Chapter 3 Fundamental Fire Protection Program and Design Elements	Mapped to APCSB BTP 9.5-1 5/1/76
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.	
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.	**IV.A Overall Requirements of Nuclear Plant Fire Protection Program** Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience is fire protection and nuclear plant safety to provide a balanced approach in directing a nuclear plant fire protection program. The PSAR should state the qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire-fighting training for the operating plant. Subsequently the FSAR should discuss the training and the updating provisions such as fire drills provided for maintaining the competence of the station fire-fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment. This staff should be responsible for: **(a)** coordination of building layout and systems design with fire requirements, including consideration of potential hazards associated with postulated design basis fires. **(b)** design and maintenance of fire detection, suppression, and extinguishing systems. **(c)** fire prevention activities. **(d)** plant personnel and fire brigade training and manual fire fighting activities.

	(NOTE: NFPA 6, "Recommendations for Organization of Industrial Fire Loss Prevention," contains useful guidance for organization and operation of the entire fire loss prevention program.)
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.	**IV.A Overall Requirements of Nuclear Plant Fire Protection Program** Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience is fire protection and nuclear plant safety to provide a balanced approach in directing a nuclear plant fire protection program. The PSAR should state the qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire-fighting training for the operating plant. Subsequently the FSAR should discuss the training and the updating provisions such as fire drills provided for maintaining the competence of the station fire-fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment. This staff should be responsible for: **(a)** coordination of building layout and systems design with fire requirements, including consideration of potential hazards associated with postulated design basis fires. **(b)** design and maintenance of fire detection, suppression, and extinguishing systems. **(c)** fire prevention activities. **(d)** plant personnel and fire brigade training and manual fire fighting activities. (NOTE: NFPA 6, "Recommendations for Organization of Industrial Fire Loss Prevention," contains useful guidance for organization and operation of the entire fire loss prevention program.)
3.2.2.1* The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.	**II.A Overall Requirements of Nuclear Plant Fire Protection Program** **1.** Responsibility for the overall fire protection program should be assigned to a designated person in the upper

	level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated.
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.	**II.A Overall Requirements of Nuclear Plant Fire Protection Program** **1.** Such delegation of authority should be to staff personnel prepared by training and experience is fire protection and nuclear plant safety to provide a balanced approach in directing a nuclear plant fire protection program. This staff should be responsible for: (a) coordination of building layout and systems design with fire requirements, including consideration of potential hazards associated with postulated design basis fires. (b) design and maintenance of fire detection, suppression, and extinguishing systems. (c) fire prevention activities. (d) plant personnel and fire brigade training and manual fire fighting activities.
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.	No similar requirement in APCSB BTP 9.5-1
3.2.2.4* The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.	No similar requirement in APCSB BTP 9.5-1
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 (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	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(a)** Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided. **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(c)** Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should' be reviewed by appropriate levels of management and appropriate special action and procedures such as fire watches or

(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.	temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular; **(1)** Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. A person trained in fire protection should directly monitor the work and function as a fire watch. **(2)** Leak testing, and similar procedures such as air flow determination, should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted. **(3)** Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety related areas should be controlled. Use of wood inside buildings containing safety related systems or equipment should be permitted only when suitable noncombustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine adequacy of the installed fire protection systems. **IV.6 Administrative Procedures, Controls and Fire Brigade** **(e)** The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these *functions*. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable. **(1)** Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan should be developed which lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems. The test plant should contain the types, frequency and detailed procedures for tasting. Procedures should also contain instructions on

	maintaining fire protection during those periods of fire protection system impairment or maintenance such as fire watches or temporary hose connections to water systems. **(2)** Basic training is a necessary element in effective firefighting operation. In order for a fire brigade to operate effectively, it must operate as a team. Each member must know what his duties are. The fire brigade must be familiar with equipment location and operation, the layout of the plant during times when a particular area is filled with smoke, and contains insufficient lighting. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of plant. The drills should include the simulated use of equipment in each area and should be preplanned and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade, the on scene fire team leader, the reactor operator in the control room, and the offsite command post. **(3)** To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site. **(4)** NFPA No. 27, "Private Fire Brigade," should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Standards referenced from this document which should be utilized are NFPA 194, "Standards for Screw Threads and Gaskets for Fire Hose Couplings," NFPA 196, "Standard for Fire Hose, NFPA 197, "Training Standard on Initial Fire Attacks, " NFPA 601, "Recommended Manual of Instructions and Duties for the Plant

	Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72, are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.

