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SUBJECT: Forwards amend 45 to FSAR section "Fire Protection Evaluation."

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WASHINGTON PUBLIC POWER SUPPLY SYSTEM

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August 21, 1992
G02-92-200

Docket No. 50-397

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Subject: WNP-2, OPERATING LICENSE NPF-21
AMENDMENT NO. 45 TO THE WNP-2
FINAL SAFETY ANALYSIS REPORT (FSAR)

References:

1) Letter G02-87-129, dated April 13, 1987, GC Sorensen (Supply System) to JB Martin (NRC), "WNP-2 Fire Protection Plant Reevaluation"

2) Letter G02-88-214, dated October 7, 1988, GC Sorensen (Supply System) to JB Martin, "Schedule for Completion of Fire Protection Issues (Inspection Report 88-16)"

3) Letter dated May 22, 1989, RB Samworth (NRC) to GC Sorensen (Supply System), "Approved Fire Protection Program at WNP-2 (TAC No. 63528)"

4) Letter dated May 25, 1989, RB Samworth (NRC) to GC Sorensen (Supply System), "Issuance of Amendment No. 67 to Facility Operating License No. NPF-21 - WPPSS Nuclear Project No. 2 (TAC No. 64655)"

5) Letter G02-91-064, dated April 4, 1991, GC Sorensen (Supply System) to NRC, "Request for Amendment to Technical Specification 4.8.2.1, Battery Load Profiles"

During the 1987 - 1989 Fire Protection Reevaluation effort, the Supply System stated that the FSAR would be revised to clarify and consolidate the commitments contained in FSAR Section 9.5.1 (Fire Protection System) and FSAR Appendix F, (Fire Protection Evaluation).

In accordance with these commitments (References 1 and 2), the Supply System hereby submits the signed original and ten (10) copies of Amendment 45 to the WNP-2 FSAR.

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This amendment reflects the following changes:

1. FSAR Section 9.5.1 (Fire Protection System) is relocated to FSAR Appendix F (Fire Protection Evaluation).

2. FSAR Appendix F (Fire Protection Evaluation) is rewritten to consolidate subject material and reduce duplication.

3. FSAR Appendix F is updated to reflect the issuance of Revision 0 of the Calculation NE-02-85-19, "Revised Appendix R Safe Shutdown Analysis".

4. FSAR Appendix F is revised to incorporate the results of the NFPA code compliance evaluation performed during the 1987 Fire Protection Reevaluation effort. These code deviations, and the associated justifications, had previously been maintained in Supply System internal manual WMC-064 "Status of NFPA Code Deviations".

5. The FSAR fire area layout figures (formerly Figures 1-74 in Appendix F) are removed by this amendment. In order to facilitate the FSAR update process, these figures will be replaced with plant drawings which are concurrently assigned FSAR figure numbers. The new FSAR figures will be transmitted separately.

6. The FSAR figures which highlight system P&IDs to show the portions of the systems used for Appendix R are deleted by this amendment. This change was initiated to prevent use of these figures in lieu of the top tier P&IDs which are included in other sections of the FSAR. A complete listing of equipment used for post fire safe shutdown is included in Appendix F (Section F.4).

7. FSAR Appendix F is revised to incorporate clarifications to the fire protection program basis in accordance with the commitments made during the Fire Protection Reevaluation effort (References 1 and 2).

8. Outstanding FSAR change notices were incorporated in accordance with the requirements of 10 CFR 50.71(e).

This amendment has been specifically reviewed to ensure that the necessary FSAR changes identified during the issuance of License Amendment No. 67 (Removal of the Fire Protection Technical Specifications) were not deleted (References 3 and 4).

Additionally, this amendment includes the battery load profiles as required to support the Reference 5 Technical Specification change request.

We are also, at this time, transmitting copies of the amendment to the Chairman of the Benton County Commissioners; Mr. J. B. Martin, Regional Administrator, NRC Region V; Mr. R. C. Sorensen, NRC Senior Resident Inspector; and the Washington State Energy Facility Site Evaluation Council Chairman.

Sincerely

Mr. G. C. Sorensen, Manager
Regulatory Programs (Mail Drop 280)

SS/
Enclosures

cc: Mr. J. B. Martin - NRC Region V
RR Assa - NRC
DL Williams - BPA/399
NRC Site Inspector - 901A
RG Waldo - EFSEC
Chairman, Benton County Commissioners

STATE OF WASHINGTON)
)
COUNTY OF BENTON)

Subject: Amendment No. 45 to the WNP-2 Final Safety Analysis Report

I. G. C. SORENSEN, being duly sworn, subscribe to and say that I am the Manager, Regulatory Programs for the WASHINGTON PUBLIC POWER SUPPLY SYSTEM, the applicant herein; that I have the full authority to execute this oath; that I have reviewed the foregoing; and that to the best of my knowledge, information, and belief the statements made in it are true.

DATE 21 August, 1992

G. C. Sorensen, Manager
Regulatory Programs

On this date personally appeared before me G. C. SORENSEN, to me known to be the individual who executed the foregoing instrument, and acknowledged that he signed the same as his free act and deed for the uses and purposes herein mentioned.

GIVEN under my hand and seal this 21 day of August 1992.

Notary Public in and for the
STATE OF WASHINGTON

Residing at Kennewick, Washington

My Commission Expires April 28, 1994

Superseded Pages per Amend #45 to FSAR
Ltd. 8/21/92
9209040103
50-397

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DIVISION 3 (HPCS) 125 Volt DC BATTERY LOAD PROFILE
HPCS-B1-DG3 (note 1)

Description	0-1 Min: 0-13 sec	0-1 Min: 13-20 sec	0-1 Min: 20-60 sec	1-60 Min	60-120 Min
HPCS system control (note 2)	6.0	6.0	6.0	6.0	6.0
Field Flashing	20	--	--	--	--
Two Air-Start Solenoid valves	2.0	--	--	--	--
Switchgear (one bkr trip)	6.0	--	--	--	--
Switchgear (two bkrs close, note 3)	--	36.5	--	--	--
DG Standby Fuel Pump (DO-P-6)	16.7	5.2	5.2	5.2	5.4
DG Lube Oil Pump (DLO-P-10)	20.6	6.9	6.9	6.9	6.9
TOTAL (amperes)	71.3	54.6	18.1	18.1	18.3

NOTES:

1. Battery load profile is based upon loss of AC power with a coincident HPCS system actuation.

2. HPCS system control components consist of: DG protective and auxiliary relays, DG control relays, time delay relays, a local annunciator panel, HPCS valve position indicators, control relays for HPCS process control logic, etc.

3. DG-3 output breaker E-CB-4/DG3 closes before the HPCS pump breaker HPCS-CB-P1. The peak current from these two breakers closing is taken as one spring-charging motor start current plus one spring-charging motor run current.

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9.5.1 FIRE PROTECTION SYSTEM

9.5.1.1 Design Bases

The basic design criterion for the fire protection system is its capability to extinguish any single fire. The entire plant is designed emphasizing minimal use and exposure of combustible materials and use of fire resistant materials to the greatest extent possible.

9.5.1.1.1 Fire Identification

Combustible materials located throughout the plant are identified in terms of the following categories:

a. Fuel and lubrication oil

b. Charcoal

c. Electrical cable insulation

d. Fixed and transit combustibles

The extent to which these combustible materials present a hazard to safety-related equipment is dependent upon the type of a fire from the particular combustible, the quantity of the combustible which limits the duration of the fire and the physical separation between the combustible and the equipment. Each area containing combustibles was evaluated.

Automatic fire suppression systems are designed to control the fire in areas where large quantities of combustibles are present. The systems provided are to protect: fuel and lubrication oil storage tanks, oil transfer equipment and lines, and major concentrations of divisional electrical cable. Manually activated fixed water spray systems are provided for protection of charcoal in filtration units.

Areas containing small quantities of combustibles have manual hoses and portable extinguishers for fire suppression. All areas containing combustibles are monitored by an early warning detection system. Redundant safety systems are physically separated by fire barriers, spatial separation, or are located in an adjacent area. See Appendix F for the plant Fire Protection Hazards analysis which addresses the design basis fires and the ability to safely shutdown the reactor.

9.5.1.1.2 Fire Characteristics

The autoignition temperatures and fuel contributions for those combustibles which would affect safety-related items are discussed in Appendix F.

Rupture of the diesel generator day tanks, which are enclosed in separate fire rated areas, can release 3,000 gallons of fuel oil. Each day tank room is capable of containing the entire spill contents of the tank without leakage from the room. A high energy source within the room would be required to ignite the fuel oil fumes. Each diesel generator day tank room and the immediate area outside of the rooms are protected by a fixed suppression system. Heavy dense smoke and toxic fumes from the burning oil would be discharged from a fire.

Charcoal used in the standby gas treatment system filter beds has an approximate ignition temperature of 340°C. The temperature within the charcoal beds is continuously monitored by high temperature alarms. The filter beds are encased in steel constructed ventilation filter trains. Recirculated air through the charcoal filters reduces the possibility of fire due to high heat buildup. Each carbon bed is protected by manually activated fixed fire suppression system.

Some electrical cable insulation are difficult to ignite, but will produce a significant quantity of smoke. All areas of heavy cable concentration have ionization detectors installed for prealarm.

9.5.1.1.3 Facility Features

Building design uses noncombustible.

Fire barrier walls are provided to cut off the following areas:

a. Turbine building from all other areas of the plant - noncombustible reinforced masonry block and/or concrete construction; hollow metal and/or steel doors.

b. Support buildings such as service building, reactor building, etc., from each other - reinforced concrete walls 3-hour minimum; steel air tight doors.

c. Turbine generator lube oil conditioning system room (containing reservoir, separator, transfer pump, etc.) within turbine building - 3-hour minimum fire rated reinforced masonry block walls; Class A fire doors. Oil cooler heads are open to the 501' floor level.

d. Turbine generator lube oil storage tanks - 3-hour minimum fire rated reinforced masonry block walls; Class A fire doors.

e. Electrical switchgear areas - reinforced concrete walls 3-hour minimum; Class A fire doors, and 1-1/2-hour fire rated dampers.

f. Standby diesel generator rooms - reinforced concrete walls 3-hour minimum; Class A fire doors.

g. Auxiliary boiler room - 3-hour minimum fire rated reinforced masonry block walls; Class A fire doors.

h. Control room - reinforced concrete walls 3-hour minimum; steel blast doors have an equivalent 3-hour fire rate. One blast door at the air lock entrance to the stairwell has an equivalent 1-1/2-hour fire rating.

Insulation over any metal roof decking is securely attached by clips or approved noncombustible adhesive. A vapor barrier consists of an approved membrane attached by approved adhesive or clips.

All insulation for piping, equipment, and ductwork consists of fire retardant materials.

U.L. listed type 1-1/2 and 3-hour fire doors (dampers) are installed in all walls, partitions, and ductwork in accordance with NFPA recommendations or as accepted by ANI.

All HEPA filters are Class 3 - fire rated, Underwriters' Laboratories listed or Factory Mutual approved.

The reactor building and stacks are equipped with an approved lightning protection system. Air terminals are spaced and installed along the parapets and across the roof in accordance with the specifications of Chapter three, NFPA 78. The ventstack lightning protection mast, the communication and fire protection masts and the air terminals are bonded to structural steel and/or heavy copper conductors which connect directly to the plant ground grid. The height of the Reactor Building (approximately 225 feet) and its installed air terminals provide zones of protection for the safety-related portions of the Radwaste Building and for the Diesel Generator Building against lightning strikes in accordance with the principles outlined in Section 3-10, NFPA 78. The Turbine Building is of steel construction and as such, is grounded directly to structural steel which is in turn, bonded to the Plant ground grid.

Suspended ceilings and their supports are of noncombustible construction: All materials have a rating of 25 or less for smoke contribution, fuel contribution, and flame spread.

Cooling towers are of noncombustible construction.

Foamed plastics are not used for construction, insulation, or as finished material except for 2-inch foam spacer material surrounding the containment vessel.

Pipe and cable penetration sealing is discussed in Appendix F.

Most stairways and elevators are enclosed in approved masonry towers with 2-hour fire rating and an approved automatic Class B fire door at each opening into the building, or as indicated in Appendix F.

A discussion of the control of combustion products is presented in Appendix F.

9.5.1.1.3.1 Reactor Building

Exterior walls, floors, and ceilings are of reinforced concrete construction of varying thicknesses from the top of the foundation mat to and including the refueling floor level. From the refueling level to the top of the roof, the exterior walls are framed with structural steel and are enclosed with insulated metal wall panels.

The required means of vertical egress consist of stairs of noncombustible material enclosed in reinforced concrete walls, with all openings protected by 1-1/2-hour fire rated door assemblies. Existing at grade are three horizontal exit passageways through air locks of noncombustible reinforced masonry block and/or concrete construction and equivalent fire rated steel air tight doors.

The minimum thickness of reinforced concrete walls is 1 foot, which provides 3-hour fire protection.

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9.5.1.1.3.2 Radwaste and Control Building

The control portion of this building is constructed of reinforced concrete walls, floors, and ceilings from the top of the foundation mat to and including the roof slab. The other portions of the building consist of reinforced concrete walls, floors, and ceilings at the lower levels and change to structural steel framing with reinforced concrete floors and enclosure walls on insulated metal wall panels at the upper levels.

The required means of vertical egress consist of stairs of noncombustible material enclosed in walls of minimum 2-hour fire rated construction. Access to stairs is by means of 1-1/2 hour fire rate door assemblies. Exiting at grade is through horizontal exit passageways of noncombustible reinforced masonry block and/or concrete construction.

The elevator is enclosed in a reinforced concrete shaft with openings protected by 1-1/2-hour fire rated door assemblies.

The minimum thickness of reinforced concrete walls is 1 foot and walls of reinforced concrete masonry units is 8 inches, both of which provide 3-hour fire protection.

9.5.1.1.3.3 Turbine Generator Building

Exterior walls, floors, and ceilings of contained areas are of reinforced concrete from the top of the foundation mat to the operating floor. Above the operating floor level, the reinforced concrete containment walls continue for a height of 23'-6". From the top of this wall, the structure changes to structural steel covered with insulated metal panels up to the roof level. A section of the exterior north wall is structural steel covered with insulated metal panels.

The equipment access areas at the ground level, mezzanine level, and operating level are contained with reinforced concrete masonry units and insulated metal panels.

Interior areas of combustible nature are enclosed in 3-hour fire rated walls. Access openings to these areas are protected by 3-hour fire rated door assemblies.

The required means of vertical egress consist of stairs of noncombustible material encloed in walls of minimum 2-hour fire rated construction. Access openings to stairs are protected by 1-1/2-hour fire rated door assemblies. Exiting at grade is directly to exterior.

The elevator is enclosed in a reinforced concrete shaft with openings protected by 1-1/2-hour fire rated door assemblies.

9.5.1.1.3.4 Service Building

The exterior walls are of reinforced concrete, changing to precast wall sections above grade. Floors are generally of reinforced concrete on structural steel framing.

Ceilings consist of either the bottom of the floor slabs or suspended ceilings of gypsum board, acoustical panels, and acoustical tile.

Interior partitions are constructed of reinforced concrete masonry units and/or steel studs with gypsum board on each face.

Fire separation within the building (between the machine shop area and the office area) is maintained by a reinforced concrete wall, with access openings protected by 1-1/2-hour fire rated door assemblies. The required means of vertical egress consist of stairs of noncombustible material enclosed in walls of minimum 2-hour fire rated construction. Access to stairs is by means of 1-1/2-hour fire rated door assemblies. The building is protected by a fixed sprinkler system.

9.5.1.1.3.5 Diesel Generator Building

Exterior walls, floors, and ceilings are of reinforced concrete of varying thicknesses from the top of the foundation mat to and including the roof.

The building is divided into three separate and contained compartments by reinforced concrete walls.

The required means of egress from each compartment is through exterior doors opening to grade.

Access to the adjacent circulation corridor is through openings protected by 3-hour fire rated door assemblies.

The minimum thickness of reinforced concrete walls is 1 foot, which provides more than 3-hour fire protection.

9.5.1.1.3.6 Circulating Water Pumphouse and Chlorination Building

The floor of the building is of reinforced concrete with insulated metal wall panels and metal roof deck over structural steel framing.

The circulating water pumphouse and the chlorination building are separated by a reinforced concrete masonry wall.

The required means of egress is through exterior doors opening to grade.

9.5.1.1.3.7 Standby Service Water Pumphouses No. 1A and 1B

Exterior walls and roof are of reinforced concrete construction. Floors are of metal grating or reinforced concrete.

The required means of egress is through exterior doors to grade.

9.5.1.1.3.8 Gas Bottle Storage Building

Exterior walls, floor, and roof are of reinforced concrete construction.

The required means of egress is through the open end of the building to grade.

9.5.1.1.3.9 Cooling Tower Electrical Buildings No. 1 and 2, Water Filtration Building

The floor of the buildings are of reinforced concrete with insulated metal wall panels and metal roof deck over structural steel framing.

The required means of egress is through exterior doors to grade.

9.5.1.1.3.10 General

In addition to the noncombustible construction of the plant buildings, certain other combustion safeguard features have been incorporated in the plant design:

a. Approved combustion safeguards are provided on boilers.

b. Plastic ductwork is not used or installed, except for the battery rack exhausts which are 6 inches round PVC with an aluminum metal jacket and branch duct from sump pit S-2 to exhaust header in Water Treatment Area of the Service Building.

c. Table 9.5-4 provides a list of the potentially combustible materials (non-electrical) with location and type of storage.

d. All electrical cables utilized in plant design exhibit fire retardant characteristics as discussed in 8.3.3.

e. Polyvinylchloride insulated and/or jacketed cables capable of releasing gases which might pose a hazard to personnel and/or hinder operator actions in the event of a fire are not permitted indoors in the main plant area (except as addressed in Appendix F.

