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7.0 FIRE SAFETY

This chapter documents the National Enrichment Facility (NEF) fire safety program. The fire safety program is intended to reduce the risk of fires and explosions at the facility. The fire safety program documents how the facility administers and ensures fire safety at the facility.

The NEF fire safety program meets the acceptance criteria in Chapter 7 of NUREG-1520 (NRC, 2002) and is developed, implemented and maintained in accordance with the requirements of 10 CFR 70.62(a) (CFR, 2003a), 10 CFR 70.22 (CFR, 2003b) and 10 CFR 70.65 (CFR, 2003c). In addition, the fire safety program complies with 10 CFR 70.61 (CFR, 2003d), 10 CFR 70.62 (CFR, 2003a) and 10 CFR 70.64 (CFR, 2003e). NUREG/CR-6410 (NRC, 1998), NUREG-1513 (NRC, 2001) NRC Generic Letter 95-01 (NRC, 1995) and NFPA 801 (NFPA, 2003) were utilized as guidance in developing this chapter.

The information provided in this chapter, the corresponding regulatory requirement and the section of NUREG-1520 (NRC, 2002), Chapter 7 in which the Nuclear Regulatory Commission (NRC) acceptance criteria are presented is summarized below:

Information Category and Requirement	10 CFR 70 Citation	NUREG-1520 Chapter 7 Reference
Section 7.1 Fire Safety Management Measures	70.62(a), (d) & 70.64(b)	7.4.3.1
Section 7.2 Fire Hazards Analysis	70.61(b), (c) & 70.62(a)&(c)	7.4.3.2
Section 7.3 Facility Design	70.62(a), (c) & 70.64(b)	7.4.3.3
Section 7.4 Process Fire Safety	70.64(b) & 70.64(b)	7.4.3.4
Section 7.5 Fire Protection and Emergency Response	70.62(a), (c) & 70.64(b)	7.4.3.5

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7.1 FIRE SAFETY MANAGEMENT MEASURES

Fire safety management measures establish the fire protection policies for the site. The objectives of the fire safety program are to prevent fires from starting and to detect, control, and extinguish those fires that do occur. The fire protection organization and fire protection systems at the NEF provide protection against fires and explosions based on the structures, systems, and components (SSC) and defense-in-depth practices described in this chapter. Fire barriers and administrative controls are considered fire protection items relied on for safety (IROFS).

7.1.1 Fire Protection IROFS

IROFS associated with fire protection are specified in the NEF Integrated Safety Analysis Summary.

7.1.2 Management Policy and Direction

Louisiana Energy Services (LES) is committed to ensuring that the IROFS, as identified in the ISA Summary, are available and reliable, and that the facility maintains fire safety awareness among employees, controls transient ignition sources and combustibles, and maintains a readiness to extinguish or limit the consequences of fire. The facility maintains fire safety awareness among employees through its General Employee Training Program. The training program is described in Chapter 11, Management Measures.

The responsibility for fire protection rests with the Health, Safety & Environment (HS&E) Manager who reports directly to the Plant Manager. The HS&E Manager is assisted by the Industrial Safety Manager, whose direct responsibility is to ensure the day-to-day safe operation of the facility in accordance with occupational safety and health regulations, including the fire safety program. Fire protection engineering support is provided by the engineering manager in Technical Services. The personnel qualification requirements for the HS&E Manager and the Industrial Safety Manager are presented in Chapter 2, Organization and Administration.

The Industrial Safety Manager is assisted by fire safety personnel who are trained in the field of fire protection and have practical day-to-day fire safety experience at nuclear facilities. The fire protection staff is responsible for the following:

- Fire protection program and procedural requirements
- Fire safety considerations
- Maintenance, surveillance, and quality of the facility fire protection features
- Control of design changes as they relate to fire protection
- Documentation and record keeping as they relate to fire protection
- Fire prevention activities (i.e., administrative controls and training)
- Organization and training of the fire brigade
- Pre-fire planning.

The facility maintains a Safety Review Committee (SRC) that reports to the Plant Manager. The SRC performs the function of a fire safety review committee. The SRC provides technical and administrative review and audit of plant operations including facility modifications to ensure that fire safety concerns are addressed.

Engineering review of the fire safety program is accomplished by configuration management and the SRC. Configuration management is discussed in Chapter 11, Management Measures, and the SRC is discussed in Chapter 2, Organization and Administration.

The subject matter discussed in Section 7.1.2 is essentially the same as the subject matter discussed in the Claiborne Enrichment Center Safety Analysis Report (LES, 1993). The NRC staff previously reviewed the Claiborne Enrichment Center SAR (LES, 1993) relative to Management Policy and Direction (Program Management) and concluded that the descriptions, specifications or analyses provided an adequate basis for safety review of the facility operations and that the construction and operation of the facility would not pose an undue risk to public health and safety. The specific discussion on Management Policy and Direction (Program Management) is discussed in NUREG –1491 (NRC, 1994), Section 4.6.

