFR Part 50, noncombustible and heat-resistant materials must be used wherever practical throughout the unit. Interior wall and structural components, thermal insulation materials, radiation shielding materials, and soundproofing should be noncombustible. The fire hazards analysis should identify in situ combustible materials used in plant SSCs and specify suitable fire protection.<br>Metal deck roof construction should be noncombustible and listed as “acceptable for fire” in the Underwriters Laboratories, Inc. (UL) “Building Materials Directory," or listed as Class I in the “Factory Mutual Research Approval Guide—Equipment, Materials, and Services for Conservation of Property,” issued September 2000. | Conform | Applicant |
| **4.1.1.1** | **Interior Finish** Interior finishes should be noncombustible. The following materials are acceptable for use as interior finish without evidence of test and listing by a recognized testing laboratory.<br>a) Plaster, acoustic plaster, and gypsum plasterboard (gypsum wallboard), either plain, wallpapered, or painted with oil- or water-base paint.<br>b) Ceramic tile and ceramic panels.<br>c) Glass and glass blocks.<br>d) Brick, stone, and concrete blocks, plain or painted.<br>e) Steel and aluminum panels, plain, painted, or enameled.<br>f) Vinyl tile, vinyl-asbestos tile, linoleum, or asphalt tile on concrete floors.<br>Suspended ceilings and their supports should be of noncombustible construction.<br>Concealed spaces should be devoid of combustibles except as noted in Regulatory Position 6.1.2 of this guide.<br>In situ fire hazards should be identified and suitable protection provided. | Conform | Applicant |
| **4.1.1.2** | **Testing and Qualification** Interior finishes should be noncombustible (see the “Glossary” of this guide) or listed by an approving laboratory. | Conform | Applicant |
| **4.1.2** | **Compartmentalization, Fire Areas, and Zones** In accordance with GDC 3, SSCs important to safety must be designed and located to minimize the probability and effect of fires and explosions. The concept of compartmentalization meets GDC 3, in part, by using passive fire barriers to subdivide the plant into separate areas or zones. The primary purpose of these fire areas or zones is to confine the effects of fires to a single compartment or area, thereby minimizing the potential for adverse effects from fires on redundant SSCs important to safety. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.2.1** | **Fire Areas** A fire area is defined as that portion of a building or plant that is separated from other areas by fire barriers, including components of construction such as beams, joists, columns, penetration seals or closures, fire doors, and fire dampers. Fire barriers that define the boundaries of a fire area should have a fire-resistance rating of three hours or more and should achieve the following.<br>a) Separation of SSCs important to safety from any potential fires in nonsafety-related areas that could affect their ability to perform their safety function.<br>b) Separation of redundant trains of systems and components important to safety from each other so that both are not subject to damage from a single fire.<br>c) Separation of individual units on a multiunit site unless the requirements of GDC 5, “Sharing of Structures, Systems, and Components," in Appendix A to 10 CFR Part 50 are met with respect to fires.<br>The fire hazards analysis should be used to establish fire areas. Particular design attention to the use of separate, isolated fire areas for redundant cables will help to avoid loss of redundant cables important to safety. Separate fire areas should also be employed to limit the spread of fires between components, including high concentrations of cables important to safety that are major fire hazards within a safety division.<br>Where fire area boundaries are not three-hour rated, or not wall-to-wall or floor-to-ceiling boundaries with all penetrations sealed to the fire rating of the boundaries, the licensee should evaluate the adequacy of the fire area boundaries (i.e., barriers) to determine whether the boundaries will withstand the hazards associated with the area and, as necessary, protect important equipment within the area from a fire outside the area. Unsealed openings should be identified and considered when evaluating the overall effectiveness of the barrier (See Regulatory Position 4.2.1 of this guide for positions related to fire barrier testing and acceptance).<br>If a wall or floor/ceiling assembly contains major unprotected openings, such as hatchways and stairways, plant locations on either side of such a barrier should be considered part of a single fire area. If success path A is separated by a cumulative horizontal distance of 6.1 m (20 ft) from success path B, with no intervening combustible materials or fire hazards, and both elevations are provided with fire detection and suppression, the area would be considered acceptable.<br>Exterior walls, including penetrations, should be qualified as rated fire barriers if they are required to separate safe-shutdown equipment on the interior of the plant from the redundant equipment located in the immediate vicinity of the exterior wall, if they separate plant areas important to safety from nonsafety-related areas that present a significant fire exposure to the areas important to safety, or if otherwise designated by the FSAR or fire hazards analysis.<br>An exterior yard area without fire barriers should be considered as one fire area. The area may consist of several fire zones. (See Regulatory Position 4.1.2.2 of this guide.) | Conform | See the FHA in Appendix 9A for special cases. |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.1.2.2** | **Fire Zones** Fire zones are subdivisions of a fire area and are typically based on fire hazards analyses that demonstrate that the fire protection systems and features within the fire zone provide an appropriate level of protection for the associated hazards. Fire zone concepts may be used to establish zones within fire areas where further subdivision into additional fire areas is not practical on the basis of existing plant design and layout (e.g., inside containment). | Conform | Applicant<br>(if zones are specified by as-built FHA) |
| **4.1.2.3** | **Access and Egress Design** The plant layout should provide adequate means of access to all plant areas for manual fire suppression. The plant layout should also allow for safe access and egress to areas for personnel performing safe-shutdown operations. Considerations should include fire and post-fire habitability in safe-shutdown areas, protection or separation from fire conditions of access and egress pathways to safe-shutdown SSCs, and potential restrictions or delays to safe-shutdown area access potentially caused by security locking systems.<br>Stairwells outside primary containment serving as escape routes, access routes for firefighting, or access routes to areas containing equipment necessary for safe shutdown should be enclosed in masonry or concrete towers with a minimum fire rating of 2 hours and self-closing Class B fire doors. Fire exit routes should be clearly marked.<br>Prompt emergency ingress into electrically locked areas by essential personnel should be ensured through the combined use and provision of the following features:<br>a) reliable and uninterruptible auxiliary power to the entire electrical locking system, including its controls,<br>b) electrical locking devices that are required to fail in the secure mode for security purposes, with secure mechanical means and associated procedures to override the devices upon loss of both primary and auxiliary power (e.g., key locks with keys held by appropriate personnel who know when and how to use them), and<br>c) periodic tests of all locking systems and mechanical overrides to confirm their operability or functionality and their capability to switch to auxiliary power.<br>Regulatory Positions 4.1.6 and 4.1.7 of this RG provide direction related to emergency lighting and communication capabilities during fires. | Alternate Conformance | There are stairwells outside primary containment that are not protected by masonry or concrete towers with a minimum fire rating of two hours. Since the HVAC equipment in these areas is not required for safe shutdown, and the unprotected stairwells are only required for egress and for access for firefighting activities, the physical separation of these access routes is considered acceptable and a two-hour fire rated masonry or concrete enclosure is not required for the unprotected open stairs. |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.3** | **Electrical Cable System Fire Protection Design** | | |
| **4.1.3.1** | **Cable Design** Electric cable construction should pass the flame test in IEEE Standard 383, “IEEE Standard for Type Test of Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations” , or IEEE Standard 1202, “IEEE Standard for Flame Testing of Cables for Use in Cable Trays in Industrial and Commercial Occupancies” (this does not imply that cables passing either test will not require additional fire protection). In the more recent editions of these standards, the flame testing requirements for cable that were originally included in IEEE 383 have been moved to IEEE 1202.<br>New reactor fiber optic cable insulation and jacketing should, as a minimum, also meet the fire and flame test requirements of IEEE 1202. | Conform | |
| **4.1.3.2** | **Raceway/Cable Tray Construction** Only metal should be used for cable trays. Only metallic tubing should be used for conduit. Thin-wall metallic tubing should not be used. Flexible metallic tubing should be used only in short lengths to connect components to equipment. Other raceways should be made of noncombustible material. Cable raceways should be used only for cables. | Conform | |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.3.3** | **Electrical Cable System Fire Detection and Suppression** Redundant cable systems important to safety outside the cable spreading room should be separated from each other and from potential fire exposure hazards in nonsafety-related areas by fire barriers with a minimum fire rating of 3 hours to the extent feasible. Those fire areas that contain cable trays important to safety should be provided with fire detection. Cable trays should be accessible for manual firefighting, and cables should be designed to allow wetting down with fire suppression water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided.<br>Manual hose standpipe systems may be relied on to provide the primary fire suppression (in lieu of automatic water suppression systems) for cable trays of a single division important to safety that are separated from redundant safety divisions by a fire barrier with a minimum rating of 3 hours and are normally accessible for manual firefighting if all of the following conditions are met:<br>a) The number of equivalent standard 610-mm (24-in.)-wide cable trays (both important to safety and nonsafety related) in a given fire area is six or less. Trays exceeding 610 mm (24 in.) should be counted as two trays; trays exceeding 1,220 mm (48 in.) should be counted as three trays, regardless of tray fill.<br>b) The cabling does not provide instrumentation, control, or power to systems required to achieve and maintain hot shutdown.<br>c) Smoke detectors are provided in the area of these cable routings, and continuous line-type heat detectors are provided in the cable trays.<br>In other areas where overriding design features necessary for nuclear safety prevent the separation of redundant cable systems important to safety by 3-hour-rated fire barriers, or if cable trays are not accessible for manual firefighting, an automatic fire suppression system should protect the cable trays. | Alternate Conformance | Manual suppression is available throughout the plant. Air-sampling systems (i.e., Very Early Warning Fire Detection Systems) or individually addressable intelligent smoke detectors are used in areas to eliminate the need for continuous line-type heat detectors. Complete design to be addressed by the Applicant as part of site-specific design. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.1.3.4** | **Electrical Cable Separation** Redundant systems used to mitigate the consequences of design-basis accidents, but not necessary for safe shutdown, may be lost to a single exposure fire. However, protection should be provided so that a fire within only one such system will not damage the redundant system. Therefore, the separation guidelines of Regulatory Position 5.3.1.1 of this guide apply only to the electrical cabling needed to support the systems that are used for post-fire safe shutdown. All other redundant Class 1E electrical cables should meet the separation guidelines of RG 1.75.<br>When the electrical cabling is covered by separation criteria required for both post-fire safe shutdown and accident mitigation, the more stringent criteria of Regulatory Position 5.3.1.1 apply. (Compliance with post-fire safe-shutdown requirements may be achieved without separation of redundant Class 1E cabling by providing alternative or dedicated shutdown capability (see Regulatory Position 5.4); however, this does not preclude the separation criteria of RG 1.75 for redundant Class 1E cables used in accident mitigation.) | Conform | |
| **4.1.3.5** | **Transformers** Transformers that present a fire hazard to equipment important to safety should be protected as described in Regulatory Position 7.3 of this guide. | Conform | |
| **4.1.3.6** | **Electrical Cabinets** Electrical cabinets present an ignition source for fires and a potential for explosive electrical faults that can damage not only the cabinet of origin, but also to equipment, cables, and other electrical cabinets in the vicinity of the cabinet of origin. Fire protection systems and features provided for the general area containing the cabinet may not be adequate to prevent damage to adjacent equipment, cables, and cabinets following an energetic electrical fault. Energetic electrical faults are more of a concern with high-voltage electrical cabinets (i.e., 480 volts (V) and above). High-voltage cabinets should be provided with adequate spatial separation or substantial physical barriers to minimize the potential for an energetic electrical fault to damage adjacent equipment, cables, or cabinets important to safety.<br>Rooms containing electrical cabinets important to safety should be provided with area wide automatic fire detection, automatic fire suppression, and manual fire suppression capability. Electrical cabinets containing a quantity of combustible materials (e.g., cabling) sufficient to propagate a fire outside the cabinet of fire origin should be provided with in-cabinet automatic fire detection. | Alternate Conformance | In-cabinet detection is only provided for cabinets containing risk-significant equipment. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 4.1.4 | **Heating, Ventilation, and Air Conditioning Design** Suitable design of the ventilation systems can limit the consequences of a fire by preventing the spread of the products of combustion to other fire areas. It is important that means be provided to ventilate, exhaust, or isolate the fire area as required and that consideration be given to the consequences of ventilation system failure caused by the fire, resulting in a loss of control for ventilating, exhausting, or isolating a given fire area.<br>Special protection for ventilation power and control cables may be necessary. The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system where practical.<br>Release of smoke and gases containing radioactive materials to the environment should be monitored in accordance with emergency plans as described in RG 1.101, “Emergency Planning and Preparedness for Nuclear Power Reactors”. Any ventilation system designed to exhaust potentially radioactive smoke or gases should be evaluated to ensure that inadvertent operation or single failures will not violate the radiologically controlled areas of the plant design. This should include containment functions for protecting the public and maintaining habitability for operations personnel.<br>Fresh air supply intakes to areas containing equipment or systems important to safety should be located away from the exhaust air outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with the products of combustion.<br>Where total-flooding gaseous fire suppression systems are used, area intake and exhaust ventilation dampers should be controlled in accordance with NFPA 12, NFPA 12A, or NFPA 2001 to maintain the necessary gas concentration. (See also Regulatory Position 3.3.2 of this guide.) | Conform | Applicant |
| 4.1.4.1 | **Combustibility of Filter Media** Filters for particulate and gaseous effluents may be fabricated of combustible media (e.g., HEPA and charcoal filters). The ignition and burning of these filters may result in a direct release of radioactive material to the environment or may provide an unfiltered pathway upon failure of the filter. Filter combustion may spread fire to other areas.<br>Engineered safety feature filters should be protected in accordance with the guidelines of RG 1.52, “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Post-Accident Engineered-Safety-Feature Atmosphere Cleanup System Light-Water-Cooled Nuclear Power Plants”. Any filter that includes combustible materials and is a potential exposure fire hazard that may affect components important to safety should be protected as determined by the fire hazards analysis. | Partially Conforms | The design follows RG 1.140. RG 1.52 does not apply since the NuScale design does not have an engineered safety feature atmosphere cleanup system. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.1.4.2** | **Smoke Control/Removal** Smoke from fires can be toxic, corrosive, and may obscure visibility for emergency egress and access to plant areas. Smoke control and removal may be necessary to support manual suppression activities and safe-shutdown operations.<br>The installation of automatic suppression systems to limit smoke and heat generation should be considered. Smoke and corrosive gases should generally be discharged directly outside to an area that will not affect plant areas important to safety. The normal plant ventilation system may be used for this purpose, if capable and available. To facilitate manual firefighting, separate smoke and heat vents should be considered in areas such as cable spreading rooms, diesel fuel oil storage areas, switchgear rooms, and other areas where the potential exists for heavy smoke conditions. (See NFPA 204, "Standard for Smoke and Heat Venting") | Conform | |
| **4.1.4.3** | **Habitability** Protection of plant operations staff from the effects of fire and fire suppression (e.g., gaseous suppression agents) may be necessary to ensure safe shutdown of the plant. For control room evacuation, egress pathways and remote control stations should also be habitable. The protection of safe-shutdown areas from infiltration of gaseous suppression agents should be considered. The capability to ventilate, exhaust, or isolate is particularly important to ensuring the habitability of rooms or spaces that should be attended in an emergency. The design should provide for personnel access to and escape routes from each fire area. Habitability of the following areas should be considered:<br>a) control room,<br>b) safe-shutdown areas, and<br>c) personnel access and egress pathways.<br>Stairwells should be designed to minimize smoke infiltration during a fire. Staircases may serve as escape routes and access routes for firefighting. Fire exit routes should be clearly marked. Stairwells, elevators, and chutes should be enclosed in fire-rated construction with automatic fire doors at least equal to the enclosure construction at each opening into the building. Elevators should not be used during fire emergencies. | Conform | Applicant |
| **4.1.4.4** | **Fire Dampers** Redundant safe-shutdown components may be separated by fire-resistant walls, floors, enclosures, or other types of barriers. For the fire barriers to be effective in limiting the propagation of fire, ventilation duct penetrations of fire barriers should be protected by means of fire dampers that are arranged to automatically close in the event of fire. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems," provides additional guidance. (See also Regulatory Position 4.2.1.3 of this guide.) | Conform | |

### Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **4.1.5** | **Drainage** Floor drains sized to remove expected firefighting water without flooding equipment important to safety should be provided in areas where fixed water fire suppression systems are installed. Floor drains should also be provided in other areas where hand hose lines may be used if such firefighting water could cause unacceptable damage to equipment important to safety in the area. Facility design should ensure that fire-water discharge in one area does not impact equipment important to safety in adjacent areas. Housekeeping procedures should ensure that accumulated dirt or other debris does not block drains.<br>Where gaseous suppression systems are installed, the drains should be provided with adequate seals, or the gas suppression system should be sized to compensate for the loss of the suppression agent through the drains. (See Regulatory Position 3.3.2 of this guide.)<br>Drainage in areas containing equipment important to safety should be designed to minimize the potential to propagate fire from areas containing flammable or combustible liquids via the drainage system.<br>Water drainage from areas that may contain radioactivity should be collected, sampled, and analyzed before discharge to the environment. | Conform | Applicant |
| **4.1.6** | **Emergency Lighting** Emergency lighting should be provided throughout the plant as necessary to support fire suppression actions and safe-shutdown operations, including access and egress pathways to safe-shutdown areas during a fire event. | Conform | |
| **4.1.6.1** | **Egress Safety** Emergency lighting should be provided in support of the emergency egress design guidelines outlined in Regulatory Position 4.1.2.3 of this guide. | Conform | . |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.6.2** | **Post-Fire Safe Shutdown** Lighting is vital to post-fire safe shutdown and emergency response in the event of fire. The licensee should provide suitable fixed and portable emergency lighting, as follows:<br>a) Fixed, self-contained lighting consisting of units with individual 8-hour minimum battery power supplies should be provided in areas needed for operation of safe-shutdown equipment and for access and egress routes to these areas. The level of illumination provided by emergency lighting in access routes to and in areas where shutdown functions are performed is sufficient to enable an operator to reach that area and perform the shutdown functions. At the alternative or dedicated shutdown panels, the illumination levels should be sufficient for control panel operators. If a licensee has provided emergency lighting in accordance with Section III.J of Appendix R to 10 CFR Part 50, the licensee should verify by field testing that this lighting is adequate to perform the intended tasks. Routine maintenance and initial and periodic field testing of emergency lighting systems should ensure their ability to support access, egress, and operations activities for the full 8-hour period accounting for anticipated environmental conditions, battery conditions, and bulb life.<br>b) Suitable battery-powered portable hand lights should be provided for emergency use by the fire brigade and other operations personnel required to achieve safe plant shutdown.<br>If a central battery or batteries power the emergency lights, the distribution system should contain protective devices necessary to preclude a fire in one area from causing a loss of emergency lighting in any unaffected area required for safe-shutdown operations. | Conform | Applicant |
| **4.1.7** | **Communications** The communication system design should provide effective communication between plant personnel in all vital areas during fire conditions under maximum potential noise levels.<br>Two-way voice communications are vital to safe shutdown and emergency response in the event of fire. Suitable communication devices should be provided, as follows:<br>a) Fixed emergency communications independent of the normal plant communication system should be installed at preselected stations.<br>b) A portable radio communications system should be provided for use by the fire brigade and other operations personnel required to achieve safe plant shutdown. This system should not interfere with the communications capabilities of the plant security force. Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure or fire damage. Preoperational and periodic testing should demonstrate that the frequencies used for portable radio communication will not affect the actuation of protective relays. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.1.8** | **Explosion Prevention** In situ and transient explosion hazards should be identified and suitable protection provided. Transient explosion hazards that cannot be eliminated should be controlled and suitable protection provided. (See Regulatory Position 2.1 of this guide regarding control of combustibles.)<br>Miscellaneous storage and piping for flammable or combustible liquids or gases should not create a potential exposure hazard to systems important to safety or the fire protection systems that serve those areas. (See also Regulatory Positions 2.1.3 and 7.5 of this guide.)<br>Systems or processes that involve hydrogen supplies (e.g., generator cooling systems and reactor coolant hydrogen addition systems) and those that may give off hydrogen or explosive gases (e.g., waste gas and solid radioactive waste processing systems) should be designed to prevent development of explosive mixtures by limiting the concentration of explosive gases and vapors within enclosures to less than 50 percent of the lower explosive limit, or by limiting oxygen within systems containing hydrogen. Hydrogen distribution and supply systems should include design features that mitigate the consequences of system damage, such as excess flow valves or flow restrictors, double-walled pipe with annulus leak detection, and rupture diaphragms. (See also Regulatory Position 7.5 of this guide.)<br>The construction, installation, operation, and maintenance of bulk gas (including liquefied gas) storage and the related loading and dispensing systems should comply with good industry practice and the relevant NFPA standards, as applicable (e.g., NFPA 54, “National Fuel Gas Code”, and NFPA 55).<br>If the potential for an explosive mixture of hydrogen and oxygen exists in offgas systems, the systems should either be designed to withstand the effects of a hydrogen explosion or be provided with dual gas analyzers with automatic control functions to preclude the formation or buildup of explosive mixtures. RG 1.143, “Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in Light-Water-Cooled Nuclear Power Plants”, includes information for explosion protection for offgas systems.<br>RG 1.91, “Evaluations of Explosions Postulated To Occur on Transportation Routes Near Nuclear Power Plants”, provides guidance for the assessment of explosion hazards related to transportation near the plant site. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.2** | **Passive Fire-Resistive Features** | | |
| **4.2.1** | **Structural Fire Barriers** Fire barriers are those components of construction (walls, floors, and their supports), including beams, joists, columns, penetration seals or closures, fire doors, and fire dampers that are rated by approving laboratories in hours of resistance to fire and are used to prevent the spread of fire.<br>Where exact replication of a tested configuration cannot be achieved, the field installation should meet all of the following criteria:<br>a) The continuity of the fire barrier material is maintained.<br>b) The thickness of the barrier is maintained.<br>c) The nature of the support assembly is unchanged from the tested configuration.<br>d) The application or “end use” of the fire barrier is unchanged from the tested configuration.<br>e) A qualified fire protection engineer has reviewed the configuration and found that it provides an equivalent level of protection.<br>For new reactor designs, see the enhanced fire protection criteria for new reactors described in Regulatory Position 8.2 of this guide.<br>See Regulatory Position 4.1.2 of this guide for additional guidance on the design of fire barriers relative to compartmentalization and separation of equipment. | Conform | Applicant |
| **4.2.1.1** | **Wall, Floor, and Ceiling Assemblies** Wall, floor, and ceiling construction should be noncombustible. (See Regulatory Position 4.1.1 of this guide.) NFPA 221, “Standard for High-Challenge Fire Walls, Fire Walls, and Fire Barrier Walls”, can be used as guidance for the construction of fire barrier walls. Materials of construction for walls, floors, and ceilings serving as fire barriers should be rated by approving laboratories in hours of resistance to fire.<br>Building design should ensure that openings through fire barriers are properly protected. Openings through fire barriers that separate fire areas should be sealed or closed to provide a fire-resistance rating at least equal to that required of the barrier itself. The construction and installation techniques for penetrations through fire barriers should be qualified by fire endurance tests (See Regulatory Position 4.2.1.5 of this guide). | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.2.1.2** | **Fire Doors** Building design should ensure that door openings are properly protected with fire doors that have been qualified by a fire test. The construction and installation techniques for doors and door openings through fire barriers should be consistent with the door manufacturer's recommendations and the tested configuration.<br>Modifications to fire doors should be evaluated. Where a door is part of a fire area boundary, and a modification does not affect the fire rating (e.g., installation of security “contacts”), no further analysis need be performed. If the modifications could reduce the fire rating (e.g., installation of a vision panel), the fire rating of the door should be reassessed to ensure that it continues to provide a level of protection equivalent to a rated fire door.<br>Fire doors should be self-closing or provided with closing mechanisms and should be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable. One of the following measures should be provided to ensure that the fire doors will protect the opening as required in case of fire:<br>a) Fire doors should be kept closed and electrically supervised at a continuously manned location.<br>b) Fire doors should be locked closed and inspected weekly to verify that the doors are in the closed position.<br>c) Fire doors should be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions.<br>d) Fire doors should be kept closed and inspected daily to verify that they are in the closed position.<br>Areas protected by automatic total flooding gas suppression systems should have electrically supervised self-closing fire doors or should satisfy option (a) above.<br>NFPA 80, “Standard for Fire Doors and Other Opening Protectives,” provides additional guidance for fire doors. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **4.2.1.3** | **Fire Dampers** Building design should ensure that ventilation openings are properly protected. These openings should be protected with fire dampers that have been fire tested. In addition, the construction and installation techniques for ventilation openings through fire barriers should be qualified by fire endurance tests. For ventilation ducts that penetrate or terminate at a fire wall, guidance in NFPA 90A indicates that ventilation fire dampers should be installed within the fire wall penetration for barriers with a fire rating greater than or equal to 2 hours. NFPA 90A requires that fire dampers be installed in all air transfer openings within a rated wall.<br>Until recently, the only industry standard governing the design, fabrication, and testing of fire dampers was UL Standard 555, “Fire Dampers”. That standard does not evaluate whether fire dampers will close under airflow conditions. Therefore, the UL fire damper rating indicates only whether a fire damper in the closed position will maintain its integrity under fire conditions for a specific time period.<br>Fire damper testing methods that do not simulate the actual total differential pressure at the damper (i.e., visual inspection or drop testing with duct access panels open) may not show operability or functionality under airflow conditions. Fire damper surveillance testing should model airflow to ensure that the dampers will close fully when called to do so. This can be addressed by (1) type testing “worst-case” airflow conditions of plant-specific fire damper configurations, (2) testing under airflow conditions all dampers installed in required fire barriers, or (3) administratively shutting down the ventilation systems to an area upon confirmation of a fire. The plant emergency procedures should incorporate the latter approach. | Conform | Applicant |
| **4.2.1.4** | **Penetration Seals** Openings through fire barriers for pipe, conduit, and cable trays that separate fire areas should be sealed or closed to provide a fire-resistance rating at least equal to that required of the barrier itself. Openings inside conduit larger than 102 mm (4 in.) in diameter should be sealed at the fire barrier penetration. Openings inside conduit 102 mm (4 in.) or less in diameter should be sealed at the fire barrier unless the conduit extends at least 1.5 m (5 ft.) on each side of the fire barrier and is sealed either at both ends or at the fire barrier with material to prevent the passage of smoke and hot gases. Fire barrier penetrations that maintain environmental isolation or pressure differentials should be qualified by test to maintain the barrier integrity under such conditions.<br>Qualified individuals who are trained and certified by the manufacturer should install penetration seals. Appropriate QA/QC methods should be in force during installation. As part of the installation process, penetration seals should be specifically labeled and documented and then inspected to ensure that the seal does not contain voids or gaps and has been installed in accordance with its design. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.2.1.5** | **Testing and Qualification**<br>a) Structural fire barriers—The design adequacy of fire barrier walls, floors, ceilings, and enclosures should be verified by fire endurance testing. The NRC fire protection guidance refers to the guidance of NFPA 251 and ASTM E119, "Standard Test Methods for Fire Tests of Building Construction and Materials", as presenting acceptable test methods for demonstrating fire endurance performance. The guidance of NFPA 251 and ASTM E119 should be consulted with regard to construction, materials, workmanship, and details such as dimensions of parts and the size of the specimens to be tested. In addition, NFPA 251 and ASTM E119 should be consulted with regard to the placement of thermocouples on the specimen.<br>b) Penetration fire barriers—An independent testing authority should qualify penetration fire barriers by tests conducted in accordance with the provisions of NFPA 251 or ASTM E119. In addition, ASTM E814, "Standard Test Method for Fire Tests of Penetration Firestop Systems", or IEEE Standard 634, "IEEE Standard Cable Penetration Fire Stop Qualification Test" could be used in the development of a standard fire test. ANSI withdrew IEEE Standard 634 on April 9, 1990, and the standard should not be used for qualification testing performed after that date.<br>The construction and installation techniques for door and ventilation openings and other penetrations through fire barriers should be qualified by fire endurance tests. The test specimen should be truly representative of the construction for which classification is desired, in terms of materials, workmanship, and details such as dimensions of parts, and should be built under conditions representative of those practically applied in building construction and operation. The physical properties of the materials and ingredients used in the test specimen should be determined and recorded.<br>In view of the many possible penetration seal configurations, it may not be practical to test every penetration configuration. The following section provides guidance on evaluating penetration seal designs against the results of limited fire test programs. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **4.2.1.6** | **Evaluation of Penetration Seal Designs with Limited Testing** The results of fire test programs that include a limited selection of test specimens that have been specifically designed to encompass or bound the entire population of in-plant penetration seal configurations may be acceptable. In such cases, the engineering evaluation performed to justify the seal designs should consider the following:<br>a) Size of sealed opening—In some cases, a successful fire endurance test of a particular fire barrier penetration seal configuration for a particular size opening may be used to justify the same configuration for smaller openings.<br>b) Penetrating items—A satisfactory test of a seal configuration that contains a particular pattern of penetrating items can be used to qualify variations on the tested pattern. Acceptable variations include eliminating or repositioning one or more of the penetrating items, reducing the size (cross-sectional area) of a particular penetrating item, or increasing the spacing between penetrating items. However, since penetrating items provide structural support to the seal, the free area of the seal material and the dimensions of the largest free span may also be factors that affect the fire-resistive performance of the seal assembly. The thickness of the seal material needed to obtain a particular fire rating may also be a function of the free area or the distance between the penetrating items and the outside edge of the seal assembly. In other cases, consideration of the penetrating items takes on special importance because of the heat sink they provide.<br>c) Cable type and fill—A satisfactory test of a seal configuration with certain electrical penetrations containing a specified fill ratio and cable type can be used to qualify similar configurations containing the same or a smaller cable fill ratio and the same cable jacket material or a less-combustible jacket material. The thermal conductivity of the penetrating cables is also important.<br>d) Damming materials—The fire-resistive performance of a given seal configuration can be improved if a fire-resistant damming material covers one or both surfaces of the seal. A satisfactory test of a seal configuration without a permanent fire-resistant dam can be used to qualify the same configuration with a permanent fire-resistant dam, all other seal attributes being equal. The converse is not true. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| | e) Configuration orientation-A satisfactory test of a particular seal configuration in the horizontal orientation (with the test fire below the seal) can be used to qualify the same configuration in a vertical orientation if the symmetry of the design configurations is comparable. For example, if a nonsymmetrical penetration seal configuration (e.g., a seal with a damming board on the bottom but not on the top) is qualified for a floor-ceiling orientation with the damming board on the fire side of the test specimen, the configuration could only be qualified for a wall orientation if a damming board was installed on both sides of the seal or if the potential fire hazard is limited to the side with the damming board.<br>f) Material type and thickness-Satisfactory testing of a particular seal configuration with a specific seal material thickness can be used to qualify the same configuration with a greater seal material thickness of the same type of seal material. The converse is not true: testing of a particular seal configuration with a specific seal material thickness cannot be used to qualify the same configuration with a lesser seal material thickness of the same type of seal material.<br>g) Type testing-In cases in which a single test of a particular seal configuration is to serve as a qualification test for the same or similar design configurations with different design parameters, the tested configuration should be the worst-case design configuration with the worst-case combination of design parameters. This would test and qualify a condition that would fail first, if failure occurs at all. Successful testing of the worst-case condition can then serve to qualify the same or similar design configurations for design parameters within the test range. It would be appropriate to conduct multiple tests to assess a range of design parameters. | | |
| **4.2.2** | **Structural Steel Protection** Structural steel forming a part of or supporting fire barriers should be protected to provide fire resistance equivalent to that required of the barrier. Where the structural steel is not protected and has a lower fire rating than the required rating of the fire barrier, the fire hazards analysis should justify the configuration by demonstrating the temperature that the steel will reach during fire and the ability of the steel to carry the required loads at that temperature. The need to protect structural steel that forms a part of or supports fire barriers is consistent with sound fire protection engineering principles as delineated in NFPA codes and standards and in the NFPA *Fire Protection Handbook*, issued in 2008.<br>Structural steel whose sole purpose is to carry dynamic loads from a seismic event need not be protected to meet fire barrier requirements, unless the failure of any structural steel member owing to a fire could result in significant degradation of the fire barrier. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.2.3** | **Fire-Resistive Protection for Electrical Circuits** | | |
| **4.2.3.1** | **Electrical Raceway Fire Barrier Systems** Redundant cable systems important to safety should be separated from each other and from potential fire exposure hazards in accordance with the separation means of Regulatory Position 5.3.1.1.a, b, and c of this guide. In areas where electrical circuits important to post-fire safe shutdown cannot be separated by means of rated structural fire barriers, cable protection assemblies should be applied to conduit and cable trays to meet 1-hour and 3-hour separation requirements, as required. Where 1-hour fire-resistive barriers are applied, automatic fire detection and suppression should also be installed.<br>The design of fire barriers for horizontal and vertical cable trays should meet the requirements of ASTM E119, including a hose stream test. Regulatory Position 4.3 of this guide discusses the acceptance criteria for raceway fire barriers. | Conform | Applicant |
| **4.2.3.2** | **Fire-Rated Cables** Pre-1979 licensees should request an exemption when relying on fire-rated cables to meet NRC requirements for protection of safe-shutdown systems or components from the effects of fire. Post-1979 licensees relying on fire-rated cables should perform an evaluation to demonstrate that the use of fire-rated cables does not adversely affect safe shutdown in accordance with their license condition and submit a license amendment if required. (See Regulatory Position 1.8 of this guide.) | N/A | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **4.3** | **Testing and Qualification of Electrical Raceway Fire Barrier Systems** Fire barriers relied on to protect post-fire shutdown-related systems and to meet the separation means discussed in Regulatory Position 5.3 should have a fire rating of either 1 or 3 hours. Fire rating is defined as the endurance period of a fire barrier or structure, which relates to the period of resistance to a standard fire exposure before the first critical point in behavior is observed.<br>Fire endurance ratings of building construction and materials are demonstrated by testing fire barrier assemblies in accordance with the provisions of the applicable sections of NFPA 251 and ASTM E119. Assemblies that pass specified acceptance criteria (e.g., standard time-temperature fire endurance exposure, unexposed side temperature rise, hose stream impingement) are considered to have a specific fire-resistance rating.<br>The basic premise of the fire-resistance criteria is that those fire barriers that do not exceed 163 degrees C (325 degrees F) cold-side temperature and pass the hose stream test provide reasonable assurance that the shutdown capability is protected without further analyses. If the temperature criterion is exceeded, sufficient additional information is needed to permit an engineering evaluation to demonstrate that the shutdown capability is protected.<br>Appendix B to this guide provides detailed guidance for the testing and qualification of electrical raceway fire barrier systems. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.** | **Safe-Shutdown Capability** When considering the consequences of a fire in a given fire area during the evaluation of the safe-shutdown capabilities of the plant, licensees should demonstrate that one success path of SSCs that can be used to bring the reactor to hot-shutdown or hot-standby conditions remains free of fire damage. Some plant designs (those that use low-pressure systems for their success path) pass through hot shutdown in a short time and then proceed directly to cold shutdown. For the purpose of this guide, the term "safe shutdown" indicates bringing a plant to safe-shutdown condition, either hot shutdown or cold shutdown (when low-pressure systems are used as the success path), as applicable to each reactor design and as defined by the plant technical specifications. The analysis should also demonstrate that fire damage to one success path of SSCs needed for achieving cold shutdown will be limited so that a success path will be returned to an operating condition within 72 hours, or for areas requiring alternative or dedicated shutdown, the licensee should demonstrate that cold-shutdown capability can be restored and cold shutdown achieved within 72 hours. For reactor designs that cannot safely remain in hot shutdown for 72 hours, the analysis should demonstrate that a cold-shutdown condition can be achieved and maintained within the required period of time.<br>The FPP should include a safe-shutdown analysis to demonstrate that the SSCs important to safety can accomplish their respective post-fire safe-shutdown functions. The safe-shutdown analysis should demonstrate that the success path SSCs, including electrical circuits, remain free of fire damage in the event of postulated fires. As required by applicable regulations, fire barriers, physical separation with no intervening combustibles, and/or automatic detection and suppression should provide this protection. When a success path cannot be adequately protected, an alternative or dedicated shutdown success path should be identified and protected to the extent necessary to ensure post-fire safe shutdown.<br>The safe-shutdown analysis for new reactor designs should demonstrate that safe shutdown can be achieved, assuming that all equipment in any one fire area (except for the control room and containment) will be rendered inoperable by fire and that reentry into the fire area for repairs and operator actions is not possible. (See Regulatory Position 8.2 of this guide.) The control room is excluded from this approach, provided that the design includes an independent alternative shutdown capability that is physically and electrically independent of the control room. Designs incorporating reactor containment buildings should provide fire protection for redundant shutdown systems in the reactor containment building that will ensure, to the extent practicable, that at least one post-fire shutdown success path will be free of fire damage.<br>The safe-shutdown analysis should evaluate a fire in each fire area containing SSCs important to safety and identify a post-fire safe-shutdown success path. The analysis should also identify all fire-induced circuit failures that could directly or indirectly (e.g., by causing spurious actuations) prevent safe shutdown. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.1** | **Post-Fire Safe-Shutdown Performance Goals** Licensees should ensure that fire protection features are provided for SSCs important to safe shutdown that are capable of limiting fire damage, so that one success path necessary to achieve and maintain hot-shutdown conditions from either the control room or the emergency control station(s) is free of fire damage. | Conform | |
| **5.2** | **Cold Shutdown and Allowable Repairs** For normal safe shutdown, a single fire may damage redundant systems necessary to achieve cold shutdown. As described in the plant-specific licensing basis (i.e., 10 CFR Part 50, Appendix R, Section III.G.1.b, or applicable BTP), fire damage must be limited so that at least one success path can be repaired or made operable within 72 hours using onsite capability or within the time period required to achieve a safe-shutdown condition, if less than 72 hours. | Alternate Conformance | Passive plant design; follows guidance of Regulatory Position 8.2 and does not credit repairs to equipment to achieve safe shutdown. |
| **5.3** | **Fire Protection of Safe-Shutdown Capabilities** The post-fire safe-shutdown analysis should ensure that one success path remains free of fire damage for a single fire in any single plant fire area. | Conform | See Regulatory Positions 5.3.1 and 5.3.1.1 through 5.3.1.5 below. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.3.1** | **Identification and Evaluation of Post-Fire Safe-Shutdown Circuits** Chapter 3 and Appendix J of NEI 00-01, Revision 4, provides an acceptable deterministic methodology for the analysis of post-fire safe-shutdown circuits, when applied in conjunction with this RG. The NRC developed NUREG/CR-7150, “Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE),” Volumes 1, 2, and 3, as a consensus report by technical experts on issues related to multiple spurious operations (MSOs). The report is based on the current best available evidence and represents the current state of the art.<br>Two classifications of equipment in the plant are important when evaluating the ability to achieve and maintain shutdown during and following a fire. Regulatory Position 5.3.1.1 describes the equipment on the success path necessary to achieve and maintain hot-shutdown conditions. This equipment is a subset of the second and more general set of SSCs important to safe shutdown described in Position 5.3.1.2. These classifications are not applicable to alternative or dedicated shutdown systems credited for post-fire safe shutdown as defined in Appendix R, Section III.G.3. Position 5.4 discusses alternative or dedicated shutdown. The information included in Appendix H of NEI 00-01, Revision 4, may be used in classifying components on the success path required for hot shutdown and those important to safe shutdown, when applied in conjunction with this RG. Note, that the NRC will treat the phrase “required for hot shutdown” in NEI 00-01 as having the same meaning as the phrase “the safe- shutdown success path” used in this guide. Further, while Appendix G to NEI 00-01, Revision 4, identifies suggested classifications for certain safe shutdown functions and SSCs, each licensee should perform their own plant-specific evaluations.<br>The post-fire safe-shutdown circuit analysis should address all possible fire-induced failures that could affect the safe-shutdown success path, including multiple spurious actuations. Some licensees have based this analysis on the assumption that multiple spurious actuations will not occur simultaneously or in rapid succession. This is known as the “one-at-a-time” assumption. Cable fire testing performed by the NRC and industry has demonstrated that multiple cable faults occur when cables are exposed to fire.<br>These faults depend on multiple factors, including cable insulation or jacketing materials and cable configurations. The success path SSCs and the components important to safe shutdown should be protected from fire damage so that the capability to shut down the plant safely is ensured; specifically, all spurious actuations that could affect safe-shutdown success path SSCs are required to be protected in accordance with Position 5.3.1.1. The one-at-a-time assumption may still pertain to the protection of components important to safe shutdown as applied per the plant’s licensing basis, using the information in Position 5.3.1.2. However, a safety and technical analysis that demonstrates the assumption's validity for each application should support the use of this assumption. | Conform | Applicant<br>(safe shutdown equipment is identified in Appendix 9A and post-fire safe-shutdown circuit analysis will be based on the as-built cable configuration) |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **5.3.1.1** | **Protection for the Safe-Shutdown Success Path** For the success path of SSCs necessary to achieve and maintain hot-shutdown conditions, fire barriers, physical separation, or automatic suppression should protect redundant systems or components. | Conform | Design follows Regulatory Posiiton 8.2. |
| **5.3.1.2** | **Protection for Components Important to Safe Shutdown** The protection options described in Regulatory Position 5.3.1.1 are available but not required for the protection of SSCs (including circuits) important to safe shutdown. Additional protection options available for this category are, for example, operator manual actions (Position 5.3.1.3) and fire modeling (Position 5.3.1.4). These additional options are not available for safe-shutdown success path equipment without prior NRC approval (Position 5.3.1.1).<br>The approach outlined in Chapter 4 of NEI 00-01, Revision 4, which relies on the Expert Panel Process and the Generic List of Multiple Spurious Operations contained in Appendices F and G, provides an acceptable methodology for the analysis of MSOs for protection of components important to safe shutdown, when applied in conjunction with this RG. | Conform | Design follows Regulatory Posiiton 8.2 |
| **5.3.1.3** | **Operator Manual Actions** When one of the redundant safe-shutdown trains in a fire area is maintained free of fire damage by one of the means specified in Regulatory Position 5.3.1.1, then the use of operator manual actions may be credited with mitigating fire-induced operation or maloperation of components that are not part of the protected success path. The crediting of operator manual actions should be in accordance with the licensee's FPP and license condition. Operator manual actions may also be credited when an alternative or dedicated shutdown capability is provided as described in Position 5.4.<br>All post-fire operator manual actions should be feasible and reliable. NUREG-1852 provides the technical bases in the form of criteria and technical guidance that may be used to demonstrate that operator manual actions are feasible and can be performed reliably under a wide range of plant conditions that an operator might encounter during a fire. The use of feasible and reliable manual actions alone may not be sufficient to address all levels of defense in depth. Therefore, fire prevention, detection, and suppression should be considered, in addition to the feasibility and reliability of operator manual actions.<br>Because the fire protection requirements, including the protection of safe-shutdown capability and the prevention of radiological release, can be integrated in the planning and design phase, a new reactor plant should have minimal reliance on operator manual actions and alternative or dedicated shutdown systems (protection for fires in the main control room will require alternative shutdown capability). | Conform | Design follows Regulatory Position 8.2. No operator manual actions are credited for standard plant design. |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.3.1.4** | **Fire Modeling** When one of the redundant safe-shutdown trains in a fire area is maintained free of fire damage by one of the specified means in Regulatory Position 5.3.1.1, then fire modeling may be used to demonstrate that components important to safe shutdown, including SSCs that are not part of the success path, are protected from fire damage. The use of fire modeling should be in accordance with the licensee's FPP and license condition. Regulatory Position 1.8.7 of this guide provides information regarding fire modeling. When fire modeling is used to demonstrate that components important to safe shutdown are protected from fire damage, the analysis should consider in situ and transient fire sources in the area and all targets that involve components important to safe shutdown. The fire models should be used within the bounds of their capability. By considering expected room configurations (e.g., doors open or closed), the fire modeling analysis should show that the largest expected fire will not affect the components important to safe shutdown. In addition, the area being analyzed should include effective automatic suppression in the fire area, a significant margin between the expected fire and the damage threshold of the target, or other features to provide an adequate safety margin and defense in depth. | Conform | Applicant |
| **5.3.1.5** | **Examples of Safe-Shutdown Success Path Components and Components Important to Safe Shutdown** General examples of components that should be considered part of the safe-shutdown success path and components that are important to safe shutdown are listed below. Appendix H to NEI 00-01, Revision 4, provides additional information about the classification of safe-shutdown equipment when applied in conjunction with this guide. | N/A | Information statement |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **5.3.2** | **High-Low Pressure Interface** The licensee should evaluate the circuits associated with high-low pressure interfaces for the potential to adversely affect safe shutdown. For example, the residual heat removal (RHR) system is generally a low-pressure system that interfaces with the high-pressure primary coolant system. Thus, the interface most likely consists of two redundant and independent motor-operated valves. Both of these motor-operated valves and their power and control cables may be subject to damage from a single fire. This single fire could cause the two valves to spuriously open, resulting in an interfacing system loss-of-coolant accident (LOCA) through the subject high-low pressure systems interface. To ensure adequate protection of this interface and other high-low pressure interfaces from the effects of a single fire, the licensee should perform an evaluation, as follows:<br>a) Identify each high-low pressure interface that uses redundant, electrically controlled devices (such as two series motor-operated valves) to isolate or preclude the rupture of any primary coolant boundary.<br>b) For each set of redundant valves, verify that the redundant cabling (power and control) has adequate physical separation, as stated in Regulatory Positions 5.3 or 6.1.1.1 of this guide, as applicable.<br>c) Where adequate separation is not provided, demonstrate that fire-induced failures (multiple hot shorts, open circuits, and shorts to ground) of the cables will not cause maloperation and result in an interfacing system LOCA that would adversely affect safe shutdown.<br>The electrical expert PIRT panel, as documented in NUREG/CR-7150, Volume 3, has determined that the potential for a fire to cause hot shorts on all three phases in proper sequence of an AC power circuit to cause a spurious operation of a motor or two shorts of proper polarity on a DC compound-wound motor is incredible and need not be considered in the evaluation.<br>The approach outlined in Appendix C to NEI 00-01, Revision 4, provides an acceptable methodology for the determination of components as high-low pressure interface components, when applied in conjunction with this RG. | Conform | Applicant. Design follows Regulatory Posiiton 8.2. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.3.3** | **Multiple High-Impedance Faults** The concept of multiple high-impedance faults (MHIFs) deviates from baseline assumptions associated with conventional electrical protective devices coordination. The MHIF failure mode is based on presuming that a fire can cause short circuits that generate abnormally high currents below the trip point of the individual overcurrent-interrupting devices for the affected circuits. Under the assumed conditions, circuit overcurrent-protective devices will not detect and interrupt the abnormal current flow. It follows that if several circuits experience a high-impedance fault (HIF), the cumulative current flow could exceed the trip setting of the supply breaker or fuse, causing it to trip. The NUREG/CR-7150, Volume 1, electrical expert PIRT panel evaluated the potential MHIF phenomenon and concluded that it need not be considered as a failure mode in the safe-shutdown circuit analysis as long as certain criteria are met. Of critical importance is the use of certain robust design criteria outlined in NEI 00-01, Revision 4, Appendix B.1, that ensure HIFs do not persist in an electrical system for extended periods of time. These criteria include the use of properly coordinated protective devices as outlined in IEEE 242, "IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems", and the use of proper protective devices that are designed and constructed according to applicable industry standards and applied within their vendor ratings. Additionally, appropriate testing and maintenance should be performed on these protective devices by following accepted industry guidelines and specific vendor recommendations for maintenance and testing. The consensus position of the panel was that the guidance in NEI 00-01, Revision 4, Appendix B.1, can be safely applied to fire safe-shutdown methodologies throughout the plant, and information in NEI 00-01, Revision 4, Appendix B.1, may be used to address multiple HIFs when used in a manner consistent with this guide, except with respect to Kapton cables. The NRC does not endorse the information in NEI 00-01, Revision 4, Appendix B.1, for analysis of Kapton cables. Kapton is a specific cable insulation material that has been shown to experience arc tracking phenomena. | Conforms | Applicant |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **5.3.4** | **Open Secondary Circuits on Current Transformers** Current transformers (CTs), a subgroup of instrument transformers, are used throughout AC electrical distribution systems in nuclear power plants to monitor current levels at select locations (e.g., cable, bus bar) and provide a signal from their secondary winding that is proportional to the current flowing through the main (primary) winding. In many cases, the protective relays and indicators associated with the CT are located at the same locations as the CT. For these cases, the secondary circuit is typically confined to the switchgear or equipment containing the CT. In other instances, the secondary circuit of the CT may provide a signal to remotely located protective relay(s) or indicator(s) (e.g., differential protective relays and remote ammeters). As such, the secondary circuit may span many fire areas within a nuclear power plant. These latter cases present a potential safety concern as an open circuit in a CT's secondary can cause high crest (or peak) voltage on the secondary circuit as the CT attempts to maintain the current relationship dictated by the transformer's winding turn ratio. This condition can generate voltages that may exceed the dielectric strength of the CT's insulating materials and may then cause arcing to connected or nearby components, potentially damaging the components. Should a fire-induced open circuit occur in the run of instrumentation cable, a high-voltage condition in the secondary circuit would result. In theory, this high-voltage condition could result in a secondary fire because of insulation breakdown. In this context, a "secondary fire" refers to a fire at a remote location, (i.e., in a separate fire area) from the original fire that is responsible for the initial open circuit in the CT's secondary circuit. The resulting secondary fire introduces a potential concern for fire protection strategies in nuclear power plants for both deterministic and performance-based approaches.<br>The NUREG/CR-7150, Volume 1, electrical expert PIRT panel investigated the above postulated failure mode and considered the concern of a secondary fire resulting from a fire-induced, open-circuited CT was more theoretical than real. Based on the availability of objective test data at that time, the panel determined that the unique combination of low-probability events makes this failure mode incredible for CTs with turn ratios of 1200:5 or below. Upon subsequent testing and evaluation of CTs with higher turn ratios (2000:5 and 4000:5), the NUREG/CR-7150, Volume 3, electrical expert PIRT panel, given the absence of secondary fires or any other fire precursors and the unique combination of low-probability events needed for their occurrence, concluded that secondary fires resulting from open-circuited CT installations up to and including 15-kilovolt (kV) primary circuit voltage are incredible. The panel recommended no further consideration of secondary fires as a result of CT failures for low- and medium-voltage applications (up to and including 15-kV primary voltage). | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.3.5** | **Shorting Switch** In response to MSO concerns, several licensees have proposed the use of shorting switches as a design feature to protect against hot short-induced spurious operations caused by fire damage. The shorting switch functions to prevent spurious operation of a component by placing a short across a coil in the circuit of concern when the circuit is in its "standby" state. When the component is desired to be operated, the motion of the hand switch removes the short before energizing the coil to actuate the component. Any circuit using a shorting switch should have this feature of removing the short provided by the shorting switch prior to energizing the coil (i.e., break-before-make).<br>An NEI task force was formed to develop generic guidance on the design, use, and implementation of shorting switches to protect against the spurious operation concerns. The NUREG/CR-7150, Volume 3, electrical expert PIRT panel subsequently reviewed the proposed NEI guidance and provided supplemental technical information to form a comprehensive set of design considerations and recommendations for the reliable use and application of shorting switches. The guidelines, including the revisions and additions from NUREG/CR-7150, were then included in NEI 00-01, Revision 4, Appendix I. The design considerations for shorting switches outlined in Appendix I to NEI 00-01, Revision 4, provide an acceptable methodology for shorting switch applications when applied in conjunction with this RG. | N/A | The standard plant design does not currently credit the use of shorting switches. |
| **5.4** | **Alternative and Dedicated Shutdown Capability** | | |
| **5.4.1** | **General Guidelines** Appendix R to 10 CFR Part 50 defines "alternative shutdown capability" as being provided by rerouting, relocating, or modifying existing systems, whereas "dedicated shutdown" is defined as being provided by installing new structures and systems for the function of post-fire shutdown. Since post-fire repairs cannot be credited for achieving and maintaining hot shutdown, the licensee should implement the required rerouting, relocating, or modifying of the existing system for alternative shutdown capability in existing plants when the need for additional alternative shutdown capability is identified.<br>The licensee should consider one spurious actuation or signal to occur before control of the plant is achieved through the alternative or dedicated shutdown system for fires in areas that require alternate or dedicated shutdown. After the operators transfer control from the control room to the alternative or dedicated shutdown system, single or multiple spurious actuations that could occur in the fire-affected area should be considered, in accordance with the plant's approved FPP.<br>The approach outlined in Appendix D to NEI 00-01, Revision 4, provides an acceptable methodology for evaluating alternative and dedicated shutdown, when applied in conjunction with this RG. In addition, the second paragraph of Appendix G to NEI 00-01, Revision 4, provides information on the analysis of multiple spurious actuations for alternative and dedicated shutdown systems. | Conform | General information. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.4.2** | **Loss of Offsite Power/Station Blackout** In evaluating the ability to accomplish safe-shutdown after fires, the licensee should consider whether offsite power will be available. However, the licensee need not consider loss of offsite power for a fire in nonalternative or nondedicated shutdown areas, if it can show that offsite power cannot be lost because of a fire in that area.<br>As described in Regulatory Position 5.4.1 of this guide, alternative shutdown capability should accommodate post-fire conditions when offsite power is available and conditions when offsite power is not available for 72 hours. In an evaluation of safe-shutdown circuits, the availability of uninterrupted power (i.e., offsite power remains available) may affect the ability to control the safe shutdown of the plant by increasing the potential for circuit interactions resulting from fire damage to energized power and control circuits that may result in spurious actuations.<br>Several operating plant licensees have alternative methodologies that rely on intentional disconnection of AC power to specific equipment or to the entire plant as a means to achieve safe shutdown after a fire. The purpose of the self-induced station blackout (SISBO) is to eliminate potential spurious actuations that could prevent safe shutdown and allow manual control of required equipment. Some licensees have procedures that cause a SISBO condition to be created as a result of fire effects (e.g., procedures that direct operators to manually trip the credited safe-shutdown EDG in the event of fire damage to circuits of vital EDG support systems). The acceptability of safe-shutdown procedures that voluntarily enter, or otherwise create, a SISBO condition is determined on a case-by-case basis.<br>The ability to cope with a SISBO as part of the post-fire safe-shutdown methodology depends on such issues as time-line logic; assumptions and bases for plant and operator response relative to component realignment; the ability of plant operators to monitor and control plant parameters and align plant components before, during, and after a SISBO has caused control room evacuation and abandonment; and the practicality and reliability of EDG start and load (and restart, if applicable) under post-fire safe-shutdown SISBO conditions.<br>The risk of a SISBO may exceed the actual risk posed by the fire, and the licensee should consider the risk carefully when evaluating the safe-shutdown design and procedures. A plant typically uses this approach to avoid or minimize the need for operator manual actions after a fire. However, acceptable operator manual actions that are implemented in accordance with Regulatory Position 5.3.1.3 of this guide and NUREG-1852 may present a lower risk than the SISBO approach. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.4.3** | **Associated Circuits of Concern** When alternative or dedicated shutdown systems are credited for achieving post-fire safe shutdown, a specific category of circuits has been defined (referred to as “associated circuits of concern”), and acceptable approaches to mitigating the consequences of fire-induced failure of these circuits have been identified. The licensee should evaluate these circuits, which are nonsafety or safety circuits that could adversely affect the identified shutdown equipment by feeding back potentially disabling conditions (e.g., hot shorts or shorts to ground) to power supplies or control circuits of that equipment. Such disabling conditions should be prevented to ensure that the identified safe-shutdown equipment will function as designed. | Conform | Applicant |
| **5.4.4** | **Protection of Associated Circuits of Concern** The shutdown capability may be protected from the adverse effect of damage to associated circuits of concern by the separation and protection guidelines of Regulatory Position 5.3 of this guide (or Regulatory Position 6.1.1.1 for cables inside a noninerted containment) or, alternatively, by the following methods, as applied to each type of associated circuit of concern. | Conform | Applicant |
| **5.4.4.1** | **Common Power Source** It may be necessary to coordinate a load fuse or breaker (i.e., interrupting devices) with a feeder fuse or breaker to prevent the loss of the redundant or alternative shutdown power source. IEEE Standard 242 provides detailed guidance on achieving proper coordination. | Conform | Applicant.<br>Power is not required to achieve passive safe shutdown. |
| **5.4.4.2** | **Spurious Actuation Circuits** Spurious actuation is considered to be mitigated if one of the following criteria is met (the fire-induced spurious actuations of components included in the safe-shutdown success path should be prevented using the methods described in Regulatory Position 5.3.1):<br>a) Provide a means to isolate the equipment and components from the fire area before the fire (i.e., remove power, open circuit breakers).<br>b) Provide electrical isolation that prevents spurious actuation. Potential isolation devices include breakers, fuses, amplifiers, control switches, CTs, fiber optic couplers, relays, and transducers.<br>c) Provide a means to detect spurious actuations and develop procedures to mitigate the maloperation of equipment (e.g., closure of the block valve if a power-operated relief valve spuriously operates, opening the breakers to remove the spurious actuation of safety injection). | Conform | Applicant |
| **5.4.4.3** | **Common Enclosures** To ensure that the coordination criteria are met, one of the following should be provided:<br>a) Provide appropriate measures to prevent propagation of the fire.<br>b) Provide electrical protection (e.g., breakers, fuses, or similar devices). | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.4.5** | **Control Room Fires** The control room fire area contains the controls and instruments for redundant shutdown systems in proximity. (Separation is usually a few inches.) Alternative or dedicated shutdown capability for the control room and its required circuits should be independent of the cables, systems, and components in the control room fire area.<br>The damage to systems in the control room for a fire that causes evacuation of the control room cannot be predicted. The licensee should conduct a bounding analysis to ensure that safe conditions can be maintained from outside the control room. This analysis is dependent on the specific design. The following assumptions usually apply:<br>a) The reactor is tripped in the control room.<br>b) Offsite power is lost, as well as automatic starting of the onsite AC generators and the automatic function of valves and pumps with control circuits that could be affected by a control room fire.<br>The analysis should demonstrate that the capability exists to manually achieve safe-shutdown conditions from outside the control room by restoring AC power to designated pumps, ensuring that valve lineups are correct, and assuming that any malfunctions of valves that permit the loss of reactor coolant can be corrected before unrestorable conditions occur.<br>The only operator action in the control room before evacuation for which credit is usually given is reactor trip. For any additional control room actions deemed necessary before evacuation, a licensee should be able to demonstrate that such actions can be performed. Additionally, the licensee should ensure that such actions cannot be negated by subsequent spurious actuation signals resulting from the postulated fire. The design basis for the control room fire should consider one spurious actuation or signal to occur before control of the plant is achieved through the alternative or dedicated shutdown system. After the alternative or dedicated shutdown system achieves control of the plant, single or multiple spurious actuations that could occur in the fire-affected area should be considered, in accordance with the plant's approved FPP.<br>Procedures and conditions described in Regulatory Position 5.5.2 should govern post-fire return to the control room.<br>After returning to the control room, the operators can take any actions compatible with the condition of the control room. Controls in any area (cabinet where the fire occurred) may not be available. Smoke and fire suppressant damage in other areas (cabinets) should also be assessed and corrective action taken before controls in such cabinets are deemed functional. Controls in undamaged areas (cabinets) may be operated as required. Repairs inside the control room may be performed to reach cold shutdown. | Alternate Conformance | Applicant. For a fire in the MCR, it is assumed that the circuit logic for the MPS cabinets and the controls in the MCR are designed such that disconnect (or isolation) switches are not required outside of the control room in order to isolate control signals and prevent spurious operations due to fire. However, alternative shutdown capability is still provided for at the MPS I&C rooms. Safe shutdown can be achieved from these rooms, even accounting for spurious operations that occur as a result of a fire in the main control room. Applicant will demonstrate, as part of site specific design, the necessary control room actions (i.e., use of hand switches) can be performed prior to control room evacuation and that such actions cannot be negated by subsequent spurious actuation signals. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **5.4.5 (Continued)** | | | The design of the circuit logic would also preclude the need to postulate spurious actuations that could challenge safe shutdown after passive safe shutdown has been initiated from the control room. Disconnect (or isolation) switches may still be provided but would not be required. |
| **5.5** | **Post-Fire Safe-Shutdown Procedures** Procedures for effecting safe shutdown should reflect the results and conclusions of the safe-shutdown analysis. Implementation of the procedures should not further degrade plant safety functions. Time-critical operations for effecting safe shutdown identified in the safe-shutdown analysis and incorporated in post-fire procedures should be validated. | Conform | Applicant |
| **5.5.1** | **Safe-Shutdown Procedures** Post-fire safe-shutdown operating procedures should be developed for those areas where alternative or dedicated shutdown is required. For other areas of the plant, shutdown would normally be achieved using the normal operating procedures, plant emergency operating procedures, or other abnormal operating procedures. (See also Regulatory Position 5.3.1.3 for a discussion of the feasibility and reliability of operator manual actions.) | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **5.5.2** | **Alternative or Dedicated Shutdown Procedures** Procedures should be in effect that describe the tasks to implement alternative or dedicated shutdown capability when offsite power is available and when offsite power is not available for 72 hours. These procedures should also address necessary actions to compensate for spurious actuations and HIFs, if such actions are necessary to affect safe shutdown.<br>Procedures governing the return to the control room should consider the following conditions:<br>a) The fire has been extinguished and so verified by appropriate fire protection personnel.<br>b) Appropriate fire protection personnel and the shift supervisor have deemed the control room to be habitable.<br>c) Damage has been assessed and, if necessary, corrective action has been taken to ensure that necessary safety, control, and information systems are functional (some operators may assist with these tasks), and the shift supervisor has authorized the return of plant control to the control room.<br>d) Turnover procedures that ensure an orderly transfer of control from the alternative or dedicated shutdown panel to the control room have been completed. | Conform | Applicant |
| **5.5.3** | **Repair Procedures** The licensee should develop procedures for performing repairs necessary to achieve and maintain cold-shutdown conditions. For alternative shutdown, procedures should be in effect to accomplish repairs necessary to achieve and maintain cold shutdown within 72 hours. For plants that must proceed to cold shutdown within 72 hours, the procedures should support the required time for initiation of cold shutdown.<br>The performance of repair procedures should not adversely affect operating systems needed to maintain hot shutdown. | Conform | Applicant.<br>Repairs are not required to achieve passive safe shutdown. |
| **5.6** | **Shutdown and Low-Power Operations** Safe-shutdown requirements and objectives focus on achieving shutdown conditions for fires occurring during normal at-power operations. During shutdown operations (i.e., maintenance or refueling outages), fire risk may increase significantly as a result of work activities. In addition, redundant systems important to safety may not be available as allowed by plant technical specifications and plant procedures. The FPP should be reviewed to verify that fire protection systems, features, and procedures will minimize the potential for fire events to affect safety functions (e.g., reactivity control, reactor decay heat removal, spent fuel pool cooling) or result in the unacceptable release of radioactive materials, under the differing conditions that may be present during shutdown operations. | Conform | Applicant |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.** | **Fire Protection for Areas Important to Safety** Several areas within a nuclear power plant present unique hazards or design issues related to fire protection and safe shutdown. This section provides guidance applicable to specific plant areas. | N/A | Title and information Statement |
| **6.1** | **Areas Related to Power Operation** | | |
| **6.1.1** | **Containment** Fire protection for the primary and secondary containment areas should be provided for the hazards identified in the fire hazards analysis. Under normal conditions, containment fire hazards may include lubricating oils, hydraulic fluids, cables, electrical penetrations, electrical cabinets, and charcoal filters. During refueling and maintenance operations, additional hazards may be introduced, including contamination control and decontamination materials and supplies, scaffolding, plastic sheathing, wood planking, chemicals, and hot work. The fire hazards analysis should evaluate the effects of postulated fires within the primary containment to ensure that the performance objectives described in Regulatory Position 5.1 of this guide are met.<br>Regulatory Position 7.1 provides guidance for RCP oil collection. | Conform | No fire protection needed for containment based on FHA. No intervening combustibles exist. Reactor Pool ensures core remains covered during refueling. |
| **6.1.1.1** | **Containment Electrical Separation** For secondary containment areas, cable fire hazards that could affect safety should be protected as described in Regulatory Position 4.1.3.3 of this guide.<br>Inside noninerted containments, one of the fire protection means specified in Regulatory Position 5.3.1.1, or one of the following, should be provided:<br>a) separation of cables and equipment and associated nonsafety circuits of redundant trains by a horizontal distance of more than 6.1 m (20 ft.) with no intervening combustibles or fire hazards,<br>b) installation of fire detectors and an automatic fire suppression system in the fire area, or<br>c) separation of cables and equipment and associated nonsafety circuits of redundant trains by a noncombustible radiant energy shield having a minimum fire rating of 30 minutes, as demonstrated by testing or analysis. | Conform | Separation in containment is maximized to the extent practicable. Details of cable routing in containment have not been determined. Electrical cables outside of containment are contained in conduit under the bioshield. Separate and separated cable trays are used outside of under the bioshield. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.1.2** | **Containment Fire Suppression** The licensee should provide fire suppression systems on the basis of a fire hazards analysis. During normal operations, containment is generally inaccessible, and therefore, automatic fixed systems should provide fire protection. Automatic fire suppression capability need not be provided in primary containment atmospheres that are inerted during normal operations. However, inerted containments should have manual firefighting capability, including standpipes, hose stations, and portable extinguishers, to provide protection during refueling and maintenance operations.<br>Standpipe and hose stations should also be installed inside PWR containments and BWR containments that are not inerted. Standpipe and hose stations inside containment may be connected to a high-quality water supply of sufficient quantity and pressure other than the fire main loop if plant-specific features prevent extending the fire main supply inside containment. For BWR drywells, standpipe and hose stations should be placed outside the drywell with adequate lengths of hose, no longer than 30.5 m (100 ft.), to reach any location inside the drywell with an effective hose stream.<br>The containment penetration of the standpipe system should meet the isolation requirements of GDC 56, “Primary Containment Isolation,” of Appendix A to 10 CFR Part 50 and should be in seismic Category I and Quality Group B.<br>Operation of the fire protection systems should not compromise the integrity of the containment or other systems important to safety. Fire protection activities in the containment areas should function in conjunction with total containment requirements such as ventilation and control of contaminated liquid and gaseous release.<br>The licensee should place adequate self-contained breathing apparatuses near the containment entrances for firefighting and damage control personnel. These units should be independent of any breathing apparatuses or air supply systems provided for general plant activities and should be clearly marked as emergency equipment. For normally inerted containments, self-contained breathing apparatuses need be staged near the containment hatches only when the containment is not inerted, such as during maintenance outages. | Conform | Applicant. Based on the FHA, the NPM containment design does not have any fire suppression. The containment will normally be under a low vacuum or flooded and combustible materials is near zero. |
| **6.1.1.3** | **Containment Fire Detection** Fire detection systems should alarm and annunciate in the control room. In primary containment, fire detection systems should be provided for each fire hazard. For primary and secondary containment, the type of detection used and the location of the detectors should be the most suitable for the particular type of fire hazard identified by the fire hazards analysis.<br>A general area fire detection capability should be provided in the primary containment as backup to the above-described hazard detection. To accomplish this, suitable smoke or heat detectors compatible with the radiation environment should be installed in the air recirculation system ahead of any filters. | Alternate Conformance | No fire detection has been provided inside containment as evaluated in the FHA. |

## Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.2** | **Control Room Complex** The control room complex (including galleys and office spaces) should be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls, and roof having minimum fire-resistance ratings of 3 hours. Peripheral rooms in the control room complex should have automatic water suppression and should be separated from the control room by noncombustible construction with a fire-resistance rating of 1 hour. Ventilation system openings between the control room and peripheral rooms should have automatic smoke dampers that close upon operation of the fire detection or suppression system. If a gas extinguishing system is used for fire suppression, these dampers should be strong enough to support the pressure rise accompanying the agent discharge and seal tightly against infiltration of the agent into the control room. $CO_2$ total flooding systems are not acceptable for these areas.<br>Breathing apparatuses for control room operators should be readily available.<br>All cables that enter the control room should terminate in the control room. That is, no cabling should be routed through the control room from one area to another. Cables in underfloor and ceiling spaces should be rated and meet the separation criteria necessary for fire protection.<br>Equipment that is important to safety should be mounted on pedestals, or the control room should have curbs and drains to direct water away from such equipment. Such drains should be provided with a means for closing to maintain integrity of the control room in the event of other accidents requiring control room isolation.<br>The control room should not be carpeted. Where carpeting has been installed (e.g., for sound abatement or other human factors), it should be tested to standards such as ASTM D2859, "Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials", to establish the flammability characteristics of the material. The fire hazards analysis should address these characteristics. | Conform | Applicant. HFE determines if carpet is used in MCR. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.2.1** | **Control Room Fire Suppression** Manual firefighting capability should be provided for both of the following:<br>a) fire originating within a cabinet, console, or connecting cables, and<br>b) exposure fires involving combustibles in the general room area.<br>Portable Class A and Class C fire extinguishers should be located in the control room. A hose station should be installed inside or immediately outside the control room.<br>Nozzles that are compatible with the hazards and equipment in the control room should be provided for the manual hose station. The nozzles chosen should meet actual firefighting needs, satisfy electrical safety, and minimize physical damage to electrical equipment from hose stream impingement.<br>Fully enclosed electrical raceways located in underfloor and ceiling spaces, if over 0.09 m2 (1 ft2) in cross-sectional area, should have automatic fire suppression inside. Area automatic fire suppression should be provided for underfloor and ceiling spaces if these spaces are used for cable runs, unless all cable is run in 10-centimeter (4-in.) or smaller steel conduit or the cables are in fully enclosed raceways internally protected by automatic fire suppression. | Alternate Conformance | Manual fire suppression capability is provided in the control room to address fire hazards. Portable fire extinguishers are provided in the control room. At least one hose station is provided inside or immediately outside the control room. |
| **6.1.2.2** | **Control Room Fire Detection** Smoke detectors should be provided in the control room, cabinets, and consoles. If redundant safe-shutdown equipment is located in the same control room cabinet or console, additional fire protection measures should be provided. Alarm and local indication should be provided in the control room.<br>The outside air intake(s) for the control room ventilation system should be provided with smoke detection capability to alarm in the control room to enable manual isolation of the control room ventilation system and, thus, prevent smoke from entering the control room. | Conform | Automatic fire detection is provided in the control room. Redundant safe shutdown equipment located in the same cabinet or console is protected with additional fire protection measures. Outside air intake for control room ventilation is provided with smoke detection that alarms in the control room. |
| **6.1.2.3** | **Control Room Ventilation** Venting of smoke produced by fire in the control room by means of the normal ventilation system is acceptable; however, provision should be made to permit isolation of the recirculating portion of the normal ventilation system. The operators should be able to manually operate venting of the control room.<br>Air-handling functions should be ducted separately from cable runs in ceiling and floor spaces. If cables are routed in underfloor or ceiling spaces, these spaces should not be used as air plenums for ventilation of the control room. | Alternate Conformance | Applicant. The design employs use of portable temporary fans and administrative controls for manual purging of smoke from the control room. |

# Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **6.1.3** | **Cable Spreading Room** A separate cable spreading room should be provided for each redundant division. Cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from the others and from other areas of the plant by barriers with a minimum fire rating of 3 hours. If this is not possible, an alternative or dedicated shutdown capability should be provided. | Alternate Conformance | The plant design does not use a cable spreading room.<br>Divisional separation is maintained in all areas except the shared main control room, the top of each module, and inside each containment.<br>Alternative shutdown capability is provided. |
| **6.1.4** | **Plant Computer Rooms** Rooms for computers performing functions important to safety that are not part of the control room complex should be separated from other areas of the plant by barriers having a minimum fire-resistance rating of 3 hours and should be protected by automatic detection and fixed automatic suppression. Computers that are part of the control room complex but are not located in the control room should be separated and protected as described in Regulatory Position 6.1.2 for peripheral rooms. Computer cabinets located in the control room should be protected as other control room equipment and cable runs in the room. Nonsafety-related computers outside the control room complex should be separated from plant areas important to safety by fire barriers with a minimum rating of 3 hours and should be protected as needed to prevent fire and smoke damage to equipment important to safety. Manual hose stations and portable extinguishers should be located in areas containing equipment important to safety. NFPA 75, "Standard for the Protection of Information Technology Equipment", provides additional guidance.<br>New reactor designs with individual digital control system servers located throughout the plant should include 3-hour fire barrier protection between redundant servers performing functions that are important to safety; however, nonsafety-related servers outside the control room complex do not need to be separated by fire barriers from plant areas important to safety, and servers that are important to safety do not need to be protected by detection and suppression unless required by the fire hazards analysis. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.5** | **Switchgear Rooms** Switchgear rooms containing equipment important to safety should be separated from the remainder of the plant by barriers with a minimum fire rating of 3 hours. Redundant switchgear safety divisions should be separated from each other by barriers with a 3-hour fire rating. Automatic fire detectors should alarm and annunciate in the control room and alarm locally. Cables entering the switchgear room that do not terminate or perform a function should be kept at a minimum to minimize the fire hazard. These rooms should not be used for any other purpose. Automatic fire suppression should be provided consistent with other safety considerations. Fire hose stations and portable fire extinguishers should be readily available outside the area.<br>Some high-voltage electrical equipment (e.g., switchgear and transformers) has the potential for an energetic electrical fault that can damage SSCs important to safety. The fire hazards analysis should consider the potential for this type of fault.<br>Equipment should be located to facilitate access for manual firefighting. Drains (see Regulatory Position 4.1.5 of this guide) should be provided to prevent water accumulation from damaging equipment important to safety. Remote, manually actuated ventilation should be considered for venting smoke when manual fire suppression effort is needed. (See Regulatory Position 4.1.4 of this guide.) | Alternate Conformance | The design does not provide switchgear rooms containing equipment with safety-related or risk-significant functions. |
| **6.1.6** | **Alternative and Dedicated Shutdown Panels** Barriers with a minimum fire rating of 3 hours should separate panels providing alternative and dedicated shutdown capability from the control room complex. Panels providing alternative and dedicated shutdown capability should be electrically isolated from the control room complex so that a fire in either area will not affect shutdown capability from the other area. The general area housing remote panels important to safety should be provided with automatic fire detectors that alarm locally and alarm and annunciate in the control room. Combustible materials should be controlled and limited to those required for operation. Portable extinguishers and manual hose stations should be readily available in the general area.<br>Locations containing alternative and dedicated shutdown panels must be habitable under fire and post-fire conditions that require their use. Habitability should also be addressed for alternative and dedicated shutdown panels protected by or adjacent to areas with gaseous fire suppression systems. | Conform | |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.7** | **Station Battery Rooms** Battery rooms important to safety should be protected against fires and explosions. Battery rooms should be separated from each other and from other areas of the plant by barriers having a minimum fire rating of 3 hours inclusive of all penetrations and openings. These battery rooms should not house DC switchgear and inverters. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Battery room ventilation systems should be capable of maintaining the hydrogen concentration well below 2 percent. Loss of ventilation should be alarmed in the control room. Standpipes, hose stations, and portable extinguishers should be readily available outside the room. | Conform | |
| **6.1.8** | **Diesel Generator Rooms** Diesel generators important to safety should be separated from each other and from other areas of the plant by fire barriers that have a fire-resistance rating of at least 3 hours. Diesel generators that are not important to safety should be separated from plant areas containing equipment and circuits important to safety by fire barriers that have a fire-resistance rating of at least 3 hours.<br>Automatic fire suppression should be installed to suppress or control any diesel generator or lubricating oil fires. Such systems should be designed to operate without affecting the diesel when it is running. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Hose stations and portable extinguishers should be readily available outside the area. Drainage for firefighting water should be provided and a means for local manual venting of smoke should be considered.<br>Day tanks with a total capacity of up to 4,164 L (1,100 gal) may be located in rooms with diesel generators important to safety under the following conditions:<br>a) The day tank is located in a separate enclosure with a fire-resistance rating of at least 3 hours, including doors or penetrations. These enclosures should be capable of containing the entire contents of the day tanks and should be protected by an automatic fire suppression system.<br>b) The day tank is located inside the diesel generator room in a diked enclosure that has sufficient capacity to hold 110 percent of the contents of the day tank or is drained to a safe location. | Conform | The SPD does not include Emergency Diesel Generators as electrical power is not required to achieve passive safe shutdown. Backup diesel generators are separated from safe shutdown equipment inside the RXB by physical separation and 3-hour fire barriers. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.1.9** | **Pump Rooms** Pump houses and rooms housing redundant pump trains important to safety should be separated from each other and from other areas of the plant by fire barriers having at least 3-hour ratings. These rooms should be protected by automatic fire detection and suppression unless a fire hazards analysis can demonstrate that a fire will not endanger other equipment required for safe plant shutdown. Fire detection should alarm and annunciate in the control room and alarm locally. Hose stations and portable extinguishers should be readily accessible.<br>Equipment pedestals, curbs, and floor drains should be provided to prevent water accumulation from damaging equipment important to safety. (See Regulatory Position 4.1.5 of this guide.)<br>Provisions should be made for manual control of the ventilation system to facilitate smoke removal if required for manual firefighting operation. (See Regulatory Position 4.1.4 of this guide.) | Conform | |
| **6.2** | **Other Areas** Other areas within the plant may contain hazards or equipment that warrant special consideration related to fire protection, including areas containing significant quantities of radioactive materials, yard areas containing water supplies or systems important to safety, and the plant cooling tower. | | Information Statement |
| **6.2.1** | **New Fuel Areas** Portable hand fire extinguishers should be located near this area. Also, hose stations should be located outside but within hose reach of this area. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Combustibles should be kept to a minimum in the new fuel area. The storage area should be provided with a drainage system to prevent accumulation of water.<br>The storage configuration of new fuel should always be maintained to preclude criticality for any water density that might occur during fire-water application. | Alternate Conformance | When new fuel is received on site it is brought into the reactor building and moved into the reactor pool. Fire protection in areas the fuel moves through is assured with administrative controls or sprinkler systems. Plant fire hose stations are located nearby. |
| **6.2.2** | **Spent Fuel Areas** Local hose stations and portable fire extinguishers should provide protection for the spent fuel pool. Automatic fire detection should alarm and annunciate in the control room and alarm locally.<br>Regulatory Guide 1.191 provides additional guidelines for fire protection of spent fuel areas for permanently shutdown reactors where removal of the spent fuel to an independently licensed storage facility is incomplete. | Conform | Applicant |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **6.2.3** | **Radwaste Building, Radwaste Storage Areas and Decontamination Areas** Radioactive waste buildings, storage areas, and decontamination areas should be separated from other areas of the plant by fire barriers having at least 3-hour ratings. Automatic sprinklers should be used in all areas where combustible materials are located. Alternatively, manual hose stations and portable extinguishers (handheld and large-wheeled units sized according to the hazards) are acceptable. Automatic fire detection should annunciate and alarm in the control room and alarm locally. Ventilation systems in these areas should be capable of being isolated to prevent the release of radioactive materials to other areas or the environment. Water from firefighting activities should drain to liquid radwaste collection systems.<br>Materials that collect and contain radioactivity, such as spent ion exchange resins, charcoal filters, and HEPA filters, should be stored in closed metal tanks or containers that are located in areas free from ignition sources or combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Requirements for removal of decay heat from entrained radioactive materials should be considered. | Conform | Applicant |
| **6.2.4** | **Independent Spent Fuel Storage Areas** The requirements of 10 CFR 72.122(c) address fire protection of dry cask storage and other independent spent fuel storage facilities. The fire protection provided for these facilities should be commensurate with the potential fire hazards and with the potential for an unacceptable release of radiation during and following a fire. In addition to the requirements of 10 CFR Part 72, “Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste”, fire protection for independent spent fuel storage installations should ensure that fires involving such installations will not impact plant operations and plant areas important to safety. | Conform | Applicant |
| **6.2.5** | **Water Tanks Important to Safety** Storage tanks that supply water for safe shutdown should be protected from the effects of an exposure fire. Combustible materials should not be stored next to outdoor tanks. | Conform | Water storage tanks are not required for safe shutdown. |
| **6.2.6** | **Cooling Towers** Cooling towers should be constructed of noncombustible materials or be located and protected in such a way that a fire will not adversely affect any systems or equipment important to safety. Cooling towers should be of noncombustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply. For the latter, provisions should be made to ensure a continuous supply of fire protection water whenever the cooling tower basin is drained for cleaning or other maintenance. | N/A | Cooling towers are not used for standard plant design.<br>Applicant to address cooling towers, if used. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **7.** | **Protection of Special Fire Hazards Exposing Areas Important to Safety** | | |
| **7.1** | **Reactor Coolant Pump Oil Collection** External RCPs with oil lubrication systems should be equipped with an oil collection system if the containment is not inerted during normal operation. The oil collection system should be designed, engineered, and installed to ensure that failure will not lead to fire during normal or design-basis accident conditions and that the system will withstand the safe-shutdown earthquake. | N/A | The design does not use reactor coolant pumps. |
| **7.2** | **Turbine Generator Building** The turbine building should be separated from adjacent structures containing equipment important to safety by a fire barrier with a rating of at least 3 hours. The fire barriers should be designed to maintain structural integrity even in the event of a complete collapse of the turbine structure. Openings and penetrations in the fire barrier should be minimized and should not be located where the turbine oil system or generator hydrogen cooling system creates a direct fire exposure hazard to the barrier. Considering the severity of the fire hazards, defense in depth may dictate additional protection to ensure barrier integrity, and the potential effect of a major turbine building fire on the ability to maintain operator control of the plant and safely shut down should be evaluated. | Conform | Applicant |
| **7.2.1** | **Oil Systems** Turbine buildings contain large sources of combustible liquids, including reservoirs and piping for lube oil, seal oil, and electrohydraulic systems. These systems should be separated from systems important to safety by 3-hour rated barriers. Additional protection should be provided on the basis of the hazard or where fire barriers are not provided (See Regulatory Position 2.1.3 of this guide). | Conform | Important to safety equipment is not located in the Turbine Generator Building. |
| **7.2.2** | **Hydrogen System** Turbine generators may use hydrogen for cooling. Hydrogen storage and distribution systems should meet the guidelines in Regulatory Position 7.5 of this guide. | N/A | Use of hydrogen for cooling is not planned in the Turbine Generator Building. |
| **7.2.3** | **Smoke Control** Smoke control should be provided in the turbine building to mitigate potential heavy smoke conditions associated with combustible liquid and cable fires. Regulatory Position 4.1.4 provides specific guidance. | Conform | Applicant |
| **7.3** | **Station Transformers** Transformers installed inside fire areas containing systems important to safety should be of the dry type or insulated and cooled with noncombustible liquid. Transformers filled with combustible fluid that are located indoors should be enclosed in a transformer vault. NFPA 70 offers additional guidance.<br>Outdoor oil-filled transformers should have oil spill confinement features or drainage away from the buildings. Such transformers should be located at least 15.2 m (50 ft.) distant from the building, or building walls within 15.2 m (50 ft.) of oil-filled transformers should be without openings and have a fire-resistance rating of at least 3 hours. | Conform | Station transformers are located in the yard. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **7.4** | **Diesel Fuel Oil Storage Areas** Diesel fuel oil tanks with a capacity greater than 4,164 L (1,100 gal) should not be located inside buildings containing equipment important to safety. If aboveground tanks are used, they should be located at least 15.2 m (50 ft.) from any building containing equipment important to safety, or if located within 15.2 m (50 ft.), they should be housed in a separate building constructed with materials having a minimum fire-resistance rating of 3 hours. Potential oil spills should be confined or directed away from buildings containing equipment important to safety. Totally buried tanks are acceptable outside or under buildings. (See NFPA 30 for additional guidance.)<br>An automatic fire suppression system should protect aboveground oil storage, including those tanks located in a separate building. | Conform | Outside storage planned. |
| **7.5** | **Flammable Gas Storage and Distribution** Bulk gas storage (either compressed or cryogenic) should not be permitted inside structures housing equipment important to safety. Storage of flammable gas such as hydrogen should be located outdoors or in separate, detached buildings so that a fire or explosion will not adversely affect any systems or equipment important to safety.<br>Care should be taken to locate high-pressure gas storage containers with the long axis parallel to building walls. This will minimize the possibility of wall penetration in the event of a container failure.<br>Acetylene-oxygen gas cylinder storage locations should not be in areas that contain or expose equipment important to safety or the fire protection systems that serve those equipment areas. NFPA 55 provides additional guidance.<br>Risks to equipment important to safety from hydrogen supply systems can be minimized by designing hydrogen lines in plant areas important to safety to seismic Category I requirements, sleeving the piping such that the pipe is directly vented to the outside. Risks can also be minimized through the use of restricting orifices or excess flow valves to limit the maximum flow rate from the storage facility to the areas of concern so that, in case of a line break, the hydrogen concentration in the affected areas will not exceed 2 percent. This approach includes preoperational testing and subsequent retesting of excess flow valves and measures to prevent buildup of unacceptable amounts of trapped hydrogen and inadvertent operation with the safety features bypassed. A somewhat less cost-effective alternative involves use of a normally isolated supply with intermittent manual makeup. EPRI NP-5283-SR-A, “Guidelines for Permanent BWR Hydrogen Water Chemistry Installations”, issued in 1987, provides additional guidelines and criteria for the design, installation, and operation of flammable cryogenic and compressed gas systems. | Conform | Bulk storage of compressed or cryogenic gas is not located indoors. Flammable gas storage is located outdoors or in separate detached buildings so that a fire or explosion does not affect equipment important to safety. |

Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| 7.6 | **Nearby Facilities** The FPP should address plant support facilities (e.g., offices, maintenance shops, warehouses, temporary structures, equipment storage yards), collocated power generating units (e.g., nuclear, coal, natural gas), and nearby industrial facilities (e.g., chemical plants, refineries, manufacturing facilities) to the extent that fires and or explosions in these facilities may affect equipment important to safety. Fire protection systems and features should be adequate to protect against potential exposure fires and explosions from nearby facilities. | Conform | Plant support facilities are designed using current fire protection codes and standards and are separated by at least 50 feet. |
| 8. | **Fire Protection for New Reactors** | | |
| 8.1 | **General** Many of the current fire protection requirements and guidelines for operating reactors were issued after Commission approval of construction permits or operating licenses. The imposition of these requirements and guidelines on existing plant designs created the need for considerable flexibility in the application of the regulations on a plant-by-plant basis. New reactor designs should integrate fire protection requirements, including the protection of safe-shutdown capability and the prevention of radiological release, into the planning and design phase for the plant. In addition, new reactor designs should minimize or eliminate the use of alternative or dedicated shutdown systems and should rely on such systems only when it is not feasible to provide the required protection for redundant safe-shutdown systems, such as in the main control room. Similarly, when practical, reliance on operator manual actions should be avoided.<br>Unless specifically noted otherwise, the guidance in this RG applies to the FPP for new reactor plants. Regulatory Guide 1.206, "Applications for Nuclear Power Plants", provides guidance on the scope and content of the COL application for new reactors. | Conform | |
| 8.2 | **Enhanced Fire Protection Criteria** New reactor designs should ensure that safe shutdown can be achieved by assuming that all equipment in any one fire area will be rendered inoperable by fire and that reentry into the fire area for repairs and operator actions is not possible. Because of its physical configuration, the control room is excluded from this approach, provided that the design includes an independent alternative shutdown capability that is physically and electrically independent of the control room. The control room should be evaluated to ensure that the effects of fire do not adversely affect the ability to achieve and maintain safe shutdown. Designs incorporating reactor containment buildings should 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, new reactor designs should 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 actions. | Conform | Core basis of new plant fire protection design criteria. The regulatory guidance provided regarding a reactor containment building is applied to the inside of containment and to the fire area immediately outside containment enclosed by the bioshields. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [1] | Conformance [2] | Comment |
|---|---|---|---|
| **8.3** | **Passive Plant Safe-Shutdown Condition** As discussed in SECY-94-084, the definitions of safe shutdown contained in the Commission's regulations and guidelines do not address the inherent limitations of passive RHR systems.<br>In GDC 34, "Residual Heat Removal," of Appendix A to 10 CFR Part 50, the NRC regulations require that the design include an RHR system to remove residual heat from the reactor core so that specified acceptable fuel design limits are not exceeded. GDC 34 further requires suitable redundancy of the components and features of the RHR system to ensure that the system safety functions can be accomplished, assuming a loss of offsite power or onsite power, coincident with a single failure.<br>Passive reactor designs are limited by the inherent ability of the passive heat removal processes and cannot reduce the temperature of the reactor coolant system below the boiling point of water for heat transfer to occur between the reactor coolant and the heat sink. The plant designs include cooling systems to bring the reactor to cold shutdown or refueling condition; however, these systems are not safety grade. These nonsafety-grade systems (i.e., makeup water to the heat sink and cooldown capability) are necessary to maintain long-term cooling (i.e., beyond 72 hours) and must be capable of accomplishing their respective functions without damage to the fuel as demonstrated by design and analysis.<br>Based on the discussion and recommendations of SECY-94-084, the passive decay heat removal systems should be capable of achieving and maintaining a temperature of 215.6 degrees C (420 degrees F) or below for non-LOCA events. This safe-shutdown condition is predicated on demonstration of acceptable passive safety system performance. New reactor designs should not rely on a SISBO to mitigate potential fire damage to safe-shutdown systems. | Conform | The design supports an exemption from the power provisions of GDC 34. The design complies with a NuScale-specific principal design criterion in lieu of GDC 34. The design utilizes the passive decay heat removal system for safe-shutdown below 420 degrees F and does not rely on nonsafety grade systems beyond 72 hours. |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position [(1)] | Conformance [(2)] | Comment |
|---|---|---|---|
| **8.4** | **Applicable Industry Codes and Standards** In general, the FPP for new LWR designs should comply with the provisions specified in NFPA 804, “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants”, as they relate to the protection of post-fire safe-shutdown capability and the mitigation of a radiological release resulting from a fire. However, the NRC has not formally endorsed NFPA 804, and some of the guidance in the NFPA standard may conflict with regulatory requirements. When conflicts occur, the applicable regulatory requirements and guidance, including the guidance in this RG, will govern.<br>As stated in SRP 9.5.1.1, Appendix A Section 3, the standards of record related to the design and installation of fire protection systems and features required to satisfy NRC requirements in all new reactor designs are those NFPA codes and standards in effect 180 days before the submittal of the application under 10 CFR Part 50 or 10 CFR Part 52. For COL applications that reference a certified design, the standards of record will be those approved for the certified design, except for FPP features that are not included in the certified design, such as unique site-specific fire protection systems or equipment. FPP features that are not addressed in the certified design, including the programmatic aspects of the FPP, should be in accordance with those NFPA codes and standards in effect 180 days before the submittal of the COL application. | Alternate Conformance | Applicant |
| **8.5** | **Other New Reactor Designs** FPPs for proposed new non-LWR designs should meet the overall fire protection objectives and guidance in the applicable regulations and this RG as they relate to safe shutdown and radiological release, as well as the specific fire protection requirements that apply. Fire hazards should be identified and evaluated, and an appropriate level of protection provided to meet these objectives. Design reviews and testing programs should confirm the safe-shutdown capability. SSCs important to safe shutdown should be protected in accordance with the enhanced criteria described above for LWRs. | N/A | The design utilizes light-water reactor technology. |
| **8.6** | **Fire Protection Program Implementation Schedule** SECY-05-0197, “Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria,” dated October 8, 2005, identifies fire protection as an “operation program.” However, only those elements of the FPP that will not be implemented fully until the completion of the plant should be addressed as an operational program. These may include, but are not limited to, the fire brigade, combustible and ignition source control program, procedures and pre-fire plans, and portable extinguishing equipment. The COL application should identify the operational program aspects of the FPP and the implementation schedule for each. In lieu of the implementation schedule, the applicant may propose inspections, tests, analyses, and acceptance criteria for these aspects of the program. | Conform | Applicant |

**Table 9.5.1-2: NuScale Fire Protection Design Compliance with RG 1.189 (Continued)**

| RG Position Number | Regulatory Guide 1.189, Rev. 4, Regulatory Position (1) | Conformance (2) | Comment |
|---|---|---|---|
| **8.7** | **Fire Protection for Nonpower Operation** The guidance for fire prevention in Regulatory Position 2 of this guide applies to all modes of plant operation, including shutdown. License applications for new reactors should also address any special provisions to ensure that, in the event of a fire during a nonpower mode of operation, the plant can be maintained in safe shutdown. | Conform | Applicant |
| **9.** | **Fire Protection for License Renewal** Licensees may apply for an initial license renewal and subsequent license renewal to permit continued plant operation beyond the original operating license period of operation, in accordance with the provisions of 10 CFR Part 54. The fire protection licensing and design basis under initial license renewal and subsequent license renewal should not differ significantly from that in effect before renewal, with the exception that fire protection SSCs must be included in an aging management program (AMP) as appropriate. | Conform | Applicant |

1. The restatement of the Regulatory Positions presented in this table may be abbreviated for brevity.
2. The design conforms to the regulatory positions delineated in RG 1.189 "Fire Protection for Nuclear Power Plants" as indicated by the following terms:
   - Applicant - The Applicant/Licensee will (also) address the subject Regulatory Position.
   - Conforms - The design conforms, or supports conformance, with the subject Regulatory Position.
   - N/A - (Not Applicable): The subject Regulatory Position is not applicable to the design.
   - Alternate Conformance - The design conforms to the subject regulatory position by alternate means or methods.
   - Non-Conformance - The design does not conform with the subject Regulatory Position or intent of the subject regulatory position. The justification for the Regulatory Position is provided in the "Comments" column.

## Table 9.5.1-3: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **FPS, Fire Protection System** | | | | | |
| All components (except as listed below): | RXB, RWB, CRB | B2 | RG 1.189 | N/A | III |
| RXB Fire department connection | Yard | B2 | RG 1.189 | N/A | I |
| • Fire department connection check valves<br>• Loop header isolation valve<br>• Stair 1 riser feed isolation valve<br>• Riser isolation valves (SRX4, NRX4, and SRX5)<br>• Angle valves (RM 304, 316, 318, 330, 407, 418, 420, 431)<br>• Flow switch instrumentation (RX5 south riser, RX4 south riser, RX4 north riser)<br>• Hose Stations (RM 304, 316, 318, 331, 407, 418, 420, 431) | RXB | B2 | RG 1.189 | N/A | I |
| • Stair 1 & 2 feed isolation valve<br>• East & west stair flow switch instrumentation | CRB | B2 | RG 1.189 | N/A | I |

## Table 9.5.1-3: Classification of Structures, Systems, and Components (Continued)

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| • CRV charcoal filter deluge hose reel<br>• Hose stations (RM 001, 002, 003, 014, 101, 102, 103, 124)<br>• Sprinkler system check valves (RM 012, Stair 1, RM 110 RM 124)<br>• Stair 1 and 2 upper & lower cross tie isolation valve<br>• Angle valves (RM 001, 002, 003, 014, 101, 102, 103, 124)<br>• Stair 1 & 2 riser isolation valves<br>• Stair 1 charcoal filter isolation valve<br>• Stair 1 & 2 riser vent valve<br>• Stair 1 & 2 riser drain valve<br>• PI-0209 and PI-0208 root valves<br>• Sprinkler system control valves (RM 012, 110, 124, Stair 1) | CRB | B2 | RG 1.189 | N/A | II |

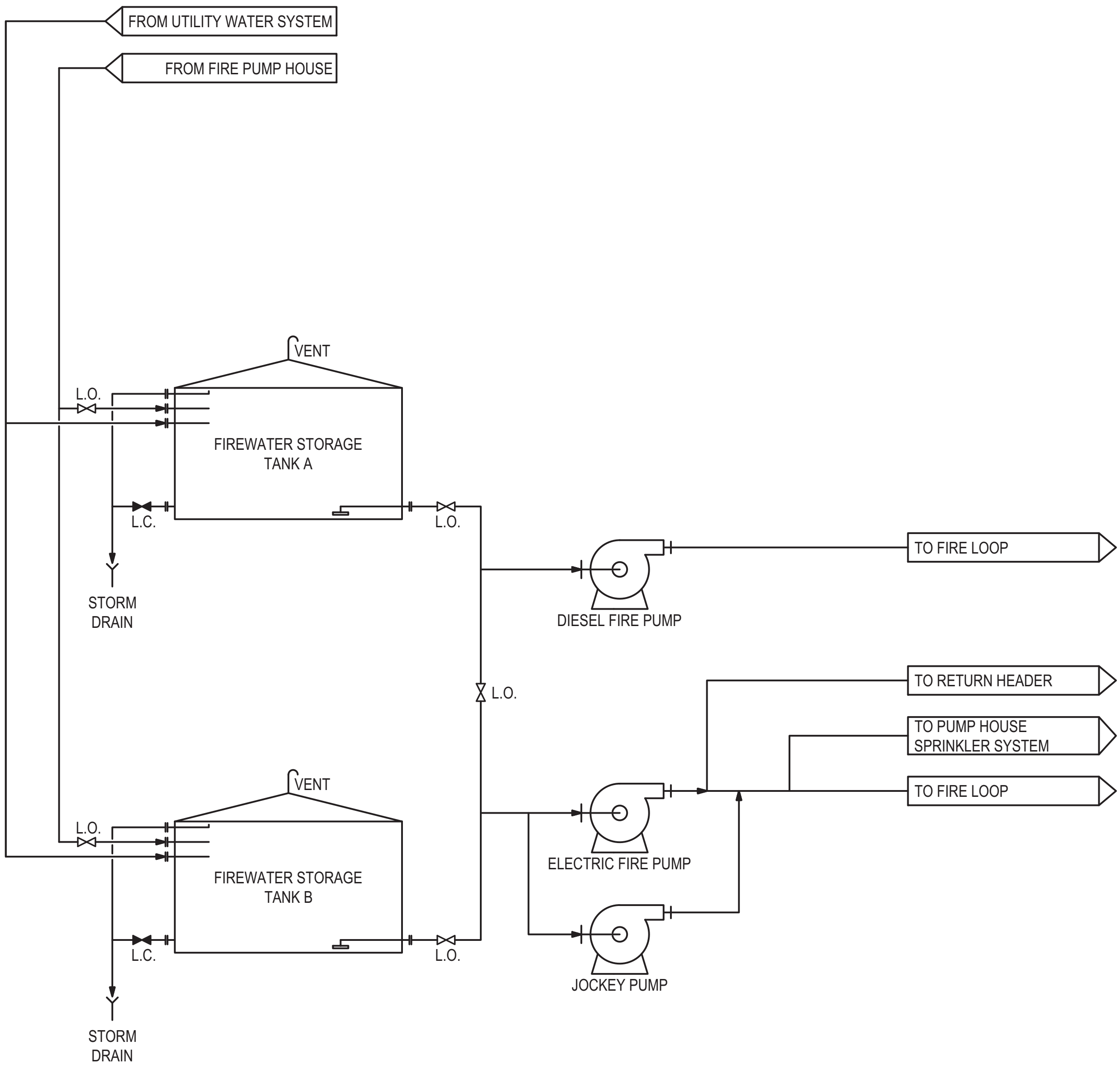
Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable.

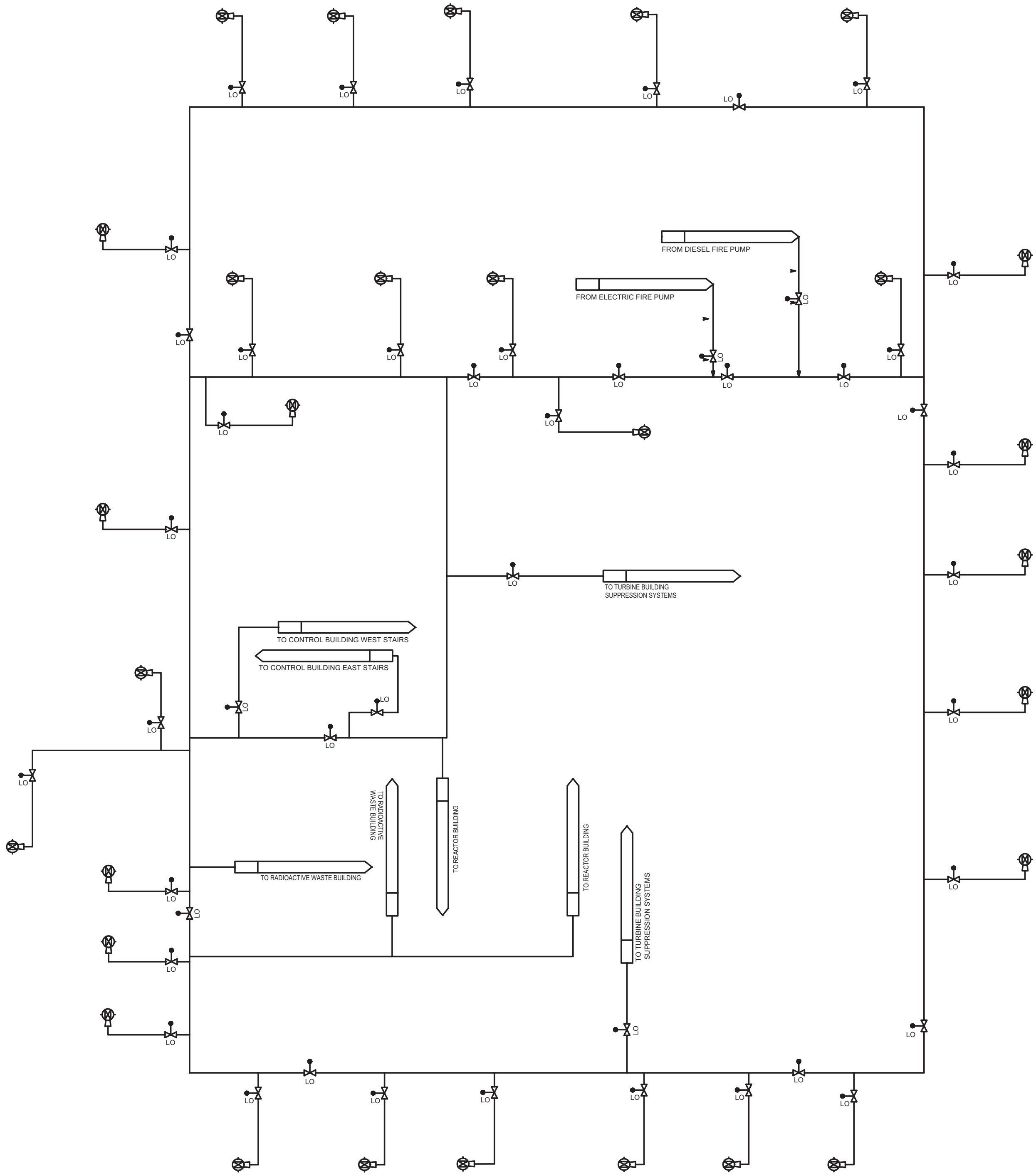
Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

### Figure 9.5.1-1: Fire Protection System Water Supplies and Fire Pumps



## Figure 9.5.1-2: Fire Protection System Yard Fire Main Loop



## 9.5.2 Communication System

The communication system (COMS) includes components for intra-plant and plant-to-offsite communications. The COMS provides communications between plant personnel in vital areas during normal operations as well as during accident or incident conditions.

The COMS includes the following systems:

- telephony
- wide area mass notification system (WAMNS)
- distributed antenna
- satellite telephony
- health physics network

### 9.5.2.1 Design Bases

The COMS serves no safety-related or risk-significant functions, is not credited for mitigation of design-basis accidents, and does not interfere with safety-related or risk-significant structures, systems, or components. Table 9.5.2-1 identifies SSC classifications for COMS. The COMS systems are independent of each other, so a failure in one system will not disable another system.

General Design Criteria (GDC) 1, 2, 3, and 4, and Principal Design Criterion 19 were considered in the design of the COMS.

Consistent with Appendix E to 10 CFR Part 50, Part IV.E(9), the COMS provides provisions for communications for emergency facilities and equipment.

COL Item 9.5-1: An applicant that references the NuScale Power Plant US460 standard design will provide a description of the offsite communication system, how that system interfaces with the onsite communications system, as well as how continuous communications capability is maintained to ensure effective command and control with onsite and offsite resources during both normal and emergency situations.

10 CFR 50.34(f)(2)(xxv), regarding Three Mile Island Action Plan Item III A.1.2, requires that details of the onsite technical support center (TSC) be provided. Section 13.3, Emergency Planning, provides design details pertaining to the TSC.

Consistent with the requirements of 10 CFR 50.47(b)(6) and 10 CFR 50.47(b)(8), adequate provisions for communications are provided and maintained in the emergency facilities and main control room (MCR) to support the emergency response.

Section 13.6, Security, discusses site physical protection, including how the COMS design complies with 10 CFR 73.

### 9.5.2.2 System Description

The telephony service includes onsite communication and an interface with an offsite public switched telephone network, and has the necessary bandwidth to support peak traffic for normal and emergency plant operations modes.

The WAMNS sends emergency alarms and communications to plant personnel by broadcast paging. The WAMNS has the capability to support operations during normal and emergency conditions.

The distributed antenna system distributes frequencies for the plant radio system in buildings and outdoors across the site, as needed. The distributed antenna system interfaces with the telephony system to allow access to both onsite telephony and the external telecommunications network. The plant radio has the capability to support operations during normal and emergency conditions.

The COMS design includes fixed and portable satellite communications. The portable satellite communications devices have batteries and battery chargers that ensure their functionality during an extended loss of alternating current (AC) power.

Consistent with the requirements of Regulatory Guide 1.189 Position 4.1.7, the COMS provides effective communication between plant personnel in vital areas during fire conditions under maximum potential noise levels. Two-way voice communications support safe shutdown and emergency response in the event of fire. The portable radio communications system used by the fire brigade and other operations personnel in support of safe shutdown operations does not interfere with the communications capabilities of the plant security force. The COMS design protects fixed repeaters, installed to permit use of portable radio communication units, from fire damage.

The COMS meets the practices for limiting electromagnetic interference and radio frequency interference provided by Regulatory Guide 1.180, which identifies electromagnetic environment operating envelopes, design, installation, and test practices for addressing the effects of electromagnetic interference, radio frequency interference, and power surges on instrumentation and controls systems and components.

The COMS operates reliably within the environment in which it is installed. The COMS equipment is accessible to personnel for operation, inspection, maintenance, and testing.

The low voltage AC electrical distribution system supplies power to COMS and provides backup power during a loss of power event. Section 8.3, Onsite Power Systems, provides additional information on the low voltage AC electrical distribution system. Personnel check the COMS for functionality as part of daily usage; therefore, COMS degradation is self-revealing.

### 9.5.2.3 Safety Evaluation

Consistent with GDC 1, COMS structures, systems, and components are designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. The COMS is classified as a non-Class 1E system and serves no safety-related function.

Consistent with GDC 2, the COMS is not required to function during or after natural phenomena.

Consistent with GDC 3, the COMS design minimizes the probability and effect of fires and explosions. The COMS provides two-way voice communications to support safe shutdown and emergency response in the event of fire. The plant radio system complies with Regulatory Guide 1.189, Regulatory Position 4.1.7, in that the COMS design provides effective communications between plant personnel in vital areas during fire conditions under maximum potential noise levels.

Consistent with GDC 4, the COMS is not required to function during or after events that result in the generation of missiles, pipe whipping, or discharging fluids.

The WAMNS, telephony system, and plant radio system are physically independent. These systems serve as a backup to one another in the event of system failure as a result of natural phenomena, environmental or dynamic effects, and fires. The independence of the voice communications systems ensures any single event does not cause a complete loss of intra-plant communication.

Principal Design Criterion 19 requires that an MCR be provided from which actions can be taken to operate the plant safely under normal conditions and to maintain it in a safe condition under accident conditions. Principal Design Criterion 19 is not directly applicable to the COMS. The design allows for safe shutdown without operator action. Therefore, the COMS need not be credited in evaluating compliance with Principal Design Criterion 19. However, the various independent and diverse communications systems located in the MCR increase the overall command and control the reactor operators have over the plant by providing the ability to communicate and direct activities with operating, maintenance, health physics, firefighting, security, and rescue personnel.

Consistent with the requirements of 10 CFR Part 50, Appendix E, IV.E(9), the COMS provides provisions for emergency facilities and equipment, which includes at least one onsite and one offsite communications system, with a backup power source. The WAMNS, telephony system, and plant radio system provide onsite communications capability. The telephony and plant radio systems provide offsite communications. The low voltage AC electrical distribution system provides both normal power and backup power, in the event of a loss of normal AC power.

Consistent with the requirements of 10 CFR 50.34(f)(2)(xxv), regarding Three Mile Island Action Plan Item III A.1.2, and the requirements of 10 CFR 50.47(b)(6) and 10 CFR 50.47(b)(8), adequate provisions for communications are provided and maintained in the emergency facilities and the MCR to support the emergency response, including prompt communication among principal response organizations to emergency personnel and to the public. The TSC has voice communications such as the telephony system, WAMNS, and the plant radio system, which provide communications between the TSC and plant, local, and offsite emergency response facilities, the Nuclear Regulatory Commission, and local and state operations centers.

Section 14.2, Initial Plant Test Program, describes the preoperational testing required for the COMS.

