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DFPP Revision 4

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DECOMMISSIONING FIRE PROTECTION PLAN

Approved: Jerry D. McCauley
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Date: 12-13-95

Reviewed: DSRC 089 DEC 13 1995
DSRC Meeting Number

Date: _____

SECTION DFP.1.

FIRE PROTECTION SYSTEMS

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DFP.1. GENERAL DISCUSSION OF THE FORT ST. VRAIN DECOMMISSIONING FIRE PROTECTION PLAN

DFP.1.1. INTRODUCTION

The Fort St. Vrain (FSV) Decommissioning Fire Protection Plan (DFPP) along with the Decommissioning Fire Protection and Administrative procedures implements the fire protection plan to be utilized during decommissioning of FSV.

The DFPP describes the overall fire protection plan during decommissioning. It identifies the responsibilities of Public Service Company of Colorado (PSC) FSV management and of the decommissioning contractor, Westinghouse Team (WT).

The DFPP describes the specific FSV features relied upon to limit fire damage through a combination of administrative controls, personnel training, fire area boundaries, fire detection capability, manual fire fighting capability, and automatic fire suppression. In addition to measures taken to prevent and extinguish incipient fires, the DFPP deals with the mitigation of the consequences of fires that may burn for a relatively long period of time, despite early detection and suppression measures. For a plant undergoing decommissioning, mitigation involves controlling quantities of combustibles and radioactivity which could be released in the event of a fire.

DFP.1.2. PURPOSE OF THE PLAN

The purpose of the FSV Decommissioning Fire Protection Plan (DFPP) is to prevent significant fires and to minimize radioactive releases to the environment in the event a significant fire occurs during decommissioning. This DFPP utilizes design features, personnel, equipment and procedures to provide defense-in-depth protection of the public health and safety. In addition, this Plan is structured to protect the safety of the decommissioning workers and minimize the risk of fire damage to the property.

DFP.1.3. DEFENSE-IN-DEPTH PHILOSOPHY OF THE PLAN

To accomplish the above purpose, the Fort St. Vrain fire protection plan, systems, and methods are directed toward the following defense-in-depth objectives:

1) Prevention: To prevent fires from starting

2) Detection: To rapidly and accurately detect those fires that do occur

3) Suppression: To control and promptly extinguish those fires that do occur

4) Mitigation: To establish controls so that a fire that is not promptly extinguished will not have the potential for releasing quantities of radioactivity that could result in doses greater than Protective Action Guidelines (Reference 1) at the Emergency Planning Zone (EPZ) boundary.

DFP.1.6. FIRE AREAS

PSC has decided to retain the use of fire areas for the purpose of limiting the spread of fires. As such, the fire areas during decommissioning are very similar to those in place when FSV was operating.

The fire areas of primary concern are those which contain radioactive components. A significant fire in the Reactor Building or in the Fuel Storage Building would have the potential for producing the worst case consequences. Although fires in other fire areas do not pose the threat of radioactive release, PSC's objective is to control and promptly extinguish fires that do occur. The use of a large number of fire areas will help to contain fires by means of the fire barriers and/or other design features associated with each individual fire area.

DFP.1.7. FIRE PROTECTION AND RESPONSIBILITIES

The responsibility for implementation of the DFPP is vested in the PSC Decommissioning Engineering Manager and implemented by PSC's Decommissioning Contractor (Westinghouse Team) for the contractor's work. Revisions necessary to maintain the DFPP up to date will be made with the appropriate management concurrence.

The Decommissioning Engineering Manager has the overall responsibility for the Plan and as such, his concurrence with Plan revisions should be documented. This includes all fire protection system design requirements and changes, including specifications, installation, testing and procedural elements.

The Project Assurance Manager has the responsibility for verifying compliance with the DFPP and updating the Plan. Also, all changes to the facility or its procedures as described in the plan will be reviewed in accordance with 10 CFR 50.59.

The Radiation Protection Manager is responsible for assuring that a fire protection training program is provided and maintained.

The Operations Manager or designee is responsible for assuring the preparation and conduct of operating, testing, maintenance, and inspection procedures. The Operations Unit Manager or designee within this department will be responsible to obtain the services of off-site fire departments and direct off-site agencies as the situation dictates.

The Decommissioning Contractor's Operations Manager is responsible to PSC's Decommissioning Engineering Manager for the execution of all decommissioning activities under their scope of work by the provisions outlined by the DFPP. This includes control of combustibles, control of hot work and training, and providing Fire Watches. The Decommissioning Contractor's Operations Manager is also responsible for the safety of his workers.

DFP.1.8. FIRE FIGHTING

DFP.1.8.1. Detection of Incipient Fires and Initial Response

Response to incipient fires is the responsibility of the performing organization. Fire watches shall be present at all activities that produce a flame, sparks, or large amounts of heat (Section DFP.1.9). Within the Reactor and Turbine Building areas fire watches are not required in fabrication shops or designated fabrication areas. Fire Watches are trained on all actions to be taken upon discovery of a fire. Automatic detection and appropriate suppression are provided in unoccupied spaces where a significant threat of fire exists. Automatic detection is provided in accessible Reactor/Turbine Building spaces.

Assurance of acceptably low radiological releases to the atmosphere in the event of a fire is provided with administrative controls of handling and storage of radioactive materials.

DFP.1.8.2. Off-Site Fire Department

The offsite fire department (Platteville Volunteer Fire Department) provides primary fire fighting capability. The Platteville Volunteer Fire Department, the closest off site fire department, is located about five miles from the plant. On site fire fighting exercises and plant orientation tours are offered annually to members of the Platteville Fire Protection District. The subject matter includes:

1. Coordination of the de-energization of plant equipment, and other operational considerations required from the plant management and site personnel.

2. Fire fighting systems and equipment available at the plant

3. Plant arrangement

4. Locations and precautions for hazardous materials

5. Radiological hazards and associated precautions and special protection

DFP.1.9. FIRE WATCH

A fire watch may be used as a compensatory measure for fire detection/suppression equipment being out of service, or stationed to support welding or hot work. This individual shall be trained in the use of fire extinguishers and know the locations and use of fire extinguishers in the area, and specific actions to take upon discovery of a fire. Both PSC and the decommissioning contractor have programs in place to address hot work and the use of fire watches.