7.1.3 Fire Prevention

Administrative controls are used to maintain the performance of the fire protection systems and delineate the responsibilities of personnel with respect to fire safety. The primary fire safety administrative controls are those that relate to fire prevention. These fire prevention controls, in the form of procedures, primarily control the storage and use of combustible materials and the use of ignition sources. These controls include, but are not limited to, the following:

- Governing the handling of transient combustibles in buildings containing IROFS, including work-generated combustibles
- Implementing a permit system to control ignition sources that may be introduced by welding, flame cutting, brazing, or soldering operations
- Ensuring that the use of open flames or combustion-generated smoke for leak testing is not permitted
- Conducting formal periodic fire prevention inspections to (1) ensure that transient combustibles adhere to established limits based on the Fire Hazard Analysis; (2) ensure the availability and acceptable condition of fire protection systems/equipment, fire stops, penetration seals, and fire-retardant coatings; and (3) ensure that prompt and effective corrective actions are taken to correct conditions adverse to fire protection and preclude their recurrence
- Performing periodic housekeeping inspections
- Implementing a permit system to control the disarming of fire detection or fire suppression systems, including appropriate compensatory measures
- Implementing fire protection system inspection, testing, and maintenance procedures.

7.1.4 Inspection, Testing, and Maintenance of Fire Protection Systems

An inspection, testing and maintenance program is implemented to ensure that fire protection systems and equipment remain operable and function properly when needed to detect and suppress fire. Fire protection procedures are written to address such topics as training of the fire brigade, reporting of fires, and control of penetration seals. The facility's Industrial Safety group has responsibility for fire protection procedures in general; with the facility's maintenance section having responsibility for certain fire protection procedures such as control of repairs to facility penetration seals. Refer to Chapter 11, Management Measures, for additional information on procedures and maintenance activities.

The subject matter discussed in Section 7.1.4 is essentially the same as the subject matter discussed in the Claiborne Enrichment Center SAR (LES, 1993). The NRC staff previously reviewed the Claiborne Enrichment Center SAR (LES, 1993) relative to Inspection, Testing, and Maintenance of Fire Protection Systems (Fire Protection Equipment Maintenance) and concluded that the descriptions, specifications or analyses provided an adequate basis for safety review of the facility operations and that the construction and operation of the facility would not pose an undue risk to public health and safety. The specific discussion on Inspection, Testing, and Maintenance of Fire Protection Systems (Fire Protection Equipment Maintenance) is discussed in NUREG –1491 (NRC, 1994), Section 4.6.

7.1.5 Emergency Organization Qualifications, Drills and Training

The qualifications, drills and training of the fire brigade members who are part of the Emergency Organization are in accordance with NFPA 600 (NFPA, 1996i). The primary purpose of the Fire Brigade Training Program is to develop a group of facility employees trained in fire prevention, fire fighting techniques, first aid procedures, and emergency response. They are trained and equipped to function as a team for the fighting of fires.

The Fire Brigade Program provides entrance and educational requirements for fire brigade candidates as well as the medical- and job-related physical requirements. The Fire Brigade Training Program provides for initial training of all new fire brigade members, semi-annual classroom training and drills, annual practical training, and leadership training for fire brigade leaders.

The NEF Emergency Plan also discusses the use of offsite emergency organizations, drills and training.

7.1.6 Pre-Fire Plans

Detailed pre-fire plans will be developed for use by the facility fire brigade.

The pre-fire plans include the location of fire protection equipment, approach paths for fire response, potential hazards in the area, power supply and ventilation isolation means, important plant equipment in the area and other information considered necessary by fire emergency response personnel.

The subject matter discussed in Section 7.1.6 is essentially the same as the subject matter discussed in the Claiborne Enrichment Center SAR (LES, 1993). The NRC staff previously reviewed the Claiborne Enrichment Center SAR (LES, 1993) relative to Pre-Fire Plans and concluded that the descriptions, specifications or analyses provided an adequate basis for safety review of the facility operations and that the construction and operation of the facility would not pose an undue risk to public health and safety. The specific discussion on Pre-Fire Plans is discussed in NUREG –1491 (NRC, 1994), Section 4.6.

7.2 FIRE HAZARDS ANALYSIS

A Fire Hazards Analysis (FHA) has been conducted for the facility including the fire areas and fire zones which if uncontrolled, could release UF_6 in quantity and form that could cause an intermediate or high consequence, as defined in 10 CFR 70.61 (CFR, 2003d). UF_6 is present in the Technical Services Building (TSB), Blending and Liquid Sampling Area, UF_6 Handling Area, Separations Building, Cylinder Receipt and Dispatch Building (CRDB), Centrifuge Test and Post Mortem Facilities in the Centrifuge Assembly Building (CAB) and the UBC Storage Pad.

The FHA develops bounding credible fire scenarios and then assesses the consequences of unmitigated fire.

The FHA for the facility consists of the following:

- A description of the facility's use and function
- The specific fire hazards and potential fire scenarios within the fire areas and fire zones
- The methods of consequence analysis
- The occupancy and construction requirements
- Life safety requirements
- The boundaries of the fire areas and fire zones
- The IROFS affected by the postulated fire scenarios within the fire area
- The facility response to the postulated fires
- Defense or mitigation strategy for overall facility protection.

The results of the FHA are utilized in the Integrated Safety Analysis (ISA) to identify possible fire initiators and accident sequences leading to radiological consequences or toxic chemical consequences resulting from interaction with UF_6.