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.	**III.A Defense-in-Depth** Nuclear power plants use the concept of defense-in-depth to achieve the required high degree of safety by use of echelons of safety systems. This concept is also applicable to fire safety in nuclear power plants. With respect to the fire protection program the defense-in-depth principle is aimed at achieving an adequate balance in: **a.** preventing fires from starting **IV.B.2 Control of Combustibles** **(a)** Safety related systems should be isolated or separated from combustible materials. When this is not possible due to the nature of the safety system or the combustible material, special protection will be required to prevent a fire defeating the safety system function. Such protection may involve a combination of automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(b)** Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety related buildings or systems during operation or maintenance periods. **(c)** Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should' be reviewed by appropriate levels of management and appropriate special action and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular; **(3)** Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety related areas should be controlled. Use of wood inside buildings containing safety related systems or equipment should be permitted only when suitable noncombustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine adequacy of the installed fire protection systems.

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.	**II Introduction** Management participation in the program should begin with early design concepts and plant layout work and continue through plant operation. This requires a qualified staff which should be responsible for engineering and design of fire protection systems for nuclear power plants. This staff should also be responsible for fire prevention activities, maintenance of fire protection systems, training, and manual fire fighting activities. **III.A Defense-in-Depth** Nuclear power plants use the concept of defense-in-depth to achieve the required high degree of safety by use of echelons of safety systems. This concept is also applicable to fire safety in nuclear power plants. With respect to the fire protection program the defense-in-depth principle is aimed at achieving an adequate balance in: **a.** Preventing fires from starting. **b.** Detecting fires quickly, suppressing those fires that occur, putting them out quickly and limiting their damage. **c.** Designing plant safety systems so that a fire that gets started, in spite of the fire prevention program, and burns for a considerable time, in spite of fire protection activities, will not prevent essential plant safety functions from being performed. **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **C.1** Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. A person trained in fire protection should directly monitor the work and function as a fire watch.
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	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(c)** Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate special action and procedures such as fire watches or

(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.	temporary fire barriers implemented to assure adequate fire protection and reactor safety. **IV.B.7 Quality Assurance Program** **b. Instructions, Procedures, and Drawings** - Inspections, tests, administrative controls, fire drills and training which govern the fire protection program should be prescribed by documented instructions, procedures or drawings and should be accomplished in accordance with these documents. **f. Inspection, Test and Operating Status** - Measures should be established to provide for the identification of items which have satisfactorily passed required tests and inspections.
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 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.	**III.C Establishment and Use of Fire Areas** Within each area special attention should be given to limiting the amount of combustible material and to providing effective barriers and fire resistive coatings to reduce the spreading of a fire in these areas. **IV.B (2) Control of Combustibles** **(b)** Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety related equipment. Flammable gas storage such as hydrogen, should be located outdoors of in separate detached buildings so that a fire or explosion will not &aversely affect any safety related systems or equipment. (Refer to NFPA 50A, "Gaseous Hydrogen Systems.") **(c)** The use of plastic materials should be minimized. Halogenated plastics especially, such as polyvinyl chloride (PVC) and neoprene, should be used only when substitute non-combustible materials are not available. All plastic materials, including flame and fire retardant, will burn with an intensity and BTU production in a range similar to ordinary hydrocarbons. They also produce heavy dense smoke when burning that obscures visibility and can plug air filters, especially charcoal and HEPA. The halogenated plastics also release free chlorine and hydrogen chloride When burning which are toxic to humans and corrosive to equipment. **(d)** Flammable liquids storage should, as a minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code." **IV.B.3 Electric Cable Construction, Cable Trays and Cable Penetrations** **(h)** Cable trays, raceways, conduit, trenches or culverts should be used only for cables. Miscellaneous storage should not be permitted. Piping for flammable or combustible liquids or gases should not be installed in

