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FIRE PROTECTION EVALUATION

F.1 INTRODUCTION

The Fire Protection Evaluation summarizes the overall fire protection program (FPP) at Columbia Generating Station (CGS). The Fire Protection Evaluation describes those fire protection related organizational responsibilities, administrative and technical controls, fire suppression and detection systems, fire hazards analyses, and the post-fire safe shutdown methods, which comprise the FPP. Columbia Generating Station FPP performance goals include:

Defense-in-Depth

The CGS FPP uses the concept of defense-in-depth to achieve the required degree of reactor safety. This concept entails the use of echelons of administrative controls, fire protection systems and features, and post-fire safe-shutdown capability to achieve the following objectives:

a. Prevent fires from starting.
b. Detect rapidly, control, and extinguish promptly those fires that do occur.
c. Provide protection for structures, systems, and components (SSC) important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

Safety-Related Structures, Systems, and Components

NRC General Design Criteria (GDC) 3 of Appendix A to 10 CFR Part 50 requires that the FPP protect SSCs important to safety from the effects of fire. However, the post-fire loss of function of systems used to mitigate the consequences of design-basis accidents does not per se impact public safety. The FPP must protect all equipment important to safety; however, the need to limit fire damage to systems required to achieve and maintain post-fire safe-shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design-basis accidents.

Post-Fire Safe-Shutdown

The CGS FPP ensures that one success path of SSCs necessary for hot shutdown is free of fire damage. The reactor safety and performance goals for safe shutdown after a fire should ensure that the specified acceptable fuel design limits are not exceeded. Section III.L of Appendix R to 10 CFR Part 50 is followed for post-fire reactor safety and performance goals for alternate remote shutdown.

Prevention of Radiological Release

The CGS FPP demonstrates that the plant will maintain the ability to minimize the potential for radioactive releases to the environment in the event of a fire. Fires are treated as anticipated operational occurrences as defined in Appendix A to 10 CFR Part 50.

The CGS structures that must satisfy the FPP are those buildings designated as "Plant Areas" in references F.7.8.a through F.7.8.f procedures.

F.1.1 FIRE PROTECTION PROGRAM

The approved fire protection program and the changes thereto are contained in this Appendix of the FSAR except for certain other sections of the FSAR included in the Fire Protection Program by Reference F.7.1.

Appendix F is divided into seven sections. This first section contains background information on the development of the fire protection program.

Section F.2 contains a description of the plant fire protection systems. The codes and standards considered and used in the design of the systems are listed. Deviations from code design commitments are identified.

Section F.3 presents point-by-point comparisons of the plant fire protection program to the guidelines of Branch Technical Position (BTP) APCSB 9.5-1 Appendix A, and with the specific commitments to 10 CFR 50, Appendix R, Section III.

Section F.4 describes the methods used to implement the post-fire safe shutdown protection commitments to 10 CFR 50, Appendix R. The selection of the post-fire shutdown equipment and the circuit analysis methods are also described in Section F.4. The fire hazards analysis for each fire area describes the respective area, combustible loading, fire protection features which may be used to mitigate the consequences of a potential fire, and the methods used to ensure post-fire safe shutdown capability.

Section F.5 references Licensee Controlled Specifications (LCS) 1.10 that contain the fire protection system operational conditions, compensatory measures, and testing requirements for the essential portions of the fire protection systems.

Section F.6 contains the fire protection arrangement drawings and Section F.7 lists the references.

F.1.2 BACKGROUND

NRC General Design Criteria for Nuclear Power Plants, Appendix A of 10 CFR 50 establish the minimum requirements for the design of nuclear power plants. See FSAR Section 3.1.2.1.3 for the CGS comparison to GDC Criterion 3 for fire protection.

The construction permit for CGS was granted March 1973 and the design of the plant fire systems began in the following years. Section F.2.1 describes the code-of record edition of the committed fire codes followed for plant design. Section 1.2.2.12.11 provides a summary of the CGS fire protection systems.

Following the March 22, 1975 Browns Ferry Fire, BTP APCSB 9.5-1, Appendix A was issued. On September 30, 1976, Energy Northwest was requested to conduct an evaluation of the FPP at CGS using the guidelines in BTP APCSB 9.5-1 Appendix A. Since then, the comparison to BTP APCSB 9.5-1, Appendix A has been maintained current in FSAR Appendix F, Table F.3-1.

10 CFR 50, Appendix R and 10 CFR 50.48 became effective on February 17, 1981. 10 CFR 50, Appendix R added new expectations for the fire protection of safe shutdown capability, emergency lighting, and lubricating oil collection systems for non-inerted containment reactor coolant pumps. Appendix R, Sections III.G/L, III.J, and III.O are 10 CFR 50.48 requirements for plants licensed to operate prior to January 1, 1979. Columbia Generating Station received its operating license on December 20, 1983 and Appendix R is not an applicable regulation to CGS. In letter dated October 15, 1981, the NRC requested CGS submit a comparison to Appendix R that would be used as a guideline for review of fire protection requirements. In NRC Safety Evaluation Report (SER) dated March 1982 Section 9.5.1 indicated Energy Northwest agreed to conform to 10 CFR 50, Appendix R. The above paragraph discussion indicates Appendix R to 10 CFR 50 is a commitment for CGS and not an applicable regulatory requirement. Therefore, CGS is not an "Appendix R plant," but does maintain a comparison to all the sections of Appendix R as "commitments" in FSAR Table F.3-2. Deviations to 10 CFR 50, Appendix R are documented in Table F.3-2. A deviation to Appendix R, Sections III.G/L and III.J has a higher potential to impact the ability to achieve post-fire safe shutdown. Since CGS has an inerted primary containment, Appendix R, Section III.O is not applicable.

From 1982 to 1989, various NUREG-0892 NRC SERs for the CGS FPP were issued. Section F.7.4 lists the SERs for the CGS FPP. These SERs compared CGS to the Standard Review Plan BTP CMEB 9.5.1 (which includes the combined guidelines of BTP 9.5-1, Appendix A and 10 CFR 50, Appendix R).

Generic Letters 86-10 and 88-12 provided guidance on moving the fire protection Technical Specifications into the FSAR and adopting the standard fire protection license condition. Each of these changes was approved in SER dated May 25, 1989 and incorporated into Facility

Operating License (FOL) Amendment 67 (see Reference F.7.4.m). The fire protection system Technical Specifications was moved to FSAR F.5 but later moved to LCS 1.10.

Facility Operating License Amendment 67 modified FOL Condition 2.C.(14) such that the approved FPP (FSAR Amendment 39 and SERs) may be altered without prior NRC approval provided the change does not adversely impact the ability to achieve and maintain safe shut down in the event of fire. Based on the FOL Condition 2.C.(14) criteria and initial date of issuance, numerous FSAR changes have been made to Appendix F since FSAR Amendment 39. The FOL Condition 2.C.(14) "approved CGS FPP" is the current amendment of FSAR Appendix F and its referenced documents.

Based on the above, section F.7.1 lists the applicable FPP regulatory requirements and commitments.

F.2 FIRE PROTECTION SYSTEMS

Fire protection is provided through a combination of active and passive features which function to detect, contain, and suppress potential fires. These features include:

a. Fire resistive construction

b. Fire detection and alarm systems

c. Fire suppression systems

    1. Fire water supply system

    2. Deluge water spray systems

    3. Wet pipe sprinkler systems

    4. Preaction sprinkler systems

    5. Carbon dioxide systems

    6. Halon 1301 systems

    7. Dry chemical suppression systems

    8. Manual fire fighting equipment

d. Manual fire fighting equipment

    1. Protective clothing and self-contained breathing apparatus (SCBA)

    2. Yard fire hydrants

    3. Standpipes, hose, and foam carts

    4. Portable extinguishers

    5. Smoke removal

e. Operator action equipment

1. Emergency lighting

2. Emergency communications

The design of the plant fire protection features is described below.

F.2.1 APPLICABLE INDUSTRY STANDARDS

The following industry standards are used, where applicable, in the design of the fire protection systems serving the reactor building, radwaste/control building, diesel generator building, turbine generator building, circulating water pump house, water filtration building 33, and transformer yard. Design-related differences between the installed plant configuration and industry standards are listed in Table F.2-1. See Section F.2.7 for inspection and testing.

a. NFPA 10 - 1975, Standard for Portable Fire Extinguishers;

b. NFPA 12 - 1973, Standard on Carbon Dioxide Extinguishing Systems;

c. NFPA 12A - 1973, Standard on Halogenated Fire Extinguishing Agent-Halon 1301;

d. NFPA 13 - 1975, Standard for the Installation of Sprinkler Systems;

e. NFPA 14 - 1974, Standard for the Installation of Standpipe and Hose Systems;

f. NFPA 15 - 1973, Standard for Water Spray Fixed Systems for Fire Protection;

g. NFPA 20 - 1974, Standard for the Installation of Centrifugal Fire Pumps;

h. NFPA 24 - 1973, Standard for Outside Protection;

i. NFPA 30 - 1973, Standard for Flammable and Combustible Liquids Code. See Table F.3-1 paragraph D.2.d for applicability;

j. NFPA 50A - 1973, Standard for Gaseous Hydrogen Systems at Consumer Sites. See Table F.3-1 paragraph D.2.b for applicability;

k. NFPA 70 - 1975, National Electric Code. Used for the design of electrical equipment and wiring for the main control room cabinet Halon 1301 systems and for wiring of the fire detection and alarm initiating devices;

l. NFPA 72A - 1975, Standard for the Installation, Maintenance and Use of Local Protective Signaling Systems for Watchman, Fire Alarm and Supervisory Service;

m. NFPA 72D - 1975, Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems for Guard, Fire Alarm, and Supervisory Service;

n. NFPA 72E - 1974, Standard for Automatic Fire Detectors;

o. NFPA 78 - 1975, Lightning Protection Code. See Table F.3-1 paragraph A.4 for applicability;

p. NFPA 80 - 1974, Standard for Fire Doors and Windows;

q. NEDO-10466-A, Power Generation Control Complex Design Criteria and Safety Evaluation. See Table F.3-1 paragraph E.4.a for applicability;

r. IEEE 383-1974, Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations. Where cable does not meet IEEE 383, NFPA 262-1990 or UL 910-1985 may be used. See Table F.3-1 paragraph D.3.f for further clarification;

s. Regulatory Guide 1.52, Revision 1, Design, Testing, and Maintenance Criteria for Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants. See Table F.3-1 paragraph D.4.d for applicability; and

t. ANSI A21.4,-1974. See Table F.3-1 paragraph E.2.a for applicability.

Current editions of the above codes are used for modifications and additions to the plant fire protection systems when new facilities or systems are constructed or enhanced and defense-in-depth is warranted. In some cases, the guidance of more recent code editions may be followed which deviates from designs of the above code of record, without a corresponding Table F.2-1 discussion (when managed through administrative controls and maintained as a plant record).

F.2.2 FIRE RESISTIVE CONSTRUCTION

Fire barriers and fire resistive construction prevent the spread of fire from one location to another. Fire resistance is provided in building construction through the use of noncombustible structural materials. Rated fire barriers further isolate certain high hazard areas and provide additional separation for those systems needed for post-fire safe shutdown.

Essential fire rated assemblies are those fire area boundary features which separate fire areas with redundant post-fire safe shutdown equipment/cables or those fire areas containing redundant post-fire safe shutdown cables where one division is protected by raceway fire barriers. The overall category of fire rated assemblies (see LCS 1.10.5) can be broken into subcategories of fire area boundary features, raceway fire barriers, and fireproof coatings.

Figures F.6-1 through F.6-5 show the fire area boundaries, barrier hourly fire ratings, and barrier classifications. Reference F.7.7.o is the raceway fire barrier drawings.

F.2.2.1 Fire Area Boundary Features

Structural fire barriers may be provided by wall, floor, or ceiling assemblies. The fire rating of structural fire barriers is described in Section F.4 fire hazards analysis. A concrete wall with a thickness of 6 in. or greater provides a 3-hr rating. Based on the construction of masonry fire barriers, the fire rating may vary from 2 to 3 hr. The fire resistance rating for structures is determined using information from the NFPA Fire Protection Handbook, vendor data, industry fire resistance directories, and/or engineering evaluation. The containment fire barrier is not a standard 3-hr rated assembly but is adequate to prevent fire propagation.

Fire doors, fire dampers, and fire rated penetration seals are typically designed with a fire rating equivalent to that of the structural barrier in which they are installed. The 2-hr barriers may have 1.5-hr rated doors and dampers.

Fire doors are installed to the guidelines of NFPA 80 - 1974, with exceptions contained in Table F.2-1. Non-fire rated specialty doors (air lock, flood, radiation shield, and blast doors) located in fire barriers are installed based on equivalent door construction, as approved in Reference F.7.4.c.

Penetrations for ventilation systems through fire rated barriers are protected by fire dampers. Some plant areas have 1.5-hr rated fire dampers in 3-hr barriers, as approved by Reference F.7.4.a. Certain fire damper assemblies consist of a 3-hr listed fire door as the guillotine or trap door, installed in unlisted frames or supports. The construction and installation of the frames and supports is similar to listed assemblies. Although the design has not been fire tested and listed as a fire damper assembly, it was approved by Reference F.7.4.f. As approved in Reference F.7.4.l, fire dampers are not drop tested under air flow conditions since administrative controls are present to shut down ventilation on confirmation of a fire. All fire dampers in rooms containing safety-related equipment are qualified to Seismic Category I.

Conduit, piping, and cable penetrations are sealed where they pass through the barrier, except for some internal conduit seals where evaluation has shown no seal is required. Penetration seals provide a fire resistance equal to that of the barrier unless a fire protection evaluation has justified a lesser fire rating. Grouted penetrations are sealed with grout to the same thickness of the wall and are assumed not to degrade the rating of the penetrated fire barrier. The fire rating of nongrouted penetration seal designs is established by tests performed in accordance with Reference F.7.6.b. Qualification of fire-rated and pressure-rated penetration seals is contained in Reference F.7.6.a. Configuration control of penetration seals is maintained by Reference F.7.5.q.

The containment barrier and penetrations are nonstandard fire barriers not qualified by representative fire testing. See Section F.2.2.5 for more details.

F.2.2.2 Raceway Fire Barriers

Raceway fire barriers are used to prevent damage to designated circuits within a fire area in the event the redundant post-fire safe shutdown circuits are damaged by fire. Raceway fire barriers wraps are constructed of Darmatt KM-1, or 3M Interam E-50D/E54A.
Darmatt KM-1 raceway fire barriers are installed to 1 or 3-hr rated designs qualified by fire testing meeting Generic Letter 86-10 Supplement 1 acceptance criteria (Reference F.7.6.m).
3M Interam raceway fire barriers are installed to 3-hr rated designs qualified by fire testing meeting Generic Letter 86-10 acceptance criteria (Reference F.7.6.k). Structural steel supports and intervening steel members for raceway fire barriers are wrapped to the distance qualified by fire testing. Load bearing supports in 1-hr fire areas need not be protected to the structural barrier (Reference F.7.3.g). Reference F.7.4.f approved that unprotected commodities can be located above raceway fire barriers wraps.

A second category of raceway fire barriers is Whittaker mineral insulated (MI) fire rated cable. MI fire rated cable is 3-hr rated in Fire Areas R-1 and TG-1, and credited as 1-hr rated in Fire Area RC-3 (Reference F.7.6.j). In 3-hr areas, the MI fire rated cable is routed to ensure the fire induced collapse of unprotected items does not adversely affect cable operability (Reference F.7.7.o). The support designs limit the amount of zinc exposure and the potential for liquid metal embrittlement (Reference F.7.5.u and F.7.7.o).

F.2.2.3 Fireproof Coatings

Thermo-Lag 330-1 is used as a fire resistive coating on certain reactor building structural steel members supporting post-fire safe shutdown credited instrument tubing and tray support TS-5269 to protect Whittaker MI fire rated cable routed below (Reference F.7.6.l).

F.2.2.4 Electrical Separation Barriers

Electrical separation barriers are present throughout the plant to limit internally generated fire damage to nearby redundant safety-related systems. See Section 8.3.1.4 for more detail.

Plant building construction is further described below. The Section F.4.4.4 fire hazards analysis for each fire area has additional building construction and fire rating details.

F.2.2.5 Reactor Building

Exterior walls, floors, and ceilings are reinforced concrete from the top of the foundation mat to the refueling floor level. The minimum thickness of reinforced-concrete walls is 1 ft. 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 reactor building is separated from other plant buildings by 3-hr fire rated reinforced-concrete walls and nonrated steel airtight doors. The building roof is a Factory Mutual Class I insulated steel roof deck.

Within the reactor building, Class 1E motor control centers are enclosed to provide separation from the general area hazards. Partial height concrete walls on the 471 ft, 501 ft, and 522 ft el. protect four Division 2 instrument racks. Fire barriers with nonrated steel flood doors separate the safety-related pump rooms below grade.

Primary containment is inerted during operation. There is no permanently installed fire protection equipment inside containment. Portable extinguishers and manual hoses are available for fire suppression when containment is deinerted for maintenance during plant outages.

The annular gap constructed between the metal shell and the primary containment vessel and the concrete biological shield wall, above 446 ft, is filled with a compressible insulating spacer system consisting of polyurethane flexible foam sheets butted at the joints and cemented directly to the primary containment shell, a jacket of premolded fiberglass reinforced polyester jacket panels, and epoxy flashing. The foam spacer is in a confined space, exposed to a minimal quantity of air through clearance around pipe penetrations. There is adequate spatial separation from the foam to the nearest combustible (electrical cable insulation) to reduce the possibility of a fire spreading into the foam liner. Mechanical penetrations within a 20-ft surface radius of Appendix R protected containment penetrations in Division 1 fire areas are 3-hr fire rated to ensure the combustible spacer/liner material does not ignite. Other containment mechanical penetrations have nonrated radiant energy refractory ceramic fiber seals. Fire spread in the annular gap would be very slow due to the limited space and oxygen deficient atmosphere. The metal vessel liner and the concrete bioshield wall would act as large heat sinks and further slow fire propagation. The use of refractory ceramic fiber seals was approved by Reference F.7.4.1.

Stair and elevator shafts in the reactor building are constructed of noncombustible reinforced concrete. Air locks are constructed of reinforced concrete with steel airtight doors.

F.2.2.6 Radwaste/Control Building

The vital island section of the building consists of reinforced-concrete walls, floors, and ceilings from the top of the foundation mat up to and including the roof slab. The radwaste sections of the building are constructed of reinforced-concrete walls, floors, and ceilings at the lower levels and structural steel framing with reinforced-concrete floors and enclosure walls on insulated metal wall panels at the upper levels. The building roof is Factory Mutual Class I insulated steel roof deck.

The main control room walls are 3-hr rated reinforced concrete.

The main control room contains steel enclosed power generation control complex (PGCC) units which are divisionally separated. Each unit consists of a false floor assembly, a vertical panel and/or benchboard panel, and a termination cabinet. All cables entering through the floor cable penetrations 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 metal conduit. Penetrations into the back of the panel assembly are fire stopped or sealed.

The remote shutdown room, the vital switchgear rooms and battery rooms, the reactor protection system rooms, and their respective mechanical equipment rooms are divisionally separated by 3-hr rated enclosures.

Stairs constructed of noncombustible material are enclosed in 2-hr minimum fire rated walls. The elevator is enclosed in a reinforced-concrete shaft.

From grade level 441 ft to 460 ft, the west wall facing the alternate health physics building is 3-hr rated.

F.2.2.7 Turbine Generator Building

The turbine building is separated from all other areas of the plant by noncombustible reinforced masonry block and/or concrete construction with hollow metal or steel doors. The building roof is a Factory Mutual Class I insulated steel roof deck.

The exterior walls of the turbine building are reinforced concrete or structural steel covered by insulated metal panels. Within the area, reinforced-concrete walls contain the turbine, feedwater heaters, and condenser. At the operating floor level, the reinforced-concrete walls isolating the turbine continue for a height of 23 ft 6 in. 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 also structural steel covered with insulated metal panels. Equipment access areas at the grade, mezzanine, and operating levels are contained with reinforced-concrete masonry units and insulated metal panels.

Rated fire barriers are provided to isolate high hazard areas:

a. The turbine generator lube oil conditioning system room (containing reservoir, separator, transfer pump, etc.) is located within 3-hr fire rated reinforced-concrete and masonry block walls. The oil cooler heads are open to the 501 ft floor level but is protected by deluge system 55;

b. The turbine generator lube oil storage tanks are located within 3-hr fire rated reinforced-concrete and masonry block walls and fire doors;

c. The auxiliary boiler room is separated from adjacent areas by 3-hr fire rated reinforced-concrete and masonry block walls;

d. The hydrogen seal oil room is separated from adjacent areas by 3-hr fire rated reinforced-concrete and masonry block walls;

e. The makeup water pump house transformer vaults are separated from adjacent areas by 3-hr fire rated reinforced-concrete and masonry block walls;

f. See Figures F.6-1 and F.6-2 for turbine building north wall facing transformer yard fire rating; and

g. From grade level 441 ft to 501 ft, the west wall facing the adjustable speed drive (ASD) building (Column D.3-H) is 3-hr fire rated.

Stairs of noncombustible material are enclosed in walls of 2-hr minimum rated construction. The elevator is enclosed in a reinforced-concrete shaft.

F.2.2.8 Diesel Generator Building

Exterior walls, floors, and ceilings are reinforced concrete of varying thicknesses from the top of the foundation mat to the roof. The building is divided into separate compartments by reinforced-concrete walls. The walls separating the diesel compartments and the walls separating the diesel generator building from adjacent plant buildings are 3-hr fire rated. The exterior walls of the building are nonrated.

F.2.2.9 Standby Service Water Pump Houses No. 1A and 1B

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

F.2.2.10 Service Building

The service building is separated from the turbine building and the reactor building by 3-hr rated reinforced-concrete walls.

F.2.2.11 Circulating Water Pump House and Chlorination Building

The building has a reinforced-concrete floor, insulated metal wall panels, and a metal roof deck over structural steel framing. The circulating water pump house and the chlorination sections of the building are separated by a reinforced-concrete masonry wall. The diesel fire pump fuel storage tank room is isolated by 2-hr rated walls.

F.2.2.12 Cooling Towers

The cooling towers are of noncombustible construction (except for fan shrouds, fan blades, fill material, and drift eliminators).

F.2.2.13 Water Filtration Building 33

The building has a reinforced-concrete floor, insulated metal wall panels, and metal roof deck over structural steel framing. All barriers are nonrated.

F.2.2.14 North Yard Transformers

The yard transformers are separated from the turbine building by 2-hr rated barriers and spatial separation. Fire barrier walls are installed between the main transformers E-TR-M1, E-TR-M2, E-TR-M3 and E-TR-M4. Other transformers are not separated by fire barriers.

F.2.2.15 Technical Support Center

The technical support center is separated from the radwaste building by 3-hr rated barriers.

F.2.2.16 Alternate Health Physics Building

The alternate health physics building is separated from the radwaste building and turbine building by 3-hr rated barriers.

F.2.2.17 Reactor Recirculation Pump Adjustable Speed Drive Building

The reactor recirculation (RRC) pump ASD building has a reinforced-concrete floor, insulated wall panels, and a metal roof deck over structural steel framing. The building walls on the west and north side are 2-hr rated. The adjacent turbine building wall is 3-hr rated. The concrete barriers separating and to the north of the ASD transformers are 2-hr fire rated.

F.2.3 FIRE DETECTION AND ALARM SYSTEMS

The fire detection and alarm systems are designed to rapidly identify developing fire conditions. Signals from plant fire detection instruments and fire suppression system alarms are transmitted via a proprietary fire alarm system to a fire alarm panel in the main control room.

Standard and functional zone annunciation indicator lights are located on the fire control panel in the main control room. Standard zone annunciation results from the installed fire detection instruments. Functional zone annunciation derives from the activation of individual devices such as deluge system flow devices, wet pipe sprinkler system flow devices, preaction system flow devices and low pressure sensors, carbon dioxide flow devices, and fire pump status. Some remote fire control panels and all main control room fire control panels have individual bells that sound automatically whenever their associated alarm devices are activated. There are no devices to automatically record incoming signals to the main control room. See Table F.2-1 for alternate recording methods.

Ionization, photoelectric, air duct ionization, thermal, or ultraviolet fire detectors are installed in hazard areas of the plant. Smoke detectors (ionization and photoelectric) are generally installed in areas containing moderate amounts of combustibles with no large combustible oil or gas hazards. Ionization detectors are not located in areas where the background radiation exceeds the manufacturer's rating. The sensitivity of thermal detectors is based on the normal average air temperature in the area where they are located.

Manual fire alarm pull stations are generally located near exterior doorways and at each elevation of the main plant buildings in close proximity to the stairwells. Manual fire alarms are wired with other detection and alarm devices in appropriate fire detection zones.

Standard and functional alarms in the main control room do not initiate a plant-wide alarm signal. Depending on the fire condition, voice announcements over the public address system or emergency evacuation alarms may be used to warn plant personnel. A manual push button in the control room initiates a coded fire alarm radio signal to the DOE fire department dispatch center.

The fire protection system wiring for alarm initiation, alarm signaling, and control room annunciation at the fire control panel is electrically supervised to prevent false fire alarms due to open or grounded wiring. The supervisory circuitry sounds a trouble alarm using a single buzzer on the fire control panel on detection of open circuits, short circuits, closed valves, low water pressure, low air pressure, or other trouble condition.

Fire detection systems which actuate suppression systems in safety-related areas have Class A circuitry (as defined in NFPA 72D - 1975). Other fire detection system wiring is Class B.

The plant fire detection system is powered from a local power panel which is normally supplied from uninterruptible power. Backup power is supplied from onsite emergency diesel generators.

The fire control panel mounted in the main control room is designated Seismic Category IM; all panel mounted equipment in this room is designated Seismic Category II. Other fire detection equipment, components, and accessories are designated Seismic Category II.

Portable detection systems may be used as a backup to fixed plant fire detection systems or as additional compensatory measures.

The fire detection system is designed in accordance with the guidelines of NFPA 72D - 1975 and NFPA 72E - 1974. Differences between the installed plant configuration and the NFPA code sections are documented in Table F.2-1. Reference F.7.4.f approved deletion of fire detection in various plant areas.

F.2.4 FIRE SUPPRESSION SYSTEMS

Automatic and manual suppression systems and manual fire fighting equipment are located within the plant as described below. The type of fire suppression provided for a particular plant area is based on consideration of the nature of the fire hazard in the area, the type of equipment protected, and the physical arrangement of the area. Fixed automatic suppression systems are installed to protect areas or equipment containing large quantities of combustibles, oils, or gases. Reference F.7.4.c approved the lack of fire suppression in various plant areas. Plant areas with fire suppression coverage and type of suppressant are shown in Figures F.6-7 through F.6-11.

The fire protection system is designed such that inadvertent operation or failure of any component of the system will not impair the ability of engineered safety features to safely shut down or isolate the reactor, or to limit the release of radioactivity to the environment in the event of an accident.

Fire protection system piping in Seismic Category I areas of the reactor building, the diesel generator building, the radwaste control building, and the reactor/radwaste corridors, required to be seismically supported/mounted, are designed to Seismic Category IM and Quality

Assurance Class II+. Fire protection system piping not required to be seismically supported/mounted are designed to Seismic Category II and Quality Assurance Class II.

F.2.4.1 Fire Protection Water Supplies

The fire protection water supply system consists of a primary fire water supply, a secondary fire water supply, and yard mains to distribute water to the yard hydrant isolation valves and building standpipes. The fire protection water supply system is shown schematically in Reference F.7.7.1 and Figure F.6-21.

The primary water supply is drawn from the circulating water pump house basin. See Table F.3-1 section E.2.d for additional details.

The primary fire protection water supply consists of three fire pumps: two electric (FP-P-2A and FP-P-2B) and one diesel driven (FP-P-1), each of which have a design capacity of 2000 gpm at a total dynamic head of 289 ft. The primary fire pump discharge lines are piped so that each electric motor-driven pump discharges to the underground fire main loop (also referred to as fire main ring header).

Each of the three primary fire pumps is furnished with an automatic air release valve. In addition, the primary diesel-driven pump is furnished with a pressure relief valve and an open discharge cone back to the circulating water basin. Each electric motor-driven pump is furnished with a circulation relief valve. Three 10-in. fire protection branch lines have been provided (one for each fire pump) to a flow element, six-headed test header for fire pump testing. Fire protection water to the plant underground fire protection loop is supplied by two 12-in. fire protection main feed lines from the fire pump discharge.

The secondary water supply is drawn from a 400,000-gal embankment supported bladder tank (FP-TK-110) with a dedicated water supply of 284,640 gal. The water supply is delivered to the fire main loop by diesel-driven fire pump (FP-P-110) located in the water filtration building. The diesel fire pump is rated at 2500 gpm at a total dynamic head of 323 ft. The secondary water supply connects to the fire loop through a 12-in. branch line.

A pressure maintenance jockey pump (primary water supply jockey pump (FP-P-3) or secondary water supply jockey pump (FP-P-111)) is normally running to maintain system pressure. Pressure control valves installed on the jockey pumps discharge limit system pressure to below 175 psig.

One or multiple fire pumps will start if the other running fire pumps cannot maintain system pressure. A drop in system pressure below 120 psig will cause motor-driven fire pump (FP-P-2A) to automatically start. A second motor-driven pump (FP-P-2B) will start after a 10 second delay, if pressure drops to 110 psig. The primary diesel-driven pump (FP-P-1) will start after a 15 second delay (20 second delay for loss of controller power), if pressure drops to

110 psig. The secondary diesel-driven fire pump (FP-P-110) will start after a 30 second delay (35 second delay for loss of controller power), if pressure drops to 100 psig. The above fire pump sequencing, along with reduced voltage soft start controllers and standpipe vacuum breakers, limit system pressure transients (Reference F.7.3.x).

The capacity of the fire water pumps is based on a maximum probable water system demand (1872 gpm in the cable spreading room), 500 gpm for a hose stream, and standby pump capacity available. Each motor-driven fire pump controller and each diesel-driven fire pump controller contains automatic start controls and manual start/stop controls. Any fire pump can be started either locally or from the main control room. After a start, a fire pump can be stopped only locally at the pump controller. Fire pump start, failure to start, and loss of current to the motor-driven pumps is indicated in the control room. Diesel-driven fire pump alarms include fire pump start, fire pump failure to start, high jacket water temperature, low oil pressure, and engine overspeed.

In the event of electrical power failure to a diesel-driven fire pump controller, the associated diesel-driven fire pump will start automatically. Both motor-driven fire pumps are inoperative during loss of offsite power.

Since either water supply can provide the necessary water demand and the circulating water basin is not considered a tank, the primary and secondary water supplies need not be interconnected.

Mitigation of system water hammer, from actuation of suppression systems causing standpipe voiding, is accomplished by diesel fire pump sequencing, redundant vacuum breakers at various standpipes (see Section F.2.5.3), and check valve FP-V-26 on the RWB-1 standpipe.

A 1.5-in. line takes water from the discharge side of the fire protection jockey pump (FP-P-3) to provide an emergency source of pump bearing lubricating water to the plant service water pumps (TSW). The backup bearing lubricating line pressure control valve TSW-PCV-26 is closed under normal conditions, but allows a flow of up to approximately 20 gpm during TSW system low pressure. This design limits the amount of water flow from the fire protection system. A sight glass is provided for verification.

Fire protection water is distributed through a 12-in. underground fire main to supply station hydrants, fire hose stations, and suppression systems. The looped arrangement of the fire protection system ensures continued flow to the remainder of the system when sections of the system are isolated for tests or repairs. Post indicator valves sectionalize the yard loop to increase the reliability of fire protection water supply in case of a fire main break.

A series of 12-in. and one 8-in. branch lines lead from the underground fire main loop to various building standpipes. Each line contains an outside post indicator isolation valve. See Reference F.7.7.1 for more detail.

A fire main is routed under the diesel generator building. This was approved according to Reference F.7.4.k.

A connection from the drain valve outlet from standpipe TGB-4 provides the capability to connect a hose to provide emergency cooling to the control and service air compressors in the event both TSW pumps or both compressor cooling loop pumps are out of service.

Leakage in the fire protection underground is monitored by a flow totalizer on the bypass line of the detector check valve on the discharge line of the jockey pump in the circulating water pump house. Serious leaks or a rupture of the fire protection system piping could also be indicated by fire pump running alarms in the main control room with no concurrent fixed automatic or preaction fire protection system operating alarms, no detector fire alarms, and no report of any fire or use of fire hose.

The location of a fire main leak may be determined by visual observation. If no visual indications are present, the location of the leak could be determined by using the sectionalizing valves to isolate a section of the system and observing the flow meter gauge on the detector check valve. The leak would be indicated by a decrease in flow as the section is isolated.

The fire pump installation is designed in accordance with the guidelines of NFPA 20 - 1975. Differences between the fire pump installation and the NFPA code sections are listed in Table F.2-1. The installation of the underground fire main is designed in accordance with the guidelines of NFPA 24 - 1973. Differences between the underground fire main installation and the NFPA code sections are listed in Table F.2-1.

F.2.4.2 Wet Pipe Sprinkler Systems

Wet pipe sprinkler systems are installed to provide automatic fire suppression of general area hazards. Wet pipe sprinklers consist of closed sprinklers attached to piping which contains water under pressure at all times. System operation is initiated when the local temperature rise from a fire reaches the operating temperature of fusible link sprinkler heads. Water discharge allows the hinged clapper in the alarm check valve to open. Valve operation provides remote alarm/indication in the main control room.

Temperature ratings for automatic sprinkler heads are selected based on normal area temperatures and proximity to heat generating components.

Sprinkler system piping may be designed using pipe schedules or hydraulically calculated to provide a minimum design density according to the nature of the hazard protected. See Figures F.6-7 through F.6-11 for locations of wet pipe sprinkler systems.

The wet pipe sprinkler system installation in the main control room is designed in accordance with the guidelines of NFPA 13 - 1975. This is the only wet pipe sprinkler system which protects a safety-related area. Differences between the installed plant configuration and the NFPA code sections are listed in Table F.2-1.

F.2.4.3 Preaction Sprinkler Systems

Preaction systems are used in areas where inadvertent operation of the sprinklers could damage or cause outages of vital electrical equipment. Preaction systems are installed in the cable spreading room and cable chase in the radwaste building, the reactor/radwaste corridor, the diesel generator building, and the RRC pump ASD building.

The preaction systems have closed fusible link sprinkler heads. Downstream of the control valve, the preaction sprinkler piping is normally dry and pressurized with air to supervise piping system integrity. Low air system pressure, which could indicate damaged piping or sprinkler heads, is alarmed in the control room. Fire detectors located in the protected area activate a solenoid valve to open the deluge valve, supplying water to fill and pressurize the sprinkler system piping. Pull stations are also provided to allow manual operation of the preaction system. Sprinkler flow is not initiated until the local temperature increases to the operating temperature of the closed fusible link sprinkler heads.

In the cable spreading room, cable chase, ASD building, and reactor/radwaste corridor smoke detectors are used to trip the preaction system. The diesel generator preaction systems are actuated by thermal detectors. Detector operation and preaction system flow devices alarm in the main control room.

The preaction sprinkler systems installed in safety-related areas are designed in accordance with the guidelines of NFPA 15 - 1975. Differences between the installed plant configuration and the NFPA code sections are listed in Table F.2-1.

F.2.4.4 Deluge Water Spray Systems

Deluge water spray systems are used where fast response may be required to control or extinguish a fire. A deluge system employs open nozzles attached to a normally dry piping system. Fire detectors located in the hazard area activate a solenoid valve to open the deluge valve and initiate water flow. Electric heat actuating devices (HAD) indicate fire conditions by sensing an abnormally high temperature or an unusually rapid rise in temperature. Detector operation and deluge system waterflow devices alarm in the main control room.

Deluge water spray systems provide automatic fire protection for various locations in the turbine generator building where oil is stored or piped, for yard transformers, and for the reactor feed pump rooms in the turbine generator building. Spray nozzles near the transformer bushings are carefully placed to avoid flashovers at the bushings or to the piping.

Manually actuated deluge water spray systems are installed to protect charcoal filters in certain HVAC filter units. High temperature signals are used to alarm control room operators to potential fire conditions.

Deluge water spray systems installed in safety-related plant areas are designed in accordance with the guidelines of NFPA 13 - 1975 and NFPA 15 - 1973. Differences between the installed plant configuration and the NFPA code sections are listed in Table F.2-1.

F.2.4.5 Carbon Dioxide Fire Suppression Systems

The low pressure carbon dioxide system automatically provides fire protection for the turbine generator exciter housing. A 1-in. manual carbon dioxide hose station, with reel and 100 ft of hose, is also provided for exciter housing protection on the turbine operating floor (501 ft). The carbon dioxide storage tank also provides carbon dioxide for generator purging during startup and shutdown conditions. The capacity of the carbon dioxide unit is 6 tons. Interlocks are provided such that the generator purge system cannot draw down tank level below that needed for automatic fire protection of the exciter housing.

The carbon dioxide unit is located in the northwest corner of the 441 ft level of the turbine generator building. The low pressure carbon dioxide storage tank maintains liquid carbon dioxide at approximately 300 psig and 0°F by refrigeration. The refrigeration is accomplished by a compressor and refrigeration coil within the vessel. The carbon dioxide storage unit is electrically powered and automatically controlled and monitored by means of pressure switches. High or low carbon dioxide pressure causes a remote alarm and indication in the main control room.

Thermal detectors located in the generator exciter housing provide early warning alarm in the main control room allowing the operator to review and evaluate the problem prior to manual or automatic actuation of the system. Automatic operation of the carbon dioxide system is initiated when the temperature increases to the setpoint of the high temperature detector. 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 carbon dioxide protected area. An automatic timer regulates the carbon dioxide discharge for both automatic and manual electric operation to provide even distribution of the discharge.

Actuation of the system alarms locally and remotely in the main control room. The local alarms consist of two separate alarm devices located near the protected area. One device sounds 20 sec before its associated carbon dioxide system is released and the other device sounds continuously during the duration of such release.

The carbon dioxide system is designed in accordance with the guidelines of NFPA 12 - 1973. The carbon dioxide distribution system is shown schematically in Reference F.7.7.n.

F.2.4.6 Halon 1301 Fire Suppression Systems

Halon 1301 suppression systems are installed in normally occupied areas where the application of water would be inappropriate. Halon 1301 provides automatic fire protection for the main control room PGCC under floor areas.

Eighteen Halon 1301 systems are installed in the various main control room PGCC subfloor duct sections to discharge on activation of their associated thermal detector units. Each system is sized to provide a 20% Halon concentration for a minimum duration of 20 minutes. Cable penetrations into the PGCC are sealed to contain Halon discharge. Thermal detector operation also causes a local alarm and indication on the main control room fire control panel. Smoke detectors are located in each PGCC section to provide early warning alarm. Each system includes supervision features which actuate a trouble alarm and indication on the main control room fire control panel in case of a wiring or component failure.

The PGCC Halon suppression system is designed in accordance with the guidelines of NFPA 12A - 1973 and Reference F.7.5.j. See Section 8.3.1.4.3.6.2 and Figure 8.3-36 for more detail. The Halon system was approved according to Reference F.7.4.a.

F.2.4.7 Dry Chemical Fire Suppression Systems

Dry chemical suppression systems may be found installed in approved portable hazardous material storage buildings within the plant. These systems automatically actuate by melting of the fusible link(s) or manually by a local pull station. Columbia Generating Station is not committed to NFPA 17 compliance.

F.2.5 MANUAL FIRE FIGHTING EQUIPMENT

Manual fire fighting equipment includes protective clothing, SCBA, fire hydrants and hydrant hose equipment, standpipe and fire hose stations, AFFF foam carts, portable fire extinguishers, and smoke removal equipment.

F.2.5.1 Protective Clothing and Self-Contained Breathing Apparatus

Protective clothing and SCBAs are provided in designated locations for use by the plant fire brigade. The SCBA positive pressure masks are National Institute for Occupational Safety and Health (NIOSH) approved. At least a 1-hr supply of breathing air in extra bottles is located onsite for each required SCBA. See Table F.3-2 III.H for more details.

F.2.5.2 Yard Fire Hydrants and Hydrant Hose Equipment

Fire hydrants are provided at approximately 300 ft intervals along the fire main loop around the main plant buildings and at each standby service water pump house. A mobile fire response vehicle and trailer is equipped with the equivalent of three hose houses (see Table F.2-1). Fire hydrants adjacent to the transformers and the diesel generator building are strategically located as backup protection in the event of a large scale fire in these areas. Fire mains and hydrants are designed in accordance with NFPA 24 - 1973. Differences between the installed plant configuration and the NFPA code sections are listed in Table F.2-1.

F.2.5.3 Standpipes, Hose, and Foam Carts

Standpipe and hose connections provide a second line of defense for fires which may get beyond the extinguishing capabilities of hand fire extinguishers. Standpipes and hose racks are installed so that all safety-related areas are within 30 ft of the nozzle when 100 ft of 1.5-in. hose is attached to the connection. The reactor building has 150 ft of 1.5-in. hose to reach all areas as approved in Reference F.7.4.d. Most standpipes are located in protected stairways. Each standpipe contains an isolation valve, hose racks on each landing, takeoffs to sprinkler or other water fire protection systems where applicable, and a pressure gauge at the top of each standpipe. Two vacuum breakers are installed at the top of standpipes RB-1, RB-2, RWB-1, RWB-2, TGB-1, TGB-2, and TGB-3, but only a single vacuum breaker per standpipe is required to be functional. During a fire water system actuation, the vacuum breakers introduce an air bubble that mitigates potential pressure transients. Venting the small volume of trapped air would not hamper fire fighting activities. To ensure the availability of primary and secondary fire protection, the following standpipes have been interconnected: TGB-1 and TGB-2; TGB-3, TGB-5, and RWB-1; and DG-1 and the 12-in. branch line to RWB-1. Hose station locations are shown on Figures F.6-7 through F.6-11. Where large combustible liquid fire hazards exist, AFFF foam eductors/carts are present. Standpipes and hose are designed in accordance with NFPA 14 - 1974. Differences between the installed plant configuration and the NFPA code sections are listed in Table F.2-1.

F.2.5.4 Portable Extinguishers

Portable extinguishers are strategically located within the plant to provide plant personnel with a readily available means to extinguish a fire in its early stages. Halon 1211, dry chemical, and wheeled dry chemical extinguishers are used. Portable fire extinguishers are installed in accordance with NFPA 10 - 1975 based on the class and quantity of combustibles in that location.

F.2.5.5 Smoke Removal

Portable fans are available for smoke removal. Fixed smoke removal fans consist of WEA-FN-52 which purges the cable spreading room, cable chase, and remote shutdown room.

WEA-FN-7 is located on the radwaste building 507-ft roof and is used primarily for purging the main control room. Large portable fan REA-FN-16 can be connected to the reactor building HVAC exhaust at 471 ft and 572 ft. See Section 6.4 for control room actions and habitability during onsite and offsite fires. Smoke purging activities include monitoring to prevent an uncontrolled release.

F.2.6 OPERATOR ACTION EQUIPMENT

Equipment for credited operator actions consists of emergency lighting and communication equipment.

F.2.6.1 Emergency Lighting

Fire protection credited emergency lighting falls into two categories: (a) 1.5-hr battery-backed life safety lighting systems and diesel backed emergency AC lighting and (b) 8-hr Appendix R credited lighting consists of fixed 8-hr battery units, diesel backed fluorescent lighting and portable 8-hr lanterns. See Section 9.5.3 and Figures F.6-18 through F.6-20 for more detail.

F.2.6.2 Emergency Communications

Fire protection credited communication equipment falls into three categories: (a) the primary communication is private branch exchange (PBX) which is used for post-fire safe shutdown activities in certain areas where the operator requires immediate communication with the control room or the remote shutdown room, see Figures F.6-18 through F.6-20, (b) certain sound powered communication may be used for post-fire safe shutdown compensatory back up communication, see Figures F.6-18 through F.6-20, and (c) fire brigade activities utilize handheld-to-handheld radio communication and PBX phones for communication with the control room. The specific actions that require PBX communications are listed in Reference F.7.3.d. See Section 9.5.2 for more detail.

F.2.7 INSPECTION AND TESTING

Periodic inspection and testing of fire suppression water supply systems, essential spray and sprinkler systems, fire hose stations, yard fire hydrant and hydrant hose equipment, essential fire rated assemblies, fire detection instrumentation, PFSS lighting, and PFSS communications is in accordance with LCS 1.10. Periodic inspection and testing of carbon dioxide suppression system, dry-chemical suppression system, manual fire extinguishers, non-essential spray and sprinkler systems, and non-essential fire-rated assemblies is in accordance with either Section F.2.1 NFPA codes, insurer criteria, or applicable industry guidance as documented in the engineering evaluations per Section F.4.2.3.

Periodic testing is performed within the specified intervals with a maximum allowable extension not to exceed 25% of the interval. Periodic tests need not be performed on inoperable equipment. Testing which would require entry into high radiation areas is performed when radiation levels allow. However, there are some areas of CGS that remain high radiation areas at all times which will require an ALARA evaluation to determine the respective testing interval.

Inspections of the fire pump diesel engines will be conducted periodically in accordance with plant procedures prepared in conjunction with the manufacturer's recommendations.