The FHA is updated and controlled by configuration management as discussed in Chapter 11, Management Measures, to ensure that the information and analysis presented in the FHA are consistent with the current state of the facility. The FHA is reviewed and updated as necessary to incorporate significant changes and modifications to the facility, its processes, or combustible inventories.

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7.3 FACILITY DESIGN

The design of the facility incorporates the following:

- Limits on areas and equipment subject to contamination
- Design of facilities, equipment, and utilities to facilitate decontamination.

7.3.1 Building Construction

The facility consists of several different buildings or functional areas:

- Visitor Center
- Site Security Buildings
- Administration Building
- Technical Services Building (TSB)
- Central Utilities Building (CUB).
- Separations Building (consisting of three Separations Building Modules), which include:

UF_6 Handling Area
Cascade Halls
Process Services Area.

- Cylinder Receipt and Dispatch Building (CRDB)
- Blending and Liquid Sampling Area
- Centrifuge Assembly Building (CAB)
- Centrifuge Test and Centrifuge Post Mortem Facilities (within the CAB)
- UBC Storage Pad
- Fire Water Pump Building.

The Visitor Center, Security Buildings, Administration Building, Fire Water Pump Building and Tanks and CUB are independent of the rest of the plant main buildings. The Visitor Center is located outside of the Controlled Area security fence. The Administration Building, Fire Water Pump Building and the CUB are provided with automatic sprinkler protection. The remaining buildings/areas have no automatic sprinkler protection.

The TSB, Separations Building, CRDB, Blending and Liquid Sampling Area, CAB and Centrifuge Test and Centrifuge Post Mortem Area are pre-cast concrete frame and concrete panel construction with an upside down ballasted roof system over pre-cast concrete tees. This construction is classified as Type I, Unsprinklered in accordance with the New Mexico Building Code (NMBC) (NMBC, 1997) and as Type I Construction by NFPA 220 (NFPA, 1999). The Administration Building, Fire Water Pump Building and the CUB are unprotected steel frame buildings with insulated metal panel exterior walls and with built-up roofing on metal deck roof. This construction is classified as Type III N, Unprotected, Sprinklered in accordance with the NMBC (NMBC, 1997) and as Type II Construction by NFPA 220 (NFPA, 1999). The Visitor

Center and the Site Security Buildings are unprotected steel frame buildings with insulated metal panel exterior walls and with built-up roofing on metal deck roof. This construction is classified as Type III N, Unprotected, in accordance with the NMBC (NMBC, 1997) and as Type II Construction by NFPA 220 (NFPA, 1999).

The UBC Storage Pad is an open lay-down area and consists of a concrete pad with a dedicated collection and drainage system. Concrete saddles are used for storage of cylinders approximately 200 mm (8 in) above ground level. There is no building for the UBC Storage Pad.

7.3.2 Fire Area Determination and Fire Barriers

The facility is subdivided into fire areas by barriers with fire resistance commensurate with the potential fire severity, in accordance with NFPA 101 (NFPA, 1997a) and the NMBC (NMBC, 1997). The design and construction of fire barrier walls is in accordance with NFPA 221 (NFPA, 1997b). These fire areas are provided to limit the spread of fire, protect personnel and limit the consequential damage to the facility. Fire barriers are shown in Figures 7.3-1 through 7.3-8. The fire resistance rating of fire barrier assemblies is determined through testing in accordance with NFPA 251 (NFPA, 1995d). Openings in fire barriers are protected consistent with the designated fire resistance rating of the barrier. Penetration seals provided for electrical and mechanical openings are listed to meet the guidance of ASTM E-814 (ASTM, 2002) or UL 1479 (UL, 2003). Penetration openings for ventilation systems are protected by fire dampers having a rating equivalent to that of the barrier. Door openings in fire rated barriers are protected with fire rated doors, frames and hardware in accordance with NFPA 80 (NFPA, 1995b).

7.3.3 Electrical Installation

All electrical systems at the facility are installed in accordance with NFPA 70 (NFPA, 1996e). Switchgear, motor control centers, panel boards, variable frequency drives, uninterruptible power supply systems and control panels are mounted in metallic enclosures and contain only small amounts of combustible material. Cable trays and conduits are metallic and the cables in cable trays are flame retardant and tested in accordance with the guidance of ANSI / IEEE 383 (ANSI / IEEE, 1974), IEEE 1202 (IEEE, 1991), UL 1277 (UL, 2001), and ICEA T-29-520 (ICEA, 1986).

Lighting fixtures are constructed of non-combustible materials and their ballasts are electronic and contain only an insignificant amount of combustible material.

All indoor transformers are dry type. Outdoor oil filled transformers are provided by the local utility and are located in the local utilities substation yard which is located at the southwest corner of the facility with adequate spatial separation from the facility buildings so as not to present an exposure fire hazard to the facility.

An auxiliary power system is provided to supply power for temporary lighting, ventilation and radiation-monitoring equipment where potential radiation hazard exists.

Electrical conduits leading to or from areas with uranic material are sealed internally to prevent the spread of radioactive materials. Only utilities required for operation within areas having uranic material enter into these areas.

7.3.4 Life Safety

The buildings are provided with means of egress, illumination, and protection in accordance with NFPA 101 (NFPA, 1997a). Barriers with fire resistance ratings consistent with NFPA 101 (NFPA, 1997a) and the FHA are provided to prevent unacceptable fire propagation.

