Form 101.1 (R08-04)

CERTIFICATION OF ENGINEERING CALCULATION

Station And Unit Number Oconee Units 1, 2 & 3

Title Of Calculation NFPA 805 Transition B-1 Table/Report

Calculation Number OSC-9295

Total Original Pages i – iv, 1 Through 84

Total Supporting Documentation Attachments 1 (37 pages) Total Microfiche Attachments 0

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Microfiche Attachment List ☐ Yes x No If Active is this a Type I Calculation/Analysis Yes ☐ No x

(See Form 101.4)

These engineering Calculations cover QA Condition 3 Items. In accordance with established procedures, the quality has been assured and I certify that the above Calculation has been Originated, Checked, or Approved as noted below:

Originated By Robert A. Jack Date 5/28/08

Checked By MATT HOGAN verbal H. Hufkins Date 28 MAY 2008

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Form 101.2 (R3-03) Calculation Number OSC-9295

REVISION DOCUMENTATION SHEET

Revision Number	Revision Description
0	Initial Issue
1	Update for 10/31/08 LAR submittal

CALCULATION IMPACT ASSESSMENT (CIA)

Station / Unit	ONS Units 1, 2, 3	Calculation No.	OSC-9295	Rev.	1	Page	iv
PIP No. (if applicable)	O-08-2163	By	Robert A. Jackson	Date	10/2/08		
Prob. No. (stress & s/r use only)	N/A	Checked By	James A. Oldham	Date	10/2/08		

NEDL reviewed to identify calculation? (formally SAROS) ☒ **YES** ☐ **NO**

Note: A NEDL search is NOT required for calculation originals (i.e. Rev. 0's)

Identify in the blocks below, the groups consulted for an Impact Assessment of this calculation origination/revision.

	Indiv. Contacted/Date		Indiv. Contacted/Date
☐ RES [Power, I & C, ERRT, Reactor]		☐ NGO [QA Tech. Services (ISI), Severe Accident Analysis, Elect. Sys. & Equip., Design & Reactor Supp., Civil Structural, Core Mech. & T/H Analysis, Mech. Sys. & Equip., Nuclear Design, Safety Analysis, and Matls/Metallurgy/Piping]	
☒ MCE [Primary Systems, Balance of Plant, Rotating Equipment, Valves & Heat Exchangers, Civil]	H. Lefkowitz / 10-1-08		
☐ MOD [Mechanical Engr., Electrical Engr., Civil Engr.]		☐ Training	
☐ Operations - OPS Support		☐ Local IT	
☐ Maintenance - Tech. Support		☐ Regulatory Compliance	
☐ Work Control - Program. Supp.		☐ Chemistry	
☐ Other Group		☐ Radiation Protection	
		☐ **No Group required to be consulted**	

Listed below are the identified documents (ex: TECHNICAL SPECIFICATION SECTIONS, UFSAR SECTIONS, DESIGN BASIS DOCUMENTS, STATION PROCEDURES*, DRAWINGS, OTHER CALCULATIONS, ETC.) that may require revision as a result of the calculation origination or revision, the document owner/group and the change required (including any necessary PIP Corrective Actions).

Note: Any design changes, which require changes to Station Procedures, must be transmitted as Design Deliverable Documents.

DOCUMENT	GROUP	CHANGE REQUIRED
Multiple associated with PIP	MCE	See PIP O-08-2163
OSC-9292	MCE	No Changes Required
OSC-9290	MCE	No Change Required

(Attach Additional Sheets As Required)

I. PURPOSE

The purpose of this calculation is to document the comparison of the existing Oconee Nuclear Station (ONS) Fire Protection Program to the requirements presented in Chapter 3 of NFPA 805. This calculation documents fire protection features needed to protect nuclear safety-related structures, systems, or components which are designated as QA Condition 3 systems.

II. BACKGROUND

Under its current operating license, Oconee Nuclear Station is required to maintain the provisions of its approved fire protection program. The current licensing basis documents for Oconee are Appendix A to BTP APCSB 9.5-1 and 10CFR50 Appendix R Sections III.G, III.J, III.L and III.O. The NRC has added 10CFR50.48(c) as an alternative method of compliance to 10CFR50.48(b). 10CFR50.48(c) is the adoption of the industry consensus standard NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition). Oconee has elected to transition to 10CFR50.48(c).

As part of the transition to NFPA 805, the fundamental fire protection program design elements are required to be identified. NFPA 805 Chapter 3 defines fundamental fire protection program attributes. This report documents the comparison of the existing Oconee Nuclear Station Fire Protection Program to the requirements presented in Chapter 3 of NFPA 805.

III. METHODOLOGY

The requirements presented in Chapter 3 of NFPA 805, 2001 Edition, were compared to the existing Oconee Nuclear Station fire protection program. The attributes of fire protection features and administrative programs that satisfy the provisions of NFPA 805 were documented. In addition where direct compliance was not found, a search of previous licensing and station documentation was conducted to determine if the NRC had previously approved alternative methods of compliance. Where compliance could not be determined, an open item was established.

The comparison of the Oconee Nuclear Station fire protection program to Chapter 3 of NFPA 805 is summarized and further substantiated with additional detail and references in Section VI, of this report. Section VI provides the descriptions, including background and discussion, for the compliance basis of each requirement presented in Chapter 3 of NFPA 805. Section VI has three components. The first is the verbatim text of NFPA 805 (provided in italics). The second is a detailed discussion for the ONS compliance basis. The third is a list of references.

Attachment A, Compliance Table lists the elements of the fire protection program for transition to the new 10CFR50.48(c) fire protection license. This table includes the NFPA 805 Code

section and text, the Compliance Statement, and the Compliance Basis. The specific elements of Chapter 3 where required by the deterministic or performance based requirements of Chapter 4 are listed in the B-3 Table of the ONS NFPA 805 Transition Report. The ONS 10CFR50.48(c) Fire Protection Program is bounded by the Power Block as defined in Attachment I of the ONS NFPA 805 Transition Report.

The following standard Compliance Statements are used in the Compliance Table:

- Comply – Oconee clearly complies with the NFPA 805 requirement, through direct 'literal' compliance or compliance with the intent (e.g. NFPA 805 specifies requirement located in one document and station has it located in another document). Sections may comply and also have an Area for Improvement which may not submitted in the LAR.
- Complies by Previous NRC Approval – Oconee does not clearly meet the NFPA 805 requirement but has been approved directly by the NRC (typically by SER).
- Complies by Previous Licensee Evaluation – Oconee does not clearly meet the NFPA 805 requirement but the Licensee has completed an equivalency evaluation.
- Submit for NRC Approval – Oconee does not clearly meet the NFPA 805 requirement and will submit the current basis for NRC review and approval.
- Further Action Required – Oconee will take an action to revise documentation or perform additional analysis and/or actions to demonstrate compliance.
- N/A – NFPA 805 requirement does not apply to Oconee.

Open items are divided into three categories:

1. Submit for Approval
2. Further Action Required
3. Area for Improvement – Area for Improvement are sections where Oconee is currently in compliance and station documentation will be enhanced for further clarification. Areas for Improvement may not be submitted in the LAR.

The comparison utilizes NEI 04-02 "Guidance for Implementing A Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 1 as a tool to determine the method and extent to which compliance is demonstrated. The Compliance Table, showing cross-reference and compliance statements, was based on Table B-1 of NEI 04-02.

IV. REFERENCES

1. Title 10, Section 50.48(c) of the Code of Federal Regulations (10CFR50.48(c)).
2. Regulatory Guide 1.205, Risk-Informed, Performance Based Fire Protection for Existing

Light-Water Nuclear Power Plants, May 2006.

3. National Fire Protection Associated (NFPA) standard, NFPA 805, Performance-Based Standard for Fire Protection for Light-Water Reactor Electric Generating Plants, 2001 edition.
4. Duke Letter to the NRC, FRAQUA Response, dated January 16, 1978.
5. Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, dated December 31, 1976.
6. Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, dated February 1982.
7. Duke letter to the NRC dated November 22, 1977.
8. Duke letter to the NRC dated February 17, 1978.
9. Duke Letter to the NRC dated March 18, 1981.
10. Duke to NRC, PIP O-99-2532/LER 270/1999-04, dated February 16, 2000.
11. NRC Safety Evaluation Report dated August 11, 1978.
12. NRC Safety Evaluation Report dated April 28, 1983.
13. NRC Safety Evaluation Report dated June 7, 1988.
14. NRC Safety Evaluation Report dated May 23, 2000.
15. NRC Letter dated April 14, 1981.
16. NRC Letter to Duke dated February 2, 1982.
17. NRC letter to Duke dated May 23, 2000.
18. NRC Exemption to various Appendix R Requirements dated August 21, 1989.
19. Design Basis Specification for Fire Protection, OSS-0254.00-00-4008, Revision 20.
20. Design Basis Specification for the Fire Detection System, OSS-0254.00-00-2017, Revision 8.
21. Design Basis Specification for the Low Pressure Service Water System, OSS-0254.00-00-1039, Revision.
22. Design Basis Specification for the High Pressure Service Water System, OSS-0254.00-00-1002, Revision 25.
23. Engineering Support Program Document for Fire Protection, Revision 4.
24. EM 4.6 "Oconee Engineering Support Program Walkdowns", Revision 6.
25. EDM-201 "Engineering Support Program", Revision 6.
26. EDM-601 "Engineering Change Manual", Revision 2.
27. ERTG-001 "Emergency Response Organization and Emergency Services Training Program".
28. EWP 7.2 "Storing Chemicals", Revision 2.
29. NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion", Revision 27.
30. NSD-106 "Configuration Management", Revision 4.
31. NSD-112 "Fire Brigade Organization, Training & Responsibilities", Revision 7.

32. NSD-116 "Nuclear Chemical Control Program", Revision 2.
33. NSD-228 "Applicability Determination", Revision 3.
34. NSD-301 "Engineering Change Program", Revision 27.
35. NSD-313 "Control of Flammable and Combustible Materials", Revision 6.
36. NSD-314 "Hot Work Authorization", Revision 6.
37. NSD-316 "Fire Protection Impairment and Surveillance", Revision 6.
38. NSD-318 "Coatings Program", Revision 2.
39. NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program", Revision 0.
40. NSD-413 "Fluid Leak Management Program", Revision 4.
41. S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process", Revision 0.
42. PIP O-99-2753.
43. PIP O-01-3492.
44. PIP O-02-3870.
45. PIP O-02-6047.
46. PIP O-05-4125.
47. PIP O-08-2006.
48. PIP O-08-2163.
49. PIP O-08-2520.
50. PIP O-08-4850.
51. Drawing KFD-109A-1.1 "Keowee Hydro Station – Flow Diagram of Service Water System".
52. Drawing Series OFD-124C.
53. Drawing OFD-135A-01-01.
54. Drawing Series O-310 K and L "Fire Protection Plan & Fire, Flood, & Pressure Boundaries".
55. SLC 16.9.2 dated 6/28/05.
56. SLC 16.9.3 dated 1/14/04.
57. SLC 16.9.4 dated 1/30/00.
58. SLC 16.9.5 dated 1/30/00.
59. SLC 16.9.6 dated 12/14/04.
60. SLC 16.9.7 dated 3/31/05.
61. SLC 16.13.1 dated 5/13/04.
62. OP/0/A/1600/004 "Operation of the SSF CO2 System".
63. PT/0/A/0400/002 "SSF CO2 Test".
64. PT/1/A/2200/006 "KHU-1 CO2 System Surveillance".
65. PT/2/A/2200/006 "KHU-2 CO2 System Surveillance".
66. PT/0/B/0250/030 "Quarterly Fire Brigade Equipment Inspection", Revision 20.

67. PT/0/A/2200/010 "KHS Fire Protection Equipment Surveillance" Revision 25.
68. PT/0/B/2000/001 "Preparation and Conduct of Emergency Drills".
69. PT/0/A/0250/010 A "Fire Protection System Monthly Inspection", Revision 65.
70. RP/0/B/1000/029 "Fire Brigade Response", Revision 11.
71. Calculation OSC-1626, Pressure at Hose Stations in Auxiliary and Turbine Building, Revision 2.
72. Calculation OSC-7185, Fire Evaluation of the East West Penetration Room Wall, Revision 0..
73. Calculation OSC-7350, ONS Penetration Seal Database and 86-10 Evaluations, Revision 6.
74. Calculation OSC-7858, Hydraulic Calculation for 2A Feedwater Turbine and TO Tank Suppression System, Revision 0.
75. Calculation OSC-7359 (DPC 1435.00-00-0006), Calculation for the Technical Basis for Fire Barrier Penetration Seals, Revision 1.
76. Calculation OSC-9292, NFPA 805 Transition B-3 Table/Report, Revision 1.
77. Calculation OSC-9302, Fire Protection Evaluation for Balance of Plant (BOP) Partitioning, Revision 0.
78. Fire Suppression NFPA Code Review calculations.
79. Duke Corporate Roof Management Program.
80. General Employee Training – Plant Access Training.
81. Oconee Emergency Plan.
82. Oconee NFPA 805 Transition Report, Revision 1.
83. Oconee Nuclear Site Fire Plan.
84. Specification OSS-241.00-00-0004 "Conventional Thermal Insulation", Revision 5.
85. Specification OSS.241A "Reactor Building and Piping Heat Insulation (Metal Reflective Type), Revision 4.
86. UFSAR Section 9.5.1 dated 12/31/05.

V. STATUS OF NFPA 805 COMPLIANCE

Compliance Statement	Total	Notes
Comply	47	
Comply by Previous NRC Approval	23	
Comply by Previous Licensee Evaluation	5	
Submit for NRC Approval	3	Section 3.3.1.2(1), Section 3.3.1.3.4, and 3.3.7

Further Action Required	24	Oconee will take an action to revise documentation or perform additional analysis and/or actions to demonstrate compliance.
Area for Improvement	11	Oconee is compliant and areas to enhance station documentation are identified
N/A	10	Section 3.9.4, 3.10.1 – 3.10.10, and Section 3.11.5

Note that there are more method of compliance statements than code sections as some sections comply by various means or additional actions are required.

Open Items

The following is a list of open items (Submit for Approval, Further Action Required, Area for Improvement) and actions required for resolution. PIP O-08-2163 has been generated to track the open items in the following table. Additional detail can be found in the applicable report section.

Section	Requirement	Action
3.2.2.4	The policy document for the Fire Protection Plan shall identify the appropriate AHJ.	Revise station documentation to state the NRC is the AHJ for fire protection changes requiring approval.
3.3.1.2(1)	Wood used within the power block shall be listed with a fire-retardant application	Submit for NRC Approval; Oconee permits non-treated wood for concrete forming or per design documents.
3.3.1.2(2)	Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, or equivalent.	Revise NSD-313 (or an alternative administrative control document) to specifically address plastic sheeting materials shall conform to NFPA 701 requirements, or equivalent.
3.3.1.3.1	A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, and NFPA 241	Evaluate NSD-314 to determine if NFPA 241 should be referenced.
3.3.1.3.3	Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.	Revise station leak testing procedures to ensure open flames and combustion generated smoke are not used.
3.3.1.3.4	Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.	Submit for NRC Approval; Oconee permits fossil fuel (gas and oil-fired) heaters.

Section	Requirement	Action
3.3.3	Interior wall, floor and ceiling finish classifications shall be in accordance with NFPA 101.	Revise NSD-318 to include the appropriate code specifications.
3.3.5.1	Wiring above suspended ceiling shall be kept to a minimum.	Revise applicable station documentation for compliance with this section.
3.3.5.2	Only metal tray and metal conduits shall be used for electrical raceways.	Revise applicable station documentation for compliance with this section.
3.3.5.3	Electric cable construction shall comply with a flame propagation test.	Revise station documentation that non-rated cables (including data/phone/ video) shall not be routed in cable trays with nuclear safety related cables.
3.3.7	Bulk flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.	Submit for NRC Approval; Storage of flammable gas cylinders is permitted for use in plant operations and systems per design
3.3.7.1	NFPA 50A shall be followed for hydrogen storage.	Perform a NFPA 50A code compliance review for outdoor hydrogen storage.
3.3.7.2	Outdoor high pressure flammable gas storage container shall be located so that the long axis is not pointed at buildings.	Resolve propane tank storage configuration; evaluate or modify the tank.
3.3.8	Bulk storage of flammable and combustible liquids.	Perform NFPA 30 code compliance review for bulk storage of the Turbine Building and Keowee lube oil storage locations.
3.3.9	Transformer oil collection basins and drain paths shall be periodically inspected to ensure they are free of debris and capable of performing their design function.	Revise Transformer Water Spray test procedures to ensure drainage is inspected during annual flow tests.
3.3.10	Administrative controls shall require the prompt cleanup of oil on insulation.	Revise NSD-104 and/or NSD-413 to clearly indicate it is a NRC requirement to promptly remove oil from insulation.
3.3.11	Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.	Revise NSD-313 to include PRA Zone of Influence distance from PRA fire modeling as exclusion area for transient combustibles.
3.4.1(a)	The fire brigade shall comply with NFPA 600.	Ensure NFPA 600 code review is formally documented.

Section	Requirement	Action
3.4.2.1	Pre-Fire Plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.	Review ONS Fire Plan for compliance with NFPA 805 requirements.
3.4.6	An effective emergency communications capability shall be provided for the industrial fire brigade.	Ensure resolution of PIP O-08-4820 satisfies the requirement of this section.
3.5.1(b)	The fire water supply shall be capable of delivering the largest system design demand and hose stream.	Ensure any credited suppression systems are within the design flow capabilities of the fire pump.
3.5.3	Fire pumps shall be installed in accordance with NFPA 20 and shall provide 100% of the required flow and pressure.	Ensure the Keowee fire pump replacement satisfies the requirements of this section
3.5.4	Electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.	Both HPSW pumps are currently powered from the same Unit. HPSW pumps should not be powered from a single unit. Consider connection to PSW or an alternate unit.
3.5.6	Fire pumps shall be provided with automatic start and manual stop only.	Document resolution of PIP O-02-3870 to install manual stop on the HPSW pumps.
3.5.10	An underground yard fire main loop, designed and installed in accordance with NFPA 24, shall be installed to furnish anticipated water requirements.	Perform a NFPA 24 code compliance review.
3.6.1	For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14.	Perform a NFPA 14 code compliance review.
3.7	Where provided, fire extinguishers of the appropriate number, size, and type shall be provide in accordance with NFPA 10.	Perform a NFPA 10 code compliance review.

Section	Requirement	Action
3.8.1 3.8.2	Fire alarm initiating devices shall be installed in accordance with NFPA 72.	Perform a NFPA 72 code compliance review.
3.9.1	Automatic or manual water based fire suppression systems required by Chapter 4 shall be installed in accordance with NFPA 13 or 15.	Review applicable existing code compliance reviews. Perform additional reviews as necessary.
3.10.1 3.10.3 3.10.9 3.10.10	Automatic total flooding or local application gaseous fire suppression systems shall be installed in accordance with NFPA 12.	Perform a NFPA 12 code compliance review. Includes addressing open items in subsequent Section 3.10.3, 3.10.9 and 3.10.10 in the code compliance review.
3.11.1	Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A.	Upgrade fire barriers in accordance with open items identified in OSC-9302.
3.11.2	Fire barriers required by Chapter 4 shall include a specific fire-resistance rating.	Upgrade fire barriers in accordance with open items identified in OSC-9302.
3.11.3	Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designed fire resistance rating of the barriers as determined by Chapter 4.	Upgrade fire barrier penetrations in accordance with open items identified in OSC-9302.
3.11.4	Through penetration fire stops for penetrations shall be protected.	Upgrade fire barrier penetration seals in accordance with open items identified in OSC-9302. Review if credited penetration seals are evaluated in Calculation OSC-7350.

VI. NFPA 805 COMPLIANCE SUMMARY

The information is a compilation of how the ONS Fire Protection Program supports each requirement of NFPA 805, Chapter 3.

Section 3.1 General

This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein.

Oconee Nuclear Station (ONS) compliance with the fire protection program elements and minimum design requirements presented in NFPA 805 Chapter 3 is not based on the performance-based methods permitted elsewhere in the standard. The following discussion of Chapter 3 requirements documents ONS compliance or intended compliance with the individual code sections. In addition documentation is provided where previous NRC approval has been granted for a deviation to the code.

Section 3.2 Fire Protection Plan

3.2.1 Intent

A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated combination of components, procedures, and personnel to implement all fire protection program activities.

The Design Bases Specification for Fire Protection, OSS-0254.00-00-4008, documents the ONS Fire Protection Program including management policy, program direction and defines the organization, responsibilities and requirements of involved personnel. Many of these attributes have been updated and revised since original correspondence with the NRC including the January 16, 1978 letter from Duke to the NRC in response to the Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance (FRAQUA) letter and the original and updated Response to Appendix A to Branch Technical Position APCSB 9.5-1. The ONS fire protection program is currently based on, and complies with, the requirements of 10CFR50.48(a).

Note that Oconee uses the terminology Fire Plan to represent the fire pre-plan (fire-fighting strategies) for fire scenarios at the site and uses the term Fire Protection Program (per 10CFR50.48) to delineate the implementation of fire protection policies at the plant.

Reference(s): Design Basis Specification for Fire Protection

Duke Letter to the NRC, FRAQUA Response, January 16, 1978

Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, December 31, 1976

Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.2.2 Management Policy Direction and Responsibility

A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program.

The Design Bases Specification for Fire Protection includes the management policy of the fire protection program organization and responsibilities. The Design Bases Specification for Fire Protection and Engineering Support Document for Fire Protection provide detailed information about the Fire Protection Program. The Design Bases Specification for Fire Protection provides the basis and regulatory framework upon which the Oconee Nuclear Station Fire Protection Program is based. The Engineering Support Program Document for Fire Protection provides the fire protection engineer an aid in defining the Oconee Fire Protection Program.

3.2.2.1

The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.

The Site Vice President has the overall responsibility for the fire protection program at Oconee Nuclear Station. The daily programmatic administration of the fire protection program at Oconee is delegated through line management to the Fire Protection Engineer. Responsibility for the fire brigade and fire brigade training are delegated to the emergency planning and training groups respectively.

Reference(s): Design Basis Specification for Fire Protection

3.2.2.2

The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation.

The Fire Protection Engineer has the overall lead responsibility for the Fire Protection Program and its administration and coordination for all facilities that are important to nuclear safety or covered by the nuclear insurer. The fire protection engineer is experienced in nuclear fire protection and is qualified consistent with member grade status in the Society of Fire Protection Engineers. All other buildings are under the oversight of the Commodities and Facilities organization.

Reference(s): Design Basis Specification for Fire Protection

3.2.2.3

The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program.

Fire protection interfaces are defined in the Design Basis Specification for Fire Protection and the Engineering Support Program Document for Fire Protection. The positions having responsibilities and authority to implement portions of the fire protection program are described below. These positions were originally described in the ONS FRAQUA response and ONS Comparison to BTP 9.5-1 and have evolved since original publication.

Fire Protection Engineer

The Fire Protection Engineer (FPE) is responsible for the overall administration of the fire protection program. This individual may not directly control or be responsible for every aspect of fire protection, detection, or mitigation at Oconee; however the individual is required to be knowledgeable of each aspect. This individual will interface with each plant internal and external customer regarding a fire protection concern. Fire Protection concerns can be regulatory, local or national code interpretations, insurance compliance, equipment configurations, equipment specifications, or industry issues. The fire protection program encompasses all structures, systems, and components important to plant and nuclear safety and those other structures, systems, and components covered by the nuclear insurer. The FPE is also the AHJ at the site level.

Fire Protection Engineering Fleet Lead

The Fire Protection Engineering Fleet Lead provides programmatic support (overall Department direction and policy in matters pertaining to Fire Protection and Appendix R safe shutdown) to the three Duke Energy site Fire Protection Engineers. This was formerly identified as Fire Protection Consultant.

Fire Detection and Instrumentation Engineer

The Fire Detection and Instrumentation Engineer responsibilities may be divided among different individuals, if management thinks this is prudent. The person responsible for fire detection and/ or instrumentation will respond to all questions and system operations concerning operational characteristics, commitments, and regulatory requirements. This person(s) will interface with plant craft personnel, the fire protection engineer, and other internal and external customers. The fire detection and instrumentation engineer is also responsible for keeping the FPE notified of major system problems.

Service Water System Engineers (HPSW, LPSW, and CCW)

The service water system engineers are responsible for notifying the FPE of any problem on their system that will affect the performance of the fire protection systems. The divisions of hydraulic responsibilities among the various engineers are that main flow paths are the concerns of the individual system engineers and the portion of the piping that is specifically designed to support fire fighting and/ or suppression are responsibilities of the FPE. There are instances where both individuals may need to combine input to problem resolution techniques.

Standby Shutdown Facility (SSF) Engineer

This person is responsible for interfacing with the FPE to ensure the 10 CFR50, Appendix "R" commitments are maintained within compliance.

Fire Brigade Specialist

This person currently resides in Emergency Planning. They are responsible for the preparedness, readiness, training, and coordination of all drill exercises for the site fire brigade members. The FPE assists the Fire Brigade Specialist in drill preparation, location, expectations and in drill response observations. The FPE is responsible for assisting in the maintenance of the Pre-Fire Plan, which is owned by the Fire Brigade Specialist.

Facilities and Maintenance Coordinator

This person works for Corporate Facilities. They are responsible for the fire protection features associated with those structures on Oconee Nuclear site that do not contain structures, systems, and components that are important to nuclear safety and/or covered by the nuclear insurer. This person also manages those individuals directly or indirectly that perform some of the preventative maintenance programs on fire hoses, extinguishers, detection and suppression systems, and misc. equipment repair.

Operations, Radwaste, SPOC and Plant Maintenance

These plant organizations are responsible for the daily general plant maintenance, testing, and inspection of fire protection systems located within the Protected Area.

Environmental Management Chemical Control Coordinator

This person is responsible for identifying to the fire protection engineer any new chemicals allowed on-site that would increase the combustible/flammable loading while the product is "In-Use" or in storage.

Site Personnel

Fire prevention is a concern of all individuals on site. Each person shall notify the Control Room via the emergency number (4911) of any fire. Plant personnel should use normal plant communications to ensure notification to the fire protection engineer or appropriate group of any fire protection feature impairment, unsafe combustible/flammable loading, or suspected fire equipment damage.

Fire Protection Working Group

This team is comprised of each nuclear site's fire protection engineer, the fire brigade specialist from each site and fire protection engineering fleet lead. The Fire Protection Working Group's major goals are communication and team effort on common problems. The Working Group constantly reviews practices, methods, and results to achieve a direct impact on the quality of work practices.

Post-Fire Safe Shutdown Engineer

This was formerly identified as Appendix R Engineer. The purpose of the Post-Fire Safe Shutdown Engineer is to evaluate the effect of plant mods, failures, and configuration changes on the ability to safely shutdown the plant in the event of a fire.

~~3-Site Post-Fire Safe Shutdown Engineer~~

This was formerly identified as 3-Site Appendix R Engineer. The purpose of the 3-Site Post-Fire Safe Shutdown Engineer is to promote consistency in thought and share resolution of issues which may impact the ability to safely shutdown the plant in the event of a fire.

References: Design Basis Specification for Fire Protection
Engineering Support Program Document for Fire Protection

3.2.2.4

The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.

The NRC is the considered AHJ for fire protection changes requiring approval. The NRC is notified of changes to the Fire Protection Program in accordance with NSD-320. NSD-320 screens changes to the Fire Protection Program to determine if NRC approval is required.

{Further Action Required – Revise the Design Basis Specification for Fire Protection which is the primary fire protection program policy document to state the NRC is the AHJ for fire protection changes requiring approval.}

References: NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program"

3.2.3 Procedures

Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established:

(1) Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program

Inspection, testing, and maintenance (ITM) for fire protection systems is provided for the following systems. A brief description of the fire protection system and applicable ITM criteria is provided below from the Engineering Support Program Document for Fire Protection. Detailed listings of the applicable surveillance procedures are documented in the Engineering Support Program Document rather than being repeated here.

System	Components/Test/Notes	Frequency
Fire Main System	Main line HPSW system valves and those valves used for fire protection check	Monthly
	Fire hydrants and Post Indicator Valves stroked test and flush	Semi-Annual
	Fire water system flow test	Every three years
	Elevated Water Storage Tank (EWST) inspection	Every 5 years
Automatic Suppression Systems	Various fire suppression systems are tested in accordance with NFPA Requirements, except for those systems which could potentially cause inadvertent adverse plant power production interruptions and/or personnel or reactor safety consequences	Varies based on system
Carbon Dioxide Extinguishing Systems	Carbon Dioxide (Cardox) extinguishing system inspection and maintenance	Monthly and semiannual basis
Halon Extinguishing Systems	Vault Halon extinguishing system inspection and maintenance	Annual
Fire Detection Systems	Main plant fire detection panel is monitored	Once per shift
	Fire detection panel and Honeywell detectors check	Monthly
	Accessible fire detectors physical check	Semi-annual
	Detector sensitivity check	Annual
Standpipe Systems	Fire hose inspection	Monthly
	Hose hydro test	Hoses considered to be influenced by the environment annually; all others on a 3 year schedule
	Fire hose in containment inspection	Refueling outage or at any time the building is open for

System	Components/Test/Notes	Frequency
		more than 30 days during a cycle
Portable Fire Extinguishers	Fire extinguisher check	Monthly
	Fire extinguisher inspection	Annually
	Carbon Dioxide and Dry Chemical extinguisher hydro	6 year
Fire Pumps	The HPSW pumps are currently tested to both NFPA and ASME Section XI requirements because these pumps serve a dual function	The NFPA requirement is monthly and the ASME requirement is quarterly
Fire Brigade Equipment	Fire brigade equipment inspection and maintenance	Quarterly
Fire Barriers and Penetration Seals	Penetration seal and fire stop inspection	1. Ten percent of each type of NRC committed fire barrier penetration seal every 18 months with all seals within 15 years 2. 100% of the exposed surface of each rated barrier every 18 months
Fire Doors	Fire door inspection	Bimonthly
Fire Dampers	Fire damper inspection	1. Ten percent of the NRC committed fire dampers every 18 months with all fire dampers within 15 years 2. Electrically controlled fire dampers that use sensors to close in the cable and equipment rooms annually

Reference(s): Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection

(2) Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration

Fire protection systems credited for the fire protection program are documented in the

Oconee Selected Licensee Commitments (SLCs) 16.9.1 through 16.9.6. The Selected Licensee Commitments include inspection and testing requirements for those fire protection systems and features which are committed to be functional. SLCs also specify remedial actions to be taken in the event that a system or feature is inoperable. Directions for compensatory actions when systems credited by the fire protection program are not operable are provided in the SLC 16.9.1 through 16.9.6, NSD 316 and S.D. 3.2.14. These documents provide the roadmap and direction to be taken in the event a system is impaired.

NSD-316, "Fire Protection Impairment and Surveillance" provides the requirements and responsibilities for reporting fire protection feature impairments and ensures proper compensatory actions are satisfied for licensing, insurance and good fire protection practices. Impairments include any action or condition which inhibits any fire protection feature to function as designed. Compensatory actions are the steps taken to minimize the fire risk potential due to a fire protection feature impairment such as staging backup suppression, temporary fire detection, fire watch tours, etc. This directive provides the directions and requirements to notify the fire brigade of any fire impairment to ensure restoration of impaired features occurs in a timely manner. This directive applies to all fire protection features in the owner controlled area, and to all work groups that impair fire protection features.

Oconee Nuclear Site, Site Directives Manual S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process," assigns responsibilities for actions and provides direction, including process charts, for actions to be taken when a fire protection component or system is not operable. The Site Directive also provides a table that lists fire protection program components, any associated Technical Specification or Selected Licensee Commitment (SLC) and the actions to be implemented if that component is impaired.

Reference(s): NSD-316 "Fire Protection Impairment and Surveillance"

S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process"

SLC 16.9.1, .2, .3, .4, .5, .6

(3) Reviews of fire protection program — related performance and trends

Reviews of the Fire Protection Program are conducted on a routine basis to evaluate performance and determine if any trends exist. The scope and responsibilities for those reviews are listed in Section 6.1 "Parameter Monitoring and Trending" of the Engineering Support Program Document for Fire Protection. The results of the reviews are provided in an annual Fire Protection Program Heath Report. In addition, internal 3-year audits and 3-year NRC triennial audits are performed.

Reference(s): Engineering Support Program Document for Fire Protection

EDM-201 "Engineering Support Program"

(4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program

All physical plant modifications and procedure changes are screened for the impact on the fire protection program.

NSD-301 "Engineering Change Program" provides the requirements for changes to a nuclear facility. A table is provided for a screening process for potential Fire Protection System impacts.

Engineering Design Manual (EDM) 601 "Engineering Change Manual" provides detailed information to help the reviewer determine if the change has the potential to impact any fire protection feature. The manual specifies the requirements for changes, permanent and temporary, to the nuclear station. The manual specifies the roles and responsibilities for involved personnel and is applicable to both QA and non-QA structures, systems and components (SSC) and includes the Keowee facility. An extensive screening checklist for fire protection features is provided. In addition, a PRA Impact Review and a Fire Protection (10CFR50.48) Electrical Review is required.

Reference(s): NSD-301 "Engineering Change Program"
EDM-601 "Engineering Change Manual"

(5) Long-term maintenance and configuration of the fire protection program

The fire protection program is maintained through NSD-106.

NSD-106 "Configuration Management" provides the basis for ensuring that Fire Protection Program and its features are properly maintained. Appendix A.106 "Functional Areas for Configuration Management" includes Fire Protection/Appendix R in the listing of Key Processes that are required to be considered to maintain the facility design consistent with the licensing bases and other design bases.

NSD-228 "Applicability Determination", Appendix E includes a specific screening checklist that will direct user to NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program" to determine impact on the Fire Protection Licensing basis.

The NRC approved the ONS Units 1, 2, 3 Operating Licenses in a letter transmittal

dated May 23, 2000 and the associated License Renewal SER. Oconee Units 1, 2 and 3 are licensed to operate until 2033. In order to obtain license renewal, detailed guidelines and commitments were provided to ensure fire protection functions are maintained during the period of extended operation. In the letter, the following was stated regarding the fire protection program: "*Duke Energy Corporation shall implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR for the facility and as approved in the SER's dated August 11, 1978, and April 28, 1983; October 5, 1978, and June 9, 1981 Supplements to the SER dated August 11, 1978; and Exemptions dated February 2, 1982; August 31, 1983; December 27, 1984; December 5, 1988; and August 21, 1989 subject to the following provision:*

> *The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire."*

Reference(s): NSD-106 "Configuration Management"
NSD-228 "Applicability Determination"
NRC Letter to Duke dated May 23, 2000
NRC SER dated May 23, 2000

(6) Emergency response procedures for the plant industrial fire brigade

The Emergency Planning Group oversees the Plant Fire Brigade, training and procedures. The Fire Plan (pre-fire plan) includes Fire Brigade Standard Operating Guidance (SOG) for various emergency responses. The Fire Brigade is provided the Fire Plan which details the potential hazards and the available fire fighting equipment for the plant along with a graphic representation of the layout of the area. Additional details on the Fire Brigade are presented in Section 3.4.

The coordination between the Fire Brigade and other plant groups during a fire emergency is defined in NSD-112. When the Control Room is notified of a fire, Procedure RP/O/B/1000/029 "Fire Brigade Response" is implemented. The procedure instructs the control room personnel on their response and provides direction on managing the conduct of the fire fighting activities including contacting offsite Fire Departments.

Reference(s): Oconee Nuclear Site Fire Plan
NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

Section 3.3 Prevention

A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:

(1) Prevention of fires and fire spread by controls on operational activities

(2) Design controls that restrict the use of combustible materials

The design control requirements listed in the remainder of this section shall be provided as described.

The Oconee Nuclear Station (ONS) fire prevention program is described in the Design Basis Specification for Fire Protection. The Design Basis Specification for Fire Protection identifies activities for fire prevention and design controls for use of combustible materials.

Reference(s): Design Basis Specification for Fire Protection

3.3.1 Fire Prevention for Operational Activities

The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible.

As part of defense-in-depth, administrative fire prevention programs for hot work, storage of combustibles and flammable material, compensatory action plans, safety precautions and employee training contribute to limit fire ignition and/or growth and ONS. Fire prevention programs are implemented to address the control of ignition sources and the use of transient combustible materials and plant access training includes instruction on fire prevention during General Employee Training (GET).

Reference(s): General Employee Training – Plant Access Training

NSD-104, "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

NSD-314 "Hot Work Authorization"

NSD-316 "Fire Protection Impairment and Surveillance"

3.3.1.1 General Fire Prevention Activities

The fire prevention activities shall include but not be limited to the following program elements:

(1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms.