Table F.2-1

Code Deviations

NFPA 13-1975

CODE SECTION		POSITION	
3-9.3	Protection of Piping Against Damage Where Subject to Earthquakes	3-9.3	Protection of Piping Against Damage Where Subject to Earthquakes
3-9.3.3	Sleeves shall be provided around all piping extending through the walls, floors, platforms, and foundations. (a) Minimum clearance between the pipe and sleeve shall not be less than 1 in. for pipes 1 in. through 3.5 in. and 2 in. for pipe sizes 4 in. and larger. (b) The clearance between pipe and sleeve shall be filled with noncombustible flexible material such as mineral wool, fiberglass, or equivalent.	3-9.3.3	No design limitations exist to ensure annular gap is greater than 1 or 2 in. Where piping penetrates a fire-rated barrier, penetration seals are installed in which the seal design accounts for pipe movement. Piping in safety-related areas is seismically qualified.
3-11	Joining of Pipes and Fittings	3-11	Joining of Pipes and Fittings
3-11.2.2	Sections of welded piping shall be joined by means of screwed flanged or flexible gasketed joints or other approved fittings.	3-11.2.2	The control room sprinkler system as installed used other design criteria (seismic and flooding concerns) which required welding as the method of installation.
3-13	Valves	3-13	Valves
3-13.2.3	Valves controlling sprinkler systems, except underground gate valves with roadway boxes, shall be supervised open by one of the following methods: (a) Central station, proprietary or remote station alarm service, (b) Local alarm service which will cause the sounding of an audible alarm at a constantly attended point, (c) Locking valves open, (d) Sealing of valves and approved weekly recorded inspection when valves are located within fenced enclosures under the control of the owner.	3-13.2.3	Control valves are locked or sealed open and inspected quarterly.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
3-14	Hangers	3-14	Hangers
3-14.1.5	The components of hanger assemblies which attach directly to building structure, except for mild steel hangers formed from rod, shall be listed.	3-14.1.5	Not all hangers are listed. For hangers with special seismic requirements the hanger design is certified by a registered professional engineer in accordance with Section 3-14.1.2.
3-16	Sprinkler Alarms	3-16	Sprinkler Alarms
3-16.2	Local waterflow alarms shall be provided on all sprinkler systems having more than 20 sprinklers.	3-16.2	Columbia Generating Station (CGS) sprinkler systems do not have local waterflow alarms. Each CGS suppression system has a proprietary protective alarm system that annunciates in the continuously manned control room. This will rapidly prompt manual suppression activities. On average, the plant has a low human occupancy. Thus, actuation of local alarms will have little effect since there is typically no one present to benefit from them.
3-16.3.1	The alarm apparatus for a wet-pipe system shall consist of an approved alarm check valve or other approved waterflow detecting alarm device with the necessary attachments required to give an alarm.	3-16.3.1	The UL Listing and FM Approval of the alarm check valve have been voided by drilling a small hole through the alarm bypass check valve to prevent trapping excess system pressure. In addition, a second torsion spring has been installed on the alarm check valve clapper of some systems to help reseat the clapper and prevent false alarms. These changes have no adverse impact on the alarm check valve's reliability or the system's capability to suppress fires.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
4-4	Locations or Conditions Involving Special Consideration	4-4	Locations or Conditions Involving Special Consideration
4-4.20	Small Rooms. In small rooms such as rest rooms, toilets, closets, and offices with smooth ceilings, sprinklers may be located a maximum distance of 7 ft 6 in. from any two walls of this room providing the total area of the room divided by the number of sprinklers does not exceed the limitation of 4-2.2.1 and 4-2.2.2. The maximum area of such a room is defined as 800 ft^2 for Light Hazard and 520 ft^2 for Ordinary Hazard occupancies.	4-4.20	Small Rooms. Sprinkler heads are located a maximum distance of 7 ft 6 in. from two walls as required by code. In the control room shift manager's office, there are two sprinklers in an area of approximately 250 ft^2. Later revisions of this code (1985) allow sprinkler heads in small rooms to be located up to 9 ft from one wall. The exception has been used in this room. The sprinklers are below the maximum spacing of 130 ft^2 for ordinary hazard occupancy.

Table F.2-1

Code Deviations (Continued)

CODE SECTION	POSITION
NFPA 14-1974	
CHAPTER 1 – GENERAL INFORMATION	CHAPTER 1 - GENERAL INFORMATION
14 Combined Systems	14 Combined Systems
145 Each outlet from a combined riser to the sprinkler system shall have an individual control valve of the same size as the outlet.	145 The TGB-1 standpipe connection for deluge system #D55 is reduced from 10 in. to 4 in. before the control valve. The connection size is sufficient to provide the water supply required by the deluge system.
15 Approved Devices	15 Approved Devices
151 All devices and materials used in standpipe systems shall be of approved type. Note: NFPA 14-1996 section 2-6 requires the valves to be listed.	151 Vacuum breakers installed at the top of standpipes RB-1, RB-2, RWB-1, RWB-2, TGB-1, TGB-2, and TGB-3 are not UL or FM approved, since none are available. The vacuum breakers are constructed of approved materials. Each of the above standpipes has redundant vacuum breakers that will ensure reliability. The vacuum breakers mitigate fire water system pressure transients and help to ensure fire water system availability. Leakage failure of a vacuum breaker would not reduce the water supply below minimum flow rates and potential flooding is bounded by existing analysis. The UL listed, cast iron isolation valves FP-V-29D (for standpipe riser RB-1) and FP-V-394 (for riser RB-2) were replaced by cast steel valves in 1998. The cast steel valves are not listed, but are approved. The cast steel valves are stronger, more ductile and resistant to yield fractures. The corrosion properties of the cast steel valves are acceptable. The presence of these stronger valves makes the two tallest CGS standpipe risers more resistant to water hammer induced valve ruptures.

Table F.2-1

Code Deviations (Continued)

CODE SECTION	POSITION
21 Design Basis	21 Design Basis
218 An approved means of maintaining a positive pressure on all zones of standpipe systems shall be provided.	218 During system transients, pressure at the top of some standpipes may not maintain a positive pressure. However, water hammer analysis shows the system pressure to remain within design limits (Reference F.7.3.x).
CHAPTER 3 - NUMBER AND LOCATION OF STANDPIPES	CHAPTER 3 - NUMBER AND LOCATION OF STANDPIPES
32 Number of Standpipes	32 Number of Standpipes
321 The number of hose stations for Class I and Class III services in each building and in each section of a building divided by fire walls shall be such that all portions of each story of the building are within 30 ft of a nozzle attached to not more than 100 ft of hose.	321 The reactor building requires 150 ft long hoses to reach all areas. This was approved per Reference F.7.4.d. The radwaste building room C405 requires 250 ft of hose. This is not a safety-related area of the plant.
CHAPTER 4 - HOSE OUTLETS	CHAPTER 4 - HOSE OUTLETS
41 Location of Hose	41 Location of Hose
412 Hose outlets for Class I service should be located in a stairway enclosure, and for Class II service in the corridor or space adjacent to the stairway enclosure and connected through the wall to the standpipe. For Class III service, the outlets for large hose should be located in a stairway enclosure, and for small hose located in the corridor or space adjacent to the stairway enclosure.	412 Hose stations are installed for Class III service. Building standpipes were originally provided with large hose outlets located in the stairways. Fire tactics have changed to prefer smaller hose lines for plant fire suppression activities. Smaller hose lines are currently provided.
413 Valves of approved indicating type shall be provided at the main riser for controlling branch lines to hose outlets so that in the event that the branch is broken during the fire, the fire department may shut off this branch, conserving the water for their use.	413 Valves are not provided at the branch lines to hose outlets at the main risers. The standpipe system is welded to increase its reliability under normal and fire conditions.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
44	Hose Valves	44	Hose Valves
442	Where the static pressure at any standpipe outlet exceeds 100 lb/in.^{2}, an approved device shall be installed at the outlet to reduce the pressure with required flow at the outlet to 100 lb/in.^{2}	442	At certain hose stations, the static pressure at the hose outlet could exceed 100 psi. Hose stations are provided for use only by the plant fire brigade. The fire brigade is hands-on trained and drilled on the use of high pressure hose lines. Pressure reducing valves are not required.
451	Nozzles shall be of an approved type and have a discharge coefficient not exceeding 7.5.	451	The Protek Model #379 fog nozzle is not UL Listed or FM Approved. Its construction is similar to the Protek Model #366 which is FM Approved. The Protek Model #379 was field tested during fire brigade training and was found to be an effective hose nozzle.
CHAPTER 5 - WATER SUPPLIES		CHAPTER 5 - WATER SUPPLIES	
56	Fire Department Connections	56	Fire Department Connections
561	A connection through which the public fire department can pump water into the standpipe system makes a desirable auxiliary supply. One or more fire department connections shall be provided for each Class I or Class III standpipe system.	561	Fire department connections are not provided. The capability exists for the Fire Department to draft from on-site water storage and pump into the underground fire protection water supply distribution system utilizing a fire hydrant.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 15-1973		
CHAPTER 2 - SYSTEM COMPONENTS		CHAPTER 2 - SYSTEM COMPONENTS	
2030	Spray Nozzles	2030	Spray Nozzles
2031	Care shall be taken in the application of nozzle types. Distance of "throw" or location of nozzle from surface shall be limited by the nozzle's discharge characteristics (see 4070). Care shall also be taken in the selection of nozzles to obtain waterways which are not easily obstructed by debris, sediment, sand, etc., in the water. Requirements for strainers and their placement are described in 2110 and 4110.	2031	Nozzles were selected based on protection requirements. Strainers are not provided for all small orifice nozzle systems.
2040	Piping	2040	Piping
2042	Galvanized pipe shall be used except that; where corrosion of galvanized pipe may be caused by corrosive atmospheres or the water, or by additives to the water, other suitable coatings shall be provided.	2042	Exterior surface of piping is galvanized.
2050	Fittings	2050	Fittings
2052	Rubber gasketed fittings subject to direct fire exposure are generally not suitable. Where necessary for piping flexibility, or for locations subject to earthquake, explosion, or similar hazards, such installations are acceptable. In such cases, special hanging or bracing may be necessary.	2052	Rubber gaskets are used for flange connections at preaction system valves in the area protected by the preaction system. The remainder of the piping joints are threaded connections. Pipe supports for these preaction systems are designed and installed to Seismic Category I requirements.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
CHAPTER 4 - SYSTEM DESIGN AND INSTALLATION		CHAPTER 4 - SYSTEM DESIGN AND INSTALLATION	
4020	Design Guides	4020	Design Guides
4021	Water spray systems shall conform to the applicable requirements of the following Standards of the National Fire Protection Association, except where otherwise specified herein: - Installation of Sprinkler Systems (NFPA No 13 - 1973) - Installation of Standpipe and Hose Systems (NFPA 14 - 1973) - Wetting Agents (NFPA 18 - 1973) - Installation of Centrifugal Fire Pump (NFPA 20 - 1972) - Water Tanks for Private Fire Protection (NFPA 22 - 1971) - Outside Protection (NFPA 24 - 1973) - Supervision of Valves (NFPA 26 - 1958) - National Electric Code (NFPA 70 - 1971) - Central Station Protective Signaling Systems (NFPA 71 - 1972) - Local Protective Signaling Systems (NFPA 72A - 1972) - Auxiliary Protective Signaling Systems (NFPA 72B - 1972) - Remote Station Protective Signaling Systems (NFPA 72C - 1972) - Proprietary Protective Signaling Systems (NFPA 72D - 1973) - Protection from Exposure Fires (NFPA 80A - 1970) - Indoor General Storage (NFPA 231C - 1972) - Rack Storage of Materials (NFPA 231C - 1973) Note: Components of the electrical portions of these protective systems, where installed in locations subject to hazardous vapors or dusts, shall be of types approved for use therein.	4021	The design of the systems has been reviewed by the authority having jurisdiction and approved for insurance purposes. CGS is not committed to meet all of the specified NFPA codes.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
4030	Density and Application	4030	Density and Application
4032	(b) Nozzles shall be installed to impinge on the areas of the source of the fire, and where spills may travel or accumulate. The water application rate on the provable surface of the spill shall be at the rate of not less than 0.50 gpm/ft^2.	4032	(b) A water spray density of 0.30 gpm/ft^2 is provided in areas of potential spill in the diesel generator rooms. The diesel fuel piping and storage tanks are welded, Seismic Category I systems; thus a line break and resulting fuel spill are unlikely. The day tanks are in separate rooms which have an average density of approximately 0.90 gpm/ft^2.
4052	Area Drainage	4052	Area Drainage
	(a) Adequate provisions shall be made to promptly and effectively dispose of all liquids from the fire area during operation of all systems in the fire area. Such provisions shall be adequate for: (1) Water discharged from fixed fire protection systems at maximum flow (2) Water likely to be discharged by hose streams (3) Surface water (4) Cooling water normally discharged to the system		(a) The RRC ASD transformer sumps are not sized to contain the total contents of 10 minutes of deluge actuation, manual hose stream, and the contents of the transformer oil. The ASD transformers are not safety-related. Fire-rated barriers separate the two transformers, the transformers from the ASD building, and the transformers from the turbine building. The grade slopes away from the transformers to a yard french drain.
4063	Drain Valves. Readily accessible drains shall be provided for low points in underground and aboveground piping.	4063	Drains are provided; however, not all drains are readily accessible.
4100	Hangers	4100	Hangers
4101	System piping shall be adequately supported. All supports in the fire area should be protected by the system. In any area where possibility of explosion may be recognized, special care shall be taken to support the piping from portions of the structure least liable to disruption.	4101	Not all supports are protected by the spray patterns. Failure of unprotected supports is unlikely as the systems are supported to Seismic Category IM requirements.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
4110	Strainers	4110	Strainers
4111	Main pipeline cleaners shall be provided for all systems using nozzles with waterways less than 3/8 in. and for any system where the water is likely to contain obstructive material.	4111	The manually actuated deluge systems which protect the SGTs and control room HVAC charcoal filter units have nozzles less than 3/8 in. but are not provided with strainers. These interior systems are periodically tested with air to verify the nozzles are not obstructed.
CHAPTER 8 - AUTOMATIC DETECTION EQUIPMENT		CHAPTER 8 - AUTOMATIC FIRE DETECTORS	
8050	RESPONSE TIME	8050	RESPONSE TIME
8051	The heat detection system shall be designed to cause actuation of the special system water control valve within 20 sec under expected fire conditions. Under test conditions when exposed to a standard heart source, the system shall operate within 40 sec. These are to be considered as maximum response times subject to the considerations described in 8011 and 8031.	8051	Response time of detectors is not checked by plant procedures. Detectors are checked for operation only. The heat detection system does not have any artificial delays that would prevent the immediate activation of the system. Later editions of this code have removed the time limit and replaced it with this intent only.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 20-1974		
CHAPTER 2 - GENERAL		CHAPTER 2 – GENERAL	
2-8	Equipment Protection	2-8	Equipment Protection
2-8.6	Floors shall be pitched for adequate draining of escaping water or fuel away from critical equipment such as the pump, driver, controller, fuel tank, etc.	2-8.6	The equipment is installed on concrete pedestals.
2-9	Discharge Pipe and Fittings	2.9	Discharge Pipe and Fittings
2-9.7	Protection of Piping Against Damage Due to Movement	2-9.7	Protection of Piping Against Damage Due to Movement
2-9.7.1	A clearance of not less than 1 in. (25.4 mm) shall be provided around pipes which pass through walls or floors.	2-9.7.1	Not all penetrations are provided with a 1-in. annular clearance. Fire pump discharge piping is designed to Seismic Category II requirements.
CHAPTER 6 - ELECTRIC DRIVE FOR PUMPS		CHAPTER 6 - ELECTRIC DRIVE FOR PUMPS	
6-3.3.2	The voltage at the motor shall not drop more than five percent below the voltage rating of the motors when the pumps are being driven at rated output, pressure, and speed, and when the lines between the power stations(s) and the motors are carrying their peak loads.	6-3.3.2	The running voltage at the motor for FP-M-2A and FP-M-2B is acceptable when the system is fed from TR-S. However, when fed from TR-N, the normal running voltage drop is slightly more than 5% below rated voltage. Since the two NEMA Standard fire pump motors are rated to operate satisfactorily at 10% below rated voltage, this condition will not affect motor operability.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
CHAPTER 7 - ELECTRIC DRIVE CONTROLLERS		CHAPTER 7 - ELECTRIC DRIVE CONTROLLERS	
7-1.1	General	7-1.1	General
7-1.1.1	All controllers shall be specifically listed for fire pump service.	7-1.1.1	Fire pump controllers FP-CP-2A and FP-CP-2B are UL listed for fire pump service. The controllers are reduced voltage type to provide a soft start to reduce pressure transients. Circuit failure of the new controllers would cause a hard start which could cause pressure transients in excess of that allowed. Therefore, the new controllers were modified to cause the pump to fail "off" in the remote occurrence of a circuit failure. This voids the UL listing. Upon failure of a single electric fire pump, the other electric pump would be available. If both electric fire pumps were inoperable, there are two diesel fire pumps available. LCS 1.10.1 limits fire pump inoperability periods.
CHAPTER 8 - DIESEL ENGINE DRIVE		CHAPTER 8 - DIESEL ENGINE DRIVE	
8-2	Engines	8-2	Engines
8-2.2.1	Engines, after the corrections for altitude and ambient temperature specified in 8-2.2.2 and 8-2.2.3 below, shall have a bare engine brake horsepower rating not less than 20 percent greater than the maximum brake horsepower required to drive the pump at its rated revolutions per minute.	8-2.2.1	After making the corrections, neither FP-ENG-1 or FP-ENG-110 provide 20% greater horsepower. However, operating experience shows the engines do have sufficient horsepower to meet the required water flow rates under any conditions of pump load.
8-2.6	Storage Battery	8-2.6	Storage Battery
8-2.6.5	Battery Location. Storage batteries shall be substantially supported, secured against displacement, and located where they will not be subject to excessive temperature, vibration, mechanical injury, or flooding with water. They shall be readily accessible for servicing.	8-2.6.5	Battery Location. Batteries are located where they are not subject to excessive temperatures, vibration, mechanical injury, or flooding. Batteries are substantially supported, but are not secured against displacement.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
CHAPTER 9 - ENGINE DRIVE CONTROLLERS		CHAPTER 9 - ENGINE DRIVE CONTROLLERS	
9-1.3	Construction	9-1.3	Construction
9-1.3.4	Locked Cabinet. All switches required to keep the controller in the "automatic" position shall be within locked cabinets having break glass panels.	9-1.3.4	Locked Cabinet. Pump controller cabinets are not locked. Controllers are supervised; "non-auto" alarms are monitored in the main control room.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 24-1973		
CHAPTER 3 - VALVES		CHAPTER 3 - VALVES	
36	Identifying and Securing	36	Identifying and Securing
3601	All control valves shall be plainly marked indicating the section or portion controlled. To ensure that valves are kept open, it is essential to provide central station proprietary valve supervisory service and/or to secure the valves in the open position using an acceptable type of seal which must be destroyed before the valve can be closed. Weekly recorded inspections shall be made.	3601	Yard control valves are labeled in accordance with the plant tagging procedures. Valves are locked in position and inspected quarterly.
CHAPTER 5 - HOSE HOUSES AND EQUIPMENT		CHAPTER 5 - HOSE HOUSES AND EQUIPMENT	
56	Equipment - General	56	Equipment - General
5601	Depending on local conditions and subject to approval of the authority having jurisdiction, each hose house should be equipped with: 2 - Underwriters' play pipes 1 - pair play pipe brackets 1 - fire axe 1 - fire axe brackets 1 - crowbar 1 - extra hydrant wrench (in addition to wrench on hydrant) 4 - coupling spanners 2 - hose and ladder straps 1 - Underwriter's play pipe holder 2 - 2.5-in. hose washers (spares)	5601	A mobile fire response vehicle and trailer is equipped with the equivalent equipment of three hose houses. This includes: 600 ft. - 2.5-in. hose 600 ft. - 1.5-in. hose 3 - 2.5-in. adjustable fog nozzles 6 - 1.5-in. adjustable fog nozzles 6 - hydrant wrenches 12 - coupling spanners 3 - 2.5-in. shut off valves 3 - 2.5-in. x 1.5-in. x 1.5-in. wye valves 6 - 2.5-in. hose washers (spares) 6 - 1.5-in. hose washers (spares) 3 - crowbars Play pipes, play pipe brackets, play pipe holders, fire axes, fire axe brackets, and hose/ladder straps are not necessary for fire fighting and are not required by NFPA 24-2002.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
58	Nozzles	58	Nozzles
5801	Nozzles shall be approved type.	5801	The Protek Model #379 fog nozzle is not UL Listed or FM Approved. Its construction is similar to the Protek Model #366 which is FM Approved. The Protek Model #379 was field tested during fire brigade training and was found to be an effective hose nozzle.
59	Domestic Service Use Prohibited	59	Domestic Service Use Prohibited
5901	The use of hydrants and hose for purposes other than fire or fire drills shall be prohibited.	5901	The use of hydrants for nonfire-related activities is controlled by plant procedures under controlled conditions only.
CHAPTER 8 - UNDERGROUND PIPE AND FITTINGS		CHAPTER 8 - UNDERGROUND PIPE AND FITTINGS	
81	Selection of Pipe	81	Selection of Pipe
8101	Piping shall be approved asbestos cement, cast iron, ductile iron, reinforced concrete, steel, or other approved pipe. Steel pipe shall have minimum thickness of 0.250 in., and be coated and lined. See paragraph 8301 for required coating and lining.	8101	CGS has ductile iron, cast iron, and steel pipe installed in the fire protection underground loop. The ductile and cast iron piping is cement lined per ANSI A21.4. The steel pipe installed in the fire protection underground loop system is not cement lined. Later editions of this code required only that steel pipe be coated (not lined).
83	Coating and Lining	83	Coating and Lining
8301	Where coating or lining or both are required for pipe or fitting, the coating or lining or both shall be approved. Coating and Lining Standards. The following apply to the application of coating and linings: - American Standard for Cement Mortar Lining for Cast-Iron Pipe and Fittings for Water, ANSI A21.4-1974, AWWA C104-71.	8301	The exterior of underground fire protection piping is coated with bitumastic enamel and coal tar. See paragraph 8101 above for discussion of interior coating.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	- AWWA Standard for Coal-Tar Enamel.Protective Coatings for Steel Water Pipe, AWWA C203-66. - AWWA Standard for Cement-Mortar Protective Lining and Coating for Steel Water Pipe, AWWA C205-71. - AWWA Standard for Cement-Mortar Lining of Water Pipe Lines in Place, Sizes 16 in. and Over, AWWA C602-67.		
CHAPTER 9 - RULES FOR LAYING PIPE		CHAPTER 9 - RULES FOR LAYING PIPE	
91	Depth of Cover	91	Depth of Cover
9101	The depth of cover over water pipes should be determined by the maximum depth of frost penetration in the locality where the pipe is laid, and in those locations where frost is not a factor, the depth of cover shall be not less than 2.5 ft to prevent mechanical injury. Pipe under driveways shall be buried a minimum of 3 ft and under railroad tracks a minimum 4 ft. Recommended depth of cover above the top of underground yard mains is indicated in Figure 91.	9101	Certain piping in the warehouse area does not have the required depth of cover. However, it was verified that the depth of bury is adequate for this locality (Reference F.7.3.v).
93	Protection Against Damage	93	Protection Against Damage
9301	Pipe should not be run under buildings or under heavy piles or iron, coal, etc. Where piping necessarily passes under a building, the foundation walls shall be arched over the pipe. See paragraph 3502. [Paragraph 3502 … It is also recommended that valves be installed to shut off sections of pipe under buildings.]	9301	The routing of a fire main under the diesel generator building was approved by the NRC in Reference F.7.4.k.
9302	Where riser is close to building foundations, underground fittings of proper design and type shall be used to avoid pipe joints being located in or under the foundations.	9302	See paragraph 9301 above.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
9303	Special care is necessary in running pipes under railroad tracks, under roads carrying heavy trucking, under large piles of iron, under building having heavy machinery liable to fall and under buildings containing hammers or other machinery or having heavy trucking which will subject the buried piping to shock or vibration. Where subject to such breakage, pipes should be run in a covered pipe trench or otherwise be properly guarded.	9303	See paragraph 9301 above.
96	Anchoring Fire Mains	96	Anchoring Fire Mains
9605	Thrust blocks are satisfactory where soil is suitable. Table 9605 gives bearing areas against undisturbed vertical well of a trench in soil equivalent to sand and gravel cemented with clay. For other soils, the values in the table should be multiplied by an appropriate factor.	9605	Thrust blocks were not installed against undisturbed soil. Design drawings specified a minimum area requirement in square feet of thrust block to be in contact with the trench wall. Compression of soil behind the thrust blocks was used to obtain a high density equivalent to undisturbed soil.

TABLE 9605
AREA OF BEARING FACE OF
CONCRETE THRUST BLOCKS

Pipe Size (in.)	1/4 bend (ft^2)	1/8 bend (ft^2)	Tees, Plugs, Caps, Hydrants (ft^2)
4	2	2	2
6	5	3	4
8	8	5	6
10	13	7	9
12	18	10	13
14	25	14	18
16	32	18	23

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 30-1973		
2343	Flammable or combustible liquid storage tanks located inside of buildings shall be provided with an automatic-closing heat actuated valve.	2343	Diesel generator and HPCS day tanks are not equipped with an automatic-closing heat actuated shutoff valve. The day tank rooms are equipped with preaction sprinkler systems and are 3-hr rated. Piping from day tanks to diesels are routed primarily in floor trenches and have substantial construction (Reference F.7.6.h).

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 72D-1975		
CHAPTER 1 - GENERAL		CHAPTER 1 - GENERAL	
ARTICLE 120 - SYSTEM FACILITIES		ARTICLE 120 - SYSTEM FACILITIES	
1210	System Operation	1210	System Operation
1211	The proprietary system shall be arranged to receive and record all signals received at its central supervising station and to transmit to the fire department, or other location acceptable to the authority having jurisdiction, indication of the building or group of buildings from which an alarm has been received. The transmitting means shall be reliable and use supervised circuits. Where permissible and deemed necessary, the means shall consist of a direct supervised circuit to the fire department or a municipal fire, alarm box, either ordinary or auxiliary type, within 50 ft of the central supervising station.	1211	The system receives but does not automatically record all signals at the fire control panel in the main control room. The circuits are supervised. Fire alarms are manually logged. Logs are retained as plant records. A manual push button on the fire control panel is used to transmit a radio fire alarm for outside fire department assistance.
1212	Recording devices shall be designed and arranged to automatically provide a permanent record of the incoming signal and date and time of receipt.	1212	See paragraph 1211 above.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
ARTICLE 200 - GENERAL		ARTICLE 200 - GENERAL	
2022	Equipment: All devices, combination of devices, and equipment constructed and installed in conformity with this standard shall be approved for the purposes for which they are intended.	2022	FP-FCP-1 zone modules have zone isolation switches with a resistor/capacitor combination that deviates from the normal listed zone modules for this fire alarm control panel. These changes allow (1) a zone to be isolated so it can be worked while the remainder of the fire alarm control panel is in service, and (2) the zone modules to communicate with the annunciator panel in the control room. FP-Zone 28 has approved, listed smoke detectors and an approved, listed zone module. However, they are not listed or approved together. In each case above, Energy Northwest testing has shown these devices operate as intended and function reliably to ensure proper fire detection and alarm.
			The use of refurbished fire alarm system components is acceptable where the component has not been modified from its original design as certified by the refurbishing company and post-maintenance testing shows the device is fully functional. Under these limitations, the fire alarm system will still perform its design function.
ARTICLE 210 - WIRING		ARTICLE 210 - WIRING	
2110	The installation of wiring and equipment shall be in accordance with Article 760, Fire Protective Signaling Systems of the National Electrical Code, NFPA No. 70 - 1975.	2110	Article 760 of the 1978 edition of the National Electric Code was used for the installation of wiring and equipment for the protective signaling system.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
ARTICLE 220 - POWER SUPPLY SOURCES		ARTICLE 220 - POWER SUPPLY SOURCES	
2224	A separate power supply, independent of the main power supply, shall be provided for the operation of trouble signals. The secondary power supply may be used for this purpose.	2224	The plant fire alarm panels do not annunciate loss of ac power. Loss of ac power to the fire alarm equipment is annunciated on other panels located in the main control room.
2230	Power Supply for Remotely Located Control Equipment	2230	Power Supply for Remotely Located Control Equipment
2231	Additional power supplies when provided for control units, transmitters, or other equipment, essential to system operation, located remote from the central supervising station, shall comprise a primary (main), secondary (standby), and a trouble power supply which shall meet the same requirements as for the central supervising station power supplies. See Paragraphs 2220 through 2224.	2231	Each local fire control panel is provided with a single power supply.
2240	Light and Power Services	2240	Light and Power Services
2243	An overcurrent protective device of suitable current-carrying capacity and capable of interrupting the maximum short-circuit current to which it may be subjected shall be provided in each ungrounded conductor. The overcurrent protective device shall be enclosed in a locked or sealed cabinet located immediately adjacent to the point of connection to the light and power conductors.	2243	Cabinets are not locked or sealed but are located in access controlled areas.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
CHAPTER 3 - TYPES OF SIGNALING SERVICES		CHAPTER 3 - TYPES OF SIGNALING SERVICES	
ARTICLE 340 - SPRINKLER SYSTEM WATERFLOW ALARM AND SUPERVISORY SIGNAL SERVICE		ARTICLE 340 - SPRINKLER SYSTEM WATERFLOW ALARM AND SUPERVISORY SIGNAL SERVICE	
3444	Water storage containers shall be supervised to obtain two separate and distinctive signals, one indicating that the required water level has been lowered or increased and the other indicating restoration to the normal level. a. A pressure tank supervisory attachment shall indicate both high and low level conditions. A signal shall be obtained when the water level is lowered or raised 3 in. from the required level. b. A supervisory attachment for other than pressure tanks shall indicate a low level condition. A signal shall be obtained when the water level is lowered 12 in. from the required level.	3444	Fire water is supplied from the circulating water basin or the 400,000 gal bladder tank. The levels are checked manually by equipment operators once per shift.
3445	Water storage containers shall be supervised to obtain two separate and distinctive signals, one indicating that the temperature of the water has been lowered to 40°F, and the other indicating restoration to proper temperature.	3445	Fire water is supplied from the circulating water basin or the 400,000 gal bladder tank. The water temperature is not supervised or alarmed. The circulating water system is continuously recirculated. The bladder tank is provided with a manually initiated recirculation pump to prevent freezing.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
ARTICLE 350 - AUTOMATIC SMOKE ALARM SERVICE		ARTICLE 350 - AUTOMATIC SMOKE ALARM SERVICE	
3540	Circuit Arrangement	3540	Circuit Arrangement
3541	A smoke detecting combination of a Class A Proprietary System shall be capable of operating for a smoke alarm signal during a single break or a single ground fault condition of the circuit wiring conductors (a) between the central supervising station and the smoke alarm signal transmitter and (b) between the smoke alarm signal transmitter and the smoke detector control unit, except as indicated in Paragraph 3542.	3541	Class A wiring is used only on detection wiring activating suppression systems in safety-related areas. All other circuits are Class B wiring including connections from local suppression panels to the fire control panel in the main control room. The Class A wiring, where provided, meets the requirements of this code section.
3542	The requirement of Paragraph 3541 does not apply to the circuits between the smoke alarm signal transmitter and the smoke detector control unit if both of these units are located in a common enclosure, or in adjacent enclosures not more than 3 ft apart and having the circuits between the enclosures run in conduit.	3542	Class A wiring is used only on detection wiring activating suppression systems in safety-related areas. All other circuits are Class B wiring including connections from local suppression panels to the fire control panel in the main control room. The Class A wiring, where provided, meets the requirements of this code section.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 72E-1974		
CHAPTER 4 - SMOKE DETECTORS		CHAPTER 4 - SMOKE DETECTORS	
4-4	Spacing	4-4	Spacing
4-4.5	High Ceilings	4-4.5	High Ceilings
4-4.5.2	For proper protection for buildings with high ceilings, detectors shall be installed alternately at two levels; one half at ceiling level, and the other held at least 3 ft below the ceiling. See Figure A-4.5.4 of Appendix.	4-4.5.2	Smoke detectors are not installed at alternating levels on the ceilings. Intermediate level detectors are installed in the cable chase (radwaste control building).
4-4.6	Beam Construction. Beams 8 in. or less in depth can be considered equivalent to a smooth ceiling in view of the "spill over" effect of smoke. In beam construction over 8 in. in depth, movement of heated air and smoke may be slowed by the pocket or bay formed by the beams. In this case, spacing shall be reduced. If the beams exceed 18 in. in depth and are more than 8 ft on centers, each bay shall be treated as a separate area requiring at least one detector.	4-4.6	Beam Construction. Various plant locations have smoke detectors that are close to beams and other large obstructions and have bays deeper than 18 inches without a smoke detector. These deviations have been evaluated and are acceptable (Reference F.7.6.o).

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
	NFPA 80-1974		
1-5	Classifications and Types of Doors	1-5	Classification and Types of Doors
1-5.1.1	Only labeled doors shall be used.	1-5.1.1	CGS has various specialty doors in fire barriers which are not labeled for fire. These doors are required to meet other design considerations associated with a nuclear facility. Specialty doors include flood, airtight, radiation shielding, low- and high-range blast and bullet resistance. These nonlabeled door types have been previously approved by the NRC (Reference F.7.4.c).
2-1	Swinging Doors with Builders Hardware	2-1	Swinging Doors with Builders Hardware
2-1.5.1	Only labeled steel door frames shall be used. The requirements to be a labeled door implies that there are no untested frame modifications, such as frame holes, which void the label.	2-1.5.1	Only labeled hollow metal steel door frames are used; however, where nonfactory frame holes are present, grout may be installed inside the frame at the area of the frame defect. Grouted frames do not void the frame laboratory label.
2-1.5.4	The clearance between the door and the frame and between meeting edges of doors swinging in pairs shall not exceed 1/8 in. The clearance between the bottom of the door and the floor surface shall not exceed 0.75 in. regardless of the existence of a raised sill or threshold.	2-1.5.4	The clearance between the door and frame and between double doors may exceed NFPA 80 dimensions by 0.125 in. Door bottom clearance can exceed NFPA 80 dimensions by 0.25 in. Industry fire testing has shown that similar construction fire doors meet a 3-hr fire rating with the above clearances. See Reference F.7.5.r.
2-1.7.4.5	A closing device shall be installed on every fire door except elevator and power-operated dumbwaiter doors.	2-1.7.4.5	Various specialty fire doors are not equipped with automatic closing devices. The presence and design of specialty doors has been previously approved by the NRC and ANI. See above. Note: the complete list of NFPA 80-1974 deviations for specialty doors in fire barriers is not further listed here.

Table F.2-1

Code Deviations (Continued)

CODE SECTION		POSITION	
2-9	Access Doors	2-9	Access Doors
2-9.2.2	When installed in a vertical surface, access doors shall be self-closing. This shall be accomplished by use of a closer or by top hinging to provide gravity closing.	2-9.2.2	Fire doors R413 and R610 are elevated equipment access doors that are only used for large equipment removal and are normally locked. Thus, periodic verification of self-closing is not performed.
4-1	General Care and Maintenance	4-1	General Care and Maintenance
4-1-3	Doors, shutters, and windows shall be operable at all times. They shall be kept closed and latched or arranged for automatic closing.	4-1.3	Fire doors D104, D105, and D107 may not always self-close due to differential pressure. These doors are equipped with strobe lights and are monitored by security.

F.3 COMPLIANCE WITH FIRE PROTECTION REGULATORY DOCUMENTS

Branch Technical Position (BTP) APCSB 9.5-1, Appendix A, Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976, provides guidance on the preferred alternatives for fire protection design for nuclear power plants for which applications for construction permits were docketed prior to July 1, 1976. Table F.3-1 provides a comparison of the Columbia Generating Station (CGS) fire protection program to BTP APCSB 9.5-1 Appendix A. The comparison describes how the CGS fire protection program implements the BTP recommendations.

10 CFR 50 Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979" provides guidance on various topics not addressed BTP APCSB 9.5-1 Appendix A including ensuring the ability to achieve and maintain post-fire safe shutdown. Table F.3-2 provides a comparison of the CGS fire protection program to 10 CFR 50 Appendix R and describes how the CGS fire protection program implements alternatives to the Appendix R guidelines.

See Section F.1.2 for the regulatory significance of BTP APCSB 9.5-1 Appendix A and 10 CFR 50 Appendix R.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
A. OVERALL REQUIREMENTS FOR NUCLEAR PLANT FIRE PROTECTION PROGRAM	A. OVERALL REQUIREMENTS FOR NUCLEAR PLANT FIRE PROTECTION PROGRAM
A.1 Personnel	A.1 Personnel
Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience in fire protection and nuclear plant safety to provide a balanced approach in directing the fire protection programs for nuclear power plants. The qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire-fighting training for the operating plant should be stated. Subsequently, the FSAR should discuss the training and the updating provisions such as fire drills provided for maintaining the competence of the station fire-fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment. The fire protection staff should be responsible for a. coordination of building layout and systems design with fire area requirements, including consideration of potential hazards associated with postulated design basis fires. b. design and maintenance of fire detection, suppression, and extinguishing systems. c. fire prevention activities. d. training and manual fire-fighting activities of plant personnel and the fire brigade. Note: NFPA 6 - Recommendations for Organization of Industrial Fire Loss Prevention, contains useful guidance for organization and operation of the entire fire loss prevention program.	The Chief Nuclear Officer is the management official responsible for the fire protection program and systems. The Vice President Technical Services, Vice President Nuclear Generation, and Vice President Corporate Services/General Counsel/Chief Financial Officer have the responsibility for the adequacy of implementation and effectiveness of the fire protection program at the facility. The Plant Fire Marshal serves as the principal point of contact for the plant fire protection program. The position responsibilities include ensuring that the fire protection administrative controls for fire protection system/component testing, maintenance, and remedial actions are adequately implemented, monitoring plant activities and plant condition for fire prevention and combustible controls, and ensuring the plant fire brigade is adequately trained, staffed, and equipped. Energy Northwest staff includes an engineer meeting the qualifications listed in Section 13.1.3.3.3. The qualified Fire Protection Engineer is delegated the responsibility for ensuring the technical adequacy of elements of the fire protection program. This responsibility is implemented through the review of proposed fire protection program changes, design changes, and procedure changes. The qualified fire protection engineer is also responsible for the assessment of the effectiveness of the fire protection programs in support of the Plant General Manager.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
A.2 Design Basis	A.2 Design Basis
The overall fire protection program should be based upon evaluation of potential fire hazards throughout the plant and the effect of postulated design basis fires related to maintaining ability to perform safety shutdown functions and minimize radioactive releases to the environment.	The overall fire protection program is based on evaluation of potential fire hazards throughout the plant relative to maintaining the ability to safely shut down the plant and minimize the releases of radioactivity to the environment. See Section F.4 for the Columbia Generating Station (CGS) fire hazards analysis.
A.3 Backup	A.3 Backup
Total reliance should not be placed on a single automatic fire suppression system. Appropriate backup fire suppression capability should be provided.	Automatic fire suppression systems have been installed in areas where there are significant fire hazards. Automatic suppression systems are backed up by hose stations and portable fire extinguishers distributed throughout the plant.
A.4 Single Failure Criterion	A.4 Single Failure Criterion
A single failure in the fire suppression system shall not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be provided. Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena. The effects of lightning strikes should be included in the overall plant fire protection program.	A combination of design features provides fire protection in the event of fire protection system component failures.

Malfunction	Consequences
Electric fire pump motor failure	Second electric fire pump on separate power supply
Electric fire pumps fail due to loss of offsite power.	Two diesel fire pumps available - one 2000 gpm and one 2500 gpm
Water source low water level (no makeup)	Primary fire pumps are supplied from the circ water pump house, second diesel fire pump is supplied from separate water supply.
Yard pipe rupture	Isolate portion of main loop header using sectionalizing valves.
System pipe rupture	Isolate using system isolation valve. Use backup hose from standpipe and/or hydrants.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	System alarm check valve fails to open — Use manual fire fighting equipment (hoses and portable extinguishers)
	Detection system wire short — Trouble alarm in control room
	Loss of offsite power to detection system — Detection system is provided with backup power from an uninterruptible power supply.
	Fire dampers — All fire dampers serving rooms containing safety-related equipment are qualified to Seismic Category I.
	The plant is provided with redundant fire pumps which supply water to the fire water supply loop from two separate water supplies (see paragraph E.2.c.).
	The fixed water suppression system and the backup fire hose station are connected to the same riser in the following safety-related areas: a. Main control room emergency filter units (with standpipe cross-connection), b. Standby gas treatment filter units, and c. Reactor building sump vent filter units
	These combination systems are permitted under NFPA 14-1974. A pipe rupture coincident with a fire is not, however, considered credible as the pipe is a passive component.
	Lightning rods and steel towers are used to minimize the potential for lightning-caused fires. The reactor building and stacks are equipped with a lightning protection system. Air terminals are installed and spaced along the roof in accordance with NFPA 78-1975. The vent stack lightning protection

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	mast, the communications 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 and its installed air terminals provide zones of protection for the diesel generator building and the safety-related portions of the radwaste/control building. The metal wall panels of the turbine building are grounded directly to the structural steel, which in turn is bonded to the plant ground grid.
A.5 Fire Suppression Systems	A.5 Fire Suppression Systems
Failure or inadvertent operation of the fire suppression system should not incapacitate safety-related systems or components. Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in APCSB Branch Technical Position 3-1, “Protection Against Postulated Piping Failures in Fluid Systems Outside Containment.”	The safety-related areas which have fixed fire suppression systems include the following: a. The standby gas treatment (SGT) filter units in the reactor building are provided with manually activated water spray that is operated from the main control room. b. The cable spreading room in the radwaste control building has an automatic preaction system. c. The diesel generator building has an automatic preaction system installed to protect each diesel generator, day tank, and oil transfer pump room. d. The main control room emergency filter units in the radwaste control building have manually actuated water spray systems within the units. e. The radwaste control building cable chase and portions of the diesel generator corridor and the radwaste-reactor building corridor have an automatic preaction system. f. The control room power generation control complex (PGCC) subfloor sections longitudinal cable ducts have automatic Halon 1301 systems.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	g. The control room office areas have automatic sprinkler protection. The deluge spray systems for the SGT filter units and the control room emergency filter units are actuated by remote manual action to prevent inadvertent wetting. The redundant units are physically separated and would remain operable. A failure or inadvertent operation of a preaction sprinkler system in the cable spreading room, cable chase, or in the diesel generator building would not incapacitate the safety-related systems as two actions would be required for water to be released: the feed mains and lines must be flooded and the sprinkler heads must be fused. Failure or inadvertent operation of the PGCC Halon 1301 system does not incapacitate safety-related systems. Fire suppression systems that are pressurized during normal plant operation meet the guidelines specified in BTP ASB 3-1. Potential flooding due to failure of the fire protection system piping has been included in plant flooding analyses.
A.6 Fuel Storage Areas	A.6 Fuel Storage Areas
The fire protection program (plans, personnel, and equipment) for buildings storing new reactor fuel and for adjacent fire zones which could affect the fuel storage zone should be fully operational before fuel is received on the site. Schedule for implementation of modifications, if any, will be established on a case-by-case basis.	The fire protection program for all fuel storage areas was fully operational when fuel was received at the site.
A.7 Fuel Loading	A.7 Fuel Loading
The fire protection program for an entire reactor unit should be fully operational prior to initial fuel loading in that reactor unit. Schedule for implementation of modifications, if any, will be established on a case-by-case basis.	The fire protection programs for the entire power unit were fully operational prior to initial fuel loading.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
A.8 Multiple-Reactor Sites	A.8 Multiple-Reactor Sites
On multiple-reactor sites where there are operating reactors and construction of remaining units is being completed, the fire protection program should provide continuing evaluation and include additional fire barriers, fire protection capability, and administrative controls necessary to protect the operating units from construction fire hazard. The superintendent of the operating plant should have the lead responsibility for site fire protection.	CGS is not a multiple-reactor site.
A.9 Simultaneous Fires	A.9 Simultaneous Fires
Simultaneous fires in more than one reactor need not be postulated, where separation requirements are met. A fire involving more than one reactor unit need not be postulated except for facilities shared between units.	CGS is not a multiple reactor site.
B. ADMINISTRATIVE PROCEDURES, CONTROLS, AND FIRE BRIGADE	B. ADMINISTRATIVE PROCEDURES, CONTROLS, AND FIRE BRIGADE
B.1 Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided.	B.1 Administrative procedures for maintaining performance of fire protection systems and personnel are provided.
Guidance is contained in the following publications: NFPA 4 - Organization for Fire Services NFPA 4A - Organization for Fire Department NFPA 6 - Industrial Fire Loss Prevention NFPA 7 - Management of Fire Emergencies NFPA 8 - Management Responsibility for Effects of Fire on Operations NFPA 27 - Private Fire Brigades	The listed NFPA codes have been superseded. The current equivalent NFPA codes may be used as guidance.
B.2 Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety-related buildings or systems during	B.2 Administrative procedures for housekeeping and fire protection control the introduction of combustible materials into the plant.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
operation or maintenance periods. Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants," provides guidance of housekeeping, including the disposal of combustible materials.	
B.3 Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management for appropriate special actions and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular:	B.3 Normal and abnormal conditions and other anticipated operations and refueling activities are reviewed by management for appropriate special actions. Primary implementing procedures are listed in Section F.7.8. In particular:
a. Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. If this is not possible, a person qualified in fire protection should directly monitor the work and function as a fire watch.	a. Work involving ignition sources is done under controlled conditions and procedures governing such work will be reviewed and approved by persons trained and experienced in fire protection. Persons performing and assisting in such work are trained and equipped to prevent and control fires. Qualified personnel monitor the work and act as fire watch.
b. Leak testing and similar procedures such as air flow determinations should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted.	b. Leak testing uses instrumentation or soapy water. Smoke detector testing may use aerosol cans. Open flames or combustion generated smoke are not permitted.
c. Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety-related areas should be controlled. Use of wood inside buildings containing safety-related systems or equipment should be permitted only when suitable	c. Provisions have been made for controlling the use of combustible materials in safety-related areas. Use of wood in the permanent structure of buildings containing safety-related systems or equipment is not permitted except when suitable non-combustible substitutes are not available. If wood is used only pressure impregnated fire retardant or fire retardant coated wood is permitted. The use of minor amounts of transient untreated wood is not considered a significant hazard. For more than minor amounts in safety-related areas, additional

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
	non-combustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety-related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine the adequacy of the installed fire protection systems.	compensating measures are implemented as necessary. d. Equipment or supplies shipped in untreated combustible packaging containers may be unpacked in safety-related areas if required for operating reasons. All combustible packing materials are removed from the area as soon as practicable after the unpacking.
B.4	Nuclear power plants are frequently located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self-sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability.	B.4 The plant is designed to be self-sufficient with respect to fire-fighting activities. The plant fire brigade is trained in fire-fighting procedures. Supplemental fire-fighting capability is available from the local fire department. Interagency agreements delineate the responsibilities and duties of the local fire department during a coordinated response.
B.5	The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these functions. The guidance in Regulatory Guide 1.101, "Emergency Planning of Nuclear Power Plants," should be followed as applicable.	B.5 Current requirements are contained in the CGS Emergency Plan.
	a. Successful fire-fighting requires testing and maintenance of the fire protection equipment, emergency lighting, and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems should be developed. The test plan should contain the types, frequency and detailed procedures for testing. Procedures should also contain instructions on maintaining fire	Procedures have been prepared for the testing and maintenance of the fire protection equipment, emergency lighting, and communication equipment. Procedures list responsibilities in connection with routine tests and inspections of the fire detection and protection systems. Procedures for compensatory measures are implemented when fire systems are impaired. The plant fire brigade composition is described in Section 13.1.2.3.4. The fire brigade training requirements are described in Section 13.2.2.5.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
protection during those periods when the fire protection system is impaired or during periods of plant maintenance, e.g., fire watches or temporary hose connections to water systems.	
b. Basic training is a necessary element in effective fire fighting operation. In order for a fire brigade to operate effectively, it must operate as a team. All members must know what their individual duties are. They must be familiar with the layout of the plant and equipment location and operation in order to permit effective firefighting operations during times when a particular area is filled with smoke or is insufficiently lighted. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of the plant.	
The drills should include the simulated use of equipment in each area and should be preplanned and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade and with the on-scene fire team leader, the reactor operator in the control room, and the offsite command post.	
c. To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that	