All of the buildings are provided with emergency lighting for the illumination of the primary exit paths and in critical operations areas where personnel are required to operate valves, dampers and other controls in an emergency. Emergency lighting is considered as a critical load. All critical loads are fed from the uninterruptible power supplies (UPSs) which are connected to the essential load motor control centers (MCCs). The UPSs receive power input from two incoming power sources, two diesel powered electric generators and stationary batteries. All power inputs to the UPS transfer automatically to another source if the first source fails. Thus, loads connected to the UPS are unaffected by offsite power and standby generator failure.

Marking of means of egress, including illuminated exit signs, are provided in accordance with NFPA 101 (NFPA, 1997a) Section 5.10 and Chapter 10 of the NMBC (NMBC, 1997).

7.3.5 Ventilation

The building heating, ventilating and air conditioning (HVAC) system provides the primary form of ventilation employed at the facility. The HVAC system is designed to maintain room temperature and the specific environmental conditions associated with processes undertaken within a particular area. The TSB HVAC System also performs a confinement ventilation function to effectively reduce the potential chronic exposure of individuals working at the plant and to the public, to hazardous materials.

The ventilation system is not engineered for smoke control. It is designed to shutdown in the event of a fire. Ductwork, accessories and support systems are designed and tested in accordance with NFPA 801 (NFPA, 2003), NFPA 90A (NFPA, 1996g), NFPA 90B (NFPA, 1996h), and NFPA 91 (NFPA, 1995c). Flexible air duct couplings in ventilation and filter systems are noncombustible. Air entry filters are UL Class I.

The power supply and controls for mechanical ventilation systems are located outside the fire area served. The ventilation system is designed such that the areas containing dispersible radioactive materials remain at a lower pressure than that of adjoining areas of the facility. These areas include the Mass Spectrometry Laboratory, the Chemical Laboratory, the Ventilated Room, the Cylinder Preparation Room and the Decontamination Workshop. Ductwork from areas containing radioactive materials that pass through non-radioactive areas are constructed of non-combustible material and are protected from possible exposure to fire by materials having an appropriate fire resistance rating.

High efficiency particulate air (HEPA) filtration systems are utilized in various areas in the plant in the confinement ventilation function of the TSB HVAC System, the gaseous effluent vent systems (GEVS) and in the Centrifuge Test and Post Mortem Facilities Exhaust Filtration System. HEPA filters are UL 586 (UL, 1996)(UL Class I), which are non-combustible. In the GEVS and, the Centrifuge Test and Post Mortem Exhaust Filtration System, and the Confinement Ventilation function of the TSB HVAC System, the HEPA filters are enclosed in ductwork. The HEPA filtration systems are analyzed in the FHA. They are designed to shutdown in the event of a fire.

Smoke control is accomplished by the Fire Brigade and off-site Fire Department utilizing portable smoke removal equipment.

7.3.6 Drainage

Water that may discharge from the fire water system or from fire fighting activities could be contaminated with radioactive materials. The water will be contained, stored, sampled, and treated if necessary. This also applies to areas containing flammable and combustible liquids. Wall and floor interfaces will be made watertight. Provisions will be made at all pertinent door openings to prevent fire protection water from migrating outside of the contained area. If there is a possibility that the water could be contaminated with fissile uranium compounds, the containment methodology will be designed to be safe with respect to criticality. The drainage system design and associated containment configuration will be addressed during the design phase and the Safety Analysis Report will be revised, as appropriate. Water runoff from the UBC Storage Pad will be collected in the UBC Storage Pad Stormwater Retention Basin. Liquid effluent monitoring associated with the UBC Storage Pad Stormwater Retention Basin is discussed in the Environmental Report.

7.3.7 Lightning Protection

Lightning protection for the facility is in accordance with NFPA 780 (NFPA, 1997c).

7.3.8 Criticality Concerns

Criticality controls will be provided by employing the basic principals of criticality safety. The premise of nuclear criticality prevention is that at least two, unlikely, independent, and concurrent changes in process conditions must occur before a criticality accident is possible. This double contingency principal is described in ANSI/ANS-8.1-1998 (ANSI, 1998). Controls or systems of controls are used to limit process variables in order to maintain safe operating conditions.

Moderation control is applied for criticality safety of UF_6 at this facility. Neither automatic sprinkler nor standpipe and hose systems are provided in the TSB, Separation Buildings, Blending and Liquid Sampling, CRDB, CAB, and Centrifuge Post Mortem areas. Procedures and training for both onsite fire brigade and offsite fire department emphasize the need for moderator control in these areas.

Fire protection concerns are addressed in the moderation control areas by fire protection IROFS. The IROFS define administrative controls which limit the transient and in situ combustibles, the ignition sources in these areas and isolate these areas from other areas of the plant with appropriately rated fire barriers to preclude fire propagation to or from these areas. There are automatic detection and manual alarm systems located in these areas. Fires will be extinguished in these areas by the fire brigade and / or local fire department with the use of portable and wheeled fire extinguishers. In the unlikely event that extinguisher cannot control or extinguish the fire, then the fire brigade, local fire department and the Emergency Operations Center will work together to ensure that moderator control is maintained in these areas. If

deemed appropriate, hose streams are available from fire hydrants located throughout the facility.