The fire watch shall watch for fires in all exposed areas and shall try to extinguish these when it is obviously within the capacity of equipment available. All fires shall be reported to the Control Room. After completion of all cutting and welding operations requiring a fire watch, the fire watch or workman shall remain in the area for one half hour, after which an inspection of the area shall be made to insure no fire potential exists. The Decommissioning Contractor's Operations Manager or his designee is responsible for the inspection of the Contractor's work. A PSC Safety Inspector, Craft Supervisor or designee will perform the inspection after PSC work.

DFP.1.10. ADMINISTRATIVE CONTROLS

DFP.1.10.1. Fire Notification

The outbreak of fire at the Fort St. Vrain Plant will be detected by installed fire detection, fire watch, or on-site personnel.

Fires lasting more than 15 minutes are treated in accordance with the FSV Decommissioning Emergency Response Plan (ERP) and are considered, as a minimum, an unusual event. Fires at the plant lasting 30 minutes or greater which could result in the release of radioactive material, require an "Alert" to be declared (Reference 5).

DFP.1.10.2. Control of Ignition Sources

Procedure DPP 3.3.4, Fire Prevention Work Permits, provides for the notification, authorization, pre-job and post-job inspection and implementation of safeguards to prevent fires that could result from welding, cutting, or use of open flame or spark producing equipment. Any jobs requiring hot work utilize dedicated fire watch personnel to watch for hot spark or flame during and after the work.

DFP.1.10.3. Combustible Materials

The use of combustible materials in the Reactor Building and other areas where decommissioning activities are taking place is limited to the extent practicable and discussed in DPM 3.3, Fire Protection Manual.

The handling of specific combustibles such as lubricants is included in DPM 3.3. Wood used in the Reactor/Turbine Building during decommissioning must be treated to make it a limited combustible construction (flame spread of 25 or less).

DPM 2.3 provides a program for industrial safety at FSV including the Independent Spent Fuel Storage Installation. The program addresses combustible materials, their use, storage and removal.

Hazardous chemicals, including paints and solvents, on site are controlled per DPM 4.3, Chemical Control Program Manual.

Procedure DPP 2.3.2, Safety Tours and General Housekeeping, addresses the removal of waste, debris, scrap, spills or other combustibles resulting from work activities.

Storage of oxygen cylinders in outside areas and temporary designated plant areas complies with NFPA 51, Oxygen-Fuel Gas Systems for Welding, Cutting, and Allied Processes. Storage, use and handling of compressed gases is discussed in DPP 3.3.5, Compressed Gases Storage and Handling.

DFP.1.10.4. Design Controls

Changes in FSV fire protection systems and plant configuration affecting fire protection features shall be required to be reviewed for their impact on the Decommissioning Technical Specifications and the DFPP and must be approved by the PSC Decommissioning Engineering Manager. Design and configuration controls implemented during decommissioning shall be as described in Section 1.5 of the DP, and DPM 4.1, Configuration Management Manual.

DFP.1.11. QUALITY ASSURANCE

A Quality Assurance Program has been developed and implemented to assure that appropriate requirements are defined for the DFPP. Specifics of the Quality Assurance Program are defined in Section 7 of the DP and in DPM 2.1, Quality Assurance Manual.

REFERENCE FOR SECTION DFP.1

1. PSC letter, Crawford to Weiss (NRC), dated June 17, 1991 (P-91176); Subject: "FSV Emergency Response Plan for Decommissioning."

SECTION DFP.2.

FIRE PROTECTION SYSTEMS

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DFP.2. FIRE PROTECTION SYSTEMS

The majority of the system and design feature descriptions given in this chapter were presented to the NRC in a PSC letter dated October 13, 1978 (P-78167), Fuller to Gammil (NRC); subject: "Evaluation of Fire Protection Provisions for Fort St. Vrain." Fire Protection provisions at that time assured safe reactor operation. With the removal of all nuclear fuel from the reactor Protected Area, many of the fire protection goals have been revised as reflected throughout this DFPP. Several systems and design features are not required to assure safe decommissioning. Where system operability is not demonstrated by surveillance, the affected system may be informally maintained, abandoned in place, or removed in all or part and these systems or features may not be available in the event of fire. It is not intended to imply any dependence is placed on these systems or features.

DFP.2.1. FIRE DETECTION AND ALARM SYSTEMS

The fire detection system is designed to:

1) quickly notify operations personnel of potential fires
2) activate associated fire suppression systems.

A distinctive audible alarm annunciates in the Control Room and in some cases locally when a fire detector is activated or upon loss of power or detector failure. The visual indication is on panels located in an adjoining room east of the Control Room. The system was designed using guidance from NFPA 72 - National Fire Alarm Code.

The Fire Detection system contains ionization smoke detectors, photoelectric detectors, linear beam detectors, thermal detectors (including rate of rise and rate compensated), heat activated devices, local control panels, the Control Room control panel, and control devices (for automatic initiation of associated suppression systems).

Power for each detector is provided from a non-interruptible power supply. Electric circuit supervision monitors exist for open circuit, closed circuit (except the Pyrotronics system which provides an alarm under closed circuit conditions) or loss of control power conditions.

DFP.2.2. FIRE WATER SYSTEM

DFP.2.2.1. Water Supply

The fire suppression water supply system is capable of providing 1500 gpm at 125 psig to the fire main and yard loop. In addition, it serves as an emergency backup to several plant systems.

Two redundant 100% capacity fire water pumps are provided. The main pump is electric motor driven and is rated for 1500 gpm at 125 psig Total Discharge Head (TDH). The backup pump is diesel engine driven and is of the same capacity rating. The fire pumps are provided with independent power supplies and controls and are located in separate rooms divided by a 3-hour fire rated concrete wall. The design and installation of the fire pumps provides equivalent design to that of NFPA 20, Standard for the Installation of Centrifugal Fire Pumps.

