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Cold Vacuum Drying Facility Fire Protection System Design Description

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Abstract: This document describes the Cold Vacuum Drying Facility (CVDF) fire protection system (FPS). The FPS provides fire detection, suppression, and loss limitation for the CVDF structure, personnel, and in-process spent nuclear fuel. The system provides, along with supporting interfacing systems, detection, alarm, and activation instrumentation and controls, distributive piping system, isolation valves, and materials and controls to limit combustibles and the associated fire loadings.

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**COLD VACUUM DRYING FACILITY
FIRE PROTECTION SYSTEM
DESIGN DESCRIPTION**

SYSTEM 24

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1.0 INTRODUCTION

1.1 System Identification

This system design description (SDD) addresses the Cold Vacuum Drying (CVD) Facility fire protection system (FPS). Inherent in all fire protection plans is the careful selection of material, method of construction, training of occupants in fire prevention techniques, and the alarm and suppression system. The system is comprised of boundaries and barriers, fire water distribution piping, sprinkles and hydrants, manual fire extinguishers, alarms and detection equipment. The FPS is supported by interface systems including service water, electrical power, drains, instrumentation and controls, and the Hanford Fire Department.

See Drawings H-1-82237, Cold Vacuum Drying Facility Fire Protection, First Floor Plan; H-1-82238, Cold Vacuum Drying Facility Fire Protection, Second Floor Plan; H-1-82239, Cold Vacuum Drying Facility Fire Protection Sections; and H-1-82240, Cold Vacuum Drying Facility Fire Protection Details, for the mechanical details of the FPS. See Drawing H-1-82244, Cold Vacuum Drying Facility Electrical Fire Alarm (Sheets 1 through 4), for the electrical details of the FPS.

This SDD, when used in conjunction with the other elements of the definitive design package, provides a complete picture of the FPS for the CVD Facility. Elements of SDD include functions, requirements, and descriptions. Other documents comprising the definitive design of the FPS include:

- Project design requirements (HNF-SD-SNF-DRD-002)
- Fire Hazard Analysis (HNF-SD-SNF-FHA-003)
- Master equipment list (SNF- 4148)
- Data and calculation matrix tracking list (SNF-3001)
- Sequence of operations (see HNF-2356).

1.2 Limitations of This SDD

This SDD has been prepared with the best available information taken from reviewed and approved design documents and drawings. There is some in-process design changes that affect the system described in this SDD. These changes are incorporated into this SDD to extent possible and practical. Further, the Fire Hazard Analysis (FHA) (HNF-SD-SNF-FHA-003) has identified some findings and proposed recommendations. As the findings are resolved and as the design changes proceed to completion by incorporation into official design documentation, this SDD will be revised as appropriate. FHA finding 18.7 specifically recommends that the FHA be reviewed and revised as necessary to reflect the final design, construction, and installation.

1.3 Ownership of This SDD

The CVD Facility Design Authority assigned to the FPS system is responsible for the accuracy and technical content of this SDD. Any questions on the system or content of this document shall be resolved through the design authority.

1.4 Acronyms

ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CFR	Code of Federal Regulations
CVD	Cold Vacuum Drying
DOE	U.S. Department of Energy
DRD	Design Requirements Document
FACP	Fire alarm control panel
FHA	Fire Hazard Analysis
FPS	Fire Protection System
FSAR	Final Safety Analysis Report
fpm	Feet per minute
gal	Gallon
gpm	Gallons per Minute
HFD	Hanford Fire Department
MCO	Multi-Canister Overpack
MCS	Monitoring and Control System
NEMA	National Equipment Manufacturers Association
NFPA	National Fire Protection Association
PIV	Post Indicator Valve
psig	Pounds per square inch gauge
RFAR	Radio fire alarm reporter
SAR	Safety Analysis Report
SDD	System design document
SNF	Spent Nuclear Fuel
TBD	To Be Determined
TSR	Technical Safety Requirement
UPS	Uninterruptible Power Supply

2.0 GENERAL OVERVIEW

This section provides a general overview of the FPS. Section 2.1 describes the system functions. Section 2.2 states the FPS classification and Section 2.3 outlines the basic operation of the FPS.

2.1 System Functions

2.1.1 Normal Process Functions

The FPS provides fire detection, suppression, and loss limitation for the CVD Facility structure, personnel, and in-process spent nuclear fuel. The system provides, along with supporting interfacing systems, detection, alarm, and activation instrumentation and controls, distributive piping system, isolation valves, and materials and controls to limit combustibles and the associated fire loadings.

2.1.2 Safety Functions

There are no nuclear safety functional requirements for fire protection. The FPS provides increased life safety and protection of government property. The system does this by providing passive design features, detecting the existence of an impending or actual fire, alerting personnel of the need to evacuate and automatically preventing the spread of the fire via a wetpipe sprinkler system and manually via portable fire extinguishers or via fire hydrants.

2.2 System Classification

All FPS equipment, valves, piping, instrumentation, and controls required to perform primary fire detection and suppression functions are designated as general service. These components are designed and qualified for performance category 2 as defined in DOE-STD-1020, *Natural Phenomena Hazards Design and Evaluation Criteria for Department of Energy Facilities*. Anchorage and piping for those portions of the system that, upon failure, could impact the performance and function of safety-significant or safety class equipment are designed and qualified for performance category 3 as defined in DOE-STD-1020.

2.3 Basic Operational Overview

The FPS consists of fire detection, alarm, and actuation system; a wet-pipe sprinkler system; and external fire hydrants. Manual fire extinguishers are included as part of the FPS. The wet pipe sprinkler distribution system covers the entire occupied portion of the building as shown on Drawings H-1-82237 and H-1-82238.

One FPS services the entire CVD Facility. The CVD Facility is divided into two fire zones by a two-hour, fire-rated wall in accordance with UBC 540.6, *Uniform Building Code, General Building Limitations, Allowable Floor Areas, Area Separation Walls*. The support (administrative) area is classified as business occupancy. The process bay and transfer corridor areas are classified as special purpose industrial occupancy.

All Process Bays except Bay 1 are equipped with sprinklers. This bay has only one smoke detector, one manual fire alarm pull box (at the bay personnel door on the east side of the building), and a fire gong with strobe at the personnel door on the west side of the facility. Each area complies with the requirement in its respective chapter in ANSI/NFPA 101, *Life Safety Code*.

3.0 REQUIREMENTS AND BASES

3.1 General Requirements

Operational and functional requirements are taken from HNF-SD-SNF-DRD-002, *Cold Vacuum Drying Facility Design Requirements*.