The prevention of fires and fire spread are managed through administrative controls and training of personnel. All persons who are authorized access to the plant receive instruction in maintaining fire barriers, controlling fire loading and hot work activities, plant emergency alarms, and the proper response to the discovery of a fire.

Reference(s): General Employee Training – Plant Access Training
NSD-313 "Control of Flammable and Combustible Materials"
NSD-314 "Hot Work Authorization"
NSD-316 "Fire Protection Impairment and Surveillance"

(2) Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified.

The responsibilities of the Fire Protection Engineer include periodic surveillance of plant areas for compliance with the Fire Protection Program. Plant Engineers, including the FPE, perform plant walkdowns in accordance with Procedure EM 4.6 "Oconee Engineering Support Program Walkdowns" which provides guidance on observations that should be made including fire hazards. Any unanalyzed fire hazards are documented in the PIP program. Plant inspections may be performed by other groups as delegated by the FPE on other frequencies.

Reference(s): EM 4.6 "Oconee Engineering Support Program Walkdowns"
Engineering Support Document for Fire Protection

(3) Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized.

All plant modifications and changes are screened for impact on the plant fire protection program through NSD-301, NSD-228, and/or EDM-601.

NSD-301 "Engineering Change Program" provides the requirements for evaluation of changes to a nuclear facility. A table is provided for a screening process for potential Fire Protection System impacts.

NSD-228 "Applicability Determination", Appendix E includes a specific screening checklist that will direct user to NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program" to determine impact on the Fire Protection Licensing basis.

Engineering Directives Manual (EDM) 601 "Engineering Change Manual" provides detailed information to help the reviewer determine if the change has the potential to impact any fire protection feature. The EDM specifies the requirements for changes, permanent and temporary, to a nuclear station. The Manual specifies the roles and responsibilities for involved personnel and is applicable to both QA and non-QA structures, systems and components (SSC) and includes the Keowee facility. An extensive screening checklist for fire protection features is provided. In addition, a PRA Impact Review and a Fire Protection (10CFR50.48) Electrical Review is required.

Reference(s): NSD-228 "Applicability Determination"

NSD-301 "Engineering Change Program"

NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program"

~~EDM-601 "Engineering Change Manual"~~

3.3.1.2 Control of Combustible Materials

Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented.

Control of combustible materials and housekeeping practices at ONS is implemented through NDS-313, NSD-104 and EWP 7.2.

The control of combustible materials is implemented by NSD- 313 "Control of Flammable and Combustible Materials." Control of housekeeping is implemented by NSD-104 "Housekeeping, Materiel Condition & Foreign Material Exclusion" which promotes plant cleanliness. EWP 7.2 "Storing Chemicals" provide specific storage requirements for control of chemicals (including flammable and combustible liquids and gases).

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

EWP 7.2 "Storing Chemicals"

These procedures shall include but not be limited to the following program elements:

(1) Wood used within the power block shall be listed pressure-impregnated or coated with a listed fire-retardant application.

Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated.

NSD-313 requires only fire retardant wood be used within the power production and

safe shutdown areas unless approval is obtained from the FPE. Three exceptions are allowed; dunnage (large timbers) for specific work activities, concrete forming, and where specified on design documents.

{Submit for NRC Approval – NFPA 805 only permits fire retardant treated wood or dunnage. NSD-313 permits concrete forming or per design documents.}

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

(2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent.

NSD-313 specifies that only fire resistant plastic (i.e. Griffolyn) be used within the power production and safe shutdown areas.

{Area for Improvement – Revise NSD-313 to specifically address plastic sheeting materials shall conform to NFPA 701 requirements, or equivalent.}

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

(3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first.

NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion" provides direction on maintaining the cleanliness of the plant. The Directive discusses Housekeeping Zones which specify the level of cleanliness for various areas and states that "Upon completion of the maintenance activity, the work supervisor or designee shall ensure the Housekeeping Zone is returned to at least its original condition." The Directive specifies that "During outage work, the Job Sponsor working with the supervisor for the crew will ensure the work area is returned to a normal or better state of appearance once work is complete."

NSD-313 "Control of Flammable and Combustible Materials" provides the following requirements for in-use materials: "At the end of each shift, housekeeping zones/work areas shall be cleared of all unnecessary materials and all waste/trash material removed and properly disposed."

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

(4) Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials.

Combustible Material storage and staging areas are specified in NSD-313. The directive discusses generally the temporary and permanent storage of the various types of combustible materials, limitations, and Oconee site specific information. The FPE establishes the material inventory (limit) for the areas and the amount of material can not be changed without approval of the FPE. Changes to the storage restrictions or locations require completion of a change form.

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

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(5) Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.

The controls on the use and storage of flammable and combustible liquids are specified in NSD-313. NSD-313 references NFPA 30 as a source document for use and storage of flammable and combustible liquids. EWP 7.2 provides specific storage requirements for control of chemicals (including flammable and combustible liquids) and references NSD-313.

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"
EWP 7-2 "Storing Chemicals"

(6) Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.

The controls on the use and storage of flammable gases are specified in NSD-313. NSD-313 references NFPA 55 and OSHA as source documents for use and storage of flammable gases. EWP 7.2 provides specific storage requirements for control of chemicals (including flammable gases) and references NSD-313.

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"
EWP 7-2 "Storing Chemicals"

3.3.1.3 Control of Ignition Sources

3.3.1.3.1

A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

NSD-314 "Hot Work Authorization" specifies the controls for performing hot work and the responsibilities of the persons authorizing and performing the activity. The directive requires inspections of the locations by trained personnel prior to hot work activity to ensure that there are no fire hazards present. NFPA 51B is a source document to NSD-314. NSD-314 is periodically updated.

NFPA 241 references NFPA 51B with regards to the requirements for administration of Hot Work. ONS was not required to incorporate NFPA 241 as a code of record.

{Area for Improvement – Evaluate NSD-314 to determine if NFPA 241 should be referenced.}

Reference(s): NSD-314 "Hot Work Authorization"

3.3.1.3.2

Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.

Ignition sources including smoking are restricted to designated areas or controlled through a permitting process.

NSD-104 restricts the use of smoking and tobacco products to areas clearly posted as a tobacco use area and provides approved receptacles for waste.

NSD-314, Hot Work, specifies controls of ignition sources typically associated with hot work including permitting and designation of areas where a permit is not required.

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"
NSD-314 "Hot Work Authorization"

3.3.1.3.3

Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.

The Duke response to Appendix A to BTP 9.5-1 states "Open flames or combustion generated smoke is not permitted at ONS for leak or air flow testing. Leak and air flow determinations are accomplished by using commercially available aerosol or soap bubble techniques. Candles may be permitted for search of secondary system condenser vacuum leaks. The secondary system condenser is removed from safety related equipment."

1978 SER Section 6.5 states *"Use of open flames or combustion generated smoke for leak detection in safety-related areas has been prohibited.*

We find that the control of ignition sources conform to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

~~{Further Action Required – Revise the appropriate station procedure(s) for leak or air flow~~ testing to preclude the use of open flames or combustion generated smoke.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

NRC SER dated August 11, 1978

3.3.1.3.4

Plant administrative procedure shall control the use of portable electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.

The use of portable heating devices is controlled by NSD-316 "Fire Protection and Impairment Surveillance." The Directive defines a heating device as "A temporary heater that uses greater than or equal to 220 Volts or is powered by a fossil fuel source and is used to heat a general area, enclosure or equipment." Site personnel are responsible for notifying the FPE of any intended use of a heating device(s).

Site Directive 3.2.14 provides a flow chart for measures to take when temporary heaters are installed. This includes consideration of location and risk. The group that requests the placement of the temporary heating device shall be responsible to ensure that fire watches are initiated. A passive fire watch shall be conducted at least once every six (6) hours but may be more frequent if determined by the FPE. Fire watches shall be documented by use of the Impairment and Compensatory Measures (ICM) Form in NSD-316.

NSD-316 specifies only steam heaters, UL Listed or FM Approved electric heaters, gas (MAPP, LP, or natural) or oil-fired heaters shall be allowed inside buildings. Gasoline and other fuels are not permitted unless approved by the FPE.

{Submit for NRC Approval – S.D. 3.2.14 and NSD-316 permit fossil fuel (gas and oil-fired) heaters.}

Reference(s): NSD-316 "Fire Protection and Impairment Surveillance."
S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process"

3.3.2 Structural

Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction.

Oconee is designed to minimize the probability of fire and explosion. Non-combustibles and fire-resistant materials were used whenever practical throughout the facility.

The Reactor Building is built using fire resistive construction. The outside walls of the Reactor Building are post-tensioned concrete for the three reactor structures. The roof and supports are also post-tensioned concrete for the three reactor structures. Interior partition walls are concrete containment or shield type walls between reactor, steam generators, coolant pumps, etc. Floors and supports are concrete on grade and various mezzanine levels are supported by concrete beams.

The Auxiliary Building is a free standing reinforced concrete structure composed of concrete frames, slabs, and walls and non-structural masonry walls. The facility has exterior walls that are reinforced concrete with fire resistive construction. Interior partition walls are mainly concrete with portions of concrete block. The roof and supports are approved insulated roofing on concrete slab supported on concrete members. Floors and supports are concrete slab on concrete members.

The Turbine Building is constructed of reinforced concrete below grade consisting of substructure walls and a mat foundation. Above grade, the building consists of structural steel with metal siding. The steel roof deck is supported by unprotected steel frame. Exterior walls are noncombustible, insulated aluminum siding on unprotected steel frame with concrete at lower levels below grade. Interior walls are reinforced concrete and concrete block.

Reference(s): Design Basis Specification for Fire Protection

3.3.3 Interior Finishes

Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.

The Duke Comparison to BTP 9.5-1 letter and the UFSAR Section 9.5.1.4.1.4 state "Interior wall, structural components and radiation shielding are non-combustible. Coatings are non-combustible with flame spread and fuel contribution of 50 or less."

NSD-318 "Coatings Program" controls the use of coatings and requires approval for any changes. Records of coating applications are required to be maintained.

{Further Action Required – Revise NSD-318 to include the specifications for Class A walls/ceilings and Class I floor finishes or include in an alternative administrative control document.}

Reference(s): NSD-318 "Coatings Program"

UFSAR Section 9.5.1.4.1

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.3.4 Insulation Materials

Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.

The thermal insulation materials used in the power production plant are non-combustible Specifications OSS-0241-00-00-002 and OSS-0241.00-00-0004 state thermal insulation materials are metal reflective type (mirror), calcium silicate, Armaflex, fiberglass and basaltic rock. These insulations are all classified as non-combustible or limited combustible materials.

Any new insulation materials would require a screening determination in accordance with EDM-601 "Engineering Directives Manual." Part of the screening process is an evaluation of the potential effects on the Fire Protection Program which would require the use of noncombustible or limited combustible materials.

Reference(s): Specification OSS-241.00-00-0004 "Conventional Thermal Insulation"

Specification OSS-241.00-00-0002 "Reactor Building and Piping Heat Insulation (Metal Reflective Type)

EDM-601 "Engineering Directives Manual"

3.3.5 Electrical

3.3.5.1

Wiring above suspended ceiling shall be kept to a minimum. Where installed, electrical wiring

shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.

The Duke Comparison to BTP 9.5-1 letter and the UFSAR Sections 9.5.1.4.1 and 9.5.1.4.3 state "Suspended ceilings and their supports are non-combustible. Combustibles in concealed spaces are minimal. There are no power and control cables in the Control Room concealed floor or ceiling space except for miscellaneous 120V power and network cables in the ceiling space supplying small OAC computer room equipment."

Currently most cables are IEEE 383 equivalent and not routed in metallic conduit or cable trays with solid metal top and bottom covers.

{Further Action Required – Include clear documentation that electrical wiring (including data/phone/video cabling) is installed above suspended ceilings and the wiring complies with this section.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.1 and Section 9.5.1.4.3

Design Basis Specification for Fire Protection

3.3.5.2

Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components.

The Duke Comparison to BTP 9.5-1 and the UFSAR Section 9.5.1.4.3 state "Cable trays are constructed of non-combustible materials." The Design Basis Specification for Fire Protection states "Cable trays are constructed of steel with all supports attached to QA condition 1 or 4 structures."

{Further Action Required – Include clear documentation that conduits used for electrical raceways are metal and thin walled metallic tubing is not used in accordance with this section.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

Design Basis Specification for Fire Protection

3.3.5.3

Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ.

The IEEE 383 Standard was developed after Oconee cables were was installed, however, the same cable construction has been used at a later plant and was found acceptable under IEEE 383.

The NRC August 11, 1978 SER Section 4.8 states *"The cable insulation used in the plant consists of armored ethylene propylene rubber (EPR) of 5-8 KV cables with a polyvinyl chloride (PVC) jacket, armored EPR with hypalon or neoprene jacket outside containment and armored EPR with hypalon jacket, some with a PVC jacket overall, for inside containment. The majority of cables at Oconee are of the metallic armored type. The IEEE standard was not in effect at the time the plant was constructed and therefore the cables were not required to meet IEEE 383. The licensee has stated, however, that the same cable construction has since been used at a later plant where the IEEE 383-1971 criteria were imposed and the cable was acceptable. We find that to retest the IEEE 383 procedure and criteria is unnecessary and would not provide information that would alter our recommendation or conclusions. Accordingly we find the electrical cables used at the Oconee Nuclear Station acceptable."*

{Further Action Required – Revise station documentation that non-rated cables (including data/phone/video) shall not be routed in cable trays with nuclear safety related cables.}

Reference(s): NRC SER dated August 11, 1978

3.3.6 Roofs

Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings.

The Auxiliary Building, Reactor Building and SSF do not utilize metal roof deck construction.

The Turbine Building has metal roof deck construction. The Design Basis Specification for Fire Protection Section 3.2.2.1.1.1 states *"The roof was constructed in accordance the Kopper Company's Specification No. 17 and is therefore considered to be in accordance with FM Class 1. In 1985, the Turbine Building roof was re-roofed in accordance with Underwriter's Laboratories Class A single ply roof system. "Fire Rating of OS-159.00-00-0002" states all materials of construction are specified to be selected under FM Approval Guide as non-combustible. It is concluded that the Turbine Building built up roof decking assembly is FM Approval Guide Classification 1, through not specifically stated in the specification."*

The Duke Corporate Roof Program specifies new roofs shall be in compliance with FM-190 which indicates a FM Class I fire resistant roof is required. A FM Class I roof is equivalent to a NFPA 256 Class A roof classification.

Reference(s): Design Basis Specification for Fire Protection

Duke Corporate Roof Management Program

3.3.7 Bulk Flammable Gas Storage

Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.

The Design Basis Specification for Fire Protection, Duke Comparison to BTP 9.5-1 letter and UFSAR Section 9.5.1.4.3 state "There is no bulk gas storage in areas affecting safe shutdown equipment."

Safe permitted use of compressed gases is controlled by operational procedures. The storage of combustible and flammable materials is controlled by administrative procedures (NSD-313, EWP 7.2). General provisions for the use and storage of chemicals, including gases, are controlled by NSD-116 "Nuclear Chemical Control Program."

Flammable gas cylinders are located in various areas of the plant, by design, for chemistry labs and for Post Accident Monitoring instrumentation.

Previously ONS stated that there is no bulk gas storage in areas affecting safe shutdown equipment. Under NFPA 805, the requirement is no bulk storage inside structures housing systems, equipment or components important to nuclear safety. NFPA 55 (2005 edition) defines bulk hydrogen compressed gas system as an assembly, including storage containers, with a capacity greater than 400 ft^3. There are hydrogen storage cylinders located in the Auxiliary Building by design. The Auxiliary Building contains systems, equipment or components important to nuclear safety; however, the immediate areas in which the cylinder storage exists do not contain systems, equipment or components important to nuclear safety.

{Submit for NRC Approval – Storage of flammable gas cylinders is permitted for use in plant operations and systems per design.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

NSD-116 "Nuclear Chemical Control Program"

Design Basis Specification for Fire Protection

EWP 7.2 "Storing Chemicals"

3.3.7.1

Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage.

Bulk storage of Hydrogen Gas is stored in the northeast yard area. There is also a propane storage tank adjacent to the Unit 1 Transformer area. These storage tanks are located outdoors and away from the SSCs important to safety.

NSD-313 "Control of Combustible and Flammable Materials" provided restrictions on the storage location of combustible materials with specific restrictions for the Oconee Plant. Any changes, to the amount of materials or the storage location of materials, require review and approval from the FPE and EWP. Bulk flammable gas is not stored in areas important to nuclear safety unless used in plant operations or systems by design.

The chemical control program, which is administered in accordance with NSD-116, ensures compliance with applicable regulations and requirements including NFPA Codes. Any changes to the bulk storage of combustible/flammable gases would require authorization in accordance with both NSD-116 and NSD-313.

{Further Action Required – Perform a code compliance review for the outdoor hydrogen storage per NFPA 50A.}

Reference(s): NSD-116 "Nuclear Chemical Control Program"
NSD-313 "Control of Combustible and Flammable Materials"

3.3.7.2

Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings.

The bulk hydrogen storage cylinders are located with the long axis parallel to the buildings in the northeast corner of the yard.

A propane storage tank is oriented with its long axis toward the Unit 1 Turbine Building. The Design Basis Specification for Fire Protection, Duke Comparison to BTP 9.5-1 letter and UFSAR Section 9.5.1.4.3 state "There is no bulk gas storage in areas affecting safe shutdown equipment."

1978 SER Section 3.1.7 states *"Propane tanks located outside the turbine building will be anchored and provided with excess flow valves."*

{Further Action Required – Resolve orientation of propane tank. The tank is not anchored per the SER recommendation. Evaluate if the previous approval by the NRC is sufficient with modification. Alternatively, determine if an evaluation is required or modify the tank position.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

NSD-116 "Nuclear Chemical Control Program"

Design Basis Specification for Fire Protection

NRC SER dated August 11, 1978

3.3.7.3

Flammable gas storage cylinders not required for normal operation shall be isolated from the system.

The use and storage of combustible and flammable materials is controlled by NSD-313 and EWP 7.2. NSD-313 and EWP 7.2 require Compressed Gas Cylinders not in use to be stored with their protective cap in place, adequately secured in an upright position and separated from other flammable/combustible and oxidizing agents. Bulk hydrogen cylinders located in the hydrogen storage areas that are not in use are isolated from the system.

Reference(s): NSD-313 "Control of Combustible and Flammable Materials"

EWP 7.2 "Storing Chemicals"

3.3.8 Bulk Storage of Flammable and Combustible Liquids

Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code.

The storage of combustible and flammable materials is controlled by NSD-313. NFPA 30, "Flammable and Combustible Liquid Code," is a source document for NSD-313. Storage limitations are provided for power block areas. The general provisions for the use and storage of chemicals are controlled by NSD-116 which requires authorization for changes to flammable and combustible liquid storage amounts or location. Although listed below for information the Safe Shutdown Facility (SSF) Diesel Generator day tank and the Turbine Lube Oil reservoirs, while located in structures containing systems, equipment or components important to nuclear

safety, are part of the operating systems of the plant and are not considered bulk storage.

The fuel oil for the SSF Diesel Generator is provided from a 50,000 gallon underground storage tank to a 550-gallon day tank that is located inside the SSF. The SSF is a Category I structure that is provided with an automatic, total flooding CO_2 system in the diesel generator room that houses the day tank. The SSF buried fuel oil storage tank located outside adjacent to the SSF structure.

Turbine Lube Oil is located in the turbine building. The main turbine lube oil reservoir tanks are located in the basement level of each unit and have a capacity of 7,450 gallons. The turbine oil transfer tank and adjoining purifier units have a 14,000 gallon capacity, which is located under the operating floor. Each unit turbine oil transfer tank is arranged within a four feet high concrete dike designed to hold the entire contents of respective tanks. The adjoining oil purifier unit is located outside of the dike area.

The concrete block lubrication oil storage building, located in the lower level of the Unit 1 Turbine Building contains seven (7) steel tanks, each having a 200-gallon capacity. The storage area has a wet-pipe automatic suppression system, fire doors, and fire dampers in the ventilation openings.

There are two aboveground fuel oil tanks (30,000 and 45,000 gallon) for the Auxiliary boiler that are located in the northeast yard. These tanks are located in a diked area and are a considerable distance from the actual power production facility.

Gasoline, diesel fuel oil and kerosene are stored in underground tanks that are located at the site garage area. The tanks are located a significant distance (greater than 1,000 feet) from the actual power production facility.

Keowee has a dedicated lube oil tank room. The storage room contains two 7,150 gallon tanks for storage of oil for the turbine generators. The room is protected by an automatic deluge sprinkler system.

{Further Action Required – Perform a NFPA 30 code review for the Turbine Building lube oil reservoirs, Turbine Building oil storage building and the Keowee lube oil tank room.}

Reference(s): NSD-116 "Nuclear Chemical Control Program"
NSD-313 "Control of Combustible and Flammable Materials"
Drawing OFD-135A-01-01
Design Basis Specification for Fire Protection

3.3.9 Transformers

Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function.

The Main, Auxiliary and Safety Transformers for the three Oconee Units are located outdoors adjacent to their respective portions of the Turbine Building. Each of the transformers is provided with an automatic deluge system. The transformers are mounted on concrete pads within an earthen graveled area. There are no specific retention basins around the main transformers that are designed to retain and direct potential transformer oil leakage to a storage basin or tank. The ground and gravel system will absorb most of the runoff from fire mitigation activities in addition to the yard drain system directing excess flow to Chemical Treatment Pond (CTP) #3. CTP #3 is provided with oil skimmers.

Transformer CT-4 is located in the Unit 1/2 Blockhouse. A concrete oil retention basin is provided under the Blockhouse.

The Keowee Transformer is located outside on the West side of the hydro station and is provided with an automatic deluge system. The transformer is mounted on a concrete pad with a gravel bed similar to those discussed above.

{Further Action Required – Revise station test procedures to include drainage inspections as part of the annual flow tests.}

Reference(s): Engineering Support Document for Fire Protection
Design Basis Specification for Fire Protection

3.3.10 Hot Pipes and Surfaces

Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the prompt cleanup of oil on insulation.

NSD-104 addresses general housekeeping requirements that apply to all personnel (permanent and temporary) that perform activities at the plant. The NSD emphasizes the plant areas should be clean and orderly with properly maintained work areas and equipment.

NSD-413 "Fluid Leak Management Program" was established to ensure aggressive identification of leaks followed by timely investigation and repair. The Leak Management Program encompasses all fluid leaks which may include high-energy process fluids steam, water, oil, hydraulic fluid, etc occurring throughout the Plant.

{Area for Improvement – Revise NSD-104 and/or NSD-413 to clearly indicate it is a NRC requirement to promptly remove oil from insulation.}

Reference(s): NSD-104 "Housekeeping, Materiel Condition & Foreign Material Exclusion"
NSD-413 "Fluid Leak Management Program"

3.3.11 Electrical Equipment

Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.

Placement of combustible materials that could be located near electrical equipment is controlled by NSD-313. NSD-313 includes specific guidance on the location of transient fire loads adjacent to plant equipment susceptible to fire damage (e.g. electrical cabinets).

{Further Action Required – Revise NSD-313 to specify the combustible free distance consistent with the PRA Zone of Influence for transients}

Reference(s): NSD-313 "Control of Combustible and Flammable Materials"

3.3.12 Reactor Coolant Pumps

For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply.

(1) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and nonpressurized leakage sites in each reactor coolant pump oil system.

A lube oil collection system was installed for each of the Reactor Coolant Pumps (RCPs) at the Oconee Plant – each of the three units has four RCPs. The RCP oil collection systems are designed and sized to collect and contain oil from potentially pressurized and unpressurized leakage areas in a seismic event resulting in failure of the lubrication system. However, the RCP oil collection system has not been designed for containment of atomized oil vapors from all areas for the RCP. The Reactor Coolant Pump (RCP) Lube Oil System for each reactor coolant pump contains approximately 250 gallons of oil in upper and lower tanks, self-contained within each RCP assembly.

Reference(s): Duke Letter to the NRC dated March 18, 1981
Design Basis Specification for Fire Protection

Letter Duke to NRC, PIP O-99-2532/LER 270/1999-04, February 16, 2000

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

(2) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system.

Any potential leakage is collected and drained to a collection tank sized to accommodate the largest potential leak system inventory (250 gallons). The collection tanks are located in the basement of the Reactor Building.

Reference(s): Duke Letter to the NRC dated March 18, 1981

(3) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback.

A flame arrestor is provided for each of the RCP oil collection tank vents.

Reference(s): Duke Letter to the NRC dated March 18, 1981

(4) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps.

Potential leakage points on the pump motor that are protected include the lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines and lube oil reservoirs.

Reference(s): Duke Letter to the NRC dated March 18, 1981

(5) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin.

Potential leakage is collected and drained through an appropriately sized drain line into the collection tank. The collection tank is sized to accommodate the largest potential leak, the entire system inventory of 250 gallons.

Reference(s): Duke Letter to the NRC dated March 18, 1981

Section 3.4 Industrial Fire Brigade

3.4.1 On-Site Fire-Fighting Capability

All of the following requirements shall apply.

(a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:

(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)

(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program

(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians

Oconee takes exception to the following sections of the aforementioned NFPA standards:

- NFPA 600 (2005) Chapter 4 Section 4.4, "Requirements for all Industrial Fire Brigades." ONS is structured differently than those described in this section. While all requirements are addressed they are not all the responsibility of the Fire Brigade Leader.
- NFPA 600 (2005) Chapter 4, Section 4.7 "Industrial Apparatus." ONS has no apparatus.

NFPA 1500 and 1582 are not applicable to ONS per in their respective scope statements and consistent with FAQ 06-0007.

- NFPA 1500 (2007) Chapter 1 "Administration" Section 1.3.2 states "This standard does not apply to Industrial Fire Brigades that might also be known as Emergency Brigades, Emergency Response Teams, Response Teams, Fire Teams, Plant Emergency Organizations, or mine emergency response teams."
- NFPA 1582 (2007) Chapter 1 "Administration" Section 1.1.4 states "This standard does not apply to Industrial Fire Brigades that might also be known as Emergency Brigades, Emergency Response Teams, Response Teams, Fire Teams, Plant Emergency Organizations, or mine emergency response teams."

The required staffing levels for the Oconee Plant are specified in SLC 16.13.1 "Minimum Station Staffing Requirements." NSD-112 "Fire Brigade Organization, Training & Responsibilities" provides the requirements for becoming a qualified fire brigade member.

When the Control Room alerts the Fire Brigade to a fire, Radiation Protection and Security Personnel are also alerted and tasked to assist the Fire Brigade in accordance with Procedure

RP/O/B/1000/029 "Fire Brigade Response."

{Area for Improvement – Ensure the NFPA 600 code review is formally documented.}

Reference(s): Selected Licensing Commitment (SLC) 16.13.1 "Minimum Station Staffing Requirements"

NSD-112 "Fire Brigade Organization, Training & Responsibilities"

RP/O/B/1000/029 "Fire Brigade Response"

(b) Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.

ONS uses a fire brigade made up of five members from Operations and five additional members. ONS does not use a dedicated fire department organization. NSD-112 states that Fire Brigade members are informed of their responsibilities at the beginning of each shift and during a fire emergency will respond under the direction of the Fire Brigade Leader and perform all duties to control, extinguish and restore the station to a safe condition. SLC 16.13.1 states minimum station staffing requirements of ten, the minimum regulatory requirements of five, and includes in the bases that staff required for fire brigade is independent of other responsibilities during fire events.

Reference(s): SLC 16.13.1 "Minimum Station Staffing Requirements"

NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance

Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria.

NSD-112 states that the Fire 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 (have completed OPS ISS Training).

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(d) The industrial fire brigade shall be notified immediately upon verification of a fire.

Plant employees receive general employee training that includes notifying the control room via the telephone using 4911 of a discovered fire. Once a fire is confirmed via the first responder

verifies the fire (or Control Room received multiple indication) the fire brigade is dispatched. NSD-112 states that Control Room personnel are responsible for initiating Fire Brigade response.

The fire brigade is dispatched using two methods; a paging system that activated pagers worn by fire brigade members and the plant paging system. Both methods are used in each event.

Reference(s): General Employee Training – Plant Access Training
NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

(e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment.

NSD-112 requires that prior to initial training and annually thereafter, each fire brigade member will receive a physical examination by a company approved medical professional to assure that they are medically capable of performing strenuous activities. Each fire brigade member must satisfactorily complete and maintain respirator use clearance as determined by the Corporate Medical Department.

NSD-112 states that for Fire Brigade Leaders and Members to remain qualified they must pass a medical examination, respiratory training and respirator fit test. The specific program requirements are listed in ERTG-001 "Emergency Response Organization and Emergency Services Training Program."

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

3.4.2 Pre-Fire Plans

Current and detailed pre-fire plans shall be available to the industrial fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5.

Current and detailed fire plans are provided in the Oconee Nuclear Site Fire Plan (Fire Brigade Strategies) for all plant locations that contain systems or components that could impact nuclear safety performance or present a potential for radioactive releases or life safety.

Reference(s): Oconee Nuclear Site Fire Plan

3.4.2.1

The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.

The Fire Plan provides a graphic representation of the various plant areas that depicts the installed fire protection/suppression features. In addition to the suppression features, the Fire Plan also provides information of any equipment important to safety and special hazards (e.g. Radiological, Electrical, Chemical, Physical and Flammable Liquids Gases) that could be encountered. The Fire Plan also provides information on available ventilation equipment.

The Fire Plan includes Fire Brigade Guides (SOGs) that provide general instructions for the fire brigade hose selection and use and specific hazards consideration such as electrical and bulk Hydrogen fires, hazardous materials response and other generic fire mitigation tactics.

{Area for Improvement – Evaluate the Fire Plan and associated documents (SOG, training materials, and directives) for compliance with NFPA 805 requirements.}

Reference(s): Oconee Nuclear Site Fire Plan

3.4.2.2

Pre-fire plans shall be reviewed and updated as necessary.

The Fire Plan is maintained by the Emergency Planning Group and is updated as required. Modifications to plant features and equipment and changes to plant procedures require a determination of potential effects on the fire protection program or features; potential impacts may lead to revision or additions to the Fire Plan.

NSD-301, Appendix B, "Technical Issues Checklist" includes a specific line item for impact on the fire plan. NSD-228, Appendix E, "Fire Protection Program Screening Aid" includes review of the impact on the Fire Brigade which utilize the Fire Plan.

Reference(s): NSD-228 "Applicability Determination"
NSD-301 "Engineering Change Program"

3.4.2.3

Pre-fire plans shall be available in the control room and made available to the plant industrial

fire brigade.

The Fire Plan is available to the Fire Brigade (FB) Leaders and Members as well as Control Room Personnel. A copy is located in each CR, FB leader's locker, NEO Supervisor's office and the FB Leader's kit.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
Oconee Nuclear Site Fire Plan

3.4.2.4

Pre-fire plans shall address coordination with other plant groups during fire emergencies.

The coordination between the Fire Brigade and other plant groups during a fire emergency is defined in NSD-112. When the Control Room is notified of a fire, Procedure RP/O/B/1000/029 "Fire Brigade Response" is implemented. The procedure instructs the control room personnel on their response and provides direction on managing the conduct of the fire fighting activities including contacting offsite Fire Departments.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

3.4.3 Training and Drills

Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities.

(a) Plant Industrial Fire Brigade Training. All of the following requirements shall apply.

(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600, Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate.

(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire.

(3) A written program shall detail the industrial fire brigade training program.

(4) Written records that include but are not limited to initial industrial fire brigade classroom and hands-on training, refresher training, special training schools attended, drill attendance records, and leadership training for industrial fire brigades shall be maintained for each industrial fire brigade member.

The fire brigade training program includes the following essential elements: use of fire fighting equipment, fire fighting principles and techniques, use of fire fighting guidelines (SOGs), annual practices in actual fire fighting and periodic fire drills. The drills implement the fire fighting procedures, including the simulated use of equipment, to assess brigade effectiveness. The drills also evaluate brigade leadership and Control Room coordination for plant control.

NSD-112 states that for Fire Brigade Leaders and Members to remain qualified they must, among other requirements, participate in an annual practical training session, quarterly training sessions and participate in at least two drills per year. NSD-112 references NFPA 600 as a source document. NFPA 1500 is not applicable to ONS. Specific training requirements are specified in ERTG-001 "Emergency Response Organization and Emergency Services Training Program." Records of personnel participation in the training sessions are maintained by the training department.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

(b) Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade.

The Oconee Nuclear Station maintains a large fire brigade size and does not typically utilize non-fire brigade qualified personnel to support fire brigade ancillary duties. Persons who perform Fire Watch duties for Hot Work are qualified in the use of the fire extinguisher and are authorized to extinguish any resulting fire of the hot work within their capabilities.

Other non-fire brigade personnel that respond to a fire incident include Security, Radiation Protection, Chemistry, Off-Site Fire Department(s), and the Medical Emergency Response Team (MERT). These personnel are trained for interfacing with the Fire Brigade. The Fire Brigade Leader is the overall Incident Commander and uses other personnel as support.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills "

(c) Drills. All of the following requirements shall apply.

(1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade.

Drills are performed quarterly for each shift fire brigade. At least one drill per year for each shift fire brigade is unannounced; at least one drill per year for each shift fire brigade is performed on a back shift.

At least one drill annually involves a response from the appropriate local fire department(s). Site fire brigade/local fire department interface is critiqued by both site and local fire department staff.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario.

Each fire drill is pre-planned to establish training objectives and critiqued to determine how well the objectives are met. The Fire Brigade drill performance is critiqued by controllers/evaluators to determine successful drill performance in accordance with stated drill objectives. Performance is documented utilizing the Fire Drill Critique Sheet.

Drills are pre-planned to determine the appropriate number of controllers/evaluators needed to effectively assess the Fire Brigade Response.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills "

(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards.

Procedure PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills" specifies that drills be conducted with onsite and local offsite fire department personnel. On-site drills are required to be conducted involving different areas and hazards, including "Risk Significant" areas. Fire drills including response of the offsite Fire Departments are conducted annually.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills"

(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team.

A completed Fire Drill Critique Sheet (Appendix B) and Training Content Summary form shall be sent to the Site Training Division is sent to Document Control for documentation and retention. Retention in document control is life of plant. Performance deficiencies of a shift fire brigade or individual fire brigade members will be noted and appropriate action taken and documented in the corrective action program.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(5) A critique shall be held and documented after each drill.

A critique is performed for each drill that involves the fire brigade in accordance with NSD-112. The completed Fire Drill Critique Sheet and Training Content Summary form is required to be sent to the Site Training Division for documentation and retention. Site Training transmits the records to Document Control for documentation and retention. Retention in Document Control is life of plant.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

3.4.4 Fire-Fighting Equipment

Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards.

Fire Fighting Equipment is located in various fire areas. The areas are shown graphically and described in the Fire Plan for that area. Fire Brigade Equipment is also specified in the SOG section of the Fire Plan. The equipment is listed by location and includes items such as air packs, spanners, smoke ejectors and nozzles. Hose stations and hydrant houses contain sufficient lengths of hose and nozzles.

Fire Brigade personnel turnout gear and air packs are stored in specified fire equipment storage locations. Ops equipment is stored in two storage containers on the Turbine deck.

Backup gear is stored in the warehouse. Each Fire Brigade member is furnished with a complete set of turn out gear consisting of pants, coat, boots, gloves, helmets and flash hoods. Radios are provided for communication in the Fire Brigade Response storage location. Other equipment available to the brigade includes portable lights, thermal imaging camera, portable ventilation as well as portable generators. Other supporting groups' equipment is stored in their respective work spaces.

Air Packs (SCBA's) provided for the brigade are NIOSH approved one hour air bottles with integrated PASS devices as well as amplified SCBA masks. Additional masks are provided within each of the two response sea-lands. In addition to spare air bottles ONS has an electric and a portable a diesel compressor capable of refilling SCBA bottles. Radiation Protection is responsible for the SCBA refill operation. SCBA refill can be performed via the cascade system or the breathing air system.

This equipment is inspected in accordance with Procedure PT/O/B/0250/030 "Quarterly Fire Brigade Equipment Inspection." to ensure the operability and availability of all Fire Brigade equipment. The Keowee Fire Brigade Equipment is inspected in accordance with Procedure PT/O/A/2200/010 "Keowee Equipment Inspection."

Fire protection equipment is procured and conforms to the applicable NFPA standards for the specific equipment.

Reference(s): Oconee Nuclear Site Fire Plan
PT/O/B/0250/030 "Quarterly Fire Brigade Equipment Inspection"
PT/O/A/2200/010 "Keowee Equipment Inspection"

3.4.5 Off-Site Fire Department Interface

3.4.5.1 Mutual Aid Agreement

Off-site fire authorities shall be offered a plan for their interface during fires and related emergencies on site.