	this area. **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(b)** Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety related buildings or systems during operation or maintenance periods. **(c)(3)** Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety related areas should be controlled. Use of wood inside buildings containing safety related systems or equipment should be permitted only when suitable noncombustible substitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine adequacy of the installed fire protection systems. **IV.E.1 Welding and Cutting, Acetylene - Oxygen Fuel Gas Systems** This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations and portable equipment should be provided as backup. The requirements of NFPA 52 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment. (Also refer to IV.B.6 herein.) **IV.E.2 Storage Areas for Dry Ion Exchange Resins** The storage of dry ion exchange resins should be kept away from essential safety related systems. Dry unused resins should be protected by automatic wet pipe sprinkler installations. Detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally. Local hose stations and portable extinguishers should provide backup for these areas. Storage areas of dry resin should have curbs and drains. (Refer to NFPA 92M, "Waterproofing and Draining of Floors.") **IV.E.3 Hazardous Chemicals** Hazardous chemicals should be stored and protected in accordance with the recommendations of NFPA No. 49, "Hazardous Chemicals Data." Chemicals storage areas should be well ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition. **IV.E.4 Materials Containing Radioactivity**

	Materials which collect and contain radioactivity such as spent ion exchange resins, charcoal filters, and HEPA filters should be stored in closed metal tanks or containers which are located in areas free from ignition sources of combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.
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.	**IV.E.1 Welding and Cutting, Acetylene - Oxygen Fuel Gas Systems** This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations and portable equipment should be provided as backup. The requirements of NFPA 52 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment. (Also refer to IV.B.6 herein.) **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(c)** Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate special action and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular; **(1)** Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. A person trained in fire protection should directly monitor the work and function as a fire watch.
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.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(c)** Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate

	special action and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular; **(1)** Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. A person trained in fire protection should directly monitor the work and function as a fire watch.
3.3.1.3.3 Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(C) (2)** Leak testing, and similar procedures such as air flow determination, should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted.
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.	No similar requirement in APCSB BTP 9.5-1
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.	**IV.B.1 Building Design** **(d)** Interior wall and structural components, thermal insulation materials and radiation shielding materials and soundproofing should be noncombustible.
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.	**IV.B.1 Building Design** **(d)** Interior finishes should be non-combustible or listed by a nationally recognized testing laboratory, such as Factory Mutual or Underwriters Laboratory, Inc. for flame spread, smoke and fuel contribution of 25 or less in its use configuration (ASTM E-84 Test, "Surface Burning Characteristics of Building Materials.")
3.3.4 Insulation Materials. Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.	**IV.B.1 Building Design** **(d)** Interior wall and structural components, thermal insulation materials and radiation shielding materials and soundproofing should be noncombustible.
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,	**IV.B.1 Building Design** **(f)** Suspended ceilings and their supports should be of non-combustible construction. Concealed spaces should be devoid of combustibles.

routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.	**IV.B.3 Electrical Cable Construction, Cable Trays and Cable Penetrations** **(f)** Electric cable constructions should at least pass the current IEEE No. 383 flame test. (This does not infer that cables passing this test will not require additional fire protection.) **(g)** To the extent practical cable construction that does not give off corrosive gases while burning should be used.
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.	**I. Definitions -** Electrical Conduit - rigid or flexible tubing usually either steel or aluminum in which electrical cables are run. **IV.B.3 Electric Cable Construction, Cable Trays and Cable Penetrations** **(a)** Only non-combustible materials should be used for cable tray construction.
3.3.5.3* Electric cable construction shall comply with a flame propagation test as acceptable to the AHJ. ~~Exception: Existing cable in place prior to the adoption of this standard shall be permitted to remain as is.~~	**IV.B.3 Electrical Cable Construction, Cable Trays and Cable Penetrations** **(f)** Electric cable constructions should at least pass the current IEEE No. 383 flame test. (This does not infer that cables passing this test will not require additional fire protection.)
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.	**IV.B.1 Building Design** **(e)** Metal deck roof construction should be non-combustible (see Underwriters Laboratory, Inc., building materials directory), or listed as Class I by Factory Mutual System Approval Guide.
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.	**IV.B.2 Control of Combustibles** **(b)** Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety related equipment.
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	**IV.B.2 Control of Combustibles** **(b)** Flammable gas storage such as hydrogen, should be located outdoors of in separate detached buildings so that a fire or explosion will not &aversely affect any safety related systems or equipment. (Refer to NFPA 50A, "Gaseous Hydrogen Systems.")