9.5.1.1.4 Seismic Design Criteria and System Requirements

Unless indicated otherwise all equipment, components, and accessories in the fire protection system are designated Seismic Category II.

The fire control panel mounted in the main control room is designated Seismic Category I, and all panel mounted equipment in this room is designated Seismic Category II.

The seismic classification of all supports for pipes, and valves in the cable spreading area, cable chase, reactor/ radwaste corridor, the reactor building, and diesel generator building is Seismic Category I.

All other fire protection piping, piping specialities, and piping supports are designated Seismic Category II.

The fire protection system has been designed so that neither inadvertent operation nor failure of the system will induce failure of any safety-related systems. (See Table 9.5-2.)

The requirements of the following fire protection subsystems are as follows:

The wet pipe sprinkler systems automatically provide fire protection for the turbine generator building, the service building the radwaste building, the circulating water pumphouse, pumphouse no. 3, the turbine generator bearings in the turbine buildings and the guardhouses. The hydraulically calculated systems with automatic closed head sprinklers provide a minimum density of 0.3 gpm per sq. ft., of floor area for the most remote 3,000 sq. ft. of the turbine builing, the machine shop area of the service building, the circulating water pumphouse. The office building and restroom system on the 501' elev. of the turbine generator building is hydraulically designed to provide a minimum density of 0.15GPM/ft^2. The guardhouses have hydraulically calculated systems with a minimum density of 0.15 gpm per sq. ft. of floor area. The service building area has a hydraulically calculated system providing a minimum density of 0.10 gpm per sq. ft. for compartmented areas of 3,000 sq. ft. The Radwaste Decon Facility is designed to a minimum density of 0.20 gpm per sq. ft. over 2500 sq. ft. area. The Radwaste Storage area on the 467 elevation is designed with an ordinary hazard pipe schedule system. The storage area and hot electrical shop, on the 487' elev. have a sprinkler system designed to ordinary hazard pipe schedule system. The Radwaste Chemistry Lab offices on the 487' elev have a sprinkler system designed to provide a minimum density of 0.15GPM per square foot.

The pre-action sprinkler systems automatically provide fire protection for the cable spreading room, cable chase, reactor/radwaste corridor, and the diesel generator building. The pre-action system is a closed head, hydraulically calculated system which provides a minimum density as per NFPA Standard 13 (1975). The coverage does not exceed 90 sq. ft. per sprinkler nozzle.

The deluge water spray systems automatically provide fire protection for various locations in the turbine generator building where oil is stored or piped, for all yard transformers, and for the reactor feed pump rooms in the turbine generator building. The deluge water spray systems for the various HVAC filter units are manually actuated. Design and construction of the system is in accordance with NFPA Standard No. 13 (1975) and No. 15 (1973) and applicable portions of ANSI B31.1 (1973).

The primary fire protection water supply system consists of three fire pumps, two electric and one diesel driven, which have a design capacity of 2,000 gpm each at a total dynamic head of 289 ft. The fire jockey pump which maintains the fire system pressurization (135-150 psig) has a design capacity of 220 gpm at a total dynamic head of 312 ft. These

pumps supply water to the fire hydrants and the building standpipes which feed the hose stations and the wet pipe sprinkler, pre-action, and deluge systems.

The secondary water supply is drawn from a 400,000 gallon embankment supported fabrictank. The water supply is delivered to the fire main loop by a 2,500 gpm diesel driven fire pump located in the water filtration building. It has a total dynamic head of 323 feet during maintenance drawdown of the circulating water intake basin, the fire loop system pressure is maintained by a 30 gpm jockey pump also located in Water Filtration Building. The secondary water supply to the fire loop is through a 12-inch branch connection.

The low pressure CO_2 system automatically provides fire protection for the turbine generator exciter housing. The system will also be used for generator purging during startup and shutdown conditions, and includes a manual hose station near the exciter on the operating floor (501'). The capacity of the CO_2 unit is six tons. The nozzles are sized in accordance with NFPA Standard No. 12 (1973) to provide even distribution of the discharge.

A Halon 1301 system automatically provides fire protection for the Main Guardhouse security central control station. Sufficient Halon 1301 storage cylinders are supplied to meet the requirements of the NFPA, No. 12A, and provide a 100% reserve for the other. Halon 1301 systems with storage cylinders having 360 psig operating pressure provide automatic fire protection to the main control room PGCC under floor areas.

Three types of portable fire extinguishers are provided at various locations throughout the plant:

a. Halon 1211 extinguishers.

b. Dry chemical extinguishers (ammonium phosphate base).

c. Wheeled dry chemical extinguisher.

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Ionization, photoelectric, and thermal detectors, as well as manual alarm stations, are provided at various locations throughout the plant as fire monitor and alarm systems.

9.5.1.1.5 Codes and Standards

The entire fire protection system has been designed in accordance with all applicable laws, codes, and regulations of the government agencies having jurisdiction thereof and to the recommendations of the National Fire Protection Association (NFPA) codes and standards (1976). The complete system design is reviewed by American Nuclear Insurers (ANI).

Deluge-type water spray systems comply with the requirements of NFPA Standard No. 13 (1975) and 15 (1973). The CO_2 fire protection system is designed in accordance with the requirements of NFPA Standard No. 12 (1973). Wet pipe sprinkler systems and pre-action systems comply with the requirements of NFPA No. 13 (1975).

Electrical equipment and wiring conform to the requirements of NFPA No. 70 (1975) as a minimum standard. Protective signalling systems conform to the requirements of NFPA No. 72A (1975) and 72D (1975), except where specifically indicated otherwise in Reference 9.5-1.

A radio signal alarm to DOE 300 Area fire station is manually transmitted in accordance with NFPA 73, Chapter 6 (1975). Lightning protection conforms to NFPA 78 (1975).

Combustible liquids are protected in compliance with NFPA No. 30 (1973) and No. 31 (1974), as classified under No. 32 (1973). Fire doors and dampers are installed in accordance with NFPA No. 80 (1975) and No. 90A (1975). Smoke and heat are controlled in accordance with No. 91 (1973) and No. 204 (1968) in relation to Life Safety Code of No. 101 (1973).

The Halon 1301 systems for the main control room cabinets meets the NFPA 70 (1975) and 12A (1973). See Reference 9.5-2.

The portable extinguishers are UL rated and are installed in accordance with the requirements of NFPA Standard 10 (1975).

The electrical metallic tubing of the fire protection system is in accordance with UL Specification 797 (1942) and ANSI Standard C80.3 (1966). Hot dipped galvanized rigid steel conduit is in accordance with UL Specification 6 (1956) and ANSI C80.1 (1966). Conduit fittings are in accordance with ANSI C80.4 (1963).

Wiring of the detection and alarm initiating devices is in accordance with the requirements of NFPA 70 (1975). The complete cable meets the "Vertical Flame Resistance Test" as outlined in IPCEA S-19-81, Section 6.19.6 (1969).

All welded piping is in accordance with the requirements of ANSI B31.1 (1973).

The design, fabrication, and installation of the fire loop, including hydrants and valves, comply with NFPA Code 24 (1973) and is subject to the approval of the ANI. Hose stations are constructed in accordance with NFPA No. 14 (1974) and are approved by ANI. The fire hose complies with NFPA 196 (1974) and is UL listed. The remaining piping, valves, and associated equipment is in accordance with applicable NFPA codes (1975).

The fire protection pumps are designed in accordance with the standards of the Hydraulic Institute (February, 1972) and comply with all requirements of NFPA Standard No. 20 (1974) and No. 37 (1975). Changes to the systems will be designed to the current NFPA codes.

9.5.1.2 System Description

The fire protecton system includes fire extinguishing and fire alarm signaling systems, as well as provisions for combustion product control and electric cable fire protection.

9.5.1.2.1 Fire Extinguishing Systems

The fire protection system is shown schematically on Figure 9.5-1. The fire protection system consists of three primary fire pumps (two electric motor-driven, one diesel-driven), a jockey pump, a secondary diesel driven fire pump and jockey pump, and yard piping mains which will supply water to hydrants, standpipe hose stations, and deluge and sprinkler systems. Post-indicator isolation valvesl for sectioning the yard loop increase the reliability of fire protection water supply in case of a fire main break. An outside hose header is provided for periodic testing. Table 9.5-1 indicates piping and design parameters.

Generally, outdoor water lines are located below the frost line.

9.5.1.2.1.1 Water Supply

The primary supply of fire protection water is drawn from the circulating water intake basin. Two 2,000 gpm electric fire pumps, backed up by one 2,000 gpm diesel-driven pump, located in the circulating water pumphouse supply the required volume of fire protection water in the event of system activation. The capacity of the fire water pumps is based on the maximum probable water demand (1885 GPM for a fixed sprinkler system and 500 GPM for hoses) with standby pump capacity available.

The secondary water source is a 400,000 gallon embankment supported Fabritank. The 2500 GPM diesel fire pump draws on this volume of water during maintenance and emergency conditions.

All pumps are provided with manual controls for testing and general safety purposes. Fire pump start or failure to start, loss of current to the electric motor-driven pumps, or loss of charge on the diesel-driven pump batteries is indicated in the control room.

Fire hydrants are provided on the yard main at approximately 300 foot intervals. Special attention is given to strategically locate fire hydrants adjacent to the transformer banks and the diesel generator building as backup protection in the event of a large scale fire in these areas.

The following describes the various flow paths of the fire protection water:

a. Fire protection water is supplied by three 2,000 gpm fire pumps located in the circulating water pump house. Two of the pumps are electric motor-driven and the third is diesel-engine driven.

b. A 220 gpm electric motor-driven jockey pump (in the circulating water pumphouse) maintains the fire protection system pressure, thereby preventing the fire pumps from on-off cycling as a result of small changes in system pressure.

c. Fire protection water to the plant underground fire protection loop is supplied by two 12-inch fire protection main feed lines from the fire pumps discharge, each capable of supplying any demand in case of a fire.

d. The fire pump discharge lines are piped so that each electric motor driven pump normally discharges to its own main feed line and the diesel driven pump can discharge to either of the lines. The piping is so arranged, however, that each pump may discharge through either 12-inch main feed line to the loop header.

e. The electric motor driven fire pumps each discharge through a 10-inch check valve and 10-inch gate valve.

f. Each of the three fire pumps is furnished with an automatic air release valve, and in addition, the diesel driven pump is furnished with a pressure relief valve and an open discharge cone which discharges back to the circulating water pumphouse suction chamber. Each electric motor driven pump is furnished with a circulation relief valve.

g. Three 10-inch fire protection branch lines have been provided (one for each fire pump) to a flow elemented, six headed test header for fire pump testing.

h. The diesel driven fire pump discharges through a check valve and shutoff valve to two lines which contain gate valves leading to the 12-inch main feed lines to the plant fire loop header.

i. The 12-inch plant fire protection loop is sectioned by valves for maintenance purposes concurrent with a fire.

j. Fire hydrants with 200 ft. of 2-1/2-inch hose, and accessories as required by NFPA No. 24 placed in adjacent protected boxes are located around the main plant buildings along the fire protection loop and at each standby service water pumphouse.

k. A series of 12-inch lines lead from the 12-inch plant fire protection loop to various building standpipes. Each line contains an outside 12-inch post indicator isolation valve. These lines are listed below:

(1) 12-inch to radwaste building standpipe RWB-2 (Stairway A-8)

(2) 12-inch to radwaste building standpipe RWB-1 (Stairway A-7)

(3) 12-inch to approximately 18' south of the diesel generator building and then 8" to the reactor building standpipe RB-2 (stairway A-6). 8" portion is sleeved under the diesel generator building inside the old cast iron fireline.

(4) 12-inch to reactor building standpipe RB-1 (Stairway A-5) and service building standpipe SB-2 (Stairway A-10)

(5) 12-inch to service building standpipe SB-1 (Stairway A-9) and turbine building standpipe TGB-1 (Stairway A-1) and on to a 10-inch line to standpipe TGB-4 (Stairway S-1)

(6) 12-inch to turbine generator building standpipe TGB-2 (Stairway A-3)

(7) 12-inch to transformer yard (1st branch)

(8) 12-inch to turbine generator building standpipe TGB-3 (Stairway A-4) and on to a 6-inch line to standpipe TGB-5 (Stairway S-2)

(9) 12-inch to transformer yard (2nd branch)

(10) 12-inch to diesel generator corridor

l. Most standpipes are located in protected stairways. Except for: two open stairways in the turbine generator building and one open stairway in the diesel generator builing. Each contain an isolation valve, drain valve (angle valve), hose racks on each landing, takeoffs to sprinkler or other water fire protection systems where applicable, and an air vent valve and pressure gauge at the top of each standpipe. Water is piped to various systems from the standpipes. To insure availability of primary and secondary fire protection, the following standpipes have been interconnected: TGB-1 and TGB-2, TGB-5 and RWB-1, DG-1 and 12" branch line to RWB-1, and RB-1 and RB-2. Standpipes and hose racks are located at approximate intervals so that all portions of the protected areas are within 30 ft. of a nozzle when attached to a hose.

m. Each hose rack station is UL listed and provided with a 2 1/2" hose valve 150 ft. of 1 1/2" hose.

n. A 6" line extends to the field office buildings.

The 220 gpm jockey pump maintains a closed system pressure of 135 to 150 psig. A drop in system pressure below 125 psig will cause the first electric motor driven fire pump to automatically start. The sequential starting of the second electric motor driven pump is controlled by a drop in pressure to 100 psi and the diesel driven pump is controlled by a time delay relay. One or both of these pumps will start if the first electric driven pump cannot maintain system pressure. Alarms are provided within the annunciator for each of the three fire pumps in the event of failure of a pump to start.

A 1-1/2" line takes water from the discharge side of the fire protection jockey pump to provide an emergency source of pump bearing lubricating water to the plant service water pumps (TSW). Normal lubricating water is provided by the TSW pump discharge. A backup supply is needed when both pumps may be

shut down which occurs infrequently such as a loss of off-site power. During such an event the fire protection system would supply water for about 10 minutes or until the on-site backup power supply restarts the TSW pump. The design of the backup bearing lubricating line limits the water to about 20 gpm and includes a shutoff valve and pressure regulating valve such that the regulating valve is closed under normal water supply to the TSW pumps and no water comes from the fire protection system. A sight glass is provided to verify this.

The secondary pumping capacity in water filtration building would automatically start if system pressure dropped below 100 psig. During outage of the main jockey pump in the CWPH, the secondary jocky pump would maintain system pressure of 115-125 psig. Each electric motor driven fire pump controller contains manual start - stop controls with provision for

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starting only from a remote station. Stopping of the pump after an automatic start can only be accomplished locally at the pump controller. The diesel engine driven fire pump controller incorporates automatic and manual controls. Once started, due to any signal, the pump can only be stopped manually and locally at the controller. Fire pumps can be started either locally or from the main control room.

In the event of AC power failure, the diesel engine driven fire pump will start automatically. Both electric driven fire pumps are inoperative during loss of offsite power.

The diesel engine driven fire pump controller is provided with a local light and alarm for each of these four failures:

a. High jacket water temperature

b. Low oil pressure

c. Engine overspeed

d. Engine failure to start

A remote common alarm for the main control room for all of the above potential failures is provided.

The following is a description of the various fire extinguishing systems located throughout the plant. The areas over which they provide fire protection are listed in Table 9.5-5.

9.5.1.2.1.2 Wet Pipe Sprinkler Systems

The wet pipe sprinkler system provides fire protection to the areas shown in Table 9.5-5 Section I.

The systems consist of closed sprinklers attached to piping which contains water under pressure at all times. When a sprinkler is opened by fire (predetermined temperature fused sprinkler head), the water under pressure discharges immediately allowing the hinged clapper in the alarm check valve to open. The monitored check valve alarms gives remote alarm and indication of actuation in the main control room. All alarms actuate only on the flow of water past the check valve caused by sprinkler discharge. Small system gate valves are locked open under administrative control.

Temperature ratings on all automatic sprinkler heads take into account proximity to heat generating components.

Test pipes are valved and are run to a point of discharge which will not damage components in the area. Pressure gauges are provided on the riser or the feed main at or near each test.

9.5.1.2.1.3 Pre-action Systems

The pre-action systems provide fire protection to the cable spreading room and cable chase in the radwaste building, the reactor/radwaste corridor, and the diesel generator building (see Table 9.5-5 Section III). Each system is normally dry with supervisory air under pressure downstream of its pre-action valve. The cable spreading room, cable chase, and reactor/radwaste corridor systems are monitored by ionization detection systems which open the pre-action valve, if the products of combustion are detected. This action floods the normally dry section of supply pipe with water. The diesel generator is monitored by heat actuating devices, which on a rise in temperature, open the pre-action valve and flood the normally dry section of the supply pipe with water. Local manual opening (tripping) of each valve is also provided. Once the pre-action valve is opened, the closed fusible link sprinkler heads may discharge at any location where local elevated temperatures occur. Smoke detection by the ionization detectors or a rise in temperature give alarm and indication of actuation in the main control room. Subsequently, the opening of the pre-action valve gives remote alarm and indication of actuation in the main control room.

A pressure regulator is provided to reduce the control air supply to the required pressure. The air pressure in the pre-action system is monitored to provide remote alarm and indication in the main control room upon low air pressure.

Test pipes are provided and are run to a discharge point which will not cause damage to components in the area.