There are "Letters of Agreement" with local Fire Departments that provide details of the interaction of their organization during a fire or related emergency on the Oconee Site. These Letters of Agreement are maintained as part of the Emergency Plan.

Letters of Agreement are in effect with the Corinth-Shiloh Volunteer Fire Department, the Keowee Fire Commission, the Keowee-Ebenezer Volunteer Fire Department, and the Six Mile Volunteer Fire Department. These Letters of Agreement are reviewed by established frequency as required by the Emergency Planning Group.

The primary response for fires inside the protected area is the ONS fire brigade with support

from off-site fire departments. The primary response for fires outside the protected area is the off-site fire departments. Except for Keowee Hydro where the ONS fire brigade will respond with assistance from the off-site fire departments.

Reference(s): Oconee Emergency Plan

3.4.5.2 Site-Specific Training

Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually.

NSD-112 specifies that at least one fire drill annually will involve response from the appropriate local fire department(s). Site fire brigade/local fire department interface will be critiqued by both site and department fire protection staff. It is the intent to have off-site fire response act as supplemental support and integrate into the site team, but not act independently.

The Letters of Agreement discussed above contain provisions for annual training of off-site personnel who would respond to an assistance request.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
Oconee Emergency Plan

3.4.5.3 Security and Radiation Protection

Plant security and radiation protection plans shall address off-site fire authority response.

NSD-112 "Fire Brigade Organization, Training & Responsibilities," contains requirements that the Security and Radiation Protection organizations assist the fire brigade. The Security and Radiation Protection organizations have plans and provisions that provide for the entry and activities of outside fire fighting organizations.

If offsite assistance is determined to be needed during a fire emergency, Procedure RP/O/B/1000/029 "Fire Brigade Response" provides direction to the Control Room personnel on contacting the off-site Fire Department and request assistance. The Fire Dispatcher is instructed to have the responding fire department enter the site through the prescribed entrance and have all responders stage in the appropriate parking lot. The Control Room also contacts Site Security and requests that a security officer escort the fire department(s) to the fire staging location.

Off-site fire response may be provided TLD's and electronic dosimeters from Radiation Protection if required.

The instructions on the methods to be used to contact the off-site fire emergency agencies, as well as site Security and Radiation Protection personnel, are provided in Procedure RP/0/B/1000/029.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

3.4.6 Communications

An effective emergency communications capability shall be provided for the industrial fire brigade.

The primary means of communication is the two-way radio system, which has a fixed location repeater base station located above the Unit 1/2 Control Room in the Ventilation Equipment Room. If the repeater is lost to fire, the system can continue to function on the "talk around" channel. This system assures general coverage of the Turbine Building, Auxiliary Building, and Containment Building areas. The redundant repeaters receive emergency power and the individual radios have their own batteries. PIP O-99-2753 verified that a radio system is in place which satisfies the above requirements. PIP O-08-4820 has been initiated to confirm fire brigade communications at various locations with and without the availability of the radio repeaters.

{Further Action Required – Ensure resolution of PIP O-08-4820 satisfies the requirement of this section.}

Reference(s): Design Basis Specification for Fire Protection
PIP O-99-2753
PIP O-08-4820

Section 3.5 Water Supply

3.5.1

A fire protection water supply of adequate reliability, quantity, and duration shall be provided by one of the two following methods.

(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies.

Lake Keowee has sufficient inventory (over 390,000 acre-feet) of water available. There are facility operational limitations based on the lake level in SLC 16.9.7 "Keowee Lake Level," that ensures an adequate supply of water is available. In addition, a 100,000 gallon elevated water storage tank has inventory which is available to provide limited back-up water for fire

protection.

The High Pressure Service Water (HPSW) System provides water for the fire protection system at the Oconee Plant. The HPSW system is connected to the Condenser Circulating Water (CCW) crossover header. The CCW piping is connected to Lake Keowee at the intake structure. This suction source would remain available on loss of power to the intake pumps because the system can be operated as a siphon.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction from separate circulating cooling water (CCW) system headers. The CCW system is supplied from Lake Keowee by pumps at the intake structure; the lake water would still be available on loss of power to the intake pumps because the system can operate as a siphon. The lake water supply has over 390,000 of water available."*

"In addition to the HPSW pumps, a 100,000 gallon elevation water storage tank floats on the HPSW system provides a backup fire protection water supply."

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The LPSW system provides water to hose stations within the Reactor Buildings. The LPSW pumps takes suction from the CCW crossover line and discharge to a common discharge header in the same arrangement as the HPSW pump described above.

The Keowee Hydro Station Water Spray and Fire Hose systems are supplied by the combined Service Water (SW)/Fire Protection Water system. The system is generally supplied via lake head pressure which provides sufficient flow and pressure for most operations. In the event additional flow/pressure is necessary an electric fire pump is provided. A portable gasoline fire pump is also provided in the event the electric fire pump is not in service.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
SLC 16.9.7

(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s) in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service.

The greatest demand for fire protection water is based on 1,000 gpm for fire hose plus 2,571

gpm (all sprinkler heads opened and flowing in the Unit 3 Turbine Building Mezzanine Level Sprinkler System) plus 500 gpm non-fire related service water for a total of 4,071 gpm. The most demanding water based fire suppression system required for Chapter 4 is the Main Feedwater Pump water spray systems. Calculation OSC-7858 hydraulically determined the water pressure and flow requirements. The results of the calculation determined a required flow of 1,404 gpm at 104.4 psi (including 750 gpm hose stream allowance. The available pressure at the calculated node when flowing 1,404 gpm is 140 psi. This calculation included the shortest flow path out of service. These demands are all less than the output of one of the HPSW Pumps which is 6,000 gpm at 117 psi.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

{Further Action Required – Ensure any credited suppression systems are within the design flow capabilities of the fire pump per NFPA 20.}

Reference(s): Design Basis Specification for Fire Protection
NRC SER dated August 11, 1978
OSC-7858

3.5.2

The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.

Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own suction and both suctions and pumps are adequately separated.

Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service.

The HPSW pumps take suction through the CCW crossover header. The crossover header can be supplied from any units CCW intake piping and can be gravity fed from Lake Keowee.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction form separate*

circulating cooling water (CCW) system headers."

"The pumps are located in the turbine building, each in a small masonry room enclosing the pump and motor."

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The Keowee Fire Protection Pump takes its suction from Lake Keowee at the spillway wall. The back-up Keowee fire pump is a portable pump which can draw water from the gravity side of the suction piping.

Reference(s): NRC SER dated August 11, 1978

Design Basis Specification for Fire Protection

Drawing KFD-109A-1.1 "Keowee Hydro Station – Flow Diagram of Service Water System"

3.5.3

Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source.

The pumps used to supply the fire protection systems at the Oconee Plant are not fire pumps but have been accepted by the NRC. As stated in Section 3.5.1, above, the HPSW System provides water for the fire protection system at Oconee. There are two 6,000 gpm (at 117 psig) HPSW pumps. There is also a 500 gpm (at 117 psig) jockey pump in the HPSW System. The jockey pump normally operates to maintain the system pressure on the fire protection headers and also supplies non fire related loads. In the event of a fire, one 6,000 gpm HPSW pump will automatically provide sufficient water for maintaining fire water demands and elevated water storage tank inventory. The second 6,000 gpm HPSW pump would be available if needed. The LPSW system provides fire water to the Reactor Building hose stations only. The LPSW pumps are rated at 15,000 gpm (at 100 psig) which is more than sufficient for the Reactor Building hose stations. The HPSW jockey pump is not considered part of the required fire protection for NFPA 20.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system. The pumps are electric motor driven receiving power from separate Unit No. 1 buses."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Keowee Hydro Station has a separate Fire Pump to supply hose stations and fixed suppression systems including the Keowee Main Transformer. The Keowee Fire Pump takes suction from Lake Keowee at the spillway structure. The Keowee Fire Pump is rated at 1,150 gpm at approximately 56 feet of head pressure with a shutoff head of 375 psi. A portable pump is provided and may be used in establishing a backup fire fighting system.

Oconee Nuclear Station initiated Problem Identification Program (PIP) O-99-4487 to evaluate the HPSW and Keowee Fire Water pumps' capabilities. The result of Calculation KC-2135, Revision 8, that was performed for the Keowee Fire Pump concluded that the flow and pressure available at the Keowee Main Transformer deluge system did not meet NFPA 15-1996 (or -1969 the Code of Record) requirements.

{Further Action Required – Ensure resolution of the Keowee fire pump replacement (PIP O-01-3492) satisfies the requirement of this section.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PIP O-01-3492
PIP O-99-4487

3.5.4

At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.

There are no permanently installed dedicated diesel engine-driven or electric motor-driven fire pumps at Oconee. Fire water is supplied via either of the two electric motor-drive HPSW pumps as part of a shared system. The HPSW pump motors are powered from separate buses. HPSW Pump A is located in Oconee 1 and power is furnished directly from 4160V Bus. No. 2 Unit No.1. Power to HPSW Pump B, which is located in Unit 2 along with the jockey pump, is furnished directly from 4160V Bus No. 1 Unit No. 1. The HPSW system is not a seismically designed system. Each HPSW pump is capable of providing 100 percent of the required flow and pressure.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system. The pumps are electric motor driven receiving power from separate Unit No. 1 buses."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

Keowee fire water supply is provided by a non-seismic electric fire pump with a portable gasoline engine-driven fire pump as backup. The backup portable gasoline fire pump is sufficient to supply the fire hose demands at Keowee.

{Area for Improvement – Both HPSW pumps are currently powered from the same Unit. HPSW pumps should not be powered from a single unit. Consider connection to PSW or an alternate unit.}

Reference(s): Design Basis Specification for Fire Protection

NRC SER dated August 11, 1978

3.5.5

Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.

HPSW Pump A is located in Unit 1 and HPSW Pump B is located in Unit 2 Turbine Building basement; each in its own small 3-hour rated or equivalent masonry block room. The power cables to the motors are embedded in the concrete floor.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The HPSW pumps are located n the turbine building, each in a small masonry room enclosing the pump and motor. The power supply to each pump extends from the blockhouse via cables which are embedded in the turbine building floor."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The 2005 NRC Triennial Fire Protection Inspection identified that the HPSW control circuit could be vulnerable from a Turbine Building Fire. A HPSW Vulnerability Evaluation was performed and is documented in PIP O-05-4125. The vulnerability study determined that although the potential exists for loss of both HPSW pumps, the postulated fire scenarios that result in loss of the pumps would not affect Standby Shutdown System. In addition, in the event of the unavailability of both HPSW pumps, the EWST can provide a limited quantity of water for fire suppression.

Reference(s): NRC SER dated August 11, 1978

PIP O-05-4125

3.5.6

Fire pumps shall be provided with automatic start and manual stop only.

The HPSW Pumps receive an automatic start signal based on the elevated storage tank level. The pumps can be manually controlled from the Control Room. A modification has been initiated to provide manual stop capabilities (PIP O-02-3870).

The NRC August 11, 1978 SER Section 4.3.1.2 states *"The HPSW pumps are operated automatically based on the water level maintained in the elevated water storage tank. The pumps can also be manually started in the control room or at the pump switchgear located in the blockhouse."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Keowee Fire Protection pump automatically starts on receipt of a pressure switch or flow switch alarm. The fire pump can only be stopped manually.

{Area for Improvement – Document the resolution of PIP O-02-3870 for installation HPSW manual stop.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PIP O-02-3870

3.5.7

Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.

Each HPSW Pump has a separate discharge into the HPSW System. Valves are arranged so that a single pipe break in the discharge piping will not remove both pumps from service.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Each HPSW Pump has a separate discharge into the HPSW System. Valving is arranged so that a single pipe break in the discharge piping will not remove both pumps from service."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area.

The Keowee Service Water system is a shared service water system that supplies cooling to equipment, fire protection equipment driven from the head of the lake, and the Keowee fire protection pump. The Keowee Fire Pump supplies some of the hydroelectric plant's fire system components. There are appropriate sectional and isolating valves in the system.

Reference(s): Design Basis Specification for Fire Protection
NRC SER dated August 11, 1978
Drawing Series OFD-124C
~~Drawing KFD-109A-1.1~~

3.5.8

A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.

Pressure is maintained in the fire water system by the head of the water contained in the EWST. One method to maintain the water level in the EWST is the jockey pump. In the event the jockey pump is not available, the EWST can be filled by cycling a HPSW pump.

At Keowee, the elevation of the lake maintains header pressure (no jockey pump).

Reference(s): Design Basis Specification for Fire Protection

3.5.9

Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.

The following alarms are provided in the Unit 1 Control Room:

- Low HPSW system header pressure
- Low elevated water storage tank level
- Elevated water storage tank overflow.

In addition to standard alarms, the control room computer alarms operators of the HPSW pump start

The Keowee Fire Protection pump start alarms to the ONS Unit 2 Control Room and the Keowee Control Room.

Reference(s): Design Basis Specification for Fire Protection

3.5.10

An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements.

An underground fire loop (16 inch cement-lined, ductile iron pipe) is provided around the perimeter of the plant site. Post indicator valves are provided and are sealed or locked open to prevent inadvertent closing of valves required open for fire protection. Post indicator valves are arranged to provide isolation to portions of the main for maintenance or repair without shutting off the complete system. Valves will allow other service water systems to be removed from the HPSW system without compromising fire protection systems.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

The Keowee Fire Water System does not have an underground loop. Underground fire water piping supplies two external fire hydrants. Appropriate isolation valves are provided for that portion of the system.

{Further Action Required – Perform a NFPA 24 code compliance review.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
Drawing series OFD-124C
Drawing KFD-109A-1.1

3.5.11

Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems.

A 16 inch loop is provided around the perimeter of the plant. In-line isolation valves are provided such that a break can be isolated without losing system capabilities from a single break. Connections from this header to the units are redundant. Auxiliary Building headers are fed from a 16 inch line coming from the yard and a 4 inch and 16 inch line from the Turbine Building. The 16 inch line that cross connects the yard loop with the Turbine Building through the Auxiliary Building is normally isolated to reduce the potential consequences of an Auxiliary Building flood event. The isolation valves can be manually opened when the cross connect is required to be placed in service. A 4 inch line from the Turbine Building will remain in service during normal operation in order to supply normal Auxiliary Building HPSW header requirements. The 4 inch line is capable of providing adequate initial HPSW flow and pressure and for fire mitigation and service water demands in all areas of the Auxiliary Building. The 4 inch line contains a 500 gpm flow limiting device. The 500 gpm flow limiting device is sized to supply two 2-1/2" hose stations.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this area."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The modifications referenced above to providing auxiliary building cross-connect have been implemented.

The Keowee fire protection system incorporates isolation valves for the various service water and fire system components.

Reference(s): NRC SER dated August 11, 1978
Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection
Drawing series OFD-124C
Drawing KFD-109A-1.1

3.5.12

Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers.

Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided.

The fire water connections at the Oconee Plant and the Keowee Hydro Station utilize standard fire hose threads that are compatible with local fire department equipment.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.5.13

Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve.

The header system for the Turbine Building and Auxiliary Building sprinkler and standpipe systems are not part of a seismically analyzed hose standpipe system. Each sprinkler and standpipe system is equipped with an approved shutoff valve. During construction ANSI B31.1 excluded fire protection; NFPA codes were applicable at this time.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction from separate circulating cooling water (CCW) system headers."*

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this*

area."

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

NRC SER dated August 11, 1978

3.5.14

All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.

(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.

(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.

(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator.

Oconee utilizes a locked or sealed method to control valve positions rather than electrical supervision. The site area fence is the Owner Controlled fence for sealing consideration. Valves are checked every 31 days per PT/0/A/0250/010 A.

Reference(s): PT/0/A/0250/010 A "Fire Protection Systems Monthly Check"

3.5.15

Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system.

Exception: Mobile means of providing hose and associated equipment, such as hose carts or trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses.

Fire hydrants are installed at a maximum of every 300 feet. Hose supplies are adequate to provide fire protection to all perimeter areas. Post indicator valves are provided and sections of the fire loop can be isolated for maintenance or repairs. Hose houses are located at several

yard hydrants and are equipped with at least 200 feet of 1½ inch hose, 200 feet of 2½ inch hose, one-2½ inch gated wye and two-1½ inch nozzles and one-2½ inch to 1½ inch reducer. In addition to the hose houses, there is an equipment storage trailer located north of the Radwaste Building, a equipment storage trailer beside the OOB and the Fire and Rescue Vehicle that each contain additional fire hose and fire fighting tools.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Yard fire hydrants have been provided at approximately 300 ft. intervals around the exterior of the plant. Auxiliary gate valves are not provided on the hydrant laterals, with the result that a portion of the fire water heads would have to be removed from service if a fire hydrant has to be isolated for maintenance."*

"Hose houses have been provided at seven of the yard hydrants, each equipped with at least 200 ft. of 2-1/2 inch hose, 200 ft. of 1-1/2 inch hose and other manual fire fighting tools."

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

The Keowee service water system incorporates two fire hydrants and one outside hose cabinet.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PT/0/B/0250/030 "Quarterly Fire Brigade Equipment Inspection"

3.5.16

The fire protection water supply system shall be dedicated for fire protection use only.

Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis.

Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section.

The fire water systems for the Oconee Plant are supplied from the HPSW System. The HPSW system is designed to support fire protection and essential service water systems flow demands. The HPSW system draws water from Lake Keowee which has sufficient capacity to meet fire protection demands.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Reactor Building hose stations are supplied via the LPSW system. The LPSW system is sized to be capable of essential service water flow demands and to support fire hose stations. The NRC August 11, 1978 SER Section 4.3.1.4 states *"Interior hose stations equipped with 1-1/2 inch fire hose have been provided through the plant except in containment. Some areas are too far away from a hose station for effective fire fighting. The licensee has proposed to provide additional hose stations so that all areas containing or exposing safety-related equipment will be within effective fire fighting range of at least one hose station using not more than 100 ft. of 1-1/2 inch fire hose, and to provide hose stations inside containment supplied by the LPSW system."*

"Upon completion of the proposed modification, we find that the interior hose stations meet the requirements of Appendix A to BTP 9.5-1 and are, therefore, acceptable." The modification referenced above to provide hose stations inside containments supplied by the LPSW system has been implemented.

The fire water supply for the Keowee Hydro Station is supplied by the Service Water System. The Service Water system draws water from Lake Keowee which has sufficient capacity to meet fire protection demands.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection

Section 3.6 Standpipe and Hose Stations

3.6.1

For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems.

Standpipes and hose stations required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

Hose stations at the Oconee site (including Keowee) are arranged to reach any location, including containment, with 100 feet of 1-1/2 inch fire hose. Some hose stations are located outside of the affected fire area but this was found acceptable by the NRC. Current NRC committed fire hose stations are listed in SLC 16.9.4.

The NRC August 11, 1978 SER Section 4.3.1.4 states *"Interior hose stations equipped with 1-1/2 inch fire hose have been provided through the plant except in containment. Some areas are too far away from a hose station for effective fire fighting. The licensee has proposed to provide additional hose stations so that all areas containing or exposing safety-related equipment will be within effective fire fighting range of at least one hose station using not more than 100 ft. of 1-1/2 inch fire hose, and to provide hose stations inside containment supplied by the LPSW system."*

"Upon completion of the proposed modification, we find that the interior hose stations meet the requirements of Appendix A to BTP 9.5-1 and are, therefore, acceptable." The modification referenced above to provide additional hose stations has been implemented.

The NRC June 7, 1988 SER states *"The licensee has proposed a modification to move five fire hose station presently located within the Cable Spreading rooms to stairwell locations outside the rooms. The purpose of this modification is to make the fire hose station accessible for fire fighting activities in these rooms."*

"The proposed modification of fire hose stations will enhance the fire fighting capabilities in the Cable Spreading Rooms and meets the intent of the guidance provided in National Fire Protection Association (NFPA) Std. 14, Standpipe and Hose Systems, for the location of fire hose connections. After reviewing these proposed TS changes, the staff has determined they are acceptable." The modification referenced above to relocate fire hose stations from the Cable Spreading rooms has been implemented.

{Further Action Required – Perform a NFPA 14 code compliance review.}

Reference(s): NRC SER dated August 11, 1978
NRC SER dated June 7, 1988
Duke letter to the NRC dated 2/17/78
SLC 16.9.4
Design Basis Specification for Fire Protection
OSC-9292

3.6.2

A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers

where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel.

Fire hose station piping is sized based on hydraulic calculations to provide a minimum of 100 gpm at 65 psi at the hose station isolation valve required for Chapter 4. The previously discussed fire water distribution system is capable of supplying this demand. The Reactor Building hose stations are supplied via the LPSW system which provides acceptable flow and pressure. The Keowee hose stations are supplied via the Service Water system which can provide adequate flow and pressure. Internal evaluations have been performed to confirm flow and pressure requirements are met. Calculation OSC-1626 validates adequate NFPA 14 flow and pressure to the required and credited fire hose stations.

Reference(s): Design Basis Specification for Fire Protection

Calculation OSC-1626

SLC 16.9.4

3.6.3

The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed.

Adjustable nozzles are provided on hoses at the hose stations of both the Oconee Plant and the Keowee Station. These nozzles are appropriate for the type fires that might occur at those locations. In addition, the fire brigade has specialized nozzles such as low pressure/high flow and articulating. Fire Brigade Guide (SOG) #3 includes guidance on electrical fires and the proper hose stream application.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

Duke letter to the NRC dated November 22, 1977

Design Basis Specification for Fire Protection

Fire Plan, SOG #3, Electrical Fires

3.6.4

Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE).

Exception: For existing plants that are not capable of meeting this requirement, provisions to

restore a water supply and distribution system for manual fire-fighting purposes shall be made. The provisional manual fire-fighting standpipe/hose station system shall be capable of providing manual fire-fighting protection to the various plant locations important to supporting and maintaining the nuclear safety function. The provisions for establishing this provisional system shall be preplanned and be capable of being implemented in a timely manner following an SSE.

Fire hose stations (with the exception of those in the Reactor Building and Unit 1/2 and Unit 3 Cable Room to Control Room back stair hose stations) are not seismically designed. NFPA 14-1969 (code of record) did not have provisions for seismically designed hose stations. The HPSW system is not seismically designed. The NRC previously found the hose stations acceptable per Section 3.6.1 above.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
~~Design Basis Specification for Fire Protection~~
Design Basis Specification for the High Pressure Service Water System

3.6.5

Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement.

The fire hose stations at the Oconee Plant and the Keowee Hydro Station were not designed to meet seismic requirements with the exception of the Reactor Building fire hose stations. The Reactor Building fire hose stations are seismically designed supplied from the LPSW system. The LPSW system is seismically designed. The LPSW system is capable of supplying the essential water system requirements and the fire flow simultaneously.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Design Basis Specification for Fire Protection
Design Basis Specification for the Low Pressure Service Water System

Section 3.7 Fire Extinguishers

Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions.

Portable fire extinguishers required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

Portable fire extinguishers are generally provided in accordance with NFPA 10, "Standard For Portable Fire Extinguishers." The portable extinguishers used on site are either "ABC", Carbon Dioxide, or Halon type fire extinguishers. In some instances extinguishers are not located in all areas due to ALARA. In these cases the extinguishers are located near the entrance to the areas

The NRC August 11, 1978 SER Section 4.3.3 states *"Portable fire extinguishers have been distributed throughout the plant in accordance with NFPA guidelines. The licensee has proposed to provide Halon 1211 extinguisher in the control room."*

"Upon completion of the proposed modification, we find that portable fire extinguishers will conform to the provisions of Appendix A to BTP 9.5-1 and accordingly is acceptable." The modification referenced above to provide Halon extinguishers in the control rooms has been implemented.

{Further Action Required – Perform a NFPA 10 code compliance review.}

Reference(s): NRC SER date August 11, 1978
Design Basis Specification for Fire Protection
OSC-9292

3.8 Fire Alarm and Detection Systems

3.8.1 Fire Alarm

Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code®. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. The following fire-related signals shall be transmitted:

(1) Actuation of any fire detection device

(2) Actuation of any fixed fire suppression system

(3) Actuation of any manual fire alarm station

(4) Starting of any fire pump

(5) Actuation of any fire protection supervisory device

(6) Indication of alarm system trouble condition

The Oconee Nuclear Station power production areas are protected by two fire alarm systems. The fire alarm control panel for Units 1 and 2 is located in the Unit 1&2 Control Room and the fire alarm control panel for Unit 3 is located in the Unit 3 Control Room. The Keowee Hydro Plant, SSF and Radwaste Facility each have their own fire alarm system which alarm to the

Unit 1&2 and/or Unit 3 Control Room. The Fire Alarm and Detection Devices in general are installed in accordance with NFPA 72D (1975). The Design Basis Specification for the Fire Detection System, Design Basis Specification for Fire Protection, and BTP comparison provide additional detail on the Oconee fire detection system.

The fire alarm systems are provided with capabilities to relay the fire-related signals from any fire detection device, actuation of fixed fire suppression systems, actuation of manual fire alarm stations, actuation of supervisory signals, and alarm of trouble conditions. Start of the HPSW pumps used for the fire protection systems also alarm in the control room.

Deviations from NFPA 72D are identified and justified by paragraph number per National Fire Code, 1975 as documented in the UFSAR, BTP comparison and Design Specification for Fire Protection. These Deviations from NFPA 72D are as follows:

- 1221, 1223 - At Oconee, the alarm comes into the control room. The operator then notifies plant personnel of the fire location.
- 1231 - Alarms on the control board are tested on each 12-hour shift by operator procedures.
- 1232 - Procedures require annual testing of transmitters and water flow actuated devices. Water spray (deluge) systems for safety-related equipment are tested on an annual basis.
- 2110 - The Oconee fire detection system is cabled using steel/aluminum sheathed #16 AWG cable for signal transmission. This cable meets or exceeds the requirements for physical and electrical protection as defined in NEC, Article 760.
- 2222, 2223 - The fire detection system at Oconee is powered from a battery backed power supply through a static inverter to provide 240/120 VAC. These batteries which are Class 1E but utilized as Non-Class 1E are continuously charged from normal station power. On loss of normal station power, the system is designed to provide power to the fire detection system for one hour. In addition, a transfer switch is provided for transferring the inverter loads to regulated normal station AC power should a malfunction of the battery inverter supply occur.
- 2521 - The annunciator audible alert at Oconee serves the fire detection system as well as other plant systems. The visual indicator provided by the visual display prevents operator confusion regarding source of the alarm.

The fire detection system provides an audible and visual alarm and annunciation in the control room. Local audible alarms do not sound at the location of the fire. The operator receives the alarm in the control room, dispatches plant personnel to the location of the alarm to ascertain the local conditions and then, if necessary, summons the fire brigade via the Public Address System (PA) and a radio paging system.

Radwaste Fire Detection system alarms to the Unit 3 Control Room and Radwaste Facility control room.

The SSF Fire Detection system alarm to the Unit 1&2 Control Room, Unit 3 Control Room and the SSF Control Room.

Keowee Hydro Station Fire Detection system provides an audible and visual alarm and annunciation in Keowee and ONS Unit 2 Control Room.

The NRC August 11, 1978 SER Section 4.2 states *"The plant has a protective signaling system which transmits alarms from fire detectors and water spray system actuation to the control room. Water flow on wet pipe sprinkler systems does not alarm in the control room. In general, the system complies with those provision of NFPA 72D which are considered essential for the facility, including requirements for emergency power supply and circuit supervision. There is no distinct audible fire alarm signal provided in the control room."*

"The licensee has proposed to provide water flow alarms in the control room for all wet pipe sprinkler systems, and a unique audible signal in the control room for fire alarm notification of the operators."

"We find that, subject to the implementation of the proposed modifications, the fire detection and signaling system in conjunction with the safe shutdown system satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable." Modifications referenced above to providing water flow alarms and a distinct audible fire alarm signal in the control room have been implemented.

{Further Action Required – Perform a NFPA 72 code compliance review of the fire alarm and detection systems.}

Reference(s): NRC SER dated August 11, 1978

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

Design Basis Specification for Fire Protection

Design Basis Specification for the Fire Detection System

UFSAR Section 9.5.1.5.1

3.8.1.1

Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location.

All persons authorized access to the Oconee site receive instruction on the proper actions to be taken upon the discovery of a fire and the proper response to a fire alarm. The primary method of communication is the telephone system with outside as well as in-plant connections. In conjunction with the telephone, a page system is used for calls throughout the plant. Each telephone is marked with the emergency reporting numbers. Emergency

reporting numbers communicate to a constantly attended location (Control Room or Security).

The Keowee Hydro Station has several methods of communication. There are in-station page phones and telephones connected to Oconee. There is an automatic ring down phone to Oconee Unit 2 Control Room.

Reference(s): Design Basis Specification for Fire Protection
General Employee Training – Plant Access Training

3.8.1.2

Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action:

~~*(1) General site population in all occupied areas*~~

(2) Members of the industrial fire brigade and other groups supporting fire emergency response

(3) Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services

Oconee is provided with a plant-wide PA system that is used to alert the general site population to any necessary instructions.

Operations informs plant personnel of the location of a fire emergency by using the PA, dispatches personnel to ascertain the local conditions and then, if necessary, summons the fire brigade by the PA, fire brigade pagers and radio communication. The Radiation Protection, Safety, and Security personnel are alerted by the PA announcement and respond as necessary to support the Fire Brigade as determined by the Fire Brigade Leader as Incident Commander.

If off-site assistance is determined to be prudent, the Control Room will contact the appropriate agencies via telephone. Secondary communication to off-site fire departments is through off-site radio communication. Off-site radios capable of communication with the off-site emergency response agencies are located in the Control Room, Security, and the station rescue vehicle.

The instructions on the methods to be used to contact the off-site fire emergency agencies are provided in Procedure RP/0/B/1000/029 "Fire Brigade Response."

Reference(s): RP/0/B/1000/029 "Fire Brigade Response"

3.8.2 Detection

If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes.

Automatic fire detection systems required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

The NRC August 11, 1978 SER Section 4.2 states *"The plant has a protective signaling system which transmits alarms from fire detectors and water spray system actuation to the control room. Water flow on wet pipe sprinkler systems does not alarm in the control room. In general, the system complies with those provision of NFPA 72D which are considered essential for the facility, including requirements for emergency power supply and circuit supervision. There is no distinct audible fire alarm signal provided in the control room."*

"Smoke detectors in some areas of the plant containing electrical cable insulation are located lower than the ceiling level and, therefore, may not respond as rapidly as they would if located at the ceiling. However, since fires in cable insulation generate heavy quantities of smoke, reasonably prompt detection can be expected. Ionization type smoke detectors are used throughout the plant. In some tests, ionization type detectors have not responded as rapidly to a fire involving PVC as they do to a fire involving other types of insulation. Tests have shown that they are, however, adequate to detect first in their early stages. To assure that fires in safe shutdown areas of the plant are detected, the licensee has proposed, in addition to the exiting detection system, to provide detectors in all areas containing safe shutdown equipment and combustibles. In addition, the licensee has proposed to provide a dedicated safe shutdown system which would be unaffected by fires involving safe shutdown equipment such that the plant can be safely shut down in the event of a fire in any location in the plant."

"We find that, subject to the implementation of the proposed modifications, the fire detection and signaling system in conjunction with the safe shutdown system satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable." Modifications referenced above including addition of detectors in areas containing safe shutdown equipment and providing a dedicated safe shutdown system have been implemented.

Original deviations to the fire detection system are listed in the Design Basis Specification for Fire Protection and the Design Basis Specification for the Fire Detection System. Modifications to the fire detection system have since been performed. Modifications are performed in accordance with NFPA 72. A major upgrade to the fire detection system was performed under modification NSM-52796 in 1992.

Currently the NRC committed fire detection instrumentation devices are listed in SLC 16.9.6.

{Further Action Required – Perform a NFPA 72 code compliance review of the fire alarm and detection systems.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
Design Basis Specification for the Fire Detection System
SLC 16.9.6
OSC-9292

Section 3.9 Automatic and Manual Water-Based Fire Suppression Systems

3.9.1

If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:

(1) NFPA 13, Standard for the Installation of Sprinkler Systems

(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection

(3) NFPA 750, Standard on Water Mist Fire Protection Systems

(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems

There are no NFPA 750 water mist systems. The power block contains one NFPA 16 foam-water system located in Radwaste and is abandoned in place.

Automatic or manual water based fire suppression systems required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

The Oconee Nuclear Station is protected by automatic wet pipe sprinkler systems, water spray system, and deluge systems. The Design Basis Specification for Fire Protection and Engineering Support Program Document for Fire Protection provide additional detail on the Oconee water based fire suppression systems. The automatic sprinkler systems were designed to conform to requirements of appropriate NFPA Standards with deviations as identified by the individual system as-built code compliance calculations.

Each automatic sprinkler system has an independent connection to the plant HPSW System. The Keowee Service Water System supplies the Keowee main transformer deluge system, lube oil room and gravity oil room. Valves for the HPSW and SW systems are not electrically supervised; however, the station requires fire protection valves to be sealed or locked in the normal open position.

Currently the NRC committed fire suppression systems are listed in SLC 16.9.2. Code compliance calculations are prepared for each Turbine Building and Auxiliary Building suppression system. PIP O-02-6047 has been initiated to disposition comments from the Fire Suppression NFPA Code Review project.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Wet pipe automatic sprinkler provide area coverage over those portions of the turbine building basement and mezzanine levels which contain the turbine oil piping systems."*

"Automatic water spray systems are installed on the turbine oil headers and reservoirs, feed water pumps, and hydrogen seal oil units in the turbine building; and on oil-filled transformers and reactors in the yard areas. The water spray systems are designed according to applicable NFPA Standards."

"We find that the sprinkler systems meet the requirements of Appendix A of BTP 9.5-1 and are, therefore, acceptable."

{Further Action Required – Review the applicable Fire Suppression NFPA Code Review calculations for adequacy. Perform new code compliance reviews as necessary.}

Reference(s): NRC SER dated August 11, 1978
SLC 16.9.2
Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection
NRC Letter to Duke dated February 2, 1982
Fire Suppression NFPA Code Review calculations
PIP O-02-6047
OSC-9292

3.9.2

Each system shall be equipped with a water flow alarm.

All fixed extinguishing systems are provided with alarms.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Duke letter to the NRC dated November 22, 1977

Design Basis Specification for Fire Protection

3.9.3

All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location.

All water based suppression systems alarm to the Control Room and/or Security. Alarms associated with the Keowee Fire Protection System are annunciated in the Unit 2 Main Control Room and the Keowee Control Room.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

Duke letter to the NRC dated November 22, 1977

Design Basis Specification for Fire Protection

Design Basis Specification for the Fire Detection System

3.9.4

Diesel-driven fire pumps shall be protected by automatic sprinklers.

The Oconee Plant does not utilize a diesel driven fire water pump.

Reference(s): Design Basis Specification for Fire Protection

3.9.5

Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.

Each automatic sprinkler system has a connection to the plant HPSW System. Each system can be isolated from the main header with an approved control valve.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this area."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

Reference(s): NRC SER dated August 11, 1978

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.9.6

All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14.

Valves for the ONS Plant HPSW and Keowee SW System are not electrically supervised. A program at the station requires fire protection valves to be sealed or locked in the normal open position. A periodic recorded inspection is conducted to ensure that the fire protection valve positions are correct. See Section 3.5.14.

Reference(s): N/A

Section 3.10 Gaseous Fire Suppression Systems

3.10.1

If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:

(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems

(2) NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems

(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems

The existing gaseous fire suppression systems at Oconee are not required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report.

The gaseous fire suppression systems at the Oconee Nuclear Plant are utilized to protect unique components and/or hazards.

The SSF Diesel Generator Room is protected by a low pressure total flooding carbon dioxide suppression system. The two Keowee Hydroelectric generators are each protected by a High Pressure Carbon Dioxide Suppression System that provides CO_2 directly into the generator

housing.

The Administration Building Record Storage Vault, Oconee Operator Training Center Simulator, and Complex Office Building communication room is protected by a Halon 1301 total flood fire suppression system. These buildings are not part of the power block.

{Area for Improvement – Perform a NFPA 12 code compliance review)

Reference(s): Design Basis Specification for Fire Protection
OSC-9292

3.10.2

Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.

Actuation of the Keowee Hydro Station CO_2 system is alarmed in the ONS Unit 2 Control Room and at Keowee.

Operation of the SSF Diesel Room CO_2 system is alarmed in the Unit 2 Control Room and Security.

Reference(s): Design Basis Specification for Fire Protection
Design Basis Specification for the Fire Detection System

3.10.3

Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.

The Keowee Hydro Station system injects into the respective hydroelectric generator's housing and not into a ventilation system. The leak tightness of the housings is included in the system testing procedure to ensure substantial concentration.

The SSF CO_2 System injects only into the Diesel Generator Room. The ventilation system to the room is isolated during system actuation to ensure concentration for at least 30 minutes.