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.	
d. NFPA 27, "Private Fire Brigade," should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Among the standards referenced in this document, the following should be utilized: NFPA 194, "Standard for Screw Threads and Gaskets for Fire Hose Couplings," NFPA 196, "Standards for Fire Hose," NFPA 197, "Training Standard on Initial Fire Attacks," NFPA 601, "Recommended Manual of Instructions and Duties for the Plant Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72, are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.	
C. QUALITY ASSURANCE PROGRAM	C. QUALITY ASSURANCE PROGRAM
C.1 Design Control and Procurement Document Control	C.1 Design Control and Procurement Document Control
Measures should be established to assure that all design-related guidelines of the Branch Technical Position are included in design and procurement	At the time BTP APCSB 9.5-1 was issued, the basic design of all fire protection equipment and systems had been completed. The established engineering

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
documents and that deviations therefrom are controlled.	procedures require the design and design changes to be reviewed by cognizant personnel to ensure material, parts, and equipment specified will meet or exceed the design criteria. Design and design changes are incorporated into design and/or procurement documents which contain requirements that deviations be documented and controlled. Design and procurement activities are audited and reviewed on a scheduled and surveilled basis.
C.2 Instructions, Procedures, and Drawings	C.2 Instructions, Procedures, and Drawings
Inspections, tests, administrative controls, fire drills, and training that govern the fire protection program should be prescribed by documented instructions, procedures, or drawings and should be accomplished in accordance with these documents.	Specifications are prepared, when required, to define design requirements. Instructions, procedures, and drawings additionally define and implement fire protection requirements. Contractors/suppliers are requested to provide instructions, procedures, or drawings as stipulated by contract/procurement documents. During plant operation, the fire protection program and those portions of the fire protection systems which are designated as essential fire protection systems (see LCS 1.10) are subject to the applicable portions of the CGS Operational Quality Assurance Program Description (OQAPD).
C.3 Control of Purchased Material, Equipment, and Services	C.3 Control of Purchased Material, Equipment, and Services
Measures should be established to assure that purchased material, equipment, and services conform to the procurement documents.	Contractors/suppliers are required to provide inspection and/or test documentation as stipulated by contract/procurement documents. Identification and traceability requirements are included in procurement documents as required. Source surveillance and/or receiving inspection will depend on the degree of design control applied.
C.4 Inspection	C.4 Inspection
A program for independent inspection of activities affecting fire protection should be established and executed by, or for, the organization performing the activity to verify conformance with documented installation drawings and test procedures for accomplishing the activities.	Purchase orders/contracts are reviewed to provide applicable quality assurance requirements. Source surveillance and/or receiving inspections are performed depending on the degree of design control applied. Plant quality control or cognizant field engineering performs inspection/surveillance, as required, to ensure compliance with fire protection requirements.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
C.5 Test and Test Control	C.5 Test and Test Control
A test program should be established and implemented to assure that testing is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. The tests should be performed in accordance with written test procedures; test results should be properly evaluated and acted on.	During construction, contractors performing installation and tests were required to perform inspections which ensured system readiness were performed in accordance with approved procedures. Additionally, these contractors were subject to surveillance and/or audit for compliance to fire protection requirements. Modifications to installations are required to be tested to ensure system readiness using approved procedures.
C.6 Inspection, Test, and Operating Status	C.6 Inspection, Test, and Operating Status
Measures should be established to provide for the identification of items that have satisfactorily passed required tests and inspections.	All items received are identified to ensure proper traceability and status. This traceability is sufficiently ensured during installation and test. A system of tagging is used during operations to establish operating status or to prevent inadvertent operation.
C.7 Non-Conforming Items	C.7 Non-Conforming Items
Measures should be established to control items that do not conform to specified requirements to prevent inadvertent use or installation.	Inspection procedures require that items that do not conform to specified requirements be tagged and segregated to prevent inadvertent installation.
C.8 Corrective Action	C.8 Corrective Action
Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and non-conformances are promptly identified, reported, and corrected.	Those portions of the fire protection system which are designated as essential fire protection systems (see LCS 1.10) are subject to the applicable portions of the CGS OQAPD. Plant procedures require that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material, and nonconformances are promptly identified, reported, and corrected.
C.9 Records	C.9 Records
Records should be prepared and maintained to furnish evidence that the criteria enumerated above are being met for activities affecting the fire protection program.	During design and construction, the quality assurance program required vendors and contractors to prepare and maintain documents indicating compliance with quality assurance requirements. During operations, documents indicating compliance with quality assurance requirements are prepared in accordance with the applicable portions of the CGS OQAPD.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
C.10 Audits	C.10 Audits
Audits should be conducted and documented to verify compliance with the fire protection program including design and procurement documents; instructions; procedures and drawings; and inspection and test activities.	During design and construction, a surveillance/audit program was implemented to include design and procurement documents, instructions, procedures, and drawings; inspection, and test activities. Procurement documents were reviewed for application of source surveillance requirements. Site contractors were subject to surveillance/audit to ensure compliance to fire protection requirements. Audits are performed in accordance with the OQAPD.
D. GENERAL GUIDELINES FOR PLANT PROTECTION	D. GENERAL GUIDELINES FOR PLANT PROTECTION
D.1 Building Design	D.1 Building Design
D.1.a Plant layouts should be arranged to: a. Isolate safety-related systems from unacceptable fire hazards, and b. Alternatives: 1. redundant safety-related systems that are subject to damage from a single fire hazard should be protected by a combination of fire retardant coatings and fire detection and suppression systems, or 2. a separate system to perform the safety function should be provided.	D.1.a Those portions of redundant systems which are required for post-fire safe shutdown are protected in accordance with 10 CFR 50 Appendix R, Section III.G, as detailed in Section F.4. Safety-related equipment which is not required for post-fire safe shutdown is generally separated to minimize potential risk from a single fire hazard. Cabling for the safety-related equipment which is not required for post-fire safe shutdown is routed in accordance with divisional electrical separation requirements (Section 8.3), not in accordance with Appendix R requirements, and could be subject to damage from a single exposure fire. Fire area boundaries serve to separate fire hazards from safety-related systems.
D.1.b In order to accomplish 1.(a) above, safety-related systems and fire hazards should be identified throughout the plant. Therefore, a detailed fire hazard analysis should be made. The fire hazards analysis should be reviewed and updated as necessary.	D.1.b In designing the plant, careful consideration has been given to equipment location, fire walls, barriers, material selection, and fire protection system design. A fire hazards analysis is included in Section F.4. Proposed plant modifications are evaluated for impact on the validity of the fire hazards analysis.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
	Additional fire hazards analysis should be done after any plant modification.		Revisions to the fire hazards analyses are performed as required.
D.1.c	For multiple reactor sites, cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from other areas of the plant by barriers (walls and floors) having a minimum fire resistance of three hr. Cabling for redundant safety divisions should be separated by walls having three hour fire barriers.	D.1.c	CGS is not a multiple reactor site. The cable spreading room is separated from other fire areas by 3-hr barriers.
D.1.d	Interior wall and structural components, thermal insulation materials and radiation shielding materials and sound-proofing should be non-combustible. Interior finishes should be non-combustible or listed by a nationally recognized testing laboratory, such as Factory Mutual or Underwriters' Laboratory, Inc. for flame spread, smoke and fuel contribution of 25 of less in its use configuration (ASTM E-84 Test, "Surface Burning Characteristics of Building Materials"). Alternative guidance for constructed plants is shown in Section E.3 "Cable Spreading Room".	D.1.d	Interior wall and structural components, thermal insulation materials, and radiation shielding materials are noncombustible. Decontaminable coatings have flame spreads less than 25. Paint on concrete or masonry block is not considered a fire hazard. Auxiliary rooms within the main control room and the north wall of the radwaste control room have plastic laminate faced wall panels. The plastic laminate faced wall panels are UL listed for a flame spread of 25 and a smoke developed rating of 40. The materials in these rooms are not, however, considered to present a significant fire hazard. The combustibility of Thermo-Lag 330-1 has been considered in the fire hazards analysis. The combustible containment barrier spacer material is shielded from fire exposure by ceramic fiber in the annular gap of mechanical containment penetrations. See Section F.2.2.5 for more details. Shielding material installed within access doors at certain penetrations in the primary containment sacrificial shield wall is under the trade name of "Permali." Flame spread and smoke contribution are both under 25.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
D.1.e	Metal deck roof construction should be noncombustible (see the building materials directory of the Underwriters' Laboratory, Inc.) or listed as Class I by Factory Manual System Approval Guide. Where combustible material is used in metal deck roofing design, acceptable alternatives are (i) replace combustibles with non-combustible materials, (ii) provide an automatic sprinkler system, or (iii) provide ability to cover roof exterior and interior with adequate water volume and pressure.	D.1.e	All metal deck roof systems meet the requirements of Factory Mutual Class I insulated steel roof decks.
D.1.f	Suspended ceilings and their supports should be of non-combustible construction. Concealed spaces should be devoid of combustibles. Adequate fire detection and suppression systems should be provided where full implementation is not practicable.	D.1.f	Suspended ceilings and their supports are of noncombustible construction. Within the control room, there are no exposed combustibles in concealed spaces above the suspended ceilings. All electrical cable above the suspended ceiling is routed in conduit. Cable trays are routed above the suspended ceilings of the 487-ft radwaste chemistry laboratory.
D.1.g	High voltage - high amperage transformers installed inside buildings containing safety related systems should be of the dry type or insulated and cooled with non-combustible liquid. Safety related systems that are exposed to flammable oil filled transformers should be protected from the effects of a fire by: (i) replacing with dry transformers or transformers that are insulated and cooled with non-combustible liquid; or (ii) enclosing the transformer with a three-hour fire barrier and installing automatic water spray protection.	D.1.g	All high voltage transformers installed inside safety-related building areas are cooled with high flash point insulating fluid. The indoor river makeup transformers are enclosed in 3-hr barriers without automatic suppression. Fire Areas RC-8 and RC-14, containing the radwaste building 467-ft switchgear room transformers, are enclosed in 3-hr barriers without automatic suppression.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
D.1.h	Buildings containing safety related systems, having openings in exterior walls closer than 50 ft to flammable oil filled transformers should be protected from the effects of a fire by: (i) closing of the opening to have fire resistance equal to three hr (ii) constructing a three-hour barrier between the transformers and the wall openings; or (iii) closing the openings and providing the capability to maintain a water curtain in case of fire.	D.1.h	There are no oil-filled transformers located within 50 ft of the exterior wall of a safety-related building. The main step-up transformers, the normal auxiliary transformers, the startup auxiliary power transformers, and the backup auxiliary power transformers are oil filled and located within 50 ft north of the turbine generator building. They are protected by deluge sprinklers. The turbine generator building wall is 2-hr rated reinforced concrete and insulated metal panel with 1.5-hr fire-rated doors. Fire barrier walls are installed between the main transformers E-TR-M1, E-TR-M2, E-TR-M3 and E-TR-M4. There are no barriers between other north yard transformers. Four additional oil-filled transformers are located in the cooling tower area. The RRC pump ASD transformers are protected by deluge systems. The adjacent RRC pump ASD building wall is 2-hr rated and turbine building wall is 3-hr rated. A 2-hr barrier separates the divisional transformers.
D.1.i	Floor drains, sized to remove expected fire fighting water flow, should be provided in those areas where fixed water fire suppression systems are installed. Drains should also be provided in other areas where hand hose lines may be used if such fire fighting water could cause unacceptable damage to equipment in the area. Equipment should be installed on pedestals, or curbs should be provided as required to contain water and direct it to floor drains. See NFPA 92M, "Waterproofing and Draining of Floors." Drains in areas containing combustible liquids should have provisions for preventing the spread of the fire throughout the drain system. Water drainage from areas which may contain	D.1.i	Floor drains for the turbine oil reservoir, turbine lube oil storage, and hydrogen seal oil rooms discharge into sumps. There are no floor drains in the diesel generator day tank rooms. The floor drain systems in areas where fixed fire protection systems are located are not sized adequately to accept the large quantity of water which could be discharged over a long period of time. Flooding may be relieved through open doorways. Potential actuation of fire protection systems has been evaluated to ensure that it would not adversely affect any safety-related equipment

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
radioactivity should be sampled and analyzed before discharge to the environment. In operating plants or plants under construction, if accumulation of water from the operation of new fire suppression systems does not create unacceptable consequences, drains need not be installed.	by flooding. Most equipment has been installed on raised concrete pads or pedestals. The NFPA 92M expectation for periodic inspection of barriers for possible leak paths is implemented for the fire/flood barriers addressed in Information Notice 88-60 (see Reference F.7.6.q). Water flowing down stairwells or into elevator shafts will not degrade safety-related equipment. All drains empty into sumps which are divided into radioactive and nonradioactive sumps according to the areas served. See FSAR 9.3.3.2.2 and FSAR 11.2.2.2.2 radioactive floor drain systems and FSAR 9.3.3.2.3 for nonradioactive floor drain system. In all buildings where fixed fire suppression systems or hand hose stations are actuated and flooding does occur, water could ultimately flow into the basement area and cover the sumps and floor. a. Areas where no or little radiation is present, the excessive quantity of water will dilute any possible contamination. This water could be pumped into the yard by portable equipment after the fire is suppressed. b. Areas where contaminated particles are prevalent, which have had flooding, must have the floor area monitored. 1. Non-contaminated water could be pumped into the yard. 2. Contaminated water would be left in the basement until the sump can be reactivated to discharge the

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
			water to the radwaste floor drain collection tank. As indicated above, temporary flooding beyond the drainage system provided is possible if water is discharged for extended periods.
D.1.j	Doors, walls, and ceilings enclosing separate fire areas should have minimum fire rating of 3 hr. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself. Door openings should be protected with equivalent rated doors, frames and hardware that have been tested and approved by a nationally recognized laboratory. Such doors should be normally closed and locked or alarmed with alarm and annunciation in the control room. Penetrations for ventilation system should be protected by a standard "fire door damper" where required. Refer to NFPA 80, "Fire Doors and Windows." The fire hazard in each area should be evaluated to determine barrier requirements. If barrier fire resistance cannot be made adequate, fire detection and suppression should be provided, such as: (i) water curtain in case of fire (ii) flame retardant coatings (iii) additional fire barriers	D.1.j	See Section F.2.2 and LCS 1.10.5 for a description of building construction and fire rated assemblies.
D.2	Control of Combustibles	D.2	Control of Combustibles
D.2.a	Safety-related systems should be isolated or separated from combustible materials. When this is not possible because of the nature of the safety system or the combustible material, special protection should be provided to prevent a fire from defeating the safety system function. Such protection may involve a combination of	D.2.a	Safety-related systems have been isolated or separated from combustible materials to the extent possible. The emergency diesel generator fuel oil day tanks are located in separate rooms with 3-hr fire-rated walls and 3-hr fire-rated door assemblies. The turbine generator oil reservoir and coolers and hydraulic control reservoir and coolers are

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
	automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. Examples of such combustible materials that may not be separable from the remainder of its system are: (1) Emergency diesel generator fuel oil day tanks, (2) Turbine-generator oil and hydraulic control fluid systems, (3) Reactor coolant pump lube oil system.		separated from each other by fire-rated walls and are protected by deluge sprinkler system. The turbine-generator oil reservoir coolers are open to the turbine-generator operating floor but the opening is protected by a deluge sprinkler system. The feedwater pump rooms are not separated by fire barriers but are protected by deluge systems. The reactor recirculation pumps are not protected by an automatic fire suppression system since the containment is inerted. Reactor recirculation, pump bearing temperature and oil level and containment temperature and pressure are monitored.
D.2.b	Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety-related equipment. Storage of flammable gas such as hydrogen, should be located outdoors or in separate detached buildings so that a fire or explosion will not adversely affect any safety related systems or equipment. Refer to NFPA 50A, “Gaseous Hydrogen Systems.” Care should be taken to locate high pressure gas storage containers with the long axis parallel to building walls. This will minimize the possibility of wall penetration in the event of a container failure. Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled. Refer to NFPA 5, “Industrial Fire Loss Prevention.”	D.2.b	A separate building, remote from the main buildings of the plant, is provided for bulk storage of hydrogen bottles. The location is north of the turbine generator building such that a fire or explosion would not affect safety-related buildings or equipment. The building is of noncombustible construction and complies with NFPA Standard 50A (1973). The storage facility consists of a three-sided elevated building with louvers to ensure proper ventilation. All bottles are stored in a vertical position. The hydrogen supply piping is installed inside a culvert to ensure proper protection of the hydrogen line. All electrical equipment within the hydrogen storage facility is rated for installation in a hazardous area Class I, Division II, Group B. The hydrogen storage facility has an elaborate grounding system. These precautions minimize the occurrence of fires and explosions. The hydrogen gas supply system is shown in Figures 1.2-2 and 10.2-4. The Hydrogen Water Chemistry (HWC) Hydrogen Storage and Supply Facility (HSSF), a separate and remote facility, provides bulk storage of both liquid and gaseous hydrogen for hydrogen injection into the condensate/feedwater system to mitigate Intergranular Stress Corrosion Cracking

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	(IGSCC) in the internals of the reactor vessel. The HSSF is located approximately 430 yards southeast of the Sewage Treatment Plant Blower and Laboratory Building (Building #24 on Figure 1.2-1). This outdoor non-safety-related facility meets the siting considerations of EPRI NP-5283-SR-A and is far removed from the main plant buildings, such that a fire or explosion at the HSSF would not affect plant safety-related buildings or equipment. The HSSF is designed to comply with NFPA 30-2000, NFPA 50A-1999, NFPA 50B-1999, and NFPA 70-2002. The storage facility consists of a 14,000-gallon liquid hydrogen storage tank, two redundant liquid hydrogen pumps and ambient air vaporizers, six high-pressure gas hydrogen storage tubes, a back-up hydrogen gas tube trailer assembly, a 1,500-gallon liquid nitrogen storage tank, and two redundant ambient air nitrogen vaporizers for system purging. The HSSF is supplied from plant power, is designed for lightning protection, and the grounding grid is connected to the site grid. All electrical equipment installed in high hazardous areas meet the requirements of NFPA 70-2002. In the yard area of the plant, the buried hydrogen supply line is encased in a guard pipe that provides mechanical protection and a means to monitor the pipe for leakage. The vent of the guard pipe is directed to a hydrogen detector outside the TG building. The hydrogen supply pipe is routed through the Turbine Generator Building 441' west end, which is not a safety-related plant area. The HSSF isolation and monitoring devices alarm at the Remote Annunciator Panel, located in the plant chemistry lab (RW 487'). HSSF is equipped with UV/IR flame sensors that isolate the hydrogen supply and alarm at both the Remote Annunciator Panel and

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	Control Room. The hydrogen supply lines are equipped with excess flow check valves to shut off the gas flow in the event of a pipe break. The hydrogen supply system incorporates hydrogen leak detectors at non-welded pipe connections within Fire Area TG-1. The HWC system is automatically shut down upon receipt of a high-high hydrogen signal from these hydrogen leak detectors. These design features minimize the occurrence of fires and explosions. Minimum amounts of compressed gases are permanently stored in safety-related buildings where the gases are required for system functioning. These are limited to the following: - Nitrogen - 2% hydrogen in argon - 2% hydrogen in nitrogen - 6% hydrogen in argon - 2% oxygen in argon - 6% oxygen in argon - Freon - 10% methane in argon - Propane - Helium - Scott air pack bottles With the exception of the air pack bottles, the compressed gases are stored in a vertical position and are seismically restrained. The air pack bottles are stored horizontally, but do not present a hazard to any safety-related equipment. The propane is used in a laboratory and does not present a hazard to any safety-related equipment. The other types of compressed gas bottles do not present explosive hazards. Temporary use of flammable and fuel compressed gases is controlled by plant procedures.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
D.2.c	The use of plastic materials should be minimized. In particular, halogenated plastics such as polyvinyl chloride (PVC) and neoprene should be used only when substitute non-combustible materials are not available. All plastic materials, including flame and fire retardant materials, will burn with an intensity and BTU production in a range similar to that of ordinary hydrocarbons. When burning, they produce heavy smoke that obscures visibility and can plug air filters, especially charcoal and HEPA. The halogenated plastics also release free chlorine and hydrogen chloride when burning, which are toxic to humans and corrosive to equipment.	D.2.c	The use of plastic materials, in particular halogenated plastics, are minimized to the extent practical. See response to paragraph D.3.f.
D.2.d	Storage of flammable liquids should, as a minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code."	D.2.d	Flammable liquids, as defined in NFPA 30-1973, are not used in plant systems. The storage of combustible liquids in plant systems conforms to the requirements of NFPA 30-1973. See Table F.2-1 and item F.9 for approved NFPA 30 deviations. Flammable/combustible liquids for incidental used in maintenance and operations are normally stored in accordance with NFPA 30. Exceptions may be authorized by special handling permits in accordance with plant procedures. Note that the storage restrictions within a fire area are implemented using the NFPA 30 definition of fire area(s) - not the fire area boundaries as defined for the purpose of post-fire safe shutdown analysis.
D.3	<u>Electric Cable Construction, Cable Trays, and Cable Penetrations</u>	D.3	<u>Electric Cable Construction, Cable Trays, and Cable Penetrations</u>
D.3.a	Only non-combustible material should be used for cable tray construction.	D.3.a	All cable trays, covers, their supports, and hardware are constructed of non-combustible material.
D.3.b	See section E3 for fire protection guidelines for cable spreading rooms.	D.3.b	See paragraph E.3 below.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
D.3.c Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room. Cables should be designed to allow wetting down with deluge water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided as backup. Safety-related equipment in the vicinity of such cable trays, that does not itself require water fire protection, but is subject to unacceptable damage from sprinkler water discharge, should be protected from sprinkler system operation or malfunction. When safety-related cables do not satisfy the provisions of Regulatory Guide 1.75, all exposed cables should be covered with an approved fire retardant coating and a fixed automatic water fire suppression system should be provided.	D.3.c Spacial separation or electrical separation barriers have been provided between redundant safety-related cable trays as described in Section 8.3. Fixed water suppression systems for all such cable trays outside the cable spreading room are, therefore, considered unnecessary. The cable spreading room and the cable chase in the radwaste/control building and the radwaste-reactor building corridor, however, contain redundant safety-related cables in trays and are located such that the heat resulting from a fire could not be dissipated. Therefore, these areas are provided with automatic water sprinkler systems even where the plant divisional separation guidelines are met. Manual hose stations and portable extinguishers are available for backup. All hose stations are equipped with fog nozzles. Use of these fog nozzles is not likely to cause unacceptable damage to any safety-related equipment when used by trained personnel in the prescribed manner. 2-½ in. hose monitors do have the capability to go solid stream and would not be used on interior energized electrical equipment fires.
D.3.d Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to that fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including the hose stream test.	D.3.d Cable and cable tray penetrations in fire barriers are sealed with a fire rating equivalent to that of the penetrated area unless fire protection evaluation has justified a lesser fire rating. Nongrouted electrical penetration seals designs through fire rated barriers are fire rated based on the criteria established in Reference F.7.6.b (which uses the ASTM E-119 time temperature curve).

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
	Where installed penetration seals are deficient with respect to fire resistance, these seals may be protected by covering both sides with an approved fire retardant material. The adequacy of using such material should be demonstrated by suitable testing.		
D.3.e	Fire breaks should be provided as deemed necessary by the fire hazards analysis. Flame or flame retardant coatings may be used as a fire break for grouped electrical cables to limit spread of fire in cable ventings. Possible cable derating owing to use of such coating materials must be considered during design.	D.3.e	Thermo-Lag and Flamemastic coated cable tray fire breaks have been abandoned in place (Reference F.7.6.e). Where long vertical run trays breach nonrated barriers, silicone foam seals which fill the entire blockout are maintained as fire breaks. Where coating materials are used on cables, derating of cables is considered in the design.
D.3.f	Electric cable constructions should as a minimum pass the current IEEE No. 383 flame test. This does not imply that cables passing this test will not require additional fire protection. For cable installation in operating plants and plants under construction that do not meet the IEEE No. 383 flame test requirements, all cables must be covered with an approved flame retardant coating and properly derated.	D.3.f	All safety-related cabling meets the IEEE 383-1974 flame test requirements. Generally, cabling within plant cable trays, cable penetrations, and enclosures meets IEEE 383-1974 flame test requirements. Certain lighting circuits and low energy wiring within plant control panels, racks, and other electrical enclosures do not meet the IEEE 383-1974 requirements. The use of polyvinyl chloride (PVC) cabling is minimized. Where IEEE 383 rated cable is not available for a particular application, cable procured to meet National Electric Code guidelines for fire resistance for plenum rated cabling using NFPA 262-1990, UL 910-985, or equivalent may be used.
D.3.g	To the extent practical, cable construction that does not give off corrosive gases while burning should be used. Applicable to new cable installations.	D.3.g	Cables are generally jacketed with a cross-linked polyolephin (XLPE) material which gives off as little corrosive gas as practical. The use of polyvinyl chloride (PVC) cabling is minimized.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
D.3.h Cable trays, raceways, conduit, trenches, or culverts should be used only for cables. Miscellaneous storage should not be permitted, nor should piping for flammable or combustible liquids or gases be installed in these areas. Installed equipment in cable tunnels or culverts need not be removed if they present no hazard to the cable runs as determined by the fire hazards analysis.	D.3.h Cable trays, raceways, and conduits are used only for cables. There are no cable tunnels or culverts in the plant. There are no provisions for miscellaneous storage in cable areas, nor are flammable or combustible liquids or gases installed in these areas.
D.3.i The design of cable tunnels, culverts and spreading rooms should provide for automatic or manual smoke venting as required to facilitate manual fire fighting capability.	D.3.i There are no cable tunnels or culverts in the plant. Air from the cable spreading room normally passes into the cable chase through openings protected by 3-hr fire-rated dampers and then back to a ventilation unit. Smoke detectors spaced through both areas and a smoke detector, mounted in the ductwork, monitor the return air. On actuation of the detector, an alarm sounds in the control room. The control room operator can then shut down the ventilation unit. As the cable spreading room and cable chase are each protected by an automatic preaction sprinkler system designed for cable tray fire extinguishment, a fire would be of limited duration. Smoke from a fire would be purged through the actuation of a fixed exhaust fan and ductwork and discharged directly to the atmosphere. The use of fans and ducting to discharge smoke to the atmosphere would help maintain visibility in both the cable chase and the cable spreading room.
D.3.j Cables in the control room should be kept to the minimum necessary for operation of the control room. All cables entering the control room should terminate there. Cables should not be installed in floor trenches or culverts in the control room.	D.3.j The main control room is composed mainly of a "panel assembly" system. Each "panel assembly" consists of a termination cabinet, a subfloor section (with enclosed, segregated ducts for cable routing), and a vertical panel and/or benchboard assembly.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
Existing cabling installed in concealed floor and ceiling spaces should be protected with an automatic total flooding Halon system.	A raised floor is provided for the entire room. The "panel assembly" subfloor sections comprise a major portion of this false floor. Panel assembly ducts, termination cabinet cable entrance/exit areas, and vertical panel and benchboard assembly cable entrance/exit areas are located beneath the false floor. Most cables entering the room enter the termination cabinets directly. They are either terminated there or route directly to vertical panels or benchboards for termination. Some cables enter the false floor outside the "panel assemblies." They then route either into the panel assemblies, or to other control room equipment not a part of the "panel assembly" system (lighting panels, relay panels, etc.). A Halon extinguishing system is provided for the subfloor sections longitudinal cable ducts. Seals for Halon containment are provided at the entrance and exit points to the ducts. All penetrations into the main control room are provided with fire-rated seals. Cables entering the false floor outside the "panel assemblies" are enclosed in rigid steel conduit, metallic flexible conduit (with the outer jacket removed), covered metal troughs, Haveg Siltemp tape, or suitable fire resistive cable as identified in NFPA 70 for under raised floors. All cables in the suspended ceiling area are enclosed in conduit. For this reason, an automatic flooding system is not deemed necessary.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
D.4 Ventilation	D.4 Ventilation
D.4.a The products of combustion that need to be removed from a specific fire area should be evaluated to determine how they will be controlled. Smoke and corrosive gases should generally be automatically discharged directly outside to a safe location. Smoke and gases containing radioactive materials should be monitored in the fire area to determine if release to the environment is within the permissible limits of the plant Technical Specifications. The products of combustion which need to be removed from a specific fire area should be evaluated to determine how they will be controlled.	D.4.a Products of combustion are removed from specific areas by two methods, as follows: a. Areas with direct duct connections to the exhaust system discharge directly to the atmosphere. These areas are: 1. Turbine generator building a) Reactor feed pump rooms b) Mechanical vacuum pump rooms c) Auxiliary boiler room 2. Reactor building a) LPCS pump room b) RHR pump rooms c) RCIC pump room d) HPCS pump room e) CRD pump room 3. Diesel generator building a) Diesel oil day tank rooms b) Diesel generator rooms c) Diesel oil transfer pump rooms d) Air compressors and electrical equipment rooms 4. Circulation water pump house b. Areas of the plant to which air is supplied and return air is routed to other areas of higher potential radioactivity prior to final exhaust are: 1. Turbine generator building (a) Turbine oil reservoir and conditioner room (b) H_2 seal oil unit room (c) Turbine lube oil storage room (d) General area containing (1) Service and instrument air compressors (2) Condensate pumps (3) Condensate booster pumps (4) Turbine oil transfer lines (5) Cables

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	2. Reactor building general area containing (a) SLC pumps (b) Cables (c) Standby gas treatment units (d) Sump vent filter units 3. Radwaste building general area containing (a) Exhaust air filter units (b) Cables Exhaust air from the reactor, radwaste, and turbine generator buildings is monitored to determine the quantity of radioactive material being released to the environment. Smoke removal equipment, such as a fixed and a portable fan and flexible ducting are available in the radwaste/control and reactor buildings to aid in smoke removal. The basic air flow patterns were established by exhausting directly from potentially contaminated areas, as well as indirectly by inducing air from nonpotentially contaminated areas into shielded areas before discharging to the atmosphere. See Section F.2.5.5 for more details on smoke removal. Fire dampers were provided in ducting and wall penetrations to protect areas containing large quantities of combustibles or redundant post-fire safe shutdown systems against the postulated fires according to the severity of the fire as determined by the fire loading in the hazards analysis. The portable fan and ducting provide the latitude of allowing the existing fire barrier dampers to remain in a closed position while exhausting the impeding smoke from the fire area.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
D.4.b Any ventilation system designed to exhaust smoke or corrosive gases should be evaluated to ensure that inadvertent operation or single failures will not violate the controlled areas of the plant design. This requirement includes containment functions for protection of the public and maintaining habitability for operations personnel.	D.4.b All ventilation systems designed to exhaust smoke and corrosive gases are functioning during normal plant operation with the exception of the SGT units and the portable smoke removal units. Standby fans are available for backup operation of the ventilation systems in the reactor, radwaste, and turbine generator buildings. Inadvertent operation or single failures of these units will not violate safety requirements for the plant personnel or the public.
D.4.c The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system.	D.4.c The power supply and controls for mechanical ventilation systems have not always been run outside the fire areas served by the system. The fire hazards analysis demonstrates that post-fire safe shutdown capability is not jeopardized by this cable routing.
D.4.d Fire suppression systems should be installed to protect charcoal filters in accordance with Regulatory Guide 1.52, "Design Testing and Maintenance Criteria for Atmospheric Cleanup Air Filtration."	D.4.d Fire suppression systems have been installed in the safety-related standby gas treatment filter unit, control room emergency filter unit, and the reactor sump vent filter unit in accordance with Regulatory Guide 1.52. The offgas system charcoal units are contained in eight ASME, Section III, Class 3 coded vessels in the radwaste building. They are not protected by a fire suppression system. Valving, however, breaks the tanks down into groups that can be closed off to eliminate oxygen thereby extinguishing a fire. The probability of flame spread from the units is considered small and they are well separated from safety-related circuits and components.
D.4.e The fresh air supply intakes to areas containing safety related equipment or systems should be located remote from the exhaust air outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with the products of combustion.	D.4.e The fresh air supply intakes to areas containing safety-related equipment or systems are located with sufficient separation from exhaust air outlets and smoke vents to minimize the possibility of contaminating the intake air with products of combustion.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
D.4.f Stairwells should be designed to minimize smoke infiltration during a fire. Staircases should serve as escape routes and access routes for fire fighting. Fire exit routes should be clearly marked. Stairwells, elevators and chutes should be enclosed in masonry towers with minimum fire rating of three hr and automatic fire doors at least equal to the enclosure construction, at each opening into the building. Elevators should not be used during fire emergencies.	D.4.f Enclosed fire rated stairwells and elevators provide either a 2-hr or 3-hr fire rating, with 1.5 hr minimum fire doors. See Figures F.6-1 through F.6-5. Door T207 to the service building roof is nonrated. Enclosed fire rated stairwells are not equipped with ventilation and would effectively limit smoke infiltration. Elevators are not typically used for egress during fire emergencies.
D.4.g Smoke and heat vents may be useful in specific areas such as cable spreading rooms and diesel fuel oil storage areas and switchgear rooms. When natural-convection ventilation is used, a minimum ratio of 1 sq. ft of venting area per 200 sq. ft of floor area should be provided. If forced-convection ventilation is used, 300 CFM should be provided for every 200 sq. ft of floor area. See NFPA No. 204 for additional guidance on smoke control.	D.4.g Provisions for smoke and heat relief are discussed in paragraphs D.3.i and D.4.a above. In areas where smoke and heat are removed by the normal ventilation systems, a minimum of 300 cfm is provided for every 200 ft^2 of floor area except in the following areas:

Area	Ventilation per 200 ft^2	Supplementary Ventilation Equipment
Safety-Related Areas		
HPCS pump room	251 cfm	Portable fan flex duct
RHR-2A pump room	148 cfm	Portable fan-flex-duct
RHR-2B pump room	127 cfm	Portable fan-flex-duct
SGT-general area	207 cfm	Portable fan-flex-duct
D.O. transfer pump room	278 cfm	Portable fan-flex-duct
Cable spreading rooms	24 cfm[a]	Fixed fan-flex-duct
Control room	0 cfm	Fixed fan-flex duct
Control bldg. mech. duct equipment room	0 cfm	Fixed fan-flex duct
Cable chase	205 cfm	Fixed fan-flex duct

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
			Non-Safety-Related Areas Turbine L.O. storage room — 277 cfm — Portable fan-flex duct TG operating floor[b] — 274 cfm — Portable fan-flex duct [a] 1000 cfm purge air. [b] Roof vents are not provided.
			Portable and fixed fans with flexible ducting are provided to allow smoke removal from rooms in which additional ventilation is required.
D.4.h	Self-contained breathing apparatus, using full face positive pressure masks, approved by NIOSH (National Institute of Occupational Safety and Health - approval formerly given by the US Bureau of Mines) should be provided for fire brigade, damage control, and control room personnel. Control room personnel may be furnished breathing air by a manifold.	D.4.h	Provisions have been made to ensure that adequate self-contained breathing apparatus (SCBA) are available for fire fighting, damage control personnel, and control room operating personnel. These units are independent of respiratory protective equipment provided for general plant activities. See Table F.3-2 of Section III.H for more SCBA requirements.
D.4.i	Where total flooding gas extinguishing systems are used, area intake and exhaust ventilation dampers should close upon initiation of gas flow to maintain necessary gas concentration. See NFPA 12, "Carbon Dioxide Systems," and 12A, "Halon 1301 Systems."	D.4.i	The total flooding Halon 1301 system for the main control room PGCC ducts does not require closure of any ventilation dampers to maintain necessary gas concentration.
D.5	Lighting and Communication	D.5	Lighting and Communication
D.5.a	Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.	D.5.a	Fixed emergency lighting for egress consists of 1.5-hr Life Safety and Appendix R 8-hr emergency lights consisting of fixed emergency battery units, portable lanterns and diesel backed up fluorescent lights. Eight-hour portable lanterns are staged to perform post-fire safe shutdown manual actions outside the control room. See Section 9.5.3.2.4 for emergency lighting systems.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
			In critical areas, such as the Main Control Room, emergency lighting is installed and powered from the emergency buses which are supplied by the diesel generators. All plant areas, which must be manned for post-fire safe shutdown and all associated access/egress routes, have been provided with adequate lighting such that any required operator actions can be accomplished. The plant emergency lighting systems are further described in Section 9.5.3.
D.5.b	Suitable sealed-beam battery powered portable hand lights should be provided for emergency use.	D.5.b	Suitable sealed-beam, battery-powered portable hand lights have been provided.
D.5.c	Fixed emergency communication should use voice powered head sets at preselected locations.	D.5.c	Voice powered head sets are provided throughout the plant at preset locations.
D.5.d	Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage.	D.5.d	The in-plant repeaters and antenna system will not permit portable radio communication from all areas of the plant because of shielding from structural steel and other metallic structures and are not protected from fire damage. Fire brigade activities rely on handheld-to-handheld radio communications and PBX phones to communicate with the Main Control Room (RC-10). Certain PBX phones are credited for post-fire safe shutdown activities in Fire Areas R-1, R-7, RC-2, and RC-10. Fires in other fire areas do not require immediate communication for post-fire safe shutdown. The PBX communication system for post-fire safe shutdown credits the PBX battery (E-B0-PBX) for 8 hours of operation following a loss of off-site power even though the system has a diesel generator backup.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
E. FIRE DETECTION AND SUPPRESSION	E. FIRE DETECTION AND SUPPRESSION
E.1 Fire Detection	E.1 Fire Detection
E.1.a Fire detection systems should as a minimum comply with NFPA 72D, "Standard for Installation, Maintenance and Use of Proprietary Protective Signaling Systems." Deviations from the requirements of NFPA 72D should be identified and justified.	E.1.a The fire detection system conforms to NFPA 72D for a Class B designation with the following exceptions: detection circuits that actuate fire suppression systems in safety-related areas are Class A. Incoming signals to the control room fire panel are manually recorded. CGS employs a pre-alarm detection system which sounds an alarm signal in the control room only. The control room operator manually sounds a building wide alarm over the public address system. All signals to the control room are identified by zones which designate the building, floor, and cause of alarm. A manual push button radio fire alarm reporter is used to transmit an alarm to the offsite fire department. Pre-alarm detectors are installed according to UL recommendations and spacing, except as justified in Table F.2-1. Certain testing which would require entry into high radiation areas may not be performed during power operation. See Section F.2 for further discussion of the fire detection system.
E.1.b Fire detection system should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire.	E.1.b Fire detection systems provide audible and visual alarms in the control room. Plant-wide alarms and public address announcements are initiated by the main control room operator in accordance with emergency procedures.
E.1.c Fire alarms should be distinctive and unique. They should not be capable of being confused with any other plant system alarms.	E.1.c Fire alarms are distinctive and unique from all other plant system alarms.
E.1.d Fire detection and actuation systems should be connected to the plant emergency power supply.	E.1.d Fire detection and actuation systems are connected to power panels which are supplied by uninterruptible power supplies.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
E.2 Fire Protection Water Supply System	E.2 Fire Protection Water Supply System
E.2.a An underground yard fire main loop should be installed to furnish anticipated fire water requirements, NFPA 24 - Standard for Outside Protection - gives necessary guidance for such installation. It references other design codes and standards developed by such organizations as the American National Standards Institute (ANSI) and the American Water Works Association (AWWA). Lined steel or cast iron pipe should be used to reduce internal tuberculation. Such tuberculation deposits in an unlined pipe over a period of years can significantly reduce water flow through the combination of increased friction and reduced pipe diameter. Means for treating and flushing the systems should be provided. Approved visually indicating sectional control valves, such as post indicator valves, should be provided to isolate portions of the main for maintenance or repair without shutting off the entire system. The fire main system piping should be separate from service or sanitary water system piping. Visible location marking signs for underground valves is acceptable. Alternative valve position indicators should also be provided. For operating plants, fire main system piping that can be isolated from service or sanitary water system piping is acceptable.	E.2.a The underground yard fire main circles the plant. NFPA 24-1973 was used as the design code. The fire main is constructed of 12-in. ductile iron, cast iron, and steel pipe. The underground pipe, valves, and fittings have an applied coating of bituminous material with a minimum thickness of 1 mil. The interior coating on ductile iron and cast iron piping conforms to the requirements of ANSI A21.4. All underground valves in the fire main loop have post indicators for visual indication and to isolate portions of the fire main. The underground fire main is periodically flushed. The fire protection water system is independent of the domestic system. The fire water system does interface with a. CW and TMU system for makeup water, b. TSW system for temporary lubrication, c. CAS system for backup station air compressor cooling, and d. COND system as one of the alternate injection methods.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
E.2.b A common yard fire main loop may serve multi-unit nuclear power plant sites if cross-connected between units. Sectional control valves should permit maintaining independence of the individual loop around each unit. For such installations, common water supplies may also be utilized. The water supply should be sized for the largest single expected flow. For multiple reactor sites with widely separated plants (approaching 1 mile or more), separate yard fire main loops should be used. Sectionalized systems are acceptable.	E.2.b CGS is not a multiple reactor site.
E.2.c If pumps are required to meet system pressure or flow requirements, a sufficient number of pumps should be provided so that 100% capacity will be available with one pump inactive (e.g., three 50% pumps or two 100% pumps). The connection to the yard fire main loop from each fire pump should be widely separated, preferably located on opposite sides of the plant. Each pump should have its own driver with independent power supplies and control. At least one pump (if not powered from the emergency diesels) should be driven by nonelectrical means, preferably diesel engine. Pumps and drivers should be located in rooms separated from the remaining pumps and equipment by a minimum 3-hr fire wall. Alarms indicating pump running, driver availability, or failure to start should be provided in the control room. Details of the fire pump installation should as a minimum conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."	E.2.c Fire pumps are required to meet the fire protection system pressure and flow requirements. This system design has been accepted by the insuring authority. Three fire pumps, each with a flow rate of 2000 gpm, are located in the circulating water pump house and draw water from the circulating water pump house basin. This is the primary source of water for fire protection. Two of the pumps are electrically driven and powered from separate electrical buses. The third pump is powered by its own diesel engine. The three pumps are spatially separated with approximately 23 ft between electric pumps and 30 ft between the nearest electric driven pump and the diesel driven pump. The pump house hall is protected by a fixed sprinkler system. The pumps and drivers are elevated above the floor by concrete pedestals thus floor drainage is not a concern. Each pump is capable of supplying 100% of the fire water flow rate except under the following conditions: a. Due to the complexity of cable tray routing in the cable chase and cable spreading rooms, two pumps are required to meet the fire water system design requirements, and

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
		b. The 100% pump flow rate capacity would be limited to the fixed system and two interior hoses. If exterior hoses are used, there would be a slight reduction in system and hose densities. Two supply lines run parallel to each other from the circulating water pump house fire pumps to the south side of the plant fire water supply loop where they connect to the loop with a 10-ft separation. A back up diesel-driven fire pump rated at 2500 gpm is provided and located in the filtration building. The pump draws water from a 400,000 gal bladder tank. It discharges into the north side of the plant fire water supply loop. NFPA 20-1974 was used for design guidance in the fire pump installation. The fire pumps are UL listed and Factory Mutual approved. Alarms indicating pump running and power failure malfunction are provided for each pump in the main control room.
E.2.d Two separate reliable water supplies should be provided. If tanks are used, two 100% (minimum of 300,000 gal each) system capacity tanks should be installed. They should be so interconnected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. The main plant fire water supply capacity should be capable of refilling either tank in a minimum of 8 hr. Common tanks are permitted for fire and sanitary or service water storage. When this is done, however, minimum fire water storage requirements should be dedicated by means of a vertical standpipe for other water services.	E.2.d	Two separate reliable water supplies are provided (see Figure F.6-21). The primary water supply is the circulating water pump house basin. The circulating water basin is not dedicated to fire protection, but is a reliable water volume (Reference F.7.3.dd). The water level in the basin is monitored and it provides 100% of the fire water supply as defined in paragraph E.2.e. Should the quantity of water drop to a low level an alarm signals the Control Room operator to initiate the makeup water pumps. Excluding a loss-of-offsite power, an inexhaustible quantity of makeup water can be supplied to the basin at the rate of 12,500 to 25,000 gpm from the cooling tower makeup water system from the Columbia River. Water is returned to the basin from the cooling towers by gravity feed. At the low level, the total

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
			water available to the fire pumps in the basin and its gravity fed tributary piping is greater than 300,000 gal. A backup water supply is provided by a 400,000 gal bladder tank which provides 100% of the fire water supply as defined in paragraph E.2.e. It has a dedicated water supply of 284,640 gal. The bladder tank can be refilled in approximately 8 hr. The primary water supply volume is at the circulating water pump house basin and the secondary water supply tank is FP-TK-110. Figure F.6-21 shows the two fire water supplies are at opposite sides of the site. Based on this large separation, interconnection of the two fire water supplies is not practical.
E.2.e	The fire water supply (total capacity and flow rate) should be calculated on the basis of the largest expected flow rate for a period of two hr, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 1000 gpm for manual hose stream plus the greater of: a. all sprinkler heads opened and flowing in the largest designed fire area; or b. the largest open head deluge system(s) operating.	E.2.e	The requirement of 1000 gpm for manual hose streams has been reduced to 500 gpm by BTP CMEB 9.5.1 (NUREG-0800). The fire protection system water supply is designed to meet the water flow demand assuming the shortest leg of the fire main loop is inoperable. The required water supply of 284,640 gal is based on a 2-hr flow period for the largest demand of a sprinkler system in a safety-related area of 2372 gpm (sprinkler demand for the cable spread room which includes 500 gpm for hose streams). See also paragraph E.2.d.
E.2.f	Lakes or fresh water ponds of sufficient size may qualify as sole source of water for fire protection, but require at least two intakes to the pump supply. When a common water supply is permitted for fire protection and the ultimate heat sink, the following should also be satisfied:	E.2.f	Two sources of water are provided for fire protection. See paragraph E.2.d above. The fire water supply is independent of the ultimate heat sink.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
	a. The additional fire protection water requirements are designed into the total storage capacity; and		
	b. Failure of the fire protection system should not degrade the function of the ultimate heat sink.		
E.2.g	Outside manual hose installation should be sufficient to reach any location with an effective hose stream. To accomplish this, hydrants should be installed approximately every 250 feet on the yard main system. The lateral to each hydrant from the yard main should be controlled by a visually indicating or key operated (curb) valve. A hose house, equipped with hose and combination nozzle, and other auxiliary equipment recommended in NFPA 24, "Outside Protection," should be provided as needed but at least every 1000 ft.	E.2.g	The yard fire main loop includes hydrants installed approximately every 300 ft. Each hydrant has a post indicating control valve (see Figure F.6-21). A mobile fire response vehicle and trailer is equipped with the equivalent of three hose houses (see Table F.2-1). This provides sufficient hose so that a single fire at any plant location can be reached by an effective hose stream. A combination fog shut-off type hose nozzle is provided.
	Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings and standpipe risers.		Threads are compatible with those used by the local fire department.
E.3.a	Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems.	E.3.a	Each automatic sprinkler system does not have an independent connection to the fire main loop. Sectionalizing valves have been installed in the yard loop to isolate impairments. Standpipes in the radwaste/control and diesel generator buildings have been interconnected with other standpipes so that a single failure would not impair systems protecting safety-related equipment. See paragraph A.4 above for further discussion of the single failure criterion.
	Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shut off valve, and water flow alarm. Safety related equipment that does not itself require sprinkler water fire protection, but is subject		Each sprinkler and standpipe system within the permanent plant island is controlled by an OS&Y gate valve or other approved shut-off valve. Alarm type check or deluge valves are installed as required in each sprinkler system and cause an alarm in the control