9.5.1.2.1.4 Deluge Water Spray Systems

The deluge water spray systems provide fire protection to various locations in the turbine generator building where oil is stored and piped, to various transformers, to various HVAC system filters, and to the reactor feed pump rooms in the turbine generator building (see Table 9.5-5, Section II). Nozzles for this system are open head. All spray nozzles near the transformer bushings are carefully placed to avoid flashovers at the bushings or to the piping.

The deluge valve is tripped upon response from an electric heat actuating device (HAD) indicating an abnormally high temperature or an unusually rapid rise in temperature generated by a fire. The tripping of the deluge valve gives remote alarm and indication of actuation in the main control room.

9.5.1.2.1.5 Dry Pipe Systems

No dry pipe systems are used.

9.5.1.2.1.6 Low Pressure CO_2 System

The low pressure CO_2 system provides fire protection for the turbine generator exciter housing as indicated in Table 9.5-5, Section IV. (This system will also be used for generator purging during startup and shutdown conditions and includes a manual hose station near the exciter on the operating floor.) The low pressure CO_2 system consists of a storage tank filled with liquid carbon dioxide, maintained at approximately 300 psig and 0°F by refrigeration. The refrigeration is accomplished by a compressor and refrigeration coil within the vessel. The CO_2 system is controlled by an electric temperature detector and electric timer arrangement. The timer regulates the CO_2 discharge for both automatic and manual electric operation.

Operation of this system is automatic; however, if a fire is noticed before the temperature detector actuates the system, the system can be manually actuated by a break glass station located near the CO_2 protected area. Actuation of the system causes local alarms and gives remote alarm and indication of actuation in the main control room. The local alarms consist of two separate alarm devices located near the protected area. One device sounds 20-seconds before its associated CO_2 system is released and the other device sounds continuously during the duration of such release.

The CO_2 storage unit is electrically powered and automatically controlled and monitored by means of pressure switches. The electro-manual pilot solenoid valve associated with the control valve can be manually activated, independent of electrical operation. High or low CO_2 pressure shall cause a remote alarm and indication in the main control room.

A one-inch manual CO_2 hose station, with reel and 100 feet of hose, is also provided for exciter housing protection.

An early warning system consisting of thermal detectors of a lower setting located in the CO_2 protected area provides remote alarm and indication of actuation in the main control room allowing the operator to review and evaluate the problem prior to manual or automatic actuation of the system.

9.5.1.2.1.7 Halon 1301 Systems

The Halon 1301 systems in the various main control room PGCC sub-floor duct sections are discharged upon activation of their associated thermal detector units which actuates the fire suppression agent. Each thermal detector when actuated also causes a local alarm and a remote alarm and indication in the main control room. Each system also includes pre-alarm ionization type detectors. Actuation of the ionization type detector causes alarm and indication on the fire control panel in the main control room. The wiring for each system includes supervision features which actuate a remote trouble alarm and indication in the main control room in case of a wiring or component failure.

Penetration seals are provided at the interconnecting cable entrances to the cabinets to prevent fire spreading from the floor sections to the cabinets.

9.5.1.2.1.8 Portable Extinguishers

Portable fire extinguishers are strategically and conspicuously placed throughout the plant. The reactor building and all potentially radioactive areas of buildings are protected by portable fire extinguishers with the intent of localizing the spread of radioactive contamination by eliminating the use of an extinguishing medium capable of transporting radioactive contaminants. Portable fire extinguishers of various classes are located at entrances to the main control room, electrical areas, all enclosed stairways in service building, turbine building, reactor building, radwaste building, control building, and all remote supporting buildings.

Three types of portable fire extinguishers are provided: Halon 1211, dry chemical, and wheeled dry chemical extinguishers. Four wheeled dry chemical extinguishers are provided, as well as the other extinguishers indicated in Table 9.5-5.

Primary containment is inerted during operation. There is no permanently installed fire protection inside of primary containment. However area high temperature detectors are available for monitoring. During reactor outages when personnel enter primary containment for maintenance and repair, portable Halon 1211 fire extinguishers and manual hoses will be made readily available.

Halon 1211 fire extinguishers are provided for use in the main control room.

9.5.1.2.2 Fire Protection in Safety-Related Areas

The main control room contains steel enclosed PGCC units which are divisionally separated. Each unit consists of a one foot false floor assembly, a vertical panel and/or benchboard panel, and a termination cabinet. All cables entering through the floor cable penetratons are sealed. The cables enter either directly into the false floor assembly to the control panels and terminate there or into an enclosed steel trough which extends to the termination cabinets. The remaining cables penetrating the control room floor behind the termination cabinets are compatible divisional cables routed in flexible conduit. All penetratons into the back of the panel assembly have fire rated seals. Within each unit, ionization detectors provide early warning. The main control room is also protected by an ionization detection system. Portable extinguishers and manual hoses are available for extinguishment.

The switchgear rooms, battery rooms, reactor protection system rooms, remote shutdown room, and the mechanical equipment rooms serving them in the control building are divisionally separated by minimum 3-hour fire rated enclosures. Each room is monitored by an ionization detector with portable extinguishers and manual hoses available for extinguishment.

All 1E control panels in the reactor building are in separate enclosures removed from all combustibles except the electrical cables serving them. These enclosures are monitored by ionization detectors with portable extinguishers and manual hoses available for extinguishment. Protection available for all other safety-related equipment is shown in Appendix F.

9.5.1.2.3 Fire Alarm Signalling Systems

The fire protection system wiring for alarm initiation and alarm signalling as well as standard and functional zone main control room annunciation at the fire control panel is electrically supervised against open circuits and grounds with annunciators to prevent the sounding of false fire alarms due to open or grounded wiring. The uninterruptable UPS bus supplies power to the main plant fire indicating units, fire alarm control units, the indicator light pushbuttons and switches for the deluge valves, fire pump control, automatic reset control, and general alarm circuits located on the fire control panel. The CO_2 storage unit heating and refrigeration service uses the 460 volt AC supply. The service for the CO_2 detection and discharge controls is from the 125 volt DC supply.

There are no devices to automatically record incoming signals to the main control room. Standard zone pre-alarm devices such as ionization detectors, smoke, thermal and rate-of-rise fire detectors are located throughout the plant alarm and indicate in the main control room but do not initiate a plant-wide alarm signal. Functional zone alarm devices such as manual pull boxes, deluge valves, wet sprinklers, and Halon and CO_2 discharge alarm switches will cause an alarm and indication in the main control room. A manual switch in the control room trips a master radio fire alarm box that sends a coded signal via its radio transmitter to the base station located at the DOE 300 fire station. This code will identify to the DOE 300 station that WPPSS Nuclear Project No. 2 has a fire condition.

Standard and functional zone annunciation indicator lights are located on the fire control panel in the main control room and indicate the operation of any activated zone either as standard or functional. In addition, other indicator lights on the fire control panel show the activation of individual devices such as deluge flow valves and control gates; wet sprinkler flow valves and control gates; preaction system flow valve, control gate, and low pressure alarms; CO_2 flow devices; and fire pump and deluge system status.

Manual fire alarm stations provide means of promptly initiating alarms of fire. The station is operated by manually pushing or pulling down the face panel or handle of the station which closes normally open switch contacts. Once these contacts are closed, they cannot be opened until reset. The manual fire alarm stations are located on all elevations of the main plant buildings in close proximity to the stairwells and near exterior doorways.

Manual fire alarm stations are located in appropriate zones intermixed with other detection and alarm devices.

When any manual fire alarm station is activated it shall cause a remote alarm and indication in the main control room.

In addition to the primary power supply from the plant's generating system, which is backed up by an offsite power supply, a secondary source is available from the emergency diesel generator with backup capabilities from DC storage batteries with a capacity of two hours. Distinct audible alarms for the fire alarm signalling system are as follows:

<u>Fire Alarm</u>

Main Control Room - Individual bells on the fire control panel sound automatically whenever their associated standard zone pre-alarm devices or functional zone alarm devices are activated.

<u>Plant-Wide Alarm</u>

An electronic tone generator automatically initiates a fire alarm distinctive tone over the public address system loudspeakers located thorughout the plant whenever the main control room operator actuates the appropriate pushbutton on the fire control panel.

Oral intructions from the main control room operator over the public address system loudspeakers located throughout the plant may follow any main control room alarm.

<u>Trouble Alarm</u>

Main Control Room - A single buzzer on the fire control panel is sounded by the supervisory circuitry provided to detect open circuits, short circuits, closed valves, low water pressure, low air pressure, etc.

Other Alarm

The only other audible alarms that are included in the fire protection system are local alarms for extinguisher release and water gongs.

9.5.1.2.4 Combustion Produces Control

The ability of the plant's various heating, ventilating, and air conditioning (HVAC) systems to remove or control potentially explosive and toxic fumes in the event of fire is discussed in 9.4.

The ingress of smoke or combustible vapors due to a fire external to the main control room is prevented by pressurizing the main control room through an emergency filter train. During this pressurization, the main control room is approximately at a positive pressure of 0.125 inch w.g. with respect to its surroundings. The system will also keep the main control room habitable, without introducing outside air, in the event that smoke or toxic fumes are detected at the fresh air intake. The HEPA filters in the main control room emergency filter train are fire resistant.

Smoke detectors in the main return air ducts to the air handlers (critical switchgear room) and in the battery room exhaust air systems alarm and indicate in the main control room in the event of fire in the switchgear area. The air in the battery rooms is continually exhausted (no recirculation) to prevent possible buildup of combustion gases generated by the emergency batteries.

Fire doors and dampers are installed in all ventilation penetrations with fire ratings equivalent to that of the boundary they penetrate.

Smoke detectors in the cable spreading room's return air ducts alarm and indicate in the main control room, in the event of fire, so that the operator can investigate and take corrective action.

Manually activated water spray systems are provided in the reactor building sump vent filter units, in the control room emergency filter units, and in the standby gas filter units.

Smoke detectors, in the main water treatment area exhaust duct, alarm and indicate in the main control room as well as stop the supply ventilation unit upon detection of smoke.

Two 150 cfm battery hood exhaust fans operate continuously to remove any combustible gases generated from batteries in the make-up water pumphouse.

A 250 cfm capacity explosive proof wall fan continuously exhausts air to atmosphere from the diesel oil tank storage room in the circulating water pumphouse to prevent buildup of combustible gases. Air is introduced into the room from the pump area through a vent opening protected by a 3-hour rated fire door (damper).

The office area and the cold chemistry HVAC system is equipped with fire dampers and smoke detectors. The dampers are equipped with fusible links to isolate in the event of fire. Smoke detectors shut the entire system down and alarm and indicate in the main control room, in the event of fire. In safety-related rooms, the fire doors (dampers are qualified for Seismic Class I.

9.5.1.2.5 Electrical Cable Fire Protection

The fire protection and detection systems in the cable spreading room, the cable chase, and the reactor/radwaste corridor, are described in 9.5.1.2.1.3. These pre-action systems utilize vertical pipe branches with closed head directional spray nozzles to extinguish fire in trays which would otherwise be shielded by the upper trays. At the ceiling the pre-action system uses horizontal and vertical pipe branches with standard sprinkler head to extinguish fires in the upper cable trays. Fires occurring in cable tray runs are contained by fire stops in the floors and walls. The flame resistant and moisture resistant features of the cables are indicated in 9.5.1.1.3.10.

The reactor protection, the nuclear steam supply shutoff, and the engineered safety system circuits are physically separated and are segregated into separate divisions so that no single credible event is capable of disabling sufficient equipment to prevent reactor shutdown, removal of decay heat from the core, or prevent isolation of the primary containment. The routing of cables in the trays provides for separation of cables serving redundant systems so that a failure in one system cannot prevent the redundant system from performing its intended function.

Raceways are arranged to separate the mutually redundant systems so that fires cannot damage more than one redundant system or propagate from one system to another, that is necessary for safe shutdown.

Routing of cable trays and conduits for redundant systems through areas where there is a potential for accumulation of large quantities of oil or other combustible material is avoided.

Refer to 8.3 for details of electrical separation. Refer to Appendix F for Fire Hazards Analysis.

All containment electrical penetration assemblies meet the requirements of ASTM D-635, Test for Flammability of Self-Supporting plastics (April 1973), as well as UL Standards.

The fire protection system wiring is in accordance with the equipment manufacturer's conductor size requirements and meets the requirements of the National Fire Protection Association (NFPA) Standard 72D (1974) and National Electrical Code (NEC) Article 725 (1975). The insulation and jacket is radiation, fire, and moisture resistant and has a flame retarding compound so formulated that the complete cable meets the "Vertical Flame Resistance Test" as outlined in IPCEA S-19-81, Section 6.19.6 (1969). Cables used in radiation areas are radiation resistant and meet the specification requirement for a radiation total integrated dose of 1.8×10^7 rads over a period of 40 years.

Fire protection system conduit is also placed in locations to avoid proximity to heat-producing equipment and high ambient temperatures. Conduit installation in hazardous areas meets the requirements of the National Electrical Code, Article 500 (1975) as applicable to the particular area.

9.5.1.2.6 New Fuel Storage Vault

The new fuel is stored in noncombustible racks which are located in a storage vault which has concrete walls and floor. Access to the vault is only through concrete plugs on the refueling deck. The vault is maintained dry by the inclusion of a sloped floor toward a floor drain.

A radiation monitor in the vault detects an increase in the radiation level above the normal operation condition and alarms in the main control room. The use of combustible material has been limited to essential components, such as the wiring for the radiation detectors.

The refueling deck is monitored ultraviolet flame detectors which would alarm in the main control room. Hand portable extinguishers and two 1-1/2-inch manual hoses are adjacent to the access plugs to be used for extinguishment.

9.5.1.3 Safety Evaluation

See Appendix F for a detailed fire hazards analysis of the plant. The potential fire hazards in the station consist of concentrations of combustibles in the form of ordinary combustibles, oils and charcoal as shown in Table 9.5-4, and the insulation coverings of cables in unattended cable vaults and electrical penetration areas.

The design of the fire protection system provides protection from these hazards by providing three lines of defense against a possible fire condition.

The first line of defense consists of portable hand extinguishers, located throughout the plant area, which could be used immediately upon detection of a fire.

Standpipe and hose connections provide a second line of defense for fires which may get beyond the extinguishing capabilities of hand type fire extinguishers. These connections are installed in all plant structures and are of sufficient number and are so located that all areas of fire potential can be reached with no more than 150-feet in non-safety-related areas and 150-feet in safety-related areas of 1-1/2-inch hose attached to the connection.

The third line of defense consists of fixed automatic and pre-action water spray or deluge systems installed to protect areas or equipment exposed to or containing large quantities of combustibles. These systems are provided to protect those areas of the plant for which rapid flame propagation would negate the effectiveness of manually directed equipment and to prevent equipment containing large quantities of combustible oils or gases from becoming involved in fires originating at another source.

The fire risk evaluation used in the design of the fire protection system is based on a study of the specific hazard or hazard areas outlined to determine the type of fire which might develop, the amount of combustibles which could be involved, and the physical arrangement of the hazard or

hazard areas to determine which fire protection equipment or systems are most effective against a fire in each circumstance.

The fire protection system is designed such that failure of any component of the system will not cause an accident or signficant release of radioactivity to the environment and will not impair the ability of engineered safety features to safely shutdown or isolate the reactor, or to limit the release of radioactivity to the environment in the event of an accident. Safety-related equipment is redundant and physically separated by spatial separation or structural barriers, thereby eliminating the possibility of a single fire becoming uncontrolled and preventing safe shutdown of the reactor.

Fires occurring in non-safety-related equipment areas cannot affect the ability of the plant to safely shutdown. Fires occurring in all switchgear areas, cable chase, tray runs, and cable vaults are contained by American Nuclear Insurers' approved fire stops rated at 3-hours at the following points:

a. Floor penetratins (prevents vertical spread of fires).

b. Fire rated wall penetrations (prevents horizontal spread of fires).

The only automatic valves provided in the fire protection system, which require actuation in the event of a fire, are the automatic valves on the automatic wet sprinkler, deluge pre-action, Halon and CO_2 systems. Failure of one of the water or gaseous control vavels can result in a loss of operability of that system. The fire can then be contained by manually operated standpipe hose stations, hydrant hoses, or portable fire extinguishers depending on the location of the fire.

During a fire emergency, all areas of the plant dependent on manually operated fire protection equipment are accessible. Air packs are available to personnel to counteract the effects of smoke, toxic combustion products, and airborne radioactivity.

The possibility of fire is minimized by the use of noncombustible materials in the construction of the station. Some electrical cables are insulated with fire-retardant material. Suitable separation distances are provided between transformers.

Extinguishing materials used in the fire protection system are compatible with safety feature equipment. Non-toxic gaseous extinguishing materials are used in fixed systems in areas normally occupied by station personnel. Portable fire extinguishers used in energized electrical areas have non-metal exhaust horns.

The effects of a fire originating outside the main control room is considered in the main control room fire protection design as follows:

a. All entrances and floor openings are sealed to limit smoke infiltration. The control room air conditioning system maintains a positive 0.125 inches water column pressurization with respect to the surrounding rooms.

b. Use of combustible materials is kept to a minimum.

c. The main control room is constantly attended and portable fire fighting equipment (Halon 1211 extinguishers) is provided.

d. Air packs are provided for personnel protection.

Serious leaks in the fire protection system piping are indicated by intermittent fire-pump-running alarms in the main control room when there are no concurrent fixed automatic or preaction fire protection system operating alarms and no reported usage of any fire protection standpipe or hydrant hose. The location of serious leaks is determined by pressurizing the fire protection system and utilizing the sectionalizing valves to isolate a section of the fire protection system. A pressure drop in an isolated section indicates the affected section of the fire protection system and the specific location of the leak is determined using sound listening device methods or by visual inspection.