There are no radioactive contaminants involved at either location protected by the gaseous fire suppression systems.

{Area for Improvement – Evaluate and document the potential effects of over pressurization in the areas of CO_2 System discharge.}

Reference(s): Design Basis Specification for Fire Protection

3.10.4

In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability.

There are no installed backup gaseous fire suppression systems utilized at Oconee. The Keowee CO_2 is designed for a "dual shot" capacity. The installed gaseous suppression systems can be manually initiated.

The CO_2 system in the SSF Diesel Generator Room is installed for property conservation and is not a NRC committed system, however the tank is sized for "dual shot" capability.

Reference(s): Design Basis Specification for Fire Protection

3.10.5

Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.

Any change to any plant system or component is strictly controlled at the Oconee Nuclear Station. Only mechanical lock-outs are allowed when personnel safety is involved. In addition, any change to the alignment for automatic actuation of either the Keowee Hydro Station CO_2 system or the SSF CO_2 system would result in an alarm. Maintenance and testing of the CO_2 Systems is controlled through approved work authorizations and appropriate implementing procedures.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"
PT/0/A/0400/002 "SSF CO2 Test"
PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"
PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.6

Total flooding carbon dioxide systems shall not be used in normally occupied areas.

The Keowee Generator housing and the SSF Diesel generator room are not normally occupied areas. When access for testing and/or maintenance purposes is authorized, plant procedures require disarming the automatic actuation feature.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"
PT/0/A/0400/002 "SSF CO2 Test"
PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"
PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.7

Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel.

The carbon dioxide system shall be provided with an odorizer.

Any work conducted inside the Keowee Hydro generator housings or inside the SSF Diesel Generator Room would require authorization via the work control process which may require manually isolating and Red Tagging the CO_2 System prior to entry. The Keowee CO_2 System whistles on discharge.

The Keowee Hydro Station's CO_2 supply is not provided with an odorizer because the area inside the generator housing would not be occupied unless testing or maintenance work was being conducted which would require the CO_2 system to be manually isolated.

Work inside the SSF Diesel Generator Room would require the issuance of a work authorization which would include a restriction to manually isolate the CO_2 System prior to entry if work was above the floor level such that egress time is impaired. There is a Pre-Discharge Alarm for the SSF Diesel Generator Room and the alarm is set between 60 and 70 seconds. There is an odorizer in the SSF CO_2 System that uses a "garlic" scent.

Reference(s): PT/0/A/0400/002 "SSF CO2 Test"

3.10.8

Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.

Each CO_2 system has manual isolation valves. The SSF CO_2 system can be locked out by manually closing the tank shutoff valve. The Keowee Hydro Station CO_2 system contains an interlock requiring the generator doors to be closed for actuation. This interlock feature is routinely verified during system surveillance. In addition, the Keowee CO_2 supply header

isolation valve can be manually closed. Closure of the supply tank valve would be included as a prerequisite for work authorization involving access to the inside of the generator housing.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"
PT/0/A/0400/002 "SSF CO2 Test"
PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"
PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.9

The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide.

The only locations that utilize CO_2 systems are the Keowee Hydro Station Generator Housings and the SSF Diesel Generator Room. There are no sensitive components that would be damaged by the rapid cooling resulting from a CO_2 system discharge into either of these locations.

{Area for Improvement – Evaluate and document the potential effects of rapid cooling of the Keowee Generators or the SSF Diesel Generator and their associate components in the area of CO_2 System discharge.}

Reference(s): None

3.10.10

Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.

The CO_2 system for the winding brushes on the Keowee Hydro Station Generator Housings would be considered a spatially separate safety system. Only one generator is needed to provide emergency power to the Oconee Plant. Fires are not assumed simultaneously at Keowee and Oconee

The SSF CO_2 system discharges only to the Diesel Generator Room which is considered a safety system.

{Area for Improvement – Evaluate and document the potential effects of corrosivity on the Keowee Generators or the SSF Diesel Generator and their associate components in the area of CO_2 System discharge.}

Reference(s): Design Basis Specification for Fire Protection

Section 3.11 Passive Fire Protection Features

This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to protect cables and electrical components and equipment from the effects of fire.

Passive fire protection features at Oconee include fire rated assemblies for building separation including fire wall, fire doors, fire dampers and penetration seals. Oconee does not utilize electrical raceway fire barrier systems (ERFBS) for passive fire protection.

~~3.11.1 Building Separation~~

Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.

There are four main buildings in the power block; the Turbine Building, the Auxiliary Building , the Control Complex, and the Reactor Building. These buildings are separated by evaluated and qualified three-hour rated fire barriers.

The NRC August 11, 1978 SER Section 4.11 states *"Fire barriers have been provided to separate the turbine building from the auxiliary building, and to cut off the equipment rooms, cable spreading rooms, control rooms, penetration areas and blockhouses from surrounding fire areas. Based on the type and quantity of combustibles present, the basic fire resistance of the barriers would prevent the spread of fire between fire areas."*

"Upon completion of the dedicated safe shutdown system, the facility will be able to sustain a fire in any fire area and still achieve safe shutdown of the three units. We conclude that, upon completion of the dedicated safe shutdown system, the fire barriers meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The dedicated shutdown system (SSF) has been completed.

The SSF is of substantial concrete (non-combustible) construction and is physically separated from the Reactor and Auxiliary Buildings by a distance of greater than 50 feet. The electrical and mechanical connections from the SSF to the Auxiliary Building are all located underground.

The Keowee Powerhouse is a noncombustible structure that is physically located a significant distance from the other Oconee power block structures with no direct connections other than electrical wiring.

{Further Action Required – Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.}

References: NRC SER dated August 11, 1978
Drawing Series O-310 K and L
NRC Exemption to various Appendix R Requirements dated August 21, 1989
NRC Letter dated April 14, 1981
Design Basis Specification for Fire Protection
~~NRC SER dated April 28, 1983~~
SLC 16.9.5
OSC-9302
PIP O-08-2006
PIP O-08-2520

3.11.2 Fire Barriers

Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials.

Fire barriers required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

Fire barriers are provided to separate the Turbine Building and Auxiliary Building and to cut off the Equipment Rooms, Cable Spreading Rooms, Control Rooms, Penetration Rooms and Blockhouses from the surrounding areas. Construction of these fire barriers are equivalent to a three-hour barrier.

Committed and non-committed fire barriers for the Turbine Building, Auxiliary Building and Reactor Building (including mechanical and electrical penetrations, fire doors, fire dampers, walls, ceiling and floors) boundaries are shown on the O-310-K and O-310-L series drawings. NRC committed fire barriers are discussed in SLC 16.9.5.

The use of unrated seismic joints between the East Penetration Rooms and the West Penetration Rooms were evaluated by the NRC and found to be acceptable in the August 21, 1989 evaluation that granted an Exemption from the Fire Protection Requirements of Section III.G of 10 CFR Part 50, Appendix R.

The NRC also evaluated the separation between the East and West penetration rooms and determined that the electrical divisions were *"effectively separated by a three-hour fire barrier."* This determination was documented in the NRC Letter dated April 14, 1981. The wall qualification is further supported by OSC-7185.

The NRC August 11, 1978 SER Section 4.11 states *"Fire barriers have been provided to separate the turbine building from the auxiliary building, and to cut off the equipment rooms, cable spreading rooms, control rooms, penetration areas and blockhouses from surrounding fire areas. Based on the type and quantity of combustibles present, the basic fire resistance of the barriers would prevent the spread of fire between fire areas."*

"Upon completion of the dedicated safe shutdown system, the facility will be able to sustain a fire in any fire area and still achieve safe shutdown of the three units. We conclude that, upon completion of the dedicated safe shutdown system, the fire barriers meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The dedicated shutdown system (SSF) has been completed.

{Further Action Required – Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.}

Reference(s): NRC SER dated August 11, 1978
Drawing Series O-310 K and L
NRC Exemption to various Appendix R Requirements dated August 21, 1989
NRC Letter dated April 14, 1981
Design Basis Specification for Fire Protection
SLC 16.9.5
OSC-7185
OSC-9292
PIP O-08-2006
PIP O-08-2520

3.11.3 Fire Barrier Penetrations

Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4.

(See 3.11.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable:

(1) NFPA 80, Standard for Fire Doors and Fire Windows

(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems

(3) NFPA 101, Life Safety Code

Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ.

Fire barrier penetrations required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

Committed and non-committed fire barriers for the Turbine Building, Auxiliary Building and Reactor Building (including mechanical and electrical penetrations, fire doors, fire dampers, walls, ceiling and floors) boundaries are shown on the O-310-K and O-310-L series drawings. NRC committed fire barriers are discussed in SLC 16.9.5.

The NRC August 11, 1978 SER Section 4.9.2 states *"The licensee has proposed to make the following modification on doors and hatches in fire barriers:*

(1) Replace unlabeled fire doors and frames in fire barriers with properly labeled fire doors and frames.

(2) Modify double-leaf fire doors to normally keep one door closed to assure proper closure.

(3) Modify the door arrangement of openings between the turbine building and auxiliary building to prevent glass doors from obstructing automatic fire door closure.

(4) Upgrade the metal hatch plates in the floor between the cable spreading room and control room to provide a 3-hour fire rated barrier.

The license has stated that doors separate redundant safe shutdown equipment or protecting safe shutdown equipment from large hazards are alarmed to the control room and provided with automatic closure devices."

"Upon completion of these modifications, the doorway and hatch penetrations of fire barriers will conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable." The fire door modifications referenced above have been implemented.

Duke letter to the NRC dated May 15, 1981 responded to some modifications indicating completion or insurance company approval of existing fire door configurations.

The NRC August 11, 1978 SER Section 4.9.3 states *"Fire dampers have been provide at some locations where ventilation ducts penetrate fire barriers. The licensee has proposed to upgrade ventilation duct penetrations with dampers having fire ratings equivalent to that required by fire barriers."*

"We find that, subject to implementation of the above modifications, ventilation duct penetrations will satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable." Current fire barrier ventilation duct penetrations are provided with fire dampers.

{Further Action Required – Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.}

Reference(s): NRC SER dated August 11, 1978
Duke Letter to the NRC, dated May 15, 1981
Drawing Series O-310 K and L
Design Basis Specification for Fire Protection
SLC 16.9.5
OSC-9292
PIP O-08-2006
PIP O-08-2520

3.11.4 Through Penetration Fire Stops

Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows.

(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a listed fire-rated device for the specified fire-resistive period.

(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible.

Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke and hot gas seal in this application.

Fire barrier penetration seams required to meet the deterministic or performance based requirements of Chapter 4 are defined in NEI 04-02 Table B-3, Fire Area Transition report. In addition, systems required by licensing actions and engineering evaluations are included in Table B-3.

Through penetration fire stops for penetrations such as pipes, conduits, cables, pneumatic tubes, etc in rated fire barriers are generally provided with rated penetration seals.

The site FPE maintains the Penetration Seal Database in the site EDB and 86-10 Evaluation calculation documenting the acceptability of the station penetration seals in Calculation OSC-7350.

OSC-7359 (DPC 1435.00-00-0006) identifies that Oconee is committed to the criteria of IEEE P634 for electrical and mechanical fire barrier penetration seals.

UFSAR Section 9.5.1.4.3 Item 4 states *"Electrical penetration seal designs shall be subjected to a standard exposure fire that follows the ASTM E-119 Standard Time-Temperature Curve. The acceptance criteria from IEEE 634 (which is identical to that of IEEE P634/D4) shall be used to evaluate the acceptability of test assemblies. The IEEE 634 acceptance limit for ONS unexposed side electrical penetration temperature shall be 700°F. This temperature was selected because the IEEE 634 acceptance criteria is the auto-ignition temperature of the outer cable covering and material in contact with the cable penetration fire stop, or 700°F, whichever is lower. The ignition temperature of outer cable jacketing has been determined to be 735°F.*

Mechanical penetration seal designs shall be subjected to a standard exposure fire that follows the ASTM E-119 Standard Time-Temperature Curve. The acceptance criteria from IEEE-634 (which is identical to that of IEEE P634/D4) shall be used to evaluate the acceptability of test assemblies. The IEEE 634 acceptance limit for Duke Power mechanical penetration seals shall be 680°F. This temperature was selected because it represents the lowest auto ignition temperature of any material normally found in close proximity to piping penetrations (Armstrong Armalok pipe insulation)."

The use of unrated fire penetrations in the ceiling of the West Penetration Room and unrated mechanical pipe penetrations between the Reactor Building and Penetration Rooms were evaluated by the NRC and found to be acceptable in the August 21, 1989 evaluation that granted an Exemption from the Fire Protection Requirements of Section III.G of 10 CFR Part 50, Appendix R.

The NRC also evaluated the separation between the East and West penetration rooms and determined that the electrical divisions were *"effectively separated by a three-hour fire barrier."* This determination was documented in the NRC Letter dated April 14, 1981.

{Further Action Required – Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.}

Reference(s): Drawing Series O-310 K and L

NRC Exemption to various Appendix R Requirements dated August 21, 1989

NRC Letter dated April 14, 1981

Design Basis Specification for Fire Protection

SLC 16.9.5

~~Calculation OSC-7350, ONS Penetration Seal Database and 86-10~~ Evaluations

UFSAR Section 9.5.1.4.3

OSC-7359 (DPC 1435.00-00-0006), Calculation for the Technical Basis for Fire Barrier Penetration Seals

OSC-9292

PIP O-08-2006

PIP O-08-2520

3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS)

ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.

Exception No. 1: When the temperatures inside the fire barrier system exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure."

Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point

temperature requirements as specified by the AHJ at the time of acceptance.

The Oconee design does not currently utilize ERFBS.

No ERFBS are required by the Fire PRA or credited by the change evaluations as required for defense-in-depth.

Reference(s): Design Basis Specification for Fire Protection

VII. CONCLUSIONS

The Oconee fire protection program complies with the requirements of NFPA 805, Chapter 3 upon resolution of open items and NRC approval on specified sections.

VIII. ATTACHMENTS

Attachment A – Compliance Table

Attachment A

Compliance Table

35 Total Pages

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
Note: All information below is summarized; for complete details, see the report in Attachment A. Links are provided below. Turn on Web Toolbar.		
Section 3.1 General *This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein.*		
Section 3.2 Fire Protection Plan		
3.2.1 Intent *A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated combination of components, procedures, and personnel to implement all fire protection program activities.*	Comply	A site-wide Fire Protection Program has been established and is documented in the Design Basis Specification for Fire Protection.
3.2.2 Management Policy Direction and Responsibility *A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program.*	Comply	A policy document has been developed and is documented in the Design Basis Specification for Fire Protection.
3.2.2.1 *The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.*	Comply	The Site Vice President is documented as responsible for the implementation of the fire protection program.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.2.2.2 *The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation.*	Comply	The Fire Protection Engineer is responsible for the administration of the fire protection program.
3.2.2.3 *The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program.*	Comply	The interfaces between the fire protection program and other organizations and fire protection programs are documented in the Design Specification for Fire Protection.
3.2.2.4 *The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.*	Further Action Required	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include the NRC as the authority having jurisdiction (AHJ) for fire protection changes requiring approval.
3.2.3 Procedures *Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established:* *(1) Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program*	Comply	Procedures have been established for implementing the fire protection program. 1. The Engineering Support Document for Fire Protection provides

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
(2) Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration *(3) Reviews of fire protection program — related performance and trends* *(4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program* *(5) Long-term maintenance and configuration of the fire protection program* *(6) Emergency response procedures for the plant industrial fire brigade*		a detailed listing of applicable surveillance procedures. 2. Compensatory actions have been established. 3. Fire protection program reviews are performed. 4. Plant modification reviews for impact on the fire protection program are performed. 5. Long term maintenance and configuration procedures for the fire protection program have been established. 6. Emergency response procedures for the plant fire brigade are documented.

Section 3.3 Prevention

A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:

(1) Prevention of fires and fire spread by controls on operational activities

(2) Design controls that restrict the use of combustible materials

The design control requirements listed in the remainder of this section shall be provided as described.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.3.1 Fire Prevention for Operational Activities *The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible.*	Comply	Fire prevention program, activities for control of ignition sources and transient combustibles include training, inspections and administrative controls.
3.3.1.1 General Fire Prevention Activities *The fire prevention activities shall include but not be limited to the following program elements:* *(1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms.* *(2) Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified.* *(3) Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized:*	Comply	The prevention of fires and fire spread are managed through training of personnel, documented plant inspections, and administrative controls.
3.3.1.2 Control of Combustible Materials *Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented.* *These procedures shall include but not be limited to the following program elements:* *(1) Wood used within the power block shall be listed*	Comply	Sections 3.3.1.2(2) through 3.3.1.2(6) - Specific administrative directives have been developed for control of combustible materials.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
pressure-impregnated or coated with a listed fire-retardant application. *Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated.* *(2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent.* *(3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first.* *(4) Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials.* *(5) Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.* *(6) Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.*	Submit for NRC Approval Area for Improvement	NFPA 805 Section 3.3.1.2(1); NSD-313 permits non treated wood for concrete forming and where specified in design drawings. For compliance with Section 3.3.1.2(2) Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to specifically address plastic sheeting material conformance to NFPA 701 requirements or equivalent.
3.3.1.3 Control of Ignition Sources		
3.3.1.3.1 *A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.*	Comply Area for Improvement	Hot work is controlled through administrative directives in accordance with NFPA 51B. Evaluate NSD-314 to

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
		determine if NFPA 241 should be referenced.
3.3.1.3.2 *Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.*	Comply	Smoking is restricted to approved locations and other sources of ignition are controlled.
3.3.1.3.3 *Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.*	Further Action Required	Open flame or combustion-generated smoke is prohibited for use in leak and air flow testing. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to revise procedures to preclude the use of open flame or combustion generated smoke for leak or air flow testing.
3.3.1.3.4 *Plant administrative procedure shall control the use of portable electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.*	Submit for NRC Approval	The use of portable heaters is controlled by administrative directives. Gas and oil-fired heaters are permitted per station procedures.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.3.2 Structural *Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction.*	Comply	Power block buildings are constructed of non-combustible materials.
3.3.3 Interior Finishes *Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.*	Further Action Required	Interior finishes are non-combustible. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include the specifications for Class A walls/ceilings and Class I floor finishes.
3.3.4 Insulation Materials *Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.*	Comply	Thermal insulation materials are non-combustible or limited combustible.
3.3.5 Electrical		
3.3.5.1 *Wiring above suspended ceiling shall be kept to a minimum. Where installed, electrical wiring shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.*	Further Action Required	Combustibles in concealed spaces are minimized. Oconee will enhance current documentation, prior

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
		to implementation of the NFPA 805 program, to include clear guidance that electrical wiring (including data/phone/video cabling) if installed above suspended ceilings will comply with the requirements of this section.
3.3.5.2 *Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components.*	Further Action Required	Cable trays are constructed of non-combustible materials. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include clear guidance that conduits used for electrical raceways are metal and thin walled metallic tubing is not used in accordance with the requirements of this section.
3.3.5.3 *Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ.*	Complies by Previous NRC Approval Further Action Required	The installed wiring has been found acceptable. Oconee will enhance current documentation, prior

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
		to implementation of the NFPA 805 program, to document that non-rated cables (including data/phone/video) shall not be routed in cable trays with nuclear safety related cables.
3.3.6 Roofs *Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings.*	Comply	Roofs comply with Class A requirements. A roof management program has been implemented requiring Class A equivalent roof installations.
3.3.7 Bulk Flammable Gas Storage *Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.*	Submit for NRC Approval	Submit for NRC Approval – Storage of flammable gas cylinders is permitted for use in plant operations and systems per design.
3.3.7.1 *Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage.*	Comply	Bulk flammable gas is not stored in areas important to nuclear safety unless used in plant operations or systems by design. Oconee will enhance

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
	Further Action Required	current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 50A a code compliance review for the outdoor hydrogen storage.
3.3.7.2 *Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings.*	Comply Further Action Required	Hydrogen gas tanks are orientated with the long axis parallel to plant buildings. Resolve orientation of propane tank. The tank is not anchored per the SER recommendation. Evaluate if the previous approval by the NRC is sufficient with the modification. Alternatively, determine if an evaluation is required or modify the tank position.
3.3.7.3 *Flammable gas storage cylinders not required for normal operation shall be isolated from the system.*	Comply	Gas cylinders are isolated when not in use and controlled by plant directives.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.3.8 Bulk Storage of Flammable and Combustible Liquids *Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code.*	Further Action Required	The storage of combustible and flammable materials is controlled by plant directives. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 30 code compliance review for the Turbine Building lube oil reservoirs, Turbine Building lube oil storage room, and the Keowee lube oil storage room.
3.3.9 Transformers *Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function.*	Further Action Required	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include drainage inspections as part of the annual flow tests.
3.3.10 Hot Pipes and Surfaces *Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the*	Comply	Administrative directives ensure upon identification prompt correction of any oil leakage.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
prompt cleanup of oil on insulation.	Area for Improvement	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to clearly indicate it is a NRC requirement to promptly remove oil from insulation.
3.3.11 Electrical Equipment *Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.*	Comply Further Action Required	Administrative directives control combustible material near electrical equipment. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to specify the combustible free distance consistent with the PRA Zone of Influence for transients.
3.3.12 Reactor Coolant Pumps *For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply.*	Comply	The RCP oil collection system meets the five criteria presented in this section.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
(1) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and nonpressurized leakage sites in each reactor coolant pump oil system. *(2) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system.* *(3) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback.* *(4) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps.* *(5) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin.*		
Section 3.4 Industrial Fire Brigade		
3.4.1 On-Site Fire-Fighting Capability *All of the following requirements shall apply.* *(a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:* *(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)* *(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program*	Comply Area for Improvement	The onsite Fire Brigade is appropriately staffed, trained and equipped. Ensure NFPA 600 code review is formally documented.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians *(b) Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.* *(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance* *Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria.* *(d) The industrial fire brigade shall be notified immediately upon verification of a fire.* *(e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment.*		
3.4.2 Pre-Fire Plans *Current and detailed pre-fire plans shall be available to the industrial fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5.*	Comply	Current and detailed pre-fire plans are available in the Oconee Plant Fire Plan.
3.4.2.1 *The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.*	Comply	Detailed pre-fire plans are available in the Oconee Nuclear Site Fire Plan.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
	Area for Improvement	Review the Fire Plan and associated documentation for compliance with NFPA 805 requirements.
3.4.2.2 *Pre-fire plans shall be reviewed and updated as necessary.*	Comply	The Fire Plan is maintained current. Plant directives require review of the Fire Plan.
3.4.2.3 *Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade.*	Comply	The Fire Plan is available in the Control Room and to the Fire Brigade at multiple locations.
3.4.2.4 *Pre-fire plans shall address coordination with other plant groups during fire emergencies.*	Comply	Plant directives and fire brigade procedures address coordination with other plant groups.
3.4.3 Training and Drills *Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities.* *(a) Plant Industrial Fire Brigade Training. All of the following requirements shall apply.* *(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600,*	Comply	The Fire Brigade personnel receive appropriate training and the training records are maintained. All plant personnel are trained on reporting fires and interfacing with the Fire

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate. *(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire.* *(3) A written program shall detail the industrial fire brigade training program.* *(4) Written records that include but are not limited to initial industrial fire brigade classroom and hands-on training, refresher training, special training schools attended, drill attendance records, and leadership training for industrial fire brigades shall be maintained for each industrial fire brigade member.* *(b) Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade.* *(c) Drills. All of the following requirements shall apply.* *(1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade.* *(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario.*		Brigade. Drills are conducted on a regular basis and involve various plant areas. The drills are critiqued and records are maintained.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards. *(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team.* *(5) A critique shall be held and documented after each drill.*		
3.4.4 Fire-Fighting Equipment *Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards.*	Comply	Fire brigade personnel are provided with the necessary equipment.
3.4.5 Off-Site Fire Department Interface		
3.4.5.1 Mutual Aid Agreement *Off-site fire authorities shall be offered a plan for their interface during fires and related emergencies on site.*	Comply	Letters of Agreement are in maintained with local off-site fire fighting organizations.
3.4.5.2 Site-Specific Training *Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually.*	Comply	Annual training is specified in the Letters of Agreement.
3.4.5.3 Security and Radiation Protection	Comply	Site directives include Security and Radiation

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
Plant security and radiation protection plans shall address off-site fire authority response.		Protection provisions for assistance to off-site fire authorities.
3.4.6 Communications *An effective emergency communications capability shall be provided for the industrial fire brigade.*	Comply Further Action Required	Emergency communication capabilities are provided. Ensure resolution of PIP O-08-4820 satisfies the requirement of this section.
Section 3.5 Water Supply		
3.5.1 *A fire protection water supply of adequate reliability, quantity, and duration shall be provided by one of the two following methods.* *(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies.* *(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s) in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service.*	Complies by Previous NRC Approval Further Action Required	The fire protection water supply is adequate and reliable. Prior to implementation of the NFPA 805 program, Oconee will ensure that any credited suppression systems for the Nuclear Safety Capability Transition are within the design flow capabilities of the fire pump per NFPA 20.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.5.2 *The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.* *Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own suction and both suctions and pumps are adequately separated.* *Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service.*	Comply	Oconee utilizes Lake Keowee as the primary fire water source.
3.5.3 *Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source.*	Complies by Previous NRC Approval Further Action Required	The use of the High Pressure Service Water (HPSW) pumps to supply fire water is acceptable. Upon replacement of the Keowee fire pump (PIP O-01-3492) ensure the installation meets the requirements of this section.
3.5.4 *At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.*	Complies by Previous NRC Approval	Diesel-engine driven fire water pumps are not utilized. Keowee uses an electric fire pump. The NRC has accepted the use

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
	Area for Improvement	of the HPSW pumps as Oconee fire pumps. Both HPSW pumps are currently powered from the same Unit. HPSW pumps should not be powered from a single unit. Consider connection to PSW or an alternate unit.
3.5.5 *Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.*	Complies by Previous NRC Approval	The HPSW pumps are separated from the rest of the plant and the NRC has approved the use and installation of the HPSW pumps for fire protection use.
3.5.6 *Fire pumps shall be provided with automatic start and manual stop only.*	Complies by Previous NRC Approval Area for Improvement	Fire pumps (HPSW and Keowee) auto-start. Document that PIP O-02-3870 has resolved HPSW manual stop.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.5.7 *Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.*	Comply	There are separate connections from pumps to the fire loops for ONS. Keowee does not have a yard main loop only underground piping.
3.5.8 *A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.*	Comply	The pressure in the HPSW system is maintained by the EWST. Keowee uses lake head to maintain system pressure.
3.5.9 *Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.*	Comply	The Control Room(s) are automatically notified of operation of the pumps used for fire protection.
3.5.10 *An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements.*	Complies by Previous NRC Approval Further Action Required	The fire water piping system was found acceptable by the NRC. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 24 code compliance review.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.5.11 *Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems.*	Comply	Sectionalizing valves are provided to allow isolation of various sections of the fire water system for maintenance or repair.
3.5.12 *Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers.* *Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided.*	Comply	Compatible threads are provided.
3.5.13 *Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve.*	Complies by Previous NRC Approval	The fire water supply system has been approved by the NRC. Each header has a separate connection with shutoff valve to the fire water system.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.5.14 *All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.* *(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.* *(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.* *(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator.*	Comply	Fire protection valves are locked or sealed and inspected monthly for position.
3.5.15 *Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system.* *Exception: Mobile means of providing hose and associated equipment, such as hose carts or trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses.*	Complies by Previous NRC Approval	The NRC determined that the hydrants installed at approximately 300 feet intervals are acceptable.
3.5.16 *The fire protection water supply system shall be dedicated for fire protection use only.* *Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and*	Complies by Previous NRC Approval	The use of the HPSW system and LPSW system for fire protection was found acceptable by the NRC.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis. *Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section.*		
Section 3.6 Standpipe and Hose Stations		
3.6.1 *For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems.*	Complies by Previous NRC Approval Further Action Required	The standpipe and fire hose systems were found acceptable by the NRC. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 14 code compliance review for standpipe systems not addressed by the previous SER approval but included in the new power block definition.
3.6.2 *A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel.*	Comply	The fire water supply system can provide adequate water flow and pressure at the hose station isolation valves per NFPA 14.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.6.3 *The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed.*	Comply	The appropriate hose nozzles have been provided.
3.6.4 *Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE).* *Exception: For existing plants that are not capable of meeting this requirement, provisions to restore a water supply and distribution system for manual fire-fighting purposes shall be made. The provisional manual fire-fighting standpipe/hose station system shall be capable of providing manual fire-fighting protection to the various plant locations important to supporting and maintaining the nuclear safety function. The provisions for establishing this provisional system shall be preplanned and be capable of being implemented in a timely manner following an SSE.*	Complies by Previous NRC Approval	The interior hose stations were found acceptable by the NRC. Seismically designed hose stations are provided in the Reactor Building and the Cable Room to Control Room back stairwells. The HPSW system is not seismically designed.
3.6.5 *Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement.*	Comply	Fire flow will not affect the essential water system.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
Section 3.7 Fire Extinguishers *Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions.*	Complies by Previous NRC Approval Further Action Required	The portable fire extinguishers (location and type) meet the requirements of NFPA 10 where provided. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 10 code compliance review.
3.8 Fire Alarm and Detection Systems		
3.8.1 Fire Alarm *Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code®. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. The following fire-related signals shall be transmitted:* *(1) Actuation of any fire detection device* *(2) Actuation of any fixed fire suppression system* *(3) Actuation of any manual fire alarm station* *(4) Starting of any fire pump* *(5) Actuation of any fire protection supervisory device*	Complies by Previous NRC Approval Further Action Required	Fire related signals are transmitted to the control rooms or security. The fire detection and signaling system was found acceptable by the NRC. Perform a NFPA 72 code compliance review for fire alarm and detection systems (Sections 3.8.1 and 3.8.2).

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
(6) Indication of alarm system trouble condition		
3.8.1.1 *Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location.*	Comply	Means to report a fire are provided.
3.8.1.2 *Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action:* *(1) General site population in all occupied areas* *(2) Members of the industrial fire brigade and other groups supporting fire emergency response* (3) *Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services*	Comply	The Control Room notifies station personnel of a fire event over the Plant PA System and can communicate with Brigade personnel and Off-Site agencies by various means.
3.8.2 Detection *If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes.*	Complies by Previous NRC Approval	The fire detection and signaling system was found acceptable by the NRC. The system was installed in accordance with applicable codes of record with documented deviations. Perform a NFPA 72 code

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
	Further Action Required	compliance review of the fire alarm and detection systems.}
Section 3.9 Automatic and Manual Water-Based Fire Suppression Systems		
3.9.1 *If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:* *(1) NFPA 13, Standard for the Installation of Sprinkler Systems* *(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection* *(3) NFPA 750, Standard on Water Mist Fire Protection Systems* *(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems*	Complies by Previous Licensee Evaluation Further Action Required	NFPA code compliance calculations have been performed for automatic and manual water-based fire suppression systems. Review the applicable Fire Suppression NFPA Code Review calculations of the water based fire suppression systems required to meet the nuclear safety performance criteria
3.9.2 *Each system shall be equipped with a water flow alarm.*	Comply	Each fixed extinguishing system is provided with an alarm of flow indication.
3.9.3 *All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location.*	Comply	Alarms are annunciated in the Control Rooms or other remote constantly attended area.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.9.4 *Diesel-driven fire pumps shall be protected by automatic sprinklers.*	N/A	There are no diesel-driven fire water pumps utilized at the Oconee Plant.
3.9.5 *Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.*	Complies by Previous NRC Approval	Each suppression system is connected to the header with an approved control valve.
3.9.6 *All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14.*	Comply	The valves are not electrically supervised but are locked or sealed in accordance with Section 3.5.14.
Section 3.10 Gaseous Fire Suppression Systems		
3.10.1 *If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:* *(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems* *(2) NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems* *(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems*	N/A	There are no required gaseous fire suppression systems. Gaseous fire suppression is only utilized for specific components – the Keowee Hydro Station's Generators and the SSF Diesel Generator are provided with CO_2 extinguishing systems.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.10.2 *Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.*	N/A	N/A
3.10.3 *Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.*	N/A	N/A
3.10.4 *In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability.*	N/A	N/A
3.10.5 *Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.*	N/A	N/A
3.10.6 *Total flooding carbon dioxide systems shall not be used in normally occupied areas.*	N/A	N/A

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.10.7 *Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel.* *The carbon dioxide system shall be provided with an odorizer.*	N/A	N/A
3.10.8 *Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.*	N/A	N/A
3.10.9 *The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide.*	N/A	N/A
3.10.10 *Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.*	N/A	N/A
Section 3.11 Passive Fire Protection Features *This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to protect cables and electrical components and equipment from the effects of fire.*		

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.11.1 Building Separation *Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.* *Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.*	Complies by Previous NRC Approval Comply by Previous Licensee Evaluation Further Action Required	Adequate building separation has been found acceptable by the NRC or by licensee evaluation. The Keowee Hydro Station and the SSF are separated from the other buildings by a distance of greater than 50 feet. Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.
3.11.2 Fire Barriers *Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials.*	Complies by Previous NRC Approval Comply by Previous Licensee Evaluation Further Action Required	The fire barriers between the major plant buildings were found to be acceptable by the NRC or by licensee evaluation. Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
3.11.3 Fire Barrier Penetrations *Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4. (See 3.11.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable:* *(1) NFPA 80, Standard for Fire Doors and Fire Windows* *(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems* *(3) NFPA 101, Life Safety Code* *Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ.*	Complies by Previous NRC Approval Comply by Previous Licensee Evaluation Further Action Required	The fire barrier penetrations were found to be acceptable by the NRC or by licensee evaluation. Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.
3.11.4 Through Penetration Fire Stops *Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows.* *(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a*	Comply by Previous Licensee Evaluation Complies by Previous NRC Approval	The Penetration Seal Database and 86-10 Evaluation calculation document the acceptability of the station penetration seals The NRC has approved exemptions for specific

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
listed fire-rated device for the specified fire-resistive period. *(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible.* *Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke and hot gas seal in this application.*	Further Action Required	penetration seals. Upgrade fire barriers in accordance with the open items in PIP O-08-2006 and PIP O-08-2520.
3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS) *ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.* *Exception No. 1: When the temperatures inside the fire barrier system exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification*	N/A	Oconee does not utilize ERFBS.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Basis
demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure." *Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point temperature requirements as specified by the AHJ at the time of acceptance.*		

Form 101.2 (R3-03) Calculation Number OSC-9295

REVISION DOCUMENTATION SHEET

Revision Number	Revision Description
0	Initial Issue

FORM 101.3 (R08-04)

CERTIFICATION OF ENGINEERING CALCULATION - REVISION LOG

Station And Unit Number Oconee Units 1, 2 & 3

Title Of Calculation NFPA 805 Transition B-1 Table/Report

Calculation Number OSC-9295

Active Calculation / Analysis Yes x No ☐

	Calculation Pages (Vol)			Supporting Documentation (Vol)			Volumes		Orig	Chkd	Verif. Meth.	Appr[1]	Issue Date
Rev. No.	Revised	Deleted	Added	Revised	Deleted	Added	Deleted	Added	Date	Date	1, 2, 3, "Other"	Date	Rec'd Date

Note 1: When approving a Calculation revision with multiple Originators or Checkers, the Approver need sign only one block.

CALCULATION IMPACT ASSESSMENT (CIA)

Station / Unit Oconee 1, 2, 3 | Calculation No. DSC-9295 | Rev. 0 | Page iv
PIP No. (if applicable) O-08-2163 | By Robert Jackson | Date 4/23/08
Prob. No. (stress & s/r use only) N/A | Checked By | Date

NEDL reviewed to identify calculations? ☐ YES ☒ NO Note: a NEDL search is NOT required for calculation originations (i.e., Rev. 0's).

Identify in the blocks below, the groups consulted for an Impact Assessment of this calculation origination/revision.

	Indiv. Contacted/Date		Indiv. Contacted/Date
☐ RES [Power, I & C, ERRT, Reactor]		☐ NGO [QA Tech. Services (ISI), Severe Accident Analysis, Elect. Sys. & Equip., Design & Reactor Supp., Civil Structural, Core Mech. & T/H Analysis, Mech. Sys. & Equip., Nuclear Design and Safety Analysis, Matls/Metallurgy/Piping]	
☒ MCE [Primary Systems, Balance of Plant, Rotating Equipment, Valves & Heat Exchangers, Civil]	Harold LeKowitz / 4/23/08		
☐ MOD [Mechanical Engr., Electrical Engr., Civil Engr.]		☐ Training	
		☐ Local IT	
☐ Operations - OPS Support		☐ Regulatory Compliance	
☐ Maintenance - Tech. Support		☐ Chemistry	
☐ Work Control - Program. Supp.		☐ Radiation Protection	
☐ Other Group _____		☐ No Group required to be consulted	

Listed below are the identified documents (ex: TECHNICAL SPECIFICATION SECTIONS, UFSAR SECTIONS, DESIGN BASIS DOCUMENTS, STATION PROCEDURES*, DRAWINGS, OTHER CALCULATIONS, ETC.) that may require revision as a result of the calculation origination or revision, the document owner/group and the change required (including any necessary PIP Corrective Actions).