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

	BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM
	to unacceptable damage if wetted by sprinkler water discharge, should be protected by water shields or baffles.		room on water flow. There are no flow alarms on hose station standpipes but the control room operator would be aware of a flow by the main fire pumps operating annunciators. There is no safety-related equipment that is subject to unacceptable damage if wetted by sprinkler water discharge. Buildings in the plant industrial area with installed sprinkler systems are isolated from the yard main by post indicating valves. These systems are alarmed to the Protected Area Access Security Control Center (SCC).
E.3.b	All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant (see NFPA 26, "Supervision at Valves"). When electrical supervision of fire protection valves is not practicable, an adequate management supervision program should be provided. Such a program should include locking valves open with strict key control; tamper proof seals; and periodic visual check of all valves.	E.3.b	Water supply control valves in the fire water system are either locked open or have valve tamper switches which alarm in the control room. Outside valves are provided with post indicators. Valves FP-V-16A and FP-V-16B have valve tamper switches which alarm in the control room. Valves that control water to the fire protection system are controlled as follows: a. Valves larger than 2-in. are locked in the wide open position with non-breakable shackle locks, b. Valves 2-in. and smaller controlling water supplies are sealed in the full open position, c. Valves to sprinkler or deluge alarm lines are sealed in the open position, and d. Valves that control water flow are checked quarterly.
E.3.c	Automatic sprinkler systems should as a minimum conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems", and NFPA 15, "Standard for Water Spray Fixed Systems."	E.3.c	Installed sprinkler systems were designed using NFPA 13-1975 and NFPA 15-1973. Fire protection systems installed in safety-related areas have been specifically reviewed to identify deviations from the code requirements. See Section F.2.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A		CGS FIRE PROTECTION PROGRAM	
E.3.d	Interior manual hose installation should be able to reach any location with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 75 ft of 1.5 in. woven jacket lined fire hose and suitable nozzles should be provided in all buildings, including containment, on all floors and should be spaced at not more than 100-ft intervals. Individual standpipes should be of at least 4-in. diameter for multiple hose connections and 2.5-in. diameter for single hose connections. These systems should follow the requirements of NFPA No. 14 for sizing, spacing and pipe support requirements of NFPA No. 14 for sizing, spacing and pipe support requirements (NELPIA).	E.3.d	Standpipes and manual hose stations were designed using NFPA 14-1974. Hose stations are presently provided with 150 ft of 1.5-in. rubber lined fire hose with shutoff type fog nozzle and are capable of reaching any location with at least one effective hose stream in all building fire areas. The interior manual hose installations provide hose connections equipped with a maximum of 100 ft of 1.5-in. fire hose in most safety-related areas. The reactor building requires 150-ft hose lengths. The modified arrangement allows any location that contains, or could present a fire exposure hazard, to safety-related equipment to be reached with at least one effective hose stream as defined in NFPA 14.
	Hose stations should be located outside entrances to normally unoccupied areas and inside normally occupied areas. Standpipes serving hose stations in areas housing safety-related equipment should have shut off valves and pressure reducing devices (if applicable) outside the area.		Hose stations are presently located inside enclosed stairways to the various fire areas of all buildings. All hose stations and their shutoff valves serving areas housing safety-related equipment are located outside of the area.
E.3.e	The proper type of hose nozzles to be supplied to each area should be based on the fire hazard analysis. The usual combination spray/straight stream nozzle may cause unacceptable mechanical damage (for example, the delicate electronic equipment in the control room) and be unsuitable. Electrically safe nozzles should be provided at locations where electrical equipment or cabling is located.	E.3.e	Manual hose stations are equipped with all fog nozzles for use with Class A, B, and C fires. Hose station fog nozzles (1.5-in. diameter) do not have straight stream capability and are electrically safe. Hose monitors (2.5-in. diameter) are available for use on large oil fires and have the capability to go straight stream, but would not be used on energized electrical equipment or in control rooms.
E.3.f	Certain fires such as those involving flammable liquids respond well to foam suppression. Consideration should be given to use of any of the available foams for such specialized protection application. These include the more common chemical and mechanical low expansion foams, high expansion foam and the relatively new aqueous film forming foam (AFFF).	E.3.f	Portable AFFF foam units are staged in designated areas for fighting combustible liquid fires. There is no bulk storage of flammable liquids included in the plant design.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
E.4 Halon Suppression Systems	E.4 Halon Suppression Systems
The use of Halon fire extinguishing agents should as a minimum comply with the requirements of NFPA 12A and 12B, “Halogenated Fire Extinguishing Agent Systems - Halon 1301 and Halon 1211.” Only UL of FM approved agents should be used. In addition to the guidelines of NFPA 12A and 12B, preventative maintenance and testing of the systems, including check weighing of the Halon cylinders should be done at least quarterly. Particular consideration should also be given to: a. minimum required Halon concentration and soak time b. toxicity of Halon c. toxicity and corrosive characteristics of thermal decomposition products of Halon	Halon 1301 extinguishing systems are installed in the control room PGCC subfloor sections longitudinal cable ducts. The systems comply with the requirements of NFPA Standard 12A and GE Topical Report NEDO 10466-A. The Halon system for the control room PGCC subfloor sections longitudinal cable ducts in Area 1 consist of high pressure cylinders and necessary piping, nozzles, valves and detectors for suppressing fires in each of the sections. The Halon system will provide 20% concentration by volume for a 20-minute duration in the subfloor section ducts. The Halon 1301 agent is considered noninjurious to room occupants when the design concentration of the gas for total flooding does not exceed 7% of room volume. Halon discharges in the PGCC subfloor only, not in the occupied areas of the control room. A local alarm is installed to alert personnel prior to any discharge. It is considered that there will be no immediate adverse effects to sensitive electronic equipment due to thermal decomposition products of Halon 1301 under fire and nonfire conditions.
E.5 Carbon Dioxide Suppression Systems	E.5 Carbon Dioxide Suppression Systems
The use of carbon dioxide extinguishing systems should as a minimum comply with the requirements of NFPA 12, “Carbon Dioxide Extinguishing Systems.” Particular consideration should be given to a. Minimum required CO_2 concentration and soak time: b. Toxicity of CO_2; c. Possibility of secondary thermal shock (cooling damage);	A low-pressure carbon dioxide extinguishing system is installed in the exciter housing of the turbine generator. During outages when the exciter housing is accessible, the CO_2 system is disarmed. The system was designed using NFPA 12-1973 where applicable.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
d. Offsetting requirements for venting during CO_2 injection to prevent overpressurization versus sealing to prevent loss of agent;	
e. Design requirements from overpressurization; and	
f. Possibility and probability of CO_2 systems being out-of-service because of personnel safety consideration. CO_2 systems are disarmed whenever people are present in an area so protected. Areas entered frequently (even though duration time for any visit is short) have often been found with CO_2 systems shut off.	
E.6 Portable Extinguishers	E.6 Portable Extinguishers
Fire extinguishers should be provided in accordance with guidelines of NFPA 10 and 10A, "Portable Fire Extinguishers, Installation, Maintenance and Use." Dry chemical extinguishers should be installed with due consideration given to cleanup problems after use and possible adverse effects on equipment installed in the area.	Dry chemical portable fire extinguishers are located throughout CGS. Halon 1211 portable extinguishers are also present in electronic equipment areas. Portable extinguishers were selected using NFPA 10-1975.
F. GUIDELINES FOR SPECIFIC PLANT AREAS	F. GUIDELINES FOR SPECIFIC PLANT AREAS
F.1 Primary and Secondary Containment	F.1 Primary and Secondary Containment
F.1.a Normal Operation	F.1.a Normal Operation
Fire protection requirements for the primary and secondary containment areas should be provided on the basis of specific identified hazards. For example: a. Lubricating oil or hydraulic fluid system for the primary coolant pumps b. Cable tray arrangements and cable penetrations	The primary containment is inerted with nitrogen. In the secondary containment, manually actuated fire suppression systems have been provided for each charcoal filter bed and roughing filter in the standby gas treatment unit and each charcoal filter bed in the sump vent filter unit. Operation of these systems will not compromise the operation of safety-related systems. Automatic fire

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
c. Charcoal filters Fire suppression systems should be provided based on the fire hazards analysis. Fixed fire suppression capability should be provided for hazards that could jeopardize safe plant shutdown. Automatic sprinklers are preferred. An acceptable alternate is automatic gas (Halon or CO_2) for hazards identified as requiring fixed suppression protection. An enclosure may be required to confine the agent if a gas system is used. Such enclosures should not adversely affect safe shutdown, or other operating equipment in containment. Automatic fire suppression capability need not be provided in the primary containment atmospheres that are inerted during normal operation. However, special fire protection requirements during refueling and maintenance operations should be satisfied as provided below.	detection is provided throughout the secondary containment with annunciation in the control room. Detectors were selected and located after evaluating the hazards involved.
F.1.b Refueling and Maintenance Refueling and maintenance operations in containment may introduce additional hazards such as contamination control materials, decontamination supplies, wood planking, temporary wiring, welding and flame cutting (with portable compressed fuel gas supply). Possible fires would not necessarily be in the vicinity of fixed detection and suppression systems. Management procedures and controls necessary to assure adequate fire protection are discussed in Section B.3.a of this table.	F.1.b Refueling and Maintenance Plant procedures establish fire protection controls during refueling and maintenance operations. Manual fire fighting capability is provided in secondary containment by standpipes with hose stations and portable fire extinguishers Adequate self-contained breathing apparatus is available for fire fighting. See Table F.3-2, paragraph III-H.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
In addition, manual fire fighting capability should be permanently installed in containment. Standpipes with hose stations, and portable fire extinguishers, should be installed at strategic locations throughout containment for any required manual fire fighting operations. Equivalent protection from portable systems should be provided if it is impractical to install standpipes with hose stations. Adequate self-contained breathing apparatus should be provided near the containment entrances for fire fighting and damage control personnel. These units should he independent of any breathing apparatus or air supply systems provided for general plant activities.	
F.2 Control Room The control room is essential to safe reactor operation. It must be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls and roofs having minimum fire resistance ratings of 3 hr. Control room cabinets and consoles are subject to damage from two distinct fire hazards: a. Fire originating within a cabinet or console, and b. Exposure fire involving combustibles in the general room area. Manual fire fighting capability should be provided for both hazards. Hose stations and portable water and Halon extinguishers should be located in the control room to eliminate the need for operators to leave the control room. An additional hose piping shut off valve and pressure reducing device should be installed outside the control room. Hose stations adjacent to the control room with portable extinguishers in the control room are acceptable.	F.2 Control Room The control room is separated from other areas of the plant by floor, walls, and ceiling having a minimum fire resistance rating of 3 hr. Access to the control room is gained by passing through low range blast doors with construction equivalent to that of a 3-hr fire-rated door. The exit from the control room consists of a door from the air lock to the stairwell which has a construction equivalent to that of a 1.5-hr fire-rated door, and a 1.5 hr rated doors from the stairwell to adjacent areas. The control room PGCC subfloor sections longitudinal cable ducts are protected from fire by a total flooding Halon 1301 system. Portable Halon and dry chemical extinguishers are located inside the control room and a standby hose station is provided adjacent to the control room for manual fighting of fires in cabinets, consoles, and involving combustibles in the general room area. Fire detection in the PGCC cabinets and consoles is provided by smoke detectors. Fire detection in the PGCC subfloor sections longitudinal cable ducts is provided by smoke and thermal detectors. Alarm and

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A

Nozzles that are compatible with the hazards and equipment in the control room should be provided for the manual hose station. The nozzles chosen should satisfy actual fire fighting needs, satisfy electrical safety and minimize physical damage to electrical equipment from hose stream impingement.

Fire detection in the control room cabinets, and consoles should be provided by smoke and heat detectors in each fire area. Alarm and annunciation should be provided in the control room. Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.

Breathing apparatus for control room operators should be readily available. Control room floors, ceiling, supporting structures, and walls, including penetrations and doors, should be designed to a minimum fire rating of three hr. All penetration seals should be air tight.

The control room ventilation intake should be provided with smoke detection capability to automatically alarm locally and isolate the control room ventilation system to protect operators by preventing smoke from entering the control room.

Manually operated venting of the control room should be available so that operators have the option of venting for visibility. Manually operated ventilation systems are acceptable.

Cables should not be located in concealed floor and ceiling spaces. All cables that enter the control room should terminate in the control room. That is, no cabling should be simply routed through the control room from one area to another.

If such concealed spaces are used, however, they should have fixed automatic total flooding Halon protection.

CGS FIRE PROTECTION PROGRAM

annunciation are provided in the control room. Fire alarms in other parts of the plant are alarmed and annunciated in the control room.

Adequate numbers of SCBA are provided for fire fighting and damage control personnel. All penetration seals to the control room are pressure resistant. All ventilation penetrations into the control room are protected by 3-hr fire-rated dampers.

The control room ventilation intake is provided with smoke detection that alarms in the control room. The control room is also monitored by area smoke detectors. Smoke is prevented from entering the control room from other areas due to the pressurization of the room by the ventilation system. Makeup air for the control room ventilation system is drawn through the outside air intake which is located approximately 87 ft above the ground. If smoke is observed entering the intake, the control room operator has the option of drawing the makeup air through alternate intakes remote from the main plant buildings.

A fire in Fire Area RC-13 could close fire dampers which prevents control room pressurization and could allow some smoke infiltration into the control room. A nearby range fire could result in diluted smoke at each remote air intake. Significant smoke intake would actuate duct smoke detectors. If desired, operators can close control room air intake valves, which would also prevent control room pressurization. In either case, the control room operators can don staged SCBA or open control room doors and purge with smoke removal fan WEA-FN-7. See section F.2.5.5.

All cables in the suspended ceiling of the control room are in electric metallic tubing (EMT) type conduit. All cables in the raised floor extending beyond the PGCC cabinets are either enclosed in rigid steel conduit covered metal troughs, flexible metal conduit (with the outer jacket removed), Haveg Siltemp tape, or suitable fire resistive cable as identified in NFPA 70 for under raised floors. There are no automatic fixed Halon systems other than those protecting the PGCC subfloor sections longitudinal cable ducts.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
F.3.a Cable Spreading Room	F.3.a Cable Spreading Room
The preferred acceptable methods (for fire suppression) are: a. Automatic water system such as closed head sprinklers, open head deluge, or open directional spray nozzles. Deluge and open spray systems should have provisions for manual operation at a remote station; however, there should also be provisions to preclude inadvertent operation. Location of sprinkler heads of spray nozzles should consider cable tray sizing and arrangements to assure adequate water coverage. Cables should be designed to allow wetting down with deluge water without electrical faulting. Open head deluge and open directional spray systems should be zoned so that a single failure will not deprive the entire area of automatic fire suppression capability. The use of foam is acceptable, provided it is of a type capable of being delivered by a sprinkler or deluge system, such as an aqueous film forming foam (AFFF). b. Manual hoses and portable extinguishers should be provided as backup. c. Each cable spreading room of each unit should have divisional cable separation, and be separated from the other and the rest of the plant by a minimum 3-hr rated fire wall (see NFPA 251 or ASTM E-119 for fire test resistance rating). d. At least two remote and separate entrances are provided to the room for access by fire brigade personnel; and e. Aisle separation provided between tray stacks should be at least 3 ft wide and 8 ft high.	The cable spreading room is protected by a closed head preaction sprinkler system designed to protect the overhead and to protect alternate open cable trays horizontally every 10 ft of the cable tray. A large number of smoke detectors are installed to reduce detection time. Cables have been designed to allow wetting without electrical fault. Inadvertent operation is prevented by the preaction system because either a manual trip from a local manual pull station or an automatic trip from the ceiling mounted smoke detectors is required to actuate the deluge valve and flood the system with water. In addition sprinkler heads must be heat actuated before water will flow from the system. The system has been designed taking into consideration cable tray sizing and arrangements such that there is adequate water coverage. Dry chemical portable extinguishers are available inside and outside the cable spreading room. A manual hose station is located immediately outside one of the entrances. An additional hose can be extended from the next lower floor at the other entrance. The cable spreading room is separated from other areas of the plant by walls having a minimum fire resistance of 3 hr. There are two remote and separate entrances to the room having doors with a 3-hr rating. Generally, tray stacks are separated by 3-ft aisles and aisle headroom is typically 8 ft; however, there are some tray crossover and support obstructions which hamper but do not preclude access. Cables have been arranged to provide divisional separation in accordance with CGS electrical separation guidelines as described in Section 8.3.1.4.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
F.3.b Cable Spreading Room	F.3.b Cable Spreading Room
For cable spreading rooms that do not provide divisional cable separation of c, in addition to meeting a, b, d, and e (of paragraph F.3.a) above, the following should also be provided: a. Divisional cable separation should meet the guidelines of Regulatory Guide 1.75, "Physical Independence of Electric Systems." b. All cabling should be covered with a suitable fire retardant coating. c. As an alternate to a above, automatically initiated gas systems (Halon or CO_2) may be used for primary fire suppression, provided a fixed water system is used as a backup. d. Plants that cannot meet the guidelines of Regulatory Guide 1.75, in addition to meeting a, b, d and e above, an auxiliary shutdown system with all cabling independent of the cable spreading room should be provided.	The cable spreading room is designed to provide divisional separation as stated in paragraph F.3.a.
F.4 Plant Computer Room	F.4 Plant Computer Room
Safety-related computers should be separated from other areas of the plant by barriers having a minimum three-hour fire resistant rating. Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Manual hose stations and portable water and Halon fire extinguishers should be provided.	The plant computers are not safety related.
F.5 Switchgear Rooms	F.5 Switchgear Rooms
Switchgear rooms should be separated from the remainder of the plant by minimum three-hour rated fire barriers to the extent practicable. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Fire hose stations and portable extinguishers should be readily available.	Switchgear rooms have been separated from the remainder of the plant by 3 hr rated barriers. Duct penetrations serving the switchgear rooms are provided with 3 hr rated fire dampers. Cable penetrations are sealed. Automatic smoke detectors are provided to alarm in the control room. Manual hose stations and dry chemical portable extinguishers are available.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
Acceptable protection for cables that pass through the switchgear room is automatic water or gas agent suppression. Such automatic suppression must consider preventing unacceptable damage to electrical equipment and possible necessary containment of agent following discharge.	Cable routing has been designed such that cables either originate or terminate at the switchgear cabinets and do not just "pass through" the room.
F.6 Remote Safety-Related Panels	F.6 Remote Safety-Related Panels
The general area housing remote safety-related panels should be provided with automatic fire detectors that alarm locally and alarm and annunciate in the control room. Combustible materials should be controlled and limited to those required for operation. Portable extinguishers and manual hose stations should be provided.	All areas housing remote safety-related panels are provided with smoke detectors which alarm and annunciate in the control room. Local alarms can be initiated from the control room. Dry chemical portable extinguishers and hose stations are available. Combustible materials are controlled and limited to those required for operation.
F.7 Station Battery Rooms	F.7 Station Battery Rooms
Battery rooms should be protected against fire explosions. Battery rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of 3-hr inclusive of all penetrations and openings. See NFPA 69, "Standard on Explosion Prevention Systems." Ventilation systems in the battery rooms should be capable of maintaining the hydrogen concentration well below 2 vol. % hydrogen concentration. Standpipe and hose and portable extinguishers should be provided. Alternatives: a. Provide a total fire rated barrier enclosure of the battery room complex that exceeds the fire load contained in the room. b. Reduce the fire load to be within the fire barrier capability of 1.5 hr. or c. Provide a remote manual actuated sprinkler system in each room and provide the 1.5-hr fire barrier separation.	Battery rooms are separated from each other and other areas of the plant by walls with a minimum fire rating of 3 hr. Door assemblies are also 3-hr rated. Ventilation penetrations serving the battery rooms are protected by 1.5-hr fire rated dampers. This is in excess of that required by the fire loading. Other penetrations serving the battery rooms are sealed. The ventilation systems serving the battery room will maintain the hydrogen concentration below 2%. Dry chemical portable extinguishers and hose stations are available to the battery rooms.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
F.8 Turbine Lubrication and Control Oil Storage and Use Areas	F.8 Turbine Lubrication and Control Oil Storage and Use Areas
A blank fire wall having a minimum resistance rating of 3 hr should separate all areas containing safety-related systems and equipment from the turbine oil system. When a blank wall is not present, open head deluge protection should be provided for the turbine oil hazards and automatic open head water curtain protection should be provided for wall openings.	The turbine oil system is located in the turbine generator building, separate from all safety-related equipment by a minimum 3-hr fire-rated barrier and/or by spatial separation of at least 50 ft. Components of the turbine oil system are protected by deluge spray or wet sprinkler systems. The ceiling opening in the turbine oil reservoir room is protected by a deluge system.
F.9 Diesel Generator Areas	F.9 Diesel Generator Areas
Diesel generators should be separated from each other and other areas of the plant by fire barriers having a minimum fire resistance rating of three hr. Automatic fire suppression such as AFFF foam, or sprinklers should be installed to combat any diesel generator or lubricating oil fires. Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Drainage for fire fighting water and means for local manual venting of smoke should be provided. Day tanks with total capacity up to 1100 gal are permitted in the diesel generator area under the following conditions: a. The day tank is located in a separate enclosure, with a minimum fire resistance rating of three hr, including doors or penetrations. These enclosures should be capable of containing the entire contents of the day tanks. The enclosure should be ventilated to avoid accumulation of oil fumes. b. The enclosure should be protected by automatic fire suppression systems such as AFFF or sprinklers.	The diesel generators are separated from each other and other areas of the plant by walls and doors having a minimum fire resistance rating of 3 hr, except at 472 ft 9 in. (see FHA for Fire Areas DG-2 or DG-3). Each diesel generator and day tank is protected by a preaction sprinkler system. Fire detectors are provided for the diesel generator and day tanks which alarm and annunciate in the control room. Means for automatic smoke venting in the diesel generator rooms is accomplished through actuation of the mechanical exhaust air system. Water which would be emitted from the preaction or manual hose systems would be carried away by the floor drain system and through the exterior hinged door flap to the yard. Day tanks, each having a 3000-gal capacity, are provided in separate enclosed areas. One tank is provided for each diesel generator. The day tank enclosures have a minimum fire resistance, including doors, of 3 hr. Enclosure penetrations are sealed. The day tank areas are vented to avoid the accumulation of oil fumes. The enclosures are capable of containing the entire contents of the day tanks. No floor drains are provided in the day tank rooms.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
When day tanks cannot be separated from the diesel generator one of the following should be provided for the diesel generator area: a. Automatic open head deluge or open head spray nozzle system(s), b. Automatic closed head sprinklers, c. Automatic AFFF that is delivered by a sprinkler deluge or spray system, d. Automatic gas system (Halon or CO_2) may be used in lieu of foam or sprinklers to combat diesel generator and/or lubricating oil fires.	Although the total gallon capacity of the day tank exceeds 1100 gal (based on the hourly consumption of the tandem diesels), adequate structural, ventilation, and fire extinguishment features are provided.
F.10 Diesel Fuel Oil Storage Areas	F.10 Diesel Fuel Oil Storage Areas
Diesel fuel oil tanks with a capacity greater than 1100 gal should not be located inside the buildings containing safety-related equipment. They should be located at least 50 ft from any building containing safety-related equipment, or if located within 50 ft, they should be housed in a separate building with construction having a minimum fire resistance rating of 3 hr. Buried tanks are considered as meeting the 3-hr fire resistance requirements. See NFPA 30, "Flammable and Combustible Liquids Code," for additional guidance. When located in a separate building, the tank should be protected by an automatic fire suppression system such as AFFF or sprinklers. Tanks, unless buried, should not be located directly above or below safety-related systems or equipment regardless of the fire rating of separating floors or ceilings.	The diesel oil storage tanks are buried in the yard except for the end portion of each tank containing the transfer pump which extends under the diesel generator building. Each transfer pump is housed in its own room and is separated from other parts of the plant by a fire barrier with a minimum rating of 3 hr. Each pump room is vented mechanically to avoid accumulation of oil fumes. Automatic fire detection is provided in each room to alarm and annunciate in the control room. Each room is protected by a preaction sprinkler system.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
In operating plants where tanks are located directly above or below the diesel generators and cannot reasonably be moved, separating floor, and main structural members should, as a minimum, have fire resistance rating of three hr. Floors should be liquid tight to prevent leaking of possible oil spills from one level to another. Drains should be provided to remove possible oil spills and fire fighting water to a safe location. One of the following acceptable methods of fire protection should also be provided: a. Automatic open head deluge or open head spray nozzle system(s); b. Automatic closed head sprinklers; or c. Automatic AFFF that is delivered by a sprinkler system or spray system.	
F.11 Safety-Related Pumps	F.11 Safety-Related Pumps
Pump houses and rooms housing safety-related pumps should be protected by automatic sprinkler protection unless a fire hazards analysis can demonstrate that a fire will not endanger other safety-related equipment required for safe plant shutdown. Early warning fire detection should be installed with alarm and annunciation locally and in the Control Room. Local hose stations and portable extinguishers should also be provided.	Safety-related pumps in the reactor building and in the standby service water pump houses are not protected by sprinklers. Early warning fire detection which alarms and annunciates in the main control room is installed in these areas. Portable fire extinguishers and local hose stations are available. The fire hazards analysis for these areas indicates that a fire will not endanger post-fire safe shutdown capability. The non-safety-related circulating water pumps and fire pumps in the circulating water pump house and the secondary diesel fire pump in the water filtration building are protected by automatic sprinkler systems.
F.12 New Fuel Area	F.12 New Fuel Area
Hand portable extinguishers should be located within this area. Also, local hose stations should be located outside but within hose reach of this area. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Combustibles should be limited to a minimum in the new fuel area. The storage area should be provided with a drainage system to preclude accumulation of water.	New fuel is temporarily stored in a storage rack on the 606-ft elevation of the reactor building. Manual hose stations and dry chemical fire extinguishers are provided in the vicinity. Control room alarms are initiated by the automatic fire detection system. Local audible alarms can be manually sounded from the control room.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
The storage configuration of new fuel should always be so maintained as to preclude criticality for any water density that might occur during fire water application.	
F.13 Spent Fuel Pool Area	F.13 Spent Fuel Pool Area
Protection for the spent fuel pool area should be provided by local hose stations and portable extinguishers. Automatic fire detection should be provided to alarm and annunciate in the Control Room and to alarm locally.	Manual hose stations and dry chemical fire extinguishers are provided in the vicinity of the spent fuel pool. Automatic fire detectors are provided which alarm and annunciate in the control room. Local audible alarms can be manually sounded from the control room.
F.14 Radwaste Building	F.14 Radwaste Building
The radwaste building should be separated from other areas of the plant by fire barriers having at least three-hour ratings. Automatic sprinklers should be used in all areas where combustible materials are located. Automatic fire detection should be provided to annunciate the alarm in the control room and alarm locally. During a fire, the ventilation systems in these areas should be capable of being isolated. Water should drain to liquid radwaste building sumps. Acceptable alternative fire protection is automatic fire detection to alarm and annunciate in the control room, in addition to manual hose stations and portable extinguishers consisting of hand held and large wheeled units.	The radwaste building is separated from other areas of the plant by fire barrier walls and door assemblies which have fire ratings adequate for the fire loadings. All penetrations in the fire barrier walls are sealed. Automatic sprinkler systems have been provided to protect the prefiltration in the radwaste building exhaust filter systems. In addition, automatic sprinkler protection has been provided over the combustible storage on the 467-ft and 487-ft elevations of the building, and in the solid waste processing area on the 437-ft elevation. Fire detectors are installed in hazard areas to alarm and annunciate in the main control room. Manual hose stations and portable extinguishers are also provided. Water from the fire suppression systems would be drained into the floor drain system which is then pumped into the floor drain collection tank.
F.15 Decontamination Areas	F.15 Decontamination Areas
The decontamination areas should be protected by automatic sprinklers if flammable liquids are stored. Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally. The ventilation system should be capable of being isolated. Local hose stations and hand portable extinguishers should be provided as backup to the sprinkler system.	The principal decontamination area is located on the 467-ft level of the radwaste building. A personnel decontamination area is located on the 487-ft level of the radwaste building. The decontamination areas are monitored by automatic fire detectors. The decontamination area on the 467-ft elevation is protected by an automatic sprinkler system. Each area has dry chemical portable extinguishers and manual hose stations

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
	provided. Flammable liquids are not stored in decontamination areas. Capability for isolation of the ventilation system is not considered necessary for fire control due to the nature of the combustible loading in the area.
F.16 Safety-Related Water Tanks	F.16 Safety-Related Water Tanks
Storage tanks that supply water for safe shutdown should be protected from the effects of fire. Local hose stations and portable extinguishers should be provided. Portable extinguishers should be located in nearby hose houses. Combustible materials should not be stored next to outdoor tanks. A minimum of 50 ft of separation should be provided between outdoor tanks and combustible materials where feasible.	Water for shutdown is supplied from the condensate storage tanks which are located in the transformer yard on the north side of the turbine generator building. The tanks are separated from the yard area by a wall approximately 18 ft high. Portable extinguishers are provided in the turbine generator building. Manual hose stations are available from the yard hydrants or the turbine generator building. The suppression pool in the reactor building supplies water for post-fire safe shutdown. Manual hose stations and portable extinguishers are provided in the building.
F.17 Cooling Towers	F.17 Cooling Towers
Cooling towers should be of non-combustible construction or so located that a fire will not adversely affect any safety-related systems or equipment. Cooling towers should be of non-combustible construction when the basins are used for the ultimate heat sink or for the fire. Cooling towers of combustible construction, so located that a fire in them could adversely affect safety-related systems or equipment should be protected with an open head deluge system installation with hydrants and hose houses strategically located.	The cooling towers are constructed of non-combustible materials (except for fan shrouds, fan blades, fill material, and drift eliminators). The cooling towers are located remote from any safety-related buildings or equipment. The cooling tower basins are not used for the ultimate heat sink. There is a separate reliable fire protection water supply provided by a bladder tank remotely located away from the cooling towers.
F.18 Miscellaneous Areas	F.18 Miscellaneous Areas
Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms should be so located that a fire or effects of a fire, including smoke, will not adversely affect any safety-related systems or equipment. Fuel oil tanks for auxiliary boilers should be buried or provided with dikes to contain the entire tank contents.	Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms are located such that a fire or the effects of a fire, including smoke, will not adversely affect any safety-related systems or equipment. The auxiliary boiler fuel oil tank is buried in the yard.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
G. SPECIAL PROTECTION GUIDELINES	G. SPECIAL PROTECTION GUIDELINES
G.1 Welding and Cutting, Acetylene - Oxygen Fuel Gas Systems	G.1 Welding and Cutting, Acetylene - Oxygen Fuel Gas Systems
This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations and portable equipment should be provided as backup. The requirements of NFPA 51 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment. Also refer to 2f herein.	Bulk storage of flammable gases is in a special structure well separated from plant structures. When not in use (to support of ongoing maintenance activities), flammable gas welding equipment is stored in designated areas which do not contain safe post-fire shutdown systems. A permit system is used for welding control and/or temporary storage of welding gases in all areas except for those specifically designated. Plant procedures call for protection or removal of combustibles, protection of equipment/cabling, and fire watch during and after the welding operation. During normal plant operation, ordinary welding and cutting is done in designated welding areas, which may not have automatic suppression. However, manual suppression equipment is available.
G.2 Storage Areas for Dry Ion Exchange Resins	G.2 Storage Areas for Dry Ion Exchange Resins
Dry ion exchange resins should not be stored near essential safety-related systems. Dry unused resins should be protected by automatic wet pipe sprinkler installations. Detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally. Local hose stations and portable extinguishers should provide backup for these areas. Storage areas of dry resin should have curbs and drains. Refer to NFPA 92M, "Waterproofing and Draining of Floors."	Bulk storage of dry ion exchange resins is located on 467 ft elevation of the radwaste building. There are no safety-related systems or equipment located in this area. Smoke detectors and automatic sprinkler protection is provided. Portable extinguishers and hose stations are available. Floor drains are provided for removal of fire fighting water.
G.3 Hazardous Chemicals	G.3 Hazardous Chemicals
Hazardous chemicals should be stored and protected in accordance with the recommendations of NFPA 49, "Hazardous Chemicals Data." Chemicals storage areas should be well ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition.	Hazardous chemicals are controlled in accordance with plant procedures.

Table F.3-1

Comparison with BTP 9.5-1 Appendix A (Continued)

BTP 9.5-1 APPENDIX A	CGS FIRE PROTECTION PROGRAM
G.4 Materials Containing Radioactivity	G.4 Materials Containing Radioactivity
Materials that collect and contain radioactivity such as spent ion exchange resins, charcoal filters, and HEPA filters should be stored in closed metal tanks or containers that are located in areas free from ignition sources of combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.	Spent resins are contained in metal vessels or containers. HEPA and charcoal filters are disposed of on a routine basis such that no large accumulation exists. After removal, the interior storage is in a controlled area where hose stations and fire extinguishers are readily available.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
I. INTRODUCTION AND SCOPE	I. INTRODUCTION AND SCOPE
This appendix applies to licensed nuclear power electric generating stations that were operating prior to January 1, 1979, except to the extent set forth in § 50.48(b) of this part. With respect to certain generic issues for such facilities it sets forth fire protection features required to satisfy Criterion 3 of Appendix A to this part.[1] A Fire Protection Safety Evaluation Report that has been issued for each operating plant states how these guidelines were applied to each facility and identifies open fire protection issues that will be resolved when the facility satisfies the appropriate requirements of Appendix R to Part 50. Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions." When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boiloff. The phrases "important to safety" or "safety-related" will be used throughout this Appendix R as applying to all safety functions. The phrase "safe shutdown" will be used throughout this appendix as applying to both hot and cold shutdown functions.	Appendix R, Section I, is provided here for information only.

[1] Clarification and guidance with respect to permissible alternatives to satisfy Appendix A to BTP 9.5-1 has been provided in four other NRC documents:

"Supplementary Guidance on Information Needed for Fire Protection Evaluation," dated October 21, 1976;
"Sample Technical Specifications," dated May 12, 1977;
"Nuclear Plant Fire Protection Functional Responsibilities, Administrative Control and Quality Assurance," dated June 14, 1977;
"Manpower Requirements for Operating Reactors," dated May 11, 1978.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under post-fire conditions dose not per se impact public safety, the need to limit fire damage to systems desired to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents. Three levels of fire damage limits are established according to the safety functions of the structure, system, or component.	

Safety Function	Fire damage limits
Hot shutdown	One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of fire damage by a single fire, including an exposure fire.[2]
Cold shutdown	Both trains of equipment necessary to achieve cold shutdown may be damaged by a single fire, but damage must be limited so that at least one train can be repaired or made operable within 72 hr using onsite capability.
Design basis accidents	Both trains of equipment necessary for mitigation of consequences following design basis accidents may be damaged by a single exposure fire.

[2]Exposure fire - An exposure fire is a fire in a given area that involves either in situ or transient combustibles and is external to any structures, systems, or components located in or adjacent to that same area. The effects of such fire (e.g. smoke, heat, or ignition) can adversely affect those structures, systems, or components important to safety. Thus, a fire involving one train of safe shutdown equipment may constitute an exposure fire for the redundant train located in the same area and a fire involving combustibles other than either redundant train may constitute an exposure fire to both redundant trains located in the same area.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
The most stringent fire damage limit shall apply for those systems that fall into more than one category. Redundant systems used to mitigate the consequences of other design basis accidents but not necessary for safe shutdown may be lost to a single exposure fire. However, protection shall be provided so that a fire within only one such system will not damage the redundant system.	
II. GENERAL REQUIREMENTS	II. GENERAL REQUIREMENTS
A. Fire Protection Program	A. Fire Protection Program
A fire protection program shall be established at each nuclear power plant. The program shall establish the fire protection of structures, systems, and components important to safety at each plant and the procedures, equipment, and personnel required to implement the program at the plant site.	The Columbia Generating Station (CGS) fire protection program establishes the fire protection policy for the protection of structures, systems, and components important to safety and describes the plant procedures, equipment, and personnel required to implement the program at the plant site.
The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position and who has available staff personnel knowledgeable in both fire protection and nuclear safety.	The personnel assigned responsibilities for the fire protection program are described in Table F.3-1, Section A.1.
The fire protection program shall extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives: - to prevent fires from starting; - to detect rapidly, control, and extinguish promptly those fires that do occur; and - to provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.	The fire protection program shall extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives: - to prevent fires from starting; - to detect rapidly, control, and extinguish promptly those fires that do occur; and - to provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant in the event of fire.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
B. Fire Hazards Analysis	B. Fire Hazards Analysis
A fire hazards analysis shall be performed by qualified fire protection and reactor systems engineers to (1) consider potential in situ and transient fire hazards; (2) determine the consequences of fire in any location in the plant on the ability to safely shutdown the reactor or on the ability to minimize and control the release of radioactivity to the environment; and (3) specify measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability as required for each fire area containing structures, systems, and components important to safety in accordance with NRC guidelines and regulations.	The CGS fire hazards analysis is provided in Section F.4.
C. Fire Prevention Features	C. Fire Prevention Features
Fire protection features shall meet the following general requirements for all areas that contain or present a fire hazard to structures, systems, or components important to safety.	Fire prevention features have been established at CGS as listed below:
1. In situ fire hazards shall be identified and suitable protection provided.	1. The combustible loading calculation (Reference F.7.3.b) identifies the in-situ and the maximum expected transient fire loading in each plant fire area. The combustible loading calculation results are an input to the fire hazards analysis.
2. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and eliminated where possible. Those transient fire hazards that can not be eliminated shall be controlled and suitable protection provided.	2. Plant procedures control the introduction of combustible materials into the safety-related areas of the plant.
3. Fire detection systems, portable extinguishers, and standpipe and hose stations shall be installed.	3. Fire detection systems, portable fire extinguishers, and standpipe and hose connections are installed.
4. Fire barriers or automatic suppression systems or both shall be installed as necessary to protect redundant systems or components necessary for safe shutdown.	4. Fire barriers or automatic suppression systems or both are installed for the protection of redundant post-fire safe shutdown equipment as detailed in the fire hazards analysis.
5. A site fire brigade shall be established, trained, and equipped and shall be on site at all times.	5. The plant fire brigade has been established, trained, and equipped. The fire brigade is maintained onsite at all times. The fire brigade composition may be less than the minimum requirements for a period of time
6. Fire detection and suppression systems shall be designed, installed, maintained, and tested by	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
personnel properly qualified by experience and training in fire protection systems.	not to exceed 2 hr in order to accommodate unexpected absence provided immediate action is taken to fill the required position.
7. Surveillance procedures shall be established to ensure that fire barriers are in place and that fire suppression systems and components are operable.	6. Fire detection and suppression systems are designed by qualified engineering personnel. Maintenance and testing is performed by qualified plant maintenance and operations personnel in accordance with plant procedures. 7. Periodic testing procedures have been established to ensure that essential fire barriers are in place and that fire detection and suppression systems are operable.
D. Alternative or Dedicated Shutdown Capability	D. Alternative or Dedicated Shutdown Capability
In areas where the fire protection features cannot ensure safe shutdown capability in the event of a fire in that area, alternative or dedicated shutdown capability shall be provided.	Alternative shutdown capability is provided for use in the event of a fire in the main control room.
III. SPECIFIC REQUIREMENTS	III. SPECIFIC REQUIREMENTS
A. Water Supplies for Fire Suppression Systems	A. Water Supplies for Fire Suppression Systems
Two separate water supplies shall be provided to furnish necessary water volume and pressure to the fire main loop. Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. Two separate redundant suctions in one or more intake structures from a large body or water (river, lake, etc.) will satisfy the requirement for two separated water storage tanks. These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply. Each supply of the fire water distribution system shall be capable of providing for a period of 2 hr the maximum expected water demands as determined by the fire hazards analysis for safety-related fire areas or other areas that present a fire exposure hazard to safety-related areas.	See Section F.2.4.1 and Table F.3-1 (paragraphs E.2.a through E.2.g) for a description of the fire protection system water supplies.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
When storage tanks are used for combined service water/fire water use the minimum volume for fire uses shall be ensured by means of dedicated tanks or by some physical means such as a vertical standpipe for other water service. Administrative controls including locks for tank outlet valves, are unacceptable as the only means to ensure minimum water volume.	
Other water systems used as one of the two fire water supplies shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps. The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall not degrade the fire main system.	
B. Sectional Isolation Valves	B. Sectional Isolation Valves
Sectional valves or key operated valves shall be installed in the fire main loop to permit isolation of portions of the fire main loop for maintenance or repair without interrupting the entire water supply.	See Section F.2.4.1 and Table F.3-1, paragraph E.2.a. for a description of the fire protection system sectional isolation valves.
C. Hydrant Isolation Valves	C. Hydrant Isolation Valves
Valves shall be installed to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems in any area containing or presenting a fire hazard to safety-related or safe shutdown equipment.	See Section F.2.4.1 and Table F.3-1, paragraph E.2.a. for a description of the fire protection system hydrant isolation valves.
D. Manual Fire Suppression	D. Manual Fire Suppression
Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.	See Section F.2.5.3 and Table F.3-1, paragraph E.2.g and E.3.d for a description of the hose standpipe system. Fire hose stations in the reactor building are adequate to reach drywell fire hazards.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present an exposure fire hazard to structures, systems, or components important to safety.	
Standpipe and hose stations shall be inside PWR containments and BWR containments that are not inerted. Standpipe and hose stations inside containment may be connected to a high quality water supply of sufficient quantity and pressure other than the fire main loop if plant specific features prevent extending the fire main supply inside containment. For BWR drywells, standpipe and hose stations shall be placed outside the dry well with adequate lengths of hose to reach any location inside the dry well with an effective hose stream.	
E. Hydrostatic Hose Tests	E. Hydrostatic Hose Tests
Fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main pressure, whichever is greater. Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every 3 years.	See LCS 1.10.3 for a description of fire system hose hydrostatic testing.
F. Automatic Fire Detection	F. Automatic Fire Detection
Automatic fire detection systems shall be installed in all areas of the plant that contain or present a hazard to safe shutdown or safety-related systems or components. These fire detection systems shall be capable of operating with or without offsite power.	See Section F.2.3 and Table F.3-1, paragraphs E.1.a through E.1.d for a description of the fire detection system.
G. Fire Protection of Safe Shutdown Capability	G. Fire Protection of Safe Shutdown Capability
1. Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:	Fire protection of post-fire safe shutdown capability is provided as detailed in the fire hazards analysis, Section F.4.
a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hr.	
2. Except as provided for in paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided.	Deviations to section III.G.2 include the use of MI fire-related cable (see Section F.2.2.2 and Reference F.7.6.j), use of operator manual actions (see Section F.4.3.1 and Reference F.7.6.u) , and unprotected Division 2 instrument sensing lines associated with MS-LT-26D (see Reference F.7.6.x).
a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hr rating. Structural steel forming a part of or supporting such fire barriers shall be protected to provide fire resistance equivalent to that required of the barrier.	
b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 ft with no intervening fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.	
c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hr fire rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.	
Inside noninerted containments one of the following fire protection means shall be provided:	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
d. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 ft with no intervening combustibles or fire hazards;	
e. Installation of fire detectors and an automatic fire suppression system in the fire area; or	
f. Separation of cables and equipment and associated non-safety circuits of redundant trains by a noncombustible radiant energy shield.	
3. Alternative or dedicated shutdown capability and its associated circuits[3] independent of cables, systems, or components in the area, room, or zone under consideration shall be provided:	
a. Where the protection of system whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section; or	
b. Where redundant trains of system required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of the fire suppression systems.	
In addition, fire detection and a fixed fire suppression system shall be installed in the area, room, or zone under consideration.	