## Table 9.5.2-1: Classification of Structures, Systems, and Components

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **COMS, Communication Systems** | | | | | |
| All components | All buildings | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

## 9.5.3 Lighting Systems

The plant lighting system (PLS) provides artificial illumination for buildings, rooms, spaces, and outdoor areas of the plant. The PLS provides illumination under plant operating conditions, including normal, transient, fire, accident, and station blackout. The PLS includes the following lighting functions:

- normal plant lighting
- emergency plant lighting
- normal and emergency main control room (MCR) lighting
- security lighting

Exterior plant lighting within the protected area is part of security lighting and receives power from the security power system. Section 13.6, Security, provides additional discussion on physical security.

### 9.5.3.1 Design Bases

Normal and emergency plant lighting are not required to function in response to a design-basis accident. The PLS is not essential for reactor shutdown, containment isolation, or containment and reactor heat removal. The PLS is not essential in preventing release of radioactive material to the environment. Failure of normal and emergency lighting does not compromise automatic actuation of nuclear safety-related systems, nor does it prevent safe shutdown of the reactor. Therefore, normal and emergency plant lighting are nonsafety-related, not risk-significant, and non-Class 1E. Table 9.5.3-1 identifies SSC classifications for PLS.

The plant illumination levels provided by the PLS are in accordance with the applicable lighting levels specified in NUREG-0700. The emergency lighting system conforms with applicable guidance of Regulatory Guide 1.189.

Lighting fixtures in the MCR and areas containing safety-related structures, systems, and components are mounted to meet Seismic Category II requirements.

### 9.5.3.2 System Description

#### 9.5.3.2.1 Normal Plant Lighting

Normal plant lighting provides artificial illumination for outdoor areas outside the protected area and within the owner controlled area, and for plant buildings.

The low voltage alternating current (AC) electrical distribution system, described in Section 8.3.1, Alternating Current Power Systems, provides power to the lighting panel boards that feed the plant's light fixtures, with the exception of MCR and security lighting.

#### 9.5.3.2.2 Emergency Plant Lighting

Emergency lighting fixtures, outside of the MCR, have self-contained batteries that are powered from the low voltage AC electrical distribution system. Upon a loss of AC power to the plant, the batteries provide power to their associated fixtures. The PLS provides two types of emergency lighting outside of the MCR. Emergency egress light fixtures have a 1.5-hour battery backup for exiting the area. Emergency operating light fixtures have an 8-hour battery backup to support fire suppression actions and safe-shutdown operations during a station blackout, including access and egress pathways to safe-shutdown areas during a fire event as required by Regulatory Guide 1.189. Emergency lighting that provides illumination for post-fire safe-shutdown activities provides at least 1 foot-candle of illumination in accordance with National Fire Protection Association 804 (Reference 9.5.3-1).

#### 9.5.3.2.3 Normal and Emergency Main Control Room Lighting

The MCR lighting system provides artificial illumination under operating, maintenance, testing, and emergency conditions. Normal and emergency illumination levels are in accordance with the applicable lighting levels for a computer-based control room specified in NUREG-0700, Revision 3.

Two divisions of the common augmented direct current power system, described in Section 8.3.2, Direct Current Power Systems, provide power to the light fixtures in the MCR. In the event of a loss of normal AC power, the common augmented direct current power system batteries supply power to the MCR lights. The batteries are capable of maintaining the MCR emergency lighting at an average illumination level of 10 foot-candles at work stations in the main operating area for a minimum of 72 hours. Power circuits to individual lighting fixtures are staggered to ensure that MCR lighting is maintained after the loss of one circuit.

### 9.5.3.3 References

9.5.3-1 National Fire Protection Association, “Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants,” National Fire Protection Association 804, 2020 Edition, Quincy, MA.

**Table 9.5.3-1: Classification of Structures, Systems, and Components**

| SSC (Note 1) | Location | SSC Classification (A1, A2, B1, B2) | Augmented Design Requirements (Note 2) | Quality Group/Safety Classification (Ref RG 1.26 or RG 1.143) (Note 3) | Seismic Classification (Ref. RG 1.29 or RG 1.143) (Note 4) |
|---|---|---|---|---|---|
| **PLS, Plant Lighting System** | | | | | |
| All components | CRB RXB/RWB | B2 | None | N/A | III |

Note 1: Acronyms used in this table are listed in Table 1.1-1

Note 2: Additional augmented design requirements, such as the application of a Quality Group, Radwaste safety, or seismic classification, to nonsafety-related SSC are reflected in the columns Quality Group / Safety Classification and Seismic Classification, where applicable. Environmental Qualifications of SSC are identified in Table 3.11-1.

Note 3: Section 3.2.2.1 through Section 3.2.2.4 provides the applicable codes and standards for each RG 1.26 Quality Group designation (A, B, C, and D). A Quality Group classification per RG 1.26 is not applicable to supports or instrumentation. Section 3.2.1.4 provides a description of RG 1.143 classification for RW-IIa, RW-IIb, and RW-IIc.

Note 4: Where SSC (or portions thereof) as determined in the as-built plant that are identified as Seismic Category III in this table could, as the result of a seismic event, adversely affect Seismic Category I SSC or result in incapacitating injury to occupants of the control room, they are categorized as Seismic Category II consistent with Section 3.2.1.2 and analyzed as described in Section 3.7.3.8.

# Appendix 9A Fire Hazards Analysis

## 9A.1 General Information

### 9A.1.1 Purpose

This appendix provides a fire hazards analysis (FHA) and a fire safe shutdown plan (Section 9A.6) that demonstrate the design conforms to General Design Criterion 3.

The FHA demonstrates how fire areas meet the following objectives relative to fire protection:

- prevent fires from starting
- promptly detect and provide suppression to extinguish fires that occur
- provide protection for structures, systems, and components (SSC) required for safe shutdown so that a fire that is not promptly extinguished by fire suppression activities does not prevent the safe shutdown of the plant

The FHA demonstrates that the plant maintains the ability to perform safe shutdown functions and to minimize radioactive material releases to the environment in the event of a fire. The FHA has the following objectives:

- to consider in-situ and transient fire hazards
- to determine the effects of a fire in any location in the plant on the ability to safely shut down the reactor or to minimize and control the release of radioactivity to the environment
- to specify measures for fire prevention, detection, suppression, and containment for each fire area containing safety-related and risk-significant SSC, in accordance with U.S. Nuclear Regulatory Commission guidance and regulations

### 9A.1.2 Scope

In accordance with National Fire Protection Association (NFPA) 804 (Reference 9.A-1) and Regulatory Guide (RG) 1.189, the FHA considers the following items:

- physical construction and layout of the buildings and equipment, including fire areas and the fire ratings of area boundaries
- inventory of the principal combustibles within each fire subdivision
- description of the fire protection equipment, including detection and alarm systems, and manual and automatic extinguishing systems
- analysis of the postulated fire in each fire area, including its effect on safe shutdown equipment, assuming automatic and manual fire protection equipment does not function

- analysis of the potential effects of a fire on life safety, release of contamination, impairment of operations, and property loss, assuming the operation of installed fire-extinguishing equipment
- analysis of the potential effects of an uncontained fire that may cause other problems not related to safe shutdown, such as a release of contamination or impairment of operations
- analysis of the post-fire recovery potential
- analysis of the protection of nuclear safety-related systems and components from the inadvertent actuation of or breaks in a fire protection system

## 9A.2 Fire Hazards Analysis Methodology

The FHA consists of an assessment of the fire hazards in the following plant structures: Reactor Building (RXB), Control Building (CRB), Radioactive Waste Building (RWB).

No other structures in the plant contain equipment necessary for safe shutdown or have the potential for a radiological release.

In accordance with RG 1.189 and Reference 9.A-1, the FHA includes the elements and attributes listed in Table 9A-1, Fire Hazards Analysis Elements and Attributes. The table identifies the limitations of this evaluation as they pertain to these features.

## 9A.3 Fire Hazards Analysis Description

### 9A.3.1 Nuclear Regulatory Commission Fire Protection Requirements

Fire Protection Programs for new reactor licensees that submit applications in accordance with 10 CFR 52 are subject to 10 CFR 50.48(a) and the criteria for enhanced fire protection, in accordance with SECY-90-016, SECY-93-087, and SECY-94-084.

Enhanced fire protection criteria for evolutionary light-water reactors is established in SECY-90-016. The recommendation that the enhanced criteria extend to include passive reactor designs is documented in SECY-93-087. The Commission approved SECY-90-016 and SECY-93-087 in Staff Requirements Memoranda. Criteria for defining safe shutdown conditions for passive light water reactor designs is established, in part, in SECY-94-084. These SECYs are met through compliance with RG 1.189.

### 9A.3.2 In-Situ and Transient Combustibles and Ignition Sources

#### 9A.3.2.1 In-Situ Combustibles and Ignition Sources

The FHA identifies in-situ hazards and addresses fire protection features of the facility, including fire separation used to protect against the in-situ hazards. The plant, to the extent practicable, is built of non-combustible or limited-combustible materials.

Table 9A-2, In-Situ Combustible Material Classification, and Table 9A-3, In-Situ Ignition Sources, identify the types of combustibles and ignition sources located in specific areas throughout the plant. Those listed are representative of the hazards and are not a comprehensive list.

Self-ignition of electrical cables that are qualified in accordance with a nationally recognized standard fire test methodology, such as Institute of Electrical and Electronics Engineers (IEEE) 1202 (Reference 9.A-6), is not credible as long as there are properly sized protective devices (fuses or circuit breakers) and there are cables appropriately derated for ampacity. Therefore, there are no postulated self-ignited cable fires from in-situ ignition sources.

#### 9A.3.2.2 Transient Combustibles

Transient combustibles are those fire hazards that are not commonly found in a space, room, or other location, but may be present in various quantities due to movement of materials, temporary storage, testing, maintenance, or other conditions of normal operation, such as refueling, maintenance, or plant modifications. Fire Protection Program features control transient combustibles. Table 9A-4,Typical Transient Combustibles, lists typical transient combustibles.

Construction materials may involve assorted materials related to construction or installation of system(s) for additional modules. This construction may occur while one or more modules are operating. Dedicated operating areas may contain construction materials, but only before operation of that area. For example, an I&C equipment room could contain construction materials before the MPS equipment in that room operates, but once the MPS equipment is operational, construction materials are not expected to be present. Some areas that contain shared equipment contain redundant safe shutdown equipment in a different area. System construction or installation includes connections, terminations, and importation of relatively small equipment because the walls, floors, and ceilings are in place, preventing the importation of large equipment skids and tanks. The building design accommodates the NuScale Power Module passage. Construction materials are typically indistinguishable from transient combustibles associated with repair and maintenance of plant systems.

#### 9A.3.2.3 Transient Ignition Sources

Transient ignition sources may be the result of maintenance, repair, or renovation work in the area that results in a temporary source that is brought into the fire area. Table 9A-5,Transient Ignition Sources, lists the transient ignition sources considered in the FHA.

### 9A.3.3 External Exposure Hazards

Protection of the Reactor, Control and Radioactive Waste buildings, from the effects of external fires from adjacent buildings, is in accordance with NFPA 80A (Reference 9.A-2). Site-specific exposure hazards have not been considered in this analysis. Exposure hazards are plant-specific and vary depending on the final location of the plant and arrangement of the nearby structures and support buildings.

Intervening combustibles have a 50-foot spatial separation in accordance with NFPA 804, Section 8.1 and Section 8.9, and RG 1.189, Section C.7.3 and Section C.7.4.

Section 9.5.1 addresses programmatic requirements regarding flammable and combustible liquid or gas storage.

### 9A.3.4 Fire Detection and Suppression

Section 9A.5 provides fire detection and suppression requirements for fire areas within the plant.

The systems are selected considering the following:

- type or class of hazard
- effect of agent discharge on critical equipment such as water damage
- health hazards

Section 9.5.1 describes specific design details and capabilities of the fire detection and suppression system.

Where they are required, the automatic fire suppression systems design and installation is in accordance with the guidance provided by RG 1.189 and the applicable NFPA standards. There is justification for significant deviations from the requirements of these standards, such as partial suppression system. Per NFPA 804, manual fire alarm boxes (i.e., pull stations) shall be installed as required by the FHA. However, this FHA has not identified the need to install any pull stations for the purpose of providing a manual alarm initiating function.

Table 9A-6,Hazard Classifications, lists hazard classifications designated in Section 9A.5; these classifications are in alignment with Chapter 5 of NFPA 13 (Reference 9.A-3) and Chapter 6 of NFPA 101 (Reference 9.A-7).

### 9A.3.5 Safety-Related and Risk-Significant System, Structure, or Component Layout

The architectural drawings of Section 1.2 depict the fire area layout, and Section 9A.5 discusses major equipment for individual fire areas.

### 9A.3.6 Qualification of Fire Barriers

Qualification of fire barriers is performed in accordance with RG 1.189.

The design minimizes the use of an electrical raceway fire barrier system, but where required there are commercially available systems designed and tested based on applicable guidance in RG 1.189.

### 9A.3.7 Fire Area Construction

Regulatory Guide 1.189 defines fire areas as the portion of a building or plant that is separated from other areas by rated fire barriers adequate for the hazard. Table 9A-8, Reactor Building Fire Areas, Table 9A-9, Radioactive Waste Building Fire Areas and Table 9A-10, Control Building Fire Areas, identify the fire areas evaluated by the FHA.

Consistent with Section 9A.3.6, qualification of fire area walls, floors, and ceilings is performed in accordance with RG 1.189. Walls, floors, and ceiling assemblies are noncombustible, and fire endurance testing verifies the design adequacy of fire barrier walls, floors, ceilings, and enclosures. Testing is performed in accordance with Standard Methods of Tests of Fire Endurance of Building Construction and Materials, NFPA 251 and Standard Test Methods for Fire Tests of Building Construction and Materials, American Society for Testing and Materials E119. Construction of fire barrier walls is also in accordance with the guidance of NFPA 221, Standard for High-Challenge Fire Walls, Fire Walls, and Fire Barrier Walls.

The design includes protection of structural steel forming part of or supporting fire barriers, as required by the tested or approved assembly, to provide fire resistance equivalent to the barrier. Structural steel designed only to carry dynamic loads from a seismic event requires no protection unless failure of the steel during a fire could cause failure of the integrity of the fire barrier.

The design includes structural fire barriers with a three-hour fire rating that separate redundant cables and equipment required for safe shutdown following a fire.

Architectural drawings in Section 1.2 show the fire barriers in the RXB, CRB, and RWB. The unique room codes on these drawings identify the fire area in the FHA (Section 9A.5). Barriers are reinforced concrete, Concrete Masonry Units (CMUs), steel plate and concrete composite, gypsum board, or other non-combustible materials. The steel-composite and steel-framed walls are designed as three-hour barriers. The interior walls of enclosed stairwells in the RXB are three hour barriers. Steel-composite walls are not limited to stairwells. Steel-composite walls form the external perimeter of the building up to a certain elevation as well as most of the internal walls.

Design and installation of fire doors are in accordance with Standard for Fire Doors and Other Opening Protectives, NFPA 80. Doors may also serve additional functions such as flooding, pressure, security, and radiation barriers. In certain cases, for specialty doors, additional testing or evaluation confirms that the door provides equivalent protection to that of a qualified fire door.

Sealing openings in fire barriers for pipes, conduits, and cable trays that separate fire areas provide a fire resistance rating at least equivalent to the required barrier rating. Some barriers (e.g., fire, radiation, flood) serve multiple purposes and require special seals (e.g., a combination fire, radiological, and flood seal). In accordance with RG 1.189, openings inside conduit greater than four inches in diameter are sealed at the fire barrier penetration. Openings in conduit four inches or less in diameter seal at the barrier unless the conduit extends at least five feet on each side of the fire barrier and are sealed either at both ends or at the fire barrier with material to prevent the passage of smoke and hot gases. Fire barrier penetrations that maintain environmental isolation or pressure differentials are qualified by test to verify the barrier integrity under such conditions.

As noted in RG 1.189, new reactor designs should ensure that smoke, hot gases, and fire suppressants do not migrate into other fire areas and adversely impact safe shutdown capability. Properly rated fire dampers are installed at fire barriers that separate fire areas in accordance with Standard for the Installation of Air-Conditioning and Ventilating Systems, NFPA 90A, and Fire Dampers, Underwriters Laboratory 555. In certain cases, there are smoke dampers designed and qualified to Standard for Smoke Dampers, UL 555S or combination fire and smoke dampers, if required. Section 9.4.1, Section 9.4.2, and Section 9.4.3 provide additional information.

Smoke dampers isolate air handling equipment, including filters, from the remainder of the ventilation system on both the building supply side and the return side, in order to restrict the circulation of smoke. Duct smoke detectors automatically shut down the corresponding air handling unit (AHU) supply air fan, or provide a main control room (MCR) fire alarm to permit manual AHU supply air fan shutdown at the discretion of the operators.

### 9A.3.8 Manual Fire Suppression

Manual firefighting capability is available throughout the plant to allow the fire brigade to limit fire damage to SSC. Section 9.5.1 addresses manual fire suppression as well as fire brigade training and organization.

Fire hose connections to Seismic Category I (SC-I) standpipes are in the RXB elevations {{ }}. These connections are used to protect safe shutdown equipment and cables post-safe shutdown earthquake in accordance with Section 3.2.1.j of RG 1.189. Standpipes and hose connections are used to protect the MPS cabinets and associated cables that de-energize other safe shutdown equipment to ensure that the equipment is in the necessary safe shutdown position. Standpipes and associated hose connections on RXB elevations {{ }} are not SC-I. The safe shutdown equipment located in the RXB on these elevations (i.e., the hydraulic skids) fail in their safe shutdown position upon de-energization. Because the MPS cabinets provide the safety function to de-energize this equipment, it is not necessary to provide fire protection post-safe shutdown earthquake for the steam galleries, the containment system (CNTS), and CRDS rooms. Portable fire extinguishers are located in accordance with NFPA 804 and NFPA 10. The fire extinguishers are located during SSD.

Because of the inaccessibility and configuration of the fire areas under the bioshields, manual fire suppression capability is not necessary when the NuScale Power Module is at power. Section 9A.5 discusses specific details regarding the configuration of these areas.

### 9A.3.9 Impact on Operations

Section 9A.5 identifies the extent to which an area impacts plant operations. As final cable routing information is site-specific, the considerations are limited to the impact of the loss of equipment physically located in the areas.

The FHA demonstrates that safe and stable conditions are maintained without the need for repairs or local operator action.

Section 9A.6 describes details regarding considerations given to the demonstration of safe shutdown following a fire in the plant.

### 9A.3.10 Fire Suppression Effects Analysis

The effect of fire suppression system operation, either in response to a fire or a spurious discharge, is minimized by providing suitable protection for equipment that may be compromised by the operation of the fire suppression system.

Areas containing only dry-type electrical equipment installed in two-hour (or greater) fire-rated enclosures where no combustible materials are permitted to be stored are not provided with sprinkler coverage in accordance with NFPA 13, Section 8.15.11. This lack of sprinkler coverage minimizes the potential for equipment damage due to spurious fire suppression system actuation.

Facility design ensures that fire water discharge in one area does not impact safety-related equipment in adjacent areas. Section 3.4 addresses internal flooding.

Section 9A.6 provides details regarding considerations given to the demonstration of safe shutdown following a fire in the plant.

### 9A.3.11 Explosion Prevention

Section 9.5.1 describes the explosion prevention measures.

### 9A.3.12 Availability of Oxygen

During normal operation, the inside of the containment vessel is maintained at a vacuum that cannot sustain a fire.

### 9A.3.13 Post-Fire Safe Shutdown

Section 9A.6 discusses safe shutdown, including alternative shutdown considerations, following a fire. Fire areas containing safe shutdown equipment or safe shutdown cables or both are identified. For such areas, fire and smoke impact on operations and post-fire recovery is discussed, as well as separation of redundant safe shutdown equipment and cables to ensure that a safe shutdown success path remains free from fire damage. As applicable, the presence of redundant system equipment is noted in the analysis even though these systems are not required for safe shutdown (e.g., batteries in the Division 1 or Division 2 Battery Rooms).

## 9A.4 Conclusion

The FHA demonstrates that the effects of a fire in any location do not preclude safe shutdown of any reactor and that radiological releases are limited as described in Section 9.5.1 and Section 9A.6.

## 9A.5 Fire Hazards Analysis

### 9A.5.1 Reactor Building Elevation {{ }} - Fire Area R0-1

Reference Drawing: Figure 1.2-8

Room Name: Vestibule (004)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0549 is located in the area. Fire hose station 00-FP-HSS-0691 is located in the adjacent area (i.e., Fire Area R0-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.2 Reactor Building Elevation {{ }} - Fire Area R0-2

Reference Drawing: Figure 1.2-8

Room Name: Boric Acid Storage (005),
Aisleway (104; on Elevation {{ }}),
Aisleway (105; on Elevation {{ }})

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump |
| **Transient Combustibles:** | Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Chemical Reactions, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is a pump fire resulting from a mechanical failure or an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0691 is located in the area on EL. 25’, and fire hose station 00-FP-HSS-0687 is located in the area on EL. 40’. Fire hose station 00-FP-HSS-0549 is located in the adjacent area (i.e., Fire Area R0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separate from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the boric addition system.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression should limit fire and smoke to the area. If boric acid addition was rendered inoperable, it could result in the controlled shutdown of all modules until repairs are made.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.3 Reactor Building Elevation {{ }} - Fire Area R0-3

Reference Drawing: Figure 1.2-8

Room Name: Corridor (016)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical appliances, lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and would not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0691 is located in the adjacent area (i.e., Fire Area R0-2). Fire hose station 00-FP-HSS-0562 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R0-10, and R0-9, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.4 Reactor Building Elevation {{ }} - Fire Area R0-4

Reference Drawing: Figure 1.2-8

Room Name: Module 1 chemical and volume control system (CVCS) Ion Exchanger Valve (006),

Module 1 CVCS Ion Exchanger (007),

Module 1 CVCS Filter (008)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Hot work |

<u>Postulated Fire:</u>

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 1 CVCS Ion Exchanger Valve (i.e., Room 006) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 1 CVCS Ion Exchanger and the Module 1 CVCS Filter (i.e., Rooms 007 and 008, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0691 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-2 and R0-3, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separate from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.5 Reactor Building Elevation {{ }} - Fire Area R0-5

Reference Drawing: Figure 1.2-8

Room Name: Module 2 CVCS Ion Exchanger Valve (009),
Module 2 CVCS Ion Exchanger (010),
Module 2 CVCS Filter (011)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Hot work |

Postulated Fire:

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 2 CVCS Ion Exchanger Valve (i.e., Room 009) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 2 CVCS Ion Exchanger and the Module 2 CVCS Filter (i.e., Rooms 010 and 011, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0691 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-2 and R0-3, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separate from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.6 Reactor Building Elevation {{ }} - Fire Area R0-6

Reference Drawing: Figure 1.2-8

Room Name: Module 3 CVCS Ion Exchanger Valve (012),
Module 3 CVCS Ion Exchanger (013),
Module 3 CVCS Filter (014)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Hot work |

<u>Postulated Fire:</u>

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 3 CVCS Ion Exchanger Valve (i.e., Room 012) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 3 CVCS Ion Exchanger and the Module 3 CVCS Filter (i.e., Rooms 013 and 014, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0691 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-2 and R0-3, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separate from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.7 Reactor Building Elevation {{ }} - Fire Area R0-7

Reference Drawing: Figure 1.2-8

Room Name: Corridor (015)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical appliances lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0691 is located in the adjacent area (i.e., Fire Area R0-2). Fire hose station 00-FP-HSS-0562 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R0-10, and R0-9, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.8 Reactor Building Elevation {{ }} - Fire Area R0-8

Reference Drawing: Figure 1.2-8

Room Name: Telecom (017)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0562 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R0-10, and R0-9, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the fire detection system (FDS) fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.9 Reactor Building Elevation {{ }} - Fire Area R0-9

Reference Drawing: Figure 1.2-8

Room Name: Vestibule (018)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from miscellaneous combustibles fan, electrical appliances lighting, or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0556 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R0-10, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.10 Reactor Building Elevation {{ }} - Fire Area R0-10

Reference Drawing: Figure 1.2-8

Room Name: Radioactive Waste Drain System (RWDS) Equipment Aisleway (019)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Pumps

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is a pump fire resulting from a mechanical failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and rated fire barriers.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0562 is located in the adjacent stairwell (i.e., Fire Area RS-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the RWDS chemical drain pumps and RWDS equipment and floor drain sump pumps. The area is a large space with limited combustibles, and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.11 Reactor Building Elevation {{ }} - Fire Area R0-11

Reference Drawing: Figure 1.2-8

Room Name: Telecom (021)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling- Instrumentation

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0651 is located in the adjacent area (i.e., Fire Area R0-12).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.12 Reactor Building Elevation {{ }} - Fire Area R0-12

Reference Drawing: Figure 1.2-8

Room Name: Vestibule (020)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from miscellaneous combustibles fan, electrical appliances lighting, or electrical junction boxes located within the area.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0651 is located in the area. Fire hose station 00-FP-HSS-0562 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R0-10, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.13 Reactor Building Elevation {{ }} - Fire Area R0-13

Reference Drawing: Figure 1.2-8

Room Name: Corridor (022)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0651 and 00-FP-HSS-0671 are located in the adjacent areas (i.e., Fire Areas R0-12 and R0-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.14 Reactor Building Elevation {{ }} - Fire Area R0-14

Reference Drawing: Figure 1.2-8

Room Name: Module 4 CVCS Ion Exchanger Valve (024),
Module 4 CVCS Ion Exchanger (025),
Module 4 CVCS Filter (026)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Hot work |

<u>Postulated Fire:</u>

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 4 CVCS Ion Exchanger Valve (i.e., Room 024) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 4 CVCS Ion Exchanger and the Module 4 CVCS Filter (i.e., Rooms 025 and 026, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0651 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-12 and R0-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.15 Reactor Building Elevation {{ }} - Fire Area R0-15

Reference Drawing: Figure 1.2-8

Room Name: Module 5 CVCS Ion Exchanger Valve (027),
Module 5 CVCS Ion Exchanger (028),
Module 5 CVCS Filter (029)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance

**Transient Ignition Sources:** Hot work

<u>Postulated Fire:</u>

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 5 CVCS Ion Exchanger Valve (i.e., Room 027) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 5 CVCS Ion Exchanger and the Module 5 CVCS Filter (i.e., Rooms 028 and 029, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0671 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-18 and R0-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.16 Reactor Building Elevation {{ }} - Fire Area R0-16

Reference Drawing: Figure 1.2-8

Room Name: Module 6 CVCS Ion Exchanger Valve (030),
Module 6 CVCS Ion Exchanger (031),
Module 6 CVCS Filter (032)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Hot work |

Postulated Fire:

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | The Module 6 CVCS Ion Exchanger Valve (i.e., Room 030) is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Module 6 CVCS Ion Exchanger and the Module 6 CVCS Filter (i.e., Rooms 031 and 032, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0671 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-18 and R0-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the CVCS for one module. The systems for other modules are separated by three-hour fire rated barrier.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.17 Reactor Building Elevation {{ }} - Fire Area R0-17

Reference Drawing: Figure 1.2-8

Room Name: Corridor (023)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0651 and 00-FP-HSS-0671 are located in the adjacent areas (i.e., Fire Areas R0-12 and R0-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.18 Reactor Building Elevation {{ }} - Fire Area R0-18

Reference Drawing: Figure 1.2-8

Room Name: Utilities Area (033),
Aisleway (131; on Elevation {{ }})

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pumps |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is a pump fire resulting from a mechanical failure, or an electrical wiring failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0671 is located in the area on EL. {{ }}, fire hose station 00-FP-HSS-0667 is located in the area on EL. {{ }}. Fire hose station 00-FP-HSS-0556 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R0-21, respectively). |

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of sumps, plant control system (PCS) cabinet, lighting cabinets, and equipment in the area. The area is a large space with limited combustibles, and the combination of fire detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Post-fire operations are not impaired as fire and smoke should be contained to the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.19 Reactor Building Elevation {{ }} - Fire Area R0-19

Reference Drawing: Figure 1.2-8

Room Name: Liquid Radioactive Waste (LRW) Degasifier Tank B (034),
LRW Degasifier Pump B (035)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump

**Transient Combustibles:** Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault, or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0671 is located in the adjacent area (i.e., Fire Area R0-18). Fire hose station 00-FP-HSS-0556 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-2, R0-21, and R0-18, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the degasifier unit B.

**Operations / Post-Fire Recovery:**

There is minimal impact on post-fire operations. The degasifier is provided with a redundant system (i.e., in Fire Area R0-20), and fire and smoke should be contained to the room of origin.

**Radiological Release:**

Fire and smoke impact on radiological release is expected to be minimal because the room is provided with barriers and fire detection.

### 9A.5.20 Reactor Building Elevation {{ }} - Fire Area R0-20

Reference Drawing: Figure 1.2-8

Room Name: LRW Degasifier Pump A (036),
LRW Degasifier Tank A (037)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump |
| **Transient Combustibles:** | Construction Materials, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault, or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0671 is located in the adjacent area (i.e., Fire Area R0-18). Fire hose station 00-FP-HSS-0556 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-2, R0-21, and R0-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the degasifier unit A.

**Operations / Post-Fire Recovery:**

There is minimal impact on post-fire operations. The degasifier is provided with a redundant system (i.e., in Fire Area R0-19), and fire and smoke should be contained to the room of origin.

**Radiological Release:**

Fire and smoke impact on radiological release is expected to be minimal because the room is provided with barriers and fire detection.

### 9A.5.21 Reactor Building Elevation {{ }} - Fire Area R0-21

Reference Drawing: Figure 1.2-8

Room Name: Vestibule (038)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0556 is located in the adjacent stairwell (i.e., Fire Area RS-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.22 Reactor Building Elevation {{ }} - Fire Area R0-22

Reference Drawing: Figure 1.2-8

Room Name: RWDS Equipment Aisleway (039)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Pumps

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is a pump fire resulting from a mechanical failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The pipe chase, enclosed by three-hour rated fire barriers, passes through this fire area.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0549 is located in the adjacent area (i.e., Fire Area R0-1), fire hose station 00-FP-HSS-0556 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R0-21, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the RWDS reactor component cooling water system drain tank pumps and RWDS floor drain sump pumps. The area is a large space with limited combustibles, and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations as fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.23 Reactor Building Elevation {{ }} - Fire Area R1-1

Reference Drawing: Figure 1.2-9

Room Name: Vestibule (103)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0548 is located in the area. Fire hose station 00-FP-HSS-0687 is located in the adjacent area (i.e., Fire Area R0-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.24 Reactor Building Elevation {{ }} - Fire Area R1-2

Reference Drawing: Figure 1.2-9

Room Name: Corridor (106)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors |

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical cabinets. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0687 is located in the adjacent area (i.e., Fire Area R0-2). Note that Fire Area R0-2 contains rooms on {{ }}. The hose station is located between the aisleways (i.e., Rooms 104 and 105) on EL. {{ }}. Fire hose station 00-FP-HSS-0561 is located in the stairwell that adjacent to two adjacent areas (i.e., Fire Areas RS-1, R1-8, and R1-7, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the variable frequency drives for CVCS recirculation and makeup pumps for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression. Damage in the area may initially limit access to the CVCS recirculation pump rooms for three modules, but would have minimal effect on overall operation.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.25 Reactor Building Elevation {{ }} - Fire Area R1-3

Reference Drawing: Figure 1.2-9

Room Name: Module 1 CVCS Filter Access (108),
Module 1 CVCS Recirc Pump Valve (109),
Module 1 CVCS Recirc Pump (110)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump

**Transient Combustibles:** Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables

**Transient Ignition Sources:** Chemical Reactions, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0687 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-2 and R1-2, respectively). Note that Fire Area R0-2 contains rooms on {{ }}. The hose station is located between the aisleways (i.e., Rooms 104 and 105) on EL. {{ }}.

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 110 could result in loss of one division of safety-related demineralized water (DW) isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DW isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.26 Reactor Building Elevation {{ }} - Fire Area R1-4

Reference Drawing: Figure 1.2-9

Room Name: Module 2 CVCS Filter Access (111),
Module 2 CVCS Recirc Pump Valve (112),
Module 2 CVCS Recirc Pump (113)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Chemical Reactions, Electric Motors, Hot work |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0687 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-2 and R1-2, respectively). Note that Fire Area R0-2 contains rooms on {{ }}. The hose station is located between the aisleways (i.e., Rooms 104 and 105) on EL. {{ }}. Fire hose station 00-FP-HSS-0561 is located in the stairwell that adjacent to three |

| | |
|---|---|
| | adjacent areas (i.e., Fire Area RS-1 and Fire Areas R1-8, R1-7, and R1-2, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 113 could result in loss of one division of safety-related DW isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DW isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.27 Reactor Building Elevation {{ }} - Fire Area R1-5

Reference Drawing: Figure 1.2-9

Room Name: Module 3 CVCS Filter Access (114),
Module 3 CVCS Recirc Pump Valve (115),
Module 3 CVCS Recirc Pump (116)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump

**Transient Combustibles:** Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables

**Transient Ignition Sources:** Chemical Reactions, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0561 is located in the stairwell that adjacent to three adjacent areas (i.e., Fire Area RS-1 and Fire Areas R1-8, R1-7, and R1-2, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 116 could result in loss of one division of safety-related DWS isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DWS isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.28 Reactor Building Elevation {{ }} - Fire Area R1-6

Reference Drawing: Figure 1.2-9

Room Name: Corridor (107)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting or electrical junction boxes located within the area. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0687 is located in the adjacent area (i.e., Fire Area R0-2). Note that Fire Area R0-2 contains rooms on {{ }}. The hose station is located between the aisleways (i.e., Rooms 104 and 105) on EL. {{ }}. Fire hose station 00-FP-HSS-0561 is located in the stairwell that adjacent to two adjacent areas (i.e., Fire Areas RS-1, R1-8, and R1-7, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.29 Reactor Building Elevation {{ }} - Fire Area R1-7

Reference Drawing: Figure 1.2-9

Room Name: Vestibule (117)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire in the area from an electrical cabinet, electrical appliances lighting, or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0561 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R1-8, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.30 Reactor Building Elevation {{ }} - Fire Area R1-8

Reference Drawing: Figure 1.2-9

Room Name: Utilities Area (118)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0561 is located in the adjacent stairwell (i.e., Fire Area RS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of electrical control equipment and wiring for the module control system (MCS).

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression. Damage in the area may limit operation of the MCS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.31 Reactor Building Elevation {{ }} - Fire Area R1-9

Reference Drawing: Figure 1.2-9

Room Name: Vestibule (119)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0647 is located in the area. Fire hose station 00-FP-HSS-0561 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R1-8, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.32 Reactor Building Elevation {{ }} - Fire Area R1-10

Reference Drawing: Figure 1.2-9

Room Name: Corridor (120)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area would involve an electrical fire from electrical appliances lighting or electrical junction boxes located within the area. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0667 is located in the adjacent area (i.e., Fire Area R0-18). Note that Fire Area R0-18 contains rooms on {{ }}. The hose station is located in the aisleway on EL. {{ }} (i.e., Room 131). Fire hose station 00-FP-HSS-0647 is located in the adjacent area (i.e., Fire Area R1-9).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.33 Reactor Building Elevation {{ }} - Fire Area R1-11

Reference Drawing: Figure 1.2-9

Room Name: Module 4 CVCS Filter Access (122),
Module 4 CVCS Recirc Pump Valve (123),
Module 4 CVCS Recirc Pump (124)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Chemical Reactions, Electric Motors, Hot work |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0647 is located in the area adjacent to adjacent area (i.e., Fire Areas R1-9 and R1-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 124 could result in loss of one division of safety-related DWS isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DWS isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.34 Reactor Building Elevation {{ }} - Fire Area R1-12

Reference Drawing: Figure 1.2-9

Room Name: Module 5 CVCS Filter Access (125),
Module 5 CVCS Recirc Pump Valve (126),
Module 5 CVCS Recirc Pump (127)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump

**Transient Combustibles:** Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables

**Transient Ignition Sources:** Chemical Reactions, Electric Motors, Hot work

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0667 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-18 and R1-14, respectively). Note that Fire Area R0-18 contains rooms on {{ }}. The hose station is located in the aisleway on EL. {{ }} (i.e., Room 131). Fire hose station 00-FP-HSS-0647 is located in the area adjacent to adjacent area (i.e., Fire Areas R1-9 and R1-14, respectively).