A rupture of the fire protection system piping is also indicated by continuous fire-pump-running alarms in the main control room with no concurrent fixed automatic or pre-action fire protection system operating alarms, no detector fire alarms, and no report of any fire or use of fire hose. The location of the pipe rupture is by visual observation or by utilizing the sectionalizing valves to isolate segments of the fire protection system if no visual indications are

present. Cessation of pump running alarms when the isolation valves are used indicates which section of the fire protection system piping is effected.

The looped arrangement of the fire protection system assures continued flow to the remainder of the system when sections of the system are isolated for tests or repairs.

The location of the fire water piping is such that in the event of an earthquake, pipe ruptures will in no way endanger the reliability of engineered safety feature systems due to local flooding.

The fire and smoke detection alarm systems are designed to provide rapid identification of the location of any fire so that corrective measures can be instituted with minimum delay.

In areas containing moderate amounts of combustibles such as cable rooms, heating and ventilating equipment rooms, switchgear, motor control centers, and reactor building electrical penetration areas, which are not under routine or continuous observation or are not subject to large combustible oil or gas hazards, ionization (products of combustion) type detectors are provided. These detectors are designed to detect and locate, by designated zones, smoke and smoldering conditions at an early stage so that corrective action may be taken with minor resultant damage. These detectors, as well as other fire detection devices, are connected to the main control room fire control panel's indicating lights. Each set of lamps is provided with a nameplate indicating its building, room name, or corresponding area description. Each automatic extinguishing system condition will also be monitored on an indicating basis by system condition lights at the fire control panel in the main control room. A detection system failure analysis is provided in Table 9.5-2.

The sensitivity of the individual products of combustion (ionization) detctors is affected by radiation. These detectors are not located in areas where the background radiation is so high that it exceeds the manufacturer's rating.

The sensitivity of the combination fixed-temperature and rate-of-rise detectors is not field adjustable, but is based on the normal average air temperature in the area where they are used. The results of a fire protection system failure mode and effects analysis are contained in Table 9.5-2.

In areas where the background radiation is low, but could still affect detector sensitivity over a period of time, the detectors are replaced on a schedule that is based on an evaluation of the radiation levels in conjunction with the manufacturer's information on radiation effects. Individual detectors are adjusted for humidity and particulates contained in the air.

The sensitivity of the combination fixed-temperature and rate-of-rise detectors is not field adjustable, but is based on the normal average air temperature in the area where they are used. The results of a fire protection system failure mode and effects analysis are contained in Table 9.5-2.

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A proprietary supervisory alarm system covering all fire protection systems is provided with alarms received in the constantly attended main control room. Fire detection systems used to actuate suppression systems in safety-related areas have class "A" circuitry.

9.5.1.4 Inspection and Testing Requirements

The equipment and system are inspected and tested after installation in accordance with local and state requirements. Pumping equipment is also shop tested to ensure that specifications are met.

The system is operated and tested initially with regard to flow path, transfer capability, and mechanical operability. Transfer capability and flow capacity will be tested at regular intervals. Pumps and valves will be tested for actuation at specified set points. Alarm systems functions are checked during preoperational testing for operability and establishment of limits.

The fire protection system and equipment are tested in accordance with the applicable NFPA standards, as well as the requirements of the standards of the fire insurance underwriter whenever feasible. Certain testing which would require entry into high radiation areas is not performed during power operation.

9.5.1.5 Personnel Qualification and Training

A private fire brigade will be organized, trained, and drilled at regular intervals. (see Appendix F)

The training and updated provisions for WNP-2 station fire fighting and operating personnel is referenced in the WNP-2 training manual, industrial safety and fire protection manual and the plant procedures manual. The Plant Procedures manual defines the personnel responsible for maintaining and inspecting the fire protection equipment.

9.5.1.6 Instrumentation Requirements

Instrumentation and design settings are given in Table 9.5-3, (see Figure 9.5-1.) The logic block diagram is given in Figure 9.5-2.

9.5.2 COMMUNICATIONS SYSTEMS

9.5.2.1 Design Basis

WNP-2 is provided with the following communication systems:

a. Public Telephone System

b. Private Digital Telephone System (PDTS)

c. Sound-Powered Telephone System

d. Public Address and Building-Wide Alarm System

e. Radio Communication Systems

f. Automatic Transmission (AT) Telephone Link to BPA, Dittmer Control Center

The public telephone system is accessed through United Telephone Company (UTC) and General Telephone Electric North West (GTENW). Telco, Public Telephone System, UTC and GTENW are all synonymous when used herein.

The system provides communication links between:

a. Selected plant management, operations and security personnel and the outside world public telephone system.

b. The PDTS switchboard exchange and the outside world public telephone system.

The PDTS provides: intra-plant and inter-plant communications links; telephone communication circuits to the BPA microwave circuits; and communication links to the public address system and radio paging systems for use in paging.

The sound-powered telephone system provides a backup to the PDTS in case of total loss of electrical power to the PDTS and can be used as a supplementary communications circuit to aid in the testing and maintenance of plant process systems.

The public address system provides means for contacting personnel in the various buildings of the plant and parts of the site which might be inaccessible with the other means of communication. The building-wide alarm system alerts (via the public address system speakers) operating personnel to fire, hazards, and other trouble conditions for which plant management finds it necessary to alert plant personnel.

The radio communications system provides the required radio-frequency communications link for Security and Emergency communications to local law enforcement agencies and emergency control centers. This is used as an alternate communications medium to the wire line and fiber-optic transmission systems leaving the protected areas of the plant complex.

In addition, the radio communications system is used for communications with personnel involved in maintenance and security in and around the plant complex by means of hand-held portable radio units, mobile radio units and hand-held paging receivers.

The automatic transmission (AT) telephone link to the BPA Ashe Sub-Station provides a direct communication link via microwave to the BPA Dittmer Control Center for use in electrical utility matters.

All equipment, components, raceways, and support systems located in the main control room are designed and anchored such that they will not become missiles and cause loss of function of nearby safety-related equipment as a result of the Safe Shutdown Earthquake. The same criteria is followed wherever such equipment is located close to safety-related equipment.

9.5.2.2 System Description

9.5.2.2.1 Public Telephone System

This system consists of interconnections to the United Telephone Company Telephone switching office as described below:

a. Individual direct trunks with direct inward and outward dialing access to several plant locations. Included are:

   1. superintendent's office

   2. main control room

   3. primary guardhouse security central alarm station (CAS)

   4. remote shutdown room

   5. security secondary alarm station (SAS) in the main control room

b. Provisions for extension of individual direct trunks with direct inward and outward dialing access to other plant locations:

   1. assistant superintendent's office

   2. shift supervisor's office

   3. radwaste control room

c. Central office trunks to the PDTS switchboard exchange to facilitate inward and outward dialing access to and from various plant locations.

9.5.2.2.2 Private Digital Telephone System (PDTS)

The switchboard exchange for this system consists of an all electronic, stored program, computer controlled telephone switching system, with integral redundant computer, solid state circuitry and pulse code modulation/time division multiplexing switching techniques. The switchboard exchange and an attendants console are respectively located in the communications equipment room of the radwaste and control building and the telephone room in building 17. Telephones are strategically placed throughout the plant complex. In general, each telephone is a separate

assigned extension of the switchboard exchange. The system receives power from the UPS system for reliable operation.

Incoming calls on the Telco's central office trunks are received at an attendant's console and extended to the outlying telephones by attendant's pushbutton set. The attendant and any outlying telephone can make outgoing calls on these trunks and tie lines by means of the dial on their respective equipment.

The PDTS provides complete inter-communication at all times between any two telephones. Connections are established by means of a dial on each telephone. Automatic dial tone, busy tone, and ringing current are provided.

Telephone communications boxes (CBs) are provided throughout the plant. The CBs in offices have a jack for plugging in a desk-type telephone. These CBs are extensions of the PDTS exchange.

Most CBs in the operating and work areas have a PDTS telephone jack and a sound-powered telephone jack. Instrument and control panels in the control room have PDTS and sound-powered telephone jacks installed in the panels. Important operating and work areas, such as the control room, have permanently mounted PDTS telephones wired into the terminals of the CB, leaving the PDTS jack available for a portable telephone. Other operating and work areas use portable telephones plugged into the jacks. A telephone number is assigned to one CE or jack of a compatible group and the others in the group are wired in parallel to it.

Head sets are plugged into adaptor jacks connected to permanently mounted telephones in the operating and work areas when hands-free communication is required.

Tie lines connect the PDTS to the BPA microwave communications system in the communications equipment room to provide telephone communications with BPA.

The PDTS provides the following special features:

a. Conference - up to eight telephones can be connected into a conference network to facilitate maintenance, testing and management activities.

b. Paging - the Public Address System can be accessed from any PDTS telephone extension.

c. Ringdown - the PDTS can be programmed to provide ringdown (hotline) service for selected telephones. The service provides automatic ringing without dialing.

Half-type acoustically treated telephone booths are used with outlying telephones in locations of high noise level in order to permit the satisfactory operation of the telephones in noisy environments. In addition, each telephone in a high noise level location is equipped with a noise-cancelling transmitter to limit undesirable background noise from entering into the conversation link.

9.5.2.2.3 Sound Powered Telephone System

The Sound Powered Telephone System consists of jacks installed in the communications boxes and panels, as noted in 9.5.2.2.2, and the connecting wiring. The system is divided into eight circuits. Each circuit serves a different area of the plant. All wiring is routed to a terminal box located in the communications equipment room. The terminal box is equipped with jumpers for interconnecting the circuits. During normal operation the jumpers are connected to form a single bus so that all sound-powered jacks are connected in parallel. Each circuit can be isolated at the terminal box if shorts or grounds occur.

Portable sound-powered telephones are plugged into the jacks to complete a communications link.

9.5.2.2.4 Public Address and Building-Wide Alarm Systems

9.5.2.2.4.1 Public Address System

The Public Address system is designed to provide area wide paging throughout the plant by means of loudspeakers located within the various areas. Audio power to the speakers is provided by preamplifiers and final amplifiers located in equipment racks within the Communications equipment room in the Radwaste and Control Building. Reliable power to these amplifiers is provided from the UPS bus.

The speakers in each of the buildings or zones are connected in two separate circuit loops. This provides an alternate path for partial communications should one loop be damaged. Each building or zone is connected to it's own amplifiers and switching relays are provided to activate all of the amplifiers at once for a "microphone actuated all zone page". Paging microphones utilized for this purpose are located in various areas including the Control Room, Remote shutdown room, Plant Emergency Directors office and the Operations Support Center.

Any telephone instrument in the PDTS can access the paging system for an individual building/zone page or an all building/zone page by dialing the appropriate assigned access number and speaking into the mouthpiece. The connection between the PDTS and the paging system is provided through special paging adapters which interface the two systems. The "microphone actuated all building/zone page" has priority over any telephone access and will override the telephone connection.

The audio amplifiers and preamplifiers have redundant units which are automatically switched on line should a primary amplifier fail. Failure of the amplifier systems is alarmed in the control room and remote shutdown room as well as locally at the Public address racks.

9.5.2.2.4.2 Building/Zone-Audio Alarm System

The audio alarm system consists of a multi-tone generator with redundant backup which is located within the Public Address system racks. The audio generators are capable of producing five distinct audio tones which are amplified by the Public Address system. The redundant generator is automatically switched online should the primary unit fail and an alarm is activated. The units are fed from the UPS system along with the PA system. Separate tones have been defined for each of the following functions:

a. General Evacuation

b. Alert

c. Containment Evacuation

The remaining two tones have not been assigned as yet.

The audio alarm system has priority over PDTS paging and "microphone actuated paging", and will override either of these functions. The main control room is capable of activating all tones. The general evacuation tone and the alert tone may be activated from either the plant superintendant's office or the Remote Shutdown Room or the Plant Emergency Director's office in the TSC.

9.5.2.2.5 Radio Communications System

The radio communications system for WNP-2 is integrated into the Supply System radio network that provides communications for all Supply System Facilities in the Hanford area. These include the Hanford Generation Project, WNP-1, WNP-2 and the Main Office complex.

The system is comprised of the following:

a. Two in plant repeater stations for Operations and Security within the plant.

b. Two radio base stations.

c. Portable handheld radios.

d. Mobile radios installed in vehicles.

In-Plant Repeaters

The in-plant repeaters are utilized to provide radio communications within the plant using a distributed antenna system. Both units are physically located in the Radwaste Building and separated from the base station and public address equipment.

Base Station Equipment

The base stations are duplicate units with the same frequencies and output power. Four 2-way communications channels are provided. Two channels are used for Operations and Maintenance and the other two are security channels.

The security system base station is located in the Primary Access Point Guardhouse and controlled by the CAS radio console. The antenna is located on the PAP building.

The operations and maintenance base station is located in the Radwaste Building HVAC Room 5. It is controlled from several areas including the SAS, CAS, SRO desk, and remote shutdown. This station is capable of being used as a backup to the Security Base in the PAP. The SAS may also prevent the CAS from controlling the operations station if required in an emergency. Two radio receivers are also provided. They receive on the two security channels. One is located in the PAP with speaker and controls on the CAS console, the other is located in the Radwaste Building with controls on the SAS console. These receivers allow security to monitor both channels at once if required.

All equipment other than mobiles or handheld portables are powered by UPS bus for reliable operation.

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9.5.2.2.6 Automatic Transmission (AT) Telephone Link to the Ashe Substation for Connection to the BPA Dittmer Control Center

This circuit consists of telephones located in the main control and remote shutdown rooms of the radwaste and control building which are directly connected to the WPPSS WNP-2 BPA microwave equipment. These special phones provide automatic ringing without dialing to the Dittmer Control Center of BPA.

9.5.2.3 Inspection and Testing Requirements

All communication cable conductors are tested for continuity and insulation resistance before connection to the various communication apparatus. A functional test on all communications systems is made after installation.

The functional test on the total installed radio communications system included a complete test of all system functions such as operation from base station, remote control units and two-way communictaion between offsite and onsite stations. Tests were made using both the maintenance and security system frequencies. Tests were performed to insure that no harmful interference results between this equipment, the repeater station on Rattlesnake Mountain, and control room equipment. During pre-operational and post-operational surveillance testing, solid state electronics in some areas exhibited spurious response to radio transmission. These areas have been flagged by signs showing "Prohibited Area For Use of Radios" and are put under administrative control.

9.5.2.4 Communication System Capability During Posulated Accident and Anticipated Transients

9.5.2.4.1 Protective Measures

The Plant Communcications System described in Section 9.5.2 provides assurance that a reliable communications link is available from the strategic plant work stations to the Control Room. The following design factors contribute toward this goal:

a. The PDTS telephone switchgear is built with plug in modular circuit boards so that defective boards can be quickly replaced.

b. The PDTS telephone switchgear has redundant central processing units with automatic switching from a failed computer to the redundant computer.

c. The sound powered telephone system backs up the PDTS system in case of a major failure of the switchgear.

d. Several telephones are connected directly to the telephone company's central office to operate independently of the PDTS. These include telephones in the Main Control Room, Remote Shutdown Room, Primary Guardhouse and Plant Superintendent's office.

9.5.2.4.2 Severing of Lines or Trunks

The failure of a single line or trunk cannot prevent communications from critical plant workstations. Alternate facilities are available as follows:

a. Radios do not require offsite lines and can be used in lieu of telephones if telephone lines are cut.

b. Portable radios can be used if the antenna leads to the base stations are severed.

c. Tie Lines connect the PDTS switchgear to the BPA microwave (MW) communications system. The lines provide telephone communications from WNP-2 to telephones that are connected to the MW system in BPA facilities, and the Hanford Generating Project. These communications are independent of the Public Telephone System.

9.5.2.4.3 High Noise

The communication system design ensures that in high noise areas:

a. Telephones are installed in sound dampening booths with either/both noise cancelling handsets and amplified receivers.

b. PA system speakers have volume controls which are adjusted according to the ambient noise level.

9.5.2.4.4 Strategic Work Area Communications Capability to Handle Anticipated Transients and Postulated Accidents

Table 9.5-9 shows the strategic work areas and the type of communications available between these locations and the control room, remote shutdown room and outside world.

9.5.3 PLANT LIGHTING SYSTEM

9.5.3.1 Design Bases

a. Lighting intensities are designed to provide indoor and outdoor illumination consistent with the latest Illumination Engineering Society recommendations (July, 1974), and to meet or exceed OSHA requirements.

b. Light sources are selected with consideration for environmental conditions and ease of maintenance.

Flourescent or H.I.D. sources are not used inside primary containment; incandescent sources are used inside primary containment.

9.5.3.2 System Description

The plant lighting system consists of four parts: normal AC lighting, normal-emergency (E) AC lighting, DC lighting, and battery powered emergency lighting. For location of various plant emergency lighting systems, see Table 9.5-8.

9.5.3.2.1 Normal AC Lighting Systems

This system consists of two completely redundant systems (A & B) which are energized continuously from the plant non-safety related 480 volt auxiliary system motor control centers directly from 3-phase 480 volt, or through 208Y/120 volt dry type lighting transformers and local area lighting panels. Fluorescent, incandescent, and H.I.D. sources are used for the normal ac lighting system.

9.5.3.2.2 Normal-Emergency (e) Lighting Systems

Normal - emergency (E) lighting is provided for safe and orderly shutdown during the loss of normal AC power. This system is energized continuously from the safety related 480 volt motor control centers through 3-phase, 4 wire 208Y/120 volt dry type lighting transformers. These transformers feed E lighting panels.

This lighting system consists of two completely redundant systems (Divisions 1 and 2). Each system has AC lighting energized continuously from critical buses which are connected both to offsite power sources and associated standby diesel generators. Upon loss of offsite power, each bank of the E lighting load is renergized from its associated standby diesel generator source. The standby diesel generators are installed to Seismic Category I requirements.