See Chapter 5, Nuclear Criticality Safety, for additional discussion on criticality control.

7.3.9 Hydrogen Control

Hydrogen is utilized within the Technical Services Building Chemical Laboratory. In order to prevent the possibility of fire or explosion in the laboratory, areas where hydrogen might accumulate will be protected by one or a combination of following features:

- Hydrogen piping will be provided with excess flow control.
- Hydrogen supply will be isolated by emergency shutoff valves interlocked with hydrogen detection in the area(s) served by the hydrogen piping.
- Natural or mechanical ventilation will be provided to ensure that hydrogen concentrations do not exceed 25% of the lower explosive limit. If mechanical ventilation is provided, it will be continuous or will be interlocked to start upon the detection of hydrogen in the area. Mechanical ventilation will also be provided with airflow sensors to sound an alarm if the fan becomes inoperative.

Hydrogen may also be generated at battery charging stations in the facility. In order to prevent the possibility of explosion or fire, areas where hydrogen might accumulate will be protected by a design which incorporates the following measures, as necessary, that are identified in NFPA 70E (NFPA, applicable version) and/or ANSI C2 (ANSI, applicable version).

- Natural or mechanical ventilation will be provided to ensure that hydrogen concentrations do not exceed 25% of the lower explosive limit. If mechanical ventilation is provided, it will be continuous or will be interlocked to start upon the detection of hydrogen in the area. Mechanical ventilation will also be provided with airflow sensors to sound an alarm if the fan becomes inoperative.

7.3.10 Environmental Concerns

Radiological and chemical monitoring and sampling will be performed as specified in NEF Environmental Report, Chapter 6, Environmental Measurements and Monitoring Programs, on the contaminated and potentially contaminated facility liquid effluent discharge including water used for fire fighting purposes. Discharges from the Liquid Effluent Collection and Treatment System will be routed to the Treated Effluent Evaporative Basin. Surface water runoff will be diverted into water collection basins. Water runoff from the UBC Storage Pad will be collected in the UBC Storage Pad Stormwater Retention Basin. Water runoff from the remaining portions of the site will be collected in the Site Stormwater Detention Basin.

7.3.11 Physical Security Concerns

In no cases will security requirements prevent safe means of egress as required by the NFPA 101 (NFPA, 1997a) and the NMBC (NMBC, 1997).

The Physical Security Plan (PSP) addresses the establishment of permanent and temporary Controlled Areas. The PSP identifies the ingress and egress methodology during both normal

and emergency conditions. This includes emergency response personnel both onsite and offsite. Two means of access to the site are provided, one via one of the two controlled gates continuously manned by Security and the other via designated emergency access gates (i.e., crash gates). Refer to the PSP for additional details.

7.3.12 Baseline Design Criteria and Defense-In-Depth

The FHA and the ISA demonstrate that the design and construction of the facility complies with the baseline design criteria (BDC) of 10 CFR 70.64(a) (CFR, 2003e), the defense-in-depth requirements of 10 CFR 70.64(b) (CFR, 2003e) and are consistent with the guidance provided in NFPA 801 (NFPA, 2003). The design provides for adequate protection against fire and explosion by incorporating defense-in-depth concepts such that health and safety are not wholly dependent on any single element of the design, construction, maintenance or operation of the facility. This is accomplished by achieving a balance between preventing fires from starting, quickly detecting, controlling and promptly extinguishing those fires that do occur and protecting structures, systems and components such that a fire that is not promptly extinguished or suppressed will not lead to an unacceptable consequence.

7.4 PROCESS FIRE SAFETY

Chapter 6, Chemical Process Safety, describes the chemical classification process, the hazards of chemicals, chemical process interactions affecting licensed material and/or hazardous chemicals produced from licensed material, the methodology for evaluating hazardous chemical consequences, and chemical safety assurance. The only process chemical of concern is uranium hexafluoride (UF_6). UF_6 is not flammable and does not disassociate to flammable constituents under conditions at which it will be handled at the NEF. The two byproducts in the event of a UF_6 release are hydrogen fluoride (HF) and uranyl fluoride (UO_2F_2) and neither presents a process fire safety hazard. The Integrated Safety Analysis has analyzed the hazards associated with the processes performed at the facility. The analysis did not identify any processes which represented a process fire safety hazard.

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7.5 FIRE PROTECTION AND EMERGENCY RESPONSE

This section documents the fire protection systems and fire emergency response organizations provided for the facility.

7.5.1 Fire Protection System

The facility fire protection systems consist of a dedicated fire water supply and distribution system, automatic suppression systems (sprinklers and alternate systems), standpipe and hose systems, portable fire extinguishers, fire detection and alarm systems, fire pump control systems, valve position supervision, system maintenance and testing, fire prevention program, fire department/fire brigade response and pre-fire plans.

7.5.1.1 Fire Water Supply and Distribution System

A single Fire Protection Water Supply System provides storage and distribution of water to the Fire Protection System that protects the entire facility as shown in Figure 7.5-1, Exterior Fire Protection System Overall Site Plan, and Figure 7.5-2, Sprinkler System Coverage.