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 127 could result in loss of one division of safety-related DWS isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DWS isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.35 Reactor Building Elevation {{ }} - Fire Area R1-13

Reference Drawing: Figure 1.2-9

Room Name: Module 6 CVCS Filter Access (128),
Module 6 CVCS Recirc Pump Valve (129),
Module 6 CVCS Recirc Pump (130)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Flammable Gas, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Hydrogen Fire, Pump

**Transient Combustibles:** Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Temporary Electrical Cables

**Transient Ignition Sources:** Chemical Reactions, Electric Motors, Hot work

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault or a lube oil fire resulting from a mechanical fault in a pump motor. Smoke and heat spread to adjacent areas and cabling is not likely due to fire area boundaries.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0667 is located in the area adjacent to adjacent area (i.e., Fire Areas R0-18 and R1-14, respectively). Note that Fire Area R0-18 contains rooms on {{ }}. The hose station is located in the aisleway on EL. {{ }} (i.e., Room 131).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of CVCS equipment for one module. An unmitigated fire in Room 130 could result in loss of one division of safety-related DWS isolation valves for one module.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related DWS isolation valves may impact one module and could require normal reactor shutdown of the affected module.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.36 Reactor Building Elevation {{ }} - Fire Area R1-14

Reference Drawing: Figure 1.2-9

Room Name: Corridor (121)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors |

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical cabinets. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0667 is located in the adjacent area (i.e., Fire Area R0-18). Note that Fire Area R0-18 contains rooms on {{ }}. The hose station is located in the aisleway on EL. {{ }} (i.e., Room 131). Fire hose station 00-FP-HSS-0647 is located in the adjacent area (i.e., Fire Area R1-9). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the variable frequency drives for CVCS recirculation and makeup pumps for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression. Damage in the area may initially limit access to the CVCS recirculation pump rooms for three modules, but would have minimal effect on overall operation.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.37 Reactor Building Elevation {{ }} - Fire Area R1-15

Reference Drawing: Figure 1.2-9

Room Name: Vestibule (132)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0555 is located in the adjacent stairwell (i.e., Fire Area RS-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.38 Reactor Building Elevation {{ }} - Fire Area R1-16

Reference Drawing: Figure 1.2-9

Room Name: Utilities Area (133)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting or electrical junction boxes located within the area. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The pipe chase, enclosed by three-hour rated fire barriers, passes through this fire area.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0548 is located in the adjacent area (i.e., Fire Area R1-1).
Fire hose station 00-FP-HSS-0555 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R1-15, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.39 Reactor Building Elevation {{ }} - Fire Area R2-1

Reference Drawing: Figure 1.2-10

Room Name: Vestibule (203)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0547 is located in the area. Fire hose station 00-FP-HSS-0683 is located in the adjacent area (i.e., Fire Area R2-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.40 Reactor Building Elevation {{ }} - Fire Area R2-2

Reference Drawing: Figure 1.2-10

Room Name: PCWS (Pool Cooling and Cleanup System) Pumps (204)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment, Pumps |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, three-hour rated fire barriers, and manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0683 is located in the area. Fire hose station 00-FP-HSS-0547 is located in the adjacent area (i.e., Fire Area R2-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of PCWS pumps and strainers, reactor building heating, ventilation and air conditioning system (RBVS) equipment, and PCS and lighting cabinets.

**Operations / Post-Fire Recovery:**

Loss of PCWS would challenge plant operations. The system would need to be repaired before normal operations could resume. Damage in the area may limit operation of the multiple systems controlled by the main control centers (MCCs) in the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual suppression.

### 9A.5.41 Reactor Building Elevation {{ }} - Fire Area R2-3

Reference Drawing: Figure 1.2-10

Room Name: Telecom (205)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling- Instrumentation

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0683 is located in the adjacent area (i.e., Fire Area R2-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.42 Reactor Building Elevation {{ }} - Fire Area R2-4

Reference Drawing: Figure 1.2-10

Room Name: Module 01-03 CVCS HX Utilities (206),
Module 01-03 CVCS HX Valve Gallery (207),
Module 1 CVCS HX (208),
Module 2 CVCS HX (209),
Module 3 CVCS HX (210)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Chemicals, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers. The chemicals in the area e.g., hydrazine, lithium hydroxide, zinc acetate dihydrate, hydrogen peroxide are in closed systems.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

| | |
|---|---|
| Detection Systems: | Area-wide smoke detection is provided in the Module 01-03 CVCS heat exchanger (HX) Utilities (i.e., Room 206) and Module 01-03 CVCS HX Valve Gallery (i.e., Room 207). The Module 1 CVCS HX, Module 2 CVCS HX, and Module 3 CVCS HX (i.e., Rooms 208, 209, 210, respectively) are high radiation areas, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided in each of these rooms. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0683 is located in the adjacent area (i.e., Fire Area R2-2). Fire hose station 00-FP-HSS-0560 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R2-6, and R2-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of CVCS equipment for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the CVCS for three modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual and active suppression.

### 9A.5.43 Reactor Building Elevation {{ }} - Fire Area R2-5

Reference Drawing: Figure 1.2-10

Room Name: Vestibule (211)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Chemicals, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable, Flammable Gas (i.e., in service CVCS Hydrogen bottles)

**In-Situ Ignition Sources:** Electric Appliances (lighting, cables), Electric Motors, Electrical Cabinets, Pump

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers. The chemicals e.g., zinc acetate and flammable gas CVCS hydrogen bottles in the area are in closed systems.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0560 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas RS-1 and R2-6, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the CVCS and MCS for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the CVCS and MCS for three modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual and active suppression.

### 9A.5.44 Reactor Building Elevation {{ }} - Fire Area R2-6

Reference Drawing: Figure 1.2-10

Room Name: Utilities Area (212)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is due to transient combustibles. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided, based on fire probabilistic risk assessment concerns. However, due to lack of combustibles located in the area, the sprinkler system could be removed as part of site-specific design. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0560 is located in the adjacent stairwell (i.e., Fire Area RS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.45 Reactor Building Elevation {{ }} - Fire Area R2-7

Reference Drawing: Figure 1.2-10

Room Name: Vestibule (214)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, cables), Electric Motors, Electrical Cabinets, Pump

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers.

Fire Protection Features:

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0643 is located in the area. Fire hose station 00-FP-HSS-0560 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas RS-1 and R2-6, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the CVCS and MCS for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the CVCS and MCS for three modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual and active suppression.

### 9A.5.46 Reactor Building Elevation {{ }} - Fire Area R2-8

Reference Drawing: Figure 1.2-10

Room Name: Module heatup system (MHS) Equipment (213),
Module 04-06 CVCS HX Utilities (215),
Module 04-06 CVCS HX Valve Gallery (216),
Module 4 CVCS HX (217),
Module 5 CVCS HX (218),
Module 6 CVCS HX (219)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Chemicals, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers. The chemicals in the area e.g., hydrazine, lithium hydroxide, zinc acetate dihydrate, hydrogen peroxide are in closed systems.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided in the rooms in this fire area.

| | |
|---|---|
| Detection Systems: | Area-wide smoke detection is provided in the MHS equipment (i.e., Room 213), Module 04-06 CVCS HX Utilities (i.e., Room 215), and Module 04-06 CVCS HX Valve Gallery (i.e., Room 216). The Module 4 CVCS HX, Module 5 CVCS HX, and Module 6 CVCS HX (i.e., Rooms 217, 218, 219, respectively) are high radiation areas, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided in each of these rooms. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0643 is located in the adjacent area (i.e., Fire Area R2-7). Fire hose station 00-FP-HSS-0663 is located in the adjacent area (i.e., Fire Area R2-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of CVCS equipment for up to three adjacent modules and may also result in the loss of MHS equipment for all modules.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the CVCS for three modules and the MHS for all modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual and active suppression.

### 9A.5.47 Reactor Building Elevation {{ }} - Fire Area R2-9

Reference Drawing: Figure 1.2-10

Room Name: Telecom (220)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0663 is located in the adjacent area (i.e., Fire Area R2-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.48 Reactor Building Elevation {{ }} - Fire Area R2-10

Reference Drawing: Figure 1.2-10

Room Name: Utilities Area (221)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Chemicals, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Paper & Cardboard (Files), Plastic, Rubber Materials, Qualified Electrical Cable, Flammable Gas (i.e., in service CVCS Hydrogen bottles) |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, HVAC Equipment, Pump |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is a pump fire resulting from a mechanical failure, or an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles and three-hour rated fire barriers. The chemicals e.g., zinc acetate and flammable gas CVCS hydrogen bottles in the area are in closed systems.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0663 is located in the area. Fire hose station 00-FP-HSS-0554 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas RS-2 and R2-11, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairs where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire could result in total loss of reactor component cooling water system pumps, loss of the CVCS for up to three adjacent modules, and loss of RBVS equipment.

**Operations / Post-Fire Recovery:**

Loss of reactor component cooling water system would challenge plant operations. The system would need to be repaired before normal operations could resume. Damage in the area may limit operation of the multiple systems controlled by the MCCs in the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual suppression.

### 9A.5.49 Reactor Building Elevation {{ }} - Fire Area R2-11

Reference Drawing: Figure 1.2-10

Room Name: Vestibule (222)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0554 is located in the adjacent stairwell (i.e., Fire Area RS-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.50 Reactor Building Elevation {{ }} - Fire Area R2-12

Reference Drawing: Figure 1.2-10

Room Name: Utilities Area (223)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Misc. Wire & Plastic Components Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling or equipment failure. Because of the small quantity of combustibles, three-hour rated fire barriers, qualified cabling, automatic detection, and manual suppression, the fire is limited to the immediate area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0547 is located in the adjacent area (i.e., Fire Area R2-1).<br>Fire hose station 00-FP-HSS-0554 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R2-11, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

An unmitigated fire could result in loss of RBVS equipment, including the spent fuel pool (SFP) exhaust filter upstream radiation monitors.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.51 Reactor Building Elevation {{ }} - Fire Area R3-1

Reference Drawing: Figure 1.2-11

Room Name: Vestibule (303)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Additionally, the main HVAC exhaust duct located in the west wall of this area will not have a three-hour rated fire damper. The adequacy of the barrier configuration is evaluated during site-specific design. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0004 is located in the area. Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the adjacent area (i.e., Fire Area R3-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.52 Reactor Building Elevation {{ }} - Fire Area R3-2

Reference Drawing: Figure 1.2-11

Room Name: PCWS Equipment Aisleway (304)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Furniture, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical cabinet failure or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, three-hour rated fire barriers, and manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0965 is located in the area. Fire hose station 00-FP-HSS-0004 is located in the adjacent area (i.e., Fire Area R3-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire may result in loss of PCWS heat exchangers.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate the decay heat removal system (DHRS). There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Loss of PCWS would challenge plant operations. The system would need to be repaired before normal operations could resume. Damage in the area may limit operation of the multiple systems controlled by the MCC in the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual suppression.

### 9A.5.53 Reactor Building Elevation {{ }} - Fire Area R3-3

Reference Drawing: Figure 1.2-11

Room Name: Telecom (305)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the adjacent area (i.e., Fire Area R3-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.54 Reactor Building Elevation {{ }} - Fire Area R3-4

Reference Drawing: Figure 1.2-11

Room Name: Module 1 Division 1 Charger (307)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-2 and R3-13, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-5, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.55 Reactor Building Elevation {{ }} - Fire Area R3-5

Reference Drawing: Figure 1.2-11

Room Name: Module 1 Division 1 Battery (308)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-2 and R3-13, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. The Division 2 battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.56 Reactor Building Elevation {{ }} - Fire Area R3-6

Reference Drawing: Figure 1.2-11

Room Name: Module 1 Division 1 I&C Equipment (309)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-2 and R3-13, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related pressurizer (PZR) heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, containment isolation valve (CIV) solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-7, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.57 Reactor Building Elevation {{ }} - Fire Area R3-7

Reference Drawing: Figure 1.2-11

Room Name: Module 2 Division 1 Charger (310)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-2 and R3-13, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-8, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.58 Reactor Building Elevation {{ }} - Fire Area R3-8

Reference Drawing: Figure 1.2-11

Room Name: Module 2 Division 1 Battery (311)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0965, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-2 and R3-13, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.59 Reactor Building Elevation {{ }} - Fire Area R3-9

Reference Drawing: Figure 1.2-11

Room Name: Module 2 Division 1 I&C Equipment (312)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0851, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-14 and R3-13, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-10, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.60 Reactor Building Elevation {{ }} - Fire Area R3-10

Reference Drawing: Figure 1.2-11

Room Name: Module 3 Division 1 Charger (313)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0851, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-14 and R3-13, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-11, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.61 Reactor Building Elevation {{ }} - Fire Area R3-11

Reference Drawing: Figure 1.2-11

Room Name: Module 3 Division 1 Battery (314)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0851, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-14 and R3-13, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.62 Reactor Building Elevation {{ }} - Fire Area R3-12

Reference Drawing: Figure 1.2-11

Room Name: Module 3 Division 1 I&C Equipment (315)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0851, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-14 and R3-13, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-13, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.63 Reactor Building Elevation {{ }} - Fire Area R3-13

Reference Drawing: Figure 1.2-11

Room Name: Corridor (306)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors |

Postulated Fire:

The postulated fire for this area is a fire resulting from an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles and rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Chases, enclosed by three-hour rated fire barriers, pass through this fire area. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0851 and 00-FP-HSS-0965, each connected to SC-I standpipes, are located in the adjacent areas (i.e., Fire Areas R3-14 and R3-2, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the PZR heater panels for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression. Damage in the area may limit PZR operation for three modules.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.64 Reactor Building Elevation {{ }} - Fire Area R3-14

Reference Drawing: Figure 1.2-11

Room Name: Vestibule (316)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, cables), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is a fire resulting from an electrical cabinet or motor generator (MG) set failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0851, connected to SC-I standpipe, is located in the area. Fire hose station 00-FP-HSS-0559 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas RS-1 and R3-15, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of one division of safety-related CRDS equipment for all modules, including power to the MG set, automatic transfer switches, power supply MCC, and voltage regulating cabinets; as well as loss of RBVS equipment. There are limited intervening combustibles and the combination of automatic suppression, detection and fire barriers should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Systems are designed to fail safe on loss of power, which in the case of the CRDS equipment would produce unplanned control rod insertions in the affected modules. Damage to the CRDS equipment would likely require complete repair before reactors could be restarted.

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the multiple systems controlled by the MCC in the area. Loss of one division of safety-related equipment may impact multiple modules in the plant. The impacted modules could require normal reactor shutdown for assessment.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.65 Reactor Building Elevation {{ }} - Fire Area R3-15

Reference Drawing: Figure 1.2-11

Room Name: Utilities Area (317)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pump |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0559 is located in the adjacent stairwell (i.e., Fire Area RS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of the Containment Flooding and Drain System pumps and MHS equipment. There are limited intervening combustibles and the combination of automatic suppression, detection, and fire barriers should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. An unmitigated fire may result in loss of Containment Flooding and Drain System and MHS.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.66 Reactor Building Elevation {{ }} - Fire Area R3-16

Reference Drawing: Figure 1.2-11

Room Name: Vestibule (318)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, cables), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is a fire resulting from an electrical cabinet or motor generator MG set failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area. Fire hose station 00-FP-HSS-0559 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas RS-1 and R3-15, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of one division of safety-related CRDS equipment for all modules, including power to the MG set, automatic transfer switches, power supply MCC, and voltage regulating cabinets; as well as loss of RBVS equipment. There are limited intervening combustibles and the combination of automatic suppression, detection and fire barriers should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Systems are designed to fail safe on loss of power, which in the case of the CRDS equipment would produce unplanned control rod insertions in the affected modules. Damage to the CRDS equipment would likely require complete repair before reactors could be restarted.

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the multiple systems controlled by the MCC in the area. Loss of one division of safety-related equipment may impact multiple modules in the plant. The impacted modules could require normal reactor shutdown for assessment.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.67 Reactor Building Elevation {{ }} - Fire Area R3-17

Reference Drawing: Figure 1.2-11

Room Name: Corridor (319)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors |

<u>Postulated Fire:</u>

The postulated fire for this area is a fire resulting from an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles and rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Chases, enclosed by three-hour rated fire barriers, pass through this fire area. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0857 and 00-FP-HSS-0859, each connected to SC-I standpipes, are located in the adjacent areas (i.e., Fire Areas R3-16 and R3-27, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the PZR heater panels for up to three adjacent modules.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression. Damage in the area may limit PZR operation for three modules.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.68 Reactor Building Elevation {{ }} - Fire Area R3-18

Reference Drawing: Figure 1.2-11

Room Name: Module 4 Division 1 Charger (320)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-16 and R3-17, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-19, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.69 Reactor Building Elevation {{ }} - Fire Area R3-19

Reference Drawing: Figure 1.2-11

Room Name: Module 4 Division 1 Battery (321)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-16 and R3-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.70 Reactor Building Elevation {{ }} - Fire Area R3-20

Reference Drawing: Figure 1.2-11

Room Name: Module 4 Division 1 I&C Equipment (322)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-16 and R3-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-21, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.71 Reactor Building Elevation {{ }} - Fire Area R3-21

Reference Drawing: Figure 1.2-11

Room Name: Module 5 Division 1 Charger (323)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-16 and R3-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-22, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.72 Reactor Building Elevation {{ }} - Fire Area R3-22

Reference Drawing: Figure 1.2-11

Room Name: Module 5 Division 1 Battery (324)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0857, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-16 and R3-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.73 Reactor Building Elevation {{ }} - Fire Area R3-23

Reference Drawing: Figure 1.2-11

Room Name: Module 5 Division 1 I&C Equipment (325)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-27 and R3-17, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-24, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.74 Reactor Building Elevation {{ }} - Fire Area R3-24

Reference Drawing: Figure 1.2-11

Room Name: Module 6 Division 1 Charger (326)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-27 and R3-17, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-25, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.75 Reactor Building Elevation {{ }} - Fire Area R3-25

Reference Drawing: Figure 1.2-11

Room Name: Module 6 Division 1 Battery (327)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-27 and R3-17, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.76 Reactor Building Elevation {{ }} - Fire Area R3-26

Reference Drawing: Figure 1.2-11

Room Name: Module 6 Division 1 I&C Equipment (328)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R3-27 and R3-17, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 1 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 2) systems located on EL. {{ }} in Fire Area R4-27, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.77 Reactor Building Elevation {{ }} - Fire Area R3-27

Reference Drawing: Figure 1.2-11

Room Name: Process Sampling System (PSS) Primary Sampling Panels (330), PSS Equipment Aisleway (331)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure or transient fire. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the area. Fire hose station 00-FP-HSS-0553 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R3-29, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of PSS and RBVS equipment. There are limited intervening combustibles and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. An unmitigated fire may result in loss of the PSS.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.78 Reactor Building Elevation {{ }} - Fire Area R3-28

Reference Drawing: Figure 1.2-11

Room Name: Telecom (329)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0859, connected to SC-I standpipe, is located in the adjacent area (i.e., Fire Area R3-27). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.79 Reactor Building Elevation {{ }} - Fire Area R3-29

Reference Drawing: Figure 1.2-11

Room Name: Vestibule (332)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0553 is located in the adjacent stairwell (i.e., Fire Area RS-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.80 Reactor Building Elevation {{ }} - Fire Area R3-30

Reference Drawing: Figure 1.2-11

Room Name: Utilities Area (333)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting or electrical junction boxes located within the area. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The pipe chase, enclosed by three-hour rated fire barriers, passes through this fire area. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0004 is located in the adjacent area (i.e., Fire Area R3-1).<br>Fire hose station 00-FP-HSS-0553 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R3-29, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.81 Reactor Building Elevation {{ }} - Fire Area R4-1

Reference Drawing: Figure 1.2-12

Room Name: Vestibule (403)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0003 is located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.82 Reactor Building Elevation {{ }} - Fire Area R4-2

Reference Drawing: Figure 1.2-12

Room Name: Reserved (405),
Reserved (406),
Reserved (407)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Furniture, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The worst case fire postulated would involve electrical components. Based on the installed FDS and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond these rooms. Furthermore, the fire would not propagate from one of the rooms to another room inside the area, as each of the three rooms in this area are separated by three-hour rated fire barriers. This area would not likely have significant quantities of transient combustibles. This analysis is based on an anticipated fire in a normally occupied office-like environment and areas with additional electrical equipment. The details of the contents of this area are safeguards information.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The rooms inside this area are separated by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area. Note that part of this area is expected to be normally occupied and a fire would be promptly detected.

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent (i.e., Fire Area R4-4). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the contents of room. The rooms are separated from each other and adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent areas.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.83 Reactor Building Elevation {{ }} - Fire Area R4-3

Reference Drawing: Figure 1.2-12

Room Name: Utilities Area (436)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical appliances lighting or electrical junction boxes located within the area. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0003 is located in the adjacent area (i.e., Fire Area R4-1).<br>Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the adjacent area (i.e., Fire Area R4-4). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.84 Reactor Building Elevation {{ }} - Fire Area R4-4

Reference Drawing: Figure 1.2-12

Room Name: Corridor (404)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors |

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical cabinets. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0863 is located in the area. Fire hose station 00-FP-HSS-0003 is located in the area adjacent to the adjacent area (i.e., Fire Areas R4-1 and R4-3, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

An unmitigated fire may result in loss of the seismic monitoring system panel.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and manual suppression.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.85 Reactor Building Elevation {{ }} - Fire Area R4-5

Reference Drawing: Figure 1.2-12

Room Name: Module 1 Division 2 Charger (409)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-4 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{        }} in Fire Area R3-4, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.86 Reactor Building Elevation {{ }} - Fire Area R4-6

Reference Drawing: Figure 1.2-12

Room Name: Module 1 Division 2 Battery (410)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-4 and R4-14, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.87 Reactor Building Elevation {{ }} - Fire Area R4-7

Reference Drawing: Figure 1.2-12

Room Name: Module 1 Division 2 I&C Equipment (411)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-4 and R4-14, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-6, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.88 Reactor Building Elevation {{ }} - Fire Area R4-8

Reference Drawing: Figure 1.2-12

Room Name: Module 2 Division 2 Charger (412)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-4 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{        }} in Fire Area R3-7, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.89 Reactor Building Elevation {{ }} - Fire Area R4-9

Reference Drawing: Figure 1.2-12

Room Name: Module 2 Division 2 Battery (413)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0863, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-4 and R4-14, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.90 Reactor Building Elevation {{ }} - Fire Area R4-10

Reference Drawing: Figure 1.2-12

Room Name: Module 2 Division 2 I&C Equipment (414)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0853, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-15 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-9, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.91 Reactor Building Elevation {{ }} - Fire Area R4-11

Reference Drawing: Figure 1.2-12

Room Name: Module 3 Division 2 Charger (415)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0853, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-15 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-10, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.92 Reactor Building Elevation {{ }} - Fire Area R4-12

Reference Drawing: Figure 1.2-12

Room Name: Module 3 Division 2 Battery (416)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0853, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-15 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.93 Reactor Building Elevation {{ }} - Fire Area R4-13

Reference Drawing: Figure 1.2-12

Room Name: Module 3 Division 2 I&C Equipment (417)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0853, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-15 and R4-14, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-12, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.94 Reactor Building Elevation {{ }} - Fire Area R4-14

Reference Drawing: Figure 1.2-12

Room Name: Corridor (408)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area would involve electrical fire from electrical appliances lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Chases, enclosed by three-hour rated fire barriers, pass through this fire area. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0853 and 00-FP-HSS-0863, each connected to SC-I standpipes, are located in the adjacent areas (i.e., Fire Areas R4-15 and R4-4, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.95 Reactor Building Elevation {{ }} - Fire Area R4-15

Reference Drawing: Figure 1.2-12

Room Name: Vestibule (418)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0853, connected to SC-I standpipe, is located in area. Fire hose station 00-FP-HSS-0018 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R4-16, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.96 Reactor Building Elevation {{ }} - Fire Area R4-16

Reference Drawing: Figure 1.2-12

Room Name: Utilities Area (419)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is a fire from an electrical control cabinet or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the automatic suppression, lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0018 is located in the adjacent stairwell (i.e., Fire Area RS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of containment flooding and drain system equipment in the area. The area is a large space with limited combustibles, and the combination of fire suppression, detection, and fire barriers should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Post-fire operations are not impaired as fire and smoke should be contained to the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.97 Reactor Building Elevation {{ }} - Fire Area R4-17

Reference Drawing: Figure 1.2-12

Room Name: Vestibule (420)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls)

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in area. Fire hose station 00-FP-HSS-0018 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R4-16, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.98 Reactor Building Elevation {{ }} - Fire Area R4-18

Reference Drawing: Figure 1.2-12

Room Name: Corridor (421)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area would involve electrical fire from electrical appliances lighting, electrical junction boxes located within the area, or transient combustibles. Based on the installed fire detection and three-hour rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Chases, enclosed by three-hour rated fire barriers, pass through this fire area. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the adjacent area (i.e., Fire Area R4-17). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.99 Reactor Building Elevation {{ }} - Fire Area R4-19

Reference Drawing: Figure 1.2-12

Room Name: Module 4 Division 2 Charger (422)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-17 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-18, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.100 Reactor Building Elevation {{ }} - Fire Area R4-20

Reference Drawing: Figure 1.2-12

Room Name: Module 4 Division 2 Battery (423)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-17 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.101 Reactor Building Elevation {{ }} - Fire Area R4-21

Reference Drawing: Figure 1.2-12

Room Name: Module 4 Division 2 I&C Equipment (424)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-17 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-20, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.102 Reactor Building Elevation {{ }} - Fire Area R4-22

Reference Drawing: Figure 1.2-12

Room Name: Module 5 Division 2 Charger (425)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-17 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-21, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.103 Reactor Building Elevation {{ }} - Fire Area R4-23

Reference Drawing: Figure 1.2-12

Room Name: Module 5 Division 2 Battery (426)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0855, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-17 and R4-18, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.104 Reactor Building Elevation {{ }} - Fire Area R4-24

Reference Drawing: Figure 1.2-12

Room Name: Module 5 Division 2 I&C Equipment (427)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-28 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-23, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.105 Reactor Building Elevation {{ }} - Fire Area R4-25

Reference Drawing: Figure 1.2-12

Room Name: Module 6 Division 2 Charger (428)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-28 and R4-18, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-24, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

## 9A.5.106 Reactor Building Elevation {{ }} - Fire Area R4-26

Reference Drawing: Figure 1.2-12

Room Name: Module 6 Division 2 Battery (429)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-28 and R4-18, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room. A redundant battery room is provided on Elevation {{ }}.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. The Division 1 and Division 2 systems are separated by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.107 Reactor Building Elevation {{ }} - Fire Area R4-27

Reference Drawing: Figure 1.2-12

Room Name: Module 6 Division 2 I&C Equipment (430)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the area adjacent to adjacent area (i.e., Fire Areas R4-28 and R4-18, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area, which includes one division of safety-related PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of the Division 2 equipment cabinets.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: PZR heater breakers, CRDS power supply breakers, and MPS cabinets for this module. This area contains safe shutdown cables associated with the PZR heater breakers, CRDS power supply breakers, MPS cabinets, manual hand switches to trip the reactor, isolate containment, and actuate DHRS, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CRDS power supply breakers and MPS cabinets would result in unplanned shutdown for the affected module. Damage to the affected equipment would likely require complete repair before the reactor could be restarted.

Minimal impact on post-fire operations. There are redundant (i.e., Division 1) systems located on EL. {{ }} in Fire Area R3-26, which is separated from this area by three-hour rated fire barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.108 Reactor Building Elevation {{ }} - Fire Area R4-28

Reference Drawing: Figure 1.2-12

Room Name: Utilities Area (431)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical control cabinet. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the area.
Fire hose station 00-FP-HSS-0552 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R4-30, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the fire area boundaries containing a potential release.

### 9A.5.109 Reactor Building Elevation {{ }} - Fire Area R4-29

Reference Drawing: Figure 1.2-12

Room Name: Hot Lab (432),
Chemistry Count (433)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** EH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Chemicals (Health Hazards), Clothing - Rubber/plastic, Clothing - Textile, Combustible/Flammable Liquids, Electrical Cabinets, Furniture, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Oxidizers, Paints, solvents, Paper & Cardboard (Files), Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Heaters, Switchgear <480 V |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Chemical Reactions, Electric Heaters, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is from combustible/flammable liquids, an electrical cable failure, or transient fire. However, a fire is not expected to spread beyond the boundaries of the room due to the presence of automatic suppression and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0861, connected to SC-I standpipe, is located in the adjacent to area (i.e., Fire Area R4-28). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this area would result in the loss of the hot lab.

**Operations / Post-Fire Recovery:**

There is minimal impact on post-fire operations as the room does not contain systems required for operation.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual and active suppression.

## 9A.5.110 Reactor Building Elevation {{ }} - Fire Area R4-30

Reference Drawing: Figure 1.2-12

Room Name: Vestibule (434)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electric Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, cables), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0552 is located in the adjacent stairwell (i.e., Fire Area RS-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the neutron monitoring system (NMS) preamplifiers.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the NMS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.111 Reactor Building Elevation {{ }} - Fire Area R4-31

Reference Drawing: Figure 1.2-12

Room Name: Fuel Handling Machine Maintenance (435)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling or equipment failure. Because of the small quantity of combustibles, three-hour rated fire barriers, qualified cabling, automatic detection, and manual suppression, the fire is limited to the immediate area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0003 is located in the adjacent area (i.e., Fire Area R4-1).<br>Fire hose station 00-FP-HSS-0552 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R4-30, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire may result in loss of fuel handling machine power and control cabinets.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

## 9A.5.112 Reactor Building Elevation {{ }} - Fire Area R5-1

Reference Drawing: Figure 1.2-13

Room Name: Entry Vestibule (503)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire in the area from electrical appliances lighting, electric heater, or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0546 is located in the adjacent area (i.e., Fire Area R5-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the adjacent area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.113 Reactor Building Elevation {{ }} - Fire Area R5-2

Reference Drawing: Figure 1.2-13

Room Name: BAS Equipment Aisleway (504)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Chemicals, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Chemical Reactions, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is an electrical cabinet failure or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, fire barriers, and manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0546 and 00-FP-HSS-0679 are located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the boric acid hopper, RBVS equipment, power and control cabinets for the module inspection rack and dry dock pool gate, and lighting cabinets.

**Operations / Post-Fire Recovery:**

Damage in the area may limit operation of the multiple systems controlled by the MCCs in the area.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual suppression.

### 9A.5.114 Reactor Building Elevation {{ }} - Fire Area R5-3

Reference Drawing: Figure 1.2-13

Room Name: EDN Battery 1 (505)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0546 and 00-FP-HSS-679 are located in the adjacent area (i.e., Fire Area R5-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour fire rated barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.115 Reactor Building Elevation {{ }} - Fire Area R5-4

Reference Drawing: Figure 1.2-13

Room Name: Telecom (506)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0679 is located in the adjacent area (i.e., Fire Area R5-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.116 Reactor Building Elevation {{ }} - Fire Area R5-5

Reference Drawing: Figure 1.2-13

Room Name: Module 01-03 Steam Gallery (507)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pumps |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall, including the boundary with the wall penetration shroud, is a three-hour rated fire barrier. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0679 is located in the adjacent area (i.e., Fire Area R5-2).<br>Fire hose station 00-FP-HSS-0558 is located in the stairwell adjacent to three adjacent areas (i.e., Fire Areas RS-1, R5-8, R5-7, and R5-6, respectively). |

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose stations are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire in could result in loss of one division of safety-related CIV solenoids, as well as DHRS actuator solenoids, on the CNTS hydraulic skids for up to three modules. The fire area is separated by three-hour fire rated barriers so the redundant division of safety-related valves and hydraulic skids is unaffected by a fire in this area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: CIV solenoids and DHRS actuator solenoids on CNTS hydraulic skids for three modules. This area contains safe shutdown cables associated with the MPS cabinets, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power, which in the case of the CNTS hydraulic skids would result in unplanned shutdown for the affected modules. Damage to the hydraulic skids would likely require complete repair before reactors could be restarted. Redundant hydraulic skids are located on EL. {{ }} in Fire Area R6-4, which is separated from this area by three-hour rated fire barriers.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related CIV solenoids isolation valves may impact multiple modules. The impact could require normal reactor shutdown of affected modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual and active suppression.

### 9A.5.117 Reactor Building Elevation {{ }} - Fire Area R5-6

Reference Drawing: Figure 1.2-13

Room Name: Vestibule (508)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Qualified Electric Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, cables), Electrical Cabinets

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0558 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R5-8, and R5-7, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the MCS and NMS cabinets.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the MCS and NMS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

## 9A.5.118 Reactor Building Elevation {{ }} - Fire Area R5-7

Reference Drawing: Figure 1.2-13

Room Name: RBVS Equipment Aisleway (509)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure or transient fire. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0558 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R5-8, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this area would potentially lead to the loss of PCS and RBVS equipment. There are limited intervening combustibles and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the PCS and RBVS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

## 9A.5.119 Reactor Building Elevation {{ }} - Fire Area R5-8

Reference Drawing: Figure 1.2-13

Room Name: Vestibule (510)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls) |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire in the area from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0558 is located in the adjacent stairwell (i.e., Fire Area RS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.120 Reactor Building Elevation {{ }} - Fire Area R5-9

Reference Drawing: Figure 1.2-13

Room Name: Vestibule (511)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Qualified Electric Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, cables), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, automatic suppression, and three-hour rated fire barriers.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0639 is located in the area. Fire hose station 00-FP-HSS-0558 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R5-8, and R5-7, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in loss of the MCS and NMS cabinets.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the MCS and NMS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.121 Reactor Building Elevation {{ }} - Fire Area R5-10

Reference Drawing: Figure 1.2-13

Room Name: Module 04-06 Steam Gallery (512)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, Pumps |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, pump failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall, including the boundary with the wall penetration shroud, is a three-hour rated fire barrier. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0639 and 00-FP-HSS-0659 are located in the adjacent areas (i.e., Fire Areas R5-9 and R5-11, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose stations are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire in could result in loss of one division of safety-related CIV solenoids, as well as DHRS actuator solenoids, on the CNTS hydraulic skids for up to three modules. The fire area is separated by three-hour fire rated barriers so the redundant division of safety-related valves and hydraulic skids is unaffected by a fire in this area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: CIV solenoids and DHRS actuator solenoids on CNTS hydraulic skids for three modules. This area contains safe shutdown cables associated with the MPS cabinets, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Systems are designed to fail safe on loss of power on loss of power, which in the case of the CNTS hydraulic skids would result in unplanned shutdown for the affected modules. Damage to the hydraulic skids would likely require complete repair before reactors could be restarted. Redundant hydraulic skids are located on EL. {{ }} in Fire Area R6-6, which is separated from this area by three-hour rated fire barriers.

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Loss of safety-related CIV solenoids isolation valves may impact multiple modules. The impact could require normal reactor shutdown of affected modules.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual and active suppression.

### 9A.5.122 Reactor Building Elevation {{ }} - Fire Area R5-11

Reference Drawing: Figure 1.2-13

Room Name: Module Assembly Equipment (MAE) Aisleway (515)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical control cabinet failure or transient fire. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0659 is located in the area. Fire hose station 00-FP-HSS-0551 is located in the adjacent stairwell (i.e., Fire Area RS-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of MAE and RBVS equipment. There are limited intervening combustibles and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. An unmitigated fire may result in loss of MAE.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.123 Reactor Building Elevation {{ }} - Fire Area R5-12

Reference Drawing: Figure 1.2-13

Room Name: EDN Battery 2 (514)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0659 is located in the adjacent area (i.e., Fire Area R5-11). Fire hose station 00-FP-HSS-0551 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R5-11, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour fire rated barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.124 Reactor Building Elevation {{ }} - Fire Area R5-13

Reference Drawing: Figure 1.2-13

Room Name: Telecom (513)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0659 is located in the adjacent area (i.e., Fire Area R5-11). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.125 Reactor Building Elevation {{ }} - Fire Area R5-14

Reference Drawing: Figure 1.2-13

Room Name: Dry Dock; when Dry Dock drained (040; on Elevation {{ }})
Module Import Trolley (516)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure or transient fire. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0546 is located in the adjacent area (i.e., Fire Area R5-2). Fire hose station 00-FP-HSS-0551 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R5-11, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would potentially lead to the loss of RXB jib crane power and control cabinets, the new fuel handling jib and power and control cabinets, and module import trolley. There are limited intervening combustibles and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. An unmitigated fire may result in loss of the RXB jib crane and new fuel handling jib.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.126 Reactor Building Elevation {{ }} - Fire Areas B1, B2, B3, B4, B5, B6

Reference Drawing: Figure 1.2-13

Room Name: Module 1 Bioshield, Module 2 Bioshield, Module 3 Bioshield, Module 4 Bioshield, Module 5 Bioshield, Module 6 Bioshield

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Qualified Electrical Cables

**In-Situ Ignition Sources:** None

**Transient Combustibles:** None

**Transient Ignition Sources:** None

Postulated Fire:

Consistent with the US600 design, a fire in the area at the top of a module i.e., under the bioshield, Fire Areas B1 - B6 is practically impossible as the cabling under the bioshield is routed in conduit or is three-hour fire rated cable which will results in no intervening combustible loading for an exposure fire impacting other cable or components in the area.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers, or barriers of equivalent construction, except for the vertical portions of the bioshields (i.e., the south boundary for Modules 01, 02, 03 and the north boundary for Modules for 04, 05, 06), which are not credited to mitigate the spread of fire; instead, the pool and physical separation are credited. These boundaries and the ceiling slabs (i.e., horizontal portions of the bioshields) are removable.