Alarm annunciation and indication is provided in the Control Room for each pump. Alarms are available for the Electric Motor Driven Pump to indicate an auto start and breaker trip. Alarms available for the Diesel Engine Driven Pump are a running alarm and trouble alarm. The trouble alarm consists of loss of battery, failure to start, overspeed, and engine trouble (high temperature, low oil pressure, and low fuel).

The fire water pumps take suction from pits which are adjacent to the circulating water tower basin. The fire pump suction pits are supplied from two storage ponds by the Circulating Water Makeup Pumps at a rate which exceeds the rate at which water is used by the fire water systems.

In addition, a 20,000 gallon fire water storage tank is located approximately 132 feet above grade level. The storage tank acts similar to a jockey pump to supplement the fire water pumps and eliminate frequent starting of the fire water pumps for minor demands on the system.

The fire water pumps discharge via independent connections to a 10-inch underground main loop surrounding the station. The yard fire hydrants are supplied directly from this loop. The underground loop and the system of distribution headers running throughout the buildings provide multiple sources of fire water to the individual fire water suppression systems. There are two main headers off the underground loop supply which feed nine fire water supply risers to supply the wet pipe sprinkler systems, deluge systems, fixed water spray systems, and manual hose stations. The nine risers are equipped with alarm monitored check valves to alert Control Room personnel to the demand for fire water. The fire main distribution piping is sectionalized with gate valves to allow isolation of piping for maintenance or repair while maintaining at least one flow path to each fire area. Post indicator type valves are provided in the yard main and in supply headers to the buildings to allow for isolation. The underground main is flushed periodically through appropriate fire

hydrants and indoor hose stations. No single pipe failure will impair both the primary and backup fire suppression to an area. The design and installation of the underground fire water piping follow the guidance of NFPA 24 "Installation of Private Fire Service Mains and Their Appurtenances."

The fire water system is capable of supplying the largest wet pipe sprinkler system flow rate of 562 gpm for the simultaneous operation of two adjacent spray water zones at the Reactor Building "J" wall with an additional 938 gpm remaining for hose station use. The largest demand from open head deluge systems is 760 gpm for the actuation of the main power transformer deluge system and the unit auxiliary transformer deluge system (These systems are interlocked to actuate together). This would allow 740 gpm remaining for hose station use.

DFP.2.2.2. Hydrants and Yard Hose Houses

Fifteen fire hydrants are located in the yard area for outside fire suppression use. Yard area hydrants are spaced no more than 250 feet apart to allow outdoor protection from at least one hose stream. The threads on each hydrant are National Standard threads and are compatible with the Platteville Fire Protection District equipment.

DFP.2.2.3. Building Loops, Standpipes, and Hose Stations

NOTE: At some point in time near the end of decommissioning physical work activities, prior to final site survey, all fire water to the Reactor Building loops, standpipes, hose stations and sprinkler/spray/deluge systems will be isolated and drained. This will prevent inadvertent fire water spills or leakage, and freezing during cold weather months following decommissioning and final release of the Reactor Building.

Manual hose stations are located throughout the Turbine and Reactor Buildings at a spacing not exceeding 115 feet to provide manual suppression capability to all areas of the station. A hose station is not provided for the 4921' elevation of the Access Control Bay, however, this area can be reached from the elevation below. Also included are two roof stations; one on the Access Control Bay roof, and one on the Reactor Building roof. For either of these stations to be operable, one of the fire water pumps must be manually started. The hose stations are supplied by an indoor fire header loop in both the Reactor Building and Turbine Building. The indoor header loops are considered extensions of the underground yard main.

The Turbine Building has a 10-inch loop supplied at each end from the underground yard main, and the Reactor Building has a 4-inch loop supplied from independent connections to the Turbine Building loop. The hose standpipes are 2 1/2 inch diameter for multiple hose connections and 1 1/2 inch for single hose connections and are equipped with an Outside Screw and Yoke (OS&Y) gate valve and a flow alarm that annunciates in the Control Room.

Each hose station is equipped with a minimum of 100 feet of fire

hose in 50 ft. or longer connected lengths and an "All Fog" (electrically safe) nozzle. The hose stations were installed using the guidance of NFPA 14," Installation of Standpipe and Hose Systems."

Interior hose stations are not provided in the Service Water Pump House, Fire Water Pump House, or Circulating Water Makeup Pump House. Manual fire fighting capability is provided by yard fire hydrants located approximately 135 feet from the Service Water Pump House and about 100 feet from the Fire Water Pump House and the Circulating Water Makeup Pump House.

DFP.2.2.4. Congested Cable Area Water Spray System

A fixed water spray system provides supplemental fire extinguishment and exposure protection for congested cable areas along the "G" and "J" walls, outside the 480 Volt Switchgear Room and the Auxiliary Electric Room. The location and orientation of the spray nozzles/sprinklers was selected to assure that congested cable areas which lack access for manual hose application are sprayed with water. The fixed water spray systems in the 480 Volt Switchgear and Auxiliary Electrical Equipment Room are activated manually by opening the appropriate control station and zone isolation valves.

The fixed water spray systems which protect the "G" and "J" wall congested cable areas are automatically activated by melting of the spray head fusible links.

During decommissioning, cables and electrical equipment in these areas are not relied upon for nuclear safety, as they were during reactor operation. Sprays along the wall do provide some protection against the spread of fire into the Reactor Building from fire in the Turbine Building areas.

DFP.2.2.5. Sprinkler Systems and Deluge Systems

The sprinkler and deluge systems are supplied from an indoor fire header loop in both the Reactor Building and Turbine Building. Each automatic sprinkler and deluge system is connected independently to the indoor headers except the three sprinkler systems located on elevation 4740'-6" in the Reactor Building. These three sprinkler systems are supplied from two of the four hose standpipes. In this case, however, hose stations on this elevation supplied from the two remaining standpipes would be used to backup the sprinkler systems. The fire main is arranged and valved so that no single failure can impair both the primary and backup fire protection for an area. The sprinkler and deluge systems are equipped with OS&Y gate valves or valves approved for use by NRC for FSV operation and flow alarms that annunciate in the Control Room. The 480V transformer deluge systems are equipped with approved deluge valves. The sprinkler and deluge systems are designed, and tested using applicable guidance of NFPA 13, "Installation of Sprinkler Systems," and NFPA 15, "Water Spray Fixed Systems".