7.5.1.1.1 System Description

A reliable fire protection water supply and distribution system of adequate flow, pressure, and duration is provided based on the characteristics of the site and the FHA. The fire protection water supply and distribution system is based on the largest fixed fire suppression system demand, including a hose stream allowance, in accordance with NFPA 13 (NFPA, 1996a). The fire protection water supply consists of two 946,354-lL (250,000-gal) (minimum) water storage tanks designed and constructed in accordance with NFPA 22 (NFPA, 1996d). The tanks are used for both fire protection water supply and process water supply. A reserve quantity of 473,179 L (125,000 gal) is maintained in the bottom of each tank for fire protection purposes. The elevation of the suction line for the process water pump is above the level of the required fire protection water supply in each tank. Thus the process water pump cannot pump water required for fire protection purposes. The fire protection water supply in each tank is sized for the maximum anticipated water supply needed to control and extinguish the design basis fire at the facility. Two, 3785 l/min at 10.35 bar (1000 gpm at 150 psi) horizontal, centrifugal, fire pumps designed and installed in accordance with NFPA 20 (NFPA, 1996c) are provided. For redundancy the capacity of the fire protection water supply is designed to ensure that 100% of the required flow rate and pressure are available in the event of failure of one of the water storage tanks or fire pumps. The maximum demand anticipated based on a design basis fire is 3785 l/min (1000 gpm) based on 1982 l/min (500 gpm) flowing from a building sprinkler system plus 1982 l/min (500 gpm) for hose streams for a duration of two hours. The tanks are arranged so that one will be available for suction at all times.

Fill and make up water for the storage tanks are from the city water supply to the site which is capable of filling either storage tank in an 8-hour period.

The fire water service main for the plant is designed and installed in accordance with NFPA 24 (NFPA, 1995a). The distribution system, including piping associated with the fire pumps is looped and arranged so that a single pipe break or valve failure will not totally impair the system

per the Fire Hazard Analysis and NFPA 801 (NFPA, 2003). Through appropriate valve alignment, either fire pump can take suction from either storage tank and discharge through either leg of the underground piping loop. The system piping is sized so that the largest sprinkler system demand (including hose stream allowance) is met with the hydraulically shortest flow path assumed to be out of service. Sectional control valves are arranged to provide adequate sectional control of the fire main loop to minimize protection impairments. All fire protection water system control valves are monitored under a periodic inspection program and their proper positioning is supervised in accordance with NFPA 801 (NFPA, 2003). Exterior fire hydrants, equipped with separate shut-off valves on the branch connection, are provided at intervals to ensure complete coverage of all facility structures, including the UBC Storage Pad.

The fire pumps are separated from each other by fire-rated barrier construction. Both pumps are diesel engine-driven. Each pump is equipped with a dedicated listed controller. The pumps are arranged for automatic start functions upon a drop in the system water pressure as detected by pressure switches contained within the pump controllers. Use of start delay timers prevents simultaneous start of both pumps. Each fire pump controller interfaces with the site-wide protective signaling system for all alarm and trouble conditions recommended by NFPA 20 (NFPA, 1996c), which are monitored and annunciated at the central alarm panel in the Control Room. Once activated, the fire pumps can only be shut-off at the pump controller location. Pumps, suction and discharge piping and valves are all provided and arranged in accordance with the recommendations of NFPA 20 (NFPA, 1996c). Dedicated diesel fuel tanks are provided for each pump. These tanks are located in the Fire Water Pump Building and are sized to provide a minimum eight hour supply of fuel in accordance with the recommendations of NFPA 20 (NFPA, 1996c). The Fire Water Pump Building is provided with automatic sprinkler protection.

A jockey pump is provided in the Fire Water Pump Building to maintain pressure in the fire protection system during normal operation.

7.5.1.1.2 System Interfaces

The Fire Protection Water Supply System interfaces with the city water supply that supplies fill and make up water to the fire water supply storage tanks.

7.5.1.1.3 Safety Considerations

Failure of the Fire Water Supply and Distribution System will not endanger public health and safety. The system is designed to assure water supply to automatic fire protection systems, standpipe systems and to fire hydrants located around the facility. This is accomplished by providing redundant water storage tanks and redundant fire pumps which are not subject to a common failure, electrical or mechanical.

7.5.1.2 Standpipe and Hose Systems

As required by the FHA, standpipe systems and interior fire hose stations are provided and installed in accordance with NFPA 14 (NFPA, 1996b) in the following locations:

- Class II standpipe systems for fire brigade and the offsite fire department use are provided in the CUB, CAB and the Administration Building.

- Standpipes and fire hose stations are positioned so that any interior location in the CUB, CAB and the Administration Building can be protected with an effective hose stream.

Each fire hose station is equipped with 30.5 m (100 ft) of 38 mm (1½-in) fire hose and the type of hose nozzle suitable for the hazard protected. The systems are designed to provide a minimum flow recommended by NFPA 14 (NFPA, 1996b) for class II standpipe systems. The systems are separated from the building sprinkler system. The separation ensures that a single impairment will not disable both the sprinklers and the hose systems.

In addition to fixed standpipes and fire hose stations, the NEF will be provided with fire hose on mobile apparatus and/or at strategic locations throughout the facility. The amount of hose provided will be sufficient to ensure that all points within the facility will be able to be reached by at least two 38 mm (1½-in) diameter attack hose lines and one 64 mm (2½-in) diameter backup hose line consistent with NFPA 1410 (NFPA, 2000). These lines are intended for use by the offsite fire response agencies in the event of a structural fire. Hydraulic margin for these hose lines will be sufficient to ensure minimum nozzle pressures of 4.5 bar (65 psia) for attack hose line(s) and 6.9 bar (100 psia) for the backup hose line.