3.1.1 System Functional Requirements

Functional requirements of the fire protection system include design requirements, safety requirements, environmental requirements, mission critical requirements, and general requirements.

3.1.1.1 Design Requirements

3.1.1.1.1 Facility Requirements

1. **Requirement:** DOE requires Two independent sources of firewater Order 5480.7A because the maximum possible fire loss estimate exceeds \$50 million.

Basis: The DOE Order 5480.7A requires two sources of firewater if the maximum possible fire loss exceeds \$50 million.

How the system meets the requirement: Although the fire hazard analysis (FHA), HNF-SD-SNF-FHA-003, states that the facility does not meet this design requirement, the present 100-K area service water system cannot support two independent sources of water to the CVD Facility without extensive modifications. Because this requirement is not met, an exemption/equivalency from the orders has been obtained by the project. (Reference HNF-SD-SNF-DRD-002, Rev. 4, Section 18.1)

2. **Requirement:** Process bays and mechanical rooms are designed for Ordinary Hazard, Group 2 occupancy.

Basis: Process bays and mechanical rooms have an increased fire hazard due to the equipment and functions that are performed therein.

How the system meets the requirement: The process bays and mechanical rooms are designed for Group 2 occupancy (confirmed by the FHA, Section 4.3).

3. **Requirement:** Office and service areas are designed for Ordinary Hazard, Group 2 occupancy.

Basis: Office and service areas are designed for Group 2 occupancy because light hazard occupancy is not permitted in the CVD Facility.

How the system meets the requirement: The office and service areas are designed for Ordinary Hazard, Group 2 occupancy. FHA Section 4.3 and Finding 18.6 discuss the fact that this area should be Group 1 design; this is to be resolved.

3.1.1.1.2 Fire Hazards Analysis

1. **Requirement:** The fire protection design shall comply with the requirements of NFPA 801, *Facilities handling radioactive materials*; DOE Order 6430.1A, *General Design Criteria*; and HNF-PRO-340 through 373, *Project Hanford Policy and Procedure System*.

Basis: The fire protection design must comply with all the required codes and orders.

How the system meets the requirement: The project has prepared the Fire Hazard Analysis (HNF-SD-SNF-FHA-003) documenting compliance to the appropriate codes and standards. The design of the FPS complies with all the codes, standards, and orders that are applicable or an exemption/equivalency from the orders is obtained by the project. The design basis fires have been defined and evaluated in the FHA. FHA finding 18.7 specifically recommends that the FHA be reviewed and revised as necessary to reflect the final design, construction, and installation.

The FHA finding 18.10 (per RLID 5480.7, paragraph 8.1.a) discusses the need for fire department standpipe connections in areas with a potential for radiological contamination. This SDD requires updating upon resolution.

3.1.1.1.3 Life Safety Code.

1. **Requirement.** The CVD Facility shall be divided into two fire zones by a two-hour, fire-rated wall in accordance with the UBC 540.6. The support area is classified as business occupancy. The process bay area is classified as special purpose industrial occupancy. Each area complies with all requirements in its respective chapter in NFPA 101.

Basis: The CVD must comply with UBC 540.6, NFPA 101, and SNF-3553 Chapter B2.7.2, "Fire Protection System". The CVD Facility must comply with UBC 540.6.

How the system meets the requirement: HNF-SD-SNF-FHA-003, Section 7.0, indicates how the FPS meets NFPA 101. The two-hour, fire-rated wall is a subject of HNF-SD-SNF-FHA-003, Section 4.6, which indicates a finding (18.11) about the construction of the wall. Once the finding in the FHA is addressed, the CVD Facility will meet the two-hour, fire-rated wall requirement.

3.1.1.1.4 Firewater Supply

1. **Requirement:** The underground firewater distribution system shall be designed and installed in accordance with NFPA 24. The FPS supplied from the distribution system incorporates a post indicator valve.

Basis: NFPA 24 deals with design requirements of firewater in underground piping.

How the system meets the requirement: The distribution system is designed with a post indicator valve, in accordance with NFPA 24, and the distribution system is designed in accordance with guidance from the Authority Having Jurisdiction (AHJ), DOE-RL. (Reference drawing H-1-82092.) The FHA finding 18.12 discusses the installation of PVC piping rather than metal pipe through the wall of 165K building. This SDD requires updating upon resolution.

2. **Requirement:** Underground firewater mains, including valves, hydrants, and fittings, shall be installed, flushed, sterilized, and tested in accordance with the requirements of the NFPA.

Basis: This is to comply with the NFPA requirements to ensure clean water will be available to the fire distribution piping and sprinklers.

How the system meets the requirement: The firewater mains, valves, hydrants, and fittings are installed, flushed, sterilized, and tested prior to operation of the CVD Facility. (Reference construction specification, Section 15300.).

3. **Requirement:** Whenever feasible, all water distribution systems shall be of the looped-grid type providing two-way flow with sectional valving arranged to provide alternated water flow paths to any point in the system.

Basis: Alternate water supplies provide defense in depth.

How the system meets the requirement: The project does not meet this requirement. The project has received a waiver for this requirement (reference DOE Letter No. 98-SNF-181, dated October 5, 1998).

4. **Requirement:** Fire mains are at least 8 in. Sprinkler supply lead-ins are at least 6 in. In no case can the lead-in be smaller than the sprinkler riser. Distribution mains that supply water for domestic and/or process water and will provide water for fire suppression are at least 12 in. in diameter. Sprinkler supply lead-ins are to run under buildings the minimum distance possible. All lead-ins are connected with the sprinkler system at the base of the riser.

Basis: RLID 5480.7 Section 8.1.a. This is a method to ensure that the hydraulic pressure drop does not detrimentally affect the supply of water to combat fire situations.

How the system meets the requirement: The fire mains are 8 in., the lead-ins are 8 in., and the CVDF uses separate water supplies for domestic water and firewater. Supply lead-ins run under the wall of the administrative section of the facility. This is the minimum possible distance under a building. The lead-ins are connected to the sprinkler system at the base of the riser. (Reference drawings H-1-82092, -82094.)

5. **Requirement:** Sprinkler risers shall be located at exterior walls.

Basis: By placing the risers on exterior walls, this reduces the likelihood that they will be inaccessible.

How the system meets the requirement: The sprinkler risers have been designed to be located at the exterior walls. (Reference drawing H-1-82237.)