All automatic water spray deluge systems (dry pipe) are equipped with backup manual actuators on the deluge valves to permit manual

operation of the deluge system on failure or damage to the actuating (release) mechanism. The automatic water deluge systems are dry pipe systems that employ deluge valves, fixed piping, and multiple open, fixed position, fog type spray nozzles arranged to completely blanket the protected area. The actuation of any deluge valve, which is automatically activated by the fire detection system, sounds an alarm near the fire hazard area and in the Control Room.

The "common" main power transformer and the unit auxiliary transformer deluge systems are both automatically actuated by any one of four devices: the associated transformer "sudden pressure" relay, the transformer differential trip relay, the transformer neutral ground overcurrent trip relay, or by the associated rate-of-temperature-rise detectors of each transformer. The main power transformer and unit auxiliary transformer deluge system tripping devices are interlocked so that when one deluge system is actuated it automatically actuates the deluge valve of the other system.

The reserve auxiliary transformer fire protection system is automatically actuated by any one of three devices: its "sudden pressure" relay, its rate-of-temperature-rise detectors, or its neutral ground overcurrent trip relay.

The deluge systems for the turbine lube oil storage and the turbine lube oil reservoir rooms are actuated automatically by rate-of-temperature-rise detectors located in their respective areas.

An integral part of the transformer fire protection system is a 16' x 16' x 1' reinforced masonry block wall between the main power and reserve auxiliary transformers. The wall has no impact on other detection/suppression systems, but provides a heat shield to reduce heat transfer to the adjacent transformer. This fire protection enhancement was installed by Engineering Change Request ECR-93-030 in September, 1993.

Automatic sprinkler or deluge system protection is presently provided in the following areas:

<u>Turbine Building</u> Elevation 4791' (Grade)

Auxiliary Boiler Room	Wet Pipe Sprinklers
Turbine Lube Oil Reservoir Room	Deluge System
Turbine Lube Oil Storage Room	Deluge System
Hydrogen Seal Oil Unit	Wet Pipe Sprinklers
"G" Wall (CCA)	Wet Pipe Sprinkler/Nozzle

<u>Reactor Building</u> Elevation 4740'-6"

Helium Circulator Turntable	Wet Pipe Sprinklers
"J" Wall (CCA) All Elevations	Wet Pipe Sprinkler/Nozzle

Yard Area

4160/480 Volt Transformers	Deluge System
Main Power Transformer	Deluge System
Unit Auxiliary Transformer	Deluge System
Reserve Auxiliary Transformer	Deluge System
Main Warehouse	Wet Pipe Sprinkler
North Warehouse	Wet Pipe Sprinkler
Visitor Center	Wet Pipe Sprinkler

DFP.2.3. GASEOUS FIRE EXTINGUISHING SYSTEMS

DFP.2.3.1. Halon 1301 Systems

The Records Storage Building is provided with an automatic Halon system, detectors and alarms following the guidance of NFPA 12A, "Halon 1301 Fire Extinguishing Systems."

DFP.2.3.2. Carbon Dioxide Systems

CO2, which is electrically non-conductive, is effective as an extinguishing agent primarily because it reduces the oxygen content of the air to a point where it can no longer support combustion. The CO2 system consists of a 4-ton CO2 storage tank with piping and discharge control valves to the Standby Diesel Generator Room. A low pressure refrigeration unit automatically keeps the CO2 at its design temperature and corresponding vapor pressure of 0 degrees Fahrenheit and 300 psi, respectively.

The Standby Diesel Generator Room, which also contains a 550 gallon capacity diesel oil day tank, is protected by a total flooding CO2 system. The minimum design concentration is 34 percent by volume in accordance with Table 4 of NFPA 12, "Carbon Dioxide Extinguishing Systems," for protecting an area where the principal combustible is lube oil or diesel oil. The design CO2 soaking time is 30 minutes. The CO2 losses during initial charging and the leakage during the 30 minute soaking period are accounted for by increasing the quantity of CO2 discharged into the protected area. The quantity of CO2 required to account for losses prior to reaching pressure equilibrium is based on losing one-half the room volume at an average CO2 concentration of 20%. The quantity of CO2 required to account for leakage during the 30 minute soaking period is based on a conservative value at 0.5% room volume leakage per minute. The 30 minute soaking period is based on a deep-seated fire consisting of waste paper or similar materials as discussed in Section 15 of the NFPA Fire Protection Handbook (16th edition). The ventilation system for the room is automatically isolated in the event of a CO2 discharge by stopping the ventilation fan and closing pneumatically-operated fire dampers in the ventilation supply and return ducts at the room boundary. A ten-inch diameter elbow is installed in the ceiling of the room to provide sufficient vent area to maintain the CO2 pressure below 40 psf. This assures the door of the room will not be blown out during CO2 injection.

The CO2 system is actuated by one of two thermal detectors installed in the room. When a thermal detector trips in the Standby Diesel Generator Room, a local audible alarm warns personnel in the room that the CO2 is about to discharge. There is a preset time between alarm initiation and CO2 discharge to enable personnel to evacuate the room. An alarm also actuates in the Control Room. In addition to automatic actuation, the system can be manually actuated from outside the room in the event of a failure in the automatic actuation system or loss of control power. The room requires approximately 800 pounds of CO2 to achieve and maintain the desired

concentration. Actuation of the system would require approximately 800 pounds of CO2, which is equal to about 10% of the capacity of the 4-ton storage tank. Actual discharge tests confirm that approximately 800 pounds of CO2 are released for a single discharge. The tank is equipped with a low level alarm which is set to sound at the 60% and 30% capacity point or system pressure high-low. The design, installation, and testing of these systems uses guidance provided in NFPA 12 "Carbon Dioxide Extinguishing Systems."

The carbon dioxide system may also be used to maintain a CO2 blanket on the main generator. A complete purge of the main generator requires approximately 15% of the storage tank's capacity.