E lighting comprises approximately 15 percent of the normal plant lighting load and consists of fluorescent, sodium (outdoor) and incandescent sources. E lighting fixtures in the main control room are designed and supported as Seismic Category I.

9.5.3.2.3 DC Lighting Systems

DC lighting is provided in the main control room, the access route to the remote shutdown room, and in the remote shutdown room.

This lighting consists of two completely redundant systems (1 and 2). Each system is energized continuously from ac power inverters and 125 volt dc plant emergency battery systems that are installed to Seismic Category I requirements. The ac powered inverters are connected to the redundant critical buses. The lighting load consists of incandescent light sources.

9.5.3.2.4 Battery Powered Emergency Lighting Systems

The battery powered emergency lighting includes normal battery units and Appendix R 8 hours battery units which are installed for the safety of operating personnel to provide lighting for egress routes during a total blackout period.

This lighting system consists of individual power packs and incandescent lamps. The lamps are automatically energized upon loss of the respective normal and/or normal-emergency ac sources. The source of emergency power consists of integral battery power packs. Emergency battery units in Seismic Category I areas of the radwaste building are Seismic Category I mounted and supported.

9.5.3.3 Safety Evaluation

Normal and normal-emergency lighting are installed with interlaced wiring throughout the plant to provide uniform lighting intensities, whether full brightness or low brightness, during a power system failure.

In areas that are serviced by H.I.D. lighting sources, ten percent of the fixtures are provided with tungsten halogen standby lamps. These standby lamps will be immediately energized after an interruption of the power source and will provide partial illumination until the H.I.D. lamps restrike.

Radiation areas depicted on radiation zone drawings (FSAR chapter 12.3, figures 12.3-26 through 12.3-39) are provided with emergency lighting to facilitate evacuation of personnel in the event of an accident or fire.

No emergency lighting is provided in the RHR valve rooms. Everything in these rooms is operable from the Control Room and there are no valves in them which would require manual cycling in an emergency loss of power situation.

9.5.4 DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM

9.5.4.1 Design Bases

a. The onsite storage capacity of each subsystem provides for continuous operation of each diesel generator for at least seven days while satisfying post-LOCA maximum load demands.

b. The design of the system conforms to IEEE Standards 308 and 387 and the intent of ANSI Standard N195. The equipment within the system conforms to the applicable codes and standards of ASME, ASTM, ANSI, DEMA, IEEE, API, and NFPA.

c. The system piping off of the engine skid is constructed to ASME Section III, Class 3 and Seismic Category I requirements. (See Table 9.5-6 for equipment design codes.) Except for the diesel oil storage tanks, all portions of the system, including the fuel oil day tanks, are protected from tornado missiles by enclosure in Seismic Category I structures. The diesel oil storage tanks are buried for tornado protection and to maximize containment of postulated oil spills. The system is not subject to flooding since the site is not subject to flooding. The piping on the engine skid is designed to guidelines of ANSI B31.1 and is Seismic Category I.

9.5.4.2 System Description

The fuel oil storage and transfer system consists of separate, independent diesel oil supply subsystems serving each of the two tandem diesel engine generators (1A and 1B) and the HPCS diesel engine generator (1C). Each of these subsystems consists of a fuel oil storage tanks a transfer pump, a day tank, interconnecting piping and valves, and associated instruments and controls. The system diagram is shown on Figure 9.5-4a and 9.5-4d.

In each supply subsystem, a transfer pump powered from a UPS bus takes suction from the diesel oil storage tank and discharges to an associated diesel generator fuel oil day tank to maintain the fuel oil level within the day tank. The transfer pump is sized to provide a flow of 4.4 times the maximum engine consumption rate and is automatically controlled by level switches activated by day tank fuel level. The capacity of each fuel oil storage tank is sufficient to provide seven days of operation for the diesel generator being served.

Each transfer pump is connected to a day tank. There is a pipe interconnecting the DG 1A and 1B transfer lines with normally closed valves. If a rupture occurs in the inter-connecting cross line when in use, this line will be isolated and thereby the fuel oil supply will not be interrupted between any storage tank and its associated day tank.

The volume of the day tanks permits eight and one-half hours of engine operation of the associated diesel generator without resupply to the day tank. This arrangement provides three hours of operation before the transfer pump starts, two hours of operation between a start signal to the transfer pump and day tank low level alarm in the event the transfer pump does not start, and three and one-half more hours of operation after low level alarms are actuated to take required corrective action.

At normal high oil level a switch will shut off the pump. If the fuel oil level goes above the normal high level, a "high-high" level switch is activated and sends an alarm signal. If the pump does not shut off the day tank overflow line will return all pump flow to the storage tank of the same DG.

Operation of the fuel storage tank transfer pump is controlled manually when fuel is being transferred through the interconnecting line from storage tank "A" to day tank "B" or from storage tank "B" to day tank "A". High and low level annunciation of the day fuel levels will provide a warning of overfilling or depleting the day tank when the transfer pump is on manual control.

The fuel oil supply from the day tanks to each diesel engine consists of two mutually redundant systems. Either system is capable of supplying fuel oil to the engine. Each system contains a fuel supply line, strainer, fuel oil pump, duplex filter, pressure gage, and relief and check valves. Separate fuel return lines from the relief valves to the day tanks are provided for each system on diesel generators 1A and 1B. The HPCS diesel utilizes a common return line to the day tank.

One of the fuel supply pumps is mechanically driven by the engine and is normally used during engine operation. The other supply pump is driven by a 120 volt DC motor and is used to fill the fuel oil system and fuel header prior to initial operation and after maintenance has been performed on system piping and components. The DC motor driven pump is also available for engine operation in the event fuel supply through the engine driven pump system fails.

The fuel pumps are located 2.3 feet higher than the suction pipes inside the day tank. The fuel pumps are designed to operate at this negative suction pressure.

The fuel oil supply and return piping is not exposed to ignition sources such as open flames or hot surfaces. The transfer lines between the storage and day tanks are buried.

The fuel oil day tank is located in a separate ventilated room which is sized to contain the full contents of the tank should a leak develop. For discussion of fire protection see 9.5.1.

The fuel oil storage tanks are provided with Seismic Category I individual fill and vent lines which are protected against the entry of contaminants. The fill lines are provided with screwed caps and the vent lines are provided with flame arrestors. The fill and vent lines terminate at 3.25 and 6.0 feet, respectively, above plant grade, which prevents direct seepage of any ground water into the storage tanks.

In the event of fill line damage due to a missile, the pump-out connection which is protected by a metal encloure, located at ground level, may be utilized for the fuel oil filling operation.

Prior to filling the storage tanks, the day tank will be confirmed to be full. This will allow sufficient time for sediment (millscale or sand) to settle before oil from the storage tanks is transferred to the day tank.

Diesel fuel oil conforming with the requirements of the Technical Specifications will be provided for operation of the emergency diesel generators. This grade of diesel fuel complies with the engine manufacturer's requirements and is available from local distribution sources as discussed in 9.5.4.3.

Equipment design characteristics for the fuel oil supply system are shown in Table 9.5-6.

9.5.4.3 Safety Evaluation

The entire diesel oil supply system is located within the confines of a Seismic Category I building except for the buried storage tank. Each subsystem oil storage tank transfer pump, day tank, and diesel generator set is physically separated within separate concrete enclosures designed to protect against missiles, in compliance with 3.5, and to provide fire protection. No high or moderate energy piping is present in the diesel generator building. The oil storage tanks are buried for protection so that storage tank failure is completely contained within the soil at a level below any building penetration or access opening. Each storage and day tank is provided with a vent directly to the outside atmosphere. In addition, the enclosures are provided with exhaust ventilation to the outside atmosphere to ensure that any diesel fuel vapors are maintained well below the combustible limit. The enclosures are automatically monitored by temperature detectors which initiate the pre-action sprinkler system in the event of fire (FSAR Appendix F). All storage and day tank vents are equipped with flame arrestor devices.

Although a single failure may result in loss of fuel to one diesel generator, the other diesel generator can provide sufficient capacity for emergency conditions, including safe shutdown of the reactor (see 8.3) coincident with loss of offsite power.

Each diesel oil storage tank of generator 1A or 1B has a capacity of 60,000 gallons which is more than sufficient to supply oil for one diesel generator or seven days. In addition, each day tank has a capacity of 3000 gallons. The diesel generator fuel consumption at 100% generator rating of 4650 kW is 340 ga/hr. The NPCS diesel oil storage tank (50,000 gallons) and its associated day tank are also adequate to sustain operation of the NPCS diesel for at least seven days.

The minimum site storage of seven days (even assuming the loss of one storage tank serving diesel generators 1A and 1B) is considered adequate time for obtaining additional fuel oil, if required. Fuel can be available at the site within six hours from local sources (Pasco, Washington), or from more remote terminals within 12 to 24 hours.

Materials for the fuel oil supply system are provided in Table 9.5-6.

For corrosion protection, the exterior surfaces of the buried piping and components are coated with coal tar enamel. Application of coatings are in strict accordance with ADA Specification C203.

The buried components of the fuel oil system are all at a uniform temperature and not subject to condensation phenomena. The periodic sampling of the fuel oil storage tank bottom will serve a two-fold purpose - determining if any water or sediment and corrosion products have accumulated so corrective action may be taken.

A fuel oil filter and strainer is provided on each fuel line to each engine to eliminate passage of particles, five (5) microns or larger in sized to the engine injectors.

Diesel oil pipe lines from the storage to the day tanks run through culvert pipe sleeves at about six feet below the diesel generator building floor. The overflow lines from the day tank to the storage tank run underground south of the DG building. Diesel oil pipe lines extending under the diesel

generator building do not receive full protection from the exterior rectifier-anode system because of the electrical shielding effect of the ground grid and foundation reinforcing and structural steel. Since the earth area under the diesel generator building is sheltered and hence relatively much drier than the earth exterior to this building, no additional cathodic protection system is provided or required.

9.5.4.4 Testing and Inspection Requirements

System components are inspected and cleaned prior to installation. Instruments are calibrated during testing and automatic controls are tested for actuation at the proper set points. Alarm functions are checked for operability and limits during plant preoperational testing. Automatic actuation of system components is tested periodically in accordance with Chapter 16, Technical Specifications. The system is operated and tested initially with regard to flow paths, flow capacity, and mechanical operability in accordance with Chapter 14.

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To assure quality and reliability of the fuel supplied to the emergency generators, certification is required that the delivered fuel conforms to the requirements of ASTM-D975, "Standard Specification for Diesel Fuels". Samples of delivered fuel are tested to measure specific or API gravity, viscosity and for water and sediment. These tests are those predominantly used by the petroleum industry for rapid checking of products being shipped via pipeline or other bulk methods. An analysis to assure the delivered fuel meets specifications of ASTM-D975 is completed within two weeks of fuel receipt. Testing of stored fuel is made at 92-day intervals to also measure viscosity, moisture, and sediment. Single tank composite samples will be obtained using ASTM-D-270, Standard Method of Sampling Petroleum and Petroleum Products. Over limit indications from the above tests initiates immediate corrective action to ensure the required quality of fuel is available for operation of the emergency diesel generators.

9.5.4.5 Instrumentation Requirements

Each diesel oil storage tank is provided with local level indicators and high and low level switches which actuate alarm annunciators in the main control room. Each day tank is provided with two level switches and a float switch which perform the following functions:

a. Start and stop the transfer pump to maintain level in the day tank.

b. Actuate an alarm in the main control room upon low level.

c. Actuate an alarm in the main control room upon high-high level.

Each transfer pump discharge line is provided with local pressure indicators. The system maintains the proper supply of diesel oil in each day tank by means of the level switches in the day tanks which signal the corresponding pump motor starters to automatically start and stop the transfer pumps.

The main control room is provided with high and low level annunciators for all the tanks in the system and with control switches for remote control of each complete transfer system train.

Local indication of differential pressure is provided across the duplex filters in the fuel oil supply lines to the diesel engines of diesel generators 1A and 1B.

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9.5.5 DIESEL GENERATOR COOLING WATER SYSTEM

9.5.5.1 Design Bases

a. The diesel generator cooling water system is designed to provide full load cooling for the diesel generator engines while they are operating and to maintain each engine at an acceptable starting temperature under standby conditions.

b. The piping system associated with the diesel cooling water system is designed, fabricated, inspected, and erected in accordance with ANSI B31.1. Seismic classification of the system is Category I as discussed in 3.2.4. The diesel cooling water heat exchangers for diesel generator 1A and 1B are designed and built in accordance with ASME Section III, Class 3 and TEMA Standards, Class C; diesel generator 1C (HPCS) is designed and built in accordance with ASME Section VIII, TEMA Standards, Class C.

c. The reliability of the diesel cooling water system is achieved by providing separate cooling water systems for each diesel generator. Thus, failure of single component in one cooling water system would not effect the operation of the other diesel generator. In addition, the subsystems are housed separately in a Seismic Category I structure containing no high or moderate energy piping.

9.5.5.2 System Description

Each diesel generator is serviced by an independent cooling system. These systems are located in separate rooms associated with their respective diesel generator. Each engine cooling water system is a closed water circuit which recirculates treated water (see 9.2.3) for engine cooling (see Figure 9.5-4 and 9.5-6). The treated water is circulated through the engine's water-jacketed components in order to remove heat from the engine parts. At normal operating conditions, the recirculation is approximately 1100 GPM with an average temperature rise of 14.6°F in the jacket water. This jacket water heat is rejected through a shell and tube heat exchanger to the Standby Service Water system (see 9.2.7). Location of the system is shown on Figure 9.5-5.

The forced circulation of cooling water through the engine, lube oil cooler, heat exchanger, and heat exchanger bypass circuit is maintained by two engine driven pumps. The separate bypass piping flow paths are provided to bypass the heat exchanger at low engine outlet temperatures and to heat the jacket water system during standby. The heat exchanger bypass flow and temperature is automatically regulated by a three way self-contained thermostatic valve. This valve is set to maintain the engine outlet water temperature at 175°F (180°F for HPCS diesel engine). This thermostatic valve outlet opens to the heat exchanger when the engine jacket water temperature reaches 165°F and is full open to the heat exchanger at 175°F (180°F for HPCS). A high temperature alarm annunciates at 200°F (195°F for HPCS diesel engine). A high temperature shutdown switch is provided to shutdown the engine when coolant temperature reaches 208°F (205°F for HPCS diesel engine) during test conditions.

The heat exchangers are designed for the heat duty expected under maximum engine load with appropriate fouling factors to take care of service conditions (see design data below). In addition, the maximum service water temperature expected is utilized. In the case of these heat exchangers, since the maximum ultimate heat sink temperature is expected to be always less than 87°F, an additional 10% margin exists because the heat exchangers were designed to a 95°F maximum service water temperature.

The diesel generator heat exchangers are designed for the following conditions:

DIESEL GENERATORS 1A and 1B

	Shell Side	Tube Side
Fluid Circulated	Engine Water	Standby Serv. Water
Number per Engine	one	
Flow GPM	1,100	825
Temp In °F	190	95
Temp Out °F	175.4	113.9
Fouling Factor	0.0005	0.001
Heat Load btu/hr	7,800,000	
Heat Emitted to the Room btu/min	22,000	

HPCS DIESEL GENERATOR 1C

	Shell Side	Tube Side
Fluid Circulated	Engine Water	Standby Serv. Water
Number per Engine	one	
Flow GPM	1,100	910
Temp In °F	187	95
Temp Out °F	170	118
Fouling Factor	0.0005	0.00185
Heat Load btu/hr	8,872,000	
Heat Emitted to the Room btu/min	11,000	

The 94 gallon expansion tank (26" diameter by 50" long) is mounted on the diesel engine skid, and its bottom is approximately 20 inches above cooling water circulating pump suction. The expansion tank is provided with a pressure cap that maintains pressure on the cooling water system (7 psi) and prevents loss of water due to evaporation.

The expansion tank is provided with a level sight glass which is mounted on the front with instructions that indicate minimum water level. An alarm is provided in the control room to annunciate in case of low water level. Make-up water is normally supplied by the Demineralized Water System, but a Seismic Category I, Safety Class 3 makeup water line from the Standby Service Water system is provided as an alternate supply to the expansion tank.

Diesel generator unit reliability, including the functions required of the circulating water pump and expansion tank were demonstrated prior to installation (qualification and shop performance tests). Periodic testing and maintenance assure continued reliability.

During shutdown periods, an electric immersion heater is provided for standby heating. The engine can thus be kept in constant readiness for an immediate start. The 15 kW, 460 V, 3-phase AC heating unit is mounted at the bottom of the accessory rack to heat the engine cooling water which circulates by thermosyphon action to the lube oil cooler, engine, and turbocharger after coolers. A thermostat sensing water temperature controls the heating elements to keep the water in the oil cooler tank between 125°F and 155°F. The auxiliary motor driven oil pump circulates lube oil through the lube oil cooler to pick up heat during standby conditions and then returns the warmed oil to the engine sump (see 9.5.6). Low oil temperature alarm is provided to ensure that the immersion tank is operating properly (see 9.5.7.2 and 8.3.11.8.2.3).

In addition, heaters supplied by Class 1E power are capable of maintaining the diesel generator rooms at temperatures in excess of 70°F during extreme weather conditions.

To assure that all components and piping are initially filled with water, a demineralized water supply is temporarily connected to the 1-1/4-inch fill-drain connection located on the engine base at the cooling water pump end. Filling the cooling water system from the bottom up allows entrapped air to be vented to the expansion tank.

The engine cooling water return pipe (between engine block and temperature regulating valve) is slightly higher than the top of the expansion tank. However, as may be seen from Figures 9.5-4 and 9.5-6, during system operation any entrapped air will be properly relieved to the expansion tank through the provided vent lines due to the differential pressures involved.