followed for 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.	**IV.B.2 Control of Combustibles** **(b)** Care should be taken to locate high pressure gas storage containers with the long axis parallel to buildings walls. This will minimize the possibility of wall penetration in the event of a container failure. Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled. (Refer to NFPA 6 , "Industrial Fire Loss Prevention.")
3.3.7.3 Flammable gas storage cylinders not required for normal operation shall be isolated from the system.	No similar requirement in APCSB BTP 9.5-1
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.	**IV.B 2 Control of Combustibles** **(d)** Flammable liquids storage should, as a minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code."
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.	No similar requirement in APCSB BTP 9.5-1
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.	No similar requirement in APCSB BTP 9.5-1
3.3.11 Electrical Equipment Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.	No similar requirement in APCSB BTP 9.5-1
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	**IV.B.2 Control of Combustibles** **(a)** Safety related systems should be isolated or separated from combustible materials. When this is not possible due to the nature of the safety system or the combustible material, special protection will be required to prevent a fire defeating the safety system function. Such protection may involve a combination of automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. Examples of such combustible materials which may not be separable from the remainder of its system are:

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.	**(3)** Reactor coolant pump lube oil system.
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 (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.	No similar requirements in APCSB BTP 9.5-1

(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.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(a)** Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided. Guidance is contained in the following NFPA publications: (1) No. 4 - Organization for Fire Services (2) No. 4A - Organization of a Fire Department (3) No. 6 - Industrial Fire Loss Prevention (4) No. 7 - Management of Fire Emergencies (5) No. 8 - Management Responsibility for Effects of Fire on Operations (6) No. 27 - Private Fire Brigades
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.	No similar requirements in APCSB BTP 9.5-1
3.4.2.2 Pre-fire plans shall be reviewed and updated as necessary.	No similar requirements in APCSB BTP 9.5-1
3.4.2.3* Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade.	No similar requirements in APCSB BTP 9.5-1
3.4.2.4* Pre-fire plans shall address coordination with other plant groups during fire emergencies.	No similar requirements in APCSB BTP 9.5-1
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.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(e)** The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these *functions*. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable.

(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. (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	**(1)** Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan should be developed which lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems. The test plan should contain the types, frequency and detailed procedures for testing. Procedures should also contain instructions on maintaining fire protection during those periods of fire protection system impairment or maintenance such as fire watches or temporary hose connections to water systems. **(2)** Basic training is a necessary element in effective firefighting operation. In order for a fire brigade to operate effectively, it must operate as a team. Each member must know what his duties are. The fire brigade must be familiar with equipment location and operation, the layout of the plant during times when a particular area is filled with smoke, and contains insufficient lighting. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of plant. The drills should include the simulated use of equipment in each area and should be preplanned and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade, the on scene fire team leader, the reactor operator in the control room, and the offsite command post. **(3)** To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.

to perform as a team. (5) A critique shall be held and documented after each drill.	**(4)** NFPA No. 27, "Private Fire Brigade," should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Standards referenced from this document which should be utilized are NFPA 194, "Standards for Screw Threads and Gaskets for Fire Hose Couplings," NFPA 196, "Standard for Fire Hose, NFPA 197, "Training Standard on Initial Fire Attacks, " NFPA 601, "Recommended Manual of Instructions and Duties for the Plant Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72, are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.
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.	**III.A Defense-in-Depth** Also backup manual firefighting capability should be provided throughout the plant to limit the extent of a fire, by providing portable equipment consisting of hoses, nozzles, portable extinguishers, and air breathing equipment for use by properly trained fire fighting personnel. **IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(e)** The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these *functions*. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable. **(e)(4)** NFPA No. 27, "Private Fire Brigade," should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Standards referenced from this document which should be utilized are NFPA 194, "Standards for Screw Threads and Gaskets for Fire Hose Couplings," NFPA 196, "Standard for Fire Hose, NFPA 197, "Training Standard on Initial Fire Attacks, " NFPA 601, "Recommended Manual of Instructions and Duties for the Plant Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72, are also applicable for good training references. In addition, courses in fire prevention and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.