Suppression Systems: None

Detection Systems: Duct smoke detection is provided in the area.

Manual Suppression: None

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

These areas are inaccessible during normal operation. Fire hose station 00-FP-HSS-0546 is located in the adjacent area to the north (i.e., Fire Area R5-2) and fire hose station 00-FP-HSS-0551 is located in the stairwell adjacent to the adjacent area to the south (i.e., Fire Areas RS-2 and R5-11, respectively). Hose line extensions would be needed to fight a fire.

**Property Loss:**

An unmitigated fire could challenge multiple redundant safety systems. Note: Based on the lack of combustibles under the bioshield a fire under the bioshield is not considered plausible.

**Operations / Post-Fire Recovery:**

These areas contain safe shutdown equipment and cables.

Unmitigated fire and smoke at the top of the module can potentially affect operation and shutdown of the module and post-fire operation of the module. The modules do not require the active systems, but may be passively cooled by the reactor pool. The plant systems and operations outside the individual module damaged by the fire should not be affected and allow for post-fire operations for other areas, and allow for other actions to address the impacted module. This is due to a combination of separations, smoke detection to alert the control room and emergency responders, and fire barriers that will restrict fire and smoke movement beyond the area. Post-fire smoke purge is provided as well to aid in post-fire recovery.

**Radiological Release:**

There is minimal potential for fire or smoke to damage equipment in the area. The radiological sources in this area is contained within piping, which is not susceptible to fire damage.

### 9A.5.127 Reactor Building Elevation {{ }} - Fire Area R6-1

Reference Drawing: Figure 1.2-14

Room Name: Utilities Area (603)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is an electrical cabinet failure or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, fire barriers, and manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0545 and 00-FP-HSS-0675 are located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where manual response is coordinated.

**Property Loss:**

An unmitigated fire may result in loss of RBVS equipment, PCS equipment, and lighting cabinets.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of functionality associated with the affected PCS system components.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the area due to the boundaries, detection, and manual suppression.

### 9A.5.128 Reactor Building Elevation {{ }} - Fire Area R6-2

Reference Drawing: Figure 1.2-14

Room Name: EDN Charger 1 (604)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0545 and 00-FP-HSS-675 are located in the adjacent area (i.e., Fire Area R6-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour fire rated barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.129 Reactor Building Elevation {{ }} - Fire Area R6-3

Reference Drawing: Figure 1.2-14

Room Name: Telecom (605)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0675 is located in the adjacent area (i.e., Fire Area R6-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.130 Reactor Building Elevation {{ }} - Fire Area R6-4

Reference Drawing: Figure 1.2-14

Room Name: CNTS and CRDS Equipment (606)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** AHUs, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, or equipment failure. Because of the small quantity of combustibles, qualified cabling, automatic detection, and automatic and manual suppression plus three-hour rated barriers, the fire is limited to the immediate area.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0675 is located in the adjacent area (i.e., Fire Area R6-1). Fire hose station 00-FP-HSS-0557 is located in the stairwell adjacent to two adjacent areas (i.e., Fire Areas RS-1, R6-5, and R7-1, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in loss of the CRDS of up to three modules. Additionally, unmitigated fire could result in loss of one division of safety-related CIV solenoids, as well as DHRS actuator solenoids, on the CNTS hydraulic skids for up to three modules. The fire area is separated by three-hour fire rated barriers so the redundant division of safety-related valves and hydraulic skids is unaffected by a fire in this area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: CIV solenoids and DHRS actuator solenoids on CNTS hydraulic skids for three modules. This area contains safe shutdown cables associated with the MPS cabinets, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

The modules are designed to work independently. A fire could result in loss of the CRDS for a single module. A large unmitigated fire in the room could result in loss of the systems for three adjacent modules and also compromise the RBVS. Systems are designed to fail safe on loss of power, which in the case of the CRDS would produce unplanned control rod insertions in the affected modules. In the case of the CNTS hydraulic skids, this would result in unplanned shutdown for the affected modules. Redundant hydraulic skids are located on EL. 100’ in Fire Area R5-5, which is separated from this area by three-hour rated fire barriers. Damage to the hydraulic skids or CRDS would likely require complete repair before the modules could be restarted.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and active and manual suppression.

### 9A.5.131 Reactor Building Elevation {{ }} - Fire Area R6-5

Reference Drawing: Figure 1.2-14

Room Name: Utilities Area (609)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Heater

**Transient Combustibles:** Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is an electric heater failure or transient fire. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and fire barriers.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The west wall of this area is credited as a partial height wall for separation from the RXB pool hall. The exterior wall is a three-hour rated fire barrier.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0557 is located in the adjacent stairwell (i.e., Fire Area RS-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area. There is potential for smoke to spread to the adjacent RXB pool hall due to the partial height wall on the west side of the area.

### 9A.5.132 Reactor Building Elevation {{ }} - Fire Area R6-6

Reference Drawing: Figure 1.2-14

Room Name: CNTS and CRDS Equipment (611)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | AHUs, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, or equipment failure. Because of the small quantity of combustibles, qualified cabling, automatic detection, and automatic and manual suppression plus three-hour rated barriers, the fire is limited to the immediate area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0635 and 00-FP-HSS-0655 are located in the adjacent areas (i.e., Fire Area R7-2 and R6-8, respectively). Note that Fire Area R7-2 contains rooms on {{ }}. The hose station is located in the vestibule on EL. {{ }} (i.e., Room 610). |

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in loss of the CRDS of up to three modules. Additionally, unmitigated fire could result in loss of one division of safety-related CIV solenoids, as well as DHRS actuator solenoids, on the CNTS hydraulic skids for up to three modules. The fire area is separated by three-hour fire rated barriers so the redundant division of safety-related valves and hydraulic skids is unaffected by a fire in this area.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment: CIV solenoids and DHRS actuator solenoids on CNTS hydraulic skids for three modules. This area contains safe shutdown cables associated with the MPS cabinets, CIV solenoids, and DHRS actuator solenoids. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

The modules are designed to work independently. A fire could result in loss of the CRDS for a single module. A large unmitigated fire in the room could result in loss of the systems for three adjacent modules and also compromise the RBVS. Systems are designed to fail safe on loss of power, which in the case of the CRDS would produce unplanned control rod insertions in the affected modules. In the case of the CNTS hydraulic skids, this would result in unplanned shutdown for the affected modules. Redundant hydraulic skids are located on EL. {{ }} in Fire Area R5-10, which is separated from this area by three-hour rated fire barriers. Damage to the hydraulic skids or CRDS would likely require complete repair before the modules could be restarted.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and active and manual suppression.

### 9A.5.133 Reactor Building Elevation {{ }} - Fire Area R6-7

Reference Drawing: Figure 1.2-14

Room Name: Telecom (613)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Battery Chargers, Electrical Cabinets, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0655 is located in the adjacent area (i.e., Fire Area R6-8). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.134 Reactor Building Elevation {{ }} - Fire Area R6-8

Reference Drawing: Figure 1.2-14

Room Name: Utilities Area (615)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical control cabinet failure, or transient introduced during repair or maintenance of the equipment. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls are three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0655 is located in the area. Fire hose station 00-FP-HSS-0009 is located in the adjacent stairwell (i.e., Fire Area RS-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this area would potentially lead to the loss of PCS and RBVS equipment. There are limited intervening combustibles and the combination of detection, fire barriers, and manual suppression should limit damage to the point of origin in the area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Damage in the area may limit operation of the PCS and RBVS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.135 Reactor Building Elevation {{ }} - Fire Area R6-9

Reference Drawing: Figure 1.2-14

Room Name: EDN Charger 2 (614)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0655 is located in the adjacent area (i.e., Fire Area R6-8). Fire hose station 00-FP-HSS-0009 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R6-8, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour fire rated barriers.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.136 Reactor Building Elevation {{ }} - Fire Area R6-10

Reference Drawing: Figure 1.2-14

Room Name: Module Maintenance Center (616),
Office (617),
Office (618),
HVAC Equipment (619)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Furniture, Lubricants, Oils, Misc. Combustibles, Misc. wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Files, Books, Records and other paper files |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Electric Motors |

<u>Postulated Fire:</u>

The worst case fire postulated would involve an office type electrical appliance. Based on the installed FDS and rated fire barriers, a fire would be detected and contained to the area of fire origin and not propagate beyond this area. This area would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall is a three-hour rated fire barrier. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0545 is located in the adjacent area (i.e., Fire Area R6-1). Fire hose station 00-FP-HSS-0009 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-2 and R6-8, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the module maintenance area, office space, and RBVS equipment.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and manual suppression should limit fire and smoke to the area. Damage in the area may limit operation of the RBVS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and manual suppression.

### 9A.5.137 Reactor Building Elevation {{ }} - Fire Area R7-1

Reference Drawing: Figure 1.2-15

Room Name: Vestibule (608; on Elevation {{ }}),
HVAC Equipment (701),
Elevator Equipment (703)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** AHUs, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault, fire in an HVAC unit, or transient fire. The fire is not expected to spread beyond the boundaries of the area due to the lack of significant combustibles. Smoke or embers will not be recirculated from or to this area via the ventilation system, because the system is provided with smoke dampers and smoke detectors to shutoff the supply fans in the event of a fire.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The walls separating Rooms 701 and 703 are two-hour rated fire barriers. The exterior walls on EL. {{ }} are three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection and ductwork supply air smoke detection are provided in the area.

| | |
|---|---|
| Manual Suppression: | Fire hose stations 00-FP-HSS-0550 and 00-FP-HSS-0883 are located in the area on EL. {{ }}. On EL. {{ }}, fire hose station 00-FP-HSS-0557 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas RS-1 and R6-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in loss of the RXB elevator and in the loss of RBVS equipment, including the AHUs for the battery and battery charger rooms for three modules and reserved space (north side only).

**Operations / Post-Fire Recovery:**

A large unmitigated fire could compromise the RBVS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and active and manual suppression.

### 9A.5.138 Reactor Building Elevation {{ }} - Fire Area R7-2

Reference Drawing: Figure 1.2-15

Room Name: Vestibule (610; on Elevation {{ }}),
HVAC Equipment (704)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** AHUs, Electric Appliances (lighting, controls), Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault, fire in an HVAC unit, or transient fire. The fire is not expected to spread beyond the boundaries of the area due to the lack of significant combustibles. Smoke or embers will not be recirculated from or to this area via the ventilation system, because the system is provided with smoke dampers and smoke detectors to shutoff the supply fans in the event of a fire.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls on EL. {{ }} are three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0933 is located in the area and fire hose station 00-FP-HSS-0967 is located in the adjacent stairwell (i.e., Fire Area RS-2) on EL. {{ }}. On EL. {{ }}, fire hose station 00-FP-HSS-0635 is located in the area and fire hose station 00-FP-HSS-0557 is located in the stairwell adjacent to the

| | |
|---|---|
| | adjacent area (i.e., Fire Areas RS-1 and R6-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose station are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in loss of RBVS equipment, including the AHUs for the battery and battery charger rooms for three modules.

**Operations / Post-Fire Recovery:**

A large unmitigated fire could compromise the RBVS.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as fire and smoke should be maintained within the room due to the boundaries, detection, and active and manual suppression.

### 9A.5.139 Reactor Building - Other - Fire Area RE

Reference Drawing: Figures 1.2-8 through 1.2-15

Room Name: Elevator (003)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. The elevator hoist way contains a negligible amount of combustible material. In addition, there are no significant ignition sources or fire hazards in the area. Generally transient combustibles are attended while in the elevator.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls on EL. 100’ and EL. 126’ are three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0549 is located in the adjacent area (i.e., Fire Area R0-1) on Elevation {{ }}. Fire hose station 00-FP-HSS-0548 is located in the adjacent area (i.e., Fire Area R1-1) on Elevation {{ }}. Fire hose station 00-FP-HSS-0547 is located in the adjacent area (i.e., Fire Area R2-1) on |

Elevation {{ }}. Fire hose station 00-FP-HSS-0004 is located in the adjacent area (i.e., Fire Area R3-1) on Elevation {{ }}. Fire hose station 00-FP-HSS-0003 is located in the adjacent area (i.e., Fire Area R4-1) on Elevation {{ }}. Fire hose station 00-FP-HSS-0546 is located in the adjacent area (i.e., Fire Area R5-2) on Elevation {{ }}. Fire hose station 00-FP-HSS-0545 is located in the adjacent area (i.e., Fire Area R6-1) on Elevation {{ }}. Fire hose station 00-FP-HSS-0550 is located in the adjacent area (i.e., Fire Area R7-1) on Elevation {{ }}.

Fire Extinguishers: A portable fire extinguisher is located in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the elevator for the RXB.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.140 Reactor Building - Other - Fire Area RS-1

Reference Drawing: Figures 1.2-8 through 1.2-15

Room Name: Stair 1 (001, 101, 201, 301, 401, 501, 601)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the stair.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior wall on {{ }} is a three-hour rated fire barrier. |
| Suppression Systems: | None. |
| Detection Systems: | Smoke detection is provided at top of shaft. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0562 is located on Elevation {{ }} (i.e., Room 001). Fire hose station 00-FP-HSS-0561 is located on Elevation {{ }} (i.e., Room 101). Fire hose station 00-FP-HSS-0560 is located on Elevation {{ }} (i.e., Room 201). Fire hose station 00-FP-HSS-0559 is located on Elevation {{ }} (i.e., Room 301). Fire hose station 00-FP-HSS-0018 is located on Elevation {{ }} (i.e., Room 401). Fire hose station 00-FP-HSS-0558 is located on Elevation {{ }} (i.e., Room 501). Fire hose station 00-FP-HSS-0557 is located on Elevation {{ }} (i.e., Room 601). |
| Fire Extinguishers: | A portable fire extinguisher is located in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire/smoke in the stairwell will have limited impact on manual firefighting as there are other stairs that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stairwell on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.141 Reactor Building - Other - Fire Area RS-2

Reference Drawing: Figures 1.2-8 through 1.2-15

Room Name: Stair 2 (002, 102, 202, 302, 402, 502, 602, 702)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electrical Appliances (lighting, controls), Electric Heaters

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers. The exterior walls on {{ }} are three-hour rated fire barriers.

Suppression Systems: None.

Detection Systems: Smoke detection is provided at top of shaft.

Manual Suppression: Fire hose station 00-FP-HSS-0556 is located on Elevation {{ }} (i.e., Room 002). Fire hose station 00-FP-HSS-0555 is located on Elevation {{ }} (i.e., Room 102). Fire hose station 00-FP-HSS-0554 is located on Elevation {{ }} (i.e., Room 202). Fire hose station 00-FP-HSS-0553 is located on Elevation {{ }} (i.e., Room 302). Fire hose station 00-FP-HSS-0552 is located on Elevation {{ }} (i.e., Room 402). Fire hose station 00-FP-HSS-0551 is located on Elevation {{ }} (i.e., Room 502). Fire hose station 00-FP-HSS-0009 is located on Elevation {{ }} (i.e., Room 602). Fire hose station 00-FP-HSS-0967 is located on Elevation {{ }} (i.e., Room 702).

Fire Extinguishers: A portable fire extinguisher is located in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire/smoke in the stairwell will have limited impact on manual firefighting as there are other stairs that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stairwell on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.142 Radioactive Waste Building Elevation {{ }} - Fire Area W0-1

Reference Drawing: Figure 1.2-22

Room Name: Service Aisleway (004),
Access Aisleway (006),
Service Aisleway (007),
Service Aisleway (027),
Service Aisleway (028),
LRW Demin Water Tank (036),
Mezzanine Aisle (104; on Elevation {{ }})

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Misc. Combustibles Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Cabinets, Pump |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Packing materials, Paints, Solvents and Cleaning Chemicals, Pallets, Plastic and Rubber materials |
| **Transient Ignition Sources:** | Electric Motors, Chemical Reactions, Hot work |

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond these rooms. These rooms would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0283 (Room 007), 00-FP-HSS-0847 (Room 027), and |

| | |
|---|---|
| | 00-FP-HSS-0823 (Room 028) are provided in the area. Fire hose station 00-FP-HSS-0280 is located in the adjacent stairwell (i.e., Fire Area WS-1). |
| Fire Extinguishers: | Portable fire extinguishers are located in the area or in an adjacent area |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a tank room and a common space on RWB Elevation {{ }} providing access to the various rooms, as well as an aisleway on Elevation {{ }}. The connecting rooms are separated. A fire in this area is mitigated by manual suppression.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the radioactive waste building HVAC system (RWBVS).

### 9A.5.143 Radioactive Waste Building Elevation {{ }} - Fire Area W0-2

Reference Drawing: Figure 1.2-22

Room Name: LRW Processing Equipment (005)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Cabinets, Electric Motors, Pump

**Transient Combustibles:** Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Packing materials, Paints, Solvents and Cleaning Chemicals, Pallets, Plastic and Rubber materials, Vehicles

**Transient Ignition Sources:** Chemical Reactions, Electric Motors

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: The portions of the area surrounding the drum dryers and the drum dryer hold-up tank are high radiation areas, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The portions of the room surrounding the low-conductivity waste (LCW) processing skid and high-conductivity waste (HCW) granulated, activated charcoal are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that

| | |
|---|---|
| | could lead to a credible fire. Smoke detection is otherwise provided. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0303 is located in the area. Fire hose station 00-FP-HSS-0283 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

This fire area consists of LRW system processing equipment on RWB Elevation {{ }}. The combustible loading of the area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.144 Radioactive Waste Building Elevation {{ }} - Fire Area W0-3

Reference Drawing: Figure 1.2-22

Room Name: GRW Charcoal Beds (038)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Charcoal Filters

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Chemical Reactions

**Transient Combustibles:** Materials for Testing & Maintenance

**Transient Ignition Sources:** Hot work

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. The charcoal decay beds are welded steel or welded stainless steel with dedicated manual fire suppression provided by fire hose reel 00FPHOS0155, located in the adjacent stairwell i.e., Fire Area WS-1. and therefore would not contribute to the fire load of the area. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Manual deluge suppression is provided for the charcoal beds.

Detection Systems: Heat detection is provided at the outlet of the charcoal decay beds, which initiates a nitrogen purge of the bed. This is a locked high radiation area, and no other fire detection is provided because the area is normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire.

Manual Suppression: Fire hose station 00-FP-HSS-0280 and fire hose reel 00-FP-HOS-0155 are located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-1 and W0-1, respectively).

Fire Extinguishers: Portable fire extinguishers are located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of charcoal decay beds in the lower elevation of the RWB. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.145 Radioactive Waste Building Elevation {{ }} - Fire Area W0-4

Reference Drawing: Figure 1.2-22

Room Name: GRW Vapor Condensers (037)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Charcoal Filters, Clothing - Rubber/plastic, Electrical Cabinets, Flammable gas

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Heaters, Electrical Cabinets, Chemical Reactions

**Transient Combustibles:** Materials for Testing & Maintenance

**Transient Ignition Sources:** Electric Heaters

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0280 and fire hose reel 00-FP-HOS-0155 are located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-1 and W0-1, respectively).

Fire Extinguishers: Portable fire extinguishers are located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a condenser room in the lower elevation of the RWB. The combustible loading of the area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.146 Radioactive Waste Building Elevation {{ }} - Fire Area W0-5

Reference Drawing: Figure 1.2-22

Room Name: LRW low-conductivity waste Sample Tank Pumps (008)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Electric Motors |

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0283 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.147 Radioactive Waste Building Elevation {{ }} - Fire Area W0-6

Reference Drawing: Figure 1.2-22

Room Name: LRW high-conductivity waste Sample Tank Pumps (009)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps

**Transient Combustibles:** Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance

**Transient Ignition Sources:** Electric Motors

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0283 is located in the adjacent area (i.e., Fire Area W0-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.148 Radioactive Waste Building Elevation {{ }} - Fire Area W0-7

Reference Drawing: Figure 1.2-22

Room Name: SRW Phase Separator Pumps (010)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps

**Transient Combustibles:** Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance

**Transient Ignition Sources:** Electric Motors

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0283 is located in the adjacent area (i.e., Fire Area W0-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.149 Radioactive Waste Building Elevation {{ }} - Fire Area W0-8

Reference Drawing: Figure 1.2-22

Room Name: SRW high integrity container (HIC) Filling (035)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-2

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Plastic, Rubber Materials, Ion Exchange Resin, Carbon Absorption Media, Qualified Electric Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motor, Pump |
| **Transient Combustibles:** | Clothing rubber/plastic, Clothing Textile |
| **Transient Ignition Sources:** | Chemical Reactions |

Postulated Fire:

The postulated fire for this area is an electrical fault in electrical cabinet, or exothermic reaction that spreads to HICs. Based on the installed fire detection/ suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this space.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | This is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0847 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of waste segregation equipment in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by fire suppression and use of the building ventilation system.

### 9A.5.150 Radioactive Waste Building Elevation {{ }} - Fire Area W0-9

Reference Drawing: Figure 1.2-22

Room Name: SRW HIC Storage (034)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-2

| | |
|---|---|
| **In-Situ Combustibles:** | Plastic, Rubber Materials, Ion Exchange Resin, Carbon Absorption Media |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Clothing rubber/plastic, Clothing Textile |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in electrical cabinet, or other electrical type that spreads to HICs. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this space.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | This is a locked high radiation area, and no fire detection is provided because the area is normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0847 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the bulk waste storage containers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by fire suppression and use of the building ventilation system.

### 9A.5.151 Radioactive Waste Building Elevation {{ }} - Fire Area W0-10

Reference Drawing: Figure 1.2-22

Room Name: LRW low-conductivity waste Collect Tank Pumps (024)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Electric Motors |

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBV.

### 9A.5.152 Radioactive Waste Building Elevation {{ }} - Fire Area W0-11

Reference Drawing: Figure 1.2-22

Room Name: LRW high-conductivity waste Collect Tank Pumps (025)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Electric Motors |

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.153 Radioactive Waste Building Elevation {{ }} - Fire Area W0-12

Reference Drawing: Figure 1.2-22

Room Name: SRW Spent Resin Pumps (026)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Electric Motors, Pumps |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Electric Motors |

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a pump room in the lower elevation of the RWB. The connecting rooms are separated. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBV.

### 9A.5.154 Radioactive Waste Building Elevation {{ }} - Fire Area W0-13

Reference Drawing: Figure 1.2-22

Room Name: PCWS Demin Valve Gallery (031),
PCWS Demineralizers (032)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Hot Work Fuel & Oxidizer

**Transient Ignition Sources:** Hot work

Postulated Fire:

The worst case fire postulated would involve transient combustibles. Based on the installed FDS, manual suppression, and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond these rooms. These rooms would not likely have significant quantities of transient combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the PCWS Demin Valve Gallery (i.e., Room 031). The PCWS Demineralizers (i.e., Room 032) is a locked high radiation area, and no fire detection is provided because the area is normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire.

Manual Suppression: Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of the use of the PCWS demineralizers.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers.

**Radiological Release:**

Fire and smoke would not have a significant impact on release of radiation as contamination levels would be low and fire and smoke should be maintained within the room due to the barriers and manual suppression.

### 9A.5.155 Radioactive Waste Building Elevation {{ }} - Fire Area W0-14

Reference Drawing: Figure 1.2-22

Room Name: PCWS Filter A (030)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer |
| **Transient Ignition Sources:** | Hot work |

Postulated Fire:

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | This is a high radiation area, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of the one of the cleanup filters.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal and should be contained to the area due to the fire barriers and detection alerting the control room of a fire.

### 9A.5.156 Radioactive Waste Building Elevation {{ }} - Fire Area W0-15

Reference Drawing: Figure 1.2-22

Room Name: PCWS Filter B (029)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Hot Work Fuel & Oxidizer |
| **Transient Ignition Sources:** | Hot work |

Postulated Fire:

The room contains a negligible amount of combustibles. In addition, there are no significant ignition sources in the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | This is a high radiation area , and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0823 is located in the adjacent area (i.e., Fire Area W0-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire could result in the loss of the one of the cleanup filters.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal and should be contained to the area due to the fire barriers and detection alerting the control room of a fire.

### 9A.5.157 Radioactive Waste Building Elevation {{ }} - Fire Area W0-16

Reference Drawing: Figure 1.2-22

Room Name: SRW Drum Storage (033)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Clothing - Rubber/plastic, Lubricants, Oils |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Pump |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Pallets |
| **Transient Ignition Sources:** | Electric Motors |

Postulated Fire:

The worst case fire postulated would involve in-situ combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0282 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-2 and W0-1, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a waste storage room in the lower elevation of the RWB. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste storage and mixed waste storage.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste storage and mixed waste storage required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, automatic and manual suppression, and the RWBVS.

### 9A.5.158 Radioactive Waste Building Elevation {{ }} - Fire Area W1-1

Reference Drawing: Figure 1.2-23

Room Name: LRW low-conductivity waste Sample Tank A (011; on Elevation {{ }}),

LRW low-conductivity waste Sample Tank B (012; on Elevation {{ }}),

LRW high-conductivity waste Sample Tank A (013; on Elevation {{ }}),

LRW high-conductivity waste Sample Tank B (014; on Elevation {{ }}),

SRW Phase Separator Tank A (015; on Elevation {{ }}),

SRW Phase Separator Tank B (016; on Elevation {{ }}),

Pipe Chase Corridor (017; on Elevation {{ }}),

LRW low-conductivity waste Collect Tank A (018; on Elevation {{ }}),

LRW low-conductivity waste Collect Tank B (019; on Elevation {{ }}),

LRW high-conductivity waste Collect Tank A (020; on Elevation {{ }}),

LRW high-conductivity waste Collect Tank B (021; on Elevation {{ }}),

SRW Spent Resin Storage Tank A (022; on Elevation {{ )}},

SRW Spent Resin Storage Tank B (023; on Elevation {{ }}),

Valve Gallery (101),

Pipe Chase Corridor (102),

Valve Gallery (103)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

**In-Situ Combustibles:** Appliances, Clothing - Rubber/plastic

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Materials for Testing & Maintenance

**Transient Ignition Sources:** None

Postulated Fire:

Access to Fire Area W1-1 is from two staircases in Room 027 in Fire Area W0-1 on Elevation {{ }} that lead to Rooms 101 and 103 on Elevation {{ }}.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. Connecting rooms in this area are separated from by three-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | The SRW Phase Separator Tanks A and B (i.e., Rooms 015 and 016, respectively) are high radiation areas, and means of fire detection suitable for the environmental conditions, such as conventional heat detection or incipient smoke detection, is provided. The Pipe Chase Corridor and SRW Spent Resin Storage Tanks A and B (i.e., Rooms 102, 022, and 023, respectively) are locked high radiation areas, and no fire detection is provided because these rooms are normally inaccessible, have limited combustibles, and have no ignition sources that could lead to a credible fire. Area-wide smoke detection is provided in the remaining rooms in the area. |
| Manual Suppression: | Fire hose reels 00-FP-HOS-0687 and 00-FP-HOS-0871 are located in the north and south valve galleries, respectively (i.e., Rooms 101 and 103). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of multiple tank rooms in the lower elevation of the RWB. The connecting rooms are separated by three-hour fire rated barriers. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.159 Radioactive Waste Building Elevation {{ }} - Fire Area W2-1

Reference Drawing: Figure 1.2-24

Room Name: Toilet (203),
Open Office (204),
Health Physics Corridor (205),
Dosimetry (207),
WBC (208),
HP Instruments (209),
Remote Monitor (210),
Respirator Facility (211),
Vestibule (212),
Exit Vestibule (213),
Entry Vestibule (214),
Radiologically controlled area (RCA) Entry Corridor (215),
Equipment Decontamination (216),
Decontamination (217),
Decontamination (218),
Counting Lab (219),
Storage (220),
RCA Exit Corridor (221)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Clothing - Rubber/plastic, Clothing - textile, Electrical cabinets, Furniture, Interior Finish - Carpet, Vinyl Tile, Vinyl Base, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Paper and cardboard (files), Plastic, Rubber materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors

**Transient Combustibles:** Clothing rubber/plastic, Clothing Textile, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Electric Motors, Chemical reactions

Postulated Fire:

The worst case fire postulated would involve in-situ combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers; except for the south wall in the Open Office (i.e., Room 204) that is the boundary with Fire Area WS-1, which is a two-hour rated barrier. Rooms inside this fire area are separated from each other by unrated fire barriers; except for the RCA boundary, which are one-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression:: | Fire hose station 00-FP-HSS-0835 and 00-FP-HSS-0843 are located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, automatic and manual suppression, and the RWBVS.

## 9A.5.160 Radioactive Waste Building Elevation {{ }} - Fire Area W2-2

Reference Drawing: Figure 1.2-24

Room Name: Telecom (206)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling- Instrumentation

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0835 is located in the adjacent area (i.e., Fire Area W2-1).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.161 Radioactive Waste Building Elevation {{ }} - Fire Area W2-3

Reference Drawing: Figure 1.2-24

Room Name: Electrical Equipment (234)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Switchgear 480 V |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the elevator (i.e., Fire Area WE), which is a two-hour rated fire barrier. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0279 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the electrical in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.162 Radioactive Waste Building Elevation {{ }} - Fire Area W2-4

Reference Drawing: Figure 1.2-24

Room Name: Hot Shop (236),
Small Parts (237),
Hot Tools (238),
Decontamination (239)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Clothing - textile, Electrical cabinets, Hot Work Fuel and Oxidizer, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber materials, Qualified Electrical Cable, Solvents |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Hot Work, Chemical Reactions |
| **Transient Combustibles:** | Clothing rubber/plastic, Clothing Textile, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Chemical reactions |

Postulated Fire:

The worst case fire postulated would involve in-situ combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0827 and 00-FP-HSS-0831 are located in the adjacent area (i.e., Fire Area W2-10). |

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, automatic and manual suppression, and the RWBVS.

### 9A.5.163 Radioactive Waste Building Elevation {{ }} - Fire Area W2-5

Reference Drawing: Figure 1.2-24

Room Name: Access Corridor (230)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors |

Postulated Fire:

Electrical fire from electrical appliances lighting or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundaries with the elevator and stairwell (i.e., Fire Areas WE and WS-1, respectively), which are two-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0279 is located in the adjacent stairwell (i.e., Fire Area WS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.164 Radioactive Waste Building Elevation {{ }} - Fire Area W2-6

Reference Drawing: Figure 1.2-24

Room Name: EDN Battery (233)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The worst case fire postulated would involve the malfunction of a battery. Based on the installed smoke detection and robust fire barrier envelope, a fire would be immediately detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the stairwell (i.e., Fire Area WS-1), which is a two-hour rated fire barrier.

Suppression Systems: None.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0279 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a battery room on RWB Elevation {{ }}. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour rated fire barriers, except for the stairwell which has two-hour rated fire barriers, to mitigate damage to adjacent systems. The battery room is separated from the battery charger room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.165 Radioactive Waste Building Elevation {{ }} - Fire Area W2-7

Reference Drawing: Figure 1.2-24

Room Name: EDN Charger (232)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Qualified Electrical Cable, Transformers - Dry |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, Switchgear =480 V |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0279 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment including battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.166 Radioactive Waste Building Elevation {{ }} - Fire Area W2-8

Reference Drawing: Figure 1.2-24

Room Name: Waste Management Control Room (231)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Furniture

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Files, Books, Records and other paper files

**Transient Ignition Sources:** None

Postulated Fire:

The worst case fire postulated would involve an office type electrical appliance. Based on the installed FDS, manual suppression, and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0279 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively).

Fire Extinguishers: Portable fire extinguishers are located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of an office equipped room on RWB Elevation 100’-0”. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of the office space and normal monitoring of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would not affect components required for power production as control of equipment in the building can be regained from other control stations outside of the fire area.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, lack of radiological material, and use of the building ventilation system.

### 9A.5.167 Radioactive Waste Building Elevation {{ }} - Fire Area W2-9

Reference Drawing: Figure 1.2-24

Room Name: Telecom (235)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0279 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and suppression systems should limit fire and smoke to the room.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.168 Radioactive Waste Building Elevation {{ }} - Fire Area W2-10

Reference Drawing: Figure 1.2-24

Room Name: Module Import Trolley Bay (222),

Vestibule (223),

Equipment Laydown (224),

Service Aisleway (228),

Truck Bay (229),

HVAC radiologically controlled area Equipment Room (303; on Elevation {{ }})

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-2

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Qualified Electrical Cable, Vehicles |
| **In-Situ Ignition Sources:** | AHUs, Batteries, Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Packing materials, Paints, Solvents and Cleaning Chemicals, Pallets, Plastic and Rubber materials, Resin, Storage (Misc.), Temporary Electrical Cables, Vehicles |
| **Transient Ignition Sources:** | Chemical Reactions, Electric Motors |

Postulated Fire:

The worst case fire postulated would involve a motor vehicle on Elevation {{ }}. This fire hazard has the potential to place the RWB and the RXB at risk of damage. Based on the installed fire detection and suppression systems and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this space. This space also has the potential to contain moderate quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers, with some exceptions. The southwest wall of the service aisleway (i.e., Room 228) that is shared with the stairwell (i.e., Fire Area WS-2) is a |

| | |
|---|---|
| | two-hour rated fire barrier. The floor plugs in the Truck Bay (i.e., Room 229) do not have three-hour rated fire seals. These seals are evaluated as part of site-specific design. The HVAC radiologically controlled area equipment room (i.e., Room 303) on Elevation {{ }} is not open to the laydown area / truck bay on Elevation {{ }} and is separated from adjacent areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided for the rooms in this area. Additionally, manual deluge sprinkler suppression systems are provided in the Module Import Trolley Bay and the Truck Bay (i.e., Rooms 222 and 229, respectively). |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0307, 00-FP-HSS-827, and 00-FP-HSS-831 are located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

This fire area consists of truck bays, the module import trolley bay, equipment laydown area, service aisleway, and RCA heating, ventilation, and air conditioning equipment room. (Note: the HVAC room on Elevation {{ }} is not open to the laydown area/truck bay on Elevation {{ }}.) The connecting rooms, on Elevation {{ }}, are separated from other fire areas. A fire in this area is mitigated by the installed suppression systems. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste processing systems and components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the building ventilation system.

### 9A.5.169 Radioactive Waste Building Elevation {{ }} - Fire Area W2-11

Reference Drawing: Figure 1.2-24

Room Name: Class A Waste Storage (225),

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Misc. Combustibles, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets

**Transient Combustibles:** Packing materials, Paints, Solvents and Cleaning Chemicals, Pallets, Plastic and Rubber materials, Resin, Temporary Electrical Cables

**Transient Ignition Sources:** Chemical Reactions, Electric Motors

Postulated Fire:

The worst case fire postulated would involve the compactor and in-situ combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated walls. Although credited as three-hour rated fire barriers, walls separating Fire Area W2-11 from Fire Areas W2-10, W2-12, and W2-13 are partial height walls to allow for overhead crane access. These walls are credited for fire area separation.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area

Manual Suppression: Fire hose station 00-FP-HSS-0281 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-2 and W2-10, respectively). Fire hose station 00-FP-HSS-0307 is located in adjacent area (i.e., Fire Area W2-10).

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area consists of a waste storage room on Elevation {{ }} of the RWB. A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of radioactive waste storage and mixed waste storage.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of radioactive waste storage and mixed waste storage required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, automatic and manual suppression, and the RWBVS.