7.5.1.3 Portable Extinguishers

Portable fire extinguishers are installed throughout all buildings in accordance with NFPA 10 (NFPA, 1994). Multi-purpose extinguishers are provided generally for Class A, B, or C fires.

The portable fire extinguishers are spaced within the travel distance limitation and provide the area coverage specified in NFPA 10 (NFPA, 1994). Specialized extinguishers are located in areas requiring protection of particular hazards. Wheeled extinguishers are provided for use in water exclusion areas.

In areas with moderator control issues, the chemical fill for the extinguishers is carbon dioxide and dry chemical and has been selected so as not to create an uncontrolled moderator source.

7.5.1.4 Automatic Suppression Systems

Wet pipe sprinkler systems are engineered to protect specific hazards in accordance with parameters established by the FHA. Water flow detectors are provided to alarm and annunciate sprinkler system actuation. Sprinkler system control valves are monitored under a periodic inspection program and their proper positioning is supervised in accordance with NFPA 801 (NFPA, 2003) to ensure the systems remain operable. The areas of sprinkler system coverage are shown in Figure 7.5-2, Sprinkler System Coverage.

Automatic wet pipe sprinkler systems, designed and tested in accordance with NFPA 13 (NFPA, 1996a), are provided in the following buildings:

- Administration Building
- Central Utilities Building (CUB)
- Fire Pump House.

Fire rated enclosures are provided for several chemical traps located on the second floor of the Process Services Area in each Separations Building Module. These enclosures will be protected with a gaseous suppression system. The particular type of suppression system utilized will be determined in the final design and will be designed and installed in accordance

with the applicable NFPA standard, NFPA 12 (NFPA, 1993) for carbon dioxide systems or NFPA 2001 (NFPA, 1996j) for clean agent suppression systems.

7.5.1.5 Fire Detection Systems

All facility structures are provided with automatic fire detectors in accordance with NFPA 72 (NFPA, 1996f) and as required by the FHA. Automatic fire detectors are installed in accordance with NFPA 72 (NFPA, 1996f), NFPA 101 (NFPA, 1997a) and as required by the FHA.

7.5.1.6 Manual Alarm Systems

All facility structures are provided with manual fire alarm pull stations in accordance with NFPA 72 (NFPA, 1996f), NFPA 101 (NFPA, 1997a) and as required by the FHA.

7.5.1.7 Fire Alarm System

Each building of the facility is equipped with a listed, modular, multi-zone fire alarm control panel installed in accordance with NFPA 72 (NFPA, 1996f). Each panel has a dual power supply, consisting of normal building power and backup power by either 24-hour battery or the facility UPS. The method of backup power will be determined in final design. Sprinkler system and hose station water flow detection devices are connected to separate control panel zone modules. Fire detector and manual pull station alarm circuits are also connected to dedicated control panel zone modules. Fire detector zone modules include detector confirmation features to reduce the potential for false alarms. Each zone module has individual disable switches so individual zones can be removed from service for maintenance and trouble shooting without disabling the entire control panel. Each zone module has separate alarm and trouble contacts for connection to the central alarm panel in the Control Room. Activation of a fire detector, manual pull station or water flow detector results in an audible and visual alarm at the building control panel and the central alarm panel.

The central alarm panel, located in the Control Room, is a listed, microprocessor-based addressable console. The central alarm panel has dual power supplies, consisting of normal building power and backup power by either 24-hour battery or the facility UPS. The method of backup power will be determined in final design. The central alarm panel monitors all functions associated with the individual building alarm panels and the fire pump controllers. All alarm and trouble functions are audibly and visually annunciated by the central alarm panel and automatically recorded via printout. Failure of the central alarm panel will not result in failure of any building fire alarm control panel functions.

The following conditions are monitored by the central alarm console through the fire pump controllers:

- Pump running
- Pump failure to start
- Pump controller in "off" or "manual" position
- Battery failure
- Diesel overspeed

- Diesel high engine jacket coolant temperature
- Diesel low oil pressure
- Battery charger failure.

Both pumps are maintained in the automatic start condition at all times, except during periods of maintenance and testing. Remote manual start switches are provided in the Control Room adjacent to the alarm console. Pumps are arranged for manual shut-off at the controllers only.

All fire protection water system control valves are monitored under a periodic inspection program and their proper positioning is supervised in accordance with NFPA 801 (NFPA, 2003).