A 500 gallon reservoir tank is provided in the cooling water system of each diesel engine associated with diesel generators 1A and 1B to permit operation of the engine for the time required to receive Standby Service Water cooling. The HPCS diesel engine is designed to permit operation without cooling for a time equivalent to that required to bring the cooling equipment into service with energy from the HPCS diesel generator.

In accordance with the manufacturer's maintenance instructions, a chromate-type corrosion inhibitor is added to the demineralized fill water to preclude corrosion and organic fouling in the diesel engine cooling water system. Examples of commercially available chromate-type inhibitors included but are not limited to, Nalco 38 and Dearborn Chemical Company, respectively. Since the entire system is enclosed in the diesel generator building and maintained in a warm condition for immersion heaters, antifreeze compounds are not needed.

Cooling system materials of construction include cast irons carbon steel, rubber, and bronze. Chromate-type inhibitors can be used effectively with these materials.

Demineralized water and a chromate-type inhibitor are in conformance with the engine manufacturer's recommendations.

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9.5.5.3 Safety Evaluation

The diesel generator cooling water system meets the single failure criterion in that if a failure in the system prevents the operation of its associated diesel generator, the remaining diesel generators will not be affected.

This redundancy is accomplished by segregating the power supplies to engineered safeguard features into three mutually exclusive divisions, each provided with a diesel generator and associated cooling water system. The cooling water systems associated with a particular diesel generator are cooled from an independent standby service water system.

In the event of the loss of offsite power, the standby service water pumps which supply cooling water to the heat exchangers begin operation within a sixty second lapse following initial startup of the engines. This time lapse is within a safe margin of the point at which the diesel generators 1A or 1B would require the cooling capability of the heat exchangers. Refer to 9.2.7, "Standby Service Water System", for evaluation of this system.

The high temperature shutdown switches are locked out of the safety circuit during the automatic (emergency) operational mode of the diesel generators in order to ensure the availability of the emergency power from each generator.

Evaluation of the diesel generator operation under light load conditions is presented in 8.3.1.1.8.1.11 and 8.3.1.1.8.2.11.

9.5.5.4 Testing and Inspection Requirements

The system is operated and tested initially with regard to flow path, flow capacity, and mechanical operability in accordance with Chapter 14.

To ensure continued integrity of the diesel generator cooling water system, scheduled inspection and testing of equipment is performed as part of the overall engine performance checks at regular intervals in accordance with 16.3.5.H.

Instrumentation is provided to monitor cooling water temperature and pressure, expansion tank level, and to alarm high water jacket temperature. These instruments receive periodic calibration and inspection to verify their accuracy.

The water in the cooling water system is periodically analyzed and treated, as necessary, to maintain the desired quality.

9.5.6 STARTING AIR SYSTEM

9.5.6.1 Design Bases

a. Each emergency diesel generator, including the HPCS diesel generator, is provided with separate, independent starting air systems.

b. Each starting air system on diesel generator 1A or 1B has sufficient air receivers to provide for seven diesel generator starts. The starting air system on each DG consists of two completely redundant systems including 2 banks of air receivers, separate piping and valves, one pair of air motors per engine which are both actuated on a start signal. The starting system on DG-1C consists of two separate systems from separate air receivers through separate piping and control valves to a pair of air motors on each side of the engine. The air receivers have sufficient air capacity for 3 starts.

c. The starting air piping off the engine skid is designed, fabricated, inspected, and erected in accordance with ANSI B31.1. The piping on the engine skid is designed, fabricated, and erected to B31.1 as a guide. The system is designed to Seismic Category I requirements. The air receivers associated with diesel generators 1A or 1B are designed and constructed in accordance with the requirements of ASME Section VIII (1973 Edition). The HPCS diesel generator air receivers were designed and constructed in accordance with the 1971 Edition of the same code.

9.5.6.2 System Description

The starting air system is shown schematically on Figure 9.5-4.

The starting air systems for diesel generators 1A and 1B consist of one electric motor driven air compressor, one dual drive (i.e., electric motor and diesel engine) air compressor, eight air receivers, and associated piping and controls.

Control switches for the electric motor driven operation of the air compressors on 1A and 1B diesel generators are on the local diesel engine control board. These control switches permit on-auto-off operation. A selector switch permits selection of either compressor function as the primary pressurization compressor.

Pressure switches in either air receiver bank automatically start the selected compressor when the receiver pressure decays to 235 psig. If the selected compressor fails to operate or cannot hold system pressure, a separate low pressure alarm switch is provided for each bank of air receivers and is set to alarm at 230 psig on a local panel and in the main control room. When the receiver pressure decays to 220 psi, the back-up air compressor starts. The HPCS pressure switch operation is the same except the setpoints are 205 psi, 200 psi for alarm and 190 psi for back-up compressor start.

The major system components are located adjacent to the diesel generator skid.

For each diesel generators (1A and 1B), two separate air cooled compressors discharge through common piping to two banks of four 32 cu. ft. air receivers which are connected in parallel. Each bank of air receivers has the capability of a minimum of seven engine starts. Each bank is connected through separate piping to a pair of air start motors on each engine.

The flow path is from the air receiver manifold, through an isolation valve, a pressure reducing valve, through piping to the engine, then a strainer, an air relay valve, and a lubricator to each pair of air starter motors.

The starting air system on each engine consists of four air start motors. These air start motors drive a flywheel ring gear which turns the engine. When a start signal is given, an air start solenoid valve in each redundant system admits air to engage a pair of the air start motor pinions on each engine to the flywheel ring gear. When the pinions are engaged, air is admitted through an air control valve to a pair of air start motors. The other pair of start motors on the engine are simultaneously engaged by the redundant start solenoid valves. Engine cranking time is approximately two seconds, with a free air flow to each pair of air start motors of 15 cubic feet per second at 150 psig.

The electric motor-diesel engine driven air compressor includes a battery for starting the diesel engine driven compressor which is actuated from a local panel.

The starting air system is designed to provide a reliable method for automatically starting each diesel generator unit. The system design is such as to preclude fouling of its components. Downstream of the air compressors, dryers are installed to assure the dewpoint of the air will be below the minimum room temperature if the system is filled during the worst ambient air conditions. The air dryers are drained once an 8 hour shift to remove oil and moisture. A filter is provided downstream of the dryer to assure no dessicant or debris can enter the system. In addition, "Y" type strainers are provided upstream of the starting air valves and motors. These strainers are cleaned periodically to assure that they are kept free from contaminants.

The air starting system of the HPCS Diesel Generator is similar to that of DG1A and 1B described above except: 1) the number of air receivers: two of 36 ft^3 each; 2) the number of engine starts: three from the air receivers with the compressors locked out; 3) the redundant starting air compressor is only diesel driven but is automatically operable without manual actions; and 4) there are two parallel systems that each simultaneously operate a pair of air motors on the diesel generator for a start. The parallel systems provide the ability to produce a start even if one system sustains a pressure boundary failure or a failure of one starting air solenoid valve to open.

See 8.3.1.1.8.2.5 for additional discussion of the HPCS diesel engine air starting system.

9.5.6.3 Safety Evaluation

Each diesel generator air starting system is capable of supplying a sufficient quantity of air from its associated air receivers to ensure a successful starting operation of the diesel generator independent of normal plant power sources.

The air starting systems for each diesel generator unit are physically and electrically separated to ensure that no single failure can cause malfunction of both divisions of standby AC power. The single failure criterion is satisfied and significantly enhanced by having redundant piping systems and mechanical equipment for DG1A and DG1B and duplicate (but not functionally redundant) piping systems and mechanical components for the HPCS DG. All three diesel generators also have redundant starting solenoid valves.

9.5.6.4 Testing and Inspection Requirements

The system is operated and tested initially with regard to flow path, flow capacity, and mechanical operability in accordance with Chapter 14. To ensure continued integrity of the diesel generator starting air system, scheduled inspection and testing of equipment will be performed as part of the overall engine performance checks at regular intervals in accordance with the Technical Specifications.

9.5.7 DIESEL GENERATOR LUBRICATION SYSTEM

9.5.7.1 Design Bases

a. The diesel generator lubrication system is designed to provide sufficient lubrication to permit proper operation of its associated diesel generator under all loading conditions. The system is required to circulate the lube oil to the diesel engine working surfaces and to remove excess heat generated by friction during operation. The system provides oil at the engine surfaces at 120°F during the long anticipated periods of standby duty by use of an electric immersion heater in the cooling water system.

b. The system is designed to Seismic Category I requirements.

9.5.7.2 System Description

The lubrication system for each diesel generator is shown on Figure 9.5-4. The lubrication system for each diesel engine is mounted on its diesel generator skid (See Figure 9.5-8) and is a combination of three separate systems. These are the main lubricating oil systems, the piston cooling system, and the scavenging oil system. Each system has its own pump. The main lube oil pump and the piston cooling oil pump are in tandem housings and share a common drive shaft. All three pumps are positive displacement, helical gear type, mounted externally at the front of the engine, and are gear-driven from the engine.

The main lubricating pump supplies oil under pressure to the various moving parts of the engine. The piston lubricating pump supplies oil for the cooling of the pistons and lubrication of the piston pin bearing surfaces. After circulation through the engine parts, the lubricating oil flows back to the engine oil sump. The scavenging oil pump takes suction from the engine oil sump and pumps this oil through a filter and lube oil cooler to the strainer sump which supplies the

main and piston lubricating pumps. The lube oil cooler is a shell and tube, water cooled type capable of adequately cooling the engine lube oil when operating at any rated load point within the engine generation load range. The diesel cooling water acts as the lube oil cooler heat sink.

The engine lubrication system including the lube oil cooler is furnished by the engine manufacturer, Electromotive Diesel, a division of General Motors. The diesel cooling water system, also furnished with the engine, removes the heat from the lube oil coolers. Heat from the diesel cooling water system is removed in the diesel generator cooling water heat exchangers. The characteristics of these heat exchangers are described in 9.5.5.

The Lubrication System on each engine also has three small lube oil pumps to circulate oil through the engine main bearings and the turbo-charger bearings to minimize wear when the engine starts.

The circulating lube oil pump continuously circulates lube oil through the main lube oil system filter, the lube oil cooler (where it is warmed to 120°F) and then through the engine main bearings. This maintains the oil level in the engine just below the camshaft so the oil pressure will increase rapidly when the engine starts from a normal standby condition or upon a hot restart.

An alternating current driven soak back pump continuously circulates lube oil through the turbo-charger bearings to minimize wear when the engine starts and to remove heat from the turbo-charger following engine shutdown. A direct current driven soak back pump is arranged in parallel with the AC soak back pump will automatically start upon loss of pressure downstream of the AC, and DC pumps.

Instrumentation is provided that alarms locally and activates a "DG Trouble Alarm" in the Control Room upon loss of pressure downstream of any of the pumps.

Abnormal lube oil pressures, temperatures, low sump level, and loss of pressure on the lube oil circulating pump discharge are annunciated.

In the event of a high crankcase pressure, annunciator and computer alarms are provided to alert the operator. A manual shutdown will then be made for diesel generators 1 and 2. For diesel generator 3 (HPCS) an automatic shutdown will occur. The hand-hole or top deck covers, following a high crankcase pressure condition, will not be opened until the engine has been allowed to cool off. This will prevent ignition of oil vapors due to air admittance.

Suitable screens and/or filters in the engine lubrication oil fill pipes prevent entry of foreign material into the engine crankcase. The control to assure that the proper lubricant is used is procedural and involves operator training together with careful labeling of fill ports to identify the standard and grade of lubricant to be used. Lubricant storage containers will be similarly labeled to identify contents. Sampling and testing of the lubricating oil to verify conformance ASTM Standard 0975-74, Grade 2-D is performed periodically.

Measures to be taken to maintain the required quality of the lubricating oil are provided in the engine instruction manual and are summarized below:

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1. The manufacturers recommendations on type of oil to use will be followed.

2. Mixing of different brands of oil will not be allowed.

3. Laboratory analysis in conjunction with a scheduled maintenance program dictates the time for oil change problem.

4. Engines found to have lubricating oil diluted with fuel oil are immediately serviced in accordance with the manufacturer's instructions.

The following sensors and alarms are provided as described in the table below:

Sensor	Alarm Point	Purpose
Engine lube oil temperature low	115°F	To warn of loss of warm-up immersion heater
Engine lube oil temperature high	240°F	To warn of loss of cooling water system
Engine lube oil pressure low (alarm)	26 psig	To warn of low oil pressure prior to engine damage
Engine lube oil pressure low (shut down)	17 psig	Shut down engine only during test mode to prevent damage
Shutdown engine lube oil pressure low (alarm)	7 psig	Warns of inadequate lube oil pressure in standby mode.

Operator actions to be taken during alarm conditions.

Conditions	Operator Action
Engine lube oil temperature falls below 115°F	Check and repair standby immersion heater
Engine lube oil temperature reaches 240°F	During test, mode shutdown engine. During emergency operation, check cooling water system and restore to operation.
Engine lube oil pressure falls below 26 psig	During test mode, shutdown engine and repair. During emergency operation, check lube oil system, find fault, and repair, if possible.
Engine lube oil pressure falls below 17 psig	During test mode engine automatically shuts down. During the emergency mode, if adequate power is available, shut-down engine, check lube oil system, find fault, and repair. Place engine back in service.

Condition	Operator Action
Standby engine lube oil pressure falls below 7 psig	Ascertain cause and repair.
Engine oil level falls below 230 gals.	Top off lube oil sump to normal level of 234 gallons

See 8.3.1.1.8.1.4 and 8.3.1.1.8.2.4 for additional discussion of the diesel generator lubrication system.

9.5.7.3 Safety Evaluation

The diesel generator lubrication system is capable of providing sufficient lubrication under all loading conditions. Each engine oil sump is of adequate size to contain a minimum running capacity of seven days.

The provision for a physically separate lubrication system for each diesel engine satisfies the requirements of the single failure criterion for complete independency and redundance of the onsite power system by avoiding any commonality between generating units. All system equipment is housed inside a Seismic Category I structure containing no high or moderate energy piping.

The lubrication system has a low level alarm in the sump to warn of low oil level. The engines are periodically visually inspected for oil leaks to guard against excessive oil leakage.

9.5.7.4 Testing and Inspection Requirements

The system is operated and tested initially with regard to flow path, flow capacity, and mechanical operability in accordance with Chapter 14. To ensure continued integrity of the diesel generator lubrication system, scheduled inspection and testing of equipment and lubrication oil quality is performed as part of the overall engine performance checks at regular intervals in accordance with the Technical Specifications.

9.5.8 DIESEL GENERATOR COMBUSTION AIR INTAKE AND EXHAUST SYSTEM

9.5.8.1 Design Bases

a. The diesel generator combustion air intake and exhaust system is designed to supply clean combustion air to each diesel engine and to exhaust combustion gases in a manner that will not effect the operational function of the diesel engines.

b. Each diesel engine is provided with an independent combustion air intake train which filters and directs air from the exterior of the diesel generator (DG) building (south side) to the engine turbocharger, and an independent exhaust train which silences and directs engine exhaust gases to the exterior of the DG building (north side). Since each diesel generator unit has its own independent and separate intake and exhaust train, the single failure criterion is satisfied.

c. The air intake trains are designed to eliminate contaminating substances, such as dust and larger foreign objects, by filtering the air supply first through a screened air intake louver, a prefilter and then through an oil bath air cleaner.

d. The combustion air intake and exhaust system is protected from externally generated missiles (i.e., tornado missiles) by enclosure in a Seismic Category I structure. The piping for the diesel engine intake and exhaust systems is Seismic Category I and is in accordance with requirements of ANSI B31.1. The exhaust silencers, however, are not ANSI B31.1 material but are ASTM A569 which is suitable for the service. The seismic and quality group classification of components in this system is provided in 3.2.

Nondestructive examination in accordance with ASME Section III, ND-5000 requirements, was performed on the welds in the combustion air intake and exhaust systems piping.

9.5.8.2 System Description

The combustion air intake and exhaust system is shown on Figure 9.5-4 and the location within the diesel generator building is shown on Figure 9.5-5.

The air intake trains associated with each diesel engine generator are housed in separate rooms and each is supplied air from the exterior of the diesel generator building (south side) through a screened air intake louver. Each engine air intake system consists of prefilters, an oil bath type air cleaner, air turning box, the necessary piping, ductwork, and flexible connections to the inlet of the engine turbocharger and aftercooler. An in-line air intake silencer is also provided in the HPCS diesel engine air intake system.

Air is drawn from the outside atmosphere through prefilters and the oil bath air cleaner to the engine by the turbocharger. Intake air is cooled in the aftercooler by the engine cooling water system in order to improve engine operational efficiency. The air intake capacity of each diesel engine associated with diesel generators 1A or 1B, at 14.7 psi and ambient temperature, is 10,120 cfm. The air intake flow to the HPCS diesel engine at 14.7 psi and ambient temperature is 10,200 cfm.

The exhaust trains associated with each diesel engine generator are also housed in separate rooms. Each engine exhaust system consists of an exhaust manifold, turbocharger, exhaust silencer, and the necessary piping and ductwork. Exhaust piping from the diesel driven air compressors in the starting air system is connected to the corresponding diesel exhaust line upstream of the exhaust silencer.

Exhaust gases are discharged through the turbocharger from the exhaust manifold and are expelled through ductwork and an exhaust silencer to the exterior of the diesel generator building (north side). The exhaust gas flow from each diesel engine associated with diesel generators 1A or 1B is 23,000 cfm at 770°F, and from the HPCS diesel engine is 23,000 cfm at 735°F.