### 9A.5.170 Radioactive Waste Building Elevation {{ }} - Fire Area W2-12

Reference Drawing: Figure 1.2-24

Room Name: FLEX Storage (227)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance |
| **Transient Ignition Sources:** | Electric Motors |

<u>Postulated Fire:</u>

The worst case fire postulated would involve in-situ combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated walls. Although credited as three-hour rated fire barriers, walls separating Fire Area W2-12 from Fire Areas W2-10, W2-11, and W2-13 are partial height walls to allow for overhead crane access. These walls are credited for fire area separation. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0281 is located in the stairwell adjacent to the adjacent area (i.e., Fire Areas WS-2 and W2-10, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room could lead to the loss of stored diverse and flexible coping strategies FLEX equipment.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.171 Radioactive Waste Building Elevation {{ }} - Fire Area W2-13

Reference Drawing: Figure 1.2-24

Room Name: Low Level Solid Radwaste Sorting (226)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Misc. Combustibles |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls) |
| **Transient Combustibles:** | Clothing rubber/plastic, Clothing Textile |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated walls. Although credited as three-hour rated fire barriers, walls separating Fire Area W2-13 from Fire Areas W2-10, W2-11, and W2-12 are partial height walls to allow for overhead crane access. These walls are credited for fire area separation. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0307 is located in the adjacent area (i.e., Fire Area W2-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the installed suppression system. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the adjacent area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles, automatic and manual suppression, and the RWBVS.

### 9A.5.172 Radioactive Waste Building Elevation {{ }} - Fire Area W3-1

Reference Drawing: Figure 1.2-25

Room Name: HVAC Equipment (302)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable, Charcoal Filters

**In-Situ Ignition Sources:** AHUs, Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment

**Transient Combustibles:** Files, Books, Records, and other paper files, Furniture, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Electric Motors, Hot work

Postulated Fire:

The postulated fire for this area is a fan motor fire resulting from a mechanical failure, or an electrical control cabinet failure. However, the fire would be limited to the immediate area due to the lack of intervening combustibles, and three-hour rated fire barriers. The charcoal filers are contained within the SFP filter unit and a fire would not likely spread outside of the unit.

Fire Protection Features:

Fire Barriers: This fire area is separated from Fire Areas WS-1 and WE by two-hour rated fire barriers, and separated from Fire Area W2-10 (i.e., Room 303) by three-hour rated fire barriers.

Suppression Systems: Manual deluge suppression is provided for the RBVS spent fuel pool charcoal filters. The SFP exhaust charcoal filter units have temperature sensors and duct smoke detectors.

Detection Systems: Area-wide smoke detection is provided in the area.

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0839 and fire hose reel 00-FP-HOS-0152 (for the charcoal filter) are located in the area. Fire hose station 00-FP-HSS-0278 is located in the adjacent stairwell (i.e., Fire Area WS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the manual suppression. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated. A manually actuated deluge system is credited for protecting the charcoal filters in the RBVS spent fuel pool ventilation exhaust air filtration unit.

**Property Loss:**

An unmitigated fire in this area could lead to the loss of the RWBVS and RBVS.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of the RWBVS and RBVS, and could have an impact on radioactive waste processing components required for power production.

**Radiological Release:**

A potential radiological release due to a fire in this area would be mitigated by the limited combustibles and the RWBVS.

### 9A.5.173 Radioactive Waste Building Elevation {{ }} - Fire Area W4-1

Reference Drawing: Figure 1.2-26

Room Name: HVAC Equipment (402),
Elevator Equipment (403)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Clothing - Rubber/plastic, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Plastic, Rubber Materials, Qualified Electrical Cable, Transformers - Dry |
| **In-Situ Ignition Sources:** | AHUs, Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The elevator equipment room contains a negligible amount of combustible material. The worst case fire postulated would involve an HVAC fan motor. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond the HVAC equipment room. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas (i.e., Fire Areas WS-1 and WE) by two-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0865 is located in the area. Fire hose station 00-FP-HSS-0277 is located in the adjacent stairwell (i.e., Fire Area WS-1). |

| | |
|---|---|
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

A fire in this area is mitigated by the manual suppression. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this area could lead to the loss of the RWBS, RBVS, and loss of the RWBS elevator.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of the RWBS and RBVS, and could have an impact on radioactive waste processing components required for power production.

**Radiological Release:**

A fire in this area could potentially affect the four RBVS main exhaust fans, which could lead to a potential radiological release. However, the fans are spatially separated with minimal intervening combustibles. Therefore, a potential radiological release due to a fire in this area would be mitigated by the limited combustibles and use of the RBVS and RWBVS, because the fans are not expected to be involved in a fire.

### 9A.5.174 Radioactive Waste - Other - Fire Area WE

Reference Drawing: Figures 1.2-22 through 1.2-26

Room Name: Elevator (003)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The worst case fire postulated would involve transient combustibles. The elevator hoist way contains a negligible amount of combustible material. In addition, there are no significant ignition sources or fire hazards in the area. Generally transient combustibles are attended while in the elevator.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0280 and fire hose reel 00-FP-HOS-0155 (for the GRW bed) are located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W0-1, respectively) on Elevation {{ }}. Fire hose station 00-FP-HSS-0279 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W2-5, respectively) on Elevation {{ }}. Fire hose station 00-FP-HSS-0278 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas |

| | |
|---|---|
| | WS-1 and W3-1, respectively) on Elevation {{ }}. Fire hose station 00-FP-HSS-0277 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas WS-1 and W4-1, respectively) on Elevation {{ }}. |
| Fire Extinguishers: | A portable fire extinguisher is located in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the elevator for the RWB.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.175 Radioactive Waste - Other - Fire Area WS-1

Reference Drawing: Figures 1.2-22 through 1.2-26

Room Name: Stair 1 (001, 201, 301, 401)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the stair.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Smoke detection is provided at top of shaft. |
| Manual Supression: | Fire hose station 00-FP-HSS-0280 and fire hose reel 00-FP-HOS-0155 (for the GRW bed) are located on Elevation {{ }} (i.e., Room 001). Fire hose station 00-FP-HSS-0279 is located on Elevation {{ }} (i.e., Room 201). Fire hose station 00-FP-HSS-0278 is located on Elevation {{ }} (i.e., Room 301). Fire hose station 00-FP-HSS-0277 is located on Elevation {{ }} (i.e., Room 401). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire/smoke in the stair will have limited impact on manual firefighting as there are other stairwell that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stair on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.176 Radioactive Waste - Other - Fire Area WS-2

Reference Drawing: Figures 1.2-22 and 1.2-24

Room Name: Stair 2 (002, 201)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the stair.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. Above Elevation {{ }} the stairwell is enclosed by two-hour fire rated gypsum board assemblies instead of CMU/concrete. |
| Suppression Systems: | None. |
| Detection Systems: | Smoke detection is provided at top of shaft. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0282 is located on Elevation {{ }} (i.e., Room 002). Fire hose station 00-FP-HSS-0281 is located on Elevation {{ }} (i.e., Room 202). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire/smoke in the stair will have limited impact on manual firefighting as there are other stairwell that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stair on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

Radiological impact due to a fire in the area would be minimal based on the lack of significant radiological sources in the area.

### 9A.5.177 Control Building Elevation {{ }} - Fire Area C0-1

Reference Drawing: Figure 1.2-18

Room Name: Mechanical Equipment (003)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Lubricants, Oils, Misc. Combustibles, Pipe Insulation, Plastic, Rubber Materials, Qualified Electrical Cable, Charcoal Filter |
| **In-Situ Ignition Sources:** | AHUs, Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets, HVAC Equipment |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Hot Work Fuel & Oxidizer, Lubricants, Grease, Hydraulic Fluids, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors, Hot work |

<u>Postulated Fire:</u>

The worst case fire postulated would involve a motor associated with one of the fans or AHU. A fire would be immediately detected through plant control monitoring and extinguished either via the installed suppression system or fire brigade intervention. This room would not likely have significant quantities of transient combustibles. The control room HVAC system (CRVS) exhaust charcoal filter is contained within the filter unit and a fire would not likely spread outside of the unit.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. CRVS exhaust charcoal filter unit temperature sensor and duct smoke detector are provided. |

| | |
|---|---|
| Manual Suppression: | Fire hose reel 00-FP-HOS-0153 and fire hose station 00-FP-HSS-0807 are located in the area. Fire hose station 00-FP-HSS-0180 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-1 and C0-2, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area is protected with a fire detection and suppression system designed to control a fire. A manually actuated deluge system is credited for protecting the charcoal filter in the air filtration unit for the CRVS; a fire would not likely spread outside of the unit. The area is separated from adjacent spaces by fire resistant construction that will resist the propagation of fire and smoke. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of various pieces of equipment associated with the CRB ventilation system.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room could lead to loss of HVAC to the CRB, resulting in heat up and loss of the CRVS.

**Radiological Release:**

A fire in the charcoal filter has the potential for a radiological release; however, the manually actuated deluge system is credited for protecting the filter.

## 9A.5.178 Control Building Elevation {{ }} - Fire Area C0-2

Reference Drawing: Figure 1.2-18

Room Name: Corridor (008),
Corridor (009)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors |

Postulated Fire:

Electrical fire from miscellaneous combustibles e.g., CRB battery exhaust fans, electrical appliances lighting, or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the stairwell (i.e., Fire Area CS-1), which is a two-hour rated fire barrier. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0180 is located in the adjacent stairwell (i.e., Fire Area CS-1). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

Unmitigated fire may result in the loss of the CRVS battery exhaust fans and accordingly impact the operation of the CRVS.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.179 Control Building Elevation {{ }} - Fire Area C0-3

Reference Drawing: Figure 1.2-18

Room Name: EDN Battery (010)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0180 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-1 and C0-2, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery room is separated from the battery charger room.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.180 Control Building Elevation {{ }} - Fire Area C0-4

Reference Drawing: Figure 1.2-18

Room Name: EDN Charger (011)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets,
Switchgear =480 V

**Transient Combustibles:** Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling- Instrumentation

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0180 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-1 and C0-2, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger room is separated from the battery room.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.181 Control Building Elevation {{ }} - Fire Area C0-5

Reference Drawing: Figure 1.2-18

Room Name: Electrical Equipment (006)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors, Electrical Cabinets |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors |

Postulated Fire:

This fire area contains low combustible loading and would not challenge the surrounding three-hour fire rated barriers. In addition, there are no additional significant ignition sources in the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the stairwell (i.e., Fire Area CS-1), which is a two-hour rated fire barrier. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0178 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C0-6, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to loss of MCS and PCS components.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room would lead to the loss of functionality associated with the affected MCS and PCS system components.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.182 Control Building Elevation {{ }} - Fire Area C0-6

Reference Drawing: Figure 1.2-18

Room Name: Corridor (005)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors

<u>Postulated Fire:</u>

Electrical fire from electrical appliances lighting or electrical junction boxes located within the area.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the stairwell (i.e., Fire Area CS-1), which is a two-hour rated fire barrier.

Suppression Systems: None.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0178 is located in the adjacent stairwell (i.e., Fire Area CS-2).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.183 Control Building Elevation {{ }} - Fire Area C0-7

Reference Drawing: Figure 1.2-18

Room Name: Telecom (007)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0178 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C0-6, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room, including the FDS fire alarm panel and battery cabinet.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection and suppression systems should limit fire and smoke to the room.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.184 Control Building Elevation {{ }} - Fire Area C0-8

Reference Drawing: Figure 1.2-18

Room Name: SDI plant protection system (PPS) Cabinets (021)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0803 is located in the adjacent area (i.e., Fire Area C0-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of a Division of equipment cabinets.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.185 Control Building Elevation {{ }} - Fire Area C0-9

Reference Drawing: Figure 1.2-18

Room Name: SDI PPS Cabinets (018)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0803 is located in the adjacent area (i.e., Fire Area C0-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment in the fire area. The fire area is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems, but would result in loss of a Division of equipment cabinets.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.186 Control Building Elevation {{ }} - Fire Area C0-10

Reference Drawing: Figure 1.2-18

Room Name: Corridor (012),
Entry Vestibule (014),
Corridor (015)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Misc. Combustibles, Misc. Wire & Plastic Components, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling-Instrumentation, Electric Motors |

Postulated Fire:

Electrical fire from miscellaneous combustibles e.g., CRB battery exhaust fans, electrical appliances lighting, or electrical junction boxes located within the area.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0083 is located in the area. |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal due to limited combustibles in the area.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown cables associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. There is appropriate separation of redundant safe shutdown equipment and cables such that a safe shutdown success path would remain free from fire damage.

Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.187 Control Building Elevation {{ }} - Fire Area C0-11

Reference Drawing: Figure 1.2-18

Room Name: EDAS Charger (020)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Battery Chargers, Electrical Cabinets, Plastic, Rubber Materials, Qualified Electrical Cable

**In-Situ Ignition Sources:** Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets,
Switchgear =480 V

**Transient Combustibles:** Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** Cabling - Low Voltage, Cabling- Instrumentation

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0180 is located in the adjacent area (i.e., Fire Area C0-10).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger rooms are separated from the battery rooms.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.188 Control Building Elevation {{ }} - Fire Area C0-12

Reference Drawing: Figure 1.2-18

Room Name: EDAS Charger (017)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Battery Chargers, Electrical Cabinets, Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets, Switchgear =480 V |
| **Transient Combustibles:** | Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Cabling - Low Voltage, Cabling- Instrumentation |

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, and electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0180 is located in the adjacent area (i.e., Fire Area C0-10). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and battery chargers in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery charger rooms are separated from the battery rooms.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.189 Control Building Elevation {{ }} - Fire Area C0-13

Reference Drawing: Figure 1.2-18

Room Name: EDAS Battery (019)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets |
| **In-Situ Ignition Sources:** | Batteries, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0803 is located in the area that is adjacent to the adjacent area (i.e., Fire Areas C0-10 and C0-11, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery rooms are separated from the battery charger rooms. A redundant battery room is provided in adjacent area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

## 9A.5.190 Control Building Elevation {{ }} - Fire Area C0-14

Reference Drawing: Figure 1.2-18

Room Name: EDAS Battery (016)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets

**In-Situ Ignition Sources:** Batteries, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** None

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The postulated fire for this area is an electrical fault in cabling, battery, electrical cabinet, or other electrical type of fire. The room separations, and area smoke detection should allow for early notification and containment of a fire to allow for manual suppression.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0803 is located in the area that is adjacent to the adjacent area (i.e., Fire Areas C0-10 and C0-12, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the equipment and batteries in the room. The room is separated from adjacent areas by three-hour fire rated barriers to mitigate damage to adjacent systems. The battery rooms are separated from the battery charger rooms. A redundant battery room is provided in adjacent area.

**Operations / Post-Fire Recovery:**

Fire or smoke should be contained to the area due to the fire barriers, smoke detection, and suppression. Minimal impact on post-fire operations. There are redundant systems separated by three-hour rated fire barriers.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.191 Control Building Elevation {{ }} - Fire Area C0-15

Reference Drawing: Figure 1.2-18

Room Name: Bottle Storage (013)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls)

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Temporary Electrical Cables

**Transient Ignition Sources:** None

<u>Postulated Fire:</u>

The worst case fire postulated would involve transient combustibles. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: Automatic wet pipe sprinkler suppression is provided.

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0803 is located in the adjacent area (i.e., Fire Area C0-10).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area is protected with a fire detection and suppression system designed to control a fire. The area is separated from adjacent spaces by three-hour rated fire barriers that will resist the propagation of fire and smoke. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the area where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire would result in loss of the control room habitability system (CRHS) emergency pressurized breathing air tank skids and loss of the CRHS. The fire area is separated by three-hour fire rated barriers to mitigate damage to adjacent areas.

**Operations / Post-Fire Recovery:**

An unmitigated fire in this room may lead to a loss of the CRHS.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.192 Control Building Elevation {{ }} - Fire Area C1-1

Reference Drawing: Figure 1.2-19

Room Name: Technical Support Center (103),
Office (104),
Office (105),
Office (106),
Conference (107),
Conference (108),
Breakroom (109)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Electrical Cabinets, Furniture, Interior Finish - Carpet, Vinyl Tile, Vinyl Base, Misc. Combustibles, Misc. Wire & Plastic Components, Paper & Cardboard (Files), Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Furniture, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | Temporary electrical installations |

<u>Postulated Fire:</u>

The worst case fire postulated would involve electrical components. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |

| | |
|---|---|
| Manual Suppression: | Fire hose station 00-FP-HSS-0815 is located in the area (i.e., Room 103). Fire hose stations 00-FP-HSS-0179 and 00-FP-HSS-0177 are located in stairwells that are adjacent to the adjacent area (i.e., Fire Areas CS-1 and CS-2, and C1-2; respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area is protected with a fire detection and suppression system designed to control a fire. The area is separated from adjacent spaces by fire resistant construction that will resist the propagation of fire and smoke. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the technical support center and the office space that supports the technical support center.

**Operations / Post-Fire Recovery:**

A fire causing closure of the return air fire dampers would likely result in shutdown of the CRVS.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.193 Control Building Elevation {{ }} - Fire Area C1-2

Reference Drawing: Figure 1.2-19

Room Name: Storage and Elevator Equipment (110),
Corridor (111),
Corridor (112),
Data Maintenance (113),
Men's Restroom (114),
Women's Restroom (115),
Janitor (116),
Records Storage (118)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Furniture, Interior Finish - Carpet, Vinyl Tile, Vinyl Base, Misc. Combustibles, Misc. Wire & Plastic Components, Paper & Cardboard (Files), Qualified Electrical Cable

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Furniture, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** Temporary electrical installations

<u>Postulated Fire:</u>

The worst case fire postulated would involve electrical components. Based on the installed fire detection/suppression system and robust fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this room. This room would not likely have significant quantities of transient combustibles.

<u>Fire Protection Features:</u>

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers, except for the boundary with the stairwells and elevator (i.e., Fire Areas CS-1, CS-2, CE), which are two hour rated fire barriers.

| | |
|---|---|
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose stations 00-FP-HSS-0179 and 00-FP-HSS-0177 are located in the adjacent stairwells (i.e., Fire Areas CS-1 and C1-2). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area is protected with a fire detection and suppression system designed to control a fire. The area is separated from adjacent spaces by fire resistant construction that will resist the propagation of fire and smoke. Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the elevator for the CRBS.

**Operations / Post-Fire Recovery:**

The fire may result in loss of CRVS due to closure of return and supply air fire dampers, loss of EDN room fan coil units located above the ceiling of the men’s restroom (i.e., Room 114), and loss of the miscellaneous exhaust fan located near the stairwell (i.e., Fire Area CS-1) .

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.194 Control Building Elevation {{ }} - Fire Area C1-3

Reference Drawing: Figure 1.2-19

Room Name: Data Equipment (117)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable

**In-Situ Ignition Sources:** Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** None

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

Fire Barriers: This fire area is separated from adjacent fire areas by three-hour rated fire barriers.

Suppression Systems: None

Detection Systems: Area-wide smoke detection is provided in the area.

Manual Suppression: Fire hose station 00-FP-HSS-0177 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C1-2, respectively).

Fire Extinguishers: A portable fire extinguisher is located in the area or in an adjacent area.

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room.

**Operations / Post-Fire Recovery:**

Fire and smoke may affect technical support center capability along with other peripheral systems but would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection along with suppression should limit fire and smoke to the room.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.195 Control Building Elevation {{ }} - Fire Area C1-4

Reference Drawing: Figure 1.2-19

Room Name: Telecom (119)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Misc. Combustibles, Misc. Wire & Plastic Components, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Batteries, Battery Charger, Electric Appliances (lighting, controls), Electrical Cabinets |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The postulated fire scenario for the area is an electrical equipment fire resulting from an electrical fault. The fire is not expected to spread beyond the boundaries of the room due to the lack of significant combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0177 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C1-2, respectively). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of network and communication equipment in the room.

**Operations / Post-Fire Recovery:**

Fire and smoke would not have a major impact on post-fire operations because the room barriers should contain the fire and smoke. The detection along with suppression systems should limit fire and smoke to the room.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.196 Control Building Elevation {{ }} - Fire Area C1-5

Reference Drawing: Figure 1.2-19

Room Name: Main Control Room (134),
MCR Toilet (135),
MCR Breakroom (136),
Airlock (137)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Batteries, Electrical Cabinets, Furniture, Interior Finish - Carpet, Vinyl Tile, Vinyl Base, Misc. Combustibles, Paper & Cardboard (Files), Plastic, Rubber Materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electrical Cabinets, Main Control Board |
| **Transient Combustibles:** | Files, Books, Records, and other paper files, Materials for Testing & Maintenance, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables |
| **Transient Ignition Sources:** | None |

Postulated Fire:

The worst case fire postulated would involve wiring in the main control boards. However, due to continuous staffing and early warning smoke detectors, a fire would be immediately detected alerting plant staff and the fire brigade. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0811 is located in the adjacent area (i.e., Fire Area C1-6). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

The Control Room complex is separated from the remainder of the CRB by three-hour rated fire barriers. Fire and smoke propagation outside of the fire area boundary is unlikely. The fire area boundaries control fire spread reducing manual firefighting efforts.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of numerous primary instrument monitoring and manual control switches.

**Operations / Post-Fire Recovery:**

This area contains safe shutdown equipment and cables. The cables are associated with the MPS cabinets and manual hand switches to trip the reactor, isolate containment, and actuate DHRS. An unmitigated fire in this room would lead to the loss of functionality associated with numerous primary instrument and control systems. Post-fire safe shutdown for the MCR is discussed in the SSA, SL-SPD1-00-F-RE-0000-00100.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.197 Control Building Elevation {{ }} - Fire Area C1-6

Reference Drawing: Figure 1.2-19

Room Name: Airlock (120),
Corridor (121),
Toilet (122),
Toilet (123),
Janitor/Storage (124),
Corridor (125),
Operator Breakroom (126),
Critical Document Reference Storage (127),
Emergency Equipment (128),
Open Office (129),
Office (130),
Office (131),
Shift Manager Office (132),
Shift Turnover Conference (133)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

**In-Situ Combustibles:** Appliances, Electrical Cabinets, Furniture, Interior Finish - Carpet, Vinyl Tile, Vinyl Base, Misc. Combustibles, Misc. Wire & Plastic Components, Paper & Cardboard (Files), Plastic, Rubber Materials

**In-Situ Ignition Sources:** Electric Appliances (lighting, controls), Electrical Cabinets

**Transient Combustibles:** Files, Books, Records, and other paper files, Furniture, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Storage (Misc.), Temporary Electrical Cables

**Transient Ignition Sources:** None

Postulated Fire:

The worst case fire postulated would involve electrical components. Based on the installed fire detection/suppression system and three-hour fire barrier envelope, a fire would be detected and contained to the area of fire origin and not propagate beyond this fire area. This room would not likely have significant quantities of transient combustibles.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by three-hour rated fire barriers. |
| Suppression Systems: | Automatic wet pipe sprinkler suppression is provided. |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0811 is located in the area (i.e., Room 124). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

This fire area is protected with a fire detection and suppression system designed to alert the fire brigade and provide suppression to control a fire. The area is separated from adjacent areas by a three-hour rated fire barrier that will resist the propagation of fire and smoke.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of accessory use space for the MCR and loss of the CRVS and CRHS.

**Operations / Post-Fire Recovery:**

There is potential loss of plant equipment in this fire area that would impact operations. Damaged equipment would need to be repaired or replaced then tested which could impact operation.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.198 Control Building - Other - Fire Area CE

Reference Drawing: Figures 1.2-18 and 1.2-19

Room Name: Elevator (004)

**NFPA 101 Hazard Classification:** Ordinary

**NFPA 13 Hazard Classification:** OH-1

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Lubricants, Oils, Misc. Wire & Plastic Components, Plastic, Rubber materials, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electric Appliances (lighting, controls), Electric Motors |
| **Transient Combustibles:** | Construction Materials, Files, Books, Records, and other paper files, Furniture, Materials for Testing & Maintenance, Paints, Solvents and Cleaning Chemicals, Plastic and Rubber materials, Temporary Electrical Cables |
| **Transient Ignition Sources:** | Electric Motors, Hot work |

Postulated Fire:

The worst case fire postulated would involve transient combustibles. The elevator hoist way contains a negligible amount of combustible material. In addition, there are no significant ignition sources or fire hazards in the area. Generally transient combustibles are attended while in the elevator.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. |
| Suppression Systems: | None |
| Detection Systems: | Area-wide smoke detection is provided in the area. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0178 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C0-6, respectively) on Elevation {{ }}. Fire hose station 00-FP-HSS-0177 is located in the stairwell that is adjacent to the adjacent area (i.e., Fire Areas CS-2 and C1-2, respectively) on Elevation {{ }}. |
| Fire Extinguishers: | A portable fire extinguisher is located in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire and smoke impact on manual firefighting is minimal as the area is physically separated from the stairwell where the standpipe and fire hose valve are located and manual response is coordinated.

**Property Loss:**

An unmitigated fire in this room would lead to the loss of the elevator for the CRB.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.199 Control Building - Other - Fire Area CS-1

Reference Drawing: Figures 1.2-18 and 1.2-19

Room Name: Stair 1 (001, 101)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

<u>Postulated Fire:</u>

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the stair.

<u>Fire Protection Features:</u>

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Smoke detection is provided at top of shaft. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0180 is located on Elevation {{ }} (i.e., Room 001) and 00-FP-HSS-0179 is located on Elevation {{ }} (i.e., Room 101). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

<u>Fire Area Fire/Smoke Impact on:</u>

**Emergency Response:**

Fire/smoke in the stair will have limited impact on manual firefighting as there are other stairs that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stair on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

### 9A.5.200 Control Building - Other - Fire Area CS-2

Reference Drawing: Figures 1.2-18 and 1.2-19

Room Name: Stair 2 (002, 102)

**NFPA 101 Hazard Classification:** Low

**NFPA 13 Hazard Classification:** LH

| | |
|---|---|
| **In-Situ Combustibles:** | Appliances, Qualified Electrical Cable |
| **In-Situ Ignition Sources:** | Electrical Appliances (lighting, controls), Electric Heaters |
| **Transient Combustibles:** | None |
| **Transient Ignition Sources:** | None |

Postulated Fire:

Electrical fire from electrical appliances lighting, electric heater, or electrical junction boxes located within the stair.

Fire Protection Features:

| | |
|---|---|
| Fire Barriers: | This fire area is separated from adjacent fire areas by two-hour rated fire barriers. |
| Suppression Systems: | None. |
| Detection Systems: | Smoke detection is provided at top of shaft. |
| Manual Suppression: | Fire hose station 00-FP-HSS-0178 is located on Elevation {{ }} (i.e., Room 002) and 00-FP-HSS-0177 is located on Elevation {{ }} (i.e., Room 102). |
| Fire Extinguishers: | A portable fire extinguisher is located in the area or in an adjacent area. |

Fire Area Fire/Smoke Impact on:

**Emergency Response:**

Fire/smoke in the stair will have limited impact on manual firefighting as there are other stairs that allow access to the level, manual hose stations are located on the floor, and hose stations are located in the stair on each level.

**Property Loss:**

No significant impact on property loss.

**Operations / Post-Fire Recovery:**

Minimal impact on post-fire operations.

**Radiological Release:**

This fire area is located outside the radiological controlled area; therefore, a fire in this location could not involve a radiological release.

## 9A.6 Fire Safe Shutdown Plan

### 9A.6.1 General Information

The purpose of this section is identification of the systems necessary for the safe shutdown of the plant following an internal fire event.

This section documents considerations given to the safe shutdown of the plant following an internal fire event in accordance with RG 1.189, NFPA 804 (Reference 9.A-1), and NEI 00-01 (Reference 9.A-4).

This section documents how a fire may challenge the safe shutdown of the plant and describes the effect of fire-induced failures on the systems credited for safe shutdown following a fire. This section assesses the impact of multiple spurious operations (MSOs).

### 9A.6.2 Fire Safe Shutdown Definition

Regulatory Guide 1.189, Regulatory Position 8.3, defines safe shutdown following a fire for plants with passive residual heat removal systems.

For the design, safe shutdown occurs following a fire event given the demonstration of the availability of the systems that are capable of achieving and maintaining a safe shutdown condition as defined in the technical specifications.

### 9A.6.3 Systems Required for Fire Safe Shutdown

Although systems credited for safe shutdown following a fire event do not require a safety-related designation, safe shutdown uses only safety-related equipment. Defense-in-depth credits nonsafety-related equipment, with specific examples in Section 9A.6.4.

Safe shutdown following a fire is achieved through the successful operation of one division of each of the systems (MPS, DHRS, emergency core cooling system [ECCS] and CRS) listed in Table 9A-7, Safe Shutdown Plant Functions. Other systems (RCS, UHS, control rod assembly, and CRDS) included in Table 9A-7 do not fail in a fire because they are fail safe or passive systems or use passive components. System functions have also been identified.

#### 9A.6.3.1 Fire-Induced Failure of Safe Shutdown Systems

Consistent with RG 1.189, Position 5.3.1.1 and Position 8.2, redundant divisions of equipment required for safe shutdown are kept separate by three-hour fire barriers except in the areas discussed in Section 9A.6.4.

The MSO expert panel results were completed prior to a final US460 design using the pressurized water reactor generic list of MSO scenarios included in Revision 3 of NEI 00-01. This is the same MSO scenarios list provided in

NEI-00-01, Revision 4. The MSO scenarios and the associated dispositions were updated, as necessary, to account for the US460 design and associated design changes. Table 9A-11 presents the MSO expert panel results determined to be challenging to safe shutdown.

### 9A.6.4 Special Cases

The specific cases discussed in this section provide a description of the achievement of safe shutdown following a fire in a single fire area where the placement of redundant equipment required for safe shutdown cannot be avoided. Regulatory Position 8.2 describes the MCR and the reactor containment building as such areas.

Although the configuration of equipment is such that one division of equipment should remain free of fire damage in the unlikely event that a fire occurs in one of these areas, additional equipment that can be used to mitigate potential equipment failures has been identified that provides additional defense-in-depth, as appropriate.

#### 9A.6.4.1 Fire in the Main Control Room

Redundant equipment necessary for safe shutdown is present in the MCR. Manual switches that provide backup control of systems automatically controlled by the MPS are in the MCR. Section 7.0.4 describes the MPS.

This configuration is acceptable because a fire in the MCR, which is continuously manned, is highly unlikely and if a fire does occur it is promptly detected and extinguished by qualified personnel. The MCR is expected to have less combustible material and ignition sources as compared to conventional nuclear plant control rooms because there is no large MCR console or electrical cabinets. Cables in the MCR meet flame test requirements (e.g., IEEE 1202) and cables are routed in raceway.

In the unlikely event that a fire grows large enough to require an evacuation of the MCR, safe shutdown can be achieved from the I&C equipment rooms, even accounting for spurious operations that occur as a result of a fire in the MCR. However, the safe shutdown analysis does not require this functionality. Instead, the operators use the manual hand switches to trip the reactor and isolate containment before evacuation. The circuit logic for the MPS cabinets and the controls in the MCR do not require disconnect (or isolation) switches outside of the control room in order to isolate control signals and prevent spurious operations due to fire. Therefore, safe shutdown does not require operator actions outside of the MCR.

#### 9A.6.4.2 Fire in the Containment

The NuScale Power Module containment is not a structural part of a building, but rather a movable metal vessel. A fire in the containment is practically impossible because the containment evacuation system (Section 9.3.6) maintains the containment vessel at a vacuum that cannot sustain a fire.

Electrical conductors within the containment vessel are of noncombustible construction or routed in conduit that results in no intervening combustible loading for an exposure fire impacting other cable or components in the containment. The vacuum remains until the containment floods with water to facilitate decay heat removal during shut down and cool down for refueling. Although this process eliminates the vacuum, flooding the containment vessel precludes the possibility of fire.

The containment is inaccessible during reactor operation, which precludes introduction of transient combustibles. Access to containment is allowed after safe shutdown is achieved, and after the reactor vessel is separated from the containment. After the core is physically separated in the refueling area, transient combustibles can be introduced inside (the) containment, when manual fire suppression is available. When the containment is accessible (during shutdown), transient combustibles are administratively controlled.

The fire safe shutdown equipment in the containment vessel is the ECCS valves, the control rod drive mechanisms, and the PZR heaters.

#### 9A.6.4.3 Fire at the Top of a Module

A fire in the area at the top of a module (i.e., under the bioshield) is practically impossible because the cabling under the bioshield is routed in conduit or is three-hour fire rated cable, which results in no intervening combustible loading for an exposure fire impacting other cables or components in the area.

The top of the module bay is inaccessible during reactor operation, which precludes introduction of transient combustibles. Removal of the bioshield is permissible after safe shutdown is achieved and certain conditions are met. Once the bioshield is removed, transient combustibles can be introduced in the top of the module area, when manual fire suppression is available. When the area of the top of the module is accessible (during shutdown), transient combustibles are administratively controlled.

Although not plausible, a fire at the top of the module has the potential to challenge multiple redundant systems required for safe shutdown. The potential for these failures to occur have been minimized through the following design considerations.

**Minimal Combustible Loading**

The cables around the top of the module route through metal conduit or are three-hour rated. The conduits are either rigid or flexible corrugated hose conduits. The metal conduit seals the insulation of the conductors from the environment; therefore, the contribution of conductor insulation fuel load within the conduits is negligible and cannot represent an exposure fire for other SSC.

The hydraulic fluid for the mechanical valves controlling various reactor systems flows through piping penetrating through the reactor pool wall that terminates at the valve actuators. The hydraulic fluid is noncombustible.

Finally, there are minimal ignition sources in this area during normal operation.

**Robust Component Design**

The operation of the DHRS valves and CIVs is independent of control equipment in the area. The energy required for valve operation is in a pressurized nitrogen bottle mounted on the valve body. During normal plant operation, the hydraulic force from a remotely located hydraulic system counteracts the force from this bottle. On an actuation signal from the MPS, an operator action, or a loss of power, two redundant solenoid valves on the remotely located hydraulic skid open, venting the hydraulic pressure from the valves. With the hydraulic pressure relieved, the nitrogen pressure drives the valve to its safe position.

Given this configuration, common fire-induced failure mechanisms for these components (e.g., hot shorts, ground faults, or open circuits in control circuits) are not failure modes of concern in this area. In order for a fire to challenge the operation of these components the smoke or radiant heat of a fire would need to physically damage the mechanical valves themselves, which is not a credible event.

Therefore, a fire under the bioshield that can damage redundant safe shutdown equipment is not credible based on the limited combustible loading, the robust component design, and the circuit design.

**Operator Actions for Defense-in-Depth**

For defense-in-depth, smoke detection is in the ventilation exhaust for the fire area enclosed by the bioshield for each module. The fire detection alerts operators so that they can take conservative actions as necessary. However, safe shutdown does not credit fire detection.

## 9A.7 Multiple Spurious Operations - Expert Panel

The MSO expert panel results were completed prior to a final US460 design using the pressurized water reactor generic list of MSO scenarios included in Revision 3 of NEI 00-01. This is the same MSO scenarios list provided in NEI-00-01, Revision 4. The MSO scenarios and the associated dispositions were updated, as necessary, to account for the US460 design and associated design changes. Table 9A-11 presents the MSO expert panel results determined to be challenging to safe shutdown.

Consideration is given to the potential for MSO in establishing the initial plant fire safe shutdown analysis.

### 9A.7.1 Preparation for the Expert Panel Meeting

Consistent with NEI 00-01, the MSO Expert Panel included experts from fire protection, probabilistic risk assessment, electrical, instrumentation and controls, operations, and engineering disciplines.

Expert panel members were trained in

- RG 1.189.
- examples of MSO, including specific details from electrical drawings.
- the generic pressurized water reactor MSO List from NEI 00-01 Revision 3, as applicable for the NuScale design.
- process for conducting the expert panel.
- expectations for the expert panel members.
- documentation of results.

**References**

9.A-1 National Fire Protection Association, "Standard for Fire Protection for Advanced Light Water Reactor Electric Generating Plants," NFPA 804, 2020 Edition, Quincy, MA.

9.A-2 National Fire Protection Association, "Recommended Practice for Protection of Buildings From Exterior Fire Exposures," NFPA 80A, 2017 Edition, Quincy, MA.

9.A-3 National Fire Protection Association, "Standard for the Installation of Sprinkler Systems," NFPA 13, 2019 Edition, Quincy, MA.

9.A-4 Nuclear Energy Institute, "Guidance for Post Fire Safe Shutdown Circuit Analysis," NEI 00-01, Revision 4, December 2019.

9.A-5 Institute of Electrical and Electronics Engineers, "Qualifying Class 1E Electric Cables and Field Splices for Nuclear Power Generating Stations," IEEE Standard 383-2003, Piscataway, NJ.

9.A-6 Institute of Electrical and Electronics Engineers, "IEEE Standard for Flame-Propagation Testing of Wire & Cable" IEEE Standard 1202-2006, Piscataway, NJ.