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.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(d)** Nuclear power plants are usually located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability.
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.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(d)** Nuclear power plants are usually located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability. **(e)** The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these *functions*. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable. **(2)** Basic training is a necessary element in effective firefighting operation. In order for a fire brigade to operate effectively, it must operate as a team. Each member must know what his duties are. The fire brigade must be familiar with equipment location and operation, the layout of the plant during times when a particular area is filled with smoke, and contains insufficient lighting. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of plant. The drills should include the simulated use of equipment in each area and should be preplanned and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade, the on scene fire team leader, the reactor operator in the control room, and the offsite command post. **(3)** To have proper coverage during all phases of

	operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that responsibilities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.
3.4.5.3* Security and Radiation Protection. Plant security and radiation protection plans shall address off-site fire authority response.	No similar requirement in APCSB BTP 9.5-1
3.4.6* Communications. An effective emergency communications capability shall be provided for the industrial fire brigade.	**IV.B.6 Administrative Procedures, Controls and Fire Brigade** **(e)** The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these *functions*. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants," should be followed as applicable. **(1)** Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan should be developed which lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems. The test plant should contain the types, frequency and detailed procedures for tasting. Procedures should also contain instructions on maintaining fire protection during those periods of fire protection system impairment or maintenance such as fire watches or temporary hose connections to water systems.
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	**IV.C.2 Water Supply Systems** **(d)** Two separate reliable water supplies should be provided. If tanks are used, two 100% (minimum of 300,000 gallons each) system capacity tanks should be installed. They should be so interconnected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. The main plant fire water supply capacity should be capable of refilling either tank in a minimum of eight hours. Common tanks are permitted for fire and sanitary or

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.	service water storage. When this is done, however, minimum fire water storage requirements should be dedicated by means of a vertical standpipe for other water services. **IV.C.2 Water Supply Systems** **(e)** The fire water supply (total capacity and flow rate) should be calculated on the basis of largest expected flow rate for a period of two hours, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 1,000 gpm for manual hose streams plus the greater of: **(1)** all sprinkler heads opened and flowing in the largest designed fire area; or **(2)** the largest open head deluge system(s) operating.
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.	**IV.C.2 Water Supply Systems** **(d)** If tanks are used, two 100% (minimum of 300,000 gallons each) system capacity tanks should be installed. They should be so interconnected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. **IV.C.2 Water Supply Systems** **(f)** Lakes or fresh water ponds of sufficient size may qualify as sole source of water for fire protection, but require at least two intakes to the pump supply. When a common water supply is permitted for fire protection and the ultimate heat sink, the following conditions should also be satisfied: **(1)** The additional fire protection water requirements are designed into the total storage capacity; and **(2)** Failure of the fire protection system should not degrade the function of the ultimate heat sink.
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.	**IV.C.2 Water Supply Systems** **(c)** If pumps are required to provide pressure and/or flow requirements, redundant 100% capacity pumps should be provided. Each pump should have its own independent water supply. The connection to the yard fire main loop from each fire pump should be widely separated, preferably located on opposite sides of the plant. Each pump should have its own driver with independent power supplies and control. At least one pump should be driven by non-electrical means, preferably diesel engine. Pumps and drivers should be located in rooms, separated from the remaining pumps and equipment by a minimum three-hour fire wall.
3.5.4 At least one diesel engine-driven fire pump or	**IV.C.2 Water Supply Systems** **(c)** Each pump should have its own driver with

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.	independent power supplies and control. At least one pump should be driven by non-electrical means, preferably diesel engine.
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.	**IV.C.2 Water Supply Systems** **(c)** Pumps and drivers should be located in rooms, separated from the remaining pumps and equipment by a minimum three-hour fire wall.
3.5.6 Fire pumps shall be provided with automatic start and manual stop only.	No specific discussion of this issue. May be tacitly covered by the following statement. **IV.C.2 Water Supply Systems** **(c)** Details of the fire pump installation should as a minimum conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."
3.5.7 Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.	**IV.C.2 Water Supply Systems** **(a)** Approved visually indicating sectional control valves, such as Post Indicator Valves, should be provided to isolate portions of the main for maintenance or repair without shutting off the entire system. **IV.C.2 Water Supply Systems** **(c)** The connection to the yard fire main loop from each fire pump should be widely separated, preferable located on opposite sides of the plant.
3.5.8 A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.	No specific discussion of this issue in BTP. May be tacitly covered by the following statement. **IV.C.2 Water Supply Systems** **(c)** Details of the fire pump installation should as a minimum conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."
3.5.9 Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.	**IV.C.2 Water Supply Systems** **(c)** Alarms indicating pump running, driver availability, or failure to start should be provided in the control room.
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.	**IV.C.2 Water Supply Systems** **(a)** An underground yard fire main loop should be installed to furnish anticipated fire water requirements. NFPA 24 – Standard for Outside Protection – gives necessary guidance for such installation. It references other design codes and standards developed by such organizations as the American National Standards Institute (ANSI) and the American Water Works Association (AWWA).
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	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(a)** Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from