[3] Alternative shutdown capability is provided by rerouting, relocating, or modification of existing systems; dedicated shutdown capability is provided by installed new structures and systems for the function of post-fire shutdown.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
H. Fire Brigade	H. Fire Brigade
A site fire brigade trained and equipped for fire fighting shall be established to ensure adequate manual fire fighting capability for all areas of the plant containing structures, systems, or components important to safety. The fire brigade shall be at least five members on each shift. The brigade leader and at least two brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability. The qualification of fire brigade members shall determine their ability to perform strenuous fire fighting activities. The shift supervisor shall not be a member of the fire brigade. The brigade leader shall be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant safety-related systems. The minimum equipment provided for the brigade shall consist of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communication equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self-contained breathing apparatus using full-face positive pressure masks approved by National Institute for Occupational Safety and Health (NIOSH) - approval formerly given by the U.S. Bureau of Mines) shall be provided for fire brigade damage control and control room personnel. At least 10 masks shall be available for fire brigade personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or rated operating life shall be a minimum of 0.5 hr for the self-contained units.	The CGS plant complies with commitments related to post-fire safe shutdown plant equipment. The fire brigade composition is specified in Section 13.1.2.3.4. See paragraph II.C.5 above and Table F.3-1, paragraphs B.2 through B.5.
At least a 1-hr supply of breathing air in extra bottles shall be located on the plant site for each unit of self-contained breathing apparatus. In addition, an onsite 6-hr supply of reserve air shall be provided and arranged to permit quick and complete replenishment	CGS has a minimum of 10 SCBA units available for fire brigade use. The 1-hr plus 6-hr reserve air supply is provided by charged SCBA bottles staged onsite (see Reference F.7.6.r). The control room SCBA air supply (for non-Appendix R fires) is

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
of exhausted air supply bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air shall be used and the compressors shall be operable assuming a loss of offsite power. Special care must be taken to locate the compressor in areas free of dust and contaminants.	provided by bottles charged from the onsite SCBA compressor (see Reference F.7.6.s) that is not provided with offsite power.
I. Fire Brigade Training	I. Fire Brigade Training
The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained. The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, fire fighting practice, and fire drills.	The CGS plant fire brigade training program is described in Section 13.2.2.5. The requirements of this section were used as guidance in the development of this program. See Table F.3-1, paragraph B.5.
1. Instruction a. The initial classroom instruction shall include: (1) Indoctrination of the plant fire fighting plan with specific identification of each individual's responsibilities. (2) Identification of the type and location of fire hazards and associated types of fires that could occur in the plant. (3) The toxic and corrosive characteristics of expected products of combustion. (4) Identification of the location of fire fighting equipment for each fire area and familiarization with the layout of the plant including access and egress routes to each area. (5) The proper use of available fire fighting equipment and the correct method of fighting each type of fire. The types of fires covered should include fires in energized electrical equipment, fires in cables and cable trays, hydrogen fires, fires involving flammable and	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
combustible liquids or hazardous process chemicals, fires resulting from construction or modifications (welding), and record file fires.	
(6) The proper use of communication, lighting, ventilation, and emergency breathing equipment.	
(7) The proper method for fighting fires inside buildings and confined spaces.	
(8) The direction and coordination of the fire fighting activities (fire brigade leaders only).	
(9) Detailed review of fire fighting strategies and procedures.	
(10) Review of latest plant modifications and corresponding changes in fire fighting plans.	
NOTE: Items (9) and (10) may be deleted from the training of no more than two of the non-operations personnel who may be assigned to the fire brigade.	
b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and suitable trained in fighting the types of fires that could occur in the plant and in using the types of equipment available in the nuclear power plant.	
c. Instruction shall be provided to all fire brigade members and fire brigade leaders.	
d. Regular planned meetings shall be held at least every 3 months for all brigade members to review changes in the fire protection program and other subjects as necessary.	
e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
2-year period. These sessions may be concurrent with the regular planned meetings.	
2. Practice	
Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions shall provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting. These practice sessions shall be provided at least once per year for each fire brigade member.	
3. Drills	
a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team.	
b. Drills shall be performed at regular intervals not to exceed 3 months for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year.	
A sufficient number of these drills, but not less that one for each shift fire brigade per year, shall be unannounced to determine the fire fighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment. Persons planning and authorizing an unannounced drill shall ensure that the responding shift fire brigade members are not aware that a drill is being planned until it is begun. Unannounced drills shall not be scheduled closer than 4 weeks.	
At least one drill per year shall be performed on a “back shift” for each shift fire brigade.	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
c. The drills shall be preplanned to establish the training objectives of the drill and shall be critiqued to determine how well the training objectives have been met. Unannounced drills shall be planned and critiqued by members of the management staff responsible for plant safety and fire protection. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade members. Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.	
d. At 3-year intervals, a randomly selected unannounced drill shall be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from such individuals shall be available for NRC review.	
e. Drills shall as a minimum include the following:	
(1) Assessment of fire alarm effectiveness.	
(2) Assessment of each brigade member's knowledge of his or her role in the fire fighting strategy for the area assumed to contain the fire. Assessment of the brigade member's conformance with established plant fire fighting procedures and use of fire fighting equipment, including self-contained breathing apparatus, communication equipment, and ventilation equipment to the extent practicable.	
(3) The simulated use of fire fighting equipment required to cope with the situation and type of fire selected for	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
the drill. The area and type of fire chosen for the drill should differ from those used in the previous drill so that brigade members are trained in fighting fires in various plant areas. The situation selected should simulate the size and arrangement of a fire that could reasonably occur in the area selected, allowing for fire development due to the time required to respond, to obtain equipment, and organize for the fire, assuming loss of automatic suppression capability.	
(4) Assessment of brigade leader's direction of the fire fighting effort as to thoroughness, accuracy, and effectiveness.	
4. Records	
Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least 3 years to ensure that each member receives training in all parts of the training program. These records of training shall be available for NRC review. Retraining or broadened training for fire fighting within buildings shall be scheduled for all those brigade members whose performance records show deficiencies.	
J. Emergency Lighting	J. Emergency Lighting
Emergency lighting units with at least an 8-hr battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.	Emergency lighting is provided as detailed in Section 9.5.3.
K. Administrative Controls	K. Administrative Controls
Administrative controls shall be established to minimize fire hazards in areas containing structures, systems, and components important to safety. These controls shall establish procedures to:	The CGS plant complies with these commitments through implementation of the procedures of Reference F.7.8 which contain the program administrative controls. See Table F.3-1, paragraphs B.1 through B.5.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in safety-related areas.	
2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas with appropriate fire protection.	
3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safety-related systems or equipment during all phases of operating, and especially during maintenance, modification, or refueling operations.	
4. Designate the onsite staff member responsible for the in plant fire protection review of proposed work activities to identify potential transient fire hazards and specify required additional fire protection in the work activity procedure.	
5. Govern the use of ignition sources by use of a flame permit system to control operations. A separate permit shall be issued for each area where work is to be done. If work continues over more than one shift, the permit shall be valid for not more than 24 hr when the plant is operating or for the duration of a particular job when the plant is shutdown.	Ignition source permit extensions are strictly controlled during plant operating conditions.
6. Control the removal from the area of all waste, debris, scrap, oil spills, or other combustibles resulting from the work activity immediately following completion of the activity, or at the end of each work shift, whichever comes first.	
Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls.	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
8. Control the use of specific combustibles in safety-related areas. All wood used in safety-related areas during maintenance, modification, or refueling operations (such as laydown blocks or scaffolding) shall be treated with a flame retardant. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in safety-related areas if required for valid operating reasons. However, all combustible materials shall be removed from the area immediately following the unpacking. Such transient combustible material, unless stored in approved containers, shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting shall be placed in metal containers with tight-fitting self-closing metal covers.	Minor amounts of untreated wood are allowed to account for necessary tools and equipment used within plant areas.
9. Control actions to be taken by an individual discovering a fire, for example, notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.	
10. Control actions to be taken by the control room operator to determine the need for brigade assistance on report of a fire or receipt of alarm on control room annunciator panel, for example, announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.	
11. Control the actions to be taken by the fire brigade after notification by the control room operator of a fire, for example, assembling in a determined location, receiving directions from the fire brigade leader, and discharging specific fire fighting responsibilities including selection and transportation of fire fighting equipment to fire location, selection of protective equipment, operating instructions for use of fire suppression systems, and use of preplanned strategies for fighting fires in specific areas.	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
12. Define the strategies for fighting fires in all safety-related areas presenting a hazard to safety-related equipment. These strategies shall designate:	
a. Fire hazards in each area covered by the specific prefire plans.	
b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of these extinguishants.	
c. Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station or elevation for fighting the fire. All access and egress routes that involve locked doors should be specifically identified in the procedure with the appropriate precautions and methods for access specified.	
d. Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g. any hydraulic or electrical systems in the zone covered by the specific fire fighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).	
e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles that need cooling should be designated.	
f. Organization of fire fighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by any complete shift personnel complement. These duties include command control of the brigade,	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
transporting fire suppression and support equipment to the fire scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.	
g. Potential radiological and toxic hazards in fire zones.	
h. Ventilation system operation that ensures desired plant air distribution when ventilation flow is modified for fire containment or smoke clearing operations.	
i. Operations requiring control room and shift engineer coordination or authorization.	
j. Instructions for plant operators and general plant personnel during fire.	
L. Alternative and Dedicated Shutdown Capability	L. Alternative and Dedicated Shutdown Capability
1. Alternative or dedicated shutdown capability provided for a specific fire area shall be able to (a) achieve and maintain subcritical reactivity conditions in the reactor, (b) maintain reactor coolant inventory, (c) achieve and maintain hot standby[4] conditions for a PWR (hot shutdown for a BWR); (d) achieve cold shutdown conditions thereafter. During the post-fire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power, and the fission product boundary integrity shall not be affected; i.e. there shall be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary.	Alternative shutdown capability is provided for use in the event of a main control room fire. CGS does not utilize dedicated shutdown capability. Sections F.4.3 and F.4.4 address post-fire safe shutdown assumptions and methodology. See Section F.4.3.2 for the remote post-fire safe shutdown system and Table F.4-1 for equipment credited for remote post-fire safe shutdown.
2. The performance goals for the shutdown functions shall be:	

[4] As defined in the Standard Technical Specifications.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
a. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.	
b. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and within the level indication in the pressurizer for PWRs.	
c. The reactor heat removal function shall be capable or achieving and maintaining decay heat removal.	
d. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.	
e. The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of the equipment used for safe shutdown functions.	
3. The shutdown capability for specific fire areas may be unique for each such area, or it may be one unique combination of systems for all such areas. In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodated post-fire conditions where offsite power is available and where offsite power is not available for 72 hr. Procedures shall be in effect to implement this capability.	
4. If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems will not be capable of being powered by both onsite and offsite electric	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
power systems because of fire damage, an independent onsite power system shall be provided. The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be onsite at all times.	
5. Equipment and systems comprising the means to achieve and maintain cold shutdown shall not be damaged by fire, or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hr. Materials for such repairs shall be readily available onsite and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hr after the fire will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. Equipment and systems used after 72 hr may be powered by offsite power only.	
6. Shutdown system installed to ensure post-fire shutdown capability need not be designed to meet Seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons, e.g. because of interface with or impact on existing safety system, or because of adverse valve actions due to fire damage.	
7. The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits or safe shutdown	

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
cables from the redundant division, or the isolation of the associated circuits such that a postulated fire involving associated circuits will not prevent safe shutdown.[5]	
M. Fire Barrier Cable Penetration Seal Qualification	M. Fire Barrier Cable Penetration Seal Qualification
Penetration seal designs shall use only noncombustible materials and shall be qualified by tests that are comparable to tests used to rate fire barriers. The acceptance criteria for the test shall include:	CGS complies with this commitment except that silicone foam is combustible. See Section F.2.2 for a discussion of penetration seal qualification.
N. Fire Doors	N. Fire Doors
Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.	See Section F.2.2.1 and LCS 1.10.5 for a discussion of fire doors.
One of the following measures shall be provided to ensure they will protect the opening as required in case of fire:	
1. Fire doors shall be kept closed and electrically supervised at a continuously manned location;	
2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position;	
3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or	
4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position.	

[5] An acceptable method of complying with this alternative would be to meet Regulatory Guide 1.75 position 4 related to associated circuits and IEEE Standard 384-1974 (Section 4.5) where trays from redundant safety divisions are so protected that postulated fires affect trays from only one safety division.

Table F.3-2

Comparison with the Specific Commitments
to 10 CFR 50 Appendix R (Continued)

10 CFR 50 APPENDIX R SECTION	CGS FIRE PROTECTION PROGRAM
The fire brigade leader shall have ready access to keys for any locked fire doors.	
Areas protected by automatic total flooding has suppression systems shall have electrically supervised self-closing fire doors or shall satisfy option 1 above.	
O. Oil Collection System for Reactor Coolant Pump	O. Oil Collection System for Reactor Coolant Pump
The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation. The oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the safe shutdown earthquake.[6]	The CGS plant has a nitrogen inerted containment and therefore this does not apply to CGS.

[6] See Regulatory Guide 1.29 - "Seismic Design Classification," Paragraph C.2.

F.4 FIRE HAZARDS ANALYSIS

The fire hazards analysis determines the adequacy of the fire protection features to prevent and mitigate the consequences of a postulated fire. A fire hazards analysis is performed for each fire area within the reactor building, the radwaste control building, the diesel generator building, the standby service water pump houses, reactor recirculation system (RRC) pump adjustable speed drive (ASD) building, and the turbine generator building.

The fire hazards analysis identifies the potential fire consequences based on consideration of the design basis fire, the location of post-fire safe shutdown equipment and cabling located within the area, the construction of the fire area, and the available fire protection systems. Potential fire consequences are evaluated to:

- Ensure the capability to achieve and maintain safe shutdown,
- Prevent radioactive release to ensure the health and safety of the public,
- Ensure safe egress for employees, and
- Provide for plant property protection.

The ability of the plant to attain and maintain post-fire safe shutdown is evaluated against the following:

- 10 CFR 50 Appendix A, General Design Criterion 3, Fire Protection,
- 10 CFR 50 Appendix R, Section III.G, Fire Protection of Safe Shutdown Capability,
- 10 CFR 50 Appendix R, Section III.J, Emergency Lighting, and
- 10 CFR 50 Appendix R, Section III.L, Alternative and Dedicated Shutdown Capability.

Clarification on the above was obtained from various generic letters (Reference F.7.2.f).

The methodology used to perform the fire hazards analyses is detailed below.

F.4.1 PLANT FIRE AREA ARRANGEMENT

The plant buildings are divided into fire areas generally based on the location of equipment needed for safe post-fire shutdown and on the construction of the building walls, floor, and ceiling assemblies. A fire area is that portion of a building or plant site which is separated from other areas by barriers which are sufficient to withstand the fire hazards associated with the area and which will protect important equipment outside the area from a fire within the area. Section F.4.4.3 provides a listing and description of the plant fire areas. Drawings which show the arrangement of the plant fire areas are contained in Section F.6.

F.4.2 DESIGN BASIS FIRE

The fire hazards analysis uses the concept of a "design basis fire" to estimate the magnitude and severity of a potential fire. Design basis fires are those postulated to result from the combustion of the exposed combustibles within the fire area, assuming that no manual or automatic fire fighting has been initiated. The effects of the design basis fire are evaluated to ensure the adequacy of the fire area boundaries and to evaluate the potential effects of the fire on plant equipment located within the area. The combustible loading for each fire area is contained in calculation FP-02-85-03.

The combustible loading value is intended to provide an approximate estimate of the probable maximum fire severity. The combustible load concept does not account for factors such as ceiling height, ventilation, combustible concentrations, or storage methods which may significantly affect actual fire growth. The combustible load is usually conservative as it assumes total combustion whereas more accurate methods account for residue and incomplete combustion. The combustible load provides a conservative, relative measure of expected fire severity in each plant fire area. This conservatism in the combustible loading calculation generally accounts for combustibles which are not specifically included in the area fire loading.

F.4.2.1 Combustible Loading Assumptions

To calculate the area combustible loading, the major sources of combustibles within each plant fire area are identified. The entire weight of cable insulation in cable trays (covered or open) is included in the combustible loading. Cables inside conduits and within fire rated raceway barriers are not considered in the overall area combustible loading calculation. Enclosures or electrical panels are expected to prevent the electrical cabling from significantly contributing to the general area fire hazard. The only exception is cabling inside main control room electrical panels which is included in the combustible loading calculation. Cabling within the main control room power generation control complex (PGCC) underfloor raceways is excluded due to the protective steel enclosures and Halon protection.

Similarly, oil or grease in totally enclosed bearing housings in which the oil or grease is not pressurized or recirculated (such as the grease inside a motor operator) is not included in the combustible load calculations. Flammable/combustible liquids stored inside listed storage cabinets are also not considered to contribute to the general area fire hazard.

The transient combustible loading is generally included in the area combustible loading calculation by adding a value of 7,496,500 Btu (corresponding to a 55-gal drum of oil) to the heat release for the fire area. Certain fire areas may have larger or smaller transient fire loadings due to fire area location and use. The transient combustible value for the fire area is assumed to represent a bounding value of the potential transient fire loading and is not expected to exactly correlate with plant walkdown data.

Floor covering materials are considered combustible if they represent an unusual hazard (wood, plastic or rubberized floor coverings and carpeting).

F.4.2.2 Combustible Loading Calculations Methodology

The combustible loading values were developed as follows:

a. First, the major sources of combustibles (oil, electrical cable, charcoal, and storage) are identified. Data from plant equipment manuals is used when available to verify the oil and charcoal quantities. The amount of electrical cable within each area is obtained from electrical raceway information. Quantities of other materials were estimated during plant walkdowns.

b. Second, the heat release from each combustible is multiplied by its heat of combustion yielding the heat released. The lower heat of combustion value is used as the combustion products remain gaseous under fire conditions. This value represents a 'maximum' heat release as incomplete oxidation or partial burning in an actual fire would reduce the heat release. See Reference F.7.3.b for a list of material heat of combustion values (Btu/lb).

c. Next, the gross floor area (the floor area within the inside perimeter of the outside walls of the building with no deduction for interior walls, columns, or other features) of the fire area is calculated using dimensions taken from (or scaled from) plant drawings.

d. The total heat released (Btu) from the in-situ combustible materials in the fire area is totaled with the assumed heat release due to transient fire loading. This value is divided by the gross floor area (ft^2) yielding the fire loading for the fire area in Btu/ft^2.

e. The expected duration of the fire may be estimated from the combustible loading calculation by dividing the fire loading in the fire area by 80,000 Btu/ft^2. This value corresponds to a 1-hr fire loading (Reference F.7.2.j).

f. The Section F.4.4.4 detailed Fire Hazards Analysis (FHA) does not list the specific combustible loading in Btu/ft^2 or expected fire duration. The detailed combustible loading analysis is in calculation FP-02-85-03 (Reference F.7.3.b). The detailed FHA, Section F.4.4.4, lists the relative fire area hazard severity as follows:

Low = 0 to 80,000 Btu/ft^2
Medium = between 80,000 and 160,000 Btu/ft^2
High = above 160,000 Btu/ft^2

The above is based on NFPA (Reference F.7.2.j) with additional conservative margin.

F.4.2.3 Fire Protection Engineering Evaluations

In accordance with the guidance of Generic Letter 86-10, fire protection engineering evaluations may be performed to assess the adequacy of alternatives to prescriptive fire protection guidance documents. Examples include deviations to NFPA codes, partial area suppression or detection, less than 3-hr barriers, etc., and typically involve a comparison of the hazards to the fire protection features. Fire protection engineering evaluations deviating from NRC committed guidance documents should be prepared/approved by a qualified fire protection engineer, meet Standard License Condition 2.c(14) and be maintained on file for NRC review.

F.4.3 POST-FIRE SAFE SHUTDOWN

The systems and equipment which are designated as post-fire safe shutdown equipment represent the minimum equipment which is necessary to bring the plant to a safe cold shutdown condition in the event of a fire in any area of the plant. Only that portion of post-fire safe shutdown equipment which is expected to be free of fire damage is credited for post-fire safe shutdown, although other plant systems and equipment could also be available for use after a fire.

The development of the post-fire safe shutdown equipment list is based on the following:

- The post-fire safe shutdown systems must be capable of accommodating conditions where offsite power is available or where offsite power is not available for 72 hr.

- Fires are not postulated to occur simultaneously with other plant accidents or design basis events such as a loss-of-coolant accident (LOCA), an operating basis earthquake, or a safe shutdown earthquake.

- Single failure (including operator error) is not considered (i.e., only a single shutdown train is required to mitigate a design basis fire). For example, a single failure of a remote shutdown transfer switch is not considered in the analysis of the remote shutdown system.

- All plant equipment is functional (not in test, maintenance, or out of service) at the time of fire.

- The post-fire safe shutdown systems need not be designed to cope with other plant accidents such as pipe breaks or stuck valves, except those portions of the systems which interface with or impact existing safety systems.

- The safe shutdown capability should not be adversely affected by a fire which results in the loss of all automatic function from unprotected circuits located in the area in conjunction with one worst case spurious actuation or signal resulting from a fire.

- Fail safe circuits (electrical divisions 4, 5, 6, and 7) are designed to fail in a safe manner if subjected to fire damage. For example, reactor scram, once initiated, cannot be overridden as a consequence of fire.

- Alternative shutdown systems used in the event of a main control room fire must meet the commitments to 10 CFR 50, Appendix R Section III.L, with the exception of the following:

  Section III.L.1 requires that "during post-fire shutdown, the reactor coolant system process variables be maintained within those predicted for a loss of normal ac power." The Columbia Generating Station (CGS) analysis is based on maintaining reactor parameters within those values predicted for the existing Chapter 15 transient analyses. Spurious signals are considered one at a time, and are evaluated to determine whether the signal could indirectly or directly affect safe shutdown capability (Reference F.7.5.c).

- Three phase power feeders are assumed not to fail in such a manner as to reconnect to an adjacent three phase power feeder and cause an electrically isolated motor to operate except for those supplying power to high-to-low pressure interface valves.

- Due to low fire loading and the large size of Fire Area R-1 or available fire suppression and detection systems in Fire Areas TG-1, Zone TG-12, and RC-3, the failure of Seismic Category I supports and steel raceways in such a manner that cross circuiting of cables between raceways or loss of safe shutdown equipment from falling debris is not considered to be credible.

- Failure of nonseismically supported electrical components of lighting, communication, fire protection, and security systems have been evaluated to ensure post-fire safe shutdown components in Seismic Category I areas are not affected.

- Stainless steel instrument sensing lines and their supports have been analyzed to ensure that the lines will not fail as a result of the temperature increases resulting from potential fire conditions in the vicinity of the lines. In certain areas, the sensing lines are routed through areas which are estimated to have a localized fire loading which could result in support temperatures exceeding 1200°F. In these areas, the sensing line supports are protected by fire barriers.

- A properly coordinated circuit protective device (fuse, breaker, etc.) will isolate any downstream fault that results from a design basis fire even if the protective device is in the fire area.

- The emergency or abnormal response procedures allow the operator sufficient information to determine which equipment is available for post-fire shutdown in the event of a fire outside the main control room.

- There are no actions (repairs) taken by plant staff to bring back into service a piece of equipment which has failed due to fire conditions and is necessary for safe post-fire shutdown.

To provide the capability to safely shut down with or without offsite power available, post-fire shutdown is accomplished using the suppression pool for reactor inventory and depressurization (Reference F.7.3.c).

Post-fire safe shutdown may be initiated by a manual reactor scram or by an automatic scram resulting from a loss of offsite power with the accompanying loss of normal feedwater. The negative reactivity available due to control rod insertion upon scram will maintain subcriticality from event initiation to cold shutdown. The high pressure systems (e.g., HPCS or RCIC) are assumed to be unavailable for post-fire shutdown.

The main steam isolation valves (MSIVs) are closed manually or automatically by a loss of the grid. Vessel isolation occurs as the water level decreases and no high pressure makeup systems are available. Upon isolation, the vessel pressure increases resulting in the safety/relief valve (SRV) opening and discharging steam to the suppression pool. Manual operation of the automatic depressurization system (ADS) SRVs is initiated to rapidly depressurize the vessel and allow initiation of residual heat removal system in its alternative cooling mode. The automatic features of the systems such as the RHR logic circuitry or auto synchronizing of the diesel generator are not credited for post-fire safe shutdown.

At least five SRVs and one residual heat removal loop are available for post-fire shutdown for a fire in any area. In the event of a main control room fire, at least five SRVs are available (three SRV controls are provided on each remote shutdown panel). Depressurization is accomplished using five SRVs as a minimum, as prescribed in the Emergency Operating Procedures (EOPs). GE analysis shows that peak clad temperature and reactor pressure vessel (RPV) water level remain acceptable for a blowdown initiated when wide range water level instrument indicates TAF (-150 in. including loop inaccuracies) (Reference F.7.3.c). TAF is shown to be reached at approximately 23 minutes after main steam line isolation, if no low pressure system injection occurs.

The RHR system is used in its alternate shutdown cooling mode to remove decay heat and maintain the suppression pool temperature below limits. Cooling water to the RHR system is supplied by the service water system.

Instrumentation for reactor vessel water level, reactor vessel pressure, suppression pool temperature, and suppression pool water level are used for process monitoring during post-fire shutdown.

Ventilation systems for the main control room, remote shutdown room, vital switchgear rooms, cable spreading room/cable chase, safe shutdown pump rooms, and MCC rooms in the reactor building are evaluated to ensure they remain available to support post-fire shutdown where required.

See Figures F.6-12 through F.6-17 and Reference F.7.7.q for post-fire safe shutdown one-line and P&ID drawings. See Figures F.6-18 through F.6-20 for post-fire safe shutdown credited lighting and communication components.

High to low pressure interfaces are defined as any low pressure piping that connects directly to the reactor coolant system boundary. To prevent a LOCA outside the primary containment from occurring due to a DBF, protection of at least one of two series high-to-low pressure interface valves is required. Energy Northwest does not consider paths with three or more normally closed valves to be a concern during fire-generated spurious equipment operation. High to low pressure interface flow paths requiring two or less spurious actuations are evaluated relative to their safety significance. The following is a listing of high to low pressure interface valves evaluated for the effects of fire.

a. RHR-V-123A and RHR-V-123B, RHR-V-53A and RHR-V-53B, RHR-V-8 and RHR-V-9 - during normal plant operation, power is removed from RHR-V-9, RHR-V-123A and RHR-V-123B. This precludes operation via spurious control circuit energization. The power cable is routed in a grounded steel conduit containing no energized circuits in fire areas R-1 and RC-3 (RHR-V-9) to prevent valve opening.

b. MS-V-1 and MS-V-2 - the spurious opening of these valves result in an equivalent small break LOCA inside containment with a potential for radiological release to the environment. Multiple system actuations will also occur as a result of the expected high drywell pressure. The results of the analysis are listed below:

1. RPV inventory loss is minimal with direct RPV inventory return to the suppression pool,

2. Resulting containment parameters are bounded by the small break LOCA analysis,

3. Multiple system actuations have no effect on safe shutdown, and

4. Radioactivity release will be minimal since containment will isolate on a FA signal limiting dose to less than 10 CFR 100 limits.

c. RCIC-V-45 and RCIC-RD-1 and RCIC-RD-2:

1. RPV inventory losses are well within the makeup capability of the protected RHR system,

2. Flooding in secondary containment does not affect safe shutdown, and

3. The potential radioactivity releases offsite are well below 10 CFR 100 limits.

d. RWCU-FCV-33 and RWCU-V-34 or RWCU-V-35 - plant procedures direct the closure of a manual isolation valve RWCU-V-32 as part of the fire safe shutdown process.

e. RCIC-V-65 to RCIC-V-66, HPCS-V-5, LPCS-V-6, RHR-V-41A to -41B to -41C, RHR-V-50A to RHR-V-53A, RHR-V-50B to RHR-V-53B – flow paths are multiple testable check valves and the check valve operators can neither unseat nor prevent from seating the valve flapper when a differential pressure exists across the valve (valves are for testing purposes only). A fire induced failure of the solenoid actuators for the pneumatic operators cannot cause the valves to simultaneously open.

f. PSR-V-X77A/1 to PSR-V-X77A/2 and PSR V-X77A/3 to PSR-V-X77A/4 – flow paths are via sample valves which are keylocked shut. Since the outboard Containment Isolation Valves PSR-V-X77A/2 and PSR-V-X77A/4 are also keylocked shut, fire cannot cause the valves to simultaneously open.

F.4.3.1 Normal Post-Fire Safe Shutdown Equipment

One train of the normal post-fire safe shutdown equipment is used to bring the plant to a safe cold shutdown condition from the main control room. The normal post-fire safe shutdown systems consist of two redundant trains (Division 1 and Division 2) as follows:

The Division 2 post-fire safe shutdown system consists of equipment and cabling of the following systems:

RHR B (alternate shutdown cooling mode Division 2),
SW B (Division 2),
ADS/MSRV (Division 2),
Supporting heating, ventilating, and air-conditioning (HVAC) systems (Division 2),
System status monitoring instrumentation (Division 2),
MSIVs (Division 2), and
Supporting electrical power, DG and battery (Division 2).

The Division 1 post-fire safe shutdown system consists of equipment and cabling of the following systems:

RHR A (alternate shutdown cooling mode, Division 1),
SW A (Division 1),
ADS/MSRV (Division 1),
Supporting HVAC systems (Division 1),
System status monitoring instrumentation (Division 1),
MSIVs (Division 1), and
Supporting electrical power including DG and battery (Division 1).

The automatic features of these systems, such as the RHR logic circuitry or auto-synchronizing of the diesel generator are not credited. Only those instruments which are designated as post-fire safe shutdown equipment have been evaluated to ensure their availability in the event of fire.

Normal shutdown operator manual actions are identified and evaluated in the Reference F.7.3.d. Reference F.7.6.u identifies which normal shutdown manual operator actions are a 10 CFR 50 Appendix R III.G.2 deviation and documents their feasibility and reliability.

The normal post-fire safe shutdown equipment is listed in Table F.4-1.

F.4.3.2 Remote Post-Fire Safe Shutdown Equipment

In the event of a main control room fire, selected portions of the Division 1 and Division 2 post-fire safe shutdown systems are used to shut down the reactor from outside the control room. Necessary instrumentation and controls for three Division 1 and three Division 2 SRVs, Division 2 RHR, Division 2 service water, and supporting power and ventilation systems are located on the remote shutdown and other local panels. Manual transfer switches isolate the controls for certain components from the main control room.

The only operator actions which are credited prior to evacuation are manual reactor scram and MSIV closure. Prior to control room evacuation, the operators will request Security to unlock security doors required for remote shutdown and announce the reactor scram and control room evacuation. If time is available, prior to control room evacuation, the operators will also perform the following actions:

- Manually initiate reactor core isolation cooling (RCIC),
- Start SW loop A and B,
- Trip the main generator, and
- Transfer SM-7 and SM-8 to the backup transformer.

The MSIVs and the reactor protection system (RPS) are fail safe systems which are routed in grounded raceways to ensure that loss of power resulting from a fire will fail these circuits to a safe condition.

Following evacuation of the control room, the operators

- Transfer control away from the control room to the remote shutdown and other local panels,

- Start standby service water pump to provide cooling water to the diesel generator,

- Start diesel generator 2 and manually sync to grid,

- Initiate RHR in the alternate shutdown cooling mode (injection of suppression pool water directly into the reactor) when the reactor pressure is reduced below the RHR pump design operating pressure,

- Operate a minimum of five SRVs using the controls at the remote and alternate remote shutdown panels when RPV level reaches 150 in. indicated, and

Reference F.7.3.d lists all remote shutdown operator manual actions.

Indication for the following parameters is located on the remote shutdown panels:

Reactor water level,
Reactor pressure,
Suppression pool water level,
Suppression pool water temperature,
Residual heat removal pump flow, and
Standby service water pump discharge pressure.

The Division 2 diesel generator supplied emergency lighting in the remote shutdown areas at el. 467 ft of the radwaste building has been evaluated to ensure the lighting will remain available in the event of a control room fire.

The remote post-fire shutdown system thus consists of the following:

RHR B (Division 2),
SW B (Division 2),
ADS/MSRV (Division 1 and Division 2),
Supporting HVAC systems (Division 2),
System status monitoring instrumentation, and
Supporting power train including DG-2 and Division 1 and Division 2 battery.

The automatic features of these systems, such as the RHR logic circuitry or auto-synchronizing of the diesel generator are not credited. Only those instruments which are designated as post-fire safe shutdown equipment been evaluated to ensure their availability in the event of fire.

Controls and instrumentation for the RCIC system are located on the remote shutdown panel. However, the RCIC system and the high-pressure core spray (HPCS) system have not been protected from the effects of a control room fire.

The major components for remote post-fire safe shutdown are listed in Table F.4-1.

F.4.4 FIRE AREA ANALYSES

F.4.4.1 Post-Fire Safe Shutdown

The potential consequences of fire damage are analyzed by evaluating the post-fire safe shutdown equipment by fire area. Post-fire safe shutdown equipment in the fire area is assumed damaged by the postulated fire, unless the equivalent level of fire protection specified by Appendix R, Section III.G is provided or the configuration is within the basis of an approved deviation.

For fire areas outside the main control room, the equipment/cabling within the area is reviewed to ensure that redundant post-fire shutdown systems remain available. First, the area is assigned as Division 1 or Division 2 based on the train of post-fire safe shutdown equipment which would be lost due to a fire in the area. Any cabling or equipment of the redundant division (which is credited for operation of post-fire safe shutdown) which is located within the area is then identified. Equipment and cabling within the main control room is evaluated to ensure that a fire will not prevent remote shutdown.

Potential multiple high impedance faults are evaluated in Reference F.7.3.ee per the Reference F.7.2.w base case. Safe shutdown power supplies that do not meet the base case are credible and are addressed in Reference F.7.3.d.

Any spurious signal cables (those cables which could cause a malfunction if compromised by a hot short, open circuit, or short to ground) which could affect the post-fire safe shutdown are analyzed to identify the potential effects of fire on post-fire safe shutdown capability. Only one spurious actuation alone, with the effects of that actuation, are assumed to occur at a time.

The adequacy of the construction of the fire area boundaries is evaluated as part of the fire hazards analysis by a comparison of the area fire hazards to the active and passive fire protection features and specific post-fire safe shutdown requirements.

The fire hazards analysis for certain areas is unique:

U-1. A fire hazards analysis is performed for primary containment (Fire Area R-2); however, the post-fire safe shutdown capability is not specifically evaluated as primary containment is inerted during power operation;

U-2. The main control room (Fire Area RC-10) is analyzed to ensure the remote shutdown system will remain available;

F.4.4.2 <u>Control of Radioactive Release</u>

A fire induced radioactive release to the environment can occur via one of the following mechanisms:

a. Inadvertent primary coolant release to the environment,

b. Inadvertent radwaste system release to the environment,

c. Contaminated smoke due to the combustion of radioactive material, and

d. Contaminated water produced as a product of fire suppression in areas containing radioactive material.

Normal plant operating procedures provide guidance for ensuring that appropriate design features are used to monitor and control the release of radioactivity to the environment which may occur as the result of a fire or fire fighting activities. Specific design features to be used will be determined at the time of the fire by health physics personnel and the Environmental Field Team, as necessary. The design features provided along with fire brigade training will ensure that any release of radiation due to fire will be controlled and monitored.

Reactor coolant system integrity is among several functional requirements necessary to achieve safe shutdown. Equipment necessary to meet these functional requirements has been identified and analyzed.

The liquid waste management system is discussed in Section 11.2. The system is designed to process potentially radioactive liquids from fire suppression activities in a manner which limits radiation exposure and controls the release of potentially radioactive material.

In the reactor building, turbine building, and radwaste building, contaminated liquid resulting from fire suppression activities in contaminated areas is routed through floor drains to the liquid waste management system. The HVAC exhaust vents in these buildings are provided with radiation monitors and can be isolated to limit the spread of smoke. In addition, procedural controls and fire brigade training stress the need to control and minimize the potential release of fire suppression water and smoke. Environmental field teams would be used as needed to monitor releases from the turbine generator, reactor, or radwaste buildings due to a significant fire.

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment
List of Primary Components

ASD/SRV SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
MS-SPV-3DA	R-2	MS-SPV-3DB	R-2	MS-SPV-3DA	R-2
MS-SPV-4AA	R-2	MS-SPV-4AB	R-2	MS-SPV-4AB	R-2
MS-SPV-4BA	R-2	MS-SPV-4BB	R-2	MS-SPV-4BB	R-2
MS-SPV-4CA	R-2	MS-SPV-4CB	R-2	MS-SPV-4CB	R-2
MS-SPV-5BA	R-2	MS-SPV-5BB	R-2	MS-SPV-5BA	R-2
MS-SPV-5CA	R-2	MS-SPV-5CB	R-2	MS-SPV-5CA	R-2

HI-LO PRESSURE INTERFACE

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
MS-V-2	R-2	MS-V-1	R-2	N/A	N/A
RCIC-V-45	R-6	N/A	N/A	N/A	N/A
RHR-V-8	R-1	RHR-V-9	R-2	RHR-V-9	R-2
RHR-V-53A	R-1	RHR-V-53B	R-1	RHR-V-53B	R-1
RHR-V-123A	R-2	RHR-V-123B	R-2	RHR-V-123B	R-2
RWCU-FCV-33	R-1	N/A	N/A	N/A	N/A
RWCU-V-34	R-1	N/A	N/A	N/A	N/A
RWCU-V-35	R-1	N/A	N/A	N/A	N/A

HVAC SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
DEA-FN-11	DG-2	DEA-FN-21	DG-3	DEA-FN-21	DG-3
DEA-FN-12	DG-2	DEA-FN-22	DG-3	DEA-FN-22	DG-3
DMA-FN-11	DG-2	DMA-FN-21	DG-3	DMA-FN-21	DG-3
DMA-FN-12	DG-2	DMA-FN-22	DG-3	DMA-FN-22	DG-3
PRA-FN-1A	SW-1	PRA-FN-1B	SW-2	PRA-FN-1B	SW-2
RRA-FN-2	R-5	RRA-FN-3	R-4	RRA-FN-3	R-4
RRA-FN-11	R-1	N/A	N/A	N/A	N/A
RRA-FN-13	R-1	N/A	N/A	N/A	N/A
WMA-AD-51A1	RC-11	WMA-AD-51B1	RC-12	N/A	N/A
N/A	N/A	WMA-AD-52/1	RC-12	N/A	N/A
N/A	N/A	WMA-AD-52/2	RC-12	N/A	N/A
WMA-EHC-7A	RC-5	WMA-EHC-8	RC-6	WMA-EHC-8	RC-6
WMA-EHC-7B	RC-5				
WMA-FN-51A	RC-11	WMA-FN-51B	RC-12	N/A	N/A

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment (Continued)
List of Primary Components

HVAC SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
WMA-FN-52A	RC-11	WMA-FN-52B	RC-12	WMA-FN-52B	RC-12
WMA-FN-53A	RC-11	WMA-FN-53B	RC-12	WMA-FN-53B	RC-12

MECHANICAL EQUIPMENT

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
RHR-RO-5A	R-5	RHR-RO-5B	R-4	RHR-RO-5B	R-4
N/A	N/A	RHR-V-19	R-4	RHR-V-19	R-4
RHR-V-31A	R-5	RHR-V-31B	R-4	RHR-V-31B	R-4
RHR-V-41A	R-2	RHR-V-41B	R-2	RHR-V-41B	R-2
RHR-V-50A	R-2	RHR-V-50B	R-2	RHR-V-50B	R-2
RHR-V-84A	R-5	RHR-V-84B	R-4	RHR-V-84B	R-4
N/A	N/A	RHR-V-89	R-4	RHR-V-89	R-4
SW-V-1A	SW-1	SW-V-1B	SW-2	SW-V-1B	SW-2
SW-V-224A	RC-11	SW-V-224B	RC-12	N/A	N/A
SW-V-225A	RC-11	SW-V-225B	RC-12	N/A	N/A
SW-V-227A	RC-11	SW-V-227B	RC-12	N/A	N/A
SW-V-822A	RC-11	SW-V-822B	RC-12	N/A	N/A
SW-V-823A	RC-11	SW-V-823B	RC-12	N/A	N/A

MSIV SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
MS-V-28A	TG-1	MS-V-22A	R-2	MS-V-22A	R-2
MS-V-28B	TG-1	MS-V-22B	R-2	MS-V-22B	R-2
MS-V-28C	TG-1	MS-V-22C	R-2	MS-V-22C	R-2
MS-V-28D	TG-1	MS-V-22D	R-2	MS-V-22D	R-2

PFSS INSTRUMENTATION

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
CMS-LR-3	RC-10	CMS-LR-4	RC-10	CMS-LI-2R	RC-9
CMS-TR-5	RC-10	CMS-TR-6	RC-10	CMS-TI-43R	RC-9
MS-LR/PR-623A	RC-10	MS-LR/PR-623B	RC-10	MS-LI-10	RC-9
				MS-PI-2	RC-9

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment (Continued)
List of Primary Components

PFSS INSTRUMENTATION

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
N/A	N/A	N/A	N/A	RHR-FT-1	M-21
RHR-FI-603A	RC-10	RHR-FI-603B	RC-10	RHR-FI-5	RC-9
SW-FI-9A	RC-10	SW-FI-9B	RC-10	SW-PI-32BR	RC-9
N/A	N/A	MS-SPV-126D	M-27	N/A	N/A

POWER DISTRIBUTION

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
DG-GEN-DG1	DG-2	DG-GEN-DG2	DG-3	DG-GEN-DG2	DG-3
DLO-P-2A1	DG-2	DLO-P-2B1	DG-3	DLO-P-2B1	DG-3
DLO-P-2A2	DG-2	DLO-P-2B2	DG-3	DLO-P-2B2	DG-3
DLO-P-3A1	DG-2	DLO-P-3B1	DG-3	DLO-P-3B1	DG-3
DLO-P-3A2	DG-2	DLO-P-3B2	DG-3	DLO-P-3B2	DG-3
DLO-P-11A1	DG-2	DLO-P-11B1	DG-3	DLO-P-11B1	DG-3
DLO-P-11A2	DG-2	DLO-P-11B2	DG-3	DLO-P-11B2	DG-3
DO-P-1A	DG-4	DO-P-1B	DG-5	DO-P-1B	DG-5
DO-P-3A1	DG-2	DO-P-3B1	DG-3	DO-P-3B1	DG-3
DO-P-3A2	DG-2	DO-P-3B2	DG-3	DO-P-3B2	DG-3
DO-TK-1A	DG-4	DO-TK-1B	DG-5	DO-TK-1B	DG-5
DO-TK-3A	DG-8	DO-TK-3B	DG-9	DO-TK-3B	DG-9
DSA-AR-1A	DG-2	DSA-AR-1B	DG-3	DSA-AR-1B	DG-3
E-SM-DG1/7	DG-2	E-SM-DG2/8	DG-3	E-SM-DG2/8	DG-3
E-SM-7	RC-14	E-SM-8	RC-8	E-SM-8	RC-8
E-SL-71	RC-14	N/A	N/A	N/A	N/A
E-SL-73	RC-14	E-SL-83	RC-8	E-SL-83	RC-8

RHR SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
RHR-FCV-64A	R-5	RHR-FCV-64B	R-4	RHR-FCV-64B	R-4
RHR-P-2A	R-5	RHR-P-2B	R-4	RHR-P-2B	R-4
RHR-V-3A	R-5	RHR-V-3B	R-4	RHR-V-3B	R-4
RHR-V-4A	R-5	RHR-V-4B	R-4	RHR-V-4B	R-4
RHR-V-6A	R-5	RHR-V-6B	R-4	RHR-V-6B	R-4
RHR-V-16A	R-1	RHR-V-16B	R-1	RHR-V-16B	R-1
RHR-V-17A	R-1	RHR-V-17B	R-1	N/A	N/A
N/A	N/A	RHR-V-23	R-4	N/A	N/A

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment (Continued)
List of Primary Components

RHR SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
RHR-V-24A	R-1	RHR-V-24B	R-4	RHR-V-24B	R-4
RHR-V-27A	R-1	RHR-V-27B	R-4	RHR-V-27B	R-4
N/A	N/A	RHR-V-40	R-4	N/A	N/A
RHR-V-42A	R-1	RHR-V-42B	R-21	RHR-V-42B	R-21
RHR-V-48A	R-5	RHR-V-48B	R-4	RHR-V-48B	R-4
N/A	N/A	RHR-V-49	R-4	RHR-V-49	R-4
RHR-V-60A	R-5	RHR-V-60B	R-4	N/A	N/A
RHR-V-68A	R-5	RHR-V-68B	R-4	RHR-V-68B	R-4
RHR-V-73A	R-5	RHR-V-73B	R-4	N/A	N/A
RHR-V-74A	R-5	RHR-V-74B	R-4	N/A	N/A
RHR-V-75A	R-5	RHR-V-75B	R-4	N/A	N/A
N/A	N/A	RHR-V-115	R-4	RHR-V-115	R-4
N/A	N/A	RHR-V-116	R-4	RHR-V-116	R-4
N/A	N/A	RHR-V-182	R-4	RHR-V-182	R-4

SW SYSTEM

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
SW-P-1A	SW-1	SW-P-1B	SW-2	SW-P-1B	SW-2
SW-TCV-11A	RC-11	SW-TCV-11B	RC-12	N/A	N/A
SW-V-2A	SW-1	SW-V-2B	SW-2	SW-V-2B	SW-2
SW-V-12A	SW-1	SW-V-12B	SW-2	SW-V-12B	SW-2
SW-V-75A	R-5	SW-V-75B	R-1	N/A	N/A
N/A	N/A	SW-V-187A	R-1	SW-V-187A	R-1
N/A	N/A	SW-V-188A	R-1	SW-V-188A	R-1
SW-V-187B	R-1	SW-V-187B	R-1	SW-V-187B	R-1
SW-V-188B	R-1	SW-V-188B	R-1	SW-V-188B	R-1

AUXILIARY POWER DISTRIBUTION EQUIPMENT

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
E-B1-1	RC-5	E-B1-2	RC-6	E-B1-2	RC-6
E-C1-1A	RC-4	E-C1-2A	RC-7	E-C1-2A	RC-7
E-C1-1B	RC-4	E-C1-2B	RC-7	E-C1-2B	RC-7
E-PNL-C1/1	RC-4	E-PNL-C1/2	RC-7	E-PNL-C1/2	RC-7
E-IN-3A	RC-4	E-IN-2A	RC-7	N/A	N/A
E-IN-3B	RC-4	E-IN-2B	RC-7	N/A	N/A

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment (Continued)
List of Primary Components

AUXILIARY POWER DISTRIBUTION EQUIPMENT

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
E-DISC-MC7F/3A1	RC-11	E-DISC-8F4B1	RC-12	N/A	N/A
E-DP-S1/1	RC-4	E-DP-S1/2	RC-7	E-DP-S1/2	RC-7
E-DP-S1/1A	RC-10	E-DP-S1/2A	RC-10	N/A	N/A
E-DP-S1/1F	RC-14	E-DP-S1/2D	RC-9	E-DP-S1/2D	RC-9
E-DP-S1/1E	DG-2	E-DP-S1/2E	DG-3	E-DP-S1/2E	DG-3
E-ELP-7FD	RC-10	E-ELP-8FD	RC-10	N/A	N/A
E-ELP-7FDA	RC-10	E-ELP-8FDA	RC-10	N/A	N/A
E-MC-S1/1D	RC-4	E-MC-S1/2D	RC-7	E-MC-S1/2D	RC-7
E-MC-7A	RC-4	E-MC-8A	RC-7	E-MC-8A	RC-7
E-MC-7AA	DG-2	E-MC-8AA	DG-3	E-MC-8AA	DG-3
E-MC-7B	R-1	E-MC-8B	R-18	E-MC-8B	R-18
E-MC-7BA	R-1	E-MC-8BA	R-18	E-MC-8BA	R-18
E-MC-7BB	R-1	E-MC-8BB	R-4	E-MC-8BB	R-4
E-MC-7F	RC-11	E-MC-8F	RC-12	E-MC-8F	RC-12
E-PP-7A	RC-4	E-PP-8A	RC-7	E-PP-8A	RC-7
E-PP-7AA	RC-10	E-PP-8AA	RC-10	N/A	N/A
E-PP-7AAA	DG-2	E-PP-8AAA	DG-3	E-PP-8AAA	DG-3
E-PP-7AB	SW-1	E-PP-8AB	SW-2	E-PP-8AB	SW-2
E-PP-7AE	R-1	E-PP-8AF	RC-9	E-PP-8AF	RC-9
E-PP-7AG	SW-1	E-PP-8AG	SW-2	E-PP-8AG	SW-2
E-PP-7FA	RC-11	E-PP-8FA	RC-12	N/A	N/A
E-PNL-IN/3	RC-4	E-PNL-IN/2	RC-7	N/A	N/A
E-TR-7A	RC-4	E-TR-8A	RC-7	E-TR-8A	RC-7
E-TR-7AAA	DG-2	E-TR-8AAA	DG-3	E-TR-8AAA	DG-3
E-TR-7AF	SW-1	E-TR-8AF	SW-2	E-TR-8AF	SW-2
E-TR-7/71	RC-14	N/A	N/A	E-TR-8/83	RC-8
E-TR-7/73	RC-14	E-TR-8/83	RC-8	E-TR-8/83	RC-8
E-TR-7AF/1	SW-1	E-TR-8AF/1	SW-2	E-TR-8AF/1	SW-2
E-TR-7AAA/1	DG-2	E-TR-8AAA/1	DG-3	E-TR-8AAA/1	DG-3
E-SM-7/75/2	RC-14	E-TR-8A/2	RC-9	E-TR-8A/2	RC-9
E-TR-7FD	RC-10	E-TR-8FD	RC-10	E-B1-1	RC-5
E-TR-7A/1	RC-4	RHR-DISC-V/9	RC-7	E-DP-S1/1	RC-4
N/A	N/A	N/A	N/A	E-DP-S1/1F	RC-14

Table F.4-1

Required Post-Fire Safe Shutdown (PFSS) Equipment (Continued)
List of Primary Components

AUXILIARY EQUIPMENT

DIVISION 1 PFSS		DIVISION 2 PFSS		REMOTE SHUTDOWN	
EPN	FIRE AREA	EPN	FIRE AREA	EPN	FIRE AREA
E-RMS-7FDA	RC-10	E-RMS-8FDA	RC-10	N/A	N/A
E-IR-21	SW-1	N/A	N/A	E-CP-ARS	RC-14
E-IR-P004	R-1	E-IR-22	SW-2	E-IR-22	SW-2
E-IR-P018	R-1	E-IR-P021	M-21	N/A	N/A
RCC-V-130	R-1	E-IR-P027	M-27	N/A	N/A
E-IR-66	R-1	N/A	N/A	N/A	N/A
E-CNTR-WMA/EHC/7A	RC-5	E-CNTR-WMA/EHC/8	RC-6	E-CNTR-WMA/EHC/8	RC-6
E-CNTR-WMA/EHC/7B	RC-5	RWCU-V-32	R-1	RWCU-V-32	R-1
WMA-FD-57	RC-11	SW-42-7BB6A	R-1	SW-42-7BB6A	R-1
WMA-RMS-FN/53B	RC-10	SW-42-7BA7A	R-1	SW-42-7BA7A	R-1
SW-42-8BB6A	R-4	SW-42-8BB6A	R-4	SW-42-8BB6A	R-4
SW-42-8BA10C	R-18	SW-42-8BA10C	R-18	SW-42-8BA10C	R-18

F.4.4.3 Scope of Areas Evaluated in Fire Hazards Analysis

Fire areas included in the fire hazards analysis are those plant areas within the primary plant structure and those remote buildings with credited post-fire safe shutdown equipment. See the following table for the listing of evaluated fire areas. The fire area boundaries are shown as fire rated barriers on Figures F.6-1 through F.6-5.