DFP.2.3.3. Dry Chemical Systems

The Hazardous Waste Storage Area (Inside the Pole Barn - Building 25) is protected by a total flooding dry chemical suppression system as described in NFPA 17 "Dry Chemical Extinguishing Systems." The system consists of two (2) dry chemical tanks connected to eight (8) discharge nozzles located in the ceiling of the area. Three (3) 140°C thermal detectors actuate electric valve actuators to discharge the dry chemical.

DFP.2.4. PORTABLE FIRE EXTINGUISHERS

Portable dry chemical, Halon 1211 and carbon dioxide fire extinguishers are installed throughout the plant in potential fire hazard areas to provide alternate fire suppression capability for Class A, B, and C type fires. Portable CO2 fire extinguishers are replaced with dry chemical fire extinguishers when replacement is necessary. Whenever possible, portable dry chemical extinguishers are the preferred extinguishers, followed by Halon as a second choice and CO2 as a last choice.

The specific areas where portable extinguishers are used and the types of extinguishers employed in those areas are given in the associated inspection and test procedure. The locations of fire extinguishers are shown in the detailed procedures. The selection, installation, inspection and maintenance and testing of portable fire extinguishers follows the guidance provided in NFPA 10, "Portable Fire Extinguishers". The portable fire extinguishers are Underwriter's Laboratories listed and approved.

DFP.2.5. EMERGENCY LIGHTING

DFP.2.5.1. Self-Contained Eight-Hour Battery Powered Lighting Units

Eight-hour self contained battery powered units and hard-wired essential/emergency backup lighting system powered from the Standby Diesel Generator and plant DC system. During Decommissioning these lights will serve to allow egress in the Turbine Building in case of a fire which causes a loss of normal lighting.

The DC-powered emergency lighting system fed from the station batteries represents approximately 3% of the plant lighting load and includes the offices. These fixtures are located at stairways, hallways, and doorways, and provide escape lighting from the buildings. Emergency lighting is provided in the auxiliary electrical equipment room, the 480 VAC essential switch-gear room, in Building 10, and the standby generator room to provide illumination for continuous operation in these areas. At each exit and in the plant, there are exit and arrow signs fed from the emergency lighting system. The DC emergency lighting system wiring is a separated segregated conduit system. However, a fire in the congested cable areas could conceivably damage the DC emergency lighting system.

The main control room normal lighting is fed from the essential lighting system. The emergency lighting for the main control room is powered from either non-interruptible bus 1A or 1B. The emergency lighting level is approximately 50% of the normal lighting level.

Battery powered lights are currently installed in the following areas:

Auxiliary Boiler Room
Service Water Pump Room
Turbine Building Stairs
Access Bay Above El. 4829'
Reactor Building Refueling Floor
Helium Storage Tank Room
Reactor Building El. 4759' Snubber Deck
Turbine Building El. 4829'
Circulating Water Pump House

Yard lighting is provided by the Security Lighting System.

DFP.2.6. SUPPORTING SYSTEMS

DFP.2.6.1. Communications

During a fire emergency, primary communication is provided by using the station's AC powered public address system (GAI-Tronics). GAI-Tronics telephones located throughout the plant, outlying buildings, shallow well pump houses, and river pump structures provide two-way communication. The public address feature allows key people to be paged throughout the plant from any telephone location and announce general fire warning. In addition, there is a Station alarm system, portable radios, telephones, and pagers. The offsite fire departments are equipped with their own portable communication systems.

DFP.2.6.2. Smoke Removal Systems

Safe heat and smoke removal or ventilation are ensured for the Reactor Building, Turbine Building, Access Control Bay, and other vital areas through features of the HVAC systems designs. The system power, control cables, and control air tubing are generally located away from fire hazards.

Ventilation systems in the Reactor Building, Turbine Building, and Access Control Bay are once through type systems combined with recirculation that is automatically proportioned to control ambient air temperatures. During a fire condition, Turbine Building and/or Access Control Bay exhaust dampers are fully opened to remove smoke and corrosive gases. These dampers can be manually positioned also. A supply air opening in the louvered ventilation system in the Turbine Building south wall is approximately 30 feet from the oil cooled Reserve Auxiliary Transformer. The transformer is protected with an automatic water deluge system. The 4160V switchgear cabinet separates the transformer from the Turbine Building, providing a substantial fire barrier. The Turbine Building Ventilation System air handling unit is connected by ducting to the wall opening.

The Reactor Building uses a chiller unit and a recirculation fan which provides greater cooling than a Reactor Building exhaust fan. The Reactor Building ventilation system has provision to monitor for airborne radioactivity. Portable equipment can also be used to determine if radioactive material is present. Discharge air is filtered through HEPA filters to ensure air release is within the requirements of the Offsite Dose Calculation Manual (ODCM). Intake and exhausts are separated to avoid possible contamination of intake air.

Ventilation to the outdoors is not direct in some areas of the Turbine Building, Reactor Building, or Access Control Bay, because return air registers are not provided in each area. In the Fire Pump House, Service Water Pump House, and Circulating Water Makeup Pump House, smoke will be removed by the once through type ventilation systems.

The 480 Volt Switchgear Room is independently ventilated but is interconnected to the Turbine Building Ventilation System. The 480 Volt Switchgear Room can be ventilated through use of a portable exhaust fan or a vent booster fan.

The Control Room can be aligned to 100% outside air by either using a supply or exhaust fan.

HVAC System or alternate ventilation is required for the Diesel and Electric Fire Pump Rooms and Circulating Water Makeup Building.

Upon fan failure in the Circulating Water Makeup Building, doors at either end of the building can be opened for cross ventilation.

Cable tunnels or culverts are not used at FSV. No venting requirement is necessary.

Enclosed stairways are not provided in the FSV smoke control design.

DFP.2.6.3. HVAC Systems

There are several independent systems which ventilate areas of the FSV station. The following buildings are set up in the above manner (Ref. 1):

- Reactor Plant and Control Room HVAC systems can be controlled from the Control Room.
- The Turbine Building ventilation system is controlled from the Evaporative Cooling Building or local control panels.
- The Access Control Bay System is controlled from a local control panel.