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.	each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems.
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.	**IV.C.2 Water Supply Systems** **(g)** Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings and standpipe risers.
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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(a)** Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems. Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shutoff valve, and water flow alarm.
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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(b)** All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant. (See NFPA 26, "Supervision of Valves).
3.5.15 Hydrants shall be installed approximately every	**IV.C.2 Water Supply Systems** **(g)** Outside manual hose installation should be sufficient

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.	to reach any location with an effective hose stream. To accomplish this, hydrants should be installed approximately every 250 feet on the yard main system. … A hose house, equipped with hose and combination nozzle, and other auxiliary equipment recommended in NFPA 24, "Outside Protection", should be provided as needed but at least every 1,000 feet.
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.	**IV.C.2 Water Supply Systems** **(a)** The fire main system piping should be separate from service or sanitary water system piping. **IV.C.2 Water Supply Systems** **(d)** Common tanks are permitted for fire and sanitary or service water storage. When this is done, however, minimum fire water storage requirements should be dedicated by means of a vertical standpipe for the other water services.
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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(d)** Interior manual hose installation should be able to reach any location with at least one effective hose stream. To accomplish this, standpipes with hose connections, equipped with a maximum of 75 feet of 1 1/2 inch woven jacket-lined fire hose and suitable nozzles should be provided in all buildings, including containment, on all floors and should be spaced at not more than 100-foot intervals. Individual standpipes should be of at least 4-inch diameter for multiple hose connections and 2 1/2-inch diameter for single hose connections. These systems should follow the requirements of NFPA No. 14, "Standpipe and Hose Systems," for sizing, spacing and pipe support requirements - (NELPIA).
3.6.2 A capability shall be provided to ensure an	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(d)** Hose stations should be located outside entrances to

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.	normally unoccupied areas and inside normally occupied areas. Standpipes serving hose stations in areas housing safety related equipment should have shut-off valves and pressure reducing devices (if applicable) outside the area.
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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(e)** The proper type of hose nozzle to be supplied in each-area should be based on the fire hazard analysis. The usual combination spray straight stream may cause unacceptable mechanical damage, (for instance delicate electronic equipment in the control room) and be unsuitable. Electrically safe nozzles should be provided at locations where electrical equipment or cabling is located.
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. This 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.~~	**III.B Defense in Depth** Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena; e.g., LOCH and fire. However, in the event of the most sever•. earthquake; namely, the safe shutdown earthquake (SSE), the fire protection system should be capable of delivering water from manual hose stations located within hose reach of areas containing equipment required for safe plant shutdown. The water supply for this condition may be obtained by manual operator actuation of valve(s) in a connection to the hose standpipe header from a normal seismic Category I water system such as the Essential Service Water system. Thus, at least manual hose and portable fire protection capability must be provided for all postulated design bases events requiring plant shutdown. **IV.A.4 Single Failure Criteria** Overall Requirements of Nuclear Plant Fire Protection Program Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena. However, in the event of the most severe earthquake; namely, the safe shutdown earthquake (SSE), the fire suppression system should be capable of delivering water to manual hose stations located within hose reach of areas containing equipment required for safe plant shutdown.