The outdoor yard area is not analyzed as a fire area in the F.4 fire hazards analysis for the following reasons:

- The yard has underground duct banks with post-fire safe shutdown cables that route from the Diesel and Radwaste buildings to the Service Water Pump houses. Each duct bank is a separate electrical division. Each divisional duct bank has at least one manhole. The manholes have spatial separation. Therefore, post-fire safe shutdown can be achieved in the event of a fire in a single duct bank,

- Remote buildings credited in the fire protection program (service water pump house 1 and 2, circulating water pump house, water filtration building 33) with nonrated barriers are sufficiently separated from each other and from the plant that a single exposure fire would not spread to more than one building,

- The Hydrogen Storage and Supply Facility (HSSF) is located approximately 0.6 miles southeast of the plant and stores approximately 9800 pounds of liquid and gaseous hydrogen. This separation ensures a fire or explosion at the HSSF has no impact on the operability of systems credited for post-fire safe shutdown (References F.7.3.bb, F.7.3.cc, and F.7.5.t). The Hydrogen Water Chemistry (HWC) system is not safety-related,

- Where nearby exposure hazards exist, plant buildings have rated fire barriers. See Sections F.2.2.14 through F.2.2.17, and

- Yard fire hazards are not postulated to impair the yard fire protection water supply system.

- The DG building south exterior wall is not fire rated and the HVAC air intake is not equipped with fire dampers. To ensure a yard fire does not spread to multiple DG fire areas, the exterior concrete pad is sloped to drain combustible liquids away from the building. Administrative control of transient combustibles ensures excessive amounts of combustibles are not stored within 10 feet of the DG building exterior. Yard structures and DG-4 are not placed within 50 feet of the non-rated south DG barrier.

The fire protection water supply buildings (circulating water pump house and water filtration building 33) are not analyzed as fire areas in the F.4 fire hazards analysis for the following reasons:

- They do not contain any post-fire safe shutdown equipment, other than the fire pumps,
- The water supply system has a sufficient capacity to provide the maximum water demand from either the primary or secondary supply,
- The redundant water supply buildings are sufficiently separated that a single exposure fire would not spread between the subject buildings, and
- The redundant water supply buildings are remote and would not be an exposure hazard to the plant.

The general service building (GSB) was originally considered in the fire hazards analysis. However, the GSB is not analyzed in the fire hazards analysis for the following reasons:

- The building does not contain any credited post-fire safe shutdown,
- The only safety-related equipment in the building are two motor-operated auxiliary steam isolation valves (AS-V-68A/68B) at 458 ft Column K.4-3.2. The isolation of the auxiliary steam system is a safety-related function since it is a potential high energy line break (HELB) source to the reactor building which could affect the qualified life of safety-related equipment. Since a GSB fire would not cause a HELB and a reactor building HELB need not be considered concurrent with a fire, the GSB area of the safety-related valves does not warrant a fire hazards analysis,
- The building is entirely isolated from the turbine and reactor building by 3-hr barriers, and
- Although GSB sprinkler and detection system alarms annunciate in the control room and use plant power, their inoperability has no impact on post-fire safe shutdown.

Building 25 (PAAP) is not analyzed in the fire hazards analysis for the following reasons:

- The building does not contain any components necessary for post-fire safe shutdown except for communication equipment. For a design basis fire in building 25, the communication system is not required.

- There are no safety related components is this building. The only connections to the plant distribution power system are made through manual disconnect switches that are normally open.

- The building is separated from the plant buildings by the yard and fire rated barriers.

The following is a listing of the fire areas and their post-fire safe shutdown code.

Diesel generator building - HPCS diesel generator room	1	DG-1
Diesel generator building - Diesel generator 1A room	1	DG-2
Diesel generator building - Diesel generator 1B room	2	DG-3
Diesel generator building - DG 1A diesel oil tank pump room	1	DG-4
Diesel generator building - DG 1B diesel oil tank pump room	2	DG-5
Diesel generator building - HPCS diesel oil tank pump room	#	DG-6
Diesel generator building - HPCS diesel day tank room	#	DG-7
Diesel generator building - DG 1A diesel day tank room	1	DG-8
Diesel generator building - DG 1B diesel day tank room	2	DG-9
Diesel generator building - Deluge valve equipment room	#	DG-10
Reactor building - General equipment area	1	R-1
Reactor building - Primary containment	U	R-2
Reactor building - HPCS pump room	#	R-3
Reactor building - RHR B pump room, pipe chase, pipe tunnels, H2 recombiner MCC room, heat exchanger rooms, and south valve rooms	2	R-4
Reactor building - RHR A pump room, pipe chase, pipe tunnels, heat exchanger rooms	1	R-5
Reactor building - RCIC pump room	2	R-6
Reactor building - RHR pump room	1	R-7
Reactor building - LPCS pump room	1	R-8
Reactor building - Stair A6	#	R-9
Reactor building - Elevator No. 2	#	R-10
Reactor building - Stair A5	#	R-11
Reactor building - Elevator No. 1	#	R-12
Reactor building - 422 ft lobby outside of stair A5	#	R-15
Reactor building - MCC room Division 2	2	R-18
Reactor building - South valve room	2	R-21
Reactor building - Instrument rack E-IR-P009 enclosure	2	M-9
Reactor building - Instrument rack E-IR-P021 enclosure	2	M-21
Reactor building - Instrument rack E-IR-P027 enclosure	2	M-27
Reactor building - Instrument rack E-IR-73 enclosure	2	M-73
Radwaste control building - Radwaste general nonvital equipment area	2	RC-1
Radwaste control building - Cable spreading room	1	RC-2

Radwaste control building - Cable chase		1	RC-3
Radwaste control building - Electrical equipment room No. 1		1	RC-4
Radwaste control building - Battery room No. 1		1	RC-5
Radwaste control building - Battery room No. 2		2	RC-6
Radwaste control building - Electrical equipment room No. 2		2	RC-7
Radwaste control building - Switchgear room No. 2		2	RC-8
Radwaste control building - Remote shutdown room		2	RC-9
Radwaste control building - Main control room		U	RC-10
Radwaste control building - Unit A - air-conditioning room		1	RC-11
Radwaste control building - Unit B - air-conditioning room		2	RC-12
Radwaste control building - Communications room, instrument shop, chiller area, and HVAC chase		2	RC-13
Radwaste control building - Switchgear room No. 1		1	RC-14
Radwaste control building - Stair A8 and room C100		#	RC-15
Radwaste control building - Stair A7		#	RC-16
Radwaste control building - Elevator No. 4 and room C504		#	RC-17
Radwaste control building - Stair A13		#	RC-18
Radwaste control building - Corridor C205		2	RC-19
Radwaste control building - PASS area/pipe chase		1	RC-20
Reactor recirculation pump ASD building		#	ASD
Standby service water pump house 1A		1	SW-1
Standby service water pump house 1B		2	SW-2
Turbine generator building - General equipment area		2	TG-1
Turbine oil storage room	Fire zone TG-2	#	
Auxiliary boiler room	Fire zone TG-5	#	
Hydrogen seal oil room	Fire zone TG-7	#	
Turbine oil reservoir room	Fire zone TG-9	#	
West transformer vault	Fire zone TG-10	#	
East transformer vault	Fire zone TG-11	#	
441 ft southern corridors	Fire zone TG-12	2	
Turbine generator building – Stair A1		#	TG-3
Turbine generator building – Elevator No. 3		#	TG-4
Turbine generator building – Stair A3		#	TG-6
Turbine generator building – Stair A4		#	TG-8

LEGEND

Plant Fire Area Identification

The prefix of the fire area number corresponds to the building in which the fire area is located as follows:

ASD	Reactor recirculation pump ASD building
DG	Diesel generator building
M	Instrument Rack room
R	Reactor building
RC	Radwaste/control building
S	Service building
SW	Standby service water pump house(s)
TG	Turbine generator building

See Figures F.6-1 through F.6-5 for fire area locations.

Explanation of Codes

#	This code indicates that this fire area does not contain equipment or cables for either division of post-fire safe shutdown equipment.
1	This code indicates that this fire area contains Division 1 post-fire safe shutdown equipment or cables that are exposed to the fire and not protected. Division 1 fire areas that contain Division 2 post-fire safe shutdown equipment or cables are required to be protected or justified.
2	This code indicates that this fire area contains Division 2 post-fire safe shutdown equipment or cables that are exposed to the fire and not protected. Division 2 fire areas that contain Division 1 post-fire safe shutdown equipment or cables are required to be protected or justified.
U	This code indicates that this fire area has been uniquely analyzed for post-fire safe shutdown. Refer to the fire hazards analysis methodology in Section F.4.4.

F.4.4.4 Detailed Fire Hazards Analysis by Fire Area

FIRE AREA DG-1

1. Description

   High-pressure core spray diesel generator room, el. 441 ft 0 in., 455 ft 0 in., and 472 ft 9 in.

2. Major equipment within the fire area

   High-pressure core spray diesel generator
   Air intake filter
   Prefilter
   Air handling units
   Transformers
   Motor-driven air compressor
   Diesel-driven air compressor
   Switchgear

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated. The south exterior wall is not fire rated.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier. Entrance door may not fully self-shut due to differential air pressure.

   c. The north entrance has a 7 in. curb. A 3 in. curb and nonrated barrier separate the switchgear area from the diesel engine area. The transfer pump rooms have a 7 in. door sill.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

c. Major combustibles include lubrication oil and electrical cable.

d. Major ignition hazards include diesel generator, diesel engine, electrical switchgear, dry transformers, and small diesel compressor.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detectors in diesel generator area

b. Smoke detectors in switchgear area

c. Manual pull boxes

d. Automatic preaction sprinkler system with heat actuating devices in diesel generator area. A pull box is provided for manual actuation.

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. standpipe hose stations

b. Hose lines from 2.5 in. outlets on yard hydrant

c. Portable extinguishers

7. Safe shutdown systems

a. This fire area contains Division 1 post-fire safe shutdown cables.

b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The HPCS diesel generator and associated equipment/cabling within the fire area is assumed to be damaged by the design basis fire. The HPCS system is not credited for post-fire safe shutdown. Division 2 post-fire safe shutdown systems would remain operable.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

c. On sensing a high heat condition, the installed thermal detectors would open the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

d. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

e. During periods of high differential air pressure on north fire door, strobe lights, and security position sensors ensure that personnel will manually shut the fire door.

f. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

g. Drain water is routed to the storm drain system. Curbs installed at the north corridor door and scuppers provided at the exterior door direct water discharge to the exterior yard area. Curbs and partition would help minimize water flow between diesel generator and switchgear area. Raised door sills to the transfer pump rooms will prevent common mode flooding from Fire Area DG-1. Flooding will not impair the ability of the plant to reach safe shutdown.

h. The south exterior wall is not fire rated and the HVAC air intake is not equipped with fire dampers. The exterior wall of adjacent Fire Area DG-2 has the same design. To ensure fire does not spread to an adjacent Fire Area DG-2, the exterior concrete pad south of DG-1 is sloped to drain combustible liquids coming through the door scupper, away from the building.

9. FHA conclusion

A design basis fire within Fire Area DG-1 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-2

1. Description

Diesel generator 1A room, el. 441 ft 0 in., el. 455 ft 0 in., and el. 472 ft 9 in.

2. Major equipment within the fire area

Diesel generator 1A (Division 1)
Air intake filter
Prefilter
Air handling units
Motor-driven air compressor
Diesel/motor-driven air compressor
Switchgear

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated. The south exterior wall is not fire rated. There is no barrier separating Fire Area DG-2 and DG-3 above the 472 ft 9 in. elevation of the upper vestibule room D301.

b. Fire doors, dampers, and penetration seals maintain the rating of the barrier. Entrance door may not fully self-shut due to differential air pressure.

c. The north entrance has a 7 in. curb. A 3 in. curb and nonrated barrier separate the switchgear area from the diesel engine area.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low." A combustible free zone has been established between Fire Areas DG-2 and DG-3 at 472 ft 9 in. to prevent transient intervening combustibles. See Reference F.7.7.b.

c. Major combustibles include lubrication oil and electrical cable.

d. Major ignition hazards include diesel generator, diesel engines, electrical switchgear, dry transformers, and grounding resistors.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detectors in diesel generator area

b. Smoke detectors in switchgear area

c. Manual pull boxes

d. Automatic preaction sprinkler system with heat actuating devices in diesel generator area. A pull box is provided for manual actuation.

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. standpipe hose stations

b. Hose lines from 2.5 in. outlets on yard hydrant

c. Portable extinguishers

7. Safe shutdown systems

a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The Division 1 diesel generator and associated equipment/cabling within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

b. Although there is no barrier separating Fire Area DG-2 from Fire Area DG-3 at the 472 ft 9 in., the adjacent barrier orientation, openings to the outdoors and a combustible free zone ensure a fire will not propagate between these redundant fire areas (Reference F.7.6.f).

c. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

d. On sensing a high heat condition, the installed thermal detectors would open the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

e. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

f. During periods of high differential air pressure on north fire door, strobe lights and security position sensors ensure that personnel will manually shut the fire door.

g. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

h. Drain water is routed to the storm drain system. Curbs installed at the north corridor door and scuppers provided at the exterior door direct water discharge to the exterior yard area. Curbs and partition would help minimize water flow between diesel generator and switchgear area. Flooding will not impair the ability of the plant to reach safe shutdown.

i. The south exterior wall is not fire rated and the HVAC air intake is not equipped with fire dampers. The exterior wall of adjacent Fire Area DG-1 and DG-3 have the same design. To ensure a DG-2 fire does not spread to an adjacent Fire Area DG-1 or DG-3, the exterior concrete pad south of DG-1 is sloped to drain combustible liquids coming through the door scupper, away from the building.

9. FHA conclusion

A design basis fire within Fire Area DG-2 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-3

1. Description

Diesel generator 1B room, el. 441 ft 0 in., el. 455 ft 0 in., and el. 472 ft 9 in.

2. Major equipment within the fire area

Diesel generator 1B (Division 2)
Air intake filter
Prefilter
Air handling units
Motor-driven air compressor
Diesel/motor-driven air compressor
Switchgear

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated. The south exterior wall is not fire rated. There is no barrier separating Fire Area DG-2 and DG-3 above the 472 ft 9 in. elevation of the upper vestibule room D301.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier. Entrance door may not fully self-shut due to differential air pressure.

   c. The north entrance has a 7 in. curb. A 3 in. curb and nonrated barrier separate the switchgear area from the diesel engine area.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include lubrication oil and electrical cable. A combustible free zone has been established between Fire Areas DG-2 and DG-3 at 472 ft 9 in. to prevent transient intervening combustibles. See Reference F.7.7.b.

d. Major ignition hazards include diesel generator, diesel engines, electrical switchgear, dry transformers, and grounding resistors.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detectors in diesel generator area

b. Smoke detectors in switchgear area

c. Manual pull boxes

d. Automatic preaction sprinkler system with heat actuating devices in diesel generator area. A pull box is provided for manual actuation.

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. standpipe hose stations

b. Hose lines from 2.5 in. outlets on yard hydrant

c. Portable extinguishers

7. Safe shutdown systems

a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The Division 2 diesel generator and associated equipment/cabling within the fire area are assumed to be damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

b. Although there is no barrier separating Fire Area DG-3 from Fire Area DG-2 at the 472 ft 9 in., the adjacent barrier orientation, openings to the outdoors and a combustible free zone ensure a fire will not propagate between these redundant fire areas (Reference F.7.6.f).

c. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

d. On sensing a high heat condition, the installed thermal detectors would open the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

e. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

f. During periods of high differential air pressure on north fire door, strobe lights and security position sensors ensure that personnel will manually the shut fire door.

g. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

h. Drain water is routed to the storm drain system. Curbs installed at the north corridor door and scuppers provided at the exterior door direct water discharge to the exterior yard area. Curbs and partition would help minimize water flow between diesel generator and switchgear area. Flooding will not impair the ability of the plant to reach safe shutdown.

i. The south exterior wall is not fire rated and the HVAC air intake is not equipped with fire dampers. The exterior wall of adjacent Fire Area DG-2 has the same design. To ensure a DG-3 fire does not spread to an adjacent Fire Area DG-2, the exterior concrete pad south of DG-1 is sloped to drain combustible liquids coming through the door scupper, away from the building.

9. FHA conclusion

A design basis fire within Fire Area DG-3 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-4

1. <u>Description</u>

   DG 1A diesel oil tank transfer pump room, el. 441 ft 0 in.

2. <u>Major equipment within the fire area</u>

   Fuel oil pump
   Fuel oil storage tank - 60,000 gal located below grade

   Fire area is a safety-related area.

3. <u>Construction of fire area boundaries</u>

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door and penetration seals maintain the rating of the barrier.

   c. A 7 in. raised door sill is present at the entrance door.

   d. See Figures F.6 for fire barrier locations and classifications.

4. <u>Fire hazards</u>

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low." The contents of the diesel fuel oils storage tank is not considered to contribute to the room fire hazard based on the tank being underground with minimal room exposure and steel enclosure.

   c. Major combustibles include assumed transient combustibles and electrical cable.

   d. Major ignition hazards include transfer pump, room heater, and exhaust fan motor.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector

   NOTE: The preaction sprinkler system is provided for protection of the underground oil tank access housing.

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Hose lines from two 2.5 in. outlets on yard hydrant

   c. Portable extinguishers

   d. Manual pull box for alarm

   e. A pull box is provided for manual flooding of the system piping.

7. Safe shutdown systems

   a. This fire area contains Division 1 post-fire safe shutdown components and cabling.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

c. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

d. East exterior wall need not be fire rated since fuel oil storage tank is buried underground and diesel fuel polishing building is adequately remote.

e. Smoke would be removed through the operation of the room exhaust system or portable smoke removal equipment.

f. Water discharge could cause flooding in the transfer pump pit. Raised door sill would prevent water intrusion from Fire Area DG-1. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-4 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-5

1. Description

DG 1B diesel oil tank transfer pump room, el. 441 ft 0 in.

2. Major equipment within the fire area

Fuel oil pump
Fuel oil storage tank - 60,000 gal located below grade

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door and penetration seals maintain the rating of the barrier.

   c. A 7 in. raised door sill is present at the entrance door.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low." The contents of the fuel oil storage tank is not considered to contribute to the room fire hazard based on the tank being underground with minimal room exposure and steel enclosure.

   c. Major combustibles include assumed transient combustibles and electrical cable.

   d. Major ignition hazards include transfer pump, room heater, and exhaust fan motor.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector

   NOTE: The preaction sprinkler system is provided for protection of the underground oil tank access housing.

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Hose lines from two 2.5 in. outlets on yard hydrant

   c. Portable extinguishers

   d. Manual pull box for alarm

   e. A pull box is provided for manual flooding of the system piping.

7. Safe shutdown systems

   a. This fire area contains Division 2 post-fire safe shutdown components and cabling.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

c. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

d. East exterior wall need not be fire rated since fuel oil storage tank is buried underground and diesel fuel polishing building is adequately remote.

e. Smoke would be removed through the operation of the room exhaust system or portable smoke removal equipment.

f. Water discharge could cause flooding in the transfer pump pit. Raised door sill would prevent water intrusion from Fire Area DG-1. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-5 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-6

1. Description

High-pressure core spray diesel oil tank transfer pump room, el. 441 ft 0 in.

2. Major equipment within the fire area

Fuel oil pump
Fuel oil storage tank - 50,000 gal located below grade
Nitrogen pump

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

c. A 7 in. raised door sill is present at the entrance door.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low." The contents of the fuel oil storage tank is not considered to contribute to the room fire hazard based on the tank being underground with minimal room exposure and steel enclosure.

c. Major combustibles include assumed transient combustibles and electrical cable.

d. Major ignition hazards include transfer pump, room heater, exhaust fan motor, and nitrogen pump motor.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector

   NOTE: The preaction sprinkler system is provided for protection of the underground oil tank access housing.

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Hose lines from two 2.5 in. outlets on yard hydrant

   c. Portable extinguishers

   d. Manual pull box for alarm

   e. A pull box is provided for manual flooding of the system piping.

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. The HPCS diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. With no safe shutdown equipment/cables, fire will not prevent safe shutdown.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the spray nozzles.

   c. The pre-action system is designed with spray nozzles protecting the primary hazard rather than the building structure. Spray nozzles equipped with heat collectors, remote from the ceiling, were approved by Reference F.7.4.f and provide adequate automatic suppression (Reference F.7.6.p).

d. East exterior wall need not be fire rated since fuel oil storage tank is buried underground and diesel fuel polishing building is adequately remote.

e. Smoke would be removed through the operation of the room exhaust system or portable smoke removal equipment.

f. Water discharge could cause flooding in the transfer pump pit. Raised door sill would prevent water intrusion from Fire Area DG-1. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-6 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-7

1. Description

   High-pressure core spray diesel day tank room, el. 441 ft 0 in.

2. Major equipment within the fire area

   Fuel oil day tank - 3000 gal

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door, dampers, and penetration seals maintain the rating of the barrier.

   c. Door entrance has a 31 in. high door sill to contain an oil spill.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “high.”

   c. The major combustible is fuel oil.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector (same system as diesel generator area)

6. <u>Fire suppression/detection equipment outside but available to the fire area</u>

   a. 1.5 in. standpipe hose stations

   b. Hose lines from 2.5 in. outlets on yard hydrant

   c. Portable extinguisher

   d. Manual pull boxes

   e. A pull box is provided for manual flooding of the system piping (which also includes diesel generator area piping).

7. <u>Safe shutdown systems</u>

   This fire area contains no post-fire safe shutdown components or cabling.

8. <u>Potential consequences of a design basis fire</u>

   a. The HPCS diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. The HPCS system is not credited for post-fire safe shutdown. With no safe shutdown equipment/cables, fire will not prevent safe shutdown.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the sprinkler heads.

   c. The fire area has a much higher combustible loading fire severity duration than the surrounding 3-hr barriers. However, the fire area is equipped with a high density preaction sprinkler system which would effectively limit fire severity.

   d. Smoke would be removed through the operation of the room exhaust system or portable smoke removal equipment.

   e. Water discharge would cause flooding within the diked/enclosed room. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-7 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-8

1. Description

   DG 1A diesel day tank room, el. 441 ft 0 in.

2. Major equipment within the fire area

   Fuel oil day tank - 3000 gal

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door, dampers, and penetration seals maintain the rating of the barrier.

   c. Door entrance has a 31 in. high door sill to contain an oil spill.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "high."

   c. Major combustible is fuel oil.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Hose lines from 2.5 in. outlets on yard hydrant

   c. Portable extinguisher

   d. Manual pull boxes.

   e. A pull box is provided for manual flooding of the system piping (which also includes diesel generator area piping).

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment.

   b. See Table F.4-1 for credited equipment.

8. Potential consequences of a design basis fire

   a. The Division 1 diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the sprinkler heads.

   c. The fire area has a much higher combustible loading fire severity duration than the surrounding 3-hr barriers. However, the fire area is equipped with a high density preaction sprinkler system which would effectively limit fire severity.

   d. Smoke would be removed through the operation of the room exhaust system or portable smoke removal equipment.

   e. Water discharge would cause flooding within the diked/enclosed room. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-8 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-9

1. Description

   DG 1B diesel oil day tank room, el. 441 ft 0 in.

2. Major equipment within the fire area

   Fuel oil day tank - 3000 gal

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door, dampers, and penetration seals maintain the rating of the barrier.

   c. Door entrance has a 31 in. high door sill to contain an oil spill.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "high."

   c. Major combustible is fuel oil.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Pre-alarm thermal detector

   b. Automatic preaction sprinkler system with thermal detector

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Hose lines from 2.5 in. outlets on yard hydrant

   c. Portable extinguisher

   d. Manual pull boxes

   e. A pull box is provided for manual flooding of the system piping (which also includes diesel generator area piping).

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment.

   b. See Table F.4-1 for credited equipment.

8. Potential consequences of a design basis fire

   a. The Division 2 diesel generator auxiliaries located within the fire area are assumed to be damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed pre-alarm thermal detector is expected to sense the heat from a developing fire and alert the control room for response by the plant fire brigade. A high heat condition would also activate the thermal detector controlling the preaction system control valve, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the sprinkler heads.

   c. The fire area has a much higher combustible loading fire severity duration than the surrounding 3-hr barriers. However, the fire area is equipped with a high density preaction sprinkler system which would effectively limit fire severity.

   d. Smoke would be removed through the operation of the room system or portable smoke removal equipment.

   e. Water discharge would cause flooding within the diked/enclosed room. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-9 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA DG-10

1. Description

Diesel generator building deluge valve room, el. 455 ft 0 in.

2. Major equipment within the fire area

Sprinkler alarm valves.

Fire area is not a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

c. See Figure F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low."

c. Major combustible is assumed transient combustibles.

d. Major ignition hazard is room heater units.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

None

6. Fire suppression/detection equipment outside but available to the fire area

a. Portable extinguisher

b. Manual pull box for alarm

c. 1.5 in. standpipe hose station

7. Safe shutdown systems

This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

a. With no safe shutdown equipment/cables, fire will not prevent safe shutdown.

b. The available portable equipment is adequate to extinguish the design basis fire.

c. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

d. Drain water is routed to the storm drain system. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area DG-10 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-1

1. Description

Reactor building general equipment area, el. 422 ft 3 in., 441 ft 0 in., 471 ft 0 in., 501 ft 0 in., 522 ft 0 in., 548 ft 0 in., 572 ft 0 in., 606 ft 10.5 in., and 623 ft 10.5 in.

2. Major equipment

a. Elevation 422 ft - auxiliary condensate pump room/CRD pump room and northwest stairwell

Control rod drive pumps
Auxiliary condensate supply pumps
Backwash pump

b. Elevation 441 ft – vehicle air lock (railroad bay), southeast air lock and northeast air lock, and vestibule

None

c. Elevation 471 ft - general equipment area

Instrument racks, switchgear, monorails, hoists.

d. Elevation 492 ft - RHR pipe tunnels

Piping

e. Elevation 501 ft - general equipment area

Instrument racks, motor control center, TIP room, CRD repair room, and outage hot tool storage.

f. Elevation 522 ft - general equipment area

Control rod drive modules
Reactor water cleanup pumps
Instrument racks
Motor control center

g. Elevation 548 ft - general equipment area

Reactor building closed cooling pumps
Standby liquid control area
Fuel pool cooling heat exchangers and pumps

h. Elevation 563 ft - RHR pipe tunnels

Piping

i. Elevation 572 ft - general equipment area

Standby gas treatment units
Hydrogen recombiners (DEACTIVATED)
Reactor building sump vent emergency filter units
Motor control centers

j. Elevation 606 ft - operating floor

Spent fuel pool
Refueling platform and crane
Dryer/separator pool
Auxiliary work platform

k. Elevation 623 ft - elevator equipment rooms

Elevator motors

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. The reactor building fire area boundaries which interface with other fire areas are constructed of reinforced concrete and are 3-hr rated (except as described below). At el. 606 ft, the reactor building exterior walls are nonrated insulated metal panels. Exterior barriers below 440 ft are nonrated. The following floor plugs are 3-hr rated: 18 in. thick concrete floor plugs to the Division 1 and 2 RHR heat exchanger rooms; 18 in. and 24 in. thick concrete floor plugs to the 422 ft pump rooms, and 60 in. thick floor plugs to 522 ft ceiling of the steam tunnel.

Walls, floors, and ceilings interior to the fire area (not adjoining other fire areas) are also concrete, but are not credited as fire rated. The nonrated floors above 471 ft have open stairways, open equipment hatches, and unsealed penetrations.

b. The reactor building general equipment area is separated from containment by a nonrated concrete bioshield wall and the metal shell of the primary containment vessel. The gap between the bioshield wall and the vessel is filled with a combustible insulating foam spacer. Refractory ceramic fiber blanket is installed in piping penetrations to eliminate exposure of the foam to potential sources of ignition. See Section F.2.2.5 for more details.

c. Three hour fire barriers separate adjacent, redundant, safety-related, hazardous equipment within the fire area including the standby gas treatment units and hydrogen recombiner units (DEACTIVATED) on 572 ft.

d. Fire Area R-1 connects with Fire Area R-5 without a barrier in the 472 ft Column J.8 pipe tunnel and 563 ft Column J-K pipe tunnel.

e. The reinforced-concrete boundary with Fire Area R-15 at 441 ft is classified as nonrated but is constructed to meet a 3-hr fire rating.

f. The removable masonry block walls of the Fire Area R-4 and R-5 pipe chases (east wall, 471 ft to 547 ft) are not qualified as 3-hr rated.

g. See the individual fire area discussions of Fire Areas M-9, M-21, M-27, and M-73 for description of instrument rack enclosures.

h. The reactor building Fire Area R-1 has numerous specialty doors used in fire barriers (high range blast, air-tight, flood, radiation shielding, and bolted closed sliding). These doors are not listed as fire rated, but have equivalent construction. Stairwell doors are 1.5-hr rated, minimum. Elevators are 1.5-hr rated. Other nonspecialty doors in fire barriers are 3-hr rated.

i. Fire dampers and penetration seals maintain the rating of the barrier (except penetration R206-5052). Various sealed electrical blockouts in nonrated floor/ceiling barriers are credited as vertical cable tray fire breaks.

j. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low." Since fire area covers approximately 78,500 ft^2, actual combustible loading varies.

   c. Major combustibles include Thermo-Lag 330-1, electrical cable, charcoal, and assumed transient combustibles.

   d. Zones of limited combustibles have been established within 10 ft of: 1) post-fire safe shutdown instrument tubing; 2) exterior of instrument rack rooms; and 3) containment mechanical penetrations. See Figure F.6-6. Combustible free zones have been established in the 492 ft and 563 ft pipe tunnel interface to Fire Area R-5.

   e. Major ignition hazards include: control rod drive pumps, auxiliary condensate supply pumps, switchgear, reactor water cleanup pumps, reactor building closed cooling pumps, fuel pool cooling pumps and standby gas unit charcoal filters.

   f. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area are high radiation zones.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors installed for general area coverage at el. 422 ft 3 in., 441 ft (railroad bay), 471 ft, 501 ft, and 572 ft.

   b. Smoke detectors in the el. 606 ft and 616 ft Refuel Floor Office.

   c. Ultraviolet detectors installed on the operating floor level, el. 606 ft.

   d. 1.5 in. standpipe hose station in vehicle air lock (railroad bay).

   e. Each reactor building sump vent charcoal filter unit is protected by a manual water spray system. Thermal detectors located within the unit initiate a high temperature alarm.

   f. Portable fire extinguishers at each floor level.

g. Manual pull boxes.

h. Each SGT unit is protected by three manual actuated water spray systems. Thermistor wires located within the SGT units initiate high temperature alarms.

6. Fire suppression/detection equipment outside but available to the fire area

a. 150 ft long 1.5 in. hose stations at each floor level enclosed stairwell.

b. 2.5 in. yard hose stations for 441 ft vehicle air lock (railroad bay).

7. Safe shutdown systems

a. Fire area contains both Division 1 and Division 2 post-fire safe shutdown cables and Division 1 equipment. Division 2 post-fire safe shutdown cables are protected by 3-hr rated raceway barrier wraps or MI fire rated cable.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

c. See Reference F.7.3.d and F.7.6.u for credited operator manual actions.

8. Potential consequences of a design basis fire

a. Equipment and cabling for the Division 1 post-fire safe shutdown systems which is located within the area is assumed damaged by the design basis fire. Loss of all unprotected equipment in this fire area is not considered a credible event due to the low fire loading and geometrical configuration of the reactor building. Division 2 post-fire safe shutdown components/cabling within the fire area are protected from fire damage as follows:

(1) Cabling for Division 2 post-fire safe shutdown components and certain associated circuits are protected by 3-hr rated raceway fire barriers

(2) Protection of raceways, structural members, or other items routed over raceway fire barriers is not required due to the limited combustible loading and ceiling openings which would prevent a hot gas layer buildup (Reference F.7.4.f).

(3) Stainless steel instrument sensing lines routed within the area do not require exposure protection. Analysis indicates that the lines will not rupture (Reference F.7.3.p). Certain instrument sensing line supports are protected with Thermo-Lag 330-1 from exposure fire damage where

the analysis predicts that the average steel temperature in the support could exceed 1100°F or point temperatures in the support could exceed 1200°F (References F.7.3.h, F.7.3.i, F.7.4.l, and F.7.6.l). Combustible controls ensure the above analyses remain valid (see Figure F.6-6). Even though Thermo-Lag 330-1 is technically a combustible material, it is still capable of adequately insulating steel supports.

(4) The fluid within stainless steel instrument sensing line is susceptible to fire-induced boiling that may affect Division 2 instrument accuracy. MS-LT-26A and MS-LT-26D structures, systems, and components are separated by a combustible free zone. There is adequate separation such that no single fire will impact the operability of both RPV level transmitters (see Reference F.7.6.x).

(5) Fire affects on the instrumentation tubing of the RPV level transmitter reference legs (MS-LT-26A and MS-LT-26D), added to correct the "notching phenomena," is mitigated by a passive high temperature isolation scheme. See Item 1.10.02 of Reference F.7.3.k for more details.

b. At the 522 ft west wall, Whittaker MI fire rated cables route under cable tray node 4380. To ensure fire-induced failure of the cable tray support does not occur, tray support TS-5269 is protected by a 3-hr rated fireproof coating of Thermo-Lag 330-1.

c. Instrument rack fire areas M-9, M-21, M-27, and M-73 are enclosed with 3-hr rated partial height walls which would shield instruments and instrument tubing from a Fire Areas R-1 fire. The lack of a ceiling was approved in Reference F.7.4.f. Fire Area R-1 combustibles above the instrument rack fire areas are minimal. Combustibles are controlled within a 10 ft radius of the instrument rack fire areas (see Figure F.6-6). With Fire Area R-1 having two open stairwell shafts and various unsealed floor openings and a large equipment hatch, a hot gas layer will not drop to the level of the instrument rack fire areas. The raised curbs at each entrance doorway will prevent a combustible liquid spill from spreading into the instrument rack fire areas (Reference F.7.3.r).

d. Containment mechanical penetrations within a 20 ft surface radius of Appendix R protected containment penetrations are 3-hr fire rated to ensure the combustible spacer/liner material does not ignite and damage the Division 2 cables in the liner area. Nonrated radiant energy refractory ceramic fiber penetration seals, spatial separation, and combustible controls near other containment penetrations (see Figure F.6-6) provide adequate assurance that a fire will not reach the unprotected Division 2 post-fire safe shutdown circuits at the combustible liner. This level of protection was approved by Reference F.7.4.1.

e. The 472 ft and 563 ft pipe tunnel interfaces to Fire Area R-5 are void of in-situ combustibles and are controlled as combustible free zones. Fire Area R-1 and R-5 both contain Division 1 post-fire safe systems and rely on Division 2 for safe shutdown. Therefore, the lack of a fire barrier will not prevent safe shutdown.

f. The east walls of the Fire Area R-4 and R-5 vertical pipe chases are not constructed to meet a fire tested configuration; however, the design is adequate to limit the spread of fire.

g. Unqualified and 1.5-hr stairwell doors are adequate to limit the spread of fire.

h. See Fire Area R-6 discussion of penetration R206-5052.

i. Penetrations R704-1001 and R704-1002 are not sealed to the reactor building elevated release chase. Below 572 ft, the chase is considered Fire Area TG-1. See TG-1 discussion for more details. With the unsealed penetrations a minimum of 80 ft above the turbine building roof, a reactor building fire would not spread to the turbine building.

j. Service water line 2”SW(46)-2-1 has a 1-in. thick refractory ceramic fiber pipe insulation for a minimum of 120 ft in length. This insulation will ensure a Fire Area R-1 fire will not cause the MCC Room cooler, in Fire Area R-18, to overheat credited Division 2 equipment. Enough foamglass insulation has been removed from the interior walls of Fire Area RC-18 to ensure the surrounding barriers can absorb the MCC heat output generated, where the Fire Area R-1 prevents immediate access for operator room cooling.

k. Smoke or flame from a fire would activate a smoke or ultraviolet detector, which would alarm in the control room for fire brigade response. Reference F.7.4.f approved the lack of fire detection in some rooms.

l. The manual suppression equipment available is sufficient to control any reactor building fire. 150 ft long hose lengths are required to reach all areas (Reference F.7.4.d).

m. Heat buildup within a sump vent charcoal filter unit would cause a temperature alarm in the main control room. The manual water spray system may be actuated locally if required to suppress a filter fire.

n. Heat buildup within an SGT filter unit would cause a temperature alarm in the main control room. The manual water spray system may be actuated from the main control room if required to suppress a charcoal fire. A LOCA/radioiodine induced charcoal fire would not result in excessive radiation release since, on a high charcoal filter temperature alarm, operators would switch over to the redundant SGT filter unit.

o. Smoke would be removed by operation of the building exhaust system. Large portable fan REA-FN-16 can be connected to the building exhaust system at the 471 ft and 572 ft. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

p. Water discharge could cause flooding until removed by the floor drain system or portable pumping. Water discharge would be removed by the floor drain system open, hatches, and stairs. Floor drains in this area are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

q. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

r. Spent fuel assemblies are loaded into storage canisters which are then sealed and prepared for dry cask storage at the Independent Spent Fuel Storage Installation (ISFSI). Spent fuel loading operations, canister sealing operations, and the transfer of spent fuel assemblies from the transfer cask to the storage overpack are performed within Fire Area R1. All dry cask storage operations are conducted in accordance with administrative controls and procedures which minimize the probability and effect of fires on equipment important to safety. The administrative controls and procedures also significantly reduce the likelihood of the occurrence of a fire that could affect cask safety and assure that there is no significant increase in the risk of radioactive releases to the environment. Refer to References F.7.3.z and F.7.3.aa for additional information.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area R-1 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-2

1. Description

   Reactor primary containment drywell and suppression pool.

2. Major equipment within the fire area

   Reactor recirculation pumps
   Containment HVAC

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The primary containment barrier consists of a steel ASME pressure vessel which varies from 1.5 in. at the vessel lower head to 0.75 in. at the drywell cone. See FSAR Section 3.8.2 for more details. See Section F.2.2.5 discussion for a more detailed discussion of bioshield wall and combustible liner.

   b. Equipment and personnel hatches are nonrated, but due to their massive construction, they are considered more than adequate for the combustibles involved.

   c. All mechanical penetrations are sealed. All cabling enters containment via sealed electrical penetration assemblies.

   d. The suppression pool has concrete walls and floor with a nonrated watertight access hatch; penetrations are embedded.

   e. See Figures F.6 for fire area boundary.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include assumed transient combustibles, lubrication oil, and electrical cables.

   d. Major ignition hazards include recirculation pumps and HVAC fans motors.

e. Equipment/piping within the area contain low level radioactive water and gas. There are airborne low level particulates and noble gases in the containment atmosphere during operation. The primary containment during outages is a potentially contaminated, high radiation zone.

5. Fire suppression/detection equipment within the fire area

a. There is no automatic fire suppression/detection equipment installed within primary containment.

b. Nitrogen inerted during plant operation.

c. Installed thermocouples monitor drywell conditions during plant operation (not part of the fire protection system).

6. Fire suppression/detection equipment outside but available to the fire area

a. Standpipe hose lines

b. Portable fire extinguishers

c. Manual pull boxes

7. Safe shutdown systems

a. Fire area contains both Division 1 and Division 2 post-fire safe shutdown cables and equipment. Primary containment is nitrogen inerted during plant operation.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The primary containment has a nitrogen inerted atmosphere which will not support combustion. Post-fire safe shutdown equipment/cabling inside containment is not considered vulnerable to fire damage.

b. During periods where containment is not inerted, staged fire protection equipment and normal fire protection administrative controls ensure fire severity will be limited and fuel pool cooling will be available. The steel containment vessel and sealed penetrations provide adequate assurance that a fire would be contained.

c. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

d. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

e. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area R-2 is not possible during plant operation. Adequate manual suppression equipment is available during outages to limit possible fire damage. Therefore, systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-3

1. Description

   High-pressure core spray pump room, el. 422 ft 3 in. and el. 444 ft 0 in.

2. Major equipment within the fire area

   High-pressure core spray pump
   High-pressure core spray water leg pump
   Sump pumps
   Room cooler

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas (except R-2) are 3-hr rated. A hatch in the ceiling at 471 ft is covered by a 3-hr rated 24-in. thick concrete plug.

   b. Fire dampers and penetration seals maintain the rating of the barrier.

   c. Flood doors and bolted-in-place sliding door are not listed as fire rated, but have equivalent construction.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include electrical cable transient combustible and lubricating oil.

   d. Major ignition hazards include HPCS pump, HPCS water leg pump, sump pumps, and cooler unit.

e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area may be high radiation zones.

5. Fire suppression/detection equipment within the fire area

Smoke detectors below 471 ft 0 in. ceiling

6. Fire suppression/detection equipment outside but available to the fire area

a. One manual pull box for alarm

b. Portable extinguisher

c. 1.5 in. standpipe hose station

7. Safe shutdown systems

This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

a. The HPCS pump and auxiliaries within the fire area are assumed to be damaged by the design basis fire. The HPCS system is not credited for post-fire safe shutdown. With no safe shutdown equipment/cables, fire will not prevent safe shutdown.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

c. Unqualified doors are adequate to limit the spread of fire.

d. Although the containment barrier is not considered 3-hr rated, it is adequate to prevent fire propagation and opposite side is suppression pool.

e. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

f. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains in this area are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

g. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-3 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-4

1. Description

   422 ft 3 in. RHR-B pump room (R-7)
   470 ft to 548 ft pipe chase
   471 ft southwest valve room (R-214)
   492 ft pipe tunnel
   548 ft south valve room (R-511)
   563 ft 1 in. pipe tunnel
   548 ft and 572 ft heat exchanger equipment rooms (R-505 and R-605)
   572 ft Division 2 hydrogen recombiner MCC room (R-612)

2. Major equipment within the fire area

   Residual heat removal pump 2B
   Sump pump
   Motor control centers - Division 2
   Residual heat removal heat exchangers
   Room coolers

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Barriers which interface with adjacent fire areas are 3-hr rated reinforced concrete, with the following exceptions. The containment barrier is not credited as fire rated. The east wall of the vertical pipe chase, from 471 ft to 547 ft is constructed of removable concrete block covered by steel decking and thus, is not qualified as 3-hr rated.

   b. A hatch at the ceiling of 471 ft and 572 ft is covered by a 3-hr rated 18-in. thick concrete plug.

   c. Radiation shield, bolted-in-place sliding and flood doors are not listed as fire rated, but have equivalent construction. Other fire doors maintain the rating of the barrier.

   d. Fire dampers and penetration seals maintain the rating of the barrier (except penetration R206-4236).

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustibles include electrical cable, assumed transient combustibles, and lubricating oil.

   d. Major ignition hazards include RHR-B pump, motor control centers, sump pump, and cooler unit.

   e. Equipment/piping within the area contain low level radioactive water and gas. There are no airborne radioactivity hazards within the area. Some portions of the fire area may a be high radiation zone.

5. Fire suppression/detection equipment within the fire area

   All rooms of the fire area are equipped with smoke detection except the pipe chase and pipe tunnels.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes on each elevation for alarm

   b. Portable extinguishers on each elevation

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

   c. See Reference F.7.8.g for credited operator actions.

8. Potential consequences of a design basis fire

   a. The B RHR pump, associated equipment and cabling are assumed damaged or unavailable due to the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

b. The mechanical integrity of excess flow check valve and instrument root valves within the 548 ft south valve room (R511) are protected from damage due to a fire occurring elsewhere in secondary containment by the 3-hr rated barriers separating the room from the general floor area.

c. The east walls of the vertical pipe chase is not constructed per a fire tested configuration; however, the design is adequate to limit the spread of fire.

d. See Fire Area RC-20 discussion of penetration R206-4236 PASS module.

e. Unqualified doors and containment barrier are adequate to limit the spread of fire.

f. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

g. Smoke would be removed by the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

h. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

i. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area R-4 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-5

1. Description

   422 ft 3 in. RHR-A pump room (R-6)
   470 ft to 548 ft pipe chase
   492 ft pipe tunnel (west half)
   563 ft 1 in. pipe tunnel (west half)
   548 ft and 572 ft heat exchanger equipment rooms (R-507 and R-606)

2. Major equipment within the fire area

   Residual heat removal pump 2A
   Sump pumps
   Residual heat removal heat exchangers
   Room cooler

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Barriers which interface with adjacent fire areas are 3-hr rated reinforced concrete, with the following exceptions. The containment barrier is not credited as fire rated. The east wall of the vertical pipe chase, from 471 ft to 547 ft is constructed of removable concrete block covered by steel decking and thus, are not qualified as 3-hr rated. The 492 ft and 563 ft pipe tunnels connect with fire area R-1 without a barrier.

   b. A hatch at the ceiling of 471 ft and 572 ft is covered by a 3-hr rated 18-in. thick concrete plug.

   c. Radiation shield and flood doors are not listed as fire rated, but have equivalent construction. Other fire doors are 3-hr rated.

   d. Fire dampers and penetration seals maintain the rating of the barrier.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low." Combustible free zones in 472 ft and 563 ft tunnels interface to Fire Area R-1.

   c. Major combustibles include Thermo-Lag 330-1, electrical cable, assumed transient combustibles, and lubricating oil.

   d. Major ignition hazards include RHR-A pump, sump pumps, and room cooler.

   e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area may be a high radiation zone.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors at the ceiling of the pump room (471 ft).

   b. Smoke detector at 548 ft and at 572 ft within the heat exchanger room.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes on each elevation for alarm

   b. Portable extinguishers on each elevation

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown cables and equipment.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The A RHR pump, associated equipment, and cabling are assumed damaged or unavailable due to the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

c. The 472 ft and 563 ft pipe tunnel interfaces to Fire Area R-1 are void of in-situ combustibles and are controlled as combustible free zones. Fire Areas R-1 and R-5 both contain Division 1 post-fire safe systems and rely on Division 2 for safe shutdown. Therefore, the lack of a fire barrier will not prevent safe shutdown.

d. The east walls of the vertical pipe chase is not constructed per a fire tested configuration; however, the design is adequate to limit the spread of fire.

e. Unqualified doors and containment barrier are adequate to limit the spread of fire.

f. Smoke would be removed by the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

g. Water discharge could cause flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

h. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area R-5 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-6

1. Description

Reactor core isolation cooling pump room, el. 422 ft 3 in. and el. 444 ft 0 in.