Local control panels are generally provided near their associated air handling equipment. The power supplies for each system are located in the 480 Volt Switchgear Room or additional motor control centers located near the air handling equipment.

The Control Room and Auxiliary Electric Equipment Room can be isolated from the ventilation system in the event of a charcoal filter fire in the charcoal emergency filter for the Control Room ventilation system.

The Station Battery Rooms are provided with ventilation systems capable of maintaining the hydrogen concentration in the rooms below 2% of the lower flammable limit.

The following HVAC components are provided for smoke removal:

Building/Area	Components
Reactor Building	Exhaust Fans
Fire Pump Room (Diesel)	Louvers Fan
Fire Pump Room (Electrical)	Louvers Fan
Turbine Building:	
• Control Room and Auxiliary Electrical Equipment Room	Portable Fans
• Switchgear Room	Portable Fans

DFP.2.6.4. Floor Drains

DFP.2.6.4.1. Water Damage

Water damage from fire suppression equipment will not be of concern during decommissioning. There will be no electrical equipment whose damage could create any substantial release of radioactive contaminants. Water from suppression system activation would travel to floor drains or across floors until it reached a floor drain or the building exterior. Where drains may be contaminated, drains are directed to the Radioactive Liquid Waste System.

DFP.2.6.4.2. Drain Protection for Combustible Fluids

The Turbine Lube Oil Storage Room, and Lube Oil Reservoir Room are diked to prevent the spread of flammable liquids and floor drains are plugged in certain areas to prevent drainage system contamination. Drains have been analyzed for possible spread of fire through the drainage system.

DFP.2.6.5. Lightning Protection

In order to protect the plant from a lightning strike, lightning protection is provided by the station's grounding system. The grounding system is electrically connected to Building 10, the Reactor Building and the Turbine Building's structure, metal roof, and metal clad siding, the cooling towers, and switchyard. This method of lightning protection was designed using the guidance of NFPA 780, "Lightning Protection Code."

DFP.2.7. PLANT DESIGN FEATURES

DFP.2.7.1. Electrical Cables, Cable Trays

During reactor operations several measures were taken to protect cables in the congested cable areas, from fire and fire spread. These measures were taken in the Auxiliary Electric Room, the 480 Volt Switchgear Room, congested cable areas of the "J" wall in the Reactor Building, and congested cable areas of the "G" wall in the Turbine Building. Flamastic 71A, 77, asbestos cloth wrap, and fiberglass and silica glass wrap were used to protect cables that did not meet IEEE-383-1974. The cables were also derated. The reduction of electrical loads carried by these cables and flame retardant coatings reduces the hazard presented by these cables. Hand held extinguishers, fire hoses, and installed fixed spray system plus automatic fire detection are relied on for fire protection.

All cable trays are constructed of steel.

All cables are installed in cable trays, raceways, conduits, trenches or culverts used exclusively for cables and contain no other materials.

Additional power requirements for decommissioning will be extended throughout the Reactor Building through installed welding outlets or tool load centers powered from existing load centers. The system of welding outlets is enclosed in metal conduit.

DFP.2.7.2. Transformers

All transformers at the Fort St. Vrain station installed inside buildings are of the dry type. Outdoor transformers are protected as discussed in DFP.2.2.5.

An integral part of the transformer fire protection system is a 16' x 16' x 1' reinforced masonry block wall erected between the main power and reserve auxiliary transformers. The wall has no impact on other detection/suppression systems, but provides a heat shield to reduce heat transfer to the adjacent transformer. This fire protection enhancement was installed by Engineering Change Request ECR-93-030 in September, 1993.

The location of some of the outdoor transformers is within 50 feet of the plant. Building 10 is within 50 feet of two separate locations having outside transformers. However, none of the walls of Building 10 have unprotected openings. The outside transformers (Essential Bus 1,2, and 3 480V transformers) have fire protection in the form of water deluge systems. Backup fire protection is in the form of two separate exterior yard hydrants. Finally, transformer oil would be contained within a concrete basin.

A supply air opening (in the louvered ventilation system) in the Turbine Building south wall is approximately 30 feet from the oil-cooled Reserve Auxiliary Transformer. The transformer is protected with an automatic water deluge system. The 4160V switchgear cabinet

separates the transformer from the Turbine Building providing a substantial fire barrier.

The Standby Diesel Generator Room is located inside the Turbine Building, 20 feet away and one level below the wall opening. All other equipment items are at least 75 feet from the wall opening. The Standby Diesel Generator Room is constructed of reinforced concrete walls and roof having a fire rating of at least 3 hours. In addition, an automatic total flooding CO2 system is installed in the Standby Diesel Generator Room. Diesel fuel oil supply lines and the generator output cables are routed underground exterior to the plant buildings.

DFP.2.7.3. Building Construction

Reactor Building

The Reactor Building contains the PCRV, fuel handling and storage areas, decontamination and radioactive waste handling areas, and reactor plant auxiliary systems.

The Reactor Building above grade outer walls are constructed of dual, corrugated steel enclosing mineral wool thermal insulation. The fire rating of the steel walls, although not confirmed by fire test, is considered adequate to mitigate the spread of a fire for the highest fire load in the building. The Reactor Building roof is a metal deck-type structure as evaluated in EE-45-0008 (Rev. 0). Below grade walls are reinforced concrete construction as are numerous equipment cells and rooms within the building.

The building is divided into two general zones (PCRV zone and auxiliary equipment zone) by a steel barrier wall which extends vertically from elevation 4739'-10" to the refueling floor, elevation 4881'. The open structure design concept employed in the building consists of open steel floor grating, open stairways, and machinery and personnel access openings in walls and floors. The entire Reactor Building is considered to be one fire area.

Access doors, emergency exits, and the elevator doors penetrating the building outer walls and 4A wall are non-fire rated steel doors. System piping, electrical cable in trays, risers and conduit, and ventilation ducts penetrate the floors and 4A wall without fire stops or ventilation fire dampers. Penetrations in the wall (fire boundary) separating the Reactor Building and the Turbine Building are sealed. Three access paths are provided in the Reactor Building which span all levels of the building. Two paths are in the Auxiliary Equipment side, east of the 4A wall, and the third is at elevation 4885 on the south side of the refueling floor. This access path is normally locked.