6. **Requirement:** Outside control valves shall be located, if possible, a minimum distance of 40 ft from the building. Alarm valves shall be located as close as practical to the building entry point.

Basis: Control valves must be located a safe distance from the facility to allow access to them during a fire.

How the system meets the requirement: The outside control valves are located approximately 40 ft from the facility. Alarm valves are located as close as possible to the building entry point in room 110. (Reference drawings H-1-82237, -82092.)

7. **Requirement:** Hydrants shall be provided so that hose lays from hydrants to all exterior portions of a protected building are not more than 275 ft. Hydrants should not be closer than 40 ft to the facility.

Basis: NFPA 24, Paragraph 4.2.2. Hydrants need to be far enough way from a building to allow the fire department access without being too close to a fire. The hose lays need to be adequate to fight fires.

How the system meets the requirement: The hydrants are located greater than the 40 feet from the facility as required by the NFPA 24, paragraph 4-2.2 (the SE hydrant is about 45 feet from the building). The hose lays are not more than 275 ft. (Reference drawing H-1-82092.)

3.1.1.1.5 Automatic Sprinkler System

1. **Requirement:** Sprinkler systems shall be wet-pipe and installed in accordance with NFPA 13. NFPA 13 shall be used to determine the hazard classification for the facility and the water supply requirements.

Basis: NFPA 13 is the required code for the sprinkler system.

How the system meets the requirement: The sprinkler systems are wet-pipe and installed in accordance with NFPA 13. The FHA finding 18.8 discusses the need for additional sprinklers under the walkway to the mezzanine located equipment. This needs to be resolved. NFPA 13 is used to determine the hazard classification for any facility. The hazard classification basis is indicated on Drawings H-1-82237 and H-1-82238.

Water supply requirements are documented in calculation MEI-2288-FP-02 (see SNF-3001).

2. **Requirement:** Hydraulic designs are required for all sprinkler systems. Density curves presented in NFPA 13 shall be used for calculating sprinkler demand for hydraulically designed systems.

Basis: Sprinkler design uses the hydraulic data presented in NFPA 13.

How the system meets the requirement: Hydraulic designs are developed based on calculations MEI-2288-FP-01 and MEI-2288-FP-03 (see SNF-3001). These designs have been implemented via the design media.

3. **Requirement:** Hose stream requirements shall be a minimum of 500 gpm regardless of the hose stream demands. Determination of the adequacy of water supplies is made based on actual flow test measurements gathered using methods in NFPA 13, Appendix B.

Basis: Hose stream measurements use the NFPA requirements.

How the system meets the requirement: A water flow test conducted on February 6, 1999 had a static pressure 112 psig, a flow of 1,110 gpm, and a residual pressure of 92 psig.

3.1.1.1.6 Fire Alarm and Detection Equipment

1. **Requirement:** All fire detection and alarm devices are suitably listed by Underwriters Laboratories (UL) or approved by Factory Mutual. All fire alarm and detection equipment is similar to and compatible with a "Pyrotronics System 3" or equal. A single system is selected for use throughout the site.

Basis: **Instrumentation** and controls need to be appropriately qualified for reliability.

How the system meets the requirement: Specification section 15300 and Submittals 0130 through 0137 comply with this requirement. Pyrotronics equipment is described in Drawing H-1-82244.

2. **Requirement:** Devices and systems shall comply with NFPA 72 as applicable (DOE Order 6430.1A paragraph 1530-8.1).

Basis: DOE Order 6430.1A Section 1530-8.1 NFPA provides standards for functionality.

How the system meets the requirement: Device and systems qualifications are indicated in Specification Section 15300 and Submittals 0130 and 0137, and meet NFPA 72. Where the devices and systems do not comply with DOE Order 6430.1A (see FHA), an exemption/equivalency from the order is obtained.

3. **Requirement:** The FACP shall have the ability to interface with the Hanford Site radio fire alarm reporter (RFAR) boxes.

Basis: The fire alarm control panel (FACP) must have the ability to interface with the Hanford Site RFAR boxes in order to send alarm signals to the HFD.

How the system meets the requirement: The FACP is interfaced with the Hanford Site RFAR boxes as shown on Drawing H-1-82244, sheet 4.

3.1.1.1.7 System Features

1. **Requirement:** The fire alarm system shall have the following basic features: transmission of signals to the 200 Area fire department alarm center, local alarms for the building or zone in alarm, transmission of troubled signals as required by NFPA 72, appropriately sized, emergency 60-hour battery for system operation, and electronic supervision of all circuits as required by the appropriate NFPA standard.

Basis: Alarm systems are to be adequate to alert personnel that a fire situation may or does exist.

How the system meets the requirement: All fire alarm systems have the following basic features: transmission of signals to the 200 Area fire department alarm center; local alarms for the building or zone; transmission of trouble signals as required by ANSI/NFPA 72; appropriately sized, emergency 60-hour battery backup for system operation; and electronic supervision of all circuits as required by the appropriate National Fire Protection Association standard. The interface between the FACP and the RFAR is indicated in Drawing H-1-82244. However, the RFAR is site-furnished and installed equipment. The signals displayed on the FACP and the battery backup are shown on Drawing H-1-82244 and indicated in the Specification Section 16720.

2. **Requirement:** Provide supervisory devices for all critical functions (valve position switches, water level, and temperature) shall be provided.

Basis: Displays are provided to give personnel information regarding the status and capabilities to combat fires.

How the system meets the requirement: Supervisory devices for all critical functions (valve position switches, water level, and temperature) are provided (reference drawing H-1-82244). The fire water control valve in the 190-KW basement is not alarmed; it is chained and locked. However, this is not considered to be within the facility.

3. **Requirement:** Bypass test switches shall be provided for all smoke detectors that operate dampers, shut down HVAC equipment, or trip pre-action systems.

Basis: Automatic functioning of key equipment requires periodic testing.

How the system meets the requirement: Bypass test switches for all smoke detectors that operate dampers, shut down HVAC equipment, or trip pre-action systems are provided. Test switches are provided as indicated on Drawing H-1-82244.

4. **Requirement:** Capability shall be provided for annunciating at least three separate conditions: 1) fire alarm, 2) supervisory alarm, 3) trouble signal indicating a fault in either of the first two conditions; annunciation of each condition shall be separate and distinct from the other two.

Basis: Each condition must have separate and distinct sound in order for the operations crew to know what alarm is activated. The three conditions are necessary in order for the operations crew to know what reaction is required.