**Note: Any design changes, which require changes to Station Procedures, must be transmitted as Design Deliverable Documents.*

DOCUMENT	GROUP	CHANGE REQUIRED
Multiple Associated w/ PIP	MCE	See PIP O-08-2163

I. PURPOSE

The purpose of this calculation is to document the comparison of the existing Oconee Nuclear Station Fire Protection Program to the requirements presented in Chapter 3 of NFPA 805. This calculation documents fire protection features needed to protect nuclear safety-related structures, systems, or components which are designated as QA Condition 3 systems.

II. BACKGROUND

Under its current operating license, Oconee Nuclear Station is required to maintain the provisions of its approved fire protection program. The current licensing basis documents for Oconee are Appendix A to BTP APCSB 9.5-1 and 10CFR50 Appendix R Sections III.G, III.J, III.L and III.O. The NRC has added 10CFR50.48(c) as an alternative method of compliance to 10CFR50.48(b). 10CFR50.48(c) is the adoption of the industry consensus standard NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants (2001 Edition). Oconee has elected to transition to 10CFR50.48(c).

As part of the transition to NFPA 805, the fundamental fire protection program design elements are required to be identified. NFPA 805 Chapter 3 defines fundamental fire protection program attributes. This report documents the comparison of the existing Oconee Nuclear Station Fire Protection Program to the requirements presented in Chapter 3 of NFPA 805.

III. METHODOLOGY

The requirements presented in Chapter 3 of NFPA 805, 2001 Edition, were compared to the existing Oconee Nuclear Station fire protection program. The attributes of fire protection features and administrative programs that satisfy the provisions of NFPA 805 were documented. Where direct compliance was not found, a search of previous licensing documentation was conducted to determine if the NRC had previously approved alternative methods of compliance. Where compliance could not be determined, an open item was established.

The comparison of the Oconee Nuclear Station fire protection program to Chapter 3 of NFPA 805 is summarized in Attachment A - Compliance Table and further substantiated with additional detail and references in Section VI, of this report. The compliance table is a brief overview which includes the NFPA 805 Code section and text, the Compliance Statement, and a Compliance Basis summary. Section VI has three components. The first is the verbatim text of NFPA 805 (provided in italics). The second is a detailed discussion of the ONS compliance basis. Finally a list of references is provided.

The following standard Compliance Statements are used in the Compliance Table:

- Comply – Oconee clearly complies with the NFPA 805 requirement, through direct 'literal' compliance or compliance with the intent (e.g. NFPA 805 specifies requirement located in one document and station has it located in another document). Sections may comply and also have an Area for Improvement which may not submitted in the LAR.
- Complies by Previous NRC Approval – Oconee does not clearly meet the NFPA 805 requirement but has been approved directly by the NRC (typically by SER).
- Complies by Previous Licensee Evaluation – Oconee does not clearly meet the NFPA 805 requirement but the Licensee has completed an equivalency evaluation.
- Submit for NRC Approval – Oconee does not clearly meet the NFPA 805 requirement and will submit the current basis for NRC review and approval.
- Further Action Required – Oconee will take an action to revise documentation or perform additional analysis and/or actions to demonstrate compliance.
- N/A – NFPA 805 requirement does not apply to Oconee.

Open items are divided into three categories:

1. Submit for Approval
2. Further Action Required
3. Area for Improvement – Area for Improvement are sections where Oconee is currently in compliance and station documentation will be enhanced for further clarification. Areas for Improvement may not be submitted in the LAR.

The comparison utilizes NEI 04-02 "Guidance for Implementing A Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)," Revision 1 as a tool to determine the method and extent to which compliance is demonstrated. The Compliance Table, showing cross-reference and compliance statements, was based on Table B-1 of NEI 04-02.

IV. REFERENCES

1. Duke Letter to the NRC, FRAQUA Response, dated January 16, 1978.
2. Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, dated December 31, 1976.
3. Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, dated February 1982.
4. Duke letter to the NRC dated November 22, 1977.
5. Duke letter to the NRC dated February 17, 1978.
6. Duke Letter to the NRC dated March 18, 1981.

7. Duke to NRC, PIP O-99-2532/LER 270/1999-04, dated February 16, 2000.
8. NRC Safety Evaluation Report dated August 11, 1978.
9. NRC Safety Evaluation Report dated April 28, 1983.
10. NRC Safety Evaluation Report dated June 7, 1988.
11. NRC Safety Evaluation Report dated May 23, 2000.
12. NRC Letter dated April 14, 1981.
13. NRC Letter to Duke dated February 2, 1982.
14. NRC letter to Duke dated May 23, 2000.
15. NRC Exemption to various Appendix R Requirements dated August 21, 1989.
16. Design Basis Specification for Fire Protection, OSS-0254.00-00-4008, Revision 16.
17. Design Basis Specification for the Fire Detection System, OSS-0254.00-00-2017, Revision 8.
18. Design Basis Specification for the Low Pressure Service Water System, OSS-0254.00-00-1039, Revision.
19. Design Basis Specification for the High Pressure Service Water System, OSS-0254.00-00-1002, Revision 25.
20. Engineering Support Program Document for Fire Protection, Revision 4.
21. EM 4.6 "Oconee Engineering Support Program Walkdowns", Revision 6.
22. EDM-201 "Engineering Support Program", Revision 6.
23. EDM-601 "Engineering Change Manual", Revision 2.
24. ERTG-001 "Emergency Response Organization and Emergency Services Training Program".
25. EWP 7.2 "Storing Chemicals", Revision 2.
26. NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion", Revision 27.
27. NSD-106 "Configuration Management", Revision 4.
28. NSD-112 "Fire Brigade Organization, Training & Responsibilities", Revision 7.
29. NSD-116 "Nuclear Chemical Control Program", Revision 2.
30. NSD-228 "Applicability Determination", Revision 3.
31. NSD-301 "Engineering Change Program", Revision 27.
32. NSD-313 "Control of Flammable and Combustible Materials", Revision 6.
33. NSD-314 "Hot Work Authorization", Revision 6.
34. NSD-316 "Fire Protection Impairment and Surveillance", Revision 6.
35. NSD-318 "Coatings Program", Revision 2.
36. NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program", Revision 0.
37. NSD-413 "Fluid Leak Management Program", Revision 4.
38. S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process", Revision 0.

39. PIP O-1999-02753.
40. PIP O-2001-03492.
41. PIP O-2002-03870.
42. PIP O-2002-06047.
43. PIP O-2005-04125.
44. PIP O-2008-02163.
45. Drawing KFD-109A-1.1 "Keowee Hydro Station – Flow Diagram of Service Water System".
46. Drawing Series OFD-124C.
47. Drawing OFD-135A-01-01.
48. Drawing Series O-310 K and L "Fire Protection Plan & Fire, Flood, & Pressure Boundaries".
49. SLC 16.9.2 dated 6/28/05.
50. SLC 16.9.3 dated 1/14/04.
51. ~~SLC 16.9.4 dated 1/30/00.~~
52. SLC 16.9.5 dated 1/30/00.
53. SLC 16.9.6 dated 12/14/04.
54. SLC 16.9.7 dated 3/31/05.
55. SLC 16.13.1 dated 5/13/04.
56. OP/0/A/1600/004 "Operation of the SSF CO2 System".
57. PT/0/A/0400/002 "SSF CO2 Test".
58. PT/1/A/2200/006 "KHU-1 CO2 System Surveillance".
59. PT/2/A/2200/006 "KHU-2 CO2 System Surveillance".
60. PT/0/B/0250/030 "Quarterly Fire Brigade Equipment Inspection", Revision 20.
61. PT/0/A/2200/010 "KHS Fire Protection Equipment Surveillance" Revision 25.
62. PT/0/B/2000/001 "Preparation and Conduct of Emergency Drills".
63. PT/0/A/0250/010 A "Fire Protection System Monthly Inspection", Revision 65.
64. RP/0/B/1000/029 "Fire Brigade Response", Revision 11.
65. Calculation OSC-1626, Pressure at Hose Stations in Auxiliary and Turbine Building, Revision 2.
66. Calculation OSC-7185, Fire Evaluation of the East West Penetration Room Wall, Revision 0.
67. Calculation OSC-7350, ONS Penetration Seal Database and 86-10 Evaluations, Revision 6.
68. Calculation OSC-7359 (DPC 1435.00-00-0006), Calculation for the Technical Basis for Fire Barrier Penetration Seals, Revision 1.
69. Fire Suppression NFPA Code Review calculations.
70. Duke Corporate Roof Management Program.
71. General Employee Training – Plant Access Training.

72. Oconee Emergency Plan.
73. Oconee Nuclear Site Fire Plan.
74. Specification OSS-241.00-00-0004 "Conventional Thermal Insulation", Revision 5.
75. Specification OSS.241A "Reactor Building and Piping Heat Insulation (Metal Reflective Type), Revision 4.
76. UFSAR Section 9.5.1 dated 12/31/05.

V. STATUS OF NFPA 805 COMPLIANCE

Compliance Statement	Total	Notes
Comply	54	
Comply by Previous NRC Approval	22	
~~Comply by Previous~~ Licensee Evaluation	~~2~~	
Submit for NRC Approval	2	Section 3.3.1.2(1) and Section 3.3.1.3.4
Further Action Required	27	Oconee will take an action to revise documentation or perform additional analysis and/or actions to demonstrate compliance.
Area for Improvement	6	Oconee is compliant and areas to enhance station documentation are identified
N/A	2	Section 3.9.4 and Section 3.11.5

Note that there are more method of compliance statements than code sections as some sections comply by various means or additional actions are required.

Open Items

The following is a list of open items (Submit for Approval, Further Action Required, Area for Improvement) and actions required for resolution. PIP O-08-2163 has been generated to track the open items in the following table. Additional detail can be found in the applicable report section.

Section	Requirement	Action
3.2.2.4	The policy document for the Fire Protection Plan shall identify the appropriate AHJ.	Revise station documentation to state the NRC is the AHJ for fire protection changes requiring approval.
3.3.1.2(1)	Wood used within the power block shall be listed with a fire-retardant application	Submit for NRC Approval; Oconee permits non-treated wood for concrete forming or per design documents.
3.3.1.2(2)	Plastic sheeting materials used in the power block shall be fire-	Revise NSD-313 (or an alternative administrative control document) to

	retardant types that have passed NFPA 701, or equivalent.	specifically address plastic sheeting materials shall conform to NFPA 701 requirements, or equivalent.

Section	Requirement	Action
3.3.1.3.1	A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, and NFPA 241	Evaluate NSD-314 to determine if NFPA 241 should be included.
3.3.1.3.3	Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.	Revise station leak testing procedures to ensure open flames and combustion generated smoke are not used.
3.3.1.3.4	Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.	Submit for NRC Approval; Oconee permits fossil fuel (gas and oil-fired) heaters.
3.3.3	Interior wall, floor and ceiling finish classifications shall be in accordance with NFPA 101.	Revise NSD-318 to include the appropriate code specifications.
3.3.5.1	Wiring above suspended ceiling shall be kept to a minimum.	Revise applicable station documentation for compliance with this section.
3.3.5.2	Only metal tray and metal conduits shall be used for electrical raceways.	Revise applicable station documentation for compliance with this section.
3.3.5.3	Electric cable construction shall comply with a flame propagation test.	Revise station documentation that non-rated cables (including data/phone/ video) shall not be routed in cable trays with nuclear safety related cables.
3.3.7.1	NFPA 50A shall be followed for hydrogen storage.	Perform a NFPA 50A code compliance review for outdoor hydrogen storage.
3.3.7.2	Outdoor high pressure flammable gas storage container shall be located so that the long axis is not pointed at buildings.	Resolve propane tank storage configuration; submit for NRC approval, evaluate or modify the tank.
3.3.8	Bulk storage of flammable and combustible liquids.	Perform NFPA 30 code compliance review for bulk storage of the Turbine Building and Keowee lube oil storage locations.
3.3.9	Transformer oil collection basins and drain paths shall be periodically inspected to ensure they are free of debris and capable of performing their design function.	Revise Transformer Water Spray test procedures to ensure drainage is inspected during annual flow tests.

Section	Requirement	Action
3.3.10	Administrative controls shall require the prompt cleanup of oil on insulation.	Revise NSD-104 and/or NSD-413 to clearly indicate it is a NRC requirement to promptly remove oil from insulation.
3.3.11	Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.	Revise NSD-313 to include PRA Zone of Influence distance from PRA fire modeling as exclusion area for transient combustibles.
3.4.1(a)	The fire brigade shall comply with NFPA 600.	Ensure NFPA 600 code review is included in the Fire Brigade Functional Area Management (FAM) manual.
3.4.2.1	Pre-Fire Plans shall detail the fire area configuration and fire hazards to be encountered in the fire area,	Review ONS Fire Plan to ensure minimum pre-plan content is included per FAQ 06-0025.
	along with any nuclear safety components and fire protection systems and features that are present.	
3.5.1(b)	The fire water supply shall be capable of delivering the largest system design demand and hose stream.	Ensure any required suppression systems for Chapter 4 are within the design flow capabilities of the fire pump.
3.5.3	Fire pumps shall be installed in accordance with NFPA 20 and shall provide 100% of the required flow and pressure.	Ensure the Keowee fire pump replacement is done in accordance with NFPA 20 and properly sized for the required maximum fire flow and pressure requirements.
3.5.6	Fire pumps shall be provided with automatic start and manual stop only.	Document resolution of PIP 02-3870 to install manual stop on the HPSW pumps.
3.6.1	For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14.	Perform a NFPA 14 code compliance review.
3.7	Where provided, fire extinguishers of the appropriate number, size, and type shall be provide in accordance with NFPA 10.	Perform a NFPA 10 code compliance review.
3.8.1	Fire alarm initiating devices shall be installed in accordance with NFPA 72.	Perform a NFPA 72 code compliance review (Sections 3.8.1 and 3.8.2).

Section	Requirement	Action
3.8.2	Automatic fire detection devices required by Chapter 4 shall be installed in accordance with NFPA 72.	Identify fire detection devices credited for PRA, defense-in-depth or as part of the change evaluation process.
3.9.1	Automatic or manual water based fire suppression systems required by Chapter 4 shall be installed in accordance with NFPA 13 or 15.	Identify automatic or manual water based fire suppression systems credited for PRA, defense-in-depth or as part of the change evaluation process. Review applicable existing code compliance reviews. Perform additional reviews as necessary.
3.10.1 3.10.3 3.10.4 3.10.9 3.10.10	Automatic total flooding or local application gaseous fire suppression systems required by Chapter 4 shall be installed in accordance with NFPA 12.	Identify gaseous fire suppression systems credited for PRA, defense-in-depth or as part of the change evaluation process. Perform a NFPA 12 code compliance review. Includes addressing open items in subsequent Section 3.10.3, 3.10.4, 3.10.9 and 3.10.10 in the code compliance review.
3.11.2	Fire barriers required by Chapter 4 shall include a specific fire-resistance rating.	Identify fire barriers credited for PRA, defense-in-depth or as part of the change evaluation process. Review if credited fire barriers are adequate.
3.11.3	Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designed fire resistance rating of the barriers as determined by Chapter 4.	Identify fire barriers credited for PRA, defense-in-depth or as part of the change evaluation process. Review if credited fire barrier penetrations are adequate.
3.11.4	Through penetration fire stops for penetrations shall be protected.	Identify fire barriers credited for PRA, defense-in-depth or as part of the change evaluation process. Review if credited penetration seals are evaluated in Calculation OSC-7350.
3.11.5	ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area.	Identify ERFBS credited for PRA, defense-in-depth or as part of the change evaluation process. Review if credited ERFBS are rated appropriately.

VI. STATEMENTS OF NFPA 805 COMPLIANCE

Each Section of Chapter 3 of NFPA 805 is individually addressed below:

Section 3.1 General

This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein.

Oconee Nuclear Station (ONS) compliance with the fire protection program elements and minimum design requirements presented in NFPA 805 Chapter 3 is not based on the performance-based methods permitted elsewhere in the standard. The following discussion of Chapter 3 requirements documents ONS compliance or intended compliance with the individual code sections. In addition documentation is provided where previous NRC approval has been granted for a deviation to the code.

Section 3.2 Fire Protection Plan

3.2.1 Intent

A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated combination of components, procedures, and personnel to implement all fire protection program activities.

The Design Bases Specification for Fire Protection, OSS-0254.00-00-4008, documents the ONS Fire Protection Program including management policy, program direction and defines the organization, responsibilities and requirements of involved personnel. Many of these attributes have been updated and revised since original correspondence with the NRC including the January 16, 1978 letter from Duke to the NRC in response to the Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls and Quality Assurance (FRAQUA) letter and the original and updated Response to Appendix A to Branch Technical Position APCSB 9.5-1. The ONS fire protection program is currently based on, and complies with, the requirements of 10CFR50.48(a).

Note that Oconee uses the terminology Fire Plan to represent the fire pre-plan (fire-fighting strategies) for fire scenarios at the site and uses the term Fire Protection Program (per 10CFR50.48) to delineate the implementation of fire protection policies at the plant.

Reference(s): Design Basis Specification for Fire Protection

Duke Letter to the NRC, FRAQUA Response, January 16, 1978

Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, December 31, 1976

Duke Letter to the NRC, Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.2.2 Management Policy Direction and Responsibility

A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program.

The Design Bases Specification for Fire Protection includes the management policy of the fire protection program organization and responsibilities. The Design Bases Specification for Fire Protection and Engineering Support Document for Fire Protection provide detailed information about the Fire Protection Program. The Design Bases Specification for Fire Protection provides the basis and regulatory framework upon which the Oconee Nuclear Station Fire Protection Program is based. The Engineering Support Program Document for Fire Protection provides the fire protection engineer an aid in defining the Oconee Fire Protection Program.

3.2.2.1

The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.

The Site Vice President has the overall responsibility for the fire protection program at Oconee Nuclear Station. The daily programmatic administration of the fire protection program at Oconee is delegated through line management to the Fire Protection Engineer. Responsibility for the fire brigade and fire brigade training are delegated to the emergency planning and training groups respectively.

Reference(s): Design Basis Specification for Fire Protection

3.2.2.2

The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation.

The Fire Protection Engineer has the overall lead responsibility for the Fire Protection Program and its administration and coordination for all facilities that are important to nuclear safety or covered by the nuclear insurer. The fire protection engineer is experienced in nuclear fire protection and is qualified consistent with member grade status in the Society of Fire Protection Engineers. All other buildings are under the oversight of the Commodities and Facilities organization.

Reference(s): Design Basis Specification for Fire Protection

3.2.2.3

The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program.

Fire protection interfaces are defined in the Design Basis Specification for Fire Protection and the Engineering Support Program Document for Fire Protection. The positions having responsibilities and authority to implement portions of the fire protection program are described below. These positions were originally described in the ONS FRAQUA response and ONS Comparison to BTP 9.5-1 and have evolved since original publication.

Fire Protection Engineer

The Fire Protection Engineer (FPE) is responsible for the overall administration of the fire protection program. This individual may not directly control or be responsible for every aspect of fire protection, detection, or mitigation at Oconee; however the individual is required to be knowledgeable of each aspect. This individual will interface with each plant internal and external customer regarding a fire protection concern. Fire Protection concerns can be regulatory, local or national code interpretations, insurance compliance, equipment configurations, equipment specifications, or industry issues. The fire protection program encompasses all structures, systems, and components important to plant and nuclear safety and those other structures, systems, and components covered by the nuclear insurer. The FPE is also the AHJ at the site level.

Fire Protection Engineering Fleet Lead

The Fire Protection Engineering Fleet Lead provides programmatic support (overall Department direction and policy in matters pertaining to Fire Protection and Appendix R safe shutdown) to the three Duke Energy site Fire Protection Engineers. This was formerly identified as Fire Protection Consultant.

Fire Detection and Instrumentation Engineer

The Fire Detection and Instrumentation Engineer responsibilities may be divided among different individuals, if management thinks this is prudent. The person responsible for fire detection and/ or instrumentation will respond to all questions and system operations concerning operational characteristics, commitments, and regulatory requirements. This person(s) will interface with plant craft personnel, the fire protection engineer, and other internal and external customers. The fire detection and instrumentation engineer is also responsible for keeping the FPE notified of major system problems.

Service Water System Engineers (HPSW, LPSW, and CCW)

The service water system engineers are responsible for notifying the FPE of any problem on their system that will affect the performance of the fire protection systems. The divisions of

hydraulic responsibilities among the various engineers are that main flow paths are the concerns of the individual system engineers and the portion of the piping that is specifically designed to support fire fighting and/ or suppression are responsibilities of the FPE. There are instances where both individuals may need to combine input to problem resolution techniques.

Standby Shutdown Facility (SSF) Engineer

This person is responsible for interfacing with the FPE to ensure the 10 CFR50, Appendix "R" commitments are maintained within compliance.

Fire Brigade Specialist

This person currently resides in Emergency Planning. They are responsible for the preparedness, readiness, training, and coordination of all drill exercises for the site fire brigade members. The FPE assists the Fire Brigade Specialist in drill preparation, location, expectations and in drill response observations. The FPE is responsible for assisting in the maintenance of the Pre-Fire Plan, which is owned by the Fire Brigade Specialist.

Facilities and Maintenance Coordinator

This person works for Corporate Facilities. They are responsible for the fire protection features associated with those structures on Oconee Nuclear site that do not contain structures, systems, and components that are important to nuclear safety and/or covered by the nuclear insurer. This person also manages those individuals directly or indirectly that perform some of the preventative maintenance programs on fire hoses, extinguishers, detection and suppression systems, and misc. equipment repair.

Operations, Radwaste, SPOC and Plant Maintenance

These plant organizations are responsible for the daily general plant maintenance, testing, and inspection of fire protection systems located within the Protected Area..

Environmental Management Chemical Control Coordinator

This person is responsible for identifying to the fire protection engineer any new chemicals allowed on-site that would increase the combustible/flammable loading while the product is "In-Use" or in storage.

Site Personnel

Fire prevention is a concern of all individuals on site. Each person shall notify the Control Room via the emergency number (4911) of any fire. Plant personnel should use normal plant communications to ensure notification to the fire protection engineer or appropriate group of any fire protection feature impairment, unsafe combustible/flammable loading, or suspected fire equipment damage.

Fire Protection Working Group

This team is comprised of each nuclear site's fire protection engineer, the fire brigade specialist from each site and fire protection engineering fleet lead. The Fire Protection Working Group's major goals are communication and team effort on common problems. The Working Group constantly reviews practices, methods, and results to achieve a direct impact on the quality of work practices.

Post-Fire Safe Shutdown Engineer

This was formerly identified as Appendix R Engineer. The purpose of the Post-Fire Safe Shutdown Engineer is to evaluate the effect of plant mods, failures, and configuration changes on the ability to safely shutdown the plant in the event of a fire.

3-Site Post-Fire Safe Shutdown Engineer

This was formerly identified as 3-Site Appendix R Engineer. The purpose of the 3-Site Post-Fire Safe Shutdown Engineer is to promote consistency in thought and share resolution of issues which may impact the ability to safely shutdown the plant in the event of a fire.

References: Design Basis Specification for Fire Protection
Engineering Support Program Document for Fire Protection

3.2.2.4

The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.

The NRC is the considered AHJ for fire protection changes requiring approval. The NRC is notified of changes to the Fire Protection Program in accordance with NSD-320. NSD-320 screens changes to the Fire Protection Program to determine if NRC approval is required.

{Further Action Required – Revise the Design Basis Specification for Fire Protection which is the primary fire protection program policy document to state the NRC is the AHJ for fire protection changes requiring approval.}

References: NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program"

3.2.3 Procedures

Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established:

(1) Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program

Inspection, testing, and maintenance (ITM) for fire protection systems is provided for the following systems. A brief description of the fire protection system and applicable ITM criteria is provided below from the Engineering Support Program Document for Fire Protection. Detailed listings of the applicable surveillance procedures are documented in the Engineering Support Program Document rather than being repeated here.

System	Components/Test/Notes	Frequency
Fire Main System	Main line HPSW system valves and those valves used for fire protection check	Monthly
	Fire hydrants and Post Indicator Valves stroked test and flush	Semi-Annual
	~~Fire water system flow test~~	~~Every three years~~
	Elevated Water Storage Tank (EWST) inspection	Every 5 years
Automatic Suppression Systems	Various fire suppression systems are tested in accordance with NFPA Requirements, except for those systems which could potentially cause inadvertent adverse plant power production interruptions and/or personnel or reactor safety consequences	Varies based on system
Carbon Dioxide Extinguishing Systems	Carbon Dioxide (Cardox) extinguishing system inspection and maintenance	Monthly and semiannual basis
Halon Extinguishing Systems	Vault Halon extinguishing system inspection and maintenance	Annual
Fire Detection Systems	Main plant fire detection panel is monitored	Once per shift
	Fire detection panel and Honeywell detectors check	Monthly
	Accessible fire detectors physical check	Semi-annual
	Detector sensitivity check	Annual
Standpipe Systems	Fire hose inspection	Monthly
	Hose hydro test	Hoses considered to be influenced by the environment annually; all others on a 3 year schedule
	Fire hose in containment inspection	Refueling outage or at any time the building is open for

System	Components/Test/Notes	Frequency
		more than 30 days during a cycle
Portable Fire Extinguishers	Fire extinguisher check	Monthly
	Fire extinguisher inspection	Annually
	Carbon Dioxide and Dry Chemical extinguisher hydro	6 year
Fire Pumps	The HPSW pumps are currently tested to both NFPA and ASME Section XI requirements because these pumps serve a dual function	The NFPA requirement is monthly and the ASME requirement is quarterly
Fire Brigade Equipment	Fire brigade equipment inspection and maintenance	Quarterly
Fire Barriers and Penetration Seals	Penetration seal and fire stop inspection	1. Ten percent of each type of NRC committed fire barrier penetration seal every 18 months with all seals within 15 years 2. 100% of the exposed surface of each rated barrier every 18 months
Fire Doors	Fire door inspection	Bimonthly
Fire Dampers	Fire damper inspection	1. Ten percent of the NRC committed fire dampers every 18 months with all fire dampers within 15 years 2. Electrically controlled fire dampers that use sensors to close in the cable and equipment rooms annually

Reference(s): Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection

(2) Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration

Fire protection systems credited for the fire protection program are documented in the

Oconee Selected Licensee Commitments (SLCs) 16.9.1 through 16.9.6. The Selected Licensee Commitments include inspection and testing requirements for those fire protection systems and features which are committed to be functional. SLCs also specify remedial actions to be taken in the event that a system or feature is inoperable. Directions for compensatory actions when systems credited by the fire protection program are not operable are provided in the SLC 16.9.1 through 16.9.6, NSD 316 and S.D. 3.2.14. These documents provide the roadmap and direction to be taken in the event a system is impaired.

NSD-316, "Fire Protection Impairment and Surveillance" provides the requirements and responsibilities for reporting fire protection feature impairments and ensures proper compensatory actions are satisfied for licensing, insurance and good fire protection practices. Impairments include any action or condition which inhibits any fire protection feature to function as designed. Compensatory actions are the steps taken to minimize the fire risk potential due to a fire protection feature impairment such as staging backup suppression, temporary fire detection, fire watch tours, etc. This directive provides the directions and requirements to notify the fire brigade of any fire impairment to ensure restoration of impaired features occurs in a timely manner. This directive applies to all fire protection features in the owner controlled area, and to all work groups that impair fire protection features.

Oconee Nuclear Site, Site Directives Manual S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process," assigns responsibilities for actions and provides direction, including process charts, for actions to be taken when a fire protection component or system is not operable. The Site Directive also provides a table that lists fire protection program components, any associated Technical Specification or Selected Licensee Commitment (SLC) and the actions to be implemented if that component is impaired.

Reference(s): NSD-316 "Fire Protection Impairment and Surveillance"

S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process"

SLC 16.9.1, .2, .3, .4, .5, .6

(3) Reviews of fire protection program — related performance and trends

Reviews of the Fire Protection Program are conducted on a routine basis to evaluate performance and determine if any trends exist. The scope and responsibilities for those reviews are listed in Section 6.1 "Parameter Monitoring and Trending" of the Engineering Support Program Document for Fire Protection. The results of the reviews are provided in an annual Fire Protection Program Heath Report. In addition, internal 3-year audits and 3-year NRC triennial audits are performed.

Reference(s): Engineering Support Program Document for Fire Protection

EDM-201 "Engineering Support Program"

(4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program

All physical plant modifications and procedure changes are screened for the impact on the fire protection program.

NSD-301 "Engineering Change Program" provides the requirements for changes to a nuclear facility. A table is provided for a screening process for potential Fire Protection System impacts.

Engineering Design Manual (EDM) 601 "Engineering Change Manual" provides detailed information to help the reviewer determine if the change has the potential to impact any fire protection feature. The manual specifies the requirements for changes, permanent and temporary, to the nuclear station. The manual specifies the roles and responsibilities for involved personnel and is applicable to both QA and non-QA structures, systems and components (SSC) and includes the Keowee facility. An extensive screening checklist for fire protection features is provided. In addition, a PRA Impact Review and a Fire Protection (10CFR50.48) Electrical Review is required.

Reference(s): NSD-301 "Engineering Change Program"
EDM-601 "Engineering Change Manual"

(5) Long-term maintenance and configuration of the fire protection program

The fire protection program is maintained through NSD-106.

NSD-106 "Configuration Management" provides the basis for ensuring that Fire Protection Program and its features are properly maintained. Appendix A.106 "Functional Areas for Configuration Management" includes Fire Protection/Appendix R in the listing of Key Processes that are required to be considered to maintain the facility design consistent with the licensing bases and other design bases.

NSD-228 "Applicability Determination", Appendix E includes a specific screening checklist that will direct user to NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program" to determine impact on the Fire Protection Licensing basis.

The NRC approved the ONS Units 1, 2, 3 Operating Licenses in a letter transmittal

dated May 23, 2000 and the associated License Renewal SER. Oconee Units 1, 2 and 3 are licensed to operate until 2033. In order to obtain license renewal, detailed guidelines and commitments were provided to ensure fire protection functions are maintained during the period of extended operation. In the letter, the following was stated regarding the fire protection program: *"Duke Energy Corporation shall implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR for the facility and as approved in the SER's dated August 11, 1978, and April 28, 1983; October 5, 1978, and June 9, 1981 Supplements to the SER dated August 11, 1978; and Exemptions dated February 2, 1982; August 31, 1983; December 27, 1984; December 5, 1988; and August 21, 1989 subject to the following provision:*

> *The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of a fire."*

Reference(s): NSD-106 "Configuration Management"
NSD-228 "Applicability Determination"
NRC Letter to Duke dated May 23, 2000
NRC SER dated May 23, 2000

(6) Emergency response procedures for the plant industrial fire brigade

The Emergency Planning Group oversees the Plant Fire Brigade, training and procedures. The Fire Plan (pre-fire plan) includes Fire Brigade Standard Operating Guidance (SOG) for various emergency responses. The Fire Brigade is provided the Fire Plan which details the potential hazards and the available fire fighting equipment for the plant along with a graphic representation of the layout of the area. Additional details on the Fire Brigade are presented in Section 3.4.

The coordination between the Fire Brigade and other plant groups during a fire emergency is defined in NSD-112. When the Control Room is notified of a fire, Procedure RP/O/B/1000/029 "Fire Brigade Response" is implemented. The procedure instructs the control room personnel on their response and provides direction on managing the conduct of the fire fighting activities including contacting offsite Fire Departments.

Reference(s): Oconee Nuclear Site Fire Plan
NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

Section 3.3 Prevention

A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:

(1) Prevention of fires and fire spread by controls on operational activities

(2) Design controls that restrict the use of combustible materials

The design control requirements listed in the remainder of this section shall be provided as described.

The Oconee Nuclear Station (ONS) fire prevention program is described in the Design Basis Specification for Fire Protection. The Design Basis Specification for Fire Protection identifies activities for fire prevention and design controls for use of combustible materials.

~~Reference(s): Design Basis Specification for Fire Protection~~

3.3.1 Fire Prevention for Operational Activities

The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible.

As part of defense-in-depth, administrative fire prevention programs for hot work, storage of combustibles and flammable material, compensatory action plans, safety precautions and employee training contribute to limit fire ignition and/or growth and ONS. Fire prevention programs are implemented to address the control of ignition sources and the use of transient combustible materials and plant access training includes instruction on fire prevention during General Employee Training (GET).

Reference(s): General Employee Training – Plant Access Training

NSD-104, "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

NSD-314 "Hot Work Authorization"

NSD-316 "Fire Protection Impairment and Surveillance"

3.3.1.1 General Fire Prevention Activities

The fire prevention activities shall include but not be limited to the following program elements:

(1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms.

The prevention of fires and fire spread are managed through administrative controls and training of personnel. All persons who are authorized access to the plant receive instruction in maintaining fire barriers, controlling fire loading and hot work activities, plant emergency alarms, and the proper response to the discovery of a fire.

Reference(s): General Employee Training – Plant Access Training
NSD-313 "Control of Flammable and Combustible Materials"
NSD-314 "Hot Work Authorization"
NSD-316 "Fire Protection Impairment and Surveillance"

(2) Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified.

The responsibilities of the Fire Protection Engineer include periodic surveillance of plant areas for compliance with the Fire Protection Program. Plant Engineers, including the FPE, perform plant walkdowns in accordance with Procedure EM 4.6 "Oconee Engineering Support Program Walkdowns" which provides guidance on observations that should be made including fire hazards. Any unanalyzed fire hazards are documented in the PIP program. Plant inspections may be performed by other groups as delegated by the FPE on other frequencies.

Reference(s): EM 4.6 "Oconee Engineering Support Program Walkdowns"
Engineering Support Document for Fire Protection

(3) Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized.

All plant modifications and changes are screened for impact on the plant fire protection program through NSD-301, NSD-228, and/or EDM-601.

NSD-301 "Engineering Change Program" provides the requirements for evaluation of changes to a nuclear facility. A table is provided for a screening process for potential Fire Protection System impacts.

NSD-228 "Applicability Determination", Appendix E includes a specific screening checklist that will direct user to NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program" to determine impact on the Fire Protection Licensing basis.

Engineering Directives Manual (EDM) 601 "Engineering Change Manual" provides detailed information to help the reviewer determine if the change has the potential to impact any fire protection feature. The EDM specifies the requirements for changes, permanent and temporary, to a nuclear station. The Manual specifies the roles and responsibilities for involved personnel and is applicable to both QA and non-QA structures, systems and components (SSC) and includes the Keowee facility. An extensive screening checklist for fire protection features is provided. In addition, a PRA Impact Review and a Fire Protection (10CFR50.48) Electrical Review is required.

Reference(s): NSD-228 "Applicability Determination"

NSD-301 "Engineering Change Program"

NSD-320 "Guidance for Performing Licensing Review of Proposed Changes to the Fire Protection Program"

EDM-601 "Engineering Change Manual"

3.3.1.2 Control of Combustible Materials

Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented.

Control of combustible materials at ONS is implemented through NDS-313, NSD-104 and EWP 7.2.

The control of combustible materials is implemented by NSD- 313 "Control of Flammable and Combustible Materials." Control of housekeeping and the amount of material that is taken into the plant is implemented by NSD-104 "Housekeeping, Materiel Condition & Foreign Material Exclusion" which promotes cleanliness and limits the amount of combustible/flammable material. EWP 7.2 "Storing Chemicals" provide specific storage requirements for control of chemicals (including flammable and combustible liquids and gases).

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

EWP 7.2 "Storing Chemicals"

These procedures shall include but not be limited to the following program elements:

(1) Wood used within the power block shall be listed pressure-impregnated or coated with a listed fire-retardant application.

Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated.

NSD-313 requires only fire retardant wood be used within the power production and safe shutdown areas unless approval is obtained from the FPE. Three exceptions are allowed; dunnage (large timbers) for specific work activities, concrete forming, and where specified on design documents.

{Submit for NRC Approval – NFPA 805 only permits fire retardant treated wood or dunnage. NSD-313 permits concrete forming or per design documents.}

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

(2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent.

NSD-313 specifies that only fire resistant plastic (i.e. Griffolyn) be used within the power production and safe shutdown areas.

{Area for Improvement – Revise NSD-313 to specifically address plastic sheeting materials shall conform to NFPA 701 requirements, or equivalent.}

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

(3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first.

NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion" provides direction on maintaining the cleanliness of the plant. The Directive discusses Housekeeping Zones which specify the level of cleanliness for various areas and states that "Upon completion of the maintenance activity, the work supervisor or designee shall ensure the Housekeeping Zone is returned to at least its original condition." The Directive specifies that "During outage work, the Job Sponsor working with the supervisor for the crew will ensure the work area is returned to a normal or better state of appearance once work is complete."