2. Major equipment within the fire area

Reactor core isolation cooling pump
Reactor core isolation cooling turbine
Reactor core isolation cooling water leg pump
Room cooler

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The walls and ceiling which interface with adjacent fire areas (except R-2) are 3-hr rated reinforced concrete. A hatch in the ceiling at 471 ft is covered by a 3-hr rated 24 in. thick concrete plug.

   b. Flood doors are not listed as fire rated, but have equivalent construction.

   c. Fire dampers and penetration seals maintain the rating of the barrier (except penetration R206-5052).

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include electrical cable and assumed transient combustibles.

   d. Major ignition hazards include RCIC pump/turbine, RCIC water leg pump, and room cooler.

   e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area may be a high radiation zone.

5. Fire suppression/detection equipment within the fire area

   Smoke detectors below 471 ft 0 in. ceiling

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguisher

   b. 1.5 in. standpipe hose stations

   c. Manual pull box for alarm

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

   c. See Reference F.7.8.g for credited operator actions.

8. Potential consequences of a design basis fire

   a. The RCIC pump and auxiliaries within the fire area are assumed to be damaged by the design basis fire. The RCIC system is not credited for post-fire safe shutdown. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   c. Unqualified doors and containment barrier are adequate to limit the spread of fire.

   d. Penetration seal R206-5052 is adequate for the hazards. See Reference F.7.6.i for more details.

   e. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   f. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

g. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-6 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-7

1. Description

   Residual heat removal - C pump room, el. 422 ft 3 in. and el. 444 ft 0 in.

2. Major equipment within the fire area

   Residual heat removal pump 2C
   Residual heat removal water leg pump
   Sump pump
   Room cooler

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The walls and ceiling which interface with adjacent fire areas (except R-2) are 3-hr rated reinforced concrete. A hatch in the ceiling at 471 ft is covered by a 3-hr rated 24-in. thick concrete plug.

   b. Flood doors are not listed as fire rated, but have equivalent construction.

   c. Fire dampers and penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustibles include assumed transient combustibles and lubrication oil.

   d. Major ignition hazards include RHR-C pump RHR water leg pump, sump pump, and room cooler.

   e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area may be a high radiation zone.

5. Fire suppression/detection equipment within the fire area

   Smoke detectors below 471 ft 0 in. ceiling

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguisher

   b. 1.5 in. standpipe hose stations

   c. Manual pull box for alarm

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The RHR 2C pump and auxiliaries within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   c. Unqualified doors and containment barrier are adequate to limit the spread of fire.

   d. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

f. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-7 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-8

1. Description

Low-pressure core spray pump room, el. 422 ft 3 in. and el. 444 ft 0 in.

2. Major equipment within the fire area

Low-pressure core spray pump
Low-pressure core spray water leg pump
Room cooler

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. The walls and ceiling which interface with adjacent fire areas (except R-2) are 3-hr rated reinforced concrete. A hatch in the ceiling at 471 ft is covered by a 3-hr rated 24-in thick concrete plug.

b. Flood doors are not listed as fire rated, but have equivalent construction.

c. Fire dampers and penetration seals maintain the rating of the barrier.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low."

c. Major combustibles include assumed transient combustibles and lubrication oil.

d. Major ignition hazards include LPCS pump, LPCS water leg pump, and room cooler.

e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area may be a high radiation zone.

5. Fire suppression/detection equipment within the fire area

Smoke detectors below 471 ft 0 in. ceiling

6. Fire suppression/detection equipment outside but available to the fire area

a. Portable extinguisher

b. 1.5 in. standpipe hose stations

c. Manual pull box for alarm

7. Safe shutdown systems

a. Fire area contains Division 1 post-fire safe shutdown cables.

b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The LPCS pump and auxiliaries within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

c. Unqualified doors and containment barrier are adequate to limit the spread of fire.

d. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

f. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-8 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-9

1. Description

   Reactor building stair A6

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 422 ft level to the elevator machine room at el. 623 ft of the reactor building. The walls and ceiling which interface with adjacent fire areas are 3-hr rated reinforced concrete.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

c. Manual pull box at 623 ft

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. 1.5 in. standpipe hose station in 441 ft vehicle air lock (railroad bay).

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. 1.5 hr fire doors are adequate to ensure safe egress and limit the spread of fire.

   d. Smoke would be removed through the operation of-portable smoke removal equipment.

   e. Without floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area R-9 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-10

1. Description

   Reactor building elevator no. 2

2. Major equipment within the fire area

   Elevator car
   Elevator electric motor

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The elevator shaft extends from the 422 ft level of the reactor building to the elevator machine room at el. 623 ft. The walls and ceiling which interface with adjacent fire areas are 3-hr rated reinforced concrete.

   b. The elevator doors are 1.5-hr rated. Stairwell door to elevator equipment room is 1.5-hr rated.

   c. Penetration seals and fire dampers maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles.

   d. The major ignition hazard is the elevator electric motor.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detector in elevator equipment room.

   b. Portable extinguisher in elevator equipment room.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Standpipe hose stations in adjacent stairwell and vehicle air lock (railroad bay).

   b. Portable extinguishers.

   c. Manual pull boxes for alarm.

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, an elevator shaft fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. Grated opening on elevator equipment room floor would allow smoke in the shaft to reach the smoke detector.

   d. 1.5-hr fire doors are adequate to limit the spread of fire.

   e. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   f. Without floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area R-10 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-11

1. Description

   Reactor building stair A5

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 422 ft level to the el. 623 ft of the reactor building. The walls and ceiling which interface with adjacent fire areas are 3-hr rated reinforced concrete.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

c. Portable extinguisher at 441 ft

6. Fire suppression/detection equipment outside but available to the fire area

a. Portable extinguishers

b. Manual pull boxes for alarm

c. Manual pull box at 623 ft

7. Safe shutdown systems

This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

b. The available portable equipment is adequate to extinguish the design basis fire.

c. 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

d. Smoke would be removed through the operation of portable smoke removal equipment.

e. Without floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area R-11 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-12

1. Description

   Reactor building elevator no. 1

2. Major equipment within the fire area

   Elevator car
   Elevator electric motor

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The elevator shaft extends from the 441 ft level of the reactor building to the elevator machine room at el. 623 ft. The walls and ceiling which interface with adjacent fire areas are 3-hr rated reinforced concrete.

   b. The doors to the elevator are 1.5-hr rated. Door to elevator equipment room is 1.5-hr rated.

   c. Penetration seals and fire dampers maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.” However, this is based on infrequent transport of large amounts of combustibles in the elevator car.

   c. Major combustible is assumed transient combustibles.

   d. The major ignition hazard is the elevator electric motor.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detector in elevator equipment room

   b. Portable extinguisher in elevator equipment room

6. Fire suppression/detection equipment outside but available to the fire area

   a. Standpipe hose stations in adjacent stairwell

   b. Portable extinguishers

   c. Manual pull boxes for alarm

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, an elevator shaft fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. 1-hr fire doors are adequate to limit the spread of fire.

   d. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Without floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area R-12 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-15

1. Description

Lobby outside stair A5, el. 422 ft 3 in.

2. Major equipment within the fire area

Dry transformers

Fire area is a safety-related area.

3. Construction of Fire Area Boundaries

   a. The walls which interface with adjacent fire areas are 3-hr rated reinforced concrete. The ceiling is not credited as fire rated, but is designed equivalent to 3-hr fire rated.

   b. The door to the stairwell is 1.5-hr rated, minimum. Flood doors are not listed as fire rated, but have equivalent construction.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustibles include assumed transient combustibles and polyethylene.

   d. Major ignition hazard is dry transformers.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Portable fire extinguisher

   b. Manual pull box for alarm

6. Fire suppression/detection equipment outside but available to the fire area

    a. Standpipe hose stations in adjacent stairwell

    b. Manual pull boxes for alarm

    c. Portable extinguishers

7. Safe shutdown systems

    This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

    a. With no safe shutdown equipment/cables or associated circuits, fire will not prevent safe shutdown.

    b. The available portable equipment is adequate to extinguish the design basis fire.

    c. Unqualified doors, 1-hr fire door and nonrated ceiling are adequate to limit the spread of fire.

    d. Smoke would be removed through the operation of portable smoke removal equipment.

    e. Without floor drains, water discharge would cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

    A design basis fire within Fire Area R-15 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-18

1. Description

   Division 2 MCC room, el. 522 ft 0 in.

2. Major equipment within the fire area

   Motor control centers - Division 2

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

   c. Foamglass interior insulation is noncombustible.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "medium."

   c. Major combustible is electrical cable.

   d. Major ignition hazard is motor control centers.

   e. Equipment/piping within the area contain low level radioactive water and gas. There are no airborne radioactivity hazards within the area.

5. Fire suppression/detection equipment within the fire area

   Smoke detector

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes for alarm

b. Portable extinguishers

c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

c. See Reference F.7.8.g for credited operator actions.

8. Potential consequences of a design basis fire

a. The Division 2 motor control center and cabling within the fire area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

b. The installed smoke detector is expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

c. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

d. Water discharge would cause water to flow out into Fire Area R-1 based on the small room area. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drain is routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

e. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-18 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA R-21

1. Description

South valve and pipe space room, el. 522 ft 0 in.

2. Major equipment within the fire area

Large piping and valves

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated, except containment barrier.

b. Fire door, dampers/blowout vent paths, and penetration seals maintain the rating of the barrier.

c. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low."

c. Major combustible is assumed transient combustibles.

d. There are no major ignition hazards in the area.

e. Equipment/piping within the area contain low level radioactive water and gas. There are no airborne radioactivity hazards within the area. Fire area is typically a high radiation zone.

5. Fire suppression/detection equipment within the fire area

Smoke detector

6. Fire suppression/detection equipment outside but available to the fire area

a. Manual pull boxes for alarm

b. Portable extinguishers

c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The cabling for the Division 2 valves in this fire area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

c. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

d. Without floor drains, water discharge could cause water to flow out into Fire Area R-1 based on the small room area. The flooding will not impair the ability of the plant to reach safe shutdown.

e. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area R-21 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA M-9

1. Description

Instrument rack E-IR-P009 enclosure, el. 471 ft 0 in.

2. Major equipment within the fire area

Instrument rack E-IR-P009

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The shield walls enclosing the instrument rack and floor are concrete and 3-hr rated. The containment barrier is nonrated. There is no ceiling to the enclosure, but the shield walls extends approximately 6 in. higher than the instrument rack.

   b. The door to the room is 3-hr fire rated.

   c. Penetration seals maintain the rating of the fire barriers.

   d. A raised curb is installed at the doorway of the instrument rack enclosure fire area to further isolate the room.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustible is electrical cable. Storage of transient combustibles is not allowed in the fire area. See Figure F.6-6.

   d. There are no major ignition hazards in the area.

   e. Equipment/piping within the area contain low level radioactive water and gas.

5. Fire suppression/detection equipment within the fire area

   None (but detection is present in overhead area of Fire Area R-1)

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes for alarm

   b. Portable extinguishers

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   Fire area contains Division 2 post-fire safe shutdown tubing.

8. Potential consequences of a design basis fire

   a. The Division 2 tubing in this fire area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The instrument rack enclosure provides exposure fire protection for Division 2 post-fire safe shutdown instrument tubing. The concrete partitions around the instrument rack function to protect the instrument racks from the radiant heat from a fire originating outside of the fire area. Convective heat and smoke would quickly dissipate in the overhead ceiling area. The low combustible loading and transient combustible controls within the instrument rack enclosure precludes the propagation of fire to the overhead enclosed cable trays. References F.7.4.f and F.7.4.j approved the lack of full fire area enclosure.

   c. The smoke detectors installed in the surrounding general equipment area are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   d. Although the containment barrier is not considered 3-hr rated, it is adequate to prevent fire propagation.

   e. Without a floor drain (only raised equipment drain), water discharge could cause localized flooding. Flooding will not impair the ability of the plant to reach safe shutdown.

   f. The raised curb at the fire area entrance would prevent a flammable liquid spill from spreading between the instrument rack fire area and Fire Area R-1.

g. Smoke would be removed through the operation of the building exhaust system. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

h. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area M-9 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA M-21

1. Description

   Instrument rack E-IR-P021 enclosure, el. 501 ft 0 in.

2. Major equipment within the fire area

   Instrument rack E-IR-P021

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The fire area boundaries enclosing the instrument rack room are concrete and 3-hr rated. There is no ceiling to the enclosure, but the shield walls extends approximately 6 in. higher than the instrument rack.

   b. The door to the room is 3-hr fire rated.

   c. Penetration seals maintain the rating of the fire barriers.

   d. A raised curb is installed at the doorway of the instrument rack enclosure fire area to further isolate the room.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable. Storage of transient combustibles is not allowed in the fire area. See Figure F.6-6.

   d. There are no major ignition hazards in the area.

   e. Equipment/piping within the area contain low level radioactive water and gas.

5. Fire suppression/detection equipment within the fire area

   None (but detection is present in overhead area of Fire Area R-1)

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes for alarm

   b. Portable extinguishers

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 equipment/cabling in this fire area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The instrument rack enclosure provides exposure fire protection for Division 2 post-fire safe shutdown instrumentation. The concrete partitions around the instrument rack function to protect the instrument racks from the radiant heat from a fire originating outside of the fire area. Convective heat and smoke would quickly dissipate in the overhead ceiling area. The low combustible loading and transient combustible controls within the instrument rack enclosure precludes the propagation of the fire to the overhead enclosed cable trays. References F.7.4.f and F.7.4.j approved the lack of full fire area enclosure.

   c. The smoke detectors installed in the surrounding general equipment area are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   d. Without a floor drain (only raised equipment drain), water discharge could cause localized flooding. Flooding will not impair the ability of the plant to reach safe shutdown.

   e. The raised curb at the fire area entrance would prevent a flammable liquid spill from spreading between the instrument rack fire area and Fire Area R-1.

f. Smoke would be removed through the operation of the building exhaust system. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

g. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area M-21 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA M-27

1. Description

   Instrument rack E-IR-P027 enclosure, el. 522 ft 0 in.

2. Major equipment within the fire area

   Instrument rack E-IR-P027

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The shield walls enclosing the instrument rack and floor are concrete and 3-hr rated. The containment barrier is nonrated. There is no ceiling to the enclosure, but the shield walls extends approximately 6 in. higher than the instrument rack.

   b. The door to the room is 3-hr fire rated.

   c. Penetration seals maintain the rating of the fire barriers.

   d. A raised curb is installed at the doorway of the instrument rack enclosure fire area to further isolate the room.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable. Storage of transient combustibles is not allowed in the fire area. See Figure F.6-6.

   d. There are no major ignition hazards in the area.

   e. Equipment/piping within the area contain low level radioactive water and gas.

5. Fire suppression/detection equipment within the fire area

   None (but detection is present in overhead area of Fire Area R-1)

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes for alarm

   b. Portable extinguishers

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. Division 1 CRD water injection instrument tubing passes over the fire area.

   c. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 equipment/cabling in this fire area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The Division 1 CRD water injection tubing that passes over the instrument rack area could heat up due to the routing over the Division 2 fire area. However, the temperature isolation functions credited for post-fire safe shutdown would not be affected.

   c. The instrument rack enclosure provides exposure fire protection for Division 2 post-fire safe shutdown instrumentation. The concrete partitions around the instrument rack function to protect the instrument racks from the radiant heat from a fire originating outside of the fire area. Convective heat and smoke would quickly dissipate in the overhead ceiling area. The low combustible loading and transient combustible controls within the instrument rack enclosure precludes the propagation of the fire to the overhead enclosed cable trays and junction boxes. References F.7.4.f and F.7.4.j approved the lack of full fire area enclosure.

d. The smoke detectors installed in the surrounding general equipment area are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

e. Although the containment barrier is not considered 3-hr rated, it is adequate to prevent fire propagation.

f. Without a floor drain (only raised equipment drain), water discharge could cause localized flooding. Flooding will not impair the ability of the plant to reach safe shutdown.

g. The raised curb at the fire area entrance would prevent a flammable liquid spill from spreading between the instrument rack fire area and Fire Area R-1.

h. Smoke would be removed through the operation of the building exhaust system. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

i. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area M-27 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA M-73

1. Description

Instrument rack E-IR-73 enclosure, el. 522 ft 0 in.

2. Major equipment within the fire area

Instrument rack E-IR-73

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The fire area boundaries enclosing the instrument rack room are concrete and 3-hr rated. There is no ceiling to the enclosure, but the shield walls extends approximately 6 in. higher than the instrument rack.

   b. The door to the room is 3-hr fire rated.

   c. Penetration seals maintain the rating of the fire barriers.

   d. A raised curb is installed at the doorway of the instrument rack enclosure fire area to further isolate the room.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable. Storage of transient combustibles is not allowed in the fire area. See Figure F.6-6.

   d. There are no major ignition hazards in the area.

   e. Equipment/piping within the area contain low level radioactive water and gas.

5. Fire suppression/detection equipment within the fire area

None (but detection is present in overhead area of Fire Area R-1)

6. Fire suppression/detection equipment outside but available to the fire area

   a. Manual pull boxes for alarm

   b. Portable extinguishers

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   Fire area contains Division 1 post-fire safe shutdown tubing.

8. Potential consequences of a design basis fire

   a. The Division 2 equipment/cabling in this fire area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The instrument rack enclosure provides exposure fire protection for Division 2 post-fire safe shutdown instrumentation. The concrete partitions around the instrument rack function to protect the instrument racks from the radiant heat from a fire originating outside of the fire area. Convective heat and smoke would quickly dissipate in the overhead ceiling area. The low combustible loading and transient combustible controls within the instrument rack enclosure precludes the propagation of the fire to the overhead enclosed cable trays. References F.7.4.f and F.7.4.j approved the lack of full fire area enclosure.

   c. The smoke detectors installed in the surrounding general equipment area are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   d. Without a floor drain (only raised equipment drain), water discharge could cause localized flooding. Flooding will not impair the ability of the plant to reach safe shutdown.

   e. The raised curb at the fire area entrance would prevent a flammable liquid spill from spreading between the instrument rack fire area and Fire Area R-1.

   f. Smoke would be removed through the operation of the building exhaust system. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

g. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA Conclusion

A design basis fire within Fire Area M-73 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-1

1. Description

General equipment nonvital areas, el. 437 ft 0 in., 452 ft 0 in., 467 ft 0 in., 487 ft 0 in., 501 ft 0 in., and 507 ft 0 in.

2. Major equipment within the fire area

a. Elevation 437 ft - general equipment area

Radwaste baling area (baled and drum waste)
Offgas equipment and charcoal adsorbers
Waste storage tank area
East high-high radwaste tank and pump rooms
Truck bay

b. Elevation 452 ft - glycol pumps area

Chiller pumps
Offgas equipment and charcoal adsorbers

c. Elevation 467 ft - general equipment area

Radwaste control room
Contaminated tool room
Mask issue room
Decontamination facility
Tool crib storage area
Motor control centers

d. Elevation 487 ft - general equipment area

Hot machine shop
Chemistry lab and offices
Relay room
Health physics storage

e. Elevation 507 ft - general equipment area

Mechanical equipment room
Filter demineralizer removal area

The majority of the fire area is not a safety-related area. However, rooms C102, C104, C105, C106, C108, C203, C204, C231, C229 (north of column L.9) do contain safety-related equipment.

3. Construction of fire area boundaries

   a. The radwaste building exterior walls are reinforced concrete below el. 467 ft and insulated metal siding from el. 467 ft to the roof.

   b. The radwaste building walls which interface with other fire areas are generally reinforced concrete and 3-hr fire rated. The boundary with Fire Area RC-15, above 467 ft, is 2-hr rated masonry. Two wall sections in the northwest corner from 487 ft to 507 ft are 2-hr rated masonry walls (Reference F.7.6.g). The walls which interface with Fire Area RC-9 are 2-hr rated.

   c. Fire dampers and penetration seals maintain the rating of the barrier. The blind corridor room C349 has nonrated penetration seals (Reference F.7.6.g).

   d. Elevator doors are 1.5-hr fire rated. Normal stairwell doors are 1.5-hr fire rated, minimum. Stairwell low range blast and bullet resistant doors are not listed as fire rated, but have equivalent construction. Other 3-hr barriers have 3-hr fire doors.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.” Since fire area covers approximately 93,400 ft^2, actual combustible loading varies.

   c. Major combustibles include electrical cable, charcoal and lubrication oil.

   d. Major ignition hazards include electrical switchgear, charcoal filters, fan motors, dry transformers, pumps motors, and hot machine shop.

   e. Equipment/piping within the area contain low level radioactive water, radioactive liquid waste, concentrated radioactive liquid waste, radioactive charcoal, and radioactive demineralizer ion exchange resins. There are typically no airborne radioactivity hazards within the area. Some portions of the fire area are high and high-high radiation zones.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors

   b. Portable extinguishers

   c. Manual pull boxes

   d. Wet pipe sprinklers over the storage areas on the 437 ft, 467 ft, and 487 ft elevation and the chemistry lab offices

   e. 1.5 in. standpipe hose stations

6. Fire suppression/detection equipment outside but available to the fire area

   a. Hose lines from 2.5 in. outlets on yard hydrants

   b. 1.5 in. standpipe hose stations in enclosed stairwells

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

   c. See Reference F.7.8.g for credited operator actions.

8. Potential consequences of a design basis fire

   a. Division 1 post-fire safe shutdown equipment and cabling located within this fire area is assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The smoke detectors installed in the surrounding general equipment area are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade.

   c. The walls which interface with Fire Area RC-9 are 6-in. thick reinforced concrete. Since this is the minimum thickness for a 3-hr rating and there are surface defects, the walls are credited as 2-hr rated. The penetration seals can only be qualified as 2-hr rated. This fire rating is adequate for the hazards and will prevent fire propagation.

d. Unqualified and 1.5-hr fire doors are adequate to limit the spread of fire. The blind corridor room C349 2-hr barrier and nonrated penetration seals are adequate to limit the spread of fire.

e. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. Roof smoke purge fan WEA-FN-7 is available to the 507 ft level. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material. Radiation monitors are located downstream from the building exhaust air HEPA filter bank would sample the air being discharged to the atmosphere.

f. Automatic sprinklers are installed to protect the storage areas on the 437 ft, 467 ft, and 487 ft elevations, and the 487 ft chemistry lab offices. A fire in one of these area is expected to be quickly controlled by the sprinkler discharge.

g. Room C405 is not equipped with a manual hose station. For a hose stream to reach the entire room, 250 ft of fire hose is required. This is not a safety-related area and adequate fire hose is available. See Table F.2-1 for associated code deviation.

h. A high heat condition in one loop of charcoal adsorbers will alarm in the control room. Closure of the associated adsorber inlet valve would limit the oxygen supply for combustion.

i. Water discharge could cause flooding until removed by the floor drain system, through open doors, or by portable pumping units. Floor drains in this area are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

j. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area RC-1 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-2

1. Description

   Cable spreading room, el. 484 ft 0 in.

2. Major equipment within the fire area

   Cable trays

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

   c. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "medium."

   c. Major combustibles include electrical cable and Thermo-Lag 330-1.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors

   b. Portable extinguishers

   c. Manual pull boxes

   d. Automatic preaction sprinkler system

   e. Smoke detector in each return air duct system

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose stations

   b. Portable extinguishers

7. Safe shutdown systems

   a. Fire Area RC-2 contains Division 1 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

   c. See Reference F.7.3.d and F.7.6.u for credited operator manual actions.

8. Potential consequences of a design basis fire

   a. The Division 1 circuits within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade. Activation of the smoke detectors causes the preaction system control valve to open, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the sprinkler heads.

   c. Smoke would be removed through the operation of smoke purge fan WEA-FN-52 or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   d. Water discharge could cause localized flooding. Certain floor penetration seals are watertight to prevent water intrusion to redundant fire areas below. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains in this area are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. FHA conclusion

A design basis fire within Fire Area RC-2 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-3

1. Description

Cable chase, el. 467 ft 0 in., el. 501 ft 0 in., and el. 525 ft 0 in.

2. Major equipment within the fire area

Cable trays

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

b. Fire dampers and penetration seals maintain the rating of the barrier.

c. Low range blast and airtight doors are not listed as fire rated, but have equivalent construction. Other fire doors maintain the rating of the barrier.

d. The 467 ft east doorway is equipped with a 12 in. floor dike.

e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “high” (based mainly on small floor area in relation to large room volume).

c. Major combustibles include electrical cable and Thermo-Lag 330-1.

d. There are no major ignition hazards in the area.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detectors at the 501 ft and 525 ft levels

b. Smoke detector in each return air duct system

c. Automatic preaction sprinkler system. A pull box is provided for manual actuation (located outside the area at el. 525 ft and at the 441 ft alarm valve).

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. standpipe hose stations

b. Portable extinguishers

c. Manual pull box for alarm

7. Safe shutdown systems

a. Fire area contains both Division 1 and Division 2 post-fire safe shutdown cables. Division 2 post-fire safe shutdown cables are protected by 1-hr rated raceway barrier wraps and/or MI fire rated cable.

b. See Reference F.7.3.d for credited cables.

c. See Reference F.7.3.d and F.7.6.u for credited operator manual actions.

8. Potential consequences of a design basis fire

a. A fire in this area could damage cabling for the Division 1 post-fire safe shutdown systems. The combination of full area fire detection, preaction sprinkler system, and 1-hr raceway barriers ensure Division 2 will be available for safe shutdown.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the plant fire brigade. Activation of the smoke detectors causes the preaction system control valve to open, allowing water to pressurize the sprinkler system piping. Sprinkler flow is initiated when further rise in ambient temperature actuates the fusible link elements on the sprinkler heads.

c. The raceway barrier load bearing supports may not be wrapped the entire distance to the concrete barrier. In addition, raceway and other structural members routed over the top of raceway barriers are not protected. This is acceptable since the entire fire area is equipped with a high density preaction suppression system which ensures steel members would not heat to the point of structural failure (Reference F.7.3.g).

d. The fire area has a much higher combustible loading fire severity duration than the surrounding 3-hr barriers. However, the fire area is equipped with a high density preaction sprinkler system which would effectively limit fire severity.

e. Unqualified doors are adequate to limit the spread of fire.

f. Smoke would be removed through the operation of smoke purge fan WEA-FN-52 or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

g. Water discharge could cause localized flooding. The floor dike and gasketed door would help limited water spread to the 467 ft vital island rooms. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area RC-3 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-4

1. Description

   Division 1 electrical equipment rooms, el. 467 ft 0 in. (battery charger room no. 1 and RPS room no. 1)

2. Major equipment within the fire area

   Battery charger #1
   Motor control centers
   Reactor protection system M/G sets
   Inverters

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. The majority of fire dampers are 1.5-hr rated; however some are 3-hr rated.

   c. Fire doors and penetration seals maintain the rating of the barrier.

   d. Doorways are equipped with a 3 in. raised curb.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable.

   d. Major ignition hazards include dry transformers, motor control centers, MG set motor/generator, and inverters.

   f. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors at ceiling level

   b. Smoke detector in the return air duct

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Based on the low combustible loading, the 1.5-hr rated fire dampers are adequate to limit the spread of fire (Reference F.7.4.a).

   d. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. Fire area does not have floor drains, but is equipped with a 3 in. raised curb at doorways. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area RC-4 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-5

1. Description

   Battery room no. 1, el. 467 ft 0 in.

2. Major equipment within the fire area

   Battery banks
   Electrical panels
   Dry transformers

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. The majority of fire dampers are 3-hr rated; however some are 1.5-hr rated.

   c. Fire doors and penetration seals maintain the rating of the barrier.

   d. East doorway is equipped with a 3 in. raised curb.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable.

   d. Major ignition hazard is arcing from shorted battery terminals, electrical panels, dry transformers, and unit heater.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors

   b. Smoke detector in return air and exhaust air duct

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Based on the low combustible loading, the 1.5-hr rated fire dampers are adequate to limit the spread of fire (Reference F.7.4.a).

   d. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. East doorway is equipped with a 3 in. raised curb. The floor drain is routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. FHA conclusion

A design basis fire within Fire Area RC-5 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-6

1. Description

Battery room no. 2, el. 467 ft 0 in.

2. Major equipment within the fire area

Battery banks

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire dampers are 1.5-hr rated.

   c. Fire doors and penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustible is assumed transient combustibles.

   d. Major ignition hazards include HVAC heating unit and shorted battery terminals.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors

   b. Smoke detector in return air and exhaust air duct

6. <u>Fire suppression/detection equipment outside but available to the fire area</u>

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. <u>Safe shutdown systems</u>

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. <u>Potential consequences of a design basis fire</u>

   a. The Division 2 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Based on the low combustible loading, the 1.5-hr rated fire dampers are adequate to limit the spread of fire (Reference F.7.4.a).

   d. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. The floor drain is routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. <u>FHA conclusion</u>

   A design basis fire within Fire Area RC-6 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-7

1. Description

Division 2 electrical equipment rooms, el. 467 ft 0 in. (battery charger room no. 2 and RPS room no. 2)

2. Major equipment within the fire area

Battery charger no. 2
Motor control centers
Reactor protection system M/G set

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

b. Fire dampers are 1.5-hr rated.

c. Fire doors and penetration seals maintain the rating of the barrier.

d. Doorways are equipped with a 3 in. raised curb.

e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low."

c. Major combustible is electrical cable.

d. Major ignition hazards include battery charger no. 2, motor control centers, RPS M/G set and dry transformers.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors at ceiling level

   b. Smoke detector in the return air duct

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Based on the low combustible loading, the 1.5-hr rated fire dampers are adequate to limit the spread of fire (Reference F.7.4.a).

   d. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. Fire area does not have floor drains, but is equipped with a 3 in. raised curb at doorways. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area RC-7 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-8

1. Description

Switchgear room no. 2, el. 467 ft 0 in.

2. Major equipment within the fire area

Division 2 switchgear
Division 2 transformers TR-8-81 and TR-8-83

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

   c. Doorways are equipped with a 3 in. raised curb. Oil-filled transformers are surrounded by 12 in. dikes.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "medium."

   c. Major combustibles include transformer oil and electrical cable.

   d. Major ignition hazards include Division 2 switchgear, oil-filled transformers, and neutral grounding resistors.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors at ceiling level

   b. Smoke detector in the return air duct system

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   d. Water discharge could cause localized flooding. Fire area does not have floor drains, but is equipped with a 3 in. raised curb at doorways. The flooding will not impair the ability of the plant to reach safe shutdown.

   e. Both oil-filled transformers are equipped with 12 in. high dikes to help prevent the spread of oil.

9. FHA conclusion

   A design basis fire within Fire Area RC-8 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-9

1. Description

Remote shutdown room, el. 467 ft 0 in.

2. Major equipment within the fire area

Remote shutdown panels

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated, except the two northwest chase walls are 2-hr fire rated.

b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

c. Doorways are equipped with a 3 in. raised curb.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “low.”

c. Major combustible is electrical cable.

d. Major ignition hazards include electrical panels and dry transformers.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detectors at ceiling level

b. Smoke detector in the return air duct system

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. This fire area contains remote shutdown panel used during a design basis fire in the main control room Fire Area RC-10.

   c. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. The northwest chase walls which interface with Fire Area RC-1 are 6-in. thick reinforced concrete. Since this is the minimum thickness for a 3-hr rating and there are surface defects, the walls are credited as 2-hr rated. The penetration seals can only be qualified as 2-hr rated. This fire rating is adequate for the hazards and will prevent fire propagation.

   d. Smoke would be removed by the operation of smoke purge fan WEA-FN-52 or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. Fire area does not have floor drains, but is equipped with a 3 in. raised curb at doorways. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area RC-9 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-10

1. Description

   Main control room, el. 501 ft 0 in.

2. Major equipment within the fire area

   Control panels, computers, and office area

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire dampers and penetration seals maintain the rating of the barrier.

   c. Low range blast/bullet resistant/airtight doors are not listed as fire rated, but have equivalent construction.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include electrical cable, vinyl flooring/carpet, and paper.

   d. Major ignition hazard is electrical panels.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors in the general area at suspended ceiling

   b. Smoke detectors in the shift manager's office

   c. Portable extinguishers

d. Manual pull boxes

e. Automatic Halon extinguishing systems in PGCC sub-floor sections longitudinal cable ducts with smoke and thermal detectors

f. Smoke detectors in PGCC termination cabinets and panels

g. Smoke detector in kitchen area

h. Automatic sprinkler system in the shift manager's office, pipe chase, restroom, and kitchen area.

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. standpipe hose station

b. Portable fire extinguisher

c. One manual pull box

7. Safe shutdown systems

a. Fire area contains both Division 1 and Division 2 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

c. See Reference F.7.3.d for credited operator manual actions.

8. Potential consequences of a design basis fire

a. The Division 1 and Division 2 equipment/cabling in Fire Area RC-10 is assumed damaged by the design basis fire. Should a fire render the main control room uninhabitable, remote post-fire shutdown is achieved from Fire Areas RC-9 and RC-14 using selected equipment which may be isolated from the effects of the fire, assuming offsite power may not be available. Primarily Division 2 and some Division 1 post-fire safe shutdown systems would remain operable to ensure safe plant shutdown. See Section F.4.3.2 discussion of remote post-fire safe shutdown methodology and equipment.

b. The main control room is constantly manned by operations personnel. A fire occurring in the control room or support areas is expected to be detected promptly. Based on the lack of combustibles, detection is not required above the suspended ceiling. Early warning is provided by the smoke detectors at suspended ceiling level and in the PGCC termination cabinets and panels.

c. A fire in the PGCC subfloor longitudinal cable ducts would be quickly detected by the installed smoke detectors. Thermal detectors will sense a high heat condition activating the Halon system into the sealed PGCC sub-floor section longitudinal cable ducts.

d. A fire in an office/support area would actuate the installed automatic sprinkler system to control the fire. The control room sprinkler and combustible wall paneling were approved per Reference F.7.4.f.

e. The main control room carpeting does not create a significant fire hazard (References F.7.4.g and F.7.6.t).

f. Unqualified doors are adequate to limit the spread of fire.

g. Smoke would be removed by the operation of smoke purge fan WEA-FN-52 or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

h. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area RC-10 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-11

1. Description

Unit A air conditioning room, radwaste control building, el. 525 ft 0 in.

2. Major equipment within the fire area

Control room air conditioning unit A
Cable spreading room unit A
Critical switchgear room air conditioning unit A
Motor control centers

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

b. Fire dampers and penetration seals maintain the rating of the barrier.

c. The chiller area door is 1.5-hr rated, minimum. The low range blast door is not listed as fire rated, but has equivalent construction.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as "low."

c. Major combustible is electrical cable.

d. Major ignition hazards include motor control centers, HVAC fan motors, and charcoal filter.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Manually actuated water spray system in the charcoal emergency filter unit. Thermistor wires provide high temperature alarm in the main control room.

   b. Smoke detectors at ceiling level.

   c. Smoke detector in return air duct.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguisher

   b. 1.5 in. standpipe hose stations

   c. Manual pull box for alarm

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 control room HVAC, cable spreading room HVAC, and critical switchgear HVAC units within the fire area are assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Heat buildup within the charcoal filter unit would cause a temperature alarm in the main control room. The manual water spray system may be remotely actuated if required to suppress a charcoal filter fire.

   d. Unqualified and 1.5-hr door are adequate to limit the spread of fire.

   e. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

f. Water discharge could cause localized flooding. Floor penetration seals are pressure resistant to essentially no leakage and would prevent water intrusion into the main control room. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. FHA conclusion

A design basis fire within Fire Area RC-11 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-12

1. Description

Unit B air conditioning room, radwaste control building, el. 525 ft 0 in.

2. Major equipment within the fire area

Control room air conditioning unit B
Cable spreading room unit B
Critical switchgear room air conditioning unit B
Motor control centers

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

b. Fire dampers and penetration seals maintain the rating of the barrier.

c. The door from the chiller area is 1.5-hr rated, minimum. The low range blast/bullet resistant door/airtight is not listed as fire rated, but has equivalent construction.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “low.”

c. Major combustible is electrical cable.

d. Major ignition hazards include motor control centers, HVAC motors, and charcoal filter.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

    a. Manually actuated water spray system in the charcoal emergency filter unit. Thermistor wires provide high temperature alarm in the main control room.

    b. Smoke detectors at ceiling level.

    c. Smoke detector in return air duct.

    d. Portable extinguisher

6. Fire suppression/detection equipment outside but available to the fire area

    a. Portable extinguishers

    b. 1.5 in. standpipe hose stations

    c. Manual pull box for alarm

7. Safe shutdown systems

    a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

    b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

    a. The Division 2 control room HVAC, cable spreading room HVAC, and critical switchgear HVAC units within the fire area are assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

    b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

    c. Heat buildup within the charcoal filter unit would cause a temperature alarm in the main control room. The manual water spray system may be remotely actuated if required to suppress a filter fire.

    d. Unqualified and 1.5-hr door are adequate to limit the spread of fire.

e. Smoke would be removed by the operation of portable smoke removal equipment. HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

f. Water discharge could cause localized flooding. Floor penetration seals are pressure resistant to essentially no leakage and would prevent water intrusion into the main control room. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. <u>FHA conclusion</u>

A design basis fire within Fire Area RC-12 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-13

1. Description

   Communications room, emergency chiller area, instrument shop, radwaste control building, el. 525 ft 0 in., and HVAC chase 484 ft to 525 ft.

2. Major equipment within the fire area

   Communications equipment room, hot instrument shop, emergency chiller area.

   Fire area is a safety-related area.

3. Construction of Fire Area Boundaries

   a. Fire area boundaries are constructed of reinforced concrete. Fire area boundaries which interface with other fire areas are 3-hr rated.

   b. Fire door assemblies have a 1.5-hr fire rating except the door at the bottom of the duct chase has a 3-hr fire rating.

   c. Fire dampers are 3-hr fire rated dampers or have doors in frames similar to fire door frames.

   d. Penetration seals maintain the rating of the barrier.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include paper, electrical cable and wood.

   d. Major ignition hazard is electrical communication cabinets.

   e. Low level radioactive material may be present due to the radiological instrument shop. There are typically no airborne radioactivity hazards within the area.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors in the communications shop

   b. Smoke detectors in the corridor

   c. Portable extinguishers

   d. Manual pull box

   e. Smoke detector in the corridor return air duct (served by Division 2 only)

   f. 1.5 in. standpipe hose station

6. Fire suppression/detection equipment outside but available to the fire area

   a. 1.5 in. standpipe hose station

   b. Manual pull station

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The cabling for the Division 2 cable spreading HVAC and critical switchgear HVAC units within the fire area is assumed damaged due to the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. Fire damage to the emergency chillers could occur. The standby service water supply to the control room air handling unit cooling coil will remain available.

   c. The closure of fire dampers could interrupt the fresh air intake to the main control room. If necessary, control room operators can don SCBA or open the control room doors and purge with smoke removal fan WEA-FN-7.

   d. 1.5-hr fire doors and fire door type fire dampers are adequate to limit the spread of fire (Reference F.7.4.f).

e. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

f. Smoke would be removed by portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

g. Water discharge could cause localized flooding. Floor penetration seals are pressure resistant to essentially no leakage and would prevent water intrusion into the main control room. Flooding will not impair the ability of the plant to reach safe shutdown. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. FHA conclusion

A design basis fire within Fire Area RC-13 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-14

1. Description

Switchgear room no. 1, radwaste/control building, el. 467 ft 0 in.

2. Major equipment within the fire area

Division 1 switchgear
Division 1 transformers TR-7-71 and TR-7-73
Alternate shutdown panel

Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire doors, dampers, and penetration seals maintain the rating of the barrier.

   c. Doorways are equipped with a 3 in. raised curb and oil-filled transformers are surrounded by 12 in. dikes.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "medium."

   c. Major combustibles include transformer oil and electrical cable.

   d. Major ignition hazards include electrical switchgear, oil-filled transformers, and neutral grounding resistors.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors at ceiling level

   b. Smoke detector in the return air duct system

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

   b. Fire area also contains alternate remote shutdown panel used during a main control room fire.

   c. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 electrical equipment and cabling within the area are assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Smoke would be removed by portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   d. Water discharge could cause localized flooding. Fire area does not have floor drains, but is equipped with a 3 in. raised curb at doorways. The flooding will not impair the ability of the plant to reach safe shutdown.

   e. Both oil-filled transformers are equipped with 12 in. high dikes to help prevent the spread of oil.

9. FHA conclusion

A design basis fire within Fire Area RC-14 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-15

1. Description

   Radwaste building, stair A8 and room C100

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 437 ft level to the 507 ft level of the radwaste building. The fire area boundary is concrete or masonry and is 3-hr rated (except floor).

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. Hose lines from 2.5 in. outlets on yard hydrants

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. 2-hr fire barriers and 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

   d. Smoke would be removed through portable smoke removal equipment.

   e. The no floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area RC-15 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-16

1. Description

   Radwaste/control building, stair A7

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area, but is used for access to perform post-fire safe shutdown operator actions.

3. Construction of fire area boundaries

   a. The stairwell extends from the 437 ft level to the 525 ft level of the radwaste/control building. The walls of the area are concrete and are 3-hr fire rated.

   b. The low range blast stairwell doors are not listed as fire rated, but have equivalent construction.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

   c. Manual pull boxes at 452 ft and 525 ft

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. Unqualified doors are adequate to ensure safe egress and limit the spread of fire.

   d. Smoke would be removed through the operation of portable smoke removal equipment.

   e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area RC-16 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-17

1. Description

Radwaste/control building, elevator no. 4, and room C504 vestibule

2. Major equipment within the fire area

Elevator electrical motor

Fire area is not a safety-related area.

3. Construction of fire area boundaries

a. The elevator shaft extends from the 437 ft level to the 525 ft level of the radwaste/control building. The walls of the area are concrete and are 3-hr fire rated.

b. The elevator doors are 1.5-hr rated. Hourly rating of elevator door C500 and equipment room door C512 is not credited. Stairwell door C501 at 525 ft is a low range blast door which is not listed as fire rated, but has equivalent construction.

c. Penetration seals and fire dampers maintain the rating of the barrier.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “low.”

c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

d. The major ignition hazard is the elevator electric motor.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

Smoke detector in elevator equipment room.

6. <u>Fire suppression/detection equipment outside but available to the fire area</u>

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. 1.5 in. standpipe hose stations

7. <u>Safe shutdown systems</u>

   This fire area contains no post-fire safe shutdown components or cabling.

8. <u>Potential consequences of a design basis fire</u>

   a. With no safe shutdown equipment/cables or associated circuits, an elevator shaft fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. Grated opening on elevator equipment room floor would allow smoke in the shaft to reach the smoke detector.

   d. Unqualified and 1.5-hr fire doors are adequate to limit the spread of fire.

   e. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to defect radioactive smoke which may result from the combustion of radioactive material.

   f. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. <u>FHA conclusion</u>

   A design basis fire within Fire Area RC-17 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-18

1. Description

   Radwaste/control building, stair A13

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 467 ft level vital island to the cable spreading room on the 484 ft level of the radwaste/control building. The fire area boundaries are concrete and 3-hr fire rated.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   1.5 in. standpipe hose station

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. Since the stairwell is void of in-situ combustibles, the lack of fire detection is acceptable.

   d. 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

   e. Smoke would be removed through the operation of portable smoke removal equipment.

   f. With no drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area RC-18 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-19

1. Description

   Corridor C-205, radwaste/control building, el. 467 ft 0 in.

2. Major equipment within the fire area

   Cabling

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. The majority of fire dampers are 3-hr rated; however some are 1.5-hr rated.

   c. Fire doors and penetration seals maintain the rating of the barrier.

   d. RC-18 stairwell door is 1.5-hr rated, minimum. The low range blast doors are not listed as fire rated, but have equivalent construction. Other fire doors maintain the rating of the barrier.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable.

   d. Major ignition hazard is a dry transformer.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detectors

   b. Portable extinguishers

c. One manual pull box

6. Fire suppression/detection equipment outside but available to the fire area

a. 1.5 in. manual hose stations

b. Manual pull boxes

7. Safe shutdown systems

a. Fire area contains Division 2 post-fire safe shutdown cables.

b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. The Division 2 cabling within the area is assumed damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

c. Based on the low combustible loading, the 1.5-hr rated fire dampers/doors and unqualified doors are adequate to limit the spread of fire (Reference F.7.4.a).

d. Smoke would be removed by the operation of portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

e. Water discharge could cause localized flooding. The 12 ft dike in RC-3 and 3 in. curbs in adjacent fire areas without drains would help limit water spread to other fire areas. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drain is routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

9. FHA conclusion

A design basis fire within Fire Area RC-19 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA RC-20

1. Description

   Pipe chase (el. 467 ft) and PASS area (el. 487 ft) - radwaste building

2. Major equipment within the fire area

   PASS cabinets
   Cable trays

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. Fire area boundaries are constructed of reinforced concrete and are 3-hr rated.

   b. Fire doors are 1.5-hr rated, minimum. Entrance door at 467 ft is normally locked.

   c. Fire dampers are 3-hr rated at 467 ft and 1.5-hr rated at 487 ft.

   d. Penetration seals maintain the rating of the barrier, except R206-4236 is nonrated.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustible is electrical cable.

   d. Major ignition hazard is the PASS control panel.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   Smoke detectors at 487 ft PASS room ceiling.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. 1.5 in. standpipe hose station

7. Safe shutdown systems

   a. Fire area contains Division 1 post-fire safe shutdown cables.

   b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 1 cabling within the area is assumed damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

   b. The installed smoke detectors are expected to detect the products of combustion from a fire in its initial stages of growth and alert the control room for response by the fire brigade.

   c. Based on the low combustible loading, the 1.5-hr rated fire damper and doors are adequate to limit the spread of fire.

   d. Penetration R206-4236 is the PASS module. The penetration has numerous tubes supported by steel plates on each side and a center sleeve through the wall to the reactor building. There is no penetration sealant in the outer area and the center sleeve can not be sealed since it is a vent line. The east side of the penetration is in the Fire Area R-4 pipe chase which is void of combustibles. The Fire Area RC-20 side has a steel enclosure which is sufficiently substantial to act as a secondary containment barrier. The enclosure has minimal combustible cables. This unique penetration design is adequate for the adjacent hazards.

   e. Smoke would be removed by the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   f. With no floor drains, water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area RC-20 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA SW-1

1. Description

Standby service water pump house 1A, el. 431 ft 0 in. and el. 441 ft 0 in.