9.A-7 National Fire Protection Association, “Life Safety Code,” NFPA 101, 2021 Edition, Quincy, MA.

## Table 9A-1: Fire Hazards Analysis Elements and Attributes

| | FHA Elements and Attributes (Regulatory Position 1.2 of RG 1.189 and NFPA 804) | Limitation of this Evaluation |
|---|---|---|
| 1 | The applicability of NRC fire protection requirements and guidance should be evaluated | No specific limitation. |
| 2 | In-situ and potential transient fire and explosion hazards, including amounts, types, configurations, and locations of flammable and combustible materials (e.g., electric cable insulation and jacketing material, lube oil, diesel fuel oil, flammable gases, chemicals, building materials and finishes) associated with operations, maintenance, and refueling activities should be identified. The continuity of combustible materials (e.g., exposed electrical cables that span the distance between redundant trains), the potential for fire spread, and sources of ignition should be identified and described in the analysis. | Typical transient combustibles are considered within this evaluation, but site-specific transient control programs have not been considered (see Section 9.5.1). |
| 3 | External exposure hazards (e.g., flammable and combustible liquid or gas storage, auxiliary boiler units, adjacent industrial facilities or transportation systems, natural vegetation, and adjacent plant support facilities) that could potentially expose SSC important to safety to damage from the effects (e.g., heat, flame, smoke) of fires should be identified. Wildfire hazards should be addressed if there is the potential for a wildfire to damage SSC important to safety. | External exposure from adjacent buildings per NFPA 80A has been considered. However, other external hazards are site-specific and have not been specifically considered in this analysis. |
| 4 | The design, installation, operation, testing, and maintenance of automatic fire detection and suppression capabilities should be addressed. The FHA should describe the level of automatic protection (e.g., water spray density, gaseous agent concentration) provided relative to the specific fire hazards that have been identified. The effects of lightning strikes should be included in the design of FDSs. | This analysis evaluates the needed fire suppression capabilities for the fire protection system. Section 9.5.1 describes system operation. |
| 5 | The layout and configurations of SSC important to safety should be depicted. The protection for safe-shutdown systems (Regulatory Positions 5.3 and 5.4 of RG 1.189) within a fire area should be determined on the basis of the worst-case fire that is likely to occur and the resulting damage. The FHA should explain and document the extent of such damage. The analysis should consider the degree of spatial separation between redundant shutdown systems, the presence of in-situ and transient combustibles, the available fire protection systems and features, sources of ignition, and the susceptibility to fire damage of the cables, equipment, systems, and features in the area that are related to safe shutdown. | Preliminary routing of SC-I cables in conduits has been completed. The detailed cable routing design is evaluated as part of the as-built FHA. Fire area layout is depicted in the architectural drawings of Section 1.2. Section 9A.5 describes major equipment for individual fire areas. |
| 6 | Reliance on and qualifications of fire barriers, including fire test results, the quality of the materials and barrier system, and the quality of the barrier installation should be described. Regulatory Position 4.3 of RG 1.189 provides detailed guidelines for testing and qualifying electrical raceway fire barrier systems. | Selection and use of electrical raceway fire barrier systems is site-specific and qualification and testing is described by the as-built FHA. |
| 7 | Fire area construction (walls, floor, and ceiling materials, including coatings and thicknesses; fireproofing of structural members; area dimensions and volume; normal ventilation and smoke removal capability; and level of congestion as it applies to access for manual firefighting activities) should be described. The FHA should provide sufficient information to determine that fire areas have been properly selected based on the fire hazards present and the need for separation of SSC important to safety. Regulatory Position 4.1.2 of RG 1.189 provides guidelines for fire areas and zones. | Fire barriers (i.e., walls, floors, ceilings) are constructed of various noncombustible materials such as reinforced concrete, concrete masonry units, and gypsum board. Specific fireproofing methods of structural members (such as exposed steel) is determined as part of Safe Shutdown Plan. Final determination of the adequacy of barrier construction is established by the as-built FHA. |

**Table 9A-1: Fire Hazards Analysis Elements and Attributes (Continued)**

| | FHA Elements and Attributes (Regulatory Position 1.2 of RG 1.189 and NFPA 804) | Limitation of this Evaluation |
|---|---|---|
| 8 | Manual fire suppression capability, including systems (e.g., hydrants, standpipes, and extinguishers), fire brigades, manual firefighting equipment, plans and procedures, training, drills, mutual aid, and accessibility of plant areas for manual firefighting should be identified. The FHA should list the location and type of manual firefighting equipment and accessibility for manual firefighting. | The location of hose connections and final measurements, and locations of fire extinguishers to ensure compliance is determined as part of Safe Shutdown Plan. No specific limitation, however elements specific to the Fire Protection Program are addressed in Section 9.5.1. |
| 9 | Potential fire impacts on operations are to be identified, including the following:<br>• fire in control rooms or other locations where safety-related operations are performed,<br>• fire conditions that may necessitate evacuation from areas that are required to be attended for safe shutdown, and<br>• lack of adequate access or smoke removal facilities that impede plant operations or fire extinguishment in plant areas important to safety. | No specific limitation. |
| 10 | Potential disabling effects of fire suppression systems on safe-shutdown capability should be identified. The term “damage by fire” in Appendix R also includes damage to equipment from the normal or inadvertent operation of fire suppression systems. The FHA should address the effects of firefighting activities. GDC 3 of Appendix A to 10 CFR Part 50 states that “Fire-fighting systems shall be designed to ensure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.” | Safety-related and risk-significant SSC are protected from the effects of fire suppression system operation as described in Section 9.5.1 and is not evaluated further in this analysis. 10 CFR 50 Appendix R is not applicable. |
| 11 | Explosion-prevention measures in areas subject to potentially explosive environments from flammable gases or other potentially energetic sources (e.g., chemical treatment systems, ion exchange columns, high-voltage electrical equipment) should be listed. | No specific limitation. |
| 12 | The availability of oxygen (e.g., inerted containment) should be identified. | No specific limitation. |
| 13 | Alternative or dedicated shutdown capability for those fire areas where adequate separation of redundant safe-shutdown systems cannot be achieved should be identified. | Special cases are identified in Section 9A.6.4. Exceptions outside these cases are not expected, but are subject to evaluation of as-built cable runs. |

## Table 9A-2: In-Situ Combustible Material Classification

| Combustible Material Classification | Common Fire Sources |
|---|---|
| Appliances | Electrical appliances (e.g., lighting, fixtures, tools) |
| Batteries | Uninterruptible power supplies, battery rooms |
| Battery Chargers | Battery chargers |
| Charcoal filters | Filters |
| Chemicals (health hazards) | Toxic, corrosive, irritants, and other chemicals not flammable |
| Clothing - rubber and plastic | Rubber gloves, plastic hardhats, and other personal protective equipment |
| Clothing - textile | Clothing of cotton, mixed fabrics |
| Combustible or flammable liquids | Storage or use of flammable or combustible liquids |
| Electrical cabinets | Junction boxes, control panels, switchgear, distribution panels, motor control centers |
| Flammable gas | Hydrogen, welding gases |
| Fuel - propane | Propane tanks for heating or stored for vehicle fuel |
| Fuel - diesel | Diesel generators, diesel storage |
| Furniture | Wood and combustible furniture |
| Hot work fuel and oxidizer | Welding, torch, plasma welders |
| Interior finish - carpet, vinyl tile, vinyl base | Office and other similar environments, MCR, and corridors |
| Lubricants, oils | Oils for gears and bearings, shafts, motor controlled valves |
| Miscellaneous combustibles | Fans, heating units |
| Miscellaneous electrical cable | Non-IEEE 383 (Reference 9.A-5) or equivalent cables |
| Miscellaneous wire and plastic components | Control cabling, internal component wiring (e.g., computers) |
| Oxidizers | Oxygen tanks |
| Paints, solvents | Paints, cleaning supplies |
| Paper and cardboard (files) | Paper and cardboard files, office areas, record storage/file rooms |
| Pipe insulation | Approved noncombustible or limited combustible pipe insulation compliant material |
| Plastic, rubber materials | Tubing, plastic parts, storage |
| Qualified electrical cable | IEEE-383/IEEE-1202 (Reference 9.A-6) and equivalent cables |
| Transformers - dry | Silicon-type transformers |
| Transformers - oil filled | Oil filled transformers |
| Vehicles | Trucks, security vehicles, forklifts |

## Table 9A-3: In-Situ Ignition Sources

| |
|---|
| Batteries |
| Pump(s) |
| Battery charger(s) |
| Electric motors |
| Electric switchgear |
| Electrical cabinets |
| Electrical heaters |
| Electric cable(s) |
| Electrical appliances |
| HVAC equipment |
| Hot work - open welding, cutting, and grinding |
| Chemical reactions |

## Table 9A-4: Typical Transient Combustibles

| Combustible Material Classification | Common Transient Sources |
|---|---|
| Vehicles | Fueling vehicles, forklifts for moving storage, security vehicles |
| Wood, such as pallets, temporary structures | Pallets for transporting materials, temporary structure such as work benches, ladders |
| Temporary electrical cables | Temporary lighting circuits (extension cabling), temporary power cables |
| Lubricants, grease, hydraulic fluids | Pumps for transferring liquids, temporary staging of materials for use |
| Hot work fuel and oxidizer | Welding, torch, plasma welders |
| Construction materials | Ladders, temporary structures, scaffolding, tools and equipment storage |
| Paints, solvents and cleaning chemicals | Materials for cleaning or maintenance on a temporary basis |
| Files, books, records, and other paper files | Temporary storage of materials in boxes |
| Plastic and rubber materials | Tools, parts, plastic carts used for transporting equipment |
| Fuel, diesel | Temporary equipment - generators, motors, and pumps |
| Fuel, propane | Propane cylinders for fuel |
| Furniture | Temporary furnishings, storage units, temporary work desks, seating |
| Materials for testing and maintenance | Test equipment |
| Resin | Material used in the Water Chemistry Program |
| Small appliances | Small heating or air units, power tools; may contain plastics that could introduce electrical hazards |
| Storage (miscellaneous) | Staging of equipment and materials |

## Table 9A-5: Transient Ignition Sources

| |
|---|
| Batteries |
| Hot work - open welding, cutting, and grinding |
| Temporary electrical installations |
| Electric motors |
| Electric switchgear |
| Diesel engines |
| Electric heaters |
| Chemical reactions |

## Table 9A-6: Hazard Classifications

| NFPA 13 | |
|---|---|
| **Term** | **Definition** |
| Light hazard occupancies (LH) | Occupancies or portions of other occupancies where the quantity and or combustibility of contents is low and fires with relatively low rates of heat release are expected. |
| Ordinary hazard (Group 1) (OH-1) | Occupancies or portions of other occupancies where combustibility is low, quantity of combustibles is moderate, stockpiles of combustibles do not exceed 8 ft, and fires with moderate rates of heat release are expected. |
| Ordinary hazard (Group 2) (OH-2) | Occupancies or portions of other occupancies where the quantity and combustibility of contents are moderate to high, stockpiles of contents with moderate rates of heat release do not exceed 12 ft, and stockpiles of contents with high rates of heat release do not exceed 8 ft. |
| Extra hazard (Group 1) (EH-1) | Occupancies or portions of other occupancies where the quantity and combustibility of contents are very high and dust, lint, or other materials are present, introducing the probability of rapidly developing fires with high rates of heat release but with little or no combustible or flammable liquids. |
| Extra hazard (Group 2) (EH-2) | Occupancies or portions of other occupancies with moderate to substantial amounts of flammable or combustible liquids or occupancies where shielding of combustibles is extensive. |
| **NFPA 101** | |
| **Term** | **Definition** |
| Low hazard contents | Low hazard contents shall be classified as those of such low combustibility that no self-propagating fire therein can occur. |
| Ordinary hazard contents | Ordinary hazard contents shall be classified as those that are likely to burn with moderate rapidity or to give off a considerable volume of smoke. |
| High hazard contents | High hazard contents shall be classified as those that are likely to burn with extreme rapidity or from which explosions are likely. |

**Table 9A-7: Safe Shutdown Plant Functions**

| System | Safe Shutdown Plant Functions |
|---|---|
| CNTS | Remove fuel assembly heat, maintain containment integrity, maintain reactor coolant pressure boundary integrity, reactivity control |
| Control rod assembly | Reactivity control |
| CRDS | Reactivity control |
| Decay heat removal system | Remove fuel assembly heat, maintain reactor coolant pressure boundary integrity, reactivity control, maintain containment integrity |
| ECCS | Remove fuel assembly heat |
| MPS | Remove fuel assembly heat, maintain reactor coolant pressure boundary integrity, reactivity control, maintain containment integrity |
| RCS | Remove fuel assembly heat, reactivity control, maintain containment integrity |
| Ultimate heat sink | Remove fuel assembly heat |

## Table 9A-8: Reactor Building Fire Areas

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| **RXB Elevation**<br>**{{ }}** | | |
| R0-1 | 004 | Vestibule |
| R0-2 | 005<br>(104)<br>(105) | Boric Acid Storage<br>(Aisleway; on Elevation 40’-0”)<br>(Aisleway; on Elevation 40’-0”) |
| R0-3 | 016 | Corridor |
| R0-4 | 006<br>007<br>008 | Module 1 CVCS Ion Exchanger Valve<br>Module 1 CVCS Ion Exchanger<br>Module 1 CVCS Filter |
| R0-5 | 009<br>010<br>011 | Module 2 CVCS Ion Exchanger Valve<br>Module 2 CVCS Ion Exchanger<br>Module 2 CVCS Filter |
| R0-6 | 012<br>013<br>014 | Module 3 CVCS Ion Exchanger Valve<br>Module 3 CVCS Ion Exchanger<br>Module 3 CVCS Filter |
| R0-7 | 015 | Corridor |
| R0-8 | 017 | Telecom |
| R0-9 | 018 | Vestibule |
| R0-10 | 019 | RWDS Equipment Aisleway |
| R0-11 | 021 | Telecom |
| R0-12 | 020 | Vestibule |
| R0-13 | 022 | Corridor |
| R0-14 | 024<br>025<br>026 | Module 4 CVCS Ion Exchanger Valve<br>Module 4 CVCS Ion Exchanger<br>Module 4 CVCS Filter |
| R0-15 | 027<br>028<br>029 | Module 5 CVCS Ion Exchanger Valve<br>Module 5 CVCS Ion Exchanger<br>Module 5 CVCS Filter |
| R0-16 | 030<br>031<br>032 | Module 6 CVCS Ion Exchanger Valve<br>Module 6 CVCS Ion Exchanger<br>Module 6 CVCS Filter |
| R0-17 | 023 | Corridor |
| R0-18 | 033<br>(131) | Utilities Area<br>(Aisleway; on Elevation 40’-0”) |
| R0-19 | 034<br>035 | Liquid Radioactive Waste System (LRWS) Degasifier Tank B<br>LRWS Degasifier Pump B |
| R0-20 | 036<br>037 | LRWS Degasifier Pump A<br>LRWS Degasifier Tank A |
| R0-21 | 038 | Vestibule |
| R0-22 | 039 | RWDS Equipment Aisleway |
| **RXB Elevation {{ }}** | | |
| R1-1 | 103 | Vestibule |
| R1-2 | 106 | Corridor |
| R1-3 | 108<br>109<br>110 | Module 1 CVCS Filter Access<br>Module 1 CVCS Recirc Pump Valve<br>Module 1 CVCS Recirc Pump |
| R1-4 | 111<br>112<br>113 | Module 2 CVCS Filter Access<br>Module 2 CVCS Recirc Pump Valve<br>Module 2 CVCS Recirc Pump |
| R1-5 | 114<br>115<br>116 | Module 3 CVCS Filter Access<br>Module 3 CVCS Recirc Pump Valve<br>Module 3 CVCS Recirc Pump |

## Table 9A-8: Reactor Building Fire Areas (Continued)

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| R1-6 | 107 | Corridor |
| R1-7 | 117 | Vestibule |
| R1-8 | 118 | Utilities Area |
| R1-9 | 119 | Vestibule |
| R1-10 | 120 | Corridor |
| R1-11 | 122<br>123<br>124 | Module 4 CVCS Filter Access<br>Module 4 CVCS Recirc Pump Valve<br>Module 4 CVCS Recirc Pump |
| R1-12 | 125<br>126<br>127 | Module 5 CVCS Filter Access<br>Module 5 CVCS Recirc Pump Valve<br>Module 5 CVCS Recirc Pump |
| R1-13 | 128<br>129<br>130 | Module 6 CVCS Filter Access<br>Module 6 CVCS Recirc Pump Valve<br>Module 6 CVCS Recirc Pump |
| R1-14 | 121 | Corridor |
| R1-15 | 132 | Vestibule |
| R1-16 | 133 | Utilities Area |
| **RXB Elevation {{ }}** | | |
| R2-1 | 203 | Vestibule |
| R2-2 | 204 | Pool Cooling and Cleanup Systems (PCWS) Pumps |
| R2-3 | 205 | Telecom |
| R2-4 | 206<br>207<br>208<br>209<br>210 | Module 01-03 CVCS Heat Exchanger (HX) Utilities<br>Module 01-03 CVCS HX Valve Gallery<br>Module 1 CVCS HX<br>Module 2 CVCS HX<br>Module 3 CVCS HX |
| R2-5 | 211 | Vestibule |
| R2-6 | 212 | Utilities Area |
| R2-7 | 214 | Vestibule |
| R2-8 | 213<br>215<br>216<br>217<br>218<br>219 | MHS Equipment<br>Module 04-06 CVCS HX Utilities<br>Module 04-06 CVCS HX Valve Gallery<br>Module 4 CVCS HX<br>Module 5 CVCS HX<br>Module 6 CVCS HX |
| R2-9 | 220 | Telecom |
| R2-10 | 221 | Utilities Area |
| R2-11 | 222 | Vestibule |
| R2-12 | 223 | Utilities Area |
| **RXB Elevation {{ }}** | | |
| R3-1 | 303 | Vestibule |
| R3-2 | 304 | PCWS Equipment Aisleway |
| R3-3 | 305 | Telecom |
| R3-4 | 307 | Module 1 Division 1 Charger |
| R3-5 | 308 | Module 1 Division 1 Battery |
| R3-6 | 309 | Module 1 Division 1 Instrumentation and Control (I&C) Equipment |
| R3-7 | 310 | Module 2 Division 1 Charger |
| R3-8 | 311 | Module 2 Division 1 Battery |
| R3-9 | 312 | Module 2 Division 1 I&C Equipment |
| R3-10 | 313 | Module 3 Division 1 Charger |
| R3-11 | 314 | Module 3 Division 1 Battery |

## Table 9A-8: Reactor Building Fire Areas (Continued)

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| R3-12 | 315 | Module 3 Division 1 I&C Equipment |
| R3-13 | 306 | Corridor |
| R3-14 | 316 | Vestibule |
| R3-15 | 317 | Utilities Area |
| R3-16 | 318 | Vestibule |
| R3-17 | 319 | Corridor |
| R3-18 | 320 | Module 4 Division 1 Charger |
| R3-19 | 321 | Module 4 Division 1 Battery |
| R3-20 | 322 | Module 4 Division 1 I&C Equipment |
| R3-21 | 323 | Module 5 Division 1 Charger |
| R3-22 | 324 | Module 5 Division 1 Battery |
| R3-23 | 325 | Module 5 Division 1 I&C Equipment |
| R3-24 | 326 | Module 6 Division 1 Charger |
| R3-25 | 327 | Module 6 Division 1 Battery |
| R3-26 | 328 | Module 6 Division 1 I&C Equipment |
| R3-27 | 330<br>331 | Process Sampling System (PSS) Primary Sampling Panels<br>PSS Equipment Aisleway |
| R3-28 | 329 | Telecom |
| R3-29 | 332 | Vestibule |
| R3-30 | 333 | Utilities Area |
| **RXB Elevation {{ }}** | | |
| R4-1 | 403 | Vestibule |
| R4-2 | 405<br>406<br>407 | Reserved<br>Reserved<br>Reserved |
| R4-3 | 436 | Utilities Area |
| R4-4 | 404 | Corridor |
| R4-5 | 409 | Module 1 Division 2 Charger |
| R4-6 | 410 | Module 1 Division 2 Battery |
| R4-7 | 411 | Module 1 Division 2 I&C Equipment |
| R4-8 | 412 | Module 2 Division 2 Charger |
| R4-9 | 413 | Module 2 Division 2 Battery |
| R4-10 | 414 | Module 2 Division 2 I&C Equipment |
| R4-11 | 415 | Module 3 Division 2 Charger |
| R4-12 | 416 | Module 3 Division 2 Battery |
| R4-13 | 417 | Module 3 Division 2 I&C Equipment |
| R4-14 | 408 | Corridor |
| R4-15 | 418 | Vestibule |
| R4-16 | 419 | Utilities Area |
| R4-17 | 420 | Vestibule |
| R4-18 | 421 | Corridor |
| R4-19 | 422 | Module 4 Division 2 Charger |
| R4-20 | 423 | Module 4 Division 2 Battery |
| R4-21 | 424 | Module 4 Division 2 I&C Equipment |
| R4-22 | 425 | Module 5 Division 2 Charger |
| R4-23 | 426 | Module 5 Division 2 Battery |
| R4-24 | 427 | Module 5 Division 2 I&C Equipment |
| R4-25 | 428 | Module 6 Division 2 Charger |
| R4-26 | 429 | Module 6 Division 2 Battery |
| R4-27 | 430 | Module 6 Division 2 I&C Equipment |
| R4-28 | 431 | Utilities Area |

### Table 9A-8: Reactor Building Fire Areas (Continued)

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| R4-29 | 432<br>433 | Hot Lab<br>Chemistry Count |
| R4-30 | 434 | Vestibule |
| R4-31 | 435 | FHM Maintenance |
| **RXB Elevation {{ }}** | | |
| R5-1 | 503 | Entry Vestibule |
| R5-2 | 504 | Boron Addition System (BAS) Equipment Aisleway |
| R5-3 | 505 | Normal DC power system (EDNS) Battery 1 |
| R5-4 | 506 | Telecom |
| R5-5 | 507 | Module 01-03 Steam Gallery |
| R5-6 | 508 | Vestibule |
| R5-7 | 509 | RBVS Equipment Aisleway |
| R5-8 | 510 | Vestibule |
| R5-9 | 511 | Vestibule |
| R5-10 | 512 | Module 04-06 Steam Gallery |
| R5-11 | 515 | MAE Aisleway |
| R5-12 | 514 | EDNS Battery 2 |
| R5-13 | 513 | Telecom |
| R5-14 | (040)<br>516 | (Dry Dock; when Dry Dock drained; on Elevation 25’-0”)<br>Module Import Trolley |
| B1 | - | Module 1 Bioshield |
| B2 | - | Module 2 Bioshield |
| B3 | - | Module 3 Bioshield |
| B4 | - | Module 4 Bioshield |
| B5 | - | Module 5 Bioshield |
| B6 | - | Module 6 Bioshield |
| **RXB Elevation {{ }}** | | |
| R6-1 | 603 | Utilities Area |
| R6-2 | 604 | EDNS Charger 1 |
| R6-3 | 605 | Telecom |
| R6-4 | 606 | CNTS and CRDS Equipment |
| R6-5 | 609 | Utilities Area (open to RXB pool hall) |
| R6-6 | 611 | CNTS and CRDS Equipment |
| R6-7 | 613 | Telecom |
| R6-8 | 615 | Utilities Area |
| R6-9 | 614 | EDNS Charger 2 |
| R6-10 | 616<br>617<br>618<br>619 | Module Maintenance Center<br>Office<br>Office<br>HVAC Equipment |
| **RXB Elevation {{ }}** | | |
| R7-1 | (608)<br>701<br>703 | (Vestibule; on Elevation 126’-0”)<br>HVAC Equipment<br>Elevator Equipment |
| R7-2 | (610)<br>704 | (Vestibule; on Elevation 126’-0”)<br>HVAC Equipment |

**Table 9A-8: Reactor Building Fire Areas (Continued)**

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| **RXB - Other** | | |
| RE | 003 | Elevator (on Elevations 25’-0”, 40’-0”, 55’-0”, 70’-0”, 85’-0”, 100’-0”, 126’-0”, 146’-6”) |
| RS-1 | 001, 101, 201, 301, 401, 501, 601 | Stair 1 (on Elevations 25’-0”, 40’-0”, 55’-0”, 70’-0”, 85’-0”, 100’-0”, 126’-0”) |
| RS-2 | 002, 102, 202, 302, 402, 502, 602, 702 | Stair 2 (on Elevations 25’-0”, 40’-0”, 55’-0”, 70’-0”, 85’-0”, 100’-0”, 126’-0”, 146’-6”) |

## Table 9A-9: Radioactive Waste Building Fire Areas

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| **RWB Elevation {{ }}** | | |
| W0-1 | 004<br>006<br>007<br>027<br>028<br>036<br>(104) | Service Aisleway<br>Access Aisleway<br>Service Aisleway<br>Service Aisleway<br>Service Aisleway<br>LRWS Demin Water Tank<br>(Mezzanine Aisle; on Elevation {{ }}) |
| W0-2 | 005 | LRWS Processing Equipment |
| W0-3 | 038 | GRWS Charcoal Beds |
| W0-4 | 037 | GRWS Vapor Condensers |
| W0-5 | 008 | LRWS Low-Conductivity Waste (LCW) Sample Tank Pumps |
| W0-6 | 009 | LRWS High-Conductivity Waste (HCW) Sample Tank Pumps |
| W0-7 | 010 | Solid radioactive waste system (SRWS) Phase Separator Pumps |
| W0-8 | 035 | SRWS High Integrity Container (HIC) Filling |
| W0-9 | 034 | SRWS HIC Storage |
| W0-10 | 024 | LRWS LCW Collect Tank Pumps |
| W0-11 | 025 | LRWS HCW Collect Tank Pumps |
| W0-12 | 026 | SRWS Spent Resin Pumps |
| W0-13 | 031<br>032 | PCWS Demin Valve Gallery<br>PCWS Demineralizers |
| W0-14 | 030 | PCWS Filter A |
| W0-15 | 029 | PCWS Filter B |
| W0-16 | 033 | SRWS Drum Storage |
| W1-1 | (011)<br>(012)<br>(013)<br>(014)<br>(015)<br>(016)<br>(017)<br>(018)<br>(019)<br>(020)<br>(021)<br>(022)<br>(023)<br>101<br>102<br>103 | (LRWS LCW Sample Tank A; on Elevation {{ }})<br>(LRWS LCW Sample Tank B; on Elevation {{ }})<br>(LRWS HCW Sample Tank A; on Elevation {{ }})<br>(LRWS HCW Sample Tank B; on Elevation {{ }})<br>(SRWS Phase Separator Tank A; on Elevation {{ }})<br>(SRWS Phase Separator Tank B; on Elevation {{ }})<br>(Pipe Chase Corridor; on Elevation {{ }})<br>(LRWS LCW Collect Tank A; on Elevation {{ }})<br>(LRWS LCW Collect Tank B; on Elevation {{ }})<br>(LRWS HCW Collect Tank A; on Elevation {{ }})<br>(LRWS HCW Collect Tank B; on Elevation {{ }})<br>(SRWS Spent Resin Storage Tank A; on Elevation {{ }})<br>(SRWS Spent Resin Storage Tank B; on Elevation {{ }})<br>Valve Gallery<br>Pipe Chase Corridor<br>Valve Gallery |

**Table 9A-9: Radioactive Waste Building Fire Areas (Continued)**

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| **RWB Elevation {{ }}** | | |
| W2-1 | 203 | Toilet |
| | 204 | Open Office |
| | 205 | Health Physics Corridor |
| | 207 | Dosimetry |
| | 208 | Whole Body Count (WBC) |
| | 209 | Health Physics (HP) Instruments |
| | 210 | Remote Monitor |
| | 211 | Respirator Facility |
| | 212 | Vestibule |
| | 213 | Exit Vestibule |
| | 214 | Entry Vestibule |
| | 215 | RCA Entry Corridor |
| | 216 | Equipment Decontamination |
| | 217 | Decontamination |
| | 218 | Decontamination |
| | 219 | Counting Lab |
| | 220 | Storage |
| | 221 | RCA Exit Corridor |
| W2-2 | 206 | Telecom |
| W2-3 | 234 | Electrical Equipment |
| W2-4 | 236 | Hot Shop |
| | 237 | Small Parts |
| | 238 | Hot Tools |
| | 239 | Decontamination |
| W2-5 | 230 | Access Corridor |
| W2-6 | 233 | EDNS Battery |
| W2-7 | 232 | EDNS Charger |
| W2-8 | 231 | Waste Management Control Room |
| W2-9 | 235 | Telecom |
| W2-10 | 222 | Module Import Trolley Bay |
| | 223 | Vestibule |
| | 224 | Equipment Laydown |
| | 228 | Service Aisleway |
| | 229 | Truck Bay |
| | (303) | (HVAC RCA Equipment Room; on Elevation {{ }}) |
| W2-11 | 225 | Class A Waste Storage |
| W2-12 | 227 | FLEX Storage |
| W2-13 | 226 | Low Level Solid Radwaste Sorting |
| **RWB Elevation {{ }}** | | |
| W3-1 | 302 | HVAC Equipment |
| **RWB Elevation {{ }}** | | |
| W4-1 | 402 | HVAC Equipment |
| | 403 | Elevator Equipment |
| **RWB - Other** | | |
| WE | 003 | Elevator (on Elevations {{ }}) |
| WS-1 | 001, 201, 301, 401 | Stair 1 (on Elevations {{ }}) |
| WS-2 | 002, 202 | Stair 2 (on Elevations {{ }}) |

## Table 9A-10: Control Building Fire Areas

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| **CRB Elevation {{ }}** | | |
| C0-1 | 003 | Mechanical Equipment |
| C0-2 | 008 | Corridor |
| | 009 | Corridor |
| C0-3 | 010 | EDNS Battery |
| C0-4 | 011 | EDNS Charger |
| C0-5 | 006 | Electrical Equipment |
| C0-6 | 005 | Corridor |
| C0-7 | 007 | Telecom |
| C0-8 | 021 | SDIS PPS Cabinets |
| C0-9 | 018 | SDIS PPS Cabinets |
| C0-10 | 012 | Corridor |
| | 014 | Entry Vestibule |
| | 015 | Corridor |
| C0-11 | 020 | Augmented DC power system (EDAS) Charger |
| C0-12 | 017 | EDAS Charger |
| C0-13 | 019 | EDAS Battery |
| C0-14 | 016 | EDAS Battery |
| C0-15 | 013 | Bottle Storage |
| **CRB Elevation {{ }}** | | |
| C1-1 | 103 | Technical Support Center |
| | 104 | Office |
| | 105 | Office |
| | 106 | Office |
| | 107 | Conference |
| | 108 | Conference |
| | 109 | Breakroom |
| C1-2 | 110 | Storage and Elevator Equipment |
| | 111 | Corridor |
| | 112 | Corridor |
| | 113 | Data Maintenance |
| | 114 | Men’s Restroom |
| | 115 | Women’s Restroom |
| | 116 | Janitor |
| | 118 | Records Storage |
| C1-3 | 117 | Data Equipment |
| C1-4 | 119 | Telecom |
| C1-5 | 134 | MCR |
| | 135 | MCR Toilet |
| | 136 | MCR Breakroom |
| | 137 | Airlock |

## Table 9A-10: Control Building Fire Areas (Continued)

| Fire Area No. | Room No. | Room Name |
|---|---|---|
| C1-6 | 120 | Airlock |
| | 121 | Corridor |
| | 122 | Toilet |
| | 123 | Toilet |
| | 124 | Janitor/Storage |
| | 125 | Corridor |
| | 126 | Operator Breakroom |
| | 127 | Critical Document Reference Storage |
| | 128 | Emergency Equipment |
| | 129 | Open Office |
| | 130 | Office |
| | 131 | Office |
| | 132 | Shift Manager Office |
| | 133 | Shift Turnover Conference |
| **CRB - Other** | | |
| CE | 004 | Elevator (on Elevations {{ }}) |
| CS-1 | 001, 101 | Stair 1 (on Elevations {{ }}) |
| CS-2 | 002, 102 | Stair 2 (on Elevations {{ }}) |

## Table 9A-11: Multiple Spurious Operations Challenging Safe Shutdown

| Generic MSO ID | Challenge to NuScale Safe Shutdown |
|---|---|
| 6 | Failing to isolate letdown can result in the potential for reactor coolant system inventory to be lost from the reactor pressure vessel.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the letdown line via the CIVs. |
| 7 | A combination of failures can result in a loss of reactor coolant system inventory should the CVCS makeup pumps spuriously operate in conjunction with a failure to isolate the CVCS makeup isolation valves. The failure involves overfilling the reactor pressure vessel and subsequently lifting the reactor safety valves. This failure would be compounded by a subsequent failure of the CVCS makeup pumps. Additionally, should makeup continue, the makeup pumps ultimately fill the containment vessel at a high enough pressure that the containment vessel may be challenged.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the CVCS makeup and spray lines via the CIVs. |
| 24 | Spuriously opening or failing to close the main steam isolation valves and the nonsafety-related backup isolation valves on the main steam lines may result in the loss of inventory in the steam generator and DHRS heat exchangers that results in a failure of the DHRS.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the main steam isolation valves. |
| 25 | Spuriously opening or failing to close the main steam isolation bypass valves and the nonsafety-related backup isolation valves on the main steam lines may result in the loss of inventory in the steam generator and DHRS heat exchangers that results in a failure of the DHRS.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the main steam isolation bypass valves. |
| 30 | NuScale Power Plant has no auxiliary feedwater system; however a failure to isolate the feedwater lines, particularly when coupled with continued operation of the main feedwater pumps, can result in overfilling the steam generator and the DHRS heat exchanger. This overflow can result in a failure of the DHRS.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the feedwater isolation valves. |
| 33a | NuScale Power Plant has no auxiliary feedwater system; however a failure to isolate the feedwater lines, particularly when coupled with continued operation of the main feedwater pumps, can result in overfilling the steam generator and the DHRS heat exchanger. This overflow can result in a failure of the DHRS.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the feedwater isolation valves. |
| 37 | Operation of the PZR heaters when the heating elements are uncovered can result in a failure of the heating element sheaths. These sheaths constitute a portion of the reactor coolant pressure boundary and their failure can accordingly result in a loss-of-coolant accident inside containment.<br>This failure can be mitigated by assuring that one division of the MPS is capable of tripping the PZR heater breakers. |
| 38 | Spurious operation of the CVCS makeup pumps with the pump suction aligned to the DW system can result in the potential for a boron dilution event.<br>This failure can be mitigated by assuring that one division of the MPS is capable of isolating the CVCS makeup and spray lines via the CIVs. |
| 49 | Spurious operation of the backup diesel generators may lead to non-synchronous paralleling of power supplies. This condition can result in a failure of the paralleled power supplies and may result in a consequential secondary fire ignition.<br>This failure can be mitigated by assuring that power supply output breakers and the bus supply breakers on supported buses are protected by appropriate protective devices. This failure cannot, by itself, challenge safe shutdown, but the consequences of the potential secondary fire are evaluated. Additionally, the backup diesel generators do not automatically restore power and must be manually aligned, which further reduces the likelihood of this scenario. |

**Table 9A-11: Multiple Spurious Operations Challenging Safe Shutdown (Continued)**

| Generic MSO ID | Challenge to NuScale Safe Shutdown |
|---|---|
| 49.2 | Non-synchronous paralleling of the main turbine generator to an otherwise energized bus, similar to MSO 49 can result in the possibility of a secondary fire developing. Additionally, spurious closure to the main generator output breaker when the steam supply to the turbine has been isolated may result in motoring the main generator or turbine or both. This condition may also result in a consequential secondary fire developing.<br>This failure can be mitigated by assuring that power supply output breakers and the bus supply breakers on supported buses are protected by appropriate protective devices. This failure cannot, by itself, challenge safe shutdown, but the consequences of the potential secondary fire are evaluated. |
| 56 | Spurious operation, provided the operation goes to completion, of an engineered safety feature is not a failure that can challenge safe shutdown. However, fire induced failures of subsets of the equipment associated with DHRS or ECCS actuations can challenge safe shutdown. Such failures of the DHRS are completely addressed in MSO 24, 25, 30, and 33a. Fire induced failures of the ECCS valves such that only the reactor vent valves or only the reactor recirculation valves open can essentially induce a loss-of-coolant accident inside the containment that challenges safe shutdown.<br>This failure can be mitigated by assuring that at least one reactor vent valve and one reactor recirculation valve are available to perform their safe shutdown function. |