NSD-313 "Control of Flammable and Combustible Materials" provides the following requirements for in-use materials: "At the end of each shift, housekeeping zones/work areas shall be cleared of all unnecessary materials and all waste/trash material removed and properly disposed."

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

(4) Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials.

Control of combustible materials is implemented through NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion." Combustible Material storage and staging areas are specified in NSD-313. The directive discusses the temporary and permanent storage of the various types of combustible materials and provides the Oconee site specific details. The FPE approves the material inventory (limit) for the area and the amount of material can not be changed without approval of the FPE. Changes to the storage restrictions require completion of a change form and approval by the FPE.

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"

NSD-313 "Control of Flammable and Combustible Materials"

(5) Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.

The controls on the use and storage of flammable and combustible liquids are specified in NSD-313. NSD-313 references NFPA 30 as a source document for use and storage of flammable and combustible liquids. EWP 7.2 provides specific storage requirements for control of chemicals (including flammable and combustible liquids) and references NSD-313.

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

EWP 7-2 "Storing Chemicals"

(6) Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.

The controls on the use and storage of flammable gases are specified in NSD-313. NSD-313 references NFPA 55 and OSHA as source documents for use and storage of flammable gases. EWP 7.2 provides specific storage requirements for control of chemicals (including flammable gases) and references NSD-313.

Reference(s): NSD-313 "Control of Flammable and Combustible Materials"

EWP 7-2 "Storing Chemicals"

3.3.1.3 Control of Ignition Sources

3.3.1.3.1

A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

NSD-314 "Hot Work Authorization" specifies the controls for performing hot work and the responsibilities of the persons authorizing and performing the activity. The directive requires inspections of the locations by trained personnel prior to hot work activity to ensure that there are no fire hazards present. There are Special Precautions from the FPE and EH&S for various situations that require additional levels of review and approval for granting a Hot Work Permit. NFPA 51B is a source document to NSD-314. NSD-314 is periodically updated.

ONS has not identified NFPA 241 as a NFPA code of record. In addition, NFPA 241 references NFPA 51B with regards to the requirements for administration of Hot Work.

{Area for Improvement – Evaluate NSD-314 to determine if NFPA 241 should be referenced.}

Reference(s): NSD-314 "Hot Work Authorization"

3.3.1.3.2

Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.

Ignition sources including smoking are restricted to designated areas or controlled through a permitting process.

NSD-104 restricts the use of smoking and tobacco products to areas clearly posted as a tobacco use area and provides approved receptacles for waste.

NSD-314, Hot Work, specifies controls of ignition sources typically associated with hot work including permitting and designation of areas where a permit is not required.

Reference(s): NSD-104 "Housekeeping, Materiel Condition, and Foreign Material Exclusion"
NSD-314 "Hot Work Authorization"

3.3.1.3.3

Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.

The Duke response to Appendix A to BTP 9.5-1 states "Open flames or combustion generated smoke is not permitted at ONS for leak or air flow testing. Leak and air flow determinations are accomplished by using commercially available aerosol or soap bubble techniques. Candles may be permitted for search of secondary system condenser vacuum leaks. The secondary system condenser is removed from safety related equipment."

1978 SER Section 6.5 states *"Use of open flames or combustion generated smoke for leak detection in safety-related areas has been prohibited.*

We find that the control of ignition sources conform to the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

{Further Action Required – Revise the appropriate station procedure(s) for leak or air flow testing to preclude the use of open flames or combustion generated smoke.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

NRC SER dated August 11, 1978

3.3.1.3.4

Plant administrative procedure shall control the use of portable electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.

The use of portable heating devices is controlled by NSD-316 "Fire Protection and Impairment Surveillance." The Directive defines a heating device as "A temporary heater that uses greater than or equal to 220 Volts or is powered by a fossil fuel source and is used to heat a general area, enclosure or equipment." Site personnel are responsible for notifying the FPE of any intended use of a heating device(s).

Site Directive 3.2.14 provides a flow chart for measures to take when temporary heaters are installed. This includes consideration of location and risk. The group that requests the placement of the temporary heating device shall be responsible to ensure that fire watches are initiated. A passive fire watch shall be conducted at least once every six (6) hours but may be more frequent if determined by the FPE. Fire watches shall be documented by use of the Impairment and Compensatory Measures (ICM) Form in NSD-316.

NSD-316 specifies only steam heaters, UL Listed or FM Approved electric heaters, gas (MAPP, LP, or natural) or oil-fired heaters shall be allowed inside buildings. Gasoline and other fuels are not permitted unless approved by the FPE.

{Submit for NRC Approval – S.D. 3.2.14 and NSD-316 permit fossil fuel (gas and oil-fired) heaters.}

Reference(s): NSD-316 "Fire Protection and Impairment Surveillance."
S.D. 3.2.14 "Fire Protection Program Compensatory Measures Process"

3.3.2 Structural

Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction.

Oconee is designed to minimize the probability of fire and explosion. Non-combustibles and fire-resistant materials were used whenever practical throughout the facility.

The Reactor Building is built using fire resistive construction. The outside walls of the Reactor Building are post-tensioned concrete for the three reactor structures. The roof and supports are also post-tensioned concrete for the three reactor structures. Interior partition walls are concrete containment or shield type walls between reactor, steam generators, coolant pumps, etc. Floors and supports are concrete on grade and various mezzanine levels are supported by concrete beams.

The Auxiliary Building is a free standing reinforced concrete structure composed of concrete frames, slabs, and walls and non-structural masonry walls. The facility has exterior walls that are reinforced concrete with fire resistive construction. Interior partition walls are mainly concrete with portions of concrete block. The roof and supports are approved insulated roofing on concrete slab supported on concrete members. Floors and supports are concrete slab on concrete members.

The Turbine Building is constructed of reinforced concrete below grade consisting of substructure walls and a mat foundation. Above grade, the building consists of structural steel with metal siding. The steel roof deck is supported by unprotected steel frame. Exterior walls are noncombustible, insulated aluminum siding on unprotected steel frame with concrete at lower levels below grade. Interior walls are reinforced concrete and concrete block.

Reference(s): Design Basis Specification for Fire Protection

3.3.3 Interior Finishes

Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.

The Duke Comparison to BTP 9.5-1 letter and the UFSAR Section 9.5.1.4.1.4 state "Interior wall, structural components and radiation shielding are non-combustible. Coatings are non-combustible with flame spread and fuel contribution of 50 or less."

NSD-318 "Coatings Program" controls the use of coatings and requires approval for any changes. Records of coating applications are required to be maintained.

{Further Action Required – Revise NSD-318 to include the specifications for Class A walls/ceilings and Class I floor finishes or include in an alternative administrative control document.}

Reference(s): NSD-318 "Coatings Program"

UFSAR Section 9.5.1.4.1

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.3.4 Insulation Materials

Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.

The thermal insulation materials used in the power production plant are non-combustible Specifications OSS-0241-00-00-002 and OSS-0241.00-00-0004 state thermal insulation materials are metal reflective type (mirror), calcium silicate, Armaflex, fiberglass and basaltic rock. These insulations are all classified as non-combustible or limited combustible materials.

Any new insulation materials would require a screening determination in accordance with EDM-601 "Engineering Directives Manual." Part of the screening process is an evaluation of the potential effects on the Fire Protection Program which would require the use of noncombustible or limited combustible materials.

Reference(s): Specification OSS-241.00-00-0004 "Conventional Thermal Insulation"

Specification OSS-241.00-00-0002 "Reactor Building and Piping Heat Insulation (Metal Reflective Type)

EDM-601 "Engineering Directives Manual"

3.3.5 Electrical

3.3.5.1

Wiring above suspended ceiling shall be kept to a minimum. Where installed, electrical wiring

shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.

The Duke Comparison to BTP 9.5-1 letter and the UFSAR Sections 9.5.1.4.1 and 9.5.1.4.3 state "Suspended ceilings and their supports are non-combustible. Combustibles in concealed spaces are minimal. There are no power and control cables in the Control Room concealed floor or ceiling space except for miscellaneous 120V power and network cables in the ceiling space supplying small OAC computer room equipment."

{Further Action Required – Include clear documentation that electrical wiring (including data/phone/video cabling) is installed above suspended ceilings the wiring complies with this section.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.1 and Section 9.5.1.4.3

Design Basis Specification for Fire Protection

3.3.5.2

Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components.

The Duke Comparison to BTP 9.5-1 and the UFSAR Section 9.5.1.4.3 state "Cable trays are constructed of non-combustible materials." The Design Basis Specification for Fire Protection states "Cable trays are constructed of steel with all supports attached to QA condition 1 or 4 structures."

{Further Action Required – Include clear documentation that conduits used for electrical raceways are metal and thin walled metallic tubing is not used in accordance with this section.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

Design Basis Specification for Fire Protection

3.3.5.3

Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ.

The IEEE 383 Standard was developed after Oconee cables were was installed, however, the same cable construction has been used at a later plant and was found acceptable under IEEE 383.

The NRC August 11, 1978 SER Section 4.8 states *"The cable insulation used in the plant consists of armored ethylene propylene rubber (EPR) of 5-8 KV cables with a polyvinyl chloride (PVC) jacket, armored EPR with hypalon or neoprene jacket outside containment and armored EPR with hypalon jacket, some with a PVC jacket overall, for inside containment. The majority of cables at Oconee are of the metallic armored type. The IEEE standard was not in effect at the time the plant was constructed and therefore the cables were not required to meet IEEE 383. The licensee has stated, however, that the same cable construction has since been used at a later plant where the IEEE 383-1971 criteria were imposed and the cable was acceptable. We find that to retest the IEEE 383 procedure and criteria is unnecessary and would not provide information that would alter our recommendation or conclusions. Accordingly we find the electrical cables used at the Oconee Nuclear Station acceptable."*

{Further Action Required – Revise station documentation that non-rated cables (including data/phone/video) shall not be routed in cable trays with nuclear safety related cables.}

Reference(s): NRC SER dated August 11, 1978

3.3.6 Roofs

Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings.

The Auxiliary Building, Reactor Building and SSF do not utilize metal roof deck construction.

The Turbine Building has metal roof deck construction. The Design Basis Specification for Fire Protection Section 3.2.2.1.1.1 states *"The roof was constructed in accordance the Kopper Company's Specification No. 17 and is therefore considered to be in accordance with FM Class 1. In 1985, the Turbine Building roof was re-roofed in accordance with Underwriter's Laboratories Class A single ply roof system. "Fire Rating of OS-159.00-00-0002" states all materials of construction are specified to be selected under FM Approval Guide as non-combustible. It is concluded that the Turbine Building built up roof decking assembly is FM Approval Guide Classification 1, through not specifically stated in the specification."*

The Duke Corporate Roof Program specifies new roofs shall be in compliance with FM-190 which indicates a FM Class I fire resistant roof is required. A FM Class I roof is equivalent to a NFPA 256 Class A roof classification.

Reference(s): Design Basis Specification for Fire Protection

Duke Corporate Roof Management Program

3.3.7 Bulk Flammable Gas Storage

Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.

The Design Basis Specification for Fire Protection, Duke Comparison to BTP 9.5-1 letter and UFSAR Section 9.5.1.4.3 state "There is no bulk gas storage in areas affecting safe shutdown equipment."

The storage of combustible and flammable materials is controlled by administrative procedures (NSD-313, EWP 7.2). General provisions for the use and storage of chemicals, including gases, are controlled by NSD-116 "Nuclear Chemical Control Program."

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

NSD-116 "Nuclear Chemical Control Program."

Design Basis Specification for Fire Protection

EWP 7.2 "Storing Chemicals"

3.3.7.1

Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage.

Bulk storage of Hydrogen Gas is stored in the northeast yard area. There is also a propane storage tank adjacent to the Unit 1 Transformer area. These storage tanks are located outdoors and away from the SSCs important to safety.

NSD-313 "Control of Combustible and Flammable Materials" provided restrictions on the storage location of combustible materials with specific restrictions for the Oconee Plant. Any changes, to the amount of materials or the storage location of materials, require review and approval from the FPE and EWP.

The chemical control program, which is administered in accordance with NSD-116, ensures compliance with applicable regulations and requirements including NFPA Codes. Any changes to the bulk storage of combustible/flammable gases would require authorization in accordance with both NSD-116 and NSD-313.

{Further Action Required – Perform a code compliance review for the outdoor hydrogen storage per NFPA 50A.}

Reference(s): NSD-116 "Nuclear Chemical Control Program"

NSD-313 "Control of Combustible and Flammable Materials"

3.3.7.2

Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings.

The bulk hydrogen storage cylinders are located with the long axis parallel to the buildings in the northeast corner of the yard.

A propane storage tank is oriented with its long axis toward the Unit 1 Turbine Building. The Design Basis Specification for Fire Protection, Duke Comparison to BTP 9.5-1 letter and UFSAR Section 9.5.1.4.3 state "There is no bulk gas storage in areas affecting safe shutdown equipment."

1978 SER Section 3.1.7 states *"Propane tanks located outside the turbine building will be anchored and provided with excess flow valves."*

{Further Action Required – Resolve orientation of propane tank. The tank is not anchored per the SER recommendation. Evaluate if the previous approval by the NRC is sufficient with modification. Alternatively, determine if an evaluation is required or modify the tank position.}

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

UFSAR Section 9.5.1.4.3

NSD-116 "Nuclear Chemical Control Program"

Design Basis Specification for Fire Protection

NRC SER dated August 11, 1978

3.3.7.3

Flammable gas storage cylinders not required for normal operation shall be isolated from the system.

The use and storage of combustible and flammable materials is controlled by NSD-313 and

EWP 7.2. NSD-313 and EWP 7.2 require Compressed Gas Cylinders not in use to be stored with their protective cap in place, adequately secured in an upright position and separated from other flammable/combustible and oxidizing agents. Bulk hydrogen cylinders located in the hydrogen storage areas that are not in use are isolated from the system.

Reference(s): NSD-313 "Control of Combustible and Flammable Materials"
EWP 7.2 "Storing Chemicals"

3.3.8 Bulk Storage of Flammable and Combustible Liquids

Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code.

The storage of combustible and flammable materials is controlled by NSD-313. NSD-313 states that Oconee is proactive in following the guidance of OSHA 29CFR1910 "Fire Protection" and lists NFPA 30-2000, "Flammable and Combustible Liquid Code," as a source document. Additional storage limitations are provided for warehouse storage within power production areas and for materials in the yard areas. The general provisions for the use and storage of chemicals are controlled by NSD-116 which requires authorization for changes to flammable and combustible liquid storage amounts or location. Although listed below for information the Safe Shutdown Facility (SSF) Diesel Generator day tank and the Turbine Lube Oil reservoirs, while located in structures containing systems, equipment or components important to nuclear safety, are part of the operating systems of the plant and are not considered bulk storage.

The fuel oil for the SSF Diesel Generator is provided from a 50,000 gallon underground storage tank to a 550-gallon day tank that is located inside the SSF. The SSF is a Category I structure that is provided with an automatic, total flooding CO_2 system in the diesel generator room that houses the day tank. The SSF buried fuel oil storage tank located outside adjacent to the SSF structure.

There are two aboveground fuel oil tanks (30,000 and 45,000 gallon) for the Auxiliary boiler that are located in the northeast yard. These tanks are located in a diked area and are a considerable distance from the actual power production facility.

Gasoline, diesel fuel oil and kerosene are stored in underground tanks that are located at the site garage area. The tanks are located a significant distance (greater than 1,000 feet) from the actual power production facility.

Turbine Lube Oil is located in the turbine building. The main turbine lube oil reservoir tanks are located in the basement level of each unit and have a capacity of 7,450 gallons. The turbine oil transfer tank and adjoining purifier units have a 14,000 gallon capacity, which is located under the operating floor. Each unit turbine oil transfer tank is arranged

within a four feet high concrete dike designed to hold the entire contents of respective tanks. The adjoining oil purifier unit is located outside of the dike area.

The concrete block lubrication oil storage building, located in the lower level of the Unit 1 Turbine Building contains seven (7) steel tanks, each having a 200-gallon capacity. The storage area has a wet-pipe automatic suppression system, fire doors, and fire dampers in the ventilation openings.

Keowee has a dedicated lube oil tank room. The storage room contains two 7,150 gallon tanks for storage of oil for the turbine generators. The room is protected by an automatic deluge sprinkler system.

{Further Action Requried – Perform a NFPA 30 code review for the Turbine Building lube oil reservoirs, Turbine Building oil storage building and the Keowee lube oil tank room.}

Reference(s): NSD-116 "Nuclear Chemical Control Program"
NSD-313 "Control of Combustible and Flammable Materials"
Drawing OFD-135A-01-01
Design Basis Specification for Fire Protection

3.3.9 Transformers

Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function.

The Main, Auxiliary and Safety Transformers for the three Oconee Units are located outdoors adjacent to their respective portions of the Turbine Building. Each of the transformers is provided with an automatic deluge system. The transformers are mounted on concrete pads within an earthen graveled area. There are no specific retention basins around the main transformers that are designed to retain and direct potential transformer oil leakage to a storage basin or tank. The ground and gravel system will absorb most of the runoff from fire mitigation activities in addition to the yard drain system directing excess flow to Chemical Treatment Pond (CTP) #3. CTP #3 is provided with oil skimmers.

Transformer CT-4 is located in the Unit 1/2 Blockhouse. A concrete oil retention basin is provided under the Blockhouse.

The Keowee Transformer is located outside on the West side of the hydro station and is provided with an automatic deluge system. The transformer is mounted on a concrete pad with a gravel bed similar to those discussed above.

{Further Action Required – Revise station test procedures to include drainage inspections as part of the annual flow tests.}

Reference(s): Engineering Support Document for Fire Protection
Design Basis Specification for Fire Protection

3.3.10 Hot Pipes and Surfaces

Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the prompt cleanup of oil on insulation.

NSD-104 addresses general housekeeping requirements that apply to all personnel (permanent and temporary) that perform activities at the plant. The NSD emphasizes the plant areas should be clean and orderly with properly maintained work areas and equipment.

NSD-413 "Fluid Leak Management Program" was established to ensure aggressive identification of leaks followed by timely investigation and repair. The Leak Management Program encompasses all fluid leaks which may include high-energy process fluids steam, water, oil, hydraulic fluid, etc occurring throughout the Plant.

{Area for Improvement – Revise NSD-104 and/or NSD-413 to clearly indicate it is a NRC requirement to promptly remove oil from insulation.}

Reference(s): NSD-104 "Housekeeping, Materiel Condition & Foreign Material Exclusion"
NSD-413 "Fluid Leak Management Program"

3.3.11 Electrical Equipment

Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.

Placement of combustible materials that could be located near electrical equipment is controlled by NSD-104 and NSD-313. NSD-313 includes specific guidance on the location of transient fire loads adjacent to plant equipment susceptible to fire damage (e.g. electrical cabinets).

{Further Action Required – Revise NSD-313 to specify the combustible free distance consistent with the PRA Zone of Influence for transients}

Reference(s): NSD-104 "Housekeeping, Materiel Condition & Foreign Material Exclusion"
NSD-313 "Control of Combustible and Flammable Materials"

3.3.12 Reactor Coolant Pumps

For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply.

(1) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and nonpressurized leakage sites in each reactor coolant pump oil system.

A lube oil collection system was installed for each of the Reactor Coolant Pumps (RCPs) at the Oconee Plant – each of the three units has four RCPs. The RCP oil collection systems are designed and sized to collect and contain oil from potentially pressurized and unpressurized leakage areas in a seismic event resulting in failure of the lubrication system. The Reactor Coolant Pump (RCP) Lube Oil System for each reactor coolant pump contains approximately 250 gallons of oil in upper and lower tanks, self-contained within each RCP assembly.

Reference(s): Duke Letter to the NRC dated March 18, 1981

Design Basis Specification for Fire Protection

Letter Duke to NRC, PIP O-99-2532/LER 270/1999-04, February 16, 2000

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

(2) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system.

Any potential leakage is collected and drained to a collection tank sized to accommodate the largest potential leak system inventory (250 gallons). The collection tanks are located in the basement of the Reactor Building.

Reference(s): Duke Letter to the NRC dated March 18, 1981

(3) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback.

A flame arrestor is provided for each of the RCP oil collection tank vents.

Reference(s): Duke Letter to the NRC dated March 18, 1981

(4) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps.

Potential leakage points on the pump motor that are protected include the lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines and lube oil reservoirs.

Reference(s): Duke Letter to the NRC dated March 18, 1981

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(5) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin.

Potential leakage is collected and drained through an appropriately sized drain line into the collection tank. The collection tank is sized to accommodate the largest potential leak, the entire system inventory of 250 gallons.

Reference(s): Duke Letter to the NRC dated March 18, 1981

Section 3.4 Industrial Fire Brigade

3.4.1 On-Site Fire-Fighting Capability

All of the following requirements shall apply.

(a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:

(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)

(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program

(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians

Oconee takes exception to the following sections of the aforementioned NFPA standards:

- NFPA 600 (2005) Chapter 4 Section 4.4, "Requirements for all Industrial Fire Brigades." ONS is structured differently than those described in this section. While all

requirements are addressed they are not all the responsibility of the Fire Brigade Leader.

- NFPA 600 (2005) Chapter 4, Section 4.7 "Industrial Apparatus." ONS has no apparatus.

NFPA 1500 and 1582 are not applicable to ONS per in their respective scope statements and consistent with FAQ 06-0007.

- NFPA 1500 (2007) Chapter 1 "Administration" Section 1.3.2 states "This standard does not apply to Industrial Fire Brigades that might also be known as Emergency Brigades, Emergency Response Teams, Response Teams, Fire Teams, Plant Emergency Organizations, or mine emergency response teams."
- NFPA 1582 (2007) Chapter 1 "Administration" Section 1.1.4 states "This standard does not apply to Industrial Fire Brigades that might also be known as Emergency Brigades, Emergency Response Teams, Response Teams, Fire Teams, Plant Emergency Organizations, or mine emergency response teams."

The required staffing levels for the Oconee Plant are specified in SLC 16.13.1 "Minimum Station Staffing Requirements." NSD-112 "Fire Brigade Organization, Training & Responsibilities" provides the requirements for becoming a qualified fire brigade member.

When the Control Room alerts the Fire Brigade to a fire, Radiation Protection and Security Personnel are also alerted and tasked to assist the Fire Brigade in accordance with Procedure RP/O/B/1000/029 "Fire Brigade Response."

{Area for Improvement – Ensure the NFPA 600 code review is included in the Fire Brigade Functional Area Management (FAM) Manual.}

Reference(s): Selected Licensing Commitment (SLC) 16.13.1 "Minimum Station Staffing Requirements"

NSD-112 "Fire Brigade Organization, Training & Responsibilities"

RP/O/B/1000/029 "Fire Brigade Response"

(b) Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.

ONS uses a fire brigade made up of five members from Operations and five additional members. ONS does not use a dedicated fire department organization. NSD-112 states that Fire Brigade members are informed of their responsibilities at the beginning of each shift and during a fire emergency will respond under the direction of the Fire Brigade Leader and perform all duties to control, extinguish and restore the station to a safe condition. SLC 16.13.1 states minimum station staffing requirements and includes in the bases that staff is required for fire brigade independent of other responsibilities.

Reference(s): SLC 16.13.1 "Minimum Station Staffing Requirements"
NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance

Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria.

NSD-112 states that the Fire 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 (have completed OPS ISS Training).

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(d) The industrial fire brigade shall be notified immediately upon verification of a fire.

Plant employees receive general employee training that includes notifying the control room via the telephone using 4911 of a discovered fire. Once a fire is confirmed via the first responder verifies the fire (or Control Room received multiple indication) the fire brigade is dispatched. NSD-112 states that Control Room personnel are responsible for initiating Fire Brigade response.

The fire brigade is dispatched using two methods; a paging system that activated pagers worn by fire brigade members and the plant paging system. Both methods are used in each event.

Reference(s): General Employee Training – Plant Access Training
NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

(e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment.

NSD-112 requires that prior to initial training and annually thereafter, each fire brigade member will receive a physical examination by a company approved medical professional to assure that they are medically capable of performing strenuous activities. Each fire brigade member must satisfactorily complete and maintain respirator use clearance as determined by

the Corporate Medical Department.

NSD-112 states that for Fire Brigade Leaders and Members to remain qualified they must pass a medical examination, respiratory training and respirator fit test. The specific program requirements are listed in ERTG-001 "Emergency Response Organization and Emergency Services Training Program."

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

3.4.2 Pre-Fire Plans

Current and detailed pre-fire plans shall be available to the industrial fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5.

Current and detailed fire plans are provided in the Oconee Nuclear Site Fire Plan (Fire Brigade Strategies) for all plant locations that contain systems or components that could impact nuclear safety performance or present a potential for radioactive releases or life safety.

Reference(s): Oconee Nuclear Site Fire Plan

3.4.2.1

The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.

The Fire Plan provides a graphic representation of the various plant areas that depicts the installed fire protection/suppression features. In addition to the suppression features, the Fire Plan also provides information of any equipment important to safety and special hazards (e.g. Radiological, Electrical, Chemical, Physical and Flammable Liquids Gases) that could be encountered. The Fire Plan also provides information on available ventilation equipment.

The Fire Plan includes Fire Brigade Guides (SOGs) that provide general instructions for the fire brigade hose selection and use and specific hazards consideration such as electrical and bulk Hydrogen fires, hazardous materials response and other generic fire mitigation tactics.

{Area for Improvement – Evaluate the Fire Plan and associated documents (SOG, training materials, and directives) to ensure the minimum pre-plan content listed in FAQ 06-0025 is addressed.}

Reference(s): Oconee Nuclear Site Fire Plan

3.4.2.2

Pre-fire plans shall be reviewed and updated as necessary.

The Fire Plan is maintained by the Emergency Planning Group and is updated as required. Modifications to plant features and equipment and changes to plant procedures require a determination of potential effects on the fire protection program or features; potential impacts may lead to revision or additions to the Fire Plan.

NSD-301, Appendix B, "Technical Issues Checklist" includes a specific line item for impact on the fire plan. NSD-228, Appendix E, "Fire Protection Program Screening Aid" includes review of the impact on the Fire Brigade which utilize the Fire Plan.

Reference(s): NSD-228 "Applicability Determination"
NSD-301 "Engineering Change Program"

3.4.2.3

Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade.

The Fire Plan is available to the Fire Brigade Leaders and Members as well as Control Room Personnel. A copy is located in each CR, FB leader's locker, NEO Supervisor's office and the FB Leader's kit.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
Oconee Nuclear Site Fire Plan

3.4.2.4

Pre-fire plans shall address coordination with other plant groups during fire emergencies.

The coordination between the Fire Brigade and other plant groups during a fire emergency is defined in NSD-112. When the Control Room is notified of a fire, Procedure RP/O/B/1000/029 "Fire Brigade Response" is implemented. The procedure instructs the control room personnel on their response and provides direction on managing the conduct of the fire fighting activities including contacting offsite Fire Departments.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

3.4.3 Training and Drills

Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities.

(a) Plant Industrial Fire Brigade Training. All of the following requirements shall apply.

(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600, Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate.

(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire.

(3) A written program shall detail the industrial fire brigade training program.

(4) Written records that include but are not limited to initial industrial fire brigade classroom and hands-on training, refresher training, special training schools attended, drill attendance records, and leadership training for industrial fire brigades shall be maintained for each industrial fire brigade member.

The fire brigade training program includes the following essential elements: use of fire fighting equipment, fire fighting principles and techniques, use of fire fighting guidelines (SOGs), annual practices in actual fire fighting and periodic fire drills. The drills implement the fire fighting procedures, including the simulated use of equipment, to assess brigade effectiveness. The drills also evaluate brigade leadership and Control Room coordination for plant control.

NSD-112 states that for Fire Brigade Leaders and Members to remain qualified they must, among other requirements, participate in an annual practical training session, quarterly training sessions and participate in at least two drills per year. NSD-112 references NFPA 600 as a source document. NFPA 1500 is not applicable to ONS. Specific training requirements are specified in ERTG-001 "Emergency Response Organization and Emergency Services Training Program." Records of personnel participation in the training sessions are maintained by the training department.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

(b) Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the

industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade.

The Oconee Nuclear Station maintains a large fire brigade size and does not utilize non-fire brigade qualified personnel to respond to a fire. Persons who perform Fire Watch duties for Hot Work are qualified in the use of the fire extinguisher and are authorized to extinguish any resulting fire of the hot work within their capabilities.

Other non-fire brigade personnel that may response to a fire incident include Security, Radiation Protection, Chemistry, Off-Site Fire Department and the Medical Emergency Response Team (MERT). These personnel are trained for interfacing with the Fire Brigade. The Fire Brigade Leader is the overall Incident Commander and uses other personnel as support.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills "

(c) Drills. All of the following requirements shall apply.

(1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade.

Drills are performed quarterly for each shift fire brigade. At least one drill per year for each shift fire brigade is unannounced; at least one drill per year for each shift fire brigade is performed on a back shift.

At least one drill annually involves a response from the appropriate local fire department(s). Site fire brigade/local fire department interface is critiqued by both site and local fire department staff.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario.

Each fire drill is pre-planned to establish training objectives and critiqued to determine how well the objectives are met. The Fire Brigade drill performance is critiqued by controllers/evaluators to determine successful drill performance in accordance with

stated drill objectives. Performance is documented utilizing the Fire Drill Critique Sheet.

Drills are pre-planned to determine the appropriate number of controllers/evaluators needed to effectively assess the Fire Brigade Response.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills "

(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards.

Procedure PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills" specifies that drills be conducted with onsite and local offsite fire department personnel. On-site drills are required to be conducted involving different areas and hazards, including "Risk Significant" areas. Fire drills including response of the offsite Fire Departments are conducted annually.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

ERTG-001 "Emergency Response Organization and Emergency Services Training Program"

PT/O/B/2000/001 "Preparation and Conduct of Emergency Drills"

(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team.

A completed Fire Drill Critique Sheet (Appendix B) and Training Content Summary form shall be sent to the Site Training Division is sent to Document Control for documentation and retention. Retention in document control is life of plant. Performance deficiencies of a shift fire brigade or individual fire brigade members will be noted and appropriate action taken and documented in the corrective action program.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

(5) A critique shall be held and documented after each drill.

A critique is performed for each drill that involves the fire brigade in accordance with NSD-112. The completed Fire Drill Critique Sheet and Training Content Summary form is required to be sent to the Site Training Division for documentation and retention. Site Training transmits the records to Document Control for documentation and retention. Retention in Document Control is life of plant.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"

3.4.4 Fire-Fighting Equipment

Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards.

Fire Fighting Equipment is located in various fire areas. The areas are shown graphically and described in the Fire Plan for that area. Fire Brigade Equipment is also specified in the SOG section of the Fire Plan. The equipment is listed by location and includes items such as air packs, spanners, smoke ejectors and nozzles. Hose stations and hydrant houses contain sufficient lengths of hose and nozzles.

Fire Brigade personnel turnout gear and air packs are stored in specified fire equipment storage locations. Ops equipment is stored in two storage containers on the Turbine deck. Backup gear is stored in the warehouse. Each Fire Brigade member is furnished with a complete set of turn out gear consisting of pants, coat, boots, gloves, helmets and flash hoods. Radios are provided for communication in the Fire Brigade Response storage location. Other equipment available to the brigade includes portable lights, thermal imaging camera, portable ventilation as well as portable generators. Other supporting groups' equipment is stored in their respective work spaces.

Air Packs (SCBA's) provided for the brigade are NIOSH approved one hour air bottles with integrated PASS devices as well as amplified SCBA masks. Additional masks are provided within each of the two response sea-lands. In addition to spare air bottles ONS has an electric and a portable a diesel compressor capable of refilling SCBA bottles. Radiation Protection is responsible for the SCBA refill operation. SCBA refill can be performed via the cascade system or the breathing air system.

This equipment is inspected in accordance with Procedure PT/O/B/0250/030 "Quarterly Fire Brigade Equipment Inspection." to ensure the operability and availability of all Fire Brigade equipment. The Keowee Fire Brigade Equipment is inspected in accordance with Procedure PT/O/A/2200/010 "Keowee Equipment Inspection."

Fire protection equipment is procured and conforms to the applicable NFPA standards for the specific equipment.

Reference(s): Oconee Nuclear Site Fire Plan
PT/O/B/0250/030 "Quarterly Fire Brigade Equipment Inspection"
PT/O/A/2200/010 "Keowee Equipment Inspection"

3.4.5 Off-Site Fire Department Interface

3.4.5.1 Mutual Aid Agreement

Off-site fire authorities shall be offered a plan for their interface during fires and related emergencies on site.

There are "Letters of Agreement" with local Fire Departments that provide details of the interaction of their organization during a fire or related emergency on the Oconee Site. These Letters of Agreement are maintained as part of the Emergency Plan.

Letters of Agreement are in effect with the Corinth-Shiloh Volunteer Fire Department, the Keowee Fire Commission, the Keowee-Ebenezer Volunteer Fire Department, and the Six Mile Volunteer Fire Department. These Letters of Agreement are reviewed by established frequency as required by the Emergency Planning Group.

The primary response for fires inside the protected area is the ONS fire brigade with support from off-site fire departments. The primary response for fires outside the protected area is the off-site fire departments. Except for Keowee Hydro where the ONS fire brigade will respond with assistance from the off-site fire departments.

Reference(s): Oconee Emergency Plan

3.4.5.2 Site-Specific Training

Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually.

NSD-112 specifies that at least one fire drill annually will involve response from the appropriate local fire department(s). Site fire brigade/local fire department interface will be critiqued by both site and department fire protection staff. It is the intent to have off-site fire response act as supplemental support and integrate into the site team, but not act independently.

The Letters of Agreement discussed above contain provisions for annual training of off-site personnel who would respond to an assistance request.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
Oconee Emergency Plan

3.4.5.3 Security and Radiation Protection

Plant security and radiation protection plans shall address off-site fire authority response.

NSD-112 "Fire Brigade Organization, Training & Responsibilities," contains requirements that the Security and Radiation Protection organizations assist the fire brigade. The Security and Radiation Protection organizations have plans and provisions that provide for the entry and activities of outside fire fighting organizations.

If offsite assistance is determined to be needed during a fire emergency, Procedure RP/O/B/1000/029 "Fire Brigade Response" provides direction to the Control Room personnel on contacting the off-site Fire Department and request assistance. The Fire Dispatcher is instructed to have the responding fire department enter the site through the prescribed entrance and have all responders stage in the appropriate parking lot. The Control Room also contacts Site Security and requests that a security officer escort the fire department(s) to the fire staging location.

Off-site fire response may be provided TLD's and electronic dosimeters from Radiation Protection if required.

The instructions on the methods to be used to contact the off-site fire emergency agencies, as well as site Security and Radiation Protection personnel, are provided in Procedure RP/0/B/1000/029.

Reference(s): NSD-112 "Fire Brigade Organization, Training & Responsibilities"
RP/O/B/1000/029 "Fire Brigade Response"

3.4.6 Communications

An effective emergency communications capability shall be provided for the industrial fire brigade.

The primary means of communication is the two-way radio system, which has a fixed location repeater base station located above the Unit 1/2 Control Room in the Ventilation Equipment Room. If the repeater is lost to fire, the system can continue to function on the "talk around" channel. This system assures general coverage of the Turbine Building, Auxiliary Building, and Containment Building areas. The redundant repeaters receive emergency power and the individual radios have their own batteries. PIP-0-O99-02753 verified that a radio system is in place which satisfies the above requirements.

Reference(s): Design Basis Specification for Fire Protection
PIP-0-O99-02753

Section 3.5 Water Supply

3.5.1

A fire protection water supply of adequate reliability, quantity, and duration shall be provided by one of the two following methods.

(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies.

The High Pressure Service Water (HPSW) System provides water for the fire protection system at the Oconee Plant. The HPSW system is connected to the Condenser Circulating Water (CCW) crossover header. The CCW piping is connected to Lake Keowee at the intake structure. This suction source would remain available on loss of power to the intake pumps because the system can be operated as a siphon. The lake has sufficient inventory (over 390,000 acre-feet) of water available. There are facility operational limitations based on the lake level in SLC 16.9.7 "Keowee Lake Level," that ensures an adequate supply of water is available. In addition, a 100,000 gallon elevated water storage tank has inventory which is available to provide limited back-up water for fire protection.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction from separate circulating cooling water (CCW) system headers. The CCW system is supplied from Lake Keowee by pumps at the intake structure; the lake water would still be available on loss of power to the intake pumps because the system can operate as a siphon. The lake water supply has over 390,000 of water available."*

"In addition to the HPSW pumps, a 100,000 gallon elevation water storage tank floats on the HPSW system provides a backup fire protection water supply."