2. Major equipment within the fire area

Standby service water pump A
High-pressure core spray service water pump

Fire area is a safety-related area.

3. Construction of fire area boundaries

a. The exterior pump house walls and ceiling are reinforced concrete and are nonrated.

b. The pump house doors are nonrated.

c. The pump house is remote from other fire areas.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “low.”

c. Major combustibles include assumed transient combustibles, transformer oil, and electrical cable.

d. Major ignition hazard is standby service water pumps.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detector in cable vault

b. Thermal detector in pump area

c. Portable extinguisher

d. Manual pull box

6. <u>Fire suppression/detection equipment outside but available to the fire area</u>

Hose lines from 2.5 in. outlets on yard hydrants

7. <u>Safe shutdown systems</u>

a. Fire area contains Division 1 post-fire safe shutdown equipment and cables.

b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. <u>Potential consequences of a design basis fire</u>

a. The Division 1 standby service water pump and associated equipment and cabling within the fire area are assumed to be damaged by the design basis fire. Division 2 post-fire safe shutdown systems would remain operable.

b. The developing fire would activate an installed smoke or thermal detector, initiating an alarm in the control room for fire brigade response. Manual hose stations are available.

c. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

d. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains in this area are routed back to the service water pond.

e. The Hydrogen Storage and Supply Facility (HSSF) is located approximately 0.6 miles southeast of the plant and stores approximately 9800 pounds of liquid and gaseous hydrogen. This separation ensures a fire or explosion at the HSSF has no impact on the operability of the redundant service water pump house fire areas and their service water ponds (References F.7.3.bb, F.7.3.cc, and F.7.5.t).

9. <u>FHA conclusion</u>

A design basis fire within Fire Area SW-1 will be confined near the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA SW-2

1. Description

   Standby service water pump house 1B, el. 431 ft 0 in. and el. 441 ft 0 in.

2. Major equipment within the fire area

   Standby service water pump B

   Fire area is a safety-related area.

3. Construction of fire area boundaries

   a. The exterior pump house walls and ceiling are reinforced concrete and are nonrated.

   b. The pump house doors are nonrated.

   c. The pump house is remote from other fire areas.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustibles include assumed transient combustibles, transformer oil and electrical cable.

   d. Major ignition hazard is standby service water pumps.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Smoke detector in cable vault

   b. Thermal detector in pump area

   c. Portable extinguisher

   d. Manual pull box

6. Fire suppression/detection equipment outside but available to the fire area

   Hose lines from 2.5 in. outlets on yard hydrants

7. Safe shutdown systems

   a. Fire area contains Division 2 post-fire safe shutdown equipment and cables.

   b. See Table F.4-1 for credited equipment and Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

   a. The Division 2 standby service water pump and associated equipment and cabling within the fire area are assumed to be damaged by the design basis fire. Division 1 post-fire safe shutdown systems would remain operable.

   b. The developing fire would activate an installed smoke or heat detector, initiating an alarm in the control room for fire brigade response. Manual hose stations are available.

   c. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment.

   d. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown. Floor drains in this area are routed back to the service water pond.

   e. The Hydrogen Storage and Supply Facility (HSSF) is located approximately 0.6 miles southeast of the plant and stores approximately 9800 pounds of liquid and gaseous hydrogen. This separation ensures a fire or explosion at the HSSF has no impact on the operability of the redundant service water pump house fire areas and their service water ponds (References F.7.3.bb, F.7.3.cc, and F.7.5.t).

9. FHA conclusion

   A design basis fire within Fire Area SW-2 will be confined near the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA TG-1

1. Description

Turbine generator building general equipment areas, el. 441 ft 0 in., el. 471 ft 0 in., and el. 501 ft 0 in. Also includes 441 ft N/S corridor between radwaste and reactor buildings, diesel building 441 ft E/W corridor and old laundry room D113, and reactor building main steam tunnel.

This fire area includes the following fire zones:

a. TG-2 - turbine oil storage room

b. TG-5 - auxiliary boiler room

c. TG-7 - hydrogen seal oil room

d. TG-9 - turbine oil reservoir room

e. TG-10 - west transformer vault

f. TG-11 - east transformer vault

g. TG-12 - 441 ft southern corridors

2. Major equipment

a. Elevation 441 ft

(1) Transformers
(2) Service air compressors
(3) Reactor feed pumps
(4) Reactor feed pump turbines
(5) Main condenser
(6) Steam jet air ejectors
(7) Condensate pumps
(8) Condensate booster pumps
(9) Health physics clothing storage area
(10) Relief valve test enclosure
(11) Turbine lube oil storage unit
(12) Main lube oil transfer pump
(13) Turbine oil pump
(14) Turbine lube oil conditioner

(15) Auxiliary boiler
(16) Air handling units

b. Elevation 471 ft

(1) Transformers
(2) Neutral grounding transformer
(3) Feedwater heaters
(4) Electrohydraulic fluid supply pumps and DEH reservoir
(5) Switchgear, motor control centers
(6) Generator bus ducts, exciter cubicles
(7) Turbine oil reservoir

c. Elevation 501 ft

(1) Transformer
(2) Heating, ventilating, and air-conditioning units
(3) Motor control centers
(4) Electrical panels
(5) Feedwater heaters
(6) Turbine generator

The majority of the fire area is not a safety-related area. However, areas adjacent main steam lines and room C202 do contain safety-related equipment/cables. In addition, the entire Fire Zone TG-12 is a safety-related area.

3. Construction of fire area boundaries

a. The turbine building walls which interface with other fire areas are generally reinforced concrete and 3-hr rated. Portions of stairwells are 2-hr rated masonry construction. Two wall sections in the southwest corner from 487 ft to 507 ft are 2-hr masonry walls (Reference F.7.6.g). The steam tunnel interfaces with the nonrated containment barrier. Floor plugs in 522 ft of steam tunnel are 3-hr rated.

b. See Figures F.6 for rating of exterior barriers due to turbine building exposures.

c. Elevator doors are 1.5-hr rated. Stairwell doors are 1.5-hr rated, minimum. The low range blast, high range blast, airtight, and bullet resistant doors are not listed as fire rated, but have equivalent construction. Other fire doors maintain the rating of the barrier.

d. Fire dampers and penetration seals maintain the rating of the barrier. The blind corridor room C349 has nonrated penetration seals (Reference F.7.6.g).

e. Floor dikes are present at various locations where combustible oil leakage hazards are present.

f. See Figures F.6 for fire barrier locations and classifications.

g. Within the fire area, the high hazard areas are isolated as follows:

(1) Turbine oil storage room - Fire Zone TG-2

(a) Most walls are 8 in. nominal masonry. The east wall and ceiling are reinforced concrete. All are 3-hr rated (Reference F.7.3.a).

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) Doorway has an 8 in. high dike to help contain an oil spill.

(e) See Figures F.6 for fire barrier locations and classifications.

(2) Hydrogen seal oil room - Fire Zone TG-7

(a) Most walls are 8 in. nominal masonry. The south wall, ceiling and lower portion of east wall are reinforced concrete. All are 3-hr rated. (Reference F.7.3.a)

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) Doorway has an 8 in. high dike to help contain an oil spill.

(e) See Figures F.6 for fire barrier locations and classifications.

(3) Turbine oil reservoir room - Fire Zone TG-9

(a) Most walls are 8 in. nominal masonry. The west wall, ceiling, and floor are reinforced concrete. All are 3-hr rated with the exception of an open ceiling hatch. The open hatch is protected by a water spray system.

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) Doorway has an 8 in. high dike to help contain an oil spill.

(e) See Figures F.6 for fire barrier locations and classifications.

(4) Auxiliary boiler room - Fire Zone TG-5

(a) Most walls are 8 in. nominal masonry. The north and east wall and ceiling are reinforced concrete. All are 3-hr rated (Reference F.7.3.a).

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) See Figures F.6 for fire barrier locations and classifications.

(5) West transformer vault (Division A makeup water transformer 75-72) - Fire Zone TG-10

(a) Most walls are 8 in. nominal masonry. The north wall and ceiling are reinforced concrete. All are 3-hr rated (Reference F.7.3.a).

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) A 12 in. high dike surrounds the transformer to help contain an oil spill.

(e) See Figures F.6 for fire barrier locations and classifications.

(6) East transformer vault (Division B makeup water transformer 85-82) - Fire Zone TG-11

(a) Most walls are 8 in. nominal masonry. The north wall and ceiling are reinforced concrete. All are 3-hr rated (Reference F.7.3.a).

(b) Fire door and dampers maintain the rating of the barrier.

(c) Penetration seals in concrete barriers are 3-hr rated. Penetration seals in masonry walls are 2-hr rated.

(d) A 12 in. high dike surrounds the transformer to help contain an oil spill.

(e) See Figures F.6 for fire barrier locations and classifications.

(7) 441 ft south corridors - Fire Zone TG-12 (includes rooms C121, D113, and D104)

(a) Fire zone is not a high hazard area, but has a large concentration of cable trays. Zone TG-12 extends a significant distance into the radwaste and diesel building structures. The north end of the fire zone at column H.3 has no rated fire barrier.

(b) This is the only fire zone of Fire Area TG-1 which contains a substantial amount of safety-related circuits. Division 1 post-fire safe shutdown circuits are protected by 1-hr rated raceway fire barrier wraps and 3-hr rated MI cable.

(c) Fire area boundaries are constructed of reinforced concrete and are 3-hr rated, except those interfacing the yard.

(d) Fire doors, fire dampers, and penetration seals maintain the rating of the barrier. Airtight doors are not listed as fire rated, but have equivalent construction. Entrance doors to Fire Areas DG-1/2/3 may not fully self-shut due to differential air pressure.

(e) See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. The fire area combustible loading is classified as "low." Since the fire area covers approximately 167,170 ft^2 actual combustible loading varies. The combustible loading of the higher hazard fire zones would be classified as "medium or high." The combustible loading in Zone TG-12, which contains post-fire safe shutdown circuits, is classified as "medium."

c. Major combustibles include lubrication oil, electrical cable, transformer oil, and Thermo-Lag 330-1. An approved flammable gas storage area is located in the sprinklered 441 ft NE truck bay. There is hydrogen supply piping routed through the Turbine Generator Building 441′ west end for the Hydrogen Water Chemistry (HWC) system and generator rotor cooling. However, this hydrogen gas is not considered additional combustible load in calculation FP-02-85-03 since the hydrogen is contained within the pipeline.

d. Major ignition hazards include: ignition of turbine lube oil through various methods, turbine generator hydrogen, reactor feedwater pump/turbines, transformers, electrical pump motors, auxiliary boiler, switchgear, motor control centers, generator bus ducts, and exciter cubicles.

e. Equipment/piping within the area contain low level radioactive water and gas. There are typically no airborne radioactivity hazards within the area. The turbine bay, condenser bay, and heater bay are high radiation zones during plant operation.

5. Fire suppression/detection equipment within the fire area

See Figures F.6-7 through F.6-9 for suppression system coverage.

a. Wet pipe sprinkler systems are installed for the protection of the following areas:

(1) Auxiliary boiler room
(2) Mechanical vacuum pump room
(3) Steam jet air ejector rooms
(4) North side of condenser, el. 441 ft and el. 471 ft
(5) South side of condenser, el. 441 ft and el. 471 ft
(6) Turbine bearings el. 501 ft
(7) West end of building, el. 441 ft
(8) West End of building and under generator, el. 471 ft

(9) Heater bay area, el. 471 ft
(10) Storage building and restroom, el. 501 ft
(11) Oil piping at north end of condenser, el. 471 ft

b. Deluge water spray systems are installed for the protection of the following areas:

(1) Turbine lube oil storage tank room

(2) Trace oil piping located in the corridor, east end of building, el. 441 ft

(3) Reactor feedwater pump rooms

(4) Hydrogen seal oil room

(5) Turbine oil reservoir and oil coolers room, el. 471 ft

c. A preaction sprinkler system is installed to protect the portion of Fire Zone TG-12 where fire rated raceway barriers are located.

d. A 6 ton capacity carbon dioxide (CO_2) system is installed to protect the generator exciter housing. A manual CO_2 hose reel is located on the 501 ft elevation. Manual release stations are located at both 441 ft and 501 ft. See Section F.2.4.5 for more details.

e. 1.5 in. standpipe hose stations

f. Portable fire extinguishers (normal and wheeled)

g. Smoke, thermal, and UV flame detectors are located in certain high hazard locations within the fire area.

h. Manual pull boxes

i. Foam carts and inductors for use with fire hose

j. Dry chemical system for hazardous material storage module(s).

6. <u>Fire suppression/detection equipment outside but available to the fire area</u>

a. 1.5 in. standpipe hose stations in stairways

b. Hose lines from 2.5 in. outlets on yard hydrants

7. Safe shutdown systems

a. Fire Zone TG-12 contains both Division 1 and Division 2 post-fire safe shutdown cables. Division 1 post-fire safe shutdown cables are protected by 1-hr rated raceway barriers, and partial area fire suppression, and detection, or 3-hr rated raceway barriers. Other areas of Fire Area TG-1 contain no post-fire safe shutdown equipment/cables.

b. See Reference F.7.3.d for credited cables.

8. Potential consequences of a design basis fire

a. Equipment and cabling for the Division 1 post-fire safe shutdown systems which is located within the area is assumed damaged by the design basis fire. Loss of all unprotected equipment in this fire area is not considered a credible event due to the low fire loading and geometrical configuration. Cabling for Division 1 post-fire safe shutdown components in the 441 ft radwaste/reactor building corridor (Fire Zone TG-12) are protected by 1-hr rated raceway fire barriers. Fire detection and a preaction sprinkler system are installed in the vicinity of the protected cabling. The adequacy of the partial area suppression and detection are further justified in Reference F.7.6.n. 3-hr rated MI cable is present in an area without suppression. Division 1 post-fire safe shutdown systems would remain operable.

b. The raceway barrier load bearing supports may not be wrapped the entire distance to the concrete barrier. In addition, raceway and other structural members routed over the top of raceway barriers are not protected. This is acceptable since the portion of the fire zone with raceway barriers is equipped with a high density preaction suppression system which ensures steel members would not heat to the point of structural failure (Reference F.7.3.g).

c. A fire in this fire area could potentially cause a loss of offsite power. Since the post-fire safe shutdown analysis assumes a loss of offsite power, onsite power will ensure safe shutdown.

d. The developing fire would activate a smoke, thermal or flame detector, initiating an alarm in the control room for fire brigade response. Manual hose stations are available.

e. The main turbine is equipped with a wet-pipe sprinkler system at the 501 ft exposed bearings and east governor area, 471 ft turbine underskirt, condenser area, heater bay, and 441 ft condenser area. Fire detection is present at each elevation which would annunciate in the continuously manned main control room. This level of protection is adequate for any expected turbine fire.

f. With no heat actuated roof vents in the turbine building roof, a worst case turbine generator fire (turbine blade failure rupturing a fire system main or branch line) could cause partial collapse of the roof structural steel. Proper turbine maintenance and inspections limit the potential for such a worst case event.

g. The only post-fire safe shutdown equipment in Fire Area TG-1 is in Fire Zone TG-12. Based on the large separation, plant configuration and installed suppression systems, a worst case turbine generator fire would not propagate to areas of Fire Zone TG-12. Thus, a secondary hydrogen fire (concurrent with a primary fire in either Fire Areas RC-3/4/5/10 and a loss of offsite power) would not prevent safe shutdown.

h. Fire Zones TG-2 and TG-9 have a much higher combustible loading than the surrounding 3-hr barriers. However, these rooms are equipped with a high density deluge system which would limit fire severity.

i. The barrier between the redundant feedwater pumps is not fire rated. However, the barrier has minimal openings and each pump has a high density deluge system. This level of protection is considered adequate.

j. Fire Zones TG-10 and TG-11 contain high voltage transformers without a suppression system. However, the zones have fire detection and 3-hr rated barriers. This, level of protection is adequate.

k. Containment barrier interface to Fire Area TG-1, in main steam tunnel, is adequate to limit the spread of fire.

l. The north yard transformers are less than 50 ft from the turbine building and are not equipped with fire rated shield walls. However, the transformers are equipped with deluge fire suppression and the north wall is 2-hr rated to 471 ft. This level of protection is adequate.

m. The generator isophase bus ducts penetrate the north turbine building wall above the level that is fire rated and the bus ducts are not internally sealed as approved in Reference F.7.4.1. With the low voltage bushings approximately 30 ft below the point where the isophase bus ducts enter the turbine building, a transformer malfunction would not result in oil entering the turbine building through the bus ducts.

n. There are five oil-filled, indoor, high voltage transformers (four at 471 ft west end and one at 501 ft east end of the turbine building). These transformers are not equipped with fire suppression systems. Each transformer has a surrounding 12 in. dike to contain an oil leak and is covered by general area fire detection. This level of protection is considered adequate protection for the nonsafety-related transformers.

o. Hazardous material storage module(s) have a high concentration of flammable paint and chemicals. The module steel enclosure and dry chemical system(s) are adequate to contain a HazMat module fire.

p. Unqualified and 1.5-hr doors are adequate to limit the spread of fire. Strobe lights and security position sensors on DG-1/2/3 entrance doors ensure that personnel will promptly shut the doors, even during periods of high differential HVAC air pressure.

q. The masonry barriers of Fire Zones TG-2, TG-5, TG-7, TG-9, TG-10, and TG-11 are hollow cell 7-5/8 in. thickness. Although this meets a 3-hr rating (Reference F.7.3.a), the penetration seals are 2-hr rated. Based on various other design limitations, upgrade of all penetrations to a 3-hr fire rating is not possible. In Fire Zones TG-2 and TG-9, the equivalent fire durations exceed 2 hr. However, these rooms are equipped with a high density deluge sprinkler systems which would effectively limit fire severity. These barriers enclose fire zones, not fire areas and are classified as nonessential fire rated. The 2-hr rated penetration seals in masonry walls are adequate to limit the spread of fire.

r. The masonry barriers and penetration seals which interface with Fire Areas TG-3, TG-6, TG-8 are credited as 2-hr rated. The 2-hr rating is adequate for safe egress during a TG-1 fire.

s. The south turbine building ceiling interfaces with the reactor building elevated release chase. The chase is Fire Area TG-1 to 572 ft, but above is Fire Area R-1. Although the floor slab of chase is 3-hr rated, the north, east and west walls of the elevated release chase are not fire rated. The south wall of the elevated release chase is 3-hr rated to 572 ft, but has two unsealed penetrations above 611 ft into the reactor building. Even though the north, east and west walls of the elevated release chase are not fire rated, they do not have penetrations and would prevent a worst case turbine building fire from entering the upper levels of the reactor building through the unsealed penetrations, 80 ft above, or unrated barrier section above 572 ft.

t. The flammable gas cylinder storage area is located in the sprinklered 441 ft NE truck bay. Cylinders are securely fastened to the storage rack and are remote from any plant safety related equipment.

u. The hydrogen supply pipe, from the HSSF for the HWC system, is routed through the Turbine Generator Building 441′ west end. There is no safety-related or post-fire safe shutdown equipment in the general area of the hydrogen supply pipe. Three hydrogen detectors are located where the hydrogen supply pipe is not welded; two detectors for the hydrogen injection module, and one at the condensate system injection point. The HWC system is automatically shut down upon receipt of a high-high hydrogen signal from these detectors. The hydrogen supply system is equipped with excess flow check valves to shut off the gas flow in the event of an isolation signal or pipe break.

v. Smoke would be removed by operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

w. Water discharge would be removed by the floor drain system open, hatches, and stairs. Water discharge could cause localized flooding until removed by the floor drain system or portable pumping. Based on the enclosure of the condenser shield walls, suppression water during a turbine fire would be primarily contained within the condenser area. Floor drains are routed to the liquid waste processing system to contain and control potentially contaminated water produced by fire suppression activities.

x. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area TG-1 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA TG-3

1. Description

   Turbine generator building, east stair A1

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 441 ft level to the 518 ft 6 in. level of the turbine generator building. The barriers of the area are concrete or masonry block. The portions of the boundary which interface with the service building, Fire Zone TG-2 and Fire Area TG-4 are 3-hr rated. Other portions which interface with Fire Area TG-1 are 2-hr rated.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

   c. Wet-pipe sprinkler system

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment and sprinkler system are adequate to extinguish the design basis fire.

   c. The masonry barriers and their penetration seals which interface with Fire Area TG-1 are 2-hr rated. The 2-hr rating is adequate to ensure a stairwell fire will not spread to adjacent fire areas.

   d. The 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

   e. Smoke would be removed through the operation of portable smoke removal equipment.

   f. Without a floor drain, water discharge would cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area TG-3 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA TG-4

1. Description

Turbine generator building east, elevator no. 3

2. Major equipment within the fire area

Elevator electric motor

Fire area is not a safety-related area.

3. Construction of fire area boundaries

a. The elevator shaft extends from the 441 ft level to the 518 ft 6 in. level of the turbine building. The walls and ceiling of the area are concrete and 3-hr rated.

b. The elevator doors are 1.5-hr rated. Equipment room entrance door is 1.5-hr rated, minimum.

c. Fire dampers and penetration seals maintain the rating of the barrier.

d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

a. The combustible loading is controlled in calculation FP-02-85-03.

b. Combustible loading is classified as “low.”

c. Major combustible is assumed transient combustibles.

d. The major ignition hazard is the elevator electric motor.

e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

a. Smoke detector in elevator equipment room.

b. Portable extinguisher in elevator equipment room.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. 1.5 in. standpipe hose stations

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, an elevator shaft fire will not prevent safe shutdown.

   b. The available portable equipment is adequate to extinguish the design basis fire.

   c. 1.5-hr fire doors are adequate to limit the spread of fire.

   d. Smoke would be removed through the operation of the building exhaust system or portable smoke removal equipment. The HVAC exhaust air is monitored to detect radioactive smoke which may result from the combustion of radioactive material.

   e. Water discharge could cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

   A design basis fire within Fire Area TG-4 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA TG-6

1. Description

Turbine generator building, NE stair A3

2. Major equipment within the fire area

None

Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 441 ft level to the 501 ft level of the turbine generator building. The walls are primarily masonry block and ceiling is concrete. All wall and ceiling barriers are 2-hr rated.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are typically no radioactive material or airborne radioactivity hazards within the area. Stairwell is adjacent the turbine condenser area and is considered a high radiation zone during plant operation.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

   c. Wet-pipe sprinkler system

6. Fire suppression/detection equipment outside but available to the fire area

   a. Portable extinguishers

   b. Manual pull boxes for alarm

   c. Hose lines from 2.5 in. outlets on yard hydrants

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

   b. The available portable equipment and sprinkler system are adequate to extinguish the design basis fire.

   c. The masonry barriers and their penetration seals which interface with Fire Area TG-1 are 2-hr rated. The 2-hr rating is adequate to ensure a stairwell fire will not spread to TG-1.

   d. The 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

   e. Smoke would be removed through the operation of portable smoke removal equipment.

   f. Without a floor drain, water discharge would cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

g. Procedural controls and fire brigade training guide fire brigade members to monitor contamination during fire brigade activities and take specific actions to control the release of contaminated fire suppression water and smoke.

9. FHA conclusion

A design basis fire within Fire Area TG-6 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA TG-8

1. Description

   Turbine generator building, NW stair A4

2. Major equipment within the fire area

   None

   Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. The stairwell extends from the 441 ft level to the 501 ft level of the turbine generator building. The walls are primarily masonry block and ceiling is concrete. All wall and ceiling barriers are 2-hr rated.

   b. The doors to the stairwell are 1.5-hr rated, minimum.

   c. Penetration seals maintain the rating of the barrier.

   d. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as “low.”

   c. Major combustible is assumed transient combustibles. However, procedural controls deter storage of combustibles in stairwells.

   d. There are no major ignition hazards in the area.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. 1.5 in. standpipe hose stations

   b. Smoke detector at top of stairwell

c. Wet-pipe sprinkler system

6. Fire suppression/detection equipment outside but available to the fire area

a. Portable extinguishers

b. Manual pull boxes for alarm

c. Hose lines from 2.5 in. outlets on yard hydrants

7. Safe shutdown systems

This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

a. With no safe shutdown equipment/cables or associated circuits, a stairwell fire will not prevent safe shutdown.

b. The available portable equipment and sprinkler system are adequate to extinguish the design basis fire.

c. The masonry barriers and their penetration seals which interface with Fire Area TG-1 are 2-hr rated. The 2-hr rating is adequate to ensure a stairwell fire will not spread to TG-1.

d. The 1.5-hr fire doors are adequate to ensure safe egress and limit the spread of fire.

e. Smoke would be removed through the operation of portable smoke removal equipment.

f. Without a floor drain, water discharge would cause localized flooding. The flooding will not impair the ability of the plant to reach safe shutdown.

9. FHA conclusion

A design basis fire within Fire Area TG-8 will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

FIRE AREA ASD

1. Description

Reactor recirculation pump ASD building, floor el. 441 ft 0 in.

NOTE: Fire area is only the ASD building; however, fire hazards analysis includes areas immediately adjacent to the building.

2. Major equipment within the fire area

(Inside ASD building) electrical cabinets, capacitors, electrical cables, circulating pumps.

(Outside ASD building) transformers, heat exchangers, link reactors.

Fire area is not a safety-related area.

3. Construction of fire area boundaries

   a. Walls on west and north side are 2-hr rated.

   b. Turbine building wall is 3-hr rated from 441 ft to 501 ft (Column D.3-H).

   c. Wall separating transformers and two walls north of transformers are 2-hr rated.

   d. Fire door and penetration seals maintain the rating of the barrier.

   e. See Figures F.6 for fire barrier locations and classifications.

4. Fire hazards

   a. The combustible loading for the ASD building (excluding exterior equipment) is controlled in calculation FP-02-85-03.

   b. Combustible loading is classified as "low."

   c. Major combustible is electrical cable.

   d. Major ignition hazard is electrical panels.

   e. There are no radioactive material or airborne radioactivity hazards.

5. Fire suppression/detection equipment within the fire area

   a. Full building automatic preaction system activated by smoke detectors or manual pull station.

   b. Transformers have deluge system activated by thermal detectors or manual pull stations.

   c. Portable extinguishers.

6. Fire suppression/detection equipment outside but available to the fire area

   a. Hose lines from 2.5 in. outlets on hydrants

   b. Exterior manual pull stations for activation and alarm of deluge systems

   c. Fire department connection to suppression systems

7. Safe shutdown systems

   This fire area contains no post-fire safe shutdown components or cabling.

8. Potential consequences of a design basis fire

   a. With no safe shutdown equipment/cables or associated circuits, an ASD fire will not prevent safe shutdown.

   b. The adjacent Turbine building 3-hr fire rated wall will prevent fire spread into other plant areas.

   c. The west and north walls are 2-hr rated, but have Hilti penetrations seals which are 2-hr “F” rated as opposed to “T” rated as required by Section F.2.2.1. This level of protection is adequate to prevent fire propagation between the ASD building and the yard.

   d. The preaction system is expected to limit the severity of a design basis fire within the building.

   e. The deluge systems are expected to limit the severity of a transformer fire.

   f. Smoke would be removed through the operation of the building ventilation system or portable smoke removal equipment.

g. Sprinkler discharge would be contained within the building in two large floor trenches.

h. The transformers are equipped with a sump to contain any oil leakage. Prolonged deluge system discharge would cause overflow of the sump. The grade slopes away from the transformers to a yard french drain.

9. FHA conclusion

A design basis fire within Fire Area ASD will be confined to the fire area and systems needed for post-fire safe shutdown will remain free of fire damage.

F.5 ESSENTIAL FIRE PROTECTION SYSTEM OPERABILITY/TESTING PROGRAM

The operability requirements, compensatory actions, and testing requirements for the essential fire protection systems are located in Licensee Controlled Specification (LCS) 1.10, Fire Protection.

F.6 FIRE PROTECTION ARRANGEMENT DRAWINGS

Figure Not Available For Public Viewing

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F.7 FIRE PROTECTION PROGRAM REFERENCES

F.7.1 REGULATORY DOCUMENTS/OTHER FSAR FIRE PROTECTION COMMITMENTS

F.7.1.1 Columbia Generating Station Regulatory Requirements

a. 10 CFR 50.48, Fire Protection

b. 10 CFR 50, Appendix A, General Design Criterion 3, Fire Protection

c. Facility Operating License (FOL) Condition 2.C.(14), Fire Protection Program

F.7.1.2 Columbia Generating Station Commitments

a. Branch Technical Position (BTP) Auxiliary Power Conversion Systems Branch (APCSB) 9.5-1, Appendix A, Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976 (see Table F.3-1)

b. 10 CFR 50 Appendix R, Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979 (see Table F.3-2)

c. FSAR Appendix F Fire Protection Evaluation

d. Section 1.2.2.12.11, Fire Protection System

e. Section 3.1.2.1.3, Criterion 3 - Fire Protection

f. Section 8.3.1.4, Independence of Redundant Systems

g. Section 9.5.2, Communication Systems

h. Section 9.5.3, Plant Lighting Systems

i. Sections 13.1.2.3.4 and 13.2.2.5, Fire Brigade

j. Section 13.1.3.3.3, Fire Protection Engineer

k. Licensee Controlled Specification 1.10, Fire Protection

F.7.2 INDUSTRY GUIDANCE

a. Regulatory Guide 1.189, Fire Protection for Nuclear Power Plants

b. BTP Chemical Engineering Branch (CMEB) 9.5-1 Guidelines for Fire Protection for Nuclear Power Plants, Revision 2, July 1, 1981

c. NUREG 0800 Standard Review Plan, Section 9.5.1, Fire Protection Program, Revision 3, July 1981

d. BTP ASB 3-1, Rev. 1, 1981, Protection Against Postulated Piping Failures in Fluid Systems Outside Containment (attached to SRP 3.6.1)

e. NRC Inspection and Enforcement Manual, Inspection Procedure 64100, Post-Fire Safe Shutdown, Emergency Lighting and Oil Collection, Inspection Procedure 64704, Fire Protection/Prevention Program

f. NRC Generic Letters (GL), applicable sections of: GL 77-02, GL dated 9/7/79, GL 81-04, GL 81-12, GL dated 4/7/82, GL 82-21, GL 83-33, GL 85-01, GL 86-10, GL 86-10 Supplement 1, GL 88-12, GL 88-20 Supplement 4, GL 92-08, GL 92-08 Supplement 1, GL 93-06

g. NRC Information Notices (IN), applicable sections of: IN 80-05, IN 80-11, IN 82-28, IN 83-41, IN 83-69, IN 84-09, IN 84-16, IN 84-34, IN 84-57, IN 84-92, IN 85-09, IN 85-85, IN 86-17, IN 86-35, IN 87-14, IN 87-50, IN 88-04, IN 88-04 Supplement 1, IN 88-05, IN 88-05, IN 88-56, IN 88-60, IN 88-64, IN 89-52, IN 89-63, IN 90-23, IN 91-17, IN 91-47, IN 91-77, IN 91-79, IN 92-18, IN 92-28, IN 92-46, IN 92-52, IN 92-55, IN 92-82, IN 93-40, IN 93-41, IN 94-12, IN 94-22, IN 94-26, IN 94-28, IN 94-31, IN 94-35, IN 94-58, IN 94-86, IN 94-86 Supplement 1, IN 95-27, IN 95-33, IN 95-36, IN 95-36 Supplement 1, IN 95-48, IN 95-49, IN 95-49 Supplement 1, IN 95-52, IN 95-52 Supplement 1, IN 97-01, IN 97-37, IN 97-59, IN 97-70, IN 97-72, IN 97-73, IN 97-82, IN 98-31, IN 99-05, IN 99-07, IN 99-17

h. NRC Policy Paper, Secretary of Commission (SECY), applicable sections of: SECY-81-114, SECY-82-268, SECY-83-269, SECY-85-306 and 306B, SECY-93-143, SECY-93-232, SECY-94-090, SECY-94-127, SECY-95-034, SECY-96-134, SECY-96-146, SECY-97-127, SECY-98-058, SECY-98-230, SECY-99-140, SECY-99-152, SECY-99-182, SECY-99-204

i. National Fire Protection Association (NFPA) Codes. See Section F.2.1 for major committed codes.

j. Fire Protection Handbook, National Fire Protection Association, Boston, Massachusetts

k. Underwriters Laboratories (UL) listings from UL Building Materials Directory and UL Fire Resistance Directory (current editions)

l. ASTM E 84-1981, Standard Test Method for Surface Burning Characteristics of Building Materials

m. ASTM E 119-1988, Fire Test of Building Construction and Materials

n. ASTM E 136-1982, Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C

o. UL 910-1985, Test Method for Fire and Smoke Characteristics of Electrical and Fiber Optic Cables Used in Air Handling Spaces

p. Factory Mutual Approval Guide (current editions)

q. IEEE 383-1974, Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations

r. Regulatory Guide 1.52, Revision 1, Design, Testing, and Maintenance Criteria for Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Plants

s. ANSI A21.4, Cement-Mortar Lining for Cast-Iron and Ductile-Iron Pipe Fittings for Water

t. ASME Boiler and Pressure Vessel Code, Section III, Rules for the Construction of Nuclear Power Plant Components

u. Nuclear Electric Insurance Limited, Members Manual, Chapter 7, Primary Property Loss Control Programs

v. Washington Administrative Code (WAC)

w. NEI 00-01, Revision 1, Guidance for Post-Fire Safe Shutdown Circuit Analysis, Appendix B.2, Justification for the Elimination of Multiple High Impedance

F.7.3 CALCULATIONS/TECHNICAL MEMOS

a. CE-02-90-39, Fire Resistance Rating of Hollow Concrete Block

b. FP-02-85-03, Combustible Loading Calculation

c. GEH-0000-0075-4920, “GE14 Fuel Design Cycle-Independent Analyses for Energy Northwest Columbia Generating Station” (most recent version referenced in the COLR)

d. NE-02-85-19, Revised Appendix R Safe Shutdown Analysis

e. NE-02-84-17, Bio-Shield Penetration Analysis for Fire Protection

f. NE-02-86-23, Temperature Response of Structural Components to Appendix R Fire

g. NE-02-86-39, Evaluation of Structural Supports for One Hour Fire Barriers

h. CE-02-89-20, Tubing Supports under Appendix R Fire

i. NE-02-88-10, Appendix R Analysis - Vital Instrument Sensing Line Supports

j. NE-02-94-08, Appendix R Dose Evaluation

k. NE-02-94-35, Post-fire Safe Shutdown System Impacts

l. FP Flooding calculations: ME-02-02-23, ME-02-02-32, ME-02-02-40, ME-02-02-41, ME-02-02-43

m. HVAC/Room Heatup PFSS Calculations ME-02-99-06, ME-02-99-18, and ME-02-99-22

n. B&R 2.05.01, Calculation for Battery and Battery Charger 250 V DC and 24 V DC

o. B&R 2.06.20, Calc for Cable Ampacity Verification for Conduit and Tray

p. B&R 7.10.12, Calculation For FP of Instrument Tubing

q. TM-1308, Evaluation of Potential Plant Transients Due to Postulated 10 CFR 50 Appendix R Fire

r. TM-2007, Reactor Building Instrument Rack Fire Hazards Analysis

s. TM-2043, Augmented Quality Requirements

t. TM-2075, Mitigation of Radiological Releases from a Fire

u. TM-2103, Leakage Requirements of Penetration Seals

v. ME-02-89-11, Calculation of Frost Protection of Warehouse Complex Fire Mains

w. ME-02-98-15, Evaluation of Fire Protection System for Water Hammer Effects

x. ME-02-99-05, Fire Protection System Water Hammer Analysis with Vacuum Breakers and Soft Start Electric Pumps

y. E/I-02-01-01, Sizing Calculation for the Plant PBX Telephone System Replacement Battery (VRLA type cells).

z. DIC 2502.3, SL-5573, Columbia Generating Station Independent Spent Fuel Storage Installation Fire Hazards Analysis

aa. DIC 0301., ENW-CGS-FHA-01, ISFSI Fire Hazards Calculation

bb. CE-02-03-19, ABS Consulting Report 1192510-R-002, “Frequency Estimation of Hydrogen Line and Hydrogen Storage Tank Explosions.”

cc. CE-02-03-20, ABS Consulting Report 1192510-C-001, “HSSF Energetic Events Analysis."

dd. TM-1235, Appendix R Dedicated Volume of Water for Fire Protection

ee. TM-2161, Technical Evaluation of High Impedance Faults in Accordance with NEI 00-01 Revision 1

F.7.4 APPLICABLE NRC SAFETY EVALUATION REPORTS

a. NUREG-0892, Safety Evaluation Report Related to the Operation of WPPSS Nuclear Project No. 2, March 1982

b. NUREG-0892, Safety Evaluation Report Related to the Operation of WPPSS Nuclear Project No. 2, Supplement 1, August 1982

c. Fire Protection Supplemental Safety Evaluation Report - WPPSS Nuclear Project No. 2, dated December 27, 1982

d. Fire Protection Supplemental Safety Evaluation Report - WPPSS Nuclear Project No. 2, dated March 17, 1983

e. NUREG 0892, Safety Evaluation Report Related to the Operation of WPPSS Nuclear Project No. 2, Supplement No. 3, May 1983

f. NUREG 0892, Safety Evaluation Report Related to the Operation of WPPSS Nuclear Project No. 2, Supplement No. 4, December 1983

g. Letter GI2-84-100, dated August 24, 1986, Supplemental Safety Evaluation

h. Letter GI2-86-020, dated March 14, 1986, Safety Evaluation Report Washington Nuclear Project No. 2 Appendix R Requirements - Noncompliance

i. Letter GI2-86-0089, R. M. Bernero to D. F. Kirsh, dated December 4, 1986, Evaluation of WNP-2 Fire Protection Analysis, with attached Safety Evaluation Report

j. Letter LI2-87-025, dated November 11, 1987, Fire Protection Safety Evaluation Report - FSAR Amendment No. 37, Washington Nuclear Project Number 2 (WNP-2)

k. Letter GI2-89-042, dated May 12, 1989, Safety Evaluation-Report Input WNP-2: Underground Fire Main Analysis

l. Letter GI2-89-048, dated May 22, 1989, Safety Evaluation by the Office of Nuclear Reactor Regulation, Evaluating Implementing Details of the Approved Fire Protection Program, Washington Public Power Supply System Nuclear Project No. 2

m. Letter GI2-89-051, dated May 25, 1989, Issuance of Amendment No. 67 to Facility Operating License No. NPF-21 - WPPSS Nuclear Project No. 2. [includes new Fire Protection License Condition 2.c.(14)]

F.7.5 OTHER MISCELLANEOUS

a. Letter GO2-82-396, dated April 22, 1982, Subject: Nuclear Plant No. 2 Response to SER on FSAR Section 9.5.1 Fire Protection Program

b. Letter GO2-83-243, dated March 21, 1983, Subject: Fire Protection Safe Shutdown Analysis

c. Letter GO2-86-613, dated June 30, 1986, Subject: Nuclear Plant No. 2, Operating License NPF-21, WNP-2 Fire Protection Program, Request for Additional Information

d. Letter GO2-88-006, dated January 6, 1988, Subject: WNP-2 Fire Protection Reevaluation Status Report

e. Letter GO2-88-008, dated January 11, 1988, Subject: Nuclear Plant No. 2 Fire Protection and Safety Shutdown Capability, Response to Safety Evaluation Report

f. Letter GO2-88-090, dated April 15, 1988, Subject: Nuclear Plant No. 2 Fire Protection and Safety Shutdown Capability, Response to Safety Evaluation Report, Supplemental Information

g. Letter GO2-88-155, dated July 15, 1988, Subject: Nuclear Plant No. 2 Fire Protection and Safety Shutdown Capability, Response to Safety Evaluation Report, Supplemental Information

h. Letter GO2-88-222, dated October 28, 1988, Subject: Nuclear Plant No. 2 Fire Protection and Safety Shutdown Capability, Response to Safety Evaluation Report (Revised Response)

i. Letter GO2-88-256, dated November 30, 1988, Subject: Nuclear Plant No. 2, Operating License NPF-21, Fire Protection Reevaluation Report - Status Report

j. GE Topical Report NEDO-10466-A, Power Generation Control Complex Design Criteria and Safety Evaluation (same as March 1978 NEDO-10466 referenced in SER)

k. Operational Quality Assurance program (OQAP)

l. Columbia Generating Station Emergency Preparedness Plan

m. Design Specification Division 200, Section 209, Post Fire Safe Shutdown (PFSS) Analysis Requirements

n. Engineering Standards Manual EES-1, Cable and Raceway Penetration Schedule (CARPS) Users Manual

o. Engineering Standards Manual EES-5, General Fuse Selection Criteria

p. Design Specification Division 300, Section 306, Fire Protection Detection and Suppression System

q. Penetration Seal Tracking System (PSTS) Database

r. Warnock Hersey International Fire Test File WHI-0495-0799 and 0800, Report of the Fire Endurance and Hose Stream Testing of Fire Rated Door Assembly Installed with Excessive Clearances, WNP-2 QA Vault Reel 502, Location 1-69

s. GE Topical Report, NEDE-24988-P, Analysis of Generic BWR Safety/Relief Valve Operability Test Results, October 1981

t. Electric Power Research Institute (EPRI), Guidelines for Permanent BWR Hydrogen Water Chemistry Installations – 1987 Revision, NP-5283-SR-A, September 1987.

u. INPO OE18226, Test Failure of Meggitt Safety System Inc. Cable, dated March 16, 2006.

F.7.6 FIRE PROTECTION ENGINEERING EVALUATIONS

a. Fire Protection File (FPF) 1.1 Items 13 through 61, Overall Qualification of Penetration Seals

b. FPF 1.1 Item 12, Penetration Seal Fire Test Review Acceptance Criteria

c. FPF 1.1 Item 16, Internal Conduit Sealing Criteria

d. FPF 1.5 Item 2, Consolidation of Fire Areas R-17 and R-19 with Fire Area R-4

e. FPF 1.7 Item 19, Evaluation of WNP-2 Vertical Cable Tray Fire Breaks

f. FPF 1.5 Item 3, Evaluation of Fire Area Boundary Between Fire Area DG-2 and DG-3

g. FPF 1.5 Item 4, Thermo-Lag Coated Wall and Blind Corridor

h. FPF 3.2 Item 3, Emergency Diesel Fuel Flash Point

i. FPF 1.1 Item 56, GL 86-10 Evaluation - Seal R206-5052

j. FPF 1.11 Item 2, Qualification of Whittaker MI Cable as a 3-hr Raceway Fire Barrier

k. FPF 1.2.2 Item 1, Analysis of 3M Fire Barrier Wrap – Conduit 2ADS-32-2

l. FPF 1.12 Item 2, Qualification of Thermo-Lag 330-1 as a Steel Fireproof Coating

m. FPF 1.2.3 Item 2, Qualification of Darmatt KM-1 Raceway Fire Barriers

n. FPF 3.22 Item 2, Thermo-Lag Resolution - Impact of Changes to Fire Area PFSS Divisions

o. FPF 2.1 Item 34, Compliance With NFPA 72E-1974 Smoke Detector Placement

p. FPF 2.6 Item 30, Adequacy of DG Building Heat Collectors and Water Spray Nozzles Remote From Ceiling

q. FPF 1.1 Item 40, Re-Analysis of NRC Information Notice 88-60

r. FPF 2.13 Item 13, Fire Brigade Equipment

s. FPF 2.10 Item 30, Control Room Habitability Smoke Intrusion Analysis

t. FPF 3.2 Item 2, Main Control Room Carpet Addition

u. FPF 4.1 Item 2, Normal Shutdown Manual Action Feasibility Review

v. FPF 3.7 Item 44, Scope of Augmented, OQAPD, and Essential Fire Protection Systems

w. FPF 2.15 Item 1, Reanalysis of Columbia Fire System Surveillance

x. FPF 1.12 Item 24, Fire-Induced Boiling of Fluid in Instrument Tube Sensing Lines

F.7.7 FIRE PROTECTION REFERENCE DRAWINGS

a. FM892-1, Fire Area Boundary Plan - Ground Floor

b. FM892-2, Fire Area Boundary Plan - Mezzanine Floors

c. FM892-3, Fire Area Boundary Plan - Operating Floor

d. FM892-4, Fire Area Boundary Plan - Reactor Building Miscellaneous Elevations

e. FM892-5, Fire Area Boundary Plan - Miscellaneous Floors and Buildings

f. FM892-6, Zones of Limited Combustibles, Reactor Building

g. FM892-7, Fire Suppression System Plan 437', 441'

h. FM892-8, Fire Suppression System Plan 467', 471'

i. FM892-9, Fire Suppression System Plan 501', 525'

j. FM892-10, Fire Suppression System Plan, Reactor Building, Miscellaneous Elevations

k. FM892-11, Fire Suppression System Plan, Miscellaneous, Floors and Buildings

l. M515-1, M515-4, and M515-5, Flow Diagram - Fire Protection System

m. M515-2, Flow Diagram - Fire Protection System - Details

n. M515-3, Flow Diagram - Fire Protection System - CO_2 Distribution

o. E948, Raceway Fire Barrier Location Drawings

p. D-DM-100, Darmatt KM-1 Installation Details

q. PFSS One-Lines and PFSS System P&IDs

r. M932-1 and M932-2, Fire Main Ring Header

F.7.8 FIRE PROTECTION PROGRAM IMPLEMENTING PROCEDURES

a. SWP-FPP-01, Nuclear Fire Protection Program includes

1. Program objectives
2. Technical and administrative program elements
3. Nuclear fire protection program elements
4. Design elements
5. Quality assurance program elements
6. Training program elements

b. PPM 1.3.10, Plant Fire Protection Program Implementation, includes

1. Emergency response capability (Fire Brigade)
2. Fire response and reporting
3. Surveillance, inspection, and testing
4. Safe shutdown capability
5. Miscellaneous use of fire system water
6. Miscellaneous Fire Protection Requirements
7. B5b Program Responsibilities

c. PPM 1.3.10A, Control of Ignition Sources

d. PPM 1.3.10B, Active Fire System Operability and Impairment Control

e. PPM 1.3.10C, Control of Transient Combustibles

f. PPM 1.3.57, Barrier Impairment

g. ABN-FIRE, Fire

h. ABN-CR-EVAC, Control Room Evacuation and Remote Cooldown

i. PPM 15 Volume Series Inspection, Test, and Surveillance Procedures

j. Industrial Safety Program Manual, Chapter 10, “Fire Protection and Life Safety”

k. Fire Protection Program Manual

l. Licensee Controlled Specification 1.10, Fire Protection