How the system meets the requirement: The FACP and the RFAR have the capability of annunciating at least three separate conditions: (1) fire alarm, (2) supervisory alarm, (3) trouble signal indicating a fault in either of the first two conditions; annunciation of each condition is separate and distinct from the other two. The details of the components used are found in Submittal 0238.

5. **Requirement:** A FACP must be provided that has the ability to transmit subsequent soundings of fire alarm panel supervisory signals.

Basis: Personnel are to be notified when fire response related actions are in process.

How the system meets the requirement: A FACP that has the ability to transmit subsequent soundings of fire alarm panel supervisory signals is provided. The interface between the FACP and the RFAR is detailed in Drawing H-1-82244 and Specification Section 16720, Part 2.

3.1.1.1.8 Fire Alarm Equipment

1. **Requirement:** Alarms that respond to the flow of water shall be provided wherever a sprinkler system is installed and complies with requirements of the NFPA standard for the type of signaling system used (DOE Order 6430.1A, Paragraph 1530-8.2.2).

Basis: This satisfies the NFPA requirement.

How the system meets the requirement: Alarms that respond to the flow of water are provided wherever a sprinkler system is installed and complies with requirements of the NFPA standard.

2. **Requirement:** A manual fire notification method, such as manual fire alarm boxes shall be provided and located in accordance with the appropriate NFPA standard.

Basis: This satisfies the NFPA requirement.

How the system meets the requirement: Pull boxes are installed as required by ANSI/NFPA 101 and are shown on Drawing H-1-82244.

3.1.1.1.9 Automatic Fire Detection System

1. **Requirement:** Automatic fire detectors and their spacing and location shall comply with the requirements of NFPA 72. Spacing shall be based on threshold fire size, growth rate, and ceiling height as described in the standard.

Basis: This satisfies the NFPA requirement.

How the system meets the requirement: Fire detector requirements are outlined in Specification Section 16720, Paragraph 1.4.3, and meets NFPA 72. Detector spacing is in accordance with NFPA 72 and is shown on Drawing H-1-82244.

2. **Requirement:** Smoke detectors shall be installed in all areas. Smoke detectors shall be photoelectric type as described in NFPA 72.

Basis: Smoke detectors provide indications of fires when personnel are not in an area.

How the system meets the requirement: While smoke detectors are required to be of a photoelectric type as described in NFPA 72, the ionization type has been specified (Submittal 238). Correspondence from fire protection engineer C. Myott states that ionization type is acceptable as an equivalent.

3.1.1.1.10 Fire Barriers

1. **Requirement:** Walls separating the process bays shall be made from pre-cast concrete panels, steel framing, and noncombustible materials in a fire-rated configuration.

Basis: The walls are used to separate and keep a fire in a local area within the CVDF.

How the system meets the requirement: Walls separating the process bays are made from pre-cast concrete panels, steel framing, and noncombustible materials in a fire-rated configuration. Details of construction are shown on Drawing H-1-82125, Cold Vacuum Drying Facility Structural Pre-cast Panels. The FHA finding 18.4 discusses the need for additional fire barrier between the process bays; this needs to be resolved.

2. **Requirement:** All closable openings in firewalls and ventilation systems penetrating rated fire separations shall be provided with fire doors or fire dampers of the appropriate ratings in accordance with NFPA 90A.

Basis: Fire doors or dampers cannot defeat the fire rating of a firewall or ventilation system.

How the system meets the requirement: All closable openings in firewalls and ventilation systems penetrating rated fire separations are provided with fire doors or fire dampers of the appropriate ratings in accordance with NFPA 90A. There is only one penetration in a fire-rated wall; door 32 is fire-rated to the appropriate rating (reference drawing H-1-82112).

3. **Requirement:** Penetrations in fire-rated separations shall be sealed with fire-rated materials that have been tested in accordance with ASTM E-119, and listed UL or approved Factory Mutual. All sealing materials shall be suitable for the fire rating of the wall, floor, or ceiling and listed for use with the applicable building materials and the penetration configuration.

Basis: The penetrations cannot defeat the fire rating in a wall, floor, or ceiling.

How the system meets the requirement: A fire stopping sealant is specified by brand name, which is approved by UL.

3.1.1.2 SAR Functional Requirements. This system has no FSAR functional requirements listed in Chapter 4 of the CVD Facility FSAR. Operational safety requirements are discussed in FSAR Chapter B11.4. It is noted that there are some "TBDs" in this section pending the resolution of findings contained in the FHA.

3.1.1.3 Environmental Requirements. There are no environmental requirements for this system.

3.1.1.4 Mission-Critical Requirements. There are no mission-critical requirements for the system.

3.1.1.4.1 General Requirements. General requirements are presented by system in Section 3.1.2.

3.1.2 Subsystem and Major Components

The FPS consists of pumps, valving, instrumentation, and controls that route the firewater throughout the CVD Facility.

3.1.3 Boundaries and Interfaces

System Boundaries

The FPS location and boundaries include the facility sprinkler system in all occupied areas, manual fire extinguishers in occupied areas, a standalone fire alarm system, and a fire riser loop around the outside of the CVD Facility. The CVD Facility incorporates noncombustible materials into the design as much as possible to reduce or eliminate the facility fire load.

3.1.3.1 System Interfaces

The FPS has the following interfaces with the CVD Facility:

- FPS interfaces include a tie-in to the service water main in the 190KW cross-tie,
- CVD Facility RFAR to the 200 Area system (SDD SNF-3065),
- Facility heating, ventilation, and air conditioning (HVAC) system for fire dampers and HEPA filters over-temperature protection (SDD SNF-3081),
- Facility HVAC system for control of fan motors upon initiation of smoke detector alarm (SDD SNF-3081),
- Facility piped systems for floor drains (SDD SNF-3073) and fire suppression distribution loops,
- Facility electrical distribution system for normal operation power and uninterruptible power supply (UPS) for the alarm system (SDD SNF-3075).

3.1.4 Codes, Standards, and Regulations

3.1.4.1 Code of Federal Regulations (CFR)

- 10 CFR 830.120, "Quality Assurance"
- 29 CFR 1910.120, "Occupational Safety and Health Standards."