9.5.8.3 Safety Evaluation

The provision of a physically separated and independent intake and exhaust train for each diesel generator unit satisfies the requirements of the single failure criterion for complete independence between units.

Since each air intake and exhaust train is housed within the Seismic Category I building, they are protected from externally generated missiles. No high or moderate energy piping is present in the DG building which could present a potential hazard to the operational function of these systems.

The air intake trains are designed so that an adequate supply of quality air is available to the diesel engines as required. In order to eliminate foreign objects which could restrict the supply of air to an engine, air is drawn into the system from the outside atmosphere through a screened intake louver and prefilter. The oil bath air cleaner in each system filters dust and airborne foreign particles from the air supply. No gases which, if released, could reduce the quality of the combustion air supply are stored in the vicinity of the air intakes.

There is no appreciable effect on a diesel generator's ability to carry its required load as a result of barometric pressure drops which would effect the capacity of the combustion air intake train.

Recirculation of combustion products from the diesel exhaust to the air intake which could significantly effect the operation of the diesel engine is precluded by the degree of horizontal and vertical separation between the exhaust and air intake (See Figure 9.5-5).

9.5.8.4 Inspection and Testing Requirements

The combustion air intake and exhaust system is checked for system leaks and blockage following initial installation and testing of the diesel engines. (See Chapter 14).

Periodic cleaning of air intake filter units is performed at regular intervals which varies according to the amount of dust present in the air. Periodic inspection of the adapter and screen assemblies in the exhaust manifold is performed as needed. Routine inspection and testing of the diesel engines (see Chapter 16) verifies the integrity of the air intake and exhaust systems.

9.5.9 REFERENCES

9.5-1 "Fire Protection Evaluation," WPPSS Nuclear Project No. 2, Washington Public Power Supply System, WNP-2, FSAR, Appendix F.

9.5-2 H. R. Clay, "Power Generation Control Complex Design Criteria and Safety Evaluation", General Electric NEDO-10466, Revision 1, September 1977.

9.5-3 Electro-Motive Division, General Motors, LaGrange, IL, "Stationary Power Operating Manual", Volume 11, 2nd Edition, June 1971.

9.5-4 SER Licensing Condition No. 9. Letter G02-82-507, to A. Schwencer (NRC) from G.D. Bouchey (SS) , dated June 4, 1982.

9.5.10.1 Design Bases

The Plant Decontamination Facility is designed to provide a central location for equipment decontamination in a relatively safe and efficient environment. Safety of personnel has been carefully considered and built into all aspects of the operation. Local filtration and increased capability, per recommendations of the Handbook of the American Conference of Governmental Industrial Hygienists, have been incorporated into the existing Radwaste Building Ventilation system to minimize airborne contamination, flooding containment is achieved through the use of curbs at the accesses to the Decontamination Room and the Contaminated Tool Room. Each of the facility components has been strategically located to provide a safe, efficient and relatively quiet process from entry to disassembly, cleaning, reassembly and exit. Controls and indication have been positioned in a central location to minimize setup time and thus reduce personnel exposure. An emergency eyewash and shower station has been provided to permit immediate treatment in the event of an accident. The Decontamination Facility has been designed to Quality Class II and Seismic Category II requirements.

9.5.10.2 System Description

The Decontamination Facility is located in the Radwaste Building on the 467' El. adjacent to the Contaminated Tool Room (see Figure 9.5-9). This facility consists of the equipment necessary to enable decontamination of a variety of plant components, tools and other portable equipment. Two basic methods of decontamination are employed; an ultrasonic cleaning immersion bath and an electro-chemical polishing bath. A freon-degreasing unit for smaller items is also available.

The ultrasonic cleaning subsystem consists of two 4' x 4' x 3' high tanks each outfitted with an integral pump and filter unit, a 36 KW immersion heater bank and a subassembly of three immersed ultrasonic transducers and an ultrasonic generator. The heaters and transducers are interlocked with a level sensor to prevent energization if the tank level is lower than its operating band. The ultrasonic generator is capable of providing ultrasonic energy simultaneously to six transducers. The controls for the ultrasonic generator and transducers are located on the generator's front panel.

The electro-chemical cleaning subsystem consists of a 4500 amp DC generator; a 3' x 3' x 14' long stainless steel immersion tank with a cooling water jacket containing a phosphoric acid electrolyte and a similarly sized rinse tank. The electrolyte tank has an integral pump and filtration unit for maintaining the solution in a relatively clean condition, The controls for the electro-chemical generator and the tank pump are located on the generator's front panel.

In order to minimize airborne contamination and process fumes in the Decontamination Room, the three cleaning tanks and the Freon Degreaser are provided with individual exhaust hoods per recommendations of the Ventilation Handbook of Governmental Industrial Hygienists. The disassembly/work table is also provided with its own exhaust hood. The exhaust system for each hood is complete with its own HEPA filter unit and exhaust fan. The air from the exhaust fans is ducted to the Radwaste Building exhaust system (see 9.4.3.2 for system description).

Differential pressure switches are provided across the prefilters and the HEPA filters to annunciate in case of a dirty filter condition. The fan CFM is controlled fly the fan differential pressure controller which controls a modulating damper at the fan discharge. All the fans except the disassembly/work table fan are located in the Contaminated Tool Room to minimize noise levels in the Decontamination Room during operation.

The heater control panels and the fan/filter instrument and control panel are grouped together in the southeast corner of the Decontamination Room to provide a central control station. The cleaning tanks are situated in positions that permit the use of the existing 5-ton monorail winch for all lifts. The equipment watch has been modified to open along its east-west centerline on hinges by use of the 5-ton monorail winch. Portable pumps have been provided to permit the use of wheeled carts for moving equipment in and out of the facility.

An automatic sprinkler system has been installed for protection against the unlikely event of a fire. A decontamination sink and an emergency eyewash shower station have been installed to permit immediate treatment in case of a splashing accident.

9.5.10.3 Safety Evaluation

The Plant Decontamination Facility has no safety function. Malfunction or failure of the Decontamination Facility will not impair normal or emergency plant operations.

9.5.10.4 Testing and Inspection Requirements

The HEPA filters are subjected to both shop and field efficiency tests. Upon installation and periodically thereafter, HEPA filters are given in-place DOP tests in accordance with ANSI N 510-1980 "Testing of Nuclear Air Cleaning Systems".

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TABLE 9.5-1

PIPING AND EQUIPMENT DESIGN PARAMETERS

Piping Design Pressures and Temperatures

Line No.	Pressure PSIG	Temperature °F
FP (ALL)-1	175	100

Primary
Fire Pump Design Parameters

Pumps, Each Pump	Fire	Jockey
Quantity	3	1
Driver	Electric Motor-2 Diesel Engine-1	Electric Motor
Capacity, gpm	2,000	50
Total Dynamic Head, ft.	289	320
Max. Speed, rpm	1,800	3,600
Inlet Water Temp., °F	78 (Average)	78 (Average)
Pump Location	Indoors (Circulating Water Pumphouse)	Indoors

Secondary
Fire Pump Design Parameters

Quantity	1	1
Driver	Diesel Engine	Electric
Capacity, gpm	2,500	175
Total Dynamic Head, ft.	323	346
Max. Speed, rpm	2,100	3,500
Inlet Water Temp., °F	78 (Average)	78 (Average)
Pump Location	Indoors	Indoors

TABLE 9.5-2

FIRE PROTECTION SYSTEM FAILURE ANALYSIS

Component	Malfunction	Consequences
Electric Fire Pumps	Motor Fails	Second electric driven pump on separate electrical division
Electrical Fire Pumps	Loss of Off-Site Power	Two diesel driven pumps available (1) 2000 GPM & (1) 2500 GPM
Water Source	Low Water Level No Makeup	Separate 300,000 Gallon water tank
Yard Pipe	Rupture	Sectionalize portions of main loop header by valves
System Pipe	Rupture	a) Use backup hose from standpipe and hydrants b) System pressure and capacity capable of full operation during this emergency
Fire Protection System Alarm Check Valve	Valve Fails to Open	Manual fire fighting utilized (Portable extinguishers and hoses)
Detection System	Short in Wire	Alarm in Control Room
Detection System	Loss of Off-Site Power	Diesel Generator available for secondary source of power
Fire Dampers	Closure	All fire dampers in rooms containing safety-related equipment are qualified to Seismic Class I

TABLE 9.5-3

INSTRUMENTATION AND DESIGN SETTINGS

Tag No.	Function	Design Settings
FP-PI-4	Indicates pressure in discharge header of diesel driven fire pump	0-250 psig-Range
FP-PS-1	Starts & stops Jockey fire pump, located in Jockey fire pump control panel	0-200 psig-Range Starts operation at 125 psig Stops operation at 139 psig
FP-PI-2	Indicates pressure in pumps header	0-250 psig-Range
FP-PI-3A	Indicates pressure in discharge header of fire pump	0-250 psig-Range
FP-PI-3B	Indicates pressure in discharge header of fire pump 2B	0-250 psig-Range
FP-PS-2	Signals pressure in pumps discharge to motor control panel 2	0-200 psig-Range Cont. Oper. at 110 psig
FP-PS-3	Signals pressure in discharge header in diesel control panel	0-200 psig-Range Cont. Oper. at 110 psig
FP-PS-4	Signals pressure in discharge header in diesel control panel	0-200 psig-Range Cont. Oper. at 110 psig
FP-FE-1	Measure flow to fire nozzles test header	0-4000 gpm
FP-FI-1	Measure flow to fire nozzles test header	0-4000 gpm
FP-PS	Starts & stops secondary Jockey fire pump, located in Jockey fire pump control panel	0-200 psig-Range Starts operation at 115 psig Stops operation at 125 psig
FP-PS-101	Signals pressure in pump discharge to diesel engine control panel	Cont. Oper. at 100 psig

TABLE 9.5-4

POTENTIAL COMBUSTION MATERIALS

(Non-Electrical)

MATERIAL	LOCATION					
	Radwaste Building	Reactor Building	Service Building	T-G Building	D-G Building	Pump-Houses
Fuel Oil	None	None	None	None	Stored in one tank per room: 9,000 gal (3,000 gal per room)	Circulating Water Pump-house in Tank: 280 gal
Lube Oil	Motors	Motors	None	Motors stored in Tanks: On TG-15,000 gal Used-25,000 gal Backup-7,000 RFP turbines- 1,360 gal Total-48,360 gal	Stored in crankcases: 2,500 gal (500 gal per crankcase)	Motors
Charcoal	In Control Room emergency filter units 9.0 cu. ft.	In sump vent units - 9 cu. ft., in standby gas treatment units 170 cu. ft. Total- 179 cu. ft.	None	None	None	None
Hydraulic Oil	None	RRC Reservoirs - 220 gal		EH Reservoir - 240 gal	None	None
Thermo-plastics	Battery Rm #1 893-lbs Battery Rm #2 275-lbs	None	None	None	None	None

NOTES: 1) All chemicals and other materials used in water treatment are all non-combustible

2) All fuel and lube oil storage containers are protected by automatic water spray systems as outlined herein.

3) Hydrogen in the off-gas system will flow through welded piping prior to oxygen mixture into water. Any potential leakage will be into ventilated areas resulting in high dilution rates, well below explosion level. The hydrogen recombiner in the turbine generator builing reduces H_2 concentration from _ 4% by volume to _ 1% by volume.

TABLE 9.5-5

FIRE PROTECTION SYSTEM LOCATIONS
I. WET PIPE SPRINKLER SYSTEMS

A. Turbine Generator Building

General Coverage of Turbine Generator Building, Elevations 441' and 471' consisting of the following systems:

System No.	Description
1	Boiler Room, Elev. 441'
2	Mechanical Vacuum Pump Room, Elev. 441'
3A, 3B	Steam Jet Air Ejector Rooms (2 systems), Elev. 441'
4	North Side of Condenser, Elev. 441'
5	South Side of Condenser, Elev. 441'
6	West End of Building, Elev. 441'
7	West End of Building, Elev. 471'
8	Heater Area, Elev. 471'
9	Corridor, Elev. 471'
24	Office Building and Restrooms, Elev. 501'
56	Oil Piping at North End of Condenser located in Turbine Generator Building El. 471'
B.	Service Building
10	Machine Shop, Elev. 441'
11	Storage Area, Elev. 420'
12A	Office Area, Elev. 456'
12B	Office Area, Elev. 441'
C.	Circulating Water Pumphouse
13	Circulating Water Pumphouse
D.	Main Guardhouse
14	Main Guardhouse Peripheral Rooms
E.	Secondary Guardhouse
15	Secondary Guardhouse
F.	Radwaste Building
20A	Decon Area Elev. 467'
20B	Storage Area Elev. 467' and 487'
21	Truck Bay and Storage Area, Elev. 437
22	Chemistry Lab Office Area, Elev. 487

TABLE 9.5-5 (Cont'd)

II. DELUGE WATER SPRAY SYSTEMS

System No.	Description
G.	Well Water Pumphouse No. 3
16	Well Water Pumphouse
H.	Warehouses-(5)
	One wet system per warehouse
49	Technical Support Center Charcoal Filter Unit
51	Turbine Lube Oil Storage Tank Room and Tank Area consisting of Hatch and Corridor located in the Turbine Generator Building, El. 441'
52	Trace Oil Piping located in the corridor in the Turbine Generator Building, El. 441'
53A, 53B	Reactor Feed Pump Rooms located in the Turbine Generator Building, El. 441'
54	H_2 Seal Oil Unit Room located in the Turbine Generator Building, El. 441'
55	Turbine Oil Reservoir and Oil Coolers Room located in the Turbine Generator Building, El. 471'
57	Main Step Up Transformer, TR-M1
58	Main Step Up Transformer, TR-M2
59	Main Step Up Transformer, TR-M3
60	Back Up Auxiliary Transformer, TR-B
61	Normal Auxiliary Power Transformer, TR-N1
62	Normal Auxiliary Power Transformer, TR-N2
63	Main Step Up Transformer, TR-M4
64	Start-up Auxiliary Power Transformer, TR-S
-	(2) HVAC Sump Vent Filter Units in the Reactor Building (One Deluge System in Each)

TABLE 9.5-5 (Cont'd)

III. PRE-ACTION SPRINKLER SYSTEMS

System No.	Description
-	(2) HVAC Emergency Filter Units in the Control Room (One Deluge System in Each)
-	(2) Standby Gas Treatment Filter Units in the Reactor Buiding (Three Deluge Systems in Each)
65	Cable Spreading Room located in the Radwaste Control Building, Elev. 484'
66	Cable Chase in Radwaste Control Building Corridor, Elev. 467'
79	Diesel Generator Room No. 1A, Elev. 441'
80	Diesel Generator No. 1A Day Tank Pump Room, Elev. 441'
81	Diesel Generator Room No. 1B, Elev. 441' and Day Tank Room
82	Diesel Generator No. 1B Day Tank Pump Room, Elev. 441'
83	HPCS Diesel Generator Room, Elev. 441'
84	HPCS Diesel Generator Day Tank Pump Room, Elev. 441'

IV. LOW PRESSURE CO_2 UNITS

Quantity	- 1
Capacity	- 6 ton
Service	- unit will be used for generator purging and fire protection of the exciter housing
Location of Equipment	- Turbine Building, ground floor, Elev. 441' southwest corner

The Turbine Generator CO_2 fire protection unit shall be divided into three systems serving the following areas:

1) Excitor Housing (total flooding)

2) Hose Station, Elev. 501', Column A15

3) Generator Housing Purge

TABLE 9.5-5 (Cont'd)

V. HALON 1301 SYSTEM

Systems Nos. 1 through 18	Main Control Room PGCC Control Cabinets, Radwaste Building, El. 501'.
System No. 20	Main Guardhouse Security Central Control Station (SCCS), El. 428' and 441'

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FIRE EXTINGUISHER LOG

D-Multi Purpose
WD-Wheeled Dry Chemical
H-Halon

BUILDING LOCATION	TYPE OF EXT
Reactor 606' Stair A-6	D
Reactor 606' Stair S-3	D
Reactor 606' Stair A-5	D
Reactor 572' Stair A-5	D
Reactor 572' Stair S-3	D
Reactor 572' Stair A-6	D
Reactor 548' Stair A-6	D
Reactor 548' Stair S-3	D
Reactor 548' Stair A-5	D
Reactor 522' Stair A-5	D
Reactor 522' Stair S-3	D
Reactor 522' Stair A-6	D
Reactor 501' Stair A-6	D
Reactor 501' Stair S-3	D
Reactor 501' N. and 4.1	D
Reactor 501' Stair A-5	D
Reactor 471' Stair A-5	D
Reactor 471' Stair S-3	D
Reactor 471' Stair A-6	D
Reactor 441' Stair A-6	D
Reactor 441' W Train Bay	D
Reactor 441' E Train Bay	D
Reactor 422' Stair A-6	D
Reactor 422' N.7 & 7	D
Reactor 422' Stair S-3	D
Reactor 422' Stair A-5	D
Reactor 422' Stair A-5	D
S.B. 441' F.5 & 2.5	D
S.B. 441' H & 2.5	D
S.B. 441' M.8 & 2.8	D
S.B. 441' M.8 & 1.8	D
S.B. 441' K.2 & .2	D
S.B. 441' H.2 & 1.8	D
S.B. 441' M.8 & 2.2	D
S.B. 420' H & 2.2 South	D
S.B. 420' H & 2.2 North	D
S.B. 420' E 2.6	D
S.B. 420' D.5 & 2.7	D

TABLE 9.5-5 (Cont'd)

FIRE EXTINGUISHER LOG (Cont'd)