Turbine Building

The Turbine Building houses the secondary plant equipment including such major components and systems as the turbine-generator, main condenser, steam, condensate, and feedwater systems, and HVAC systems. The building is essentially a three-level structure, except

for the Access Control Bay portion attached to the south side of the Reactor Building. Like the Reactor Building, the Turbine Building and Access Control Bay are constructed with insulated dual corrugated steel walls and a Class I construction metal deck roof. The Turbine Building is similar to the Reactor Building in its open structure design consisting of open steel floor grating, open stairways, and contains unsegregated machinery areas.

The Turbine Building has been divided into fire areas by segregated rooms. Barriers between fire areas are generally concrete or concrete block construction. The major volume of the Turbine Building is considered to be one fire area since it has open steel floor grating. Structures enclosing the high fire hazard areas such as the Auxiliary Boiler Room, Turbine Lube Oil Storage and Reservoir Rooms, and the Standby Diesel Generator Room are provided with fire rated concrete enclosures, doors, and ventilation dampers and sealed penetrations.

Emergency lighting is provided in the Turbine Building and assures adequate illumination for personnel egress.

Aside from Reactor Building entry control at Level 7 and some packaging of low level wastes at the control point and on the Turbine Deck, no decommissioning activities are planned for the Turbine Building. The Decommissioning Contractor utilizes the east side of the Turbine Deck as a break and sanitary facility area.

Activities pertaining to Repowering of FSV as a fossil fueled (natural gas) plant will take place from time to time in various locations of the Turbine Building. These activities will not affect general building construction.

DFP.2.8. FIRE AREAS AND FIRE BARRIERS

DFP.2.8.1. Fire Barriers

Floors, walls and ceilings enclosing separate fire areas are generally masonry block or reinforced concrete. The barriers are discussed in Section DFP.2.8.5.

DFP.2.8.2. Penetrations Seals

Penetration seals relied upon in the DFPP have been tested and installed in accordance with ASTM E-119 or ASTM E-814, (Revision applicable at time of testing) and have a three hour fire rating.

DFP.2.8.3. Fire Doors

Underwriters Laboratories (UL) labeled fire doors were originally installed in the Fort St. Vrain fire area boundaries; however, since the time of plant construction a number of modifications have been made to the door assemblies for security or other purposes. The end result of these modifications has been to alter the fire resistance rating of the door assemblies. To provide assurance that qualified fire door assemblies are installed in all required fire area boundaries, a field review of all such fire doors has been conducted by UL. Modifications required by the UL survey have been made to ensure the continued rating of the assemblies.

DFP.2.8.4. Fire Dampers

Fire dampers are installed in ventilation ducts passing through fire boundaries maintained during decommissioning. In other areas, because ventilation ducts are constructed of heavy gauge steel, fire dampers are not considered necessary as the barriers do not form fire area boundaries.

DFP.2.8.5. Fire Areas

Fire areas at FSV are no longer required to assure separation of shutdown/cooldown trains or to comply with NRC guidelines. Fire areas described by this DFPP assure reasonable fire protection and serve as a general description of the facility.

Separate FSV Fire Areas have been selected as follows:

1. Reactor Building
2. Turbine Building
3. Standby Diesel Generator Room 1A
4. Auxiliary Boiler Room
5. Turbine Lube Oil Storage Room
6. Turbine Lube Oil Reservoir Room
7. Electric Motor Driven Fire Pump Room
8. Diesel Engine Driven Fire Pump Room
9. Circulating Water Make-up Pump House
10. Service Water Pump House

11. Turbine Evaporative Cooling Building
12. Water Chiller Building
13. Technical Support Center
14. Circulating Water Pump Pit
15. Fuel Storage Building
16. Record Storage Building
17. Helium Storage Building
18. Main Cooling Water Tower
19. Diesel Fuel Unloading Area
20. Outside Auxiliary Boiler

The major fire areas are briefly discussed below:

Reactor Building

The Reactor Building is located on the north side of the plant adjacent to the Turbine Building. The Reactor Building has a wall common to the Turbine Building, the Three Room Control Complex, and the Turbine Lube Oil Storage Room. The Three Room Control Complex and the Turbine Lube Oil Storage Room interface walls are rated fire barriers. The exterior walls of the Reactor Building are not fire rated but are considered adequate as presently constructed.

The balance of the common wall between the Turbine Building and Reactor Building consists of corrugated steel panels filled with a mineral wool insulation.

The highest fire loading occurs on the grade elevation of the Turbine Building. At the location of the steel wall, grating in the elev. 4811' floor would allow dissipation of heat for a fire at the grade elevation to pass to other open areas of the Turbine Building.

Fire detection is provided on both sides of the wall. Due to the large open volumes of the Turbine Building and Reactor Building, smoke and hot gases would be dissipated. Openings in the wall are sealed to maintain the pressure differential required for the Reactor Building.

Turbine Building

Except for the:

- Diesel Generator Room
- Auxiliary Boiler Room
- Turbine Lube Oil Reservoir Room
- Turbine Lube Oil Storage Room

The Turbine Building is considered one fire area and includes the Access Control Bay, the Three Room Control Complex and Building 10. The common wall between the Turbine Building and the Reactor Building was discussed above.

The Three Room Control Complex consists of the Control Room, the Auxiliary Electric Room and the 480 volt Switchgear Room. The fire barriers between the Three Room Control Complex and the Turbine Building were rated and maintained as such when FSV was an operating facility, to prevent a fire in one area from spreading to adjacent areas, and causing malfunction of more than one of the redundant reactor shutdown/cooldown trains. With all the nuclear fuel removed from the protected area, reactor shutdown/cooling is not a consideration, and a fire spreading throughout the Turbine Building, the Three Room Control Complex and Building 10 would not result in the release of significant amounts of radioactivity, and would not pose a threat to the health and safety of the public.

The 480 Volt Switchgear and Auxiliary Electric Rooms have a fire detection system and manually operated fixed spray suppression systems. These fire detection and suppression systems follow guidance provided by NFPA 72 "National Fire Alarm Code" and 15, "Water Spray Fixed Systems."