3.1.4.2 American Society of Mechanical Engineers (ASME)

- B16.5, Pipe Flanges and Flanged Fittings (ANSI-approved)
- B16.10, Face to Face and End to End Dimensions of Valves
- B16.11, Forged Steel Fittings, Socket-Welding and Threaded (ANSI-approved)
- B16.21, Nonmetallic Flat Gaskets for Pipe Flanges
- B16.25, Buttwelding Ends
- B16.34, Valves Flanged, Threaded, and Welding End
- B16.39, Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300 (ANSI-approved)
- B31.3, Process Piping Code, Category M

3.1.4.3 American Society of Nondestructive Testing

- SNT-TC-1A, Recommended Practice

3.1.4.4 American Society for Testing and Materials (ASTM)

- A36, Standard Specification for Structural Steel
- A105, Standard Specification for Forgings, Carbon Steel, for Piping Components
- A269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
- A276, Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes
- A312/312M, Standard Specification for Seamless and Welded Austenitic Stainless Steel Pipes

- A354, Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs and Other Externally Threaded Fasteners
- A403, Standard Specification for Wrought Austenitic Stainless Steel Piping Fittings
- A480, Standard Specification for General Requirements for Flat-Rolled Stainless Heat-Resisting Steel Plate, Sheet, and Strip
- A500, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- A563, Standard Specification for Carbon and Alloy Steel Nuts

3.1.4.5 American Welding Society (AWS)

- D1.1, Structural Welding Code - Steel

3.1.4.6 DOE Standards

All FPS valves, components, instrumentation, controls, and support structures required to perform the general services are designed and qualified for performance category 2 as defined in DOE-STD-1020. Anchorage for those portions of the system that, upon failure, could impact the performance and function of safety-significant or safety-class equipment are designed and qualified for performance category 3 as defined in DOE-STD-1020.

3.1.4.7 National Equipment Manufacturers Association (NEMA)

- 250, Enclosures for Electrical Equipment

3.1.4.8 National Fire Protection Association (NFPA)

- NFPA 13, *Standard for the Installation of Sprinkler Systems*
- NFPA 70, *National Electrical Code*
- NFPA 72, *National Fire Alarm Code*
- NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*
- NFPA 101, *Code for Safety to Life from Fire in Buildings and Structures*
- NFPA 1221, *Installation Maintenance and Use of Public Fire Service Communication Systems*
- NFPA 1963, *Standard for Screw Threads and Gaskets for Fire Hose Connections*
- UL, *Electrical Appliance and Utilization Equipment Directory*
- UL, *Electrical Construction Materials Directory*
- UL, *Fire Protection Equipment Directory*
- UL, *Fire Resistance Directory*
- WAC 246-290, "Public Water Supplies."

3.1.5 Operability

There are no technical safety requirements (TSRs) for the FPS.

3.2 Special Requirements

3.2.1 Radiation and Other Hazards

This section does not apply to this SDD.

3.2.2 ALARA

There are no specific ALARA requirements imposed on the FPS. There is a requirement (reference DRD Section 6.6.4) regarding the containment, routing, and controls placed on floor drains in areas covered by automatic sprinkles. This is related to the waste treatment and handling systems to minimize releases.

3.2.3 Nuclear Criticality Safety

Criticality control is not required for the FPS.

3.2.4 Industrial Hazards

There are no unique industrial hazards requirements not covered by National Codes and Standards.

3.2.5 Operating Environment and Natural Phenomena

All FPS components are designed to function under worst case internal and external environmental conditions (excluding seismic conditions). The FPS is seismically qualified for performance category 2. It is protected from high winds and tornadoes by the structure of the CVD Facility. Flooding, lightning, and snow load projection are provided by the placement and design of the CVD Facility.

3.2.6 Human Interface Requirements

With the exception of the manual pull box, all FPS operation is automatically controlled through the FACP. Certain manual operations (e.g., turning on the service water) are performed prior to the system being fully functional. There are no unique human interface requirements not covered by National Codes and Standards.

3.2.7 Specific Commitments

All aspects of the FPS are in compliance with the *Hanford Federal Facility Agreement and Consent Order* (Ecology 1994), and in compliance with applicable federal, state, and local laws and American Indian treaty rights.

3.3 Engineering Disciplinary Requirements

3.3.1 Civil and Structural

All FPS valves, components, instrumentation, and controls are required to perform the general service functions and are designed and qualified for performance category 2 as defined in DOE-STD-1020.

3.3.2 Mechanical and Materials

The FPS is designated as general service. To meet the general service requirements, the FPS is designed and tested to the following standards:

3.3.2.1 AWWA C651, Disinfecting Water Mains

3.3.2.2 FM, Factory Mutual System Approval Guide

- A-A-1922A, *Shield, Expansion (Caulking Anchors, Single Lead)*
- A-A-1923A, *Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)*
- A-A-1924A, *Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)*
- A-A-1925A, *Shield, Expansion (Nail Anchors)*
- A-A-1556A, *Sealing Compound (Elastomeric Joint Sealant)*
- A-A-55614, *Shield, Expansion (Non-Drilling Expansion Anchors)*
- A-A-55615, *Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)*
- UBC, *Uniform Building Code*

3.3.2.1 Materials Requirement. The materials of construction for the various general service components of the fire protection and detection system meet the following requirements as defined by the construction specification.

American Society for Testing and Materials (ASTM)

- ASTM A135, *Standard Specification for Electric-Resistance-Welded Steel Pipe*
- ASTM A536, *Standard Specification for Ductile Iron Castings*
- ASTM A568, *General Requirements for Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled, and Cold Rolled*

Federal Specification

- A-A-1922A, *Shield, Expansion (Caulking Anchors, Single Lead)*
- A-A-1923A, *Shield, Expansion (Lag, Machine and Externally Threaded Wedge Bolt Anchors)*
- A-A-1924A, *Shield, Expansion (Self Drilling Tubular Expansion Shell Bolt Anchors)*
- A-A-1925A, *Shield, Expansion (Nail Anchors)*
- A-A-55614, *Shield, Expansion (Non-Drilling Expansion Anchors)*
- A-A-55615, *Shield, Expansion (Wood Screw and Lag Bolt Self Threading Anchors)*

3.3.3 Chemical and Process

This section does not apply to this SDD.

3.3.4 Electrical Power

All FPS detection and alarm wiring to the FACP are per NFPA 70 to meet general service requirements. All FACP interfaces with the CVD Facility electrical system are through dedicated hard-wired circuits, with connections to the facility single-phase 120 V (ac) electrical as needed. All wiring is installed per NFPA 70.

3.3.5 Instrumentation and Control

The FPS interfaces with the facility monitoring and control system. It is a standalone system with a dedicated control panel and UPS and a RFAR.

All FPS power is non-safety, supplied by the facility power grid. Isolation from power transients and failures is provided such that detection functions are accomplished under power loss or transient conditions. Upon failure of the building power supply, UPS is automatically activated.