D-Multi Purpose
WD-Wheeled Dry Chemical
H-Halon

BUILDING LOCATION	TYPE OF EXT
S.B. 420' D.2 & 2.2	D
S.B. 441' D.5 & 2.5	D
S.B. 441' D.5 & 4	D
S.B. 441' C & 3	D
S.B. 441' B.5 & 2.5	D
S.B. 441' B.1 & 3.5	D
S.B. 456' B.5 & 3.5	D
S.B. 456' B.5 & 1.6	D
S.B. 456' D & 3	D
S.B. 456' D.8 & 4	D
S.B. 456' Records Rm	H
S.B. 456' E.5 & 1.5	D
S.B. 456' G.5 & 1.5	D
S.B. 456' G.5 & 2.7	D
S.B. 441' G.9 & 4	D
T.G. 441' H & 10	D
T.G. 441' H & 14	D
T.G. 441' F & 17	D
T.G. 441' C.6 & 16	D
T.G. 441' A & 16	D
T.G. 441' A.5 & 14.5	D
T.G. 441' B & 10	D
T.G. 441' A.4 & 8	D
T.G. 441' E & 11.3	D
T.G. 441' G & 10.5	D
T.G. 441' G.5 & 8	D
T.G. 441' G.5 & 6	D
T.G. 441' D & 6	D
T.G. 441' D & 6	WD
T.G. 441' B & 6	D
T.G. 441' D.3 & 4.5	D
T.G. 471' D & 4.5	D
T.G. 471' D & 4.5	WD
T.G. 501' D & 4.2	D
T.G. 501' D & 7	D
T.G. 501' A.5 & 6	D
T.G. 501' A.5 & 6	WD
T.G. 501' B & 12	D

TABLE 9.5-5 (Cont'd) Page 7 of 9

FIRE EXTINGUISHER LOG (Cont'd)

D-Multi Purpose
WD-Wheeled Dry Chemical
H-Halon

BUILDING LOCATION	TYPE OF EXT
T.G. 501' H & 8	D
T.G. 501' F & 12	D
T.G. 501' C.9 & 12	D
T.G. 501' C.5 & 13	D
T.G. 501' A.4 & 16	D
T.G. 501' H & 14.3	D
T.G. 501' H & 13	H
T.G. 501' G & 7	D
T.G. 471' H & 10	D
T.G. 471' E & 11	D
T.G. 471' E & 7	D
T.G. 471' A.5 & 7	D
T.G. 471' G & 14	D
T.G. 471' E & 17	D
T.G. 471' A & 15	D
T.G. 456' T-124 Door	D
R.W. 525' K & 14.7	D
R.W. 525' Communication Rm	H
R.W. 525' C-507 Door	D
R.W. 525' L.9 & 11.1	D
R.W. 507' H.8 & 15.9	D
R.W. 507' L.9 & 15	D
R.W. 507' R.5 & 13.2	D
R.W. 487' R.2 & 13.2	D
R.W. 487' N.8 & 13.2	D
R.W. 487' L.9 & 13.2	D
R.W. 487' M & 10	D
R.W. 467' R.5 & 10.9	D
R.W. 467' R & 10.7	D
R.W. 467' L.9 & 11	D
R.W. 467' L.9 & 10	D
R.W. 467' C-211 Door	H
R.W. 467' C-212 Door	H
R.W. 467' C210 Door	H
R.W. 467' N.10 & 13.2	D
R.W. 467' R.2 & 13.2	D
R.W. 467' S & 15.1	D
R.W. 467' R.2 & 15.9	D

TABLE 9.5-5 (Cont'd) Page 8 of 9

FIRE EXTINGUISHER LOG (Cont'd)

D-Multi Purpose
WD-Wheeled Dry Chemical
H-Halon

BUILDING LOCATION	TYPE OF EXT
R.W. 467' N.9 & 15	D
R.W. 467' L.9 & 15	D
R.W. 467' H.5 & 15.5	D
R.W. 467' H.5 & 14.7	H
R.W. 467' K.5 & 14.7	H
R.W. 467' K.5 & 12	H
R.W. 467' K.5 & 10	H
R.W. 484' K.5 & 11.5	D
R.W. 484' H.9 & 15	D
R.W. 487' H.5 & 15.5	D
R.W. 487' L.9 & 15.1	D
R.W. 487' R.1 & 14.9	D
R.W. 487' R & 14.9	D
R.W. 437' R.2 & 13.1	D
R.W. 437' R & 15.1	D
R.W. 437' L.9 & 12.2	D
R.W. 437' K.1 & 12.5	D
R.W. 437' L.9 & 13.9	D
R.W. 437' H.8 & 15.1	D
R.W. 452' H.5 & 15.1	D
TSC 441' Corridor	D
TSC 441' Door to Mech Rm	D
TSC 441' Kitchen	D
D.G. 441' D-104 Door	D
D.G. 441' D-103 Door	D
D.G. 441' D-105 Door	D
D.G. 441' D-106 Door	D
D.G. 441' D-107 Door	D
D.G. 441' R & 4.6	D
D.G. 441' Q.1 & 3.8	D
R.W. 501' C-424 Door	H
R.W. 501' C-409 Door	H
R.W. 501' K.1 & 11	H
R.W. 501' SE Control Rm	H
R.W. 501' C-415 Door	H
R.W. 501' Lunch Room	D
R.W. 501' C-410 Door	H
R.W. 501' K.1 & 12.5	H

TABLE 9.5-5 (Cont'd) Page 9 of 9.

FIRE EXTINGUISHER LOG (Cont'd)

D-Multi Purpose
WD-Wheeled Dry Chemical
H-Halon

BUILDING LOCATION	TYPE OF EXT
SWP 1A 441'	D
SWP 1B 441'	D
MWP 375'	D
MWP 375'	WD
CWPH 448' NW Door	D
CWPH 448' Diesel Day Tank	D
CWPH 448' SE Door	D
Elect Bldg 1 N Door	D
Elect Bldg 2 N Door	D
Filtration Bldg S Door	D
Filtration Bldg NE Door	D
Filtration Bldg NW Door	D

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TABLE 9.5-6

DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM

(Capacities are on a per component basis)

Diesel Oil Storage Tanks	
Number	3
Capacity-gallons	60,000-Diesel Generators 1A or 1B 50,000 HPCS Diesel Generator
Type	Horizontal - Buried
Shell Material	ASME SA-515 Gr. 70
Shell Thickness, in.	3/4 - 15/16
Design Temperature,	150
Design Pressure	Atmos. plus Static Head
Corrosion Allowance, in.	3/16
Code	ASME Section III Class 3 (April 1973)
Seismic Category	I
Diesel Oil Day Tank	
Number	3
Capacity-gallons	3,000
Type	Horizontal
Shell Material	ASME SA-283 Gr. C
Shell Thickness, in.	3/8
Design Pressure	Atmos. plus Static Head
Corrosion Allowance, in.	3/16
Code	ASME Section III Class 3 (April, 1973)
Seismic Category	I
Diesel Oil Transfer Pumps	
Number	3
Type	Vertical Turbine
Rated Speed, RPM	3,500
Rated Capacity, gpm	25
Total Dynamic Head, ft.	51
Code	ASME Section III Class 3 (April 1973)
Seismic Category	I

TABLE 9.5-7

Not Valid

The pumps are provided power only from the division they serve, so they cannot pump to the other day tank unless the diesel is running in which there is no point in doing so.

TABLE 9.5-8

LOCATIONS OF EMERGENCY LIGHTING

	Normal AC	Normal Emergency	DC	Batt. Powered Emerg. Lightning: Norm Batt.	Batt. Powered Emerg. Lightning: Appendix R 8 Hrs. Batt.
RADWASTE BLDG.					
Access Route to Remote Shutdown Room	X	X	X	-	X
Control Room	-	X	X	-	X
Remote Shutdown Room	-	X	X	-	X
#1 RPS Room, el. 467'	X	X	-	X	-
Alternate Remote Shutdown Room el. 467'	X	X	-	-	X
Vital 4160v Swgr Sm-8 el. 467'	X	X	-	-	X
Battery Charger Room No. 2 (C224)	X	X	-	-	-
TURBINE BLDG.					
Local Feed Pump Control Stat. el. 441'	X	X	-	-	
Hotwell Level Control Stat. el. 441'	X	-	-	-	
NonVital 4160v Swgr el. 471'	X	X	-	X	
DIESEL GENERATOR BLDG.					
Corridor, el. 441'	X	-	-	X	X
Bldg.	X	X	-	X	-
Div. 2 Diesel Room (D116) fl. el. 441'					X
STANDBY SW BLDG.					
#1	X	-	-	X	
#2	X	-	-	X	
REACTOR BLDG.					
ECCS Equipment, el. 420' & 441'	X	X	-	X	
RHR Valve Room #1, el. 471'	X	-	-	-	
RHR Valve Room #2, el. 471'	X	-	-	-	
Containment Air Compressors, el. 501'	X	-	-	-	
Reactor Closed Cooling- Pumps, el. 548'	X	X	-	X	
Hydrogen Recombiner, el. 572'	X	X	-	-	
CIRCULATING WATER PUMPHOUSE	X	-	-	X	
MAIN GUARDHOUSE	X	X	X	-	
TECHNICAL SUPPORT CENTER	X	-	-	X	
Access Route from Remote Shutdown Room to Div. 2 DG Room (D116), fl. el. 441' Stairwell A7.TG Corridor (C120 and C121) el. 441' DG Corridor (D104) el. 441'	X	-	-	-	X

TABLE 9.5-9
STATEGIC WORK AREA COMMUNICATION

Strategic Area	Type of Location	Type of Communication	Remarks
1) # RPS Room	EL 467 Radwaste Bldg	PABX, Sound Powered	
2) Local Feed Pump Control Station	El 441 Turbine Bldg	PABX, Sound Powered	
3) Hotwell Level Control Station	El 441 Turbine Bldg	PABX, Sound Powered 2 way Radio	
4) Nonvital 4160 SWGR	El 471 Turbine Bldg	PABX, Sound Powered 2 way Radio	
5) Vital 4160 SWGR	El 467 Radwaste Bldg	PABX, Sound Powered	
6) Vital 4160 SWGR SM-8	EL 467 Radwaste Bldg	PABX, Sound Powered (One way from outside to inside)	
7) Diesel Gen Bldg Corridor	EL 441 Diesel Gen Bldg	PABX, Sound Powered, 2 way Radio	
8) Diesel Gen Bldg	EL 441 Diesel Gen Bldg	PABX, Sound Powered, 2 way Radio	
9) Standby SW Bldg #1	EL 441 Diesel Gen Bldg	PABX, Sound Powered, 2 way Radio	
10) Standby SW Bldg #2	EL 441 Diesel Gen Bldg	PABX, Sound Powered, 2 way Radio	
11) Circulating Water Pumphouse	EL 441 Diesel Gen Bldg	PABX, Sound Powered, 2 way Radio	
12) ECCS Equipment	EL 420' and 441' Reactor Bldg	PABX, Sound Powered	
13) RHR Valve Room #1	EL 471 Reactor Bldg	PABX, Sound Powered 2 way Radio	
14) RHR Valve Room #2	EL 471 Reactor Bldg	PABX, Sound Powered 2 way Radio	

TABLE 9.5-9

STATEGIC WORK AREA COMMUNICATION
(Continued)

Strategic Area	Type of Location	Type of Communication	Remarks
15) Containment Air Compressor	EL 501 Reactor Bldg	PABX, Sound Powered 2 way Radio	
16) Reactor Closed Cooling Pumps	El 549 Reactor Bldg	PABX, Sound Powered 2 way Radio	
17) Hydrogen Recombiner	El 572 Reactor Bldg	PABX, Sound Powered 2 way Radio	
18) Main Guardhouse		PABX, Sound Powered 2 way Radio	

WNP-2

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Q. 040.076

Provide a table that lists Class 1E and non-Class 1E cables that are associated with the essential safe shutdown systems identified in Q.040.075. For each cable listed (see note below):

a. Define cables' association to the safe shutdown system (common poer source, common raceway, separation less than the IEEE Standard 384 guidelines, cables for equipment whose spurious operation will adversely affect shutdown systems, etc.);

b. Describe each associated cable routing (by fire area) from source to termination; and

c. Identify each location where the associated cables are separated by less than a wall having a three-hour fire rating from cables required for or associated with any redundant shutdown system.

NOTE: Option (a) of Q. 040.077 is considered to be one method of meeting the requirements of Section III.G.3 Appendix R. If option (a) above is selected, the information requested in items (a) and (c) above should be provided in general terms and the information requested by (b) above need not be provided.

Response:

Circuits referred to in Appendix R as being associated with essential safe shutdown systems are referred to as "allied circuits" on WNP-2. The choice of the term "allied circuits" was arbitrary, and was made for the sole purpose of facilitating a fire hazards shutdown analysis free of misinterpretation. The term "associated" is reserved for use in conjunction with circuits defined as "associated" under the guidelines of Regulatory Guide 1.75.

The manner in which allied circuits impact the fire hazard shutdown analysis for any specific fire area is dependent upon the type of analysis being utilized for the particular fire area. (Refer to Appendix F, "Fire Protection Evaluation" for a discussion of fire hazard shutdown analysis methodology.)

For the case of a fire area analyzed by means of the Redundant Fire Area method, direct consideration of all allied circuits is not required. Analysis for divisional fire areas is dependent only upon review of the impact of fire upon intruding Class 1E and associated circuits. In fact, all associated circuits of the electrial separation divisions which are not compatible with the fire area divisional assignment are the allied circuits, although they are not referred to as such. Analysis of only the intruding associated circuits is required for the Fire Hazards Shutdown Analysis contained in Appendix F, with the exception of the analysis of the potential for "bridging" of associated circuits across the plant electrical separation divisions. Analysis of the "bridging" circuit condition has been addressed as part of an overall electrical separation review for WNP-2 (Reference: B&R Richland Office, BOP Separation Study - Task 3670). This subject has been addressed with NRC offices separately from the Appendix F (Reference: NRC to Supply System letter, "Staff Response to the Presently Proposed Cable Separation Criteria for the WNP-2 Facility", dated May 4, 1981, and GO2-81-146).

DELETED

Q. 040.077

Provide one of the following for each of the circuits identified in Q. 040.076 item (c):

a. The results of an analysis that demonstrates that failure caused by open, ground, or hot short of cables will not affect its association shutdown system (see note below).

b. Identify each circuit requiring a solution in accordance with Section III.G.3 of Appendix R; or,

c. Identify each circuit meeting or that will be modified to meet the requirements of Section III.G.3 of Appendix R (i.e., three-hour wall, 20 feet of clear space with automatic fire suppression, or one-hour barrier with automatic fire suppression.

NOTE: Option (a) above is considered to be one method of meeting the requirements of Section III.G.3 Appendix R. If option (a) above is selected, the information requested in Q. 040.076 items (a) and (c) should be provided in general terms and the information requested by Q. 040.076 item (b) need not be provided.

Response:

The method utilized for the Fire Hazard Analysis of a particular fire area determines the method and extent two which allied circuits area analyzed.

As indicated in Question 040.076, all associated circuits that are not compatible with the divisional assignment of a divisional fire area are allied circuits. This is a result of the assumption that all Class 1E cabling, except that corresponding to the fire area divisional assignment, is required for shutdown, unless otherwise justified (intruding cables). However, the only allied circuits of concern are those associated circuits located in the fire area undergoing analysis. These intruding circuits are all individually analyzed to determine the effects their fire related failures might have on the Class 1E systems, and the acceptability/ unacceptability of those effects.

The results of all analysis is provided in the Fire Hazards Shutdown Analysis contained in Appendix F.

Figure Number	Title	Engineering Dwg. No.
9.3-10	Steam and Liquid Sampling Turbine and Service Buildings	M607,Sh.1
9.3-11	Steam and Liquid Sampling Reactor Building	M607,Sh.2
9.3-12	Steam and Liquid Sampling Radwaste Building	M607,Sh.3
9.3-13	Standby Liquid Control System	M522
9.4-1	HVAC - Control Room and Critical Switchgear	M548
9.4-2	HVAC Systems for Reactor Building	M545
9.4-3	HVAC Systems for Radwaste Building	M549
9.4-4	HVAC Chilled Water System in Radwaste Building	M550
9.4-5	HVAC Off-Gas Charcoal Absorber Vault in Radwaste Building	M555
9.4-6	HVAC Systems for Turbine Generator Building	M546
9.4-7	HVAC Systems for Circulating, Makeup and Standby Service Water Pump House and Diesel Generator Building	M551
9.4-8	Flow Diagram - Reactor Building Primary Containment Cooling and Purging System	M543
9.4-9	HVAC Systems for Office Area and Laboratories in Service Building	M552
9.4-10	Heating Hot Water and Chilled Water Systems for Service Building	M553
9.4-11	HVAC Systems for Water Treatment and Machine Shop Areas in Service Building	M547
9.4-12	Heating Steam all Buildings	M514
9.5-1	Fire Protection System	M515

Figure Number	Title	Engineering Dwg. No.
9.5-4	Diesel Generator Systems	M512
9.5-5	General Arrangement of the Diesel Generator Building	M587

Figure Number	Title	Engineering Dwg. No.
12.3-35	Radiation Zone Drawing Plan El. 501'-0", 507'-0", 525'-0" Radwaste Building	M577
12.3-36	Radiation Zone Drawing Plan El. 422'-3" and El. 441'-0" and 444'-0" Reactor Building	M567
12.3-37	Radiation Zone Drawing Plan El. 471'-0" and El. 501'-0" Reactor Building	M568
12.3-38	Radiation Zone Drawing Plan El. 522'-0" and El. 548'-0" Reactor Building	M569
12.3-39	Radiation Zone Drawing Plan El. 572'-0" and El. 606'-10-1/2" Reactor Building	M570