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The LPSW system provides water to hose stations within the Reactor Buildings. The LPSW pumps takes suction from the CCW crossover line and discharge to a common discharge header in the same arrangement as the HPSW pump described above.

The Keowee Hydro Station Water Spray and Fire Hose systems are supplied by the combined Service Water (SW)/Fire Protection Water system. The system is generally supplied via lake head pressure which provides sufficient flow and pressure for most operations. In the event additional flow/pressure is necessary an electric fire pump is provided. A portable gasoline fire pump is also provided in the event the electric fire pump is not in service.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
SLC 16.9.7

(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s) in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service.

The greatest demand for fire protection water is based on 1,000 gpm for fire hose plus 2,571 gpm (all sprinkler heads opened and flowing in the Unit 3 Turbine Building Mezzanine Level Sprinkler System) plus 500 gpm non-fire related service water for a total of 4,071 gpm. Currently the largest NRC committed BTP demand is 1,738 gpm required by the Unit 3 Cable Room Water Spray System. The system demand is 1,238 gpm plus a 500 gpm non-fire related service water demand. A hose stream allowance is not included for this system based upon its expected usage. These demands are all less than the output of one of the HPSW Pumps which is 6,000 gpm.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

{Further Action Required – Ensure any required suppression systems for Chapter 4 are within the design flow capabilities of the fire pumps per NFPA 20.}

Reference(s): Design Basis Specification for Fire Protection
NRC SER dated August 11, 1978

3.5.2

The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.

Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own

suction and both suctions and pumps are adequately separated.

Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service.

The HPSW pumps take suction through the CCW crossover header that is connected to Lake Keowee at the intake structure. The crossover header can be supplied from any units CCW piping/pumps and can be gravity fed.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction form separate circulating cooling water (CCW) system headers."*

"The pumps are located in the turbine building, each in a small masonry room enclosing the pump and motor."

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The Keowee Fire Protection Pump takes its suction from Lake Keowee at the spillway wall. The back-up Keowee fire pump is a portable pump which can draw water from the gravity side of the suction piping.

Reference(s): NRC SER dated August 11, 1978

Design Basis Specification for Fire Protection

Drawing KFD-109A-1.1 "Keowee Hydro Station – Flow Diagram of Service Water System"

3.5.3

Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source.

The pumps used to supply the fire protection systems at the Oconee Plant are not fire pumps but have been accepted by the NRC. As stated in Section 3.5.1, above, the HPSW System provides water for the fire protection system at Oconee. There are two 6,000 gpm (at 117 psig) HPSW pumps. There is also a 500 gpm (at 117 psig) jockey pump in the HPSW System. The jockey pump normally operates to maintain the system pressure on the fire protection headers and also supplies non fire related loads. In the event of a fire, one 6,000 gpm HPSW pump will automatically provide sufficient water for maintaining fire water demands and elevated

water storage tank inventory. The second 6,000 gpm HPSW pump would be available if needed. The LPSW system provides fire water to the Reactor Building hose stations only. The LPSW pumps are rated at 15,000 gpm (at 100 psig) which is more than sufficient for the Reactor Building hose stations. The HPSW jockey pump is not considered part of the required fire pumps.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system. The pumps are electric motor driven receiving power from separate Unit No. 1 buses."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Keowee Hydro Station has a separate Fire Pump to supply hose stations and fixed suppression systems including the Keowee Main Transformer. The Keowee Fire Pump takes suction from Lake Keowee at the spillway structure. The Keowee Fire Pump is rated at 1,150 gpm at approximately 56 feet of head pressure with a shutoff head of 375 psi. A portable pump is provided and may be used in establishing a backup fire fighting system.

Oconee Nuclear Station initiated Problem Identification Program (PIP) 99-4487 to evaluate the HPSW and Keowee Fire Water pumps' capabilities. The result of Calculation KC-2135, Revision 8, that was performed for the Keowee Fire Pump concluded that the flow and pressure available at the Keowee Main Transformer deluge system did not meet NFPA 15-1996 (or -1969 the Code of Record) requirements.

{Further Action Required – Ensure resolution of the Keowee fire pump replacement (PIP O-2001-03492) satisfies the requirement of this section.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PIP 2001-3492
PIP 1999-4487

3.5.4

At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.

There are no permanently installed dedicated diesel engine-driven or electric motor-driven fire

pumps at Oconee. Fire water is supplied via either of the two electric motor-drive HPSW pumps as part of a shared system. The HPSW pump motors are powered from separate buses. HPSW Pump A is located in Oconee 1 and power is furnished directly from 4160V Bus. No. 2 Unit No.1. Power to HPSW Pump B, which is located in Unit 2 along with the jockey pump, is furnished directly from 4160V Bus No. 1 Unit No. 1. The HPSW system is not a seismically designed system. Each HPSW pump is capable of providing 100 percent of the required flow and pressure.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system. The pumps are electric motor driven receiving power from separate Unit No. 1 buses."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

Keowee fire water supply is provided by a non-seismic electric fire pump with a portable gasoline engine-driven fire pump as backup. The backup portable gasoline fire pump is sufficient to supply the fire hose demands at Keowee.

Reference(s): Design Basis Specification for Fire Protection
NRC SER dated August 11, 1978

3.5.5

Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.

HPSW Pump A is located in Unit 1 and HPSW Pump B is located in Unit 2 Turbine Building basement; each in its own small 3-hour rated or equivalent masonry block room. The power cables to the motors are embedded in the concrete floor.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The HPSW pumps are located n the turbine building, each in a small masonry room enclosing the pump and motor. The power supply to each pump extends from the blockhouse via cables which are embedded in the turbine building floor."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The 2005 NRC Triennial Fire Protection Inspection identified that the HPSW control circuit

could be vulnerable from a Turbine Building Fire. A HPSW Vulnerability Evaluation was performed and is documented in PIP-O-05-04125. The vulnerability study determined that although the potential exists for loss of both HPSW pumps, the postulated fire scenarios that result in loss of the pumps would not affect Standby Shutdown System. In addition, in the event of the unavailability of both HPSW pumps, the EWST can provide a limited quantity of water for fire suppression.

Reference(s): NRC SER dated August 11, 1978
PIP-O-05-04125

3.5.6

Fire pumps shall be provided with automatic start and manual stop only.

The HPSW Pumps receive an automatic start signal based on the elevated storage tank level. The pumps can be manually controlled from the Control Room. A modification has been initiated to provide manual stop capabilities (PIP 02-3870).

The NRC August 11, 1978 SER Section 4.3.1.2 states *"The HPSW pumps are operated automatically based on the water level maintained in the elevated water storage tank. The pumps can also be manually started in the control room or at the pump switchgear located in the blockhouse."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Keowee Fire Protection pump automatically starts on receipt of a pressure switch or flow switch alarm. The fire pump can only be stopped manually.

{Area for Improvement – Document the resolution of PIP 2002-3870 for installation HPSW manual stop.}

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PIP 02-3870

3.5.7

Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.

Each HPSW Pump has a separate discharge into the HPSW System. Valves are arranged so that a single pipe break in the discharge piping will not remove both pumps from service.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Each HPSW Pump has a separate discharge into the HPSW System. Valving is arranged so that a single pipe break in the discharge piping will not remove both pumps from service."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area.

The Keowee Service Water system is a shared service water system that supplies cooling to equipment, fire protection equipment driven from the head of the lake, and the Keowee fire protection pump. The Keowee Fire Pump supplies some of the hydroelectric plant's fire system components. There are appropriate sectional and isolating valves in the system.

Reference(s): Design Basis Specification for Fire Protection
NRC SER dated August 11, 1978
Drawing Series OFD-124C
Drawing KFD-109A-1.1

3.5.8

A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.

At ONS a 500 gpm Jockey Pump operates continuously to meet non-fire protection related HPSW loads and to maintain pressure in the fire protection headers. Power for the Jockey Pump is provided from 600 Volt Motor Control Center (MCC) 1XE. The Jockey Pump has no fire protection requirements and is not intended to meet the fire protection demands.

At Keowee, the elevation of the lake maintains header pressure (no jockey pump).

Reference(s): Design Basis Specification for Fire Protection

3.5.9

Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.

The following alarms are provided in the Unit 1 Control Room:

- Jockey pump stopped
- Low HPSW system header pressure
- Low elevated water storage tank level
- Elevated water storage tank overflow.

In addition to standard alarms, the control room computer alarms operators of the HPSW pump start

The Keowee Fire Protection pump start alarms to the ONS Unit 2 Control Room and the Keowee Control Room.

~~Reference(s): Design Basis Specification for Fire Protection~~

3.5.10

An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements.

An underground fire loop (16 inch cement-lined, ductile iron pipe) is provided around the perimeter of the plant site. Post indicator valves are provided and are sealed or locked open to prevent inadvertent closing of valves required open for fire protection. Post indicator valves are arranged to provide isolation to portions of the main for maintenance or repair without shutting off the complete system. Valves will allow other service water systems to be removed from the HPSW system without compromising fire protection systems.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

The Keowee Fire Water System does not have an underground loop. Underground fire water piping supplies two external fire hydrants. Appropriate isolation valves are provided for that portion of the system.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
Drawing series OFD-124C
Drawing KFD-109A-1.1

3.5.11

Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems.

A 16 inch loop is provided around the perimeter of the plant. In-line isolation valves are provided such that a break can be isolated without losing system capabilities from a single break. Connections from this header to the units are redundant. Auxiliary Building headers are fed from a 16 inch line coming from the yard and a 4 inch and 16 inch line from the Turbine Building. The 16 inch line that cross connects the yard loop with the Turbine Building through the Auxiliary Building is normally isolated to reduce the potential consequences of an Auxiliary Building flood event. The isolation valves can be manually opened when the cross connect is required to be placed in service. A 4 inch line from the Turbine Building will remain in service during normal operation in order to supply normal Auxiliary Building HPSW header requirements. The 4 inch line is capable of providing adequate initial HPSW flow and pressure and for fire mitigation and service water demands in all areas of the Auxiliary Building. The 4 inch line contains a 500 gpm flow limiting device. The 500 gpm flow limiting device is sized to supply two 2-1/2" hose stations.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this area."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The modifications referenced above to providing auxiliary building cross-connect have been implemented.

The Keowee fire protection system incorporates isolation valves for the various service water and fire system components.

Reference(s): NRC SER dated August 11, 1978
Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection
Drawing series OFD-124C
Drawing KFD-109A-1.1

3.5.12

Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers.

Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided.

The fire water connections at the Oconee Plant and the Keowee Hydro Station utilize standard fire hose threads that are compatible with local fire department equipment.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.5.13

Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve.

The header system for the Turbine Building and Auxiliary Building sprinkler and standpipe systems are not part of a seismically analyzed hose standpipe system. Each sprinkler and standpipe system is equipped with an approved shutoff valve. During construction ANSI B31.1 excluded fire protection; NFPA codes were applicable at this time.

The NRC August 11, 1978 SER Section 4.3.1.1 states *"The fire protection water supply is provided by the high-pressure service water (HPSW) pumps which take suction from separate circulating cooling water (CCW) system headers."*

"We find that the basic water supply system satisfies the provisions of Appendix A to BTP 9.5-1 and is, therefore, acceptable."

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this area."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

NRC SER dated August 11, 1978

3.5.14

All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.

(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.

(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.

(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator.

Oconee utilizes a locked or sealed method to control valve positions rather than electrical supervision. The site area fence is the Owner Controlled fence for sealing consideration. Valves are checked every 31 days per PT/0/A/0250/010 A.

Reference(s): PT/0/A/0250/010 A "Fire Protection Systems Monthly Check"

3.5.15

Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system.

Exception: Mobile means of providing hose and associated equipment, such as hose carts or

trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses.

Fire hydrants are installed at a maximum of every 300 feet. Hose supplies are adequate to provide fire protection to all perimeter areas. Post indicator valves are provided and sections of the fire loop can be isolated for maintenance or repairs. Hose houses are located at several yard hydrants and are equipped with at least 200 feet of 1½ inch hose, 200 feet of 2½ inch hose, one-2½ inch gated wye and two-1½ inch nozzles and one-2½ inch to 1½ inch reducer. In addition to the hose houses, there is an equipment storage trailer located north of the Radwaste Building, a equipment storage trailer beside the OOB and the Fire and Rescue Vehicle that each contain additional fire hose and fire fighting tools.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Yard fire hydrants have been provided at approximately 300 ft. intervals around the exterior of the plant. Auxiliary gate valves are not provided on the hydrant laterals, with the result that a portion of the fire water heads would have to be removed from service if a fire hydrant has to be isolated for maintenance."*

"Hose houses have been provided at seven of the yard hydrants, each equipped with at least 200 ft. of 2-1/2 inch hose, 200 ft. of 1-1/2 inch hose and other manual fire fighting tools."

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

The Keowee service water system incorporates two fire hydrants and one outside hose cabinet.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection
PT/0/B/0250/030 "Quarterly Fire Brigade Equipment Inspection"

3.5.16

The fire protection water supply system shall be dedicated for fire protection use only.

Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis.

Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section.

The fire water systems for the Oconee Plant are supplied from the HPSW System. The HPSW system is designed to support fire protection and essential service water systems flow demands. The HPSW system draws water from Lake Keowee which has sufficient capacity to meet fire protection demands.

The NRC August 11, 1978 SER Section 4.3.1.2 states *"There are two 6,000 gpm HPSW pumps and one 500 gpm jockey pump, all rated at 117 psi net pressure. The two large pumps are considered redundant, each capable of supplying the largest design fire flows plus other simultaneous demands on the HPSW system."*

"We find that the fire pumps meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable."

The Reactor Building hose stations are supplied via the LPSW system. The LPSW system is sized to be capable of essential service water flow demands and to support fire hose stations. The NRC August 11, 1978 SER Section 4.3.1.4 states *"Interior hose stations equipped with 1-1/2 inch fire hose have been provided through the plant except in containment. Some areas are too far away from a hose station for effective fire fighting. The licensee has proposed to provide additional hose stations so that all areas containing or exposing safety-related equipment will be within effective fire fighting range of at least one hose station using not more than 100 ft. of 1-1/2 inch fire hose, and to provide hose stations inside containment supplied by the LPSW system."*

"Upon completion of the proposed modification, we find that the interior hose stations meet the requirements of Appendix A to BTP 9.5-1 and are, therefore, acceptable." The modification referenced above to provide hose stations inside containments supplied by the LPSW system has been implemented.

The fire water supply for the Keowee Hydro Station is supplied by the Service Water System. The Service Water system draws water from Lake Keowee which has sufficient capacity to meet fire protection demands.

Reference(s): NRC SER dated August 11, 1978
Design Basis Specification for Fire Protection

Section 3.6 Standpipe and Hose Stations

3.6.1

For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems.

Hose stations at the Oconee site (including Keowee) are arranged to reach any location, including containment, with 100 feet of 1-1/2 inch fire hose. Some hose stations are located outside of the affected fire area but this was found acceptable by the NRC. Current NRC committed fire hose stations are listed in SLC 16.9.4.

The NRC August 11, 1978 SER Section 4.3.1.4 states *"Interior hose stations equipped with 1-1/2 inch fire hose have been provided through the plant except in containment. Some areas are too far away from a hose station for effective fire fighting. The licensee has proposed to provide additional hose stations so that all areas containing or exposing safety-related equipment will be within effective fire fighting range of at least one hose station using not more than 100 ft. of 1-1/2 inch fire hose, and to provide hose stations inside containment supplied by the LPSW system."*

"Upon completion of the proposed modification, we find that the interior hose stations meet the requirements of Appendix A to BTP 9.5-1 and are, therefore, acceptable." The modification referenced above to provide additional hose stations has been implemented.

The NRC June 7, 1988 SER states *"The licensee has proposed a modification to move five fire hose station presently located within the Cable Spreading rooms to stairwell locations outside the rooms. The purpose of this modification is to make the fire hose station accessible for fire fighting activities in these rooms."*

"The proposed modification of fire hose stations will enhance the fire fighting capabilities in the Cable Spreading Rooms and meets the intent of the guidance provided in National Fire Protection Association (NFPA) Std. 14, Standpipe and Hose Systems, for the location of fire hose connections. After reviewing these proposed TS changes, the staff has determined they are acceptable." The modification referenced above to relocate fire hose stations from the Cable Spreading rooms has been implemented.

{Further Action Required – Perform a NFPA 14 code compliance review.}

Reference(s): NRC SER dated August 11, 1978
NRC SER dated June 7, 1988
Duke letter to the NRC dated 2/17/78
SLC 16.9.4
Design Basis Specification for Fire Protection

3.6.2

A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel.

Fire hose station piping is sized based on hydraulic calculations to provide a minimum of 100 gpm at 65 psi at the committed hose station isolation valve. The previously discussed fire water distribution system is capable of supplying this demand. The Reactor Building hose stations are supplied via the LPSW system which provides acceptable flow and pressure. The Keowee hose stations are supplied via the Service Water system which can provide adequate flow and pressure. Internal evaluations have been performed to confirm flow and pressure requirements are met. Calculation OSC-1626 validates adequate NFPA 14 flow and pressure to the committed fire hose stations.

Reference(s): Design Basis Specification for Fire Protection

Calculation OSC-1626

3.6.3

The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed.

Adjustable nozzles are provided on hoses at the hose stations of both the Oconee Plant and the Keowee Station. These nozzles are appropriate for the type fires that might occur at those locations. The fire brigade has specialized nozzles such as low pressure/high flow and articulating for various situations. Fire Brigade Guide (SOG) #3 includes guidance on electrical fires and the proper hose stream application.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

Duke letter to the NRC dated November 22, 1977

Design Basis Specification for Fire Protection

Fire Plan, SOG #3, Electrical Fires

3.6.4

Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE).

Exception: For existing plants that are not capable of meeting this requirement, provisions to restore a water supply and distribution system for manual fire-fighting purposes shall be made. The provisional manual fire-fighting standpipe/hose station system shall be capable of providing manual fire-fighting protection to the various plant locations important to supporting and maintaining the nuclear safety function. The provisions for establishing this provisional

system shall be preplanned and be capable of being implemented in a timely manner following an SSE.

Fire hose stations (with the exception of those in the Reactor Building and Unit 1/2 and Unit 3 Cable Room to Control Room back stair hose stations) are not seismically designed. NFPA 14-1969 (code of record) did not have provisions for seismically designed hose stations. The HPSW system is not seismically designed. The NRC previously found the hose stations acceptable per Section 3.6.1 above.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Design Basis Specification for Fire Protection
Design Basis Specification for the High Pressure Service Water System

3.6.5

Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement.

The fire hose stations at the Oconee Plant and the Keowee Hydro Station were not designed to meet seismic requirements with the exception of the Reactor Building fire hose stations. The Reactor Building fire hose stations are seismically designed supplied from the LPSW system. The LPSW system is seismically designed. The LPSW system is capable of supplying the essential water system requirements and the fire flow simultaneously.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Design Basis Specification for Fire Protection
Design Basis Specification for the Low Pressure Service Water System

Section 3.7 Fire Extinguishers

Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions.

Portable fire extinguishers are provided in accordance with NFPA 10, "Standard For Portable Fire Extinguishers." The portable extinguishers used on site are either "ABC", Carbon Dioxide, or Halon type fire extinguishers. Fire extinguishers are generally stationed in accordance the requirements of NFPA 10. In some instances extinguishers are not located in all areas due to ALARA. In these cases the extinguishers are located near the entrance to the areas.

Halon fire extinguishers are provided in the Main Control Room, Training Simulator Room, the Communications Room, and at the vault in the first floor of Administrative Building.

The NRC August 11, 1978 SER Section 4.3.3 states *"Portable fire extinguishers have been distributed throughout the plant in accordance with NFPA guidelines. The licensee has proposed to provide Halon 1211 extinguisher in the control room."*

"Upon completion of the proposed modification, we find that portable fire extinguishers will conform to the provisions of Appendix A to BTP 9.5-1 and accordingly is acceptable." The modification referenced above to install Halon extinguishers in the control rooms has been implemented.

{Further Action Required – Perform a NFPA 10 code compliance review.}

Reference(s): NRC SER date August 11, 1978

Design Basis Specification for Fire Protection

3.8 Fire Alarm and Detection Systems

3.8.1 Fire Alarm

Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code®. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. The following fire-related signals shall be transmitted:

(1) Actuation of any fire detection device

(2) Actuation of any fixed fire suppression system

(3) Actuation of any manual fire alarm station

(4) Starting of any fire pump

(5) Actuation of any fire protection supervisory device

(6) Indication of alarm system trouble condition

The Oconee Nuclear Station power production areas are protected by two fire alarm systems. The fire alarm control panel for Units 1 and 2 is located in the Unit 1&2 Control Room and the fire alarm control panel for Unit 3 is located in the Unit 3 Control Room. The Keowee Hydro Plant, SSF and Radwaste Facility each have their own fire alarm system which alarm to the Unit 1&2 and/or Unit 3 Control Room. The Fire Alarm and Detection Devices in general are installed in accordance with NFPA 72D (1975). The Design Basis Specification for the Fire Detection System, Design Basis Specification for Fire Protection, and BTP comparison provide additional detail on the Oconee fire detection system.

The fire alarm systems are provided with capabilities to relay the fire-related signals from any

fire detection device, actuation of fixed fire suppression systems, actuation of manual fire alarm stations, actuation of supervisory signals, and alarm of trouble conditions. Start of the HPSW pumps used for the fire protection systems also alarm in the control room.

Deviations from NFPA 72D are identified and justified by paragraph number per National Fire Code, 1975 as documented in the UFSAR, BTP comparison and Design Specification for Fire Protection. These Deviations from NFPA 72D are as follows:

- 1221, 1223 - At Oconee, the alarm comes into the control room. The operator then notifies plant personnel of the fire location.
- 1231 - Alarms on the control board are tested on each 12-hour shift by operator procedures.
- 1232 - Procedures require annual testing of transmitters and water flow actuated devices. Water spray (deluge) systems for safety-related equipment are tested on an annual basis.
- 2110 - The Oconee fire detection system is cabled using steel/aluminum sheathed #16 AWG cable for signal transmission. This cable meets or exceeds the requirements for physical and electrical protection as defined in NEC, Article 760.
- 2222, 2223 - The fire detection system at Oconee is powered from a battery backed power supply through a static inverter to provide 240/120 VAC. These batteries which are Class 1E but utilized as Non-Class 1E are continuously charged from normal station power. On loss of normal station power, the system is designed to provide power to the fire detection system for one hour. In addition, a transfer switch is provided for transferring the inverter loads to regulated normal station AC power should a malfunction of the battery inverter supply occur.
- 2521 - The annunciator audible alert at Oconee serves the fire detection system as well as other plant systems. The visual indicator provided by the visual display prevents operator confusion regarding source of the alarm.

The fire detection system provides an audible and visual alarm and annunciation in the control room. Local audible alarms do not sound at the location of the fire. The operator receives the alarm in the control room, dispatches plant personnel to the location of the alarm to ascertain the local conditions and then, if necessary, summons the fire brigade via the Public Address System (PA) and a radio paging system.

Radwaste Fire Detection system alarms to the Unit 3 Control Room and Radwaste Facility control room.

The SSF Fire Detection system alarm to the Unit 1&2 Control Room, Unit 3 Control Room and the SSF Control Room.

Keowee Hydro Station Fire Detection system provides an audible and visual alarm and annunciation in Keowee and ONS Unit 2 Control Room.

The NRC August 11, 1978 SER Section 4.2 states *"The plant has a protective signaling*

system which transmits alarms from fire detectors and water spray system actuation to the control room. Water flow on wet pipe sprinkler systems does not alarm in the control room. In general, the system complies with those provision of NFPA 72D which are considered essential for the facility, including requirements for emergency power supply and circuit supervision. There is no distinct audible fire alarm signal provided in the control room."

"The licensee has proposed to provide water flow alarms in the control room for all wet pipe sprinkler systems, and a unique audible signal in the control room for fire alarm notification of the operators."

"We find that, subject to the implementation of the proposed modifications, the fire detection and signaling system in conjunction with the safe shutdown system satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable." Modifications referenced above to providing water flow alarms and a distinct audible fire alarm signal in the control room have been implemented.

{Further Action Required – Perform a NFPA 72 code compliance review.}

Reference(s): NRC SER dated August 11, 1978

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

Design Basis Specification for Fire Protection

Design Basis Specification for the Fire Detection System

UFSAR Section 9.5.1.5.1

3.8.1.1

Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location.

All persons authorized access to the Oconee site receive instruction on the proper actions to be taken upon the discovery of a fire and the proper response to a fire alarm. The primary method of communication is the telephone system with outside as well as in-plant connections. In conjunction with the telephone, a page system is used for calls throughout the plant. Each telephone is marked with the emergency reporting numbers. Emergency reporting numbers communicate to a constantly attended location (Control Room or Security).

The Keowee Hydro Station has several methods of communication. There are in-station page phones and telephones connected to Oconee. There is an automatic ring down phone to Oconee Unit 2 Control Room.

Reference(s): Design Basis Specification for Fire Protection
General Employee Training – Plant Access Training

3.8.1.2

Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action:

(1) General site population in all occupied areas

(2) Members of the industrial fire brigade and other groups supporting fire emergency response

(3) Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services

Oconee is provided with a plant-wide PA system that is used to alert the general site population to any necessary instructions.

Operations informs plant personnel of the location of a fire emergency by using the PA, dispatches personnel to ascertain the local conditions and then, if necessary, summons the fire brigade by the PA, fire brigade pagers and radio communication. The Radiation Protection, Safety, and Security personnel are alerted by the PA announcement and respond as necessary to support the Fire Brigade as determined by the Fire Brigade Leader as Incident Commander.

If off-site assistance is determined to be prudent, the Control Room will contact the appropriate agencies via telephone. Secondary communication to off-site fire departments is through off-site radio communication. Off-site radios capable of communication with the off-site emergency response agencies are located in the Control Room, Security, and the station rescue vehicle.

The instructions on the methods to be used to contact the off-site fire emergency agencies are provided in Procedure RP/0/B/1000/029 "Fire Brigade Response."

Reference(s): RP/0/B/1000/029 "Fire Brigade Response"

3.8.2 Detection

If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes.

The NRC August 11, 1978 SER Section 4.2 states *"The plant has a protective signaling system which transmits alarms from fire detectors and water spray system actuation to the control room. Water flow on wet pipe sprinkler systems does not alarm in the control room. In*

general, the system complies with those provision of NFPA 72D which are considered essential for the facility, including requirements for emergency power supply and circuit supervision. There is no distinct audible fire alarm signal provided in the control room."

"Smoke detectors in some areas of the plant containing electrical cable insulation are located lower than the ceiling level and, therefore, may not respond as rapidly as they would if located at the ceiling. However, since fires in cable insulation generate heavy quantities of smoke, reasonably prompt detection can be expected. Ionization type smoke detectors are used throughout the plant. In some tests, ionization type detectors have not responded as rapidly to a fire involving PVC as they do to a fire involving other types of insulation. Tests have shown that they are, however, adequate to detect first in their early stages. To assure that fires in safe shutdown areas of the plant are detected, the licensee has proposed, in addition to the exiting detection system, to provide detectors in all areas containing safe shutdown equipment and combustibles. In addition, the licensee has proposed to provide a dedicated safe shutdown system which would be unaffected by fires involving safe shutdown equipment such that the plant can be safely shut down in the event of a fire in any location in the plant."

"We find that, subject to the implementation of the proposed modifications, the fire detection and signaling system in conjunction with the safe shutdown system satisfies the objectives of Section 2.2 of this report and is, therefore, acceptable." Modifications referenced above including addition of detectors in areas containing safe shutdown equipment and providing a dedicated safe shutdown system have been implemented.

Original deviations to the fire detection system are listed in the Design Basis Specification for Fire Protection and the Design Basis Specification for the Fire Detection System. Modifications to the fire detection system have since been performed. Modifications are performed in accordance with NFPA 72. A major upgrade to the fire detection system was performed under modification NSM-52796 in 1992.

Currently the NRC committed fire detection instrumentation devices are listed in SLC 16.9.6.

{Further Action Required – Upon completion of Chapter 4 work and determination where automatic fire detection is required to meet the performance or deterministic requirements of NFPA 805, PRA, change evaluation or defense-in-depth. Perform a NFPA 72 code compliance review of the fire alarm and detection systems.}

Reference(s): NRC SER dated August 11, 1978

Design Basis Specification for Fire Protection

Design Basis Specification for the Fire Detection System

SLC 16.9.6

Section 3.9 Automatic and Manual Water-Based Fire Suppression Systems

3.9.1

If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:

(1) NFPA 13, Standard for the Installation of Sprinkler Systems

(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection

(3) NFPA 750, Standard on Water Mist Fire Protection Systems

(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems

There are no NFPA 750 water mist systems. The one NFPA 16 foam-water system in Radwaste is abandoned in place.

The Oconee Nuclear Station is protected by automatic wet pipe sprinkler systems, water spray system, and deluge systems. The Design Basis Specification for Fire Protection and Engineering Support Program Document for Fire Protection provide additional detail on the Oconee water based fire suppression systems. The automatic sprinkler systems were designed to conform to requirements of appropriate NFPA Standards with deviations as identified by the individual system as-built code compliance calculations.

Each automatic sprinkler system has an independent connection to the plant HPSW System. The Keowee Service Water System supplies the Keowee main transformer deluge system, lube oil room and gravity oil room. Valves for the HPSW and SW systems are not electrically supervised; however, the station requires fire protection valves to be sealed or locked in the normal open position.

Currently the NRC committed fire suppression systems are listed in SLC 16.9.2. Code compliance calculations are prepared for each Turbine Building and Auxiliary Building suppression system. PIP O-02-06047 has been initiated to disposition comments from the Fire Suppression NFPA Code Review project.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"Wet pipe automatic sprinkler provide area coverage over those portions of the turbine building basement and mezzanine levels which contain the turbine oil piping systems."*

"Automatic water spray systems are installed on the turbine oil headers and reservoirs, feed water pumps, and hydrogen seal oil units in the turbine building; and on oil-filled transformers and reactors in the yard areas. The water spray systems are designed according to applicable NFPA Standards."

"We find that the sprinkler systems meet the requirements of Appendix A of BTP 9.5-1 and are, therefore, acceptable."

{Further Action Required – Upon completion of Chapter 4 work and determination where water based fire suppression systems are required to meet the performance or deterministic requirements of NFPA 805, PRA, change evaluation or defense-in-depth; review the applicable Fire Suppression NFPA Code Review calculations for adequacy. Perform new code compliance reviews as necessary.}

Reference(s): NRC SER dated August 11, 1978
SLC 16.9.2
Engineering Support Program Document for Fire Protection
Design Basis Specification for Fire Protection
NRC Letter to Duke dated February 2, 1982
Fire Suppression NFPA Code Review calculations
PIP O-02-06047

3.9.2

Each system shall be equipped with a water flow alarm.

All fixed extinguishing systems are provided with alarms.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Duke letter to the NRC dated November 22, 1977
Design Basis Specification for Fire Protection

3.9.3

All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location.

All extinguishing systems including sprinklers and deluge systems alarm to the Control Room and/or Security. Alarms associated with the Keowee Fire Protection System are annunciated in the Unit 2 Main Control Room and the Keowee Control Room.

Reference(s): Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982
Duke letter to the NRC dated November 22, 1977

Design Basis Specification for Fire Protection

Design Basis Specification for the Fire Detection System

3.9.4

Diesel-driven fire pumps shall be protected by automatic sprinklers.

The Oconee Plant does not utilize a diesel driven fire water pump.

Reference(s): Design Basis Specification for Fire Protection

3.9.5

Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.

Each automatic sprinkler system has a connection to the plant HPSW System. Each system can be isolated from the main header with an approved control valve.

The NRC August 11, 1978 SER Section 4.3.1.3 states *"All yard fire hydrants, fixed water suppression systems, and interior hose lines are supplied by the HPSW system through underground yard mains and headers inside buildings. Sectionalizing valves are provided to allow isolation of various sections of the system for maintenance; however there are locations in the turbine building where a single piping break could affect both automatic water suppression systems and manual hose stations. The licensee has proposed to cross-connect the ends of the two auxiliary building headers to provide dual feed for the hose stations in this area."*

"We conclude that, upon implementation of the modifications described above, the fire water piping system meets the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." Note that modifications referred to in the conclusion pertain to cross-connections of the auxiliary building headers to provide dual feed for hose stations in the area and are not applicable to this NFPA 805 section.

Reference(s): NRC SER dated August 11, 1978

Response to Appendix A to Branch Technical Position APCSB 9.5-1, February 1982

3.9.6

All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14.

Valves for the ONS Plant HPSW and Keowee SW System are not electrically supervised. A program at the station requires fire protection valves to be sealed or locked in the normal open position. A periodic recorded inspection is conducted to ensure that the fire protection valve positions are correct. See Section 3.5.14.

Reference(s): N/A

Section 3.10 Gaseous Fire Suppression Systems

3.10.1

If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:

(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems

(2) NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems

(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems

The gaseous fire suppression systems at the Oconee Nuclear Plant are utilized to protect unique components and/or hazards.

The SSF Diesel Generator Room is protected by a low pressure total flooding carbon dioxide suppression system. SSF Diesel Generator Room CO_2 system is not a regulatory committed system.

The two Keowee Hydroelectric generators are each protected by a High Pressure Carbon Dioxide Suppression System that provides CO_2 directly into the generator housing. The Keowee CO_2 Fire Suppression System is currently a NRC committed system listed in SLC 16.9.3.

The Administration Building Record Storage Vault, Oconee Operator Training Center Simulator, and Complex Office Building communication room is protected by a Halon 1301 total flood fire suppression system. These buildings are, however, not part of the power production plant covered by these fire protection requirements and are not discussed in the following sections

{Further Action Required – Upon completion of Chapter 4 work and determination where gaseous fire suppression systems are required to meet the performance or deterministic requirements of NFPA 805, PRA, change evaluation or defense-in-depth. Perform a NFPA 12 code compliance review.}

Reference(s): Design Basis Specification for Fire Protection

SLC 16.9.3

3.10.2

Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.

Actuation of the Keowee Hydro Station CO_2 system is alarmed in the ONS Unit 2 Control Room and at Keowee.

Operation of the SSF Diesel Room CO_2 system is alarmed in the Unit 2 Control Room and Security.

Reference(s): Design Basis Specification for Fire Protection
Design Basis Specification for the Fire Detection System

3.10.3

Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.

The Keowee Hydro Station system injects into the respective hydroelectric generator's housing and not into a ventilation system. The leak tightness of the housings is included in the system testing procedure to ensure substantial concentration.

The SSF CO_2 System injects only into the Diesel Generator Room. The ventilation system to the room is isolated during system actuation to ensure concentration for at least 30 minutes.

There are no radioactive contaminants involved at either location protected by the gaseous fire suppression systems.

{Further Action Required – Evaluate and document the potential effects of over pressurization in the areas of CO_2 System discharge.}

Reference(s): Design Basis Specification for Fire Protection

3.10.4

In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability.

There are no installed backup gaseous fire suppression systems utilized at Oconee. The Keowee CO_2 is designed for a "dual shot" capacity. The installed gaseous suppression systems can be manually initiated.

The CO_2 system in the SSF Diesel Generator Room is installed for property conservation and is not a NRC committed system, however the tank is sized for "dual shot" capability.

{Further Action Required – Upon completion of Chapter 4 work and determination if backup gaseous fire suppression systems are required to meet the performance or deterministic requirements, PRA, change evaluation or defense-in-depth; compliance with this section should be reviewed.}

Reference(s): Design Basis Specification for Fire Protection

3.10.5

Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.

Any change to any plant system or component is strictly controlled at the Oconee Nuclear Station. Only mechanical lock-outs are allowed when personnel safety is involved. In addition, any change to the alignment for automatic actuation of either the Keowee Hydro Station CO_2 system or the SSF CO_2 system would result in an alarm. Maintenance and testing of the CO_2 Systems is controlled through approved work authorizations and appropriate implementing procedures.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"
PT/0/A/0400/002 "SSF CO2 Test"
PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"
PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.6

Total flooding carbon dioxide systems shall not be used in normally occupied areas.

The Keowee Generator housing and the SSF Diesel generator room are not normally occupied areas. When access for testing and/or maintenance purposes is authorized, plant procedures require disarming the automatic actuation feature.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"

PT/0/A/0400/002 "SSF CO2 Test"

PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"

PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.7

Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel.

The carbon dioxide system shall be provided with an odorizer.

Any work conducted inside the Keowee Hydro generator housings or inside the SSF Diesel Generator Room would require authorization via the work control process which may require manually isolating and Red Tagging the CO_2 System prior to entry. The Keowee CO_2 System whistles on discharge.