The fire detection inputs and outputs are located as follows.

- Smoke ionization type: one in each regularly occupied room.
- Detectors: five in process bays 2 through 5, five in the transfer corridor, and one on the second floor of process bay 1. Hallways in the administrative area have at least one each.
- Pull boxes: Manual fire alarm located at each personnel egress door (including process bay 1) in the process and administrative areas. Manual pull boxes are the only components of the FPS that could be considered local control.
- Fire gongs: Located in each process bay (including process bay 1) at the entrance with strobe and three in the transfer corridor. In the administrative section, there is one in each of the restrooms and at least one in each hallway.

The FACP displays only an indication of the state of the monitored signal source. For example, there is no volumetric indication of firewater flow; it is either flowing or not. Smoke detector activation is indicated by zone.

No engineering units are used and no values are displayed on the FACP. There is only an indication of the state (on or off) of the monitored condition. This is true during both upset and emergency conditions.

Fire detection equipment is standardized throughout the facility.

3.3.6 Computer Hardware and Software

General service computer hardware and software are covered under the SDD for computer software design description (CSDD) for the Monitoring and Control System (MCS) (SDD SNF-3090).

3.3.7 Fire Protection

The fire protection requirements are discussed throughout this SDD. Refer to Section 3.1.4.8 for the fire protection codes that must be met.

3.4 Testing And Maintenance Requirements

3.4.1 Testability

The requirements for the testability of the FPS are dictated by the individual components as directed by the test specification, construction specification, and operating manuals. No unique testability requirements are identified.

3.4.2 Technical Safety Requirement-Required Surveillance

There are no TSR required surveillances for the FPS.

3.4.3 Non-Technical Safety Requirement Inspections and Testing

The FPS is designed to operate through the design life (five years) of the facility without regularly scheduled facility shutdowns for maintenance. System maintenance activities are limited to maintenance due to failures. Additional maintenance activities and procedures are scheduled if system surveillance, testing, or maintenance identifies additional requirements. All maintenance is performed under controlled procedures using approved (by HFD) equipment and materials. Only spare parts meeting design criteria are procured and used. The fire protection equipment is designed for efficient maintainability. Surveillance, testing, and maintenance of the system is performed by the HFD. Periodic testing is performed with the system on line and fire department personnel present.

3.4.4 Maintenance

The FPS is designed to operate through the design life of the equipment (five years) without regularly scheduled facility shutdowns for maintenance. System maintenance activities are limited to maintenance due to failures. Additional maintenance activities and procedures may be scheduled if additional requirements are identified by system surveillance.

3.5 Other Requirements

3.5.1 Security and Special Nuclear Material Protection

This section does not apply to this SDD.

3.5.2 Special Installation Requirements

This section does not apply to this SDD.

3.5.3 Reliability, Availability, and Preferred Failure Modes

The actual life of the project is scheduled to be three years and the design life is scheduled for five years. Adequate spare parts per the maintenance manuals are on hand to handle any downtime situation in a timely manner.

3.5.4 Quality Assurance

The fire prevention system fabrication quality assurance/control program is based on the Master Equipment List (SNF-4148) and application of a graded approach as described in the Project Hanford Quality Assurance Program Description (HNF-MP-599).

3.4.5 Miscellaneous

A conceptual decontamination and decommissioning plan for the CVDF, as identified in the guidelines of DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, is included in HNF-SD-SNF-SAR-002.

4.0 SYSTEM DESCRIPTION

4.1 Configuration

4.1.1 Description of System, Subsystems, and Major Components

There is one FPS that services all of the process bays, the tank room, and the administrative area. That system includes the following components:

- Supply water from 190-KW tunnel
- Fire hydrants external to the facility
- Fire detectors
- Sprinklers
- Manual fire extinguishers
- Manual pull box fire alarms
- Ventilation duct heat detectors
- Fire alarm control panel
- Radio fire alarm reporter

Components (piping, instruments, and electrical conduit) are mounted to the facility walls and floor as required. The FPS is configured as described in the following paragraphs (see Figure 4-1 for a general layout of the FPS).

Firewater is received from existing firewater supplies in the 100-K Area. The CVD Facility 8-in. fire water line ties into the existing 24-in. 100-K Area line in the 190-KW tunnel. The water travels approximately 250 ft with little elevation gain before connecting to the riser in Room 110 of the CVD Facility. From the riser the water is distributed by headers to three primary areas: the administrative area, the transfer corridor, and the process bays.

Firewater is delivered to the administrative area in a 3-in. header. Sprinkler branches off the header vary in size from 1.5 in. to 1 in. depending on location.

Firewater is delivered to the first floor bay and process corridor in separate 3-in. and 4-in. headers. The first floor process bay header is routed along the west side of the bays running through each bay and terminating just short of process bay 1. There are two sprinkler branches varying from 1.5 in. to 1 in. in size along the north and south walls of each process bay. There are no sprinklers at the first floor level in process bay 1.

The 3-in. transfer corridor header is centered along the length of Room 116. From this, 1.25-in. and 1-in. branches supply sprinklers in each room and the tank room.

Figure 4-1 General Layout

4.1.2 Boundaries and Interfaces

4.1.2.1 See Section 3.1.3

4.1.3 Physical Location and Layout

The fire water supply connection comes into the fire riser mechanical room (room 110) as shown on Drawing H-1-82237. The FACP is located in room 109 and shown on Drawing H-1-82244. The FACP provides indications, alarms, and signals to site and other fire response functions. Remote indication is accomplished by use of a radio fire alarm reporter (RFAR).

4.1.4 Principles of Operation

The FPS serves two primary purposes. First, the room ionization detectors and the heat sensors in the ventilation ducts serve to warn occupants of a fire. Second, the wet-pipe sprinklers, external fire hydrants, and manual fire extinguishers limit property losses. Together, the components limit personnel exposure to contaminants.

The fire detection (or alarm) system is powered by 120 V (ac) from the building power supply. Both the FACP and the RFAR are on dedicated circuits and both have an UPS. After completion of installation and testing, the fire detection system requires only periodic testing by the HFD. User interface is limited to the static displays on the FACP. These displays include indication of water flow and alarm status by zone. Also shown is the status of the UPS, tamper switches, HVAC fan motors, and the RFAR.

There are three separate means of detecting fires. In each instance of detection, the resulting alarm is the same. There are 12 alarm locations. At each location, there is a 92 DBA gong accompanied by a minimum 75-candela strobe. Alarms are located in hallways, process bays, both restrooms, and at the facility entry.