7.5.2 Fire Emergency Response

7.5.2.1 Fire Brigade

The facility maintains a fire brigade made up of employees trained in fire prevention, fire fighting techniques, first aid procedures, emergency response, and criticality safety. The criticality safety training addresses water moderation, water reflection, product cylinder safety by moderation control, and water flooding. The fire brigade is organized, operated, trained and equipped in accordance with NFPA 600 (NFPA, 1996i). The fire brigade is considered an incipient fire brigade as classified under NFPA 600 (NFPA, 1996i), e.g., not required to wear thermal protective clothing nor self-contained breathing apparatus during firefighting. The intent of the facility fire brigade is to be able to handle all minor fires and to be a first response effort designed to supplement the local fire department for major fires at the plant. The fire brigade members are trained and equipped to respond to fire emergencies and contain fire damage until offsite help from a neighboring fire department arrives. This will include the use of hand portable and wheeled fire extinguishers as well as hoselines to fight interior/exterior incipient fires and to fight larger exterior fires in a defensive mode (e.g., vehicle fires). When the local fire department arrives onsite, the local fire department assumes control and is responsible for all fire fighting activities. The plant fire brigade, working with the plant's Emergency Operations Center, will coordinate offsite fire department activities to ensure moderator control and criticality safety. The fire brigade is staffed so that there are a minimum of five fire brigade members available per shift. The fire brigade includes a safety officer who is responsible to ensure that moderator concerns for criticality safety are considered during firefighting activities.

Periodic training is provided to offsite assistance organization personnel in the facility emergency planning procedures. Facility emergency response personnel meet at least annually with each offsite assistance group to accomplish training and review items of mutual interest including relevant changes to the program. This training includes facility tours, information concerning facility access control (normal and emergency), potential accident scenarios, emergency action levels, notification procedures, exposure guidelines, personnel monitoring devices, communications, contamination control, moderator control issues, and the offsite assistance organization role in responding to an emergency at the facility, as appropriate.

7.5.2.2 Off-Site Organizations

LES will use the services of local, offsite fire departments to supplement the capability of the facility Fire Brigade. The two primary agencies that will be available for this response are the City of Eunice, New Mexico Fire and Rescue Agency and the City of Hobbs, New Mexico Fire

Department. Both of these agencies are signatories to the Lea County, New Mexico Mutual Aid agreement and can request additional mutual aid from any of several county fire departments/fire districts.

A Memorandum of Understanding is in place between LES and these two local fire departments that defines the fire protection and emergency response commitments between the organizations. The training and conduct of emergency drills and the Memoranda of Understanding are discussed in the NEF Emergency Plan.

LES has performed a baseline needs assessment evaluating the response to fires and related emergencies to confirm adequacy of the response considering both facility resources and response of the two primary response agencies. This assessment identified that with some supplemental resource and training development, adequate response is assured.

Eunice Fire and Rescue, as the initial response agency, is comprised of a roster of approximately 20 volunteers. Eunice has three structural fire engines, three grass fire trucks, one water tanker, two command vehicles, and three ambulances, each equipped to provide intermediate level life support. Firefighters are trained to a minimum Firefighter Level I and ambulance personnel to a minimum of Emergency Medical Technician (EMT) – Basic per New Mexico standards.

The Hobbs Fire Department, as the secondary response agency, is comprised of a roster of approximately 70 paid personnel, staffing three fire stations in a three-shift rotation. The department has five structural engines, a ladder truck, a heavy rescue, three grass fire trucks, one water tanker, several command vehicles and six ambulances, each equipped to provide advanced level life support. Firefighters are required to be a minimum Firefighter Level I and EMT – Basic per New Mexico standards. Shift assigned ambulance personnel are EMT – Paramedics per New Mexico standards.

The estimated response time to NEF for a basic life support ambulance is 11 minutes with a second ambulance available within an additional seven minutes. NEF personnel will be trained and equipped to provide first aid and circulatory/respiratory support in the interim (e.g., provide CPR, apply automatic external defibrillation, and administer oxygen).

The estimated response time to NEF for a structural fire engine and full structural crew from Eunice Fire and Rescue is between 11 and 15 minutes. In the event of a fire, the NEF fire brigade will respond and Eunice Fire and Rescue will be notified to respond. If the fire is incipient, the NEF fire brigade will fight the fire utilizing hand portable/wheeled fire extinguishers and/or 38 mm (1½-in) hose lines. In the event that structural fire response is needed, the Hobbs Fire Department will also be notified to respond and the 38 mm (1½-in) and/or 64 mm (2½-in) hose lines from the NEF fire water supply system to the nearest points to the fire will be extended by the NEF fire brigade, where it can be done safely. The latter activity will minimize deployment time for the offsite responders upon their arrival. To ensure that application of water or other firefighting activities are consistent with moderator concerns for criticality safety, the NEF fire brigade safety officer is trained and equipped to don structural firefighting gear and will accompany offsite responders to the firefighting location. In the event that offsite responders are needed in more than one facility location, the criticality safety role of the NEF fire brigade safety officer is fulfilled by appropriately trained NEF personnel (typically fire brigade members). These NEF personnel are trained in criticality safety and trained and equipped to don structural firefighting gear to accompany the offsite responders to required facility locations.

In order to respond to airborne release emergencies or other chemical incidents, NEF will

maintain full hazardous material response capability. This is further described in SAR Section 6.4.8, Emergency Planning.

Through a combination of onsite capability, offsite responders, or through contract arrangements, LES will ensure that capabilities are in place to respond to other events such as confined space rescue, trench rescue, high angle rescue, and other technical emergencies as required. The NEF fire brigade/emergency response team equipment will also be inventoried, inspected and tested in accordance with recognized standards. Final needs for these response areas and response equipment will be reassessed after detailed facility design to ensure adequate response capabilities are in place and training completed prior to any construction activities.

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