The Keowee Hydro Station's CO_2 supply is not provided with an odorizer because the area inside the generator housing would not be occupied unless testing or maintenance work was being conducted which would require the CO_2 system to be manually isolated.

Work inside the SSF Diesel Generator Room would require the issuance of a work authorization which would include a restriction to manually isolate the CO_2 System prior to entry if work was above the floor level such that egress time is impaired. There is a Pre-Discharge Alarm for the SSF Diesel Generator Room and the alarm is set between 60 and 70 seconds. There is an odorizer in the SSF CO_2 System that uses a "garlic" scent.

Reference(s): PT/0/A/0400/002 "SSF CO2 Test"

3.10.8

Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.

Each CO_2 system has manual isolation valves. The SSF CO_2 system can be locked out by manually closing the tank shutoff valve. The Keowee Hydro Station CO_2 system contains an interlock requiring the generator doors to be closed for actuation. This interlock feature is routinely verified during system surveillance. In addition, the Keowee CO_2 supply header isolation valve can be manually closed. Closure of the supply tank valve would be included as a prerequisite for work authorization involving access to the inside of the generator housing.

Reference(s): OP/0/A/1600/004 "Operation of the SSF CO2 System"

PT/0/A/0400/002 "SSF CO2 Test"

PT/1/A/2200/006 "KHU-1 CO2 System Surveillance"

PT/2/A/2200/006 "KHU-2 CO2 System Surveillance"

3.10.9

The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide.

The only locations that utilize CO_2 systems are the Keowee Hydro Station Generator Housings and the SSF Diesel Generator Room. There are no sensitive components that would be damaged by the rapid cooling resulting from a CO_2 system discharge into either of these locations.

{Further Action Required – Evaluate and document the potential effects of rapid cooling of the Keowee Generators or the SSF Diesel Generator and their associate components in the area of CO_2 System discharge.}

Reference(s): None

3.10.10

Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.

The CO_2 system for the winding brushes on the Keowee Hydro Station Generator Housings would be considered a spatially separate safety system. Only one generator is needed to provide emergency power to the Oconee Plant. Fires are not assumed simultaneously at Keowee and Oconee

The SSF CO_2 system discharges only to the Diesel Generator Room which is considered a safety system.

{Further Action Required – Evaluate and document the potential effects of corrosivity on the Keowee Generators or the SSF Diesel Generator and their associate components in the area of CO_2 System discharge.}

Reference(s): Design Basis Specification for Fire Protection

Section 3.11 Passive Fire Protection Features

This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to

protect cables and electrical components and equipment from the effects of fire.

Passive fire protection features at Oconee include fire rated assemblies for building separation including fire wall, fire doors, fire dampers and penetration seals. Oconee does not utilize electrical raceway fire barrier systems (ERFBS) for passive fire protection.

3.11.1 Building Separation

Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.

Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.

There are three main buildings in the power block; the Turbine Building, the Auxiliary Building and the Reactor Building.

The Turbine Building and Auxiliary Building are separated by a three-hour rated fire barrier. The fire barrier is not a fully committed BTP 9.5-1 barrier and thus not maintained as such. Committed three hour fire barriers are controlled by SLC 16.9.5 and shown on the O-310-K and O-310-L series drawings include:

- Unit 1 & 2 Equipment Rooms from 5'-4" north of column line 68 to 6'-4" south of column line 78.
- Unit 3 Equipment Room from column line N to column line R and from column line 87 to 6'-7" south of column line 93.
- Unit 1 & 2 Cable Rooms from 6'-7" north of column line 68 to 6'-10" south of column line 93.
- Unit 3 Cable Rooms from column line 87 to 6'-7" south of column line 93
- Unit 1 & 2 Control Room from column line 69 to 77
- Unit 3 Control Room from column line 87 to 92.

Note: The above wall sections outlines the Turbine Building to Control Complex portion of the Control Rooms, Cable Rooms, and Equipment Rooms. The committed portion of the above barrier extends 50 feet beyond the Control Complex.

The Auxiliary Building and the Reactor Building are separated by a substantial reinforced concrete wall. Certain areas of this AB/RB common wall are rated for three hours between the Reactor Building. These areas include some areas of the general Auxiliary Building rooms, the East Penetration Room and West Penetration Room. The remainder of the AB/RB common walls are not considered a fire barrier. In addition, the East Penetration Room and the West Penetration Room are separated by a qualified three-hour fire wall.

The NRC August 11, 1978 SER Section 4.11 states *"Fire barriers have been provided to separate the turbine building from the auxiliary building, and to cut off the equipment rooms, cable spreading rooms, control rooms, penetration areas and blockhouses from surrounding fire areas. Based on the type and quantity of combustibles present, the basic fire resistance of the barriers would prevent the spread of fire between fire areas."*

"Upon completion of the dedicated safe shutdown system, the facility will be able to sustain a fire in any fire area and still achieve safe shutdown of the three units. We conclude that, upon completion of the dedicated safe shutdown system, the fire barriers meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The dedicated shutdown system (SSF) has been completed.

The SSF is of substantial concrete (non-combustible) construction and is physically separated from the Reactor and Auxiliary Buildings by a distance of greater than 50 feet. The electrical and mechanical connections from the SSF to the Auxiliary Building are all located underground.

The Keowee Powerhouse is a noncombustible structure that is physically located a significant distance from the other Oconee power block structures with no direct connections other than electrical wiring.

References:
- NRC SER dated August 11, 1978
- Drawing Series O-310 K and L
- NRC Exemption to various Appendix R Requirements dated August 21, 1989
- NRC Letter dated April 14, 1981
- Design Basis Specification for Fire Protection
- NRC SER dated April 28, 1983
- SLC 16.9.5

3.11.2 Fire Barriers

Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials.

Fire barriers are provided to separate the Turbine Building and Auxiliary Building and to cut off the Equipment Rooms, Cable Spreading Rooms, Control Rooms, Penetration Rooms and Blockhouses from the surrounding areas. Construction of these fire barriers are equivalent to a three-hour barrier.

Committed and non-committed fire barriers for the Turbine Building, Auxiliary Building and Reactor Building (including mechanical and electrical penetrations, fire doors, fire dampers, walls, ceiling and floors) boundaries are shown on the O-310-K and O-310-L series drawings. NRC committed fire barriers are discussed in SLC 16.9.5.

The use of unrated seismic joints between the East Penetration Rooms and the West Penetration Rooms were evaluated by the NRC and found to be acceptable in the August 21, 1989 evaluation that granted an Exemption from the Fire Protection Requirements of Section III.G of 10 CFR Part 50, Appendix R.

The NRC also evaluated the separation between the East and West penetration rooms and determined that the electrical divisions were *"effectively separated by a three-hour fire barrier."* This determination was documented in the NRC Letter dated April 14, 1981. The wall qualification is further supported by OSC-7185.

The NRC August 11, 1978 SER Section 4.11 states *"Fire barriers have been provided to separate the turbine building from the auxiliary building, and to cut off the equipment rooms, cable spreading rooms, control rooms, penetration areas and blockhouses from surrounding fire areas. Based on the type and quantity of combustibles present, the basic fire resistance of the barriers would prevent the spread of fire between fire areas."*

"Upon completion of the dedicated safe shutdown system, the facility will be able to sustain a fire in any fire area and still achieve safe shutdown of the three units. We conclude that, upon completion of the dedicated safe shutdown system, the fire barriers meet the objectives outlined in Section 2.2 of this report and are, therefore, acceptable." The dedicated shutdown system (SSF) has been completed.

{Further Action Required – Upon completion of Chapter 4 work, identify barriers credited for compliance, PRA, defense-in-depth or as part of the change evaluation process. Review if credited barriers are adequate.}

Reference(s): NRC SER dated August 11, 1978

Drawing Series O-310 K and L

NRC Exemption to various Appendix R Requirements dated August 21, 1989

NRC Letter dated April 14, 1981

Design Basis Specification for Fire Protection

SLC 16.9.5

OSC-7185

3.11.3 Fire Barrier Penetrations

Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4. (See 3.11.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable:

(1) NFPA 80, Standard for Fire Doors and Fire Windows

(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems

(3) NFPA 101, Life Safety Code

Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ.

Committed and non-committed fire barriers for the Turbine Building, Auxiliary Building and Reactor Building (including mechanical and electrical penetrations, fire doors, fire dampers, walls, ceiling and floors) boundaries are shown on the O-310-K and O-310-L series drawings. NRC committed fire barriers are discussed in SLC 16.9.5.

The NRC August 11, 1978 SER Section 4.9.2 states *"The licensee has proposed to make the following modification on doors and hatches in fire barriers:*

(1) Replace unlabeled fire doors and frames in fire barriers with properly labeled fire doors and frames.

(2) Modify double-leaf fire doors to normally keep one door closed to assure proper closure.

(3) Modify the door arrangement of openings between the turbine building and auxiliary building to prevent glass doors from obstructing automatic fire door closure.

(4) Upgrade the metal hatch plates in the floor between the cable spreading room and control room to provide a 3-hour fire rated barrier.

The license has stated that doors separate redundant safe shutdown equipment or protecting safe shutdown equipment from large hazards are alarmed to the control room and provided with automatic closure devices."

"Upon completion of these modifications, the doorway and hatch penetrations of fire barriers will conform to the provisions of Appendix A to BTP 9.5-1 and are, therefore, acceptable."

The fire door modifications referenced above have been implemented.

Duke letter to the NRC dated May 15, 1981 responded to some modifications indicating completion or insurance company approval of existing fire door configurations.

The NRC August 11, 1978 SER Section 4.9.3 states *"Fire dampers have been provide at some locations where ventilation ducts penetrate fire barriers. The licensee has proposed to upgrade ventilation duct penetrations with dampers having fire ratings equivalent to that required by fire barriers."*

"We find that, subject to implementation of the above modifications, ventilation duct penetrations will satisfy the objectives identified in Section 2.2 of this report and are, therefore, acceptable." Current fire barrier ventilation duct penetrations are provided with fire dampers.

{Further Action Required – Upon completion of Chapter 4 work, identify barriers credited for compliance, PRA, defense-in-depth or as part of the change evaluation process. Review if credited barrier penetrations are adequate.}

Reference(s): NRC SER dated August 11, 1978
Duke Letter to the NRC, dated May 15, 1981
Drawing Series O-310 K and L
Design Basis Specification for Fire Protection
SLC 16.9.5

3.11.4 Through Penetration Fire Stops

Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows.

(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a listed fire-rated device for the specified fire-resistive period.

(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible.

Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke and hot gas

seal in this application.

Through penetration fire stops for penetrations such as pipes, conduits, cables, pneumatic tubes, etc in rated fire barriers are generally provided with rated penetration seals.

The site FPE maintains the Penetration Seal Database in the site EDB and 86-10 Evaluation calculation documenting the acceptability of the station penetration seals in Calculation OSC-7350.

OSC-7359 (DPC 1435.00-00-0006) identifies that Oconee is committed to the criteria of IEEE P634 for electrical and mechanical fire barrier penetration seals.

UFSAR Section 9.5.1.4.3 Item 4 states *"Electrical penetration seal designs shall be subjected to a standard exposure fire that follows the ASTM E-119 Standard Time-Temperature Curve. The acceptance criteria from IEEE 634 (which is identical to that of IEEE P634/D4) shall be used to evaluate the acceptability of test assemblies. The IEEE 634 acceptance limit for ONS unexposed side electrical penetration temperature shall be 700°F. This temperature was selected because the IEEE 634 acceptance criteria is the auto-ignition temperature of the outer cable covering and material in contact with the cable penetration fire stop, or 700°F, whichever is lower. The ignition temperature of outer cable jacketing has been determined to be 735°F.*

Mechanical penetration seal designs shall be subjected to a standard exposure fire that follows the ASTM E-119 Standard Time-Temperature Curve. The acceptance criteria from IEEE-634 (which is identical to that of IEEE P634/D4) shall be used to evaluate the acceptability of test assemblies. The IEEE 634 acceptance limit for Duke Power mechanical penetration seals shall be 680°F. This temperature was selected because it represents the lowest auto ignition temperature of any material normally found in close proximity to piping penetrations (Armstrong Armalok pipe insulation)."

The use of unrated fire penetrations in the ceiling of the West Penetration Room and unrated mechanical pipe penetrations between the Reactor Building and Penetration Rooms were evaluated by the NRC and found to be acceptable in the August 21, 1989 evaluation that granted an Exemption from the Fire Protection Requirements of Section III.G of 10 CFR Part 50, Appendix R.

The NRC also evaluated the separation between the East and West penetration rooms and determined that the electrical divisions were *"effectively separated by a three-hour fire barrier."* This determination was documented in the NRC Letter dated April 14, 1981.

{Further Action Required – Upon completion of Chapter 4 work, identify barriers credited for compliance, PRA, defense-in-depth or as part of the change evaluation process. Review if credited penetration seals are evaluated by Calculation OSC-7350.}

Reference(s): Drawing Series O-310 K and L

NRC Exemption to various Appendix R Requirements dated August 21, 1989

NRC Letter dated April 14, 1981

Design Basis Specification for Fire Protection

SLC 16.9.5

Calculation OSC-7350, ONS Penetration Seal Database and 86-10 Evaluations

UFSAR Section 9.5.1.4.3

OSC-7359 (DPC 1435.00-00-0006), Calculation for the Technical Basis for Fire Barrier Penetration Seals

3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS)

ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.

Exception No. 1: When the temperatures inside the fire barrier system exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure."

Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point temperature requirements as specified by the AHJ at the time of acceptance.

The Oconee design does not currently utilize ERFBS

{Further Action Required – Upon completion of Chapter 4 work, identify barriers credited for compliance, PRA, defense-in-depth or as part of the change evaluation process. Review if credited ERFBS are rated appropriately.}

Reference(s): Design Basis Specification for Fire Protection

VII. CONCLUSIONS

The Oconee fire protection program complies with the requirements of NFPA 805, Chapter 3 upon resolution of open items and NRC approval on specified sections.

VIII. ATTACHMENTS

Attachment A – Compliance Table

Attachment A

Compliance Table

37 Total Pages

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
Note: All information below is summarized; for complete details, see the report in Attachment A. Links are provided below. Turn on Web Toolbar.		
Section 3.1 General *This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein.*		
Section 3.2 Fire Protection Plan		
3.2.1 Intent *A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated combination of components, procedures, and personnel to implement all fire protection program activities.*	Comply	A site-wide Fire Protection Plan has been established. The ONS Fire Protection Program is documented in the Design Basis Specification for Fire Protection.
3.2.2 Management Policy Direction and Responsibility *A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program.*	Comply	A policy document has been developed. The ONS Fire Protection Program policy is documented in the Design Basis Specification for Fire Protection.
3.2.2.1 *The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.*	Comply	The Site Vice President is documented as responsible for the implementation of the fire protection program.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.2.2.2 *The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation.*	Comply	The Fire Protection Engineer is responsible for the administration of the fire protection program.
3.2.2.3 *The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program.*	Comply	The interfaces between the fire protection program and other organizations and fire protection programs are documented in the Design Specification for Fire Protection.
3.2.2.4 *The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.*	Further Action Required	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include the NRC as the authority having jurisdiction for fire protection changes requiring approval.
3.2.3 Procedures *Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established:* *(1) Inspection, testing, and maintenance for fire protection systems and features credited by the fire protection program*	Comply	Procedures have been established for implementing the fire protection program. 1. The Engineering Support Document for Fire Protection provides

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
(2) Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration *(3) Reviews of fire protection program — related performance and trends* *(4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program* *(5) Long-term maintenance and configuration of the fire protection program* *(6) Emergency response procedures for the plant industrial fire brigade*		a detailed listing of applicable surveillance procedures. 2. Compensatory actions have been established. 3. Fire protection program reviews are performed. 4. Plant modification reviews for impact on the fire protection program are performed. 5. Long term maintenance and configuration procedures for the fire protection program have been established. 6. Emergency response procedures for the plant fire brigade are documented.

Section 3.3 Prevention

A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:

(1) Prevention of fires and fire spread by controls on operational activities

(2) Design controls that restrict the use of combustible materials

The design control requirements listed in the remainder of this section shall be provided as described.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.1 Fire Prevention for Operational Activities *The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible.*	Comply	Fire prevention program, activities for control of ignition sources and transient combustibles include training, inspections and administrative controls.
3.3.1.1 General Fire Prevention Activities *The fire prevention activities shall include but not be limited to the following program elements:* *(1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms.* *(2) Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified.* *(3) Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized.*	Comply	The prevention of fires and fire spread are managed through training of personnel, documented plant inspections, and administrative controls.
3.3.1.2 Control of Combustible Materials *Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented.* *These procedures shall include but not be limited to the following program elements:* *(1) Wood used within the power block shall be listed*	Comply	Sections 3.3.1.2(2) through 3.3.1.2(6) - Specific administrative directives have been developed for control of combustible materials.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
pressure-impregnated or coated with a listed fire-retardant application. *Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated.* *(2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent.* *(3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first.* *(4) Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials.* *(5) Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.* *(6) Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.*	Submit for NRC Approval Area for Improvement	NFPA 805 Section 3.3.1.2(1); NSD-313 permits non treated wood for concrete forming and where specified in design drawings. For compliance with Section 3.3.1.2(2) Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to specifically address plastic sheeting material conformance to NFPA 701 requirements or equivalent.
3.3.1.3 Control of Ignition Sources		
3.3.1.3.1 *A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.*	Comply	Hot work is controlled through administrative directives in accordance with NFPA 51B. Note NFPA 241 references NFPA 51B with regards to the requirements for the

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
	Area for Improvement	administration of hot work Evaluate NSD-314 to determine if NFPA 241 should be included.
3.3.1.3.2 *Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.*	Comply	Smoking is restricted to approved locations and other sources of ignition are controlled.
3.3.1.3.3 *Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.*	Further Action Required	Open flame or combustion-generated smoke is prohibited for use in leak and air flow testing. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to revise procedures to preclude the use of open flame or combustion generated smoke for leak or air flow testing.
3.3.1.3.4 *Plant administrative procedure shall control the use of portable*	Submit for NRC Approval	The use of portable heaters is controlled by

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.		administrative directives. Gas and oil-fired heaters are permitted per station procedures.
3.3.2 Structural *Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction.*	Comply	Power production buildings are constructed of non-combustible materials.
3.3.3 Interior Finishes *Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.*	Further Action Required	Interior finishes are non-combustible. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include the specifications for Class A walls/ceilings and Class I floor finishes.
3.3.4 Insulation Materials *Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.*	Comply	Thermal insulation materials are non-combustible or limited combustible.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.5 Electrical		
3.3.5.1 *Wiring above suspended ceiling shall be kept to a minimum. Where installed, electrical wiring shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.*	Further Action Required	Combustibles in concealed spaces are minimized. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include clear guidance that electrical wiring (including data/phone/video cabling) if installed above suspended ceilings will comply with the requirements of this section.
3.3.5.2 *Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components.*	Further Action Required	Cable trays are constructed of non-combustible materials. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include clear guidance that conduits used for electrical raceways are metal and thin walled metallic tubing is not used in accordance with the requirements of this section.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.5.3 *Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ.*	Complies by Previous NRC Approval Further Action Required	The installed wiring has been found acceptable. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to document that non-rated cables (including data/phone/video) shall not be routed in cable trays with nuclear safety related cables.
3.3.6 Roofs *Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings.*	Comply	Roofs comply with Class A requirements. A roof management program has been implemented requiring Class A equivalent roof installations.
3.3.7 Bulk Flammable Gas Storage *Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.*	Comply	Bulk gas is not stored in areas with equipment important to nuclear safety. Storage of flammable gases are controlled by plant directives.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.7.1 *Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage.*	Comply Further Action Required	Bulk gas is not stored in areas important to nuclear safety. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 50A a code compliance review for the outdoor hydrogen storage.
3.3.7.2 *Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings.*	Comply Further Action Required	Hydrogen gas tanks are orientated with the long axis parallel to plant buildings. Resolve orientation of propane tank. The tank is not anchored per the SER recommendation. Evaluate if the pervious approval by the NRC is sufficient with the modification. Alternatively, determine if an evaluation is required or modify the tank position.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.7.3 *Flammable gas storage cylinders not required for normal operation shall be isolated from the system.*	Comply	Gas cylinders are isolated when not in use and controlled by plant directives.
3.3.8 Bulk Storage of Flammable and Combustible Liquids *Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code.*	Further Action Required	The storage of combustible and flammable materials is controlled by plant directives. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 30 code compliance review for the Turbine Building lube oil reservoirs, Turbine Building lube oil storage room, and the Keowee lube oil storage room.
3.3.9 Transformers *Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function.*	Further Action Required	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to include drainage inspections as part of the annual flow tests.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.10 Hot Pipes and Surfaces *Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the prompt cleanup of oil on insulation.*	Comply Area for Improvement	Administrative directives ensure the prompt identification and correction of any oil leakage. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to clearly indicate it is a NRC requirement to promptly remove oil from insulation.
3.3.11 Electrical Equipment *Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.*	Comply Further Action Required	Administrative directives control combustible material near electrical equipment. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to specify the combustible free distance consistent with the PRA Zone of Influence for transients and change evaluation results.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.3.12 Reactor Coolant Pumps *For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply.* *(1) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and nonpressurized leakage sites in each reactor coolant pump oil system.* *(2) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system.* *(3) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback.* *(4) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps.* *(5) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin.*	Comply	The RCP oil collection system meets the five criteria presented in this section.
Section 3.4 Industrial Fire Brigade		
3.4.1 On-Site Fire-Fighting Capability *All of the following requirements shall apply.* *(a) A fully staffed, trained, and equipped fire-fighting force shall be*	Comply	The onsite Fire Brigade is appropriately staffed, trained and equipped.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable: *(1) NFPA 600, Standard on Industrial Fire Brigades (interior structural fire fighting)* *(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program* *(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians* *(b) Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.* *(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance* *Exception: Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria.* *(d) The industrial fire brigade shall be notified immediately upon verification of a fire.* *(e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respiratory protection equipment.*	Area for Improvement	Ensure NFPA 600 code review documented in the Fire Brigade Functional Area Management (FAM) manual.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.4.2 Pre-Fire Plans *Current and detailed pre-fire plans shall be available to the industrial fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5.*	Comply	Current and detailed pre-fire plans are available in the Oconee Plant Fire Plan.
3.4.2.1 *The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.*	Comply Area for Improvement	Detailed pre-fire plans are available in the Oconee Nuclear Site Fire Plan. Review the Fire Plan and associated documentation for compliance with FAQ 06-0025.
3.4.2.2 *Pre-fire plans shall be reviewed and updated as necessary.*	Comply	The Fire Plan is maintained current. Plant directives require review of the Fire Plan.
3.4.2.3 *Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade.*	Comply	The Fire Plan is available in the Control Room and to the Fire Brigade at multiple locations.
3.4.2.4 *Pre-fire plans shall address coordination with other plant groups during fire emergencies.*	Comply	Plant directives and fire brigade procedures address coordination with other plant

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
		groups.
3.4.3 Training and Drills *Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities.* *(a) Plant Industrial Fire Brigade Training. All of the following requirements shall apply.* *(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600, Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate.* *(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire.* *(3) A written program shall detail the industrial fire brigade training program.* *(4) Written records that include but are not limited to initial industrial fire brigade classroom and hands-on training, refresher training, special training schools attended, drill attendance records, and leadership training for industrial fire brigades shall be maintained for each industrial fire brigade member.* *(b) Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade.*	Comply	The Fire Brigade personnel receive appropriate training and the training records are maintained. All plant personnel are trained on reporting fires and interfacing with the Fire Brigade. Drills are conducted on a regular basis and involve various plant areas. The drills are critiqued and records are maintained.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
(c) Drills. All of the following requirements shall apply. *(1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade.* *(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario.* *(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards.* *(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team.* *(5) A critique shall be held and documented after each drill.*		
3.4.4 Fire-Fighting Equipment *Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards.*	Comply	Fire brigade personnel are provided with the necessary equipment.
3.4.5 Off-Site Fire Department Interface		
3.4.5.1 Mutual Aid Agreement *Off-site fire authorities shall be offered a plan for their interface during*	Comply	Letters of Agreement are in maintained with local off-

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
fires and related emergencies on site.		site fire fighting organizations.
3.4.5.2 Site-Specific Training *Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually.*	Comply	Annual training is specified in the Letters of Agreement.
3.4.5.3 Security and Radiation Protection *Plant security and radiation protection plans shall address off-site fire authority response.*	Comply	Site directives include Security and Radiation Protection provisions for assistance to off-site fire authorities.
3.4.6 Communications *An effective emergency communications capability shall be provided for the industrial fire brigade.*	Comply	Emergency communication capabilities are provided.
Section 3.5 Water Supply		
3.5.1 *A fire protection water supply of adequate reliability, quantity, and duration shall be provided by one of the two following methods.* *(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies.* *(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s)*	Complies by Previous NRC Approval Further Action Required	The fire protection water supply is adequate and reliable. Prior to implementation of the NFPA 805 program, Oconee will ensure that any required suppression

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service.		systems for the Nuclear Safety Capability Transition are within the design flow capabilities of the fire pump per NFPA 20.
3.5.2 *The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection.* *Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own suction and both suctions and pumps are adequately separated.* *Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service.*	Comply	Oconee utilizes Lake Keowee as the primary fire water source.
3.5.3 *Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source.*	Complies by Previous NRC Approval Further Action Required	The use of the High Pressure Service Water (HPSW) pumps to supply fire water is acceptable. Upon replacement of the Keowee fire pump (PIP 2001-3492) ensure the installation meets the requirements of this section.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.5.4 *At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.*	Complies by Previous NRC Approval	Diesel-engine driven fire water pumps are not utilized. Keowee uses an electric fire pump. The NRC has accepted the use of the HPSW pumps as Oconee fire pumps.
3.5.5 *Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.*	Complies by Previous NRC Approval	The HPSW pumps are separated from the rest of the plant and the NRC has approved the use and installation of the HPSW pumps for fire protection use.
3.5.6 *Fire pumps shall be provided with automatic start and manual stop only.*	Complies by Previous NRC Approval Area for Improvement	Fire pumps (HPSW and Keowee) auto-start. Document that PIP 2002-3870 has resolved HPSW manual stop.
3.5.7 *Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.*	Comply	There are separate connections from pumps to the fire loops for ONS. Keowee does not have a

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
		yard main loop only underground piping.
3.5.8 *A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.*	Comply	The pressure in the HPSW system is maintained by the jockey pump. Keowee uses lake head to maintain system pressure.
3.5.9 *Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.*	Comply	The Control Room(s) are automatically notified of operation of the pumps used for fire protection.
3.5.10 *An underground yard fire main loop, designed and installed in accordance with NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be installed to furnish anticipated water requirements.*	Complies by Previous NRC Approval	The fire water piping system was found acceptable by the NRC.
3.5.11 *Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems.*	Comply	Sectionalizing valves are provided to allow isolation of various sections of the fire water system for maintenance or repair.
3.5.12	Comply	Compatible threads are

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers. *Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided.*		provided.
3.5.13 *Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve.*	Complies by Previous NRC Approval	The fire water supply system has been approved by the NRC. Each header has a separate connection with shutoff valve to the fire water system.
3.5.14 *All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.* *(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.* *(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.* *(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator.*	Comply	Fire protection valves are locked or sealed.
3.5.15	Complies by Previous	The NRC determined that

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system. *Exception: Mobile means of providing hose and associated equipment, such as hose carts or trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses.*	NRC Approval	the hydrants installed at approximately 300 feet intervals are acceptable.
3.5.16 *The fire protection water supply system shall be dedicated for fire protection use only.* *Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis.* *Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section.*	Complies by Previous NRC Approval	The use of the HPSW system and LPSW system for fire protection was found acceptable by the NRC.
Section 3.6 Standpipe and Hose Stations		
3.6.1 *For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems.*	Complies by Previous NRC Approval	The standpipe and fire hose systems were found acceptable.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.8 Fire Alarm and Detection Systems		
3.8.1 Fire Alarm *Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code®. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. The following fire-related signals shall be transmitted:* *(1) Actuation of any fire detection device* *(2) Actuation of any fixed fire suppression system* *(3) Actuation of any manual fire alarm station* *(4) Starting of any fire pump* *(5) Actuation of any fire protection supervisory device* *(6) Indication of alarm system trouble condition*	Complies by Previous NRC Approval Further Action Required	Fire related signals are transmitted to the control rooms. The fire detection and signaling system was found acceptable by the NRC. Perform a NFPA 72 code compliance review for fire alarm and detection systems (Sections 3.8.1 and 3.8.2).
3.8.1.1 *Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location.*	Comply	Means to report a fire are provided.
3.8.1.2 *Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action:* *(1) General site population in all occupied areas*	Comply	The Control Room notifies station personnel of a fire event over the Plant PA System and can communicate with Brigade personnel and Off-Site

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
	Further Action Required	Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 14 code compliance review for standpipe systems not addressed by the previous SER approval but included in the new power block definition.
3.6.2 *A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel.*	Comply	The fire water supply system can provide adequate water flow and pressure at all hose stations.
3.6.3 *The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed.*	Comply	The appropriate hose nozzles have been provided.
3.6.4	Complies by Previous	The interior hose stations

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE). *Exception: For existing plants that are not capable of meeting this requirement, provisions to restore a water supply and distribution system for manual fire-fighting purposes shall be made. The provisional manual fire-fighting standpipe/hose station system shall be capable of providing manual fire-fighting protection to the various plant locations important to supporting and maintaining the nuclear safety function. The provisions for establishing this provisional system shall be preplanned and be capable of being implemented in a timely manner following an SSE.*	NRC Approval	were found acceptable by the NRC. Seismically designed hose stations are provided in the Reactor Building and the Cable Room to Control Room back stairwells. The HPSW system is not seismically designed.
3.6.5 *Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement.*	Comply	Fire flow will not affect the essential water system.
Section 3.7 Fire Extinguishers *Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions.*	Complies by Previous NRC Approval Further Action Required	The portable fire extinguishers meet the requirements of NFPA 10. Oconee will enhance current documentation, prior to implementation of the NFPA 805 program, to perform a NFPA 10 code compliance review.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
(2) Members of the industrial fire brigade and other groups supporting fire emergency response (3) *Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services*		agencies by various means.
3.8.2 Detection *If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes.*	Complies by Previous NRC Approval Further Action Required	The fire detection and signaling system was found acceptable by the NRC. The system was installed in accordance with applicable codes of record with documented deviations. Upon completion of the Nuclear Safety Capability Transition, Oconee will perform a NFPA 72 code compliance review of the fire alarm and detection systems required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action).

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
Section 3.9 Automatic and Manual Water-Based Fire Suppression Systems		
3.9.1 *If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:*	Complies by Previous Licensee Evaluation	NFPA code compliance calculations have been performed for automatic and manual water-based fire suppression systems.
(1) NFPA 13, Standard for the Installation of Sprinkler Systems *(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection* *(3) NFPA 750, Standard on Water Mist Fire Protection Systems*	Complies by Previous NRC Approval	The installed sprinkler systems were found acceptable by the NRC.
(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems	Further Action Required	Upon completion of the Nuclear Safety Capability Transition, Oconee will perform code compliance review and/or review the applicable Fire Suppression NFPA Code Review calculations of the water based fire suppression systems required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action).

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.9.2 *Each system shall be equipped with a water flow alarm.*	Comply	Each fixed extinguishing system is provided with an alarm.
3.9.3 *All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location.*	Comply	Alarms are annunciated in the Control Rooms or other remote constantly attended area.
3.9.4 *Diesel-driven fire pumps shall be protected by automatic sprinklers.*	N/A	There are no diesel-driven fire water pumps utilized at the Oconee Plant.
3.9.5 *Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.*	Complies by Previous NRC Approval	Each suppression system is connected to the header with an approved control valve.
3.9.6 *All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14.*	Complies by Previous NRC Approval	The valves are not electrically supervised but are locked or sealed in accordance with Section 3.5.14.
Section 3.10 Gaseous Fire Suppression Systems		

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.10.1 *If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:* *(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems* *(2) NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems* *(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems*	Further Action Required	Gaseous fire suppression is only utilized for specific components – the Keowee Hydro Station's Generators and the SSF Diesel Generator are provided with CO_2 extinguishing systems. Upon completion of the Nuclear Safety Capability Transition, Oconee will perform a code compliance review of gaseous fire suppression systems required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action).
3.10.2 *Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.*	Comply	Operation of a Keowee gaseous suppression system is annunciated in the Unit 2 Control Room and Keowee; operation of the SSF gaseous suppression system is annunciated in the Unit 2

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
		Control Room and Security.
3.10.3 *Ventilation system design shall take into account prevention from over-pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.*	Comply	The Keowee Hydro Station system injects into the respective hydroelectric generator's housing and not into a ventilation system. The leak tightness of the housings is included in the system testing procedure to ensure substantial concentration. The SSF CO_2 System injects only into the Diesel Generator Room. The ventilation system to the room is isolated during system actuation to ensure concentration for at least 30 minutes. There are no radioactive contaminants involved at either location protected by the gaseous fire suppression systems.
	Further Action Required	Evaluate and document the potential effects of over-pressurization in the areas of CO2 system discharge

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.10.4 *In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability.*	Comply Further Action Required	There are no installed backup gaseous fire suppression systems utilized at Oconee. Upon completion of the Nuclear Safety Capability Transition and determination if backup gaseous fire suppression systems are required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action) this section should be reviewed.
3.10.5 *Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.*	Comply	Locally disarming an automatic gaseous fire suppression system is controlled.
3.10.6 *Total flooding carbon dioxide systems shall not be used in normally occupied areas.*	Comply	The areas protected by the installed CO_2 systems are not normally occupied.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.10.7 *Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel.* *The carbon dioxide system shall be provided with an odorizer.*	Comply	A pre-discharge alarm is provided for the SSF CO_2 Systems. Keowee whistles on discharge. The SSF System is provided with an odorizer. The Keowee Hydro Station's CO_2 supply is not provided with an odorizer because the area is not occupied.
3.10.8 *Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.*	Comply	There are positive means to lock out the respective CO_2 system during work in the area.
3.10.9 *The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide.*	Further Action Required	Evaluate and document the potential effect of rapid cooling of the Keowee Generators and the SSF Diesel Generator and their associated components in the area of CO2 System discharge.
3.10.10 *Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.*	Further Action Required	There are safety systems protected by CO_2 systems.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
		Evaluate and document the potential effect of corrosivity on the Keowee Generators and the SSF Diesel Generator and their associated components in the area of CO2 System discharge.
Section 3.11 Passive Fire Protection Features *This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to protect cables and electrical components and equipment from the effects of fire.*		
3.11.1 Building Separation *Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, Recommended Practice for Protection of Buildings from Exterior Fire Exposures.* *Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.*	Complies by Previous NRC Approval	Building separation has been approved by the NRC. The Keowee Hydro Station and the SSF are separated from the other buildings by a distance of greater than 50 feet.
3.11.2 Fire Barriers *Fire barriers required by Chapter 4 shall include a specific fire-resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire*	Complies by Previous NRC Approval	The fire barriers between the major plant buildings were found to be acceptable by the NRC.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials.	Further Action Required	Upon completion of the Nuclear Safety Capability Transition, identify barriers required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action). Review the credited barriers to determine their adequacy.
3.11.3 Fire Barrier Penetrations *Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4. (See 3.11.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable:* *(1) NFPA 80, Standard for Fire Doors and Fire Windows* *(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems* *(3) NFPA 101, Life Safety Code* *Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to*	Complies by Previous NRC Approval Further Action Required	The fire barrier penetrations were found to be acceptable by the NRC. Upon completion of the Nuclear Safety Capability Transition, identify barriers required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action). Review the

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ.		credited barrier penetrations to determine their adequacy.
3.11.4 Through Penetration Fire Stops *Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows.*	Comply by Previous Licensee Evaluation	The Penetration Seal Database and 86-10 Evaluation calculation document the acceptability of the station penetration seals
(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a listed fire-rated device for the specified fire-resistive period.	Complies by Previous NRC Approval	The NRC has approved exemptions for specific penetration seals.
(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible. *Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke and hot gas seal in this application.*	Further Action Required	Upon completion of the Nuclear Safety Capability Transition, identify barriers required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action). Review the credited barrier penetration seals to determine their adequacy.

NFPA 805 Chapter 3 Section	Compliance Statement	Compliance Summary
3.11.5 Electrical Raceway Fire Barrier Systems (ERFBS) *ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.* *Exception No. 1: When the temperatures inside the fire barrier system exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure."* *Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point temperature requirements as specified by the AHJ at the time of acceptance.*	N/A Further Action Required	Oconee does not utilize ERFBS. Upon completion of the Nuclear Safety Capability Transition, identify ERFBS required to meet the nuclear safety performance criteria (compliance with deterministic criteria, or as a defense-in-depth feature for a change evaluation or transitioning licensing action). Determine if credited ERFBS is rated appropriately.