Fire alarms are initiated by ionizing smoke detectors, rate of rise heat detectors in ventilation ducts, and manual pull boxes.

The ionization principal fire detectors are manufactured by Cerberus Pyrotronics, Model DI-3. The detectors respond to the first traces of fire in the form of visible smoke or invisible products of combustion. The detectors have dual ionization chambers. One chamber detects the presence of combustion products; the second chamber serves as a reference to stabilize the detector's sensitivity for changes in environmental conditions.

As products of combustion enter the sampling chamber, the chamber current is reduced, producing a voltage change. At the time the voltage range exceeds the predetermined threshold, the alarm is signaled to the control unit. The detector locks in upon alarm and must be reset from the control panel. Detector sensitivity is preset at the factory.

The DI-3 detector is designed for open area protection in areas with air velocities up to 300 fpm. Fire detection (alarm) zones are shown in Table 4-1.

Table 4-1. Fire Detection Zones

Zone	Area covered	Alarm type
1	Water flow	Flow alarm switch
2	Manual stations	Manual fire alarm boxes
3	Tank room	Ionization detection
4	Process bay 1	Ionization detection
5	Process bay 2	Ionization detection
6	Process bay 3	Ionization detection
7	Process bay 4	Ionization detection
8	Process bay 5	Ionization detection
9	Transfer corridor	Ionization detection
10	Office area	Ionization detection
11	Mechanical room (second floor)	Ionization detection
12	Spare	None
13	Spare	None
14	Spare	None
15	Tamper switches	PIV and fire alarm cabinet

PIV = post indicative valve.

Rate-compensated fire detectors are provided in the ductwork upstream of the HEPA filter housings in the general and local exhaust systems. Each fire detector is set at 190 °F. This temperature setting ensures that no damage to the filters results from exposure to excessive heat. These detectors detect slow or fast rate fires, but do not give false alarms for temperature surges below the 190 °F setpoint. Upon activation of a duct fire detector, an alarm is sent to the FACP, the appropriate exhaust fan shuts down, and the respective isolation dampers close.

Manual pull stations are located on the latch side of all personnel egress doors. At the main entrance, the pull station is located just inside the vestibule on the south wall.

The manual fire stations are manufactured by Cerberus. Model MS-501 is used in all applications. The boxes require a double action to activate; the initiator is required to push in a tab, then the actuating lever is pulled down. After activation, the lever is locked in the "down" position. Restoring the system to normal can only be accomplished by opening the cover of the

hinged housing and then opening, closing, and locking the cover.

In the event a manual pull box is activated, the building alarms sound. No sprinklers are activated unless the thermal link in an individual sprinkler is melted. The RFAR transmits this information to the HFD.

The primary means of fire protection within the facility is the wet-pipe sprinkler system. Manual extinguishers are available to supplement the sprinklers as required. Fire hydrants are available for protection from external fires.

Sprinklers are provided throughout the facility in accordance with NFPA 13. The Operational Support Area (administrative section) is designed for ordinary hazard Group 2, while the process bays and process bay support area (transfer corridor) is designed for ordinary hazard Group 2.

Three types of sprinklers are used: upright, pendent, and recessed pendent. All are automatically actuated using a fusible link that melts at its rated temperature. All sprinklers are set to activate between 165 °F and 212 °F. Individual sprinkler distribution areas comply with NFPA 13.

In the event of a fire, the thermal fusible link in each sprinkler head melts, releasing water. A water flow alarm sounds at the FACP and, if water flow is sufficient, a motor gong is activated at the fire riser in Room 110. Fire detectors near the fire activate the building alarms and the RFAR. Building occupants evacuate in accordance with the building evacuation plan. The RFAR communicates with the HFD, transmitting the location and type of alarm.

Manual fire extinguishers are provided in each of the process bays, including bay 1, along the west wall of the transfer corridor, at the north and south ends of the mechanical equipment room, and in each of the main corridors of the administrative section. All fire extinguishers are listed in the current *Fire Protection Equipment Directory* (UL 1994c).

Two fire hydrants are provided on the exterior of the facility: one at the southeast corner and the other at the northwest corner of the building. Hydrants are provided so that hose lays to all portions of the building are no more than 275 ft long. Available flow into the facility is 890 gpm; required flow is 869 gpm. Both fire hydrants are listed in the current *Fire Protection Equipment Directory* (UL 1994c).

4.1.5 System Reliability

The FPS is designed to be highly reliable in its operation and to not require regularly scheduled maintenance. The FPS is designed to stay in operation throughout the process operations period for the CVD Facility. The FPS is designed to provide all services required for operation of the safety-class components identified for the system.

4.1.6 System Control Features

The FPS operates in a passive mode with no operator interface under normal conditions. Setpoints are built in with equipment type and are not adjustable by building occupants.

4.1.6.1 System Monitoring.

The FPS contains instrumentation and alarms that monitor system parameters.

4.1.6.2 Setpoints and Ranges

4.1.6.1.1 Operating Limits

Equipment, components, and systems that comprise the FPS have been selected to perform specific functions. The following absolute operating limits must be complied with to maintain functionality and confidence in the operability of the system. Violation of any of these limitations requires the restoration of the affected service prior to return of active service of the FPS.

- Facility power cannot be out for more than 60 hours. Battery backup in the FACP is limited to 60 hours.
- Firewater supply pressure cannot fall to less than 103 psig at the 190-KW tunnel tap in location.

Precautions

System controls and presets preclude violation of system and component limitations under normal conditions. Operations beyond normal conditions require inspection of the affected components to determine if operation limits have been exceeded. Items of special concern are noted in the operations manuals provided by the fabricator for the respective equipment and are integrated into the normal periodic testing procedures by the HFD.

4.2 Operations

4.2.1 Initial Configurations (Pre-startup)

A Test specification will be developed identifying the requirements for all testing associated with this system. This specification will address factory acceptance tests (FATS) and construction acceptance tests (CATS), and pre-startup tests.

4.2.2 System Startup

Startup, alignment, prerequisite testing, and formal start up activities will be identified in the test specification.

4.2.3 Normal Operations

Normal operation of the EFS is described in Section 4.1.4.

Operational procedures providing detailed information on operating modes and activities (including alarm response, shutdown, etc.) will be developed.

4.2.4 Off-Normal Operations

The only identified off-normal event would be if the fire suppression system fails to turn off after initiation. This event would eventually cause the retention basin to overflow. Manual intervention is required in this case, and the appropriate actions will be identified in the alarm response procedures.