Contiguous to the outside boundary firewalls of the Three Room Control Complex are two areas containing numerous cable trays located in a congested manner. These two areas and the Three Room Control Complex are referred to as the "congested cable areas" (CCA). Fire detection and water spray systems have been installed in the congested cable areas outside of and contiguous to the "J" and "G" wall locations that serve as a fire rated boundary to the Three Room Control Complex. These have been modified for automatic actuation of the water spray system. Hence, the Three Room Control Complex boundary north and south ("J" and "G" walls) fire walls have fire detection and fire suppression systems on both sides; the coverage on the outside of the "J" and "G" walls is over the congested cable locations. Any fire occurring within the Three Room Control Complex or close to its external perimeter walls would be rapidly detected and extinguished via operation of manual fixed suppression systems inside the 480 Volt Switchgear room and automatic fixed suppression systems along the G and J walls.

Non-rated doors and dampers are protected by detection and suppression systems in the Three Room Control Complex and along the "J" and "G" walls. Additionally, these doors and dampers are of substantial and noncombustible construction and would serve as fire stops.

The existing cable tray and conduit penetration seals through the "J" wall are sufficient in thickness and packing density and are noncombustible (mineral fiber) such that they would serve as a fire stop. Since the "J" wall of the CCA is also protected by fire suppression systems a fire in the Turbine Building is not likely to threaten the safety of decommissioning activities.

Building 10 is located on the east side of the plant, approximately 15 feet from the existing outside walls. It is connected to the Three Room Control Complex via an enclosed walkway. Within Building 10 are six separate fire zones.

The topmost floor contains offices and no plant equipment. It has full fire detector coverage. The lower two levels located off the Three Room Control Complex, contain electrical equipment related to the instrument power systems. Building 10 has two rooms housing this equipment. Both rooms have a fire detection system.

Fire Water Pump House Rooms

The Fire Water Pump building is located adjacent to the Main Cooling Tower. No other buildings or equipment are located contiguous to the fire pump building. The Electric Motor Driven Fire Pump Room is constructed of reinforced concrete with a 3-hour fire rating, including the barriers that separate the electric fire pump from the diesel fire pump. The door to the Electric Motor Driven Fire Pump Room is rated at 3 hours.

Circulating Water Makeup Pump Building

The Circulating Water Makeup Pump House is a separate structure located approximately 50 feet northeast of the Main Cooling Tower. The building is constructed of reinforced concrete with a fire rating of 3 hours. The doors and penetrations to the building are unrated. Due to the isolated location of the building, it is not credible to postulate a single fire of sufficient magnitude to involve both this area and any area where radioactive materials are stored.

Service Water Pump Building and Cooling Tower

The Service Water Pump Building is located adjacent to the Service Water Cooling Tower. There are several penetrations which are not fire rated, and the access door to the building is unrated. Due to the remote location of the building and cooling tower, their physical separation is considered an adequate fire barrier.

Diesel Generator Room

The Standby Diesel Generator Room is located in the Turbine Building at grade elevation. The generator is enclosed by 3 hour rated reinforced concrete walls, floor, and ceiling. A set of double doors is provided for access to the room from the Turbine Building. HVAC ducts entering the room are provided with automatic dampers which close upon actuation of the carbon dioxide system. All fire door assemblies and penetration seals have been replaced with 3 hour rated components. The diesel generator fire walls have unrated HVAC fire stop dampers (that were installed with the CO2 fire suppression system) provided for HVAC duct penetrations. These dampers are automatically operated to close when the CO2 system is activated. The existing HVAC duct dampers will stop the gross movement of smoke and/or flames.

The Standby Diesel Generator Room is protected by a fixed, automatically or manually actuated CO2 flooding system. Automatic fire detection is provided by two thermal devices in the room which alarm and annunciate in the Control Room and alarm locally.

The Standby Diesel Generator Room is continuously purged with air by the Turbine Building Ventilation System. Ventilation return air is exhausted from the Diesel Generator Room to the Turbine Building. During a CO2 system discharge, a signal from the CO2 control system stops the ventilation fans and closes pneumatically-operated fire dampers in the ventilation supply and return ducts at the room boundary. After opening the dampers, the exhaust fans can be locally started to permit room venting.

Auxiliary Boiler Room

The Auxiliary Boiler Room is located near the southwest corner of the Turbine Building at grade elevation. The west wall of the Auxiliary Boiler Room is an exterior wall of the Turbine Building. The east wall is an 8-inch hollow concrete block wall. The south and north walls are of reinforced concrete. The existing fire doors and penetration seals have 3 hour rated components. The 8-inch block wall is estimated to have a fire resistance of 2 hours.

The Auxiliary Boiler Room is protected by an area-wide wet pipe sprinkler system that alarms locally as well as in the Control Room. In the event of a fire in the Auxiliary Boiler Room, the automatic sprinkler system will control the growth and magnitude of the fire while alerting the Control Room operators to evacuate personnel and summon local fire departments. The action of the automatic sprinkler system, in conjunction with the passive protection afforded by the concrete and block walls, would act to contain the fire until the arrival of the fire department.

Based on the substantial construction of the concrete and block walls, it is expected that they would be capable of preventing flame spread for this period of time, and its existing fire resisting capability is, therefore, considered adequate.

Turbine Lube Oil Storage Room

This area is located in the northwest corner of the Turbine Building at grade elevation. Boundary walls are block walls. The fire doors and penetration seals have 3 hour rating components.

Turbine Lube Oil Reservoir Room

This area is located near the northwest corner of the Turbine Building at grade elevation. The fire area is bounded by 3-hour concrete block walls. The fire door assembly into the room is equipped with modified hardware and frame. The fire doors and penetration seals have 3 hour rating.

Fuel Storage Building

This area is located on the east side of the plant in a separate structure made of reinforced concrete walls and ceiling. Linear beam detectors with remote alarm capability have been installed in the Fuel Storage Building.

As discussed in the Decommissioning Plan, Section 3.3, the Fuel Storage Building may be used for either waste packaging or waste storage. Nuclear fuel is no longer stored in this building.