4.2.5 System Shutdown

There is no emergency shutdown of the FPS. Once in operation, the system is only shut down by the HFD.

4.2.6 Safety Management Programs and Administrative Controls

The necessary administrative controls procedures will be developed and incorporated into the operating procedures to prevent manually draining contaminated water from a sump to the retention basin.

These controls and procedures are in accordance with the Spent Fuel Integrated Safety Management Plan.

4.3 Testing And Maintenance

4.3.1 Temporary Configurations

The FPS cannot be placed in a temporary configuration. If this is not feasible, the facility cannot be operated until the FPS can be returned to normal configuration.

4.3.2 Technical Safety Requirement-Required Surveillances

No TSR surveillances are applicable to this system.

4.3.3 Non-Technical Safety Requirement Inspections and Testing

Non-TSR inspections and testing are to be conducted while the system is in service and performed per the equipment manufacturer's recommendations. Per the operations manuals, surveillance is incorporated into the FPS operating procedures. Operators are to report all occurrences to their supervisors who then initiate an occurrence investigation. The FPS is designed to enable both manual and electronic inspection of the system and its component and supporting system equipment.

Operational safety requirements are discussed in FSAR Chapter B11.4. It is noted that there are some "TBDs" in this section pending the resolution of findings contained in the FHA.

4.3.4 Maintenance

The FPS is designed to operate through the design life of the equipment (five years) without regularly scheduled facility shutdowns for maintenance. System maintenance activities are limited to maintenance due to failures. Additional maintenance activities and procedures are scheduled as required by HFD procedures. All maintenance is performed under controlled procedures using approved (HFD qualified) equipment and materials. Only spare parts meeting design criteria are procured and used. The equipment is designed for efficient maintainability. The surveillance, testing, and maintenance of the system is achieved at minimum cost and level of support services per DOE Order 6430.1A, Section 1300-12.4.10.

4.3.5 Equipment Calibration

All equipment must be calibrated and recalibrated according to HFD procedures. Calibration and test connections are provided to enable in-service testing and calibration when practical.

Appendix A
Source Documents

INDUSTRY STANDARDS AND CODES

ASME B31.1, 1995, *Power Piping Code*, American Society of Mechanical Engineers, New York, New York.

AWS-D1.1, 1994, *Structural Welding Code Steel*, American Welding Society, Miami, Florida.

AWWA C151/A21.51-96, 1996, *Ductile-Iron Pipe, Centrifuge Cast, for Water*, American Water Works Association, Denver, Colorado.

NFPA 13, 1996, *Standard for the Installation of Sprinkler Systems*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 24, 1995, *Standard for the Installation of Private Fire Service Mains and their Appurtenances*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 70, 1996, *National Electrical Code*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 72, 1996, *National Fire Alarm Code*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 80, 1995, *Standard for Fire Doors and Fire Windows*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 90A, 1993, *Standard for the Installation of Air Conditioning and Ventilating Systems*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 101, 1997, *Life Safety Code*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 252, 1995, *Standard Methods of Fire Tests of Door Assemblies*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 801, 1995, *Standard for Facilities Handling Radioactive Materials*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 1963, 1995, *Standard for Screw Threads and Gaskets for Fire Hose Connections*, National Fire Protection Association, Quincy, Massachusetts.

ASTM A135, 1993, *Standard Specification for Electric-Resistance-Welded Steel Pipe*, American Society for Testing and Materials, West Conshohocken, Pennsylvania.

ASTM A536, 1984 (R 93), *Standard Specification for Ductile Iron Castings*, American Society for Testing and Materials, West Conshohocken, Pennsylvania.

ASTM A568/A568M, 1997, *General Requirements for Standard Specification for Steel, Sheet*,

Carbon, and High-Strength, Low-Alloy, Hot-Rolled, and Cold Rolled, American Society for Testing and Materials, West Conshohocken, Pennsylvania.

ASTM E119, 1995, *Fire Tests of Building Construction and Materials*, American Society for Testing and Materials, West Conshohocken, Pennsylvania. (See also ANSI/NFPA 25.)

ASTM E152, 1981, *Standard Methods Fire Test for Door Assembly*, Rev. A, American Society for Testing Materials, West Conshohocken, Pennsylvania.

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Appendix B
System Drawings

Fire protection system drawings are grouped under eight drawing numbers. The primary drawing title of all drawings is *Cold Vacuum Drying Facility*. The secondary title, drawing numbers, and numbers of applicable sheets with each subpackage are as listed in Table B-1 along with some general CVD Facility drawings related to fire protection. Complete sets of facility drawings are located with the Spent Nuclear Fuel Project files for the CVD Facility project.

Table B-1. Fire Protection Drawings.

Drawing No.	Title	Sheet No.
General		
H-1-82090	Drawing List and Vicinity Map	1
H-1-82092	Civil Site Plan, Legend	1
H-1-82094	Civil Site Utility Details	1
H-1-82112	Architectural Door Schedule, Details	1
H-1-82125	Structural Precast Panels	1
Mechanical/piping		
H-1-82237	Fire Protection, First Floor Plan	1
H-1-82238	Fire Protection, Second Floor Plan	1
H-1-82239	Fire Protection Sections	1
H-1-82240	Fire Protection Details	1
Electrical		
H-1-82244	Electrical First Floor Fire Alarm Plan	1
H-1-82244	Electrical Second Floor Fire Alarm Plan	2
H-1-82244	Electrical Fire Alarm Control Panel	3
H-1-82244	Electrical Fire Alarm Wiring Diagrams	4
H-1-82246	Electrical Service Area One-Line Diagram	1
H-1-82247	Electrical Service Area Panel Schedules	3
H-1-82280	Electrical Wire Run List and Cnd. Schedule	3
H-1-82280	Electrical Wire Run List and Cnd. Schedule	4

Appendix C
System Procedures

Operating and maintenance procedures will be developed.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Technical Integration	Date June 14, 1999
Project Title/Work Order <i>EDT-626313</i> SNF-3061, SNF-3066(SNF-3067) SNF-3072, SNF-3073, SNF-3074, SNF-3077(SNF-3078, SNF-3079, SNF-3080, SNF-3081) <i>on EDT-626311</i>		EDT No. 626308 <i>626311</i> ECN No. NA

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
W. C. Alaconis	R3-86	X			
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CVD Project File	R3-86	X			
SNF Project File	R3-11	X			