	IV.C.3 Water Sprinkler and Hose Standpipe Systems **(d)** Provisions should be made to supply water at least to standpipes and hose connections for manual fire fighting in areas within hose reach of equipment required for safe plant shutdown in the event of a safe shutdown earthquake (SSE). The standpipe system serving such hose stations should be analyzed for SSE loading and be provided with supports to assure system pressure integrity. The piping and valves for the portion of hose standpipe system affected by this functional requirement should at least satisfy ANSI Standard B31.1, "Power Piping." The water supply for this condition may be obtained by manual operator actuation of valve(s) in a connection to the hose standpipe header from a normal seismic Category I water system such as the Essential Service Water System. The cross connection should be (a) capable of providing flow to at least two hose stations (approximately 150 gpm/hose station); (b) designed to the same standards as the seismic Category I water system and should not degrade the performance of the seismic Category I 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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(d)** Provisions should be made to supply water at least to standpipes and hose connections for manual fire fighting in areas within hose reach of equipment required for safe plant shutdown in the event of a safe shutdown earthquake (SSE). The standpipe system serving such hose stations should be analyzed for SSE loading and be provided with supports to assure system pressure integrity. The piping and valves for the portion of hose standpipe system affected by this functional requirement should at least satisfy ANSI Standard B31.1. "Power Piping." The water supply for this condition may be obtained by manual operator actuation of valve(s) in a connection to the hose standpipe header from a normal seismic Category I water system such as the Essential Service Water System. The cross connection should be (a) capable of providing flow to at least two hose stations (approximately 150 gpm/hose station); (b) designed to the same standards as the seismic Category I water system and should not degrade the performance of the seismic Category I water system.
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	**IV.C.6 Portable Extinguishers** Fire extinguishers should be provided in accordance with guidelines of National Fire Protection Association No. 10 and 10 A, "Portable Fire Extinguishers, Installation" and "Portable Fire Extinguishers, Maintenance and Use.." Dry chemical extinguishers should be installed with due

areas due to radiological conditions.	consideration given to cleanup problems after use and possible adverse effects on equipment installed in the area. **IV.D.1.b Refueling and Maintenance** In addition, manual fire fighting capability should be permanently installed in containment. Standpipes with hose stations, and portable fire extinguishers, should be installed at strategic locations throughout containment for any required manual fire fighting operations.
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	**IV.C.1 Fire Detection** **(a)** Fire detection systems should as a minimum comply with NFPA 72D, "Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems. **(b)** Fire detection systems should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire. **IV.C.2 Fire Protection Water Supply Systems** **(c)** Alarms indicating pump running, driver availability or failure to start should be provided in the control room. **IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(b)** All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant. (Refer to NFPA 26, "Supervision of Valves.")
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.	No similar requirement in APCSB BTP 9.5-1
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	**IV.C.1 Fire Detection** **(b)** Fire detection systems should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire.

(e.g., telephone and radio) for notification of off-site emergency services	
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.	**IV.C.1 Fire Detection** **(a)** Fire detection systems should as a minimum comply with NFPA 72D, "Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems.
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	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(c)** Automatic sprinkler systems should as a minimum conform to requirements of appropriate NFPA Standards such as No. 13, “Standard for' the Installation of Sprinkler Systems” and No. 15, “Standard for Water Spray Fixed Systems." **(f)** Certain fires such as those involving flammable liquids respond well to foam suppression. Consideration should be given to use of any of the available foams for such specialized protection application. These include the more common chemical and mechanical low expansion foams, high expansion foam and the relatively new aqueous film forming foam (AFFF).
3.9.2 Each system shall be equipped with a water flow alarm.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(a)** … Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shut off valve, and water flow alarm.
3.9.3 All alarms from fire suppression systems shall annunciate in the control room or other suitable constantly attended location.	**IV.D.2 Control Room** … Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.
3.9.4 Diesel-driven fire pumps shall be protected by automatic sprinklers.	No similar requirement in APCSB BTP 9.5-1
3.9.5 Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(a)** … Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shut off valve, and water flow alarm.
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.	**IV.C.3 Water Sprinkler and Hose Standpipe Systems** **(b)** All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant. (Refer to NFPA 26, "Supervision of Valves.")

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	**IV.C.4 Halon Suppression Systems** The use of Halon fire extinguishing agents should as a minimum comply with the requirements of NFPA Nos.-12A and 12B, "Halogenated Fire Extinguishing Agent Systems - Halon 1301 *and* Halon 1211." Only UL or FM approved agents should be used. **IV.C.5 Carbon Dioxide Suppression Systems** The use of carbon dioxide extinguishing systems should as a minimum comply with the requirements of NFPA No. 12, "Carbon Dioxide Extinguishing Systems."
3.10.2 Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.	**IV.D.2 Control Room** … Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.
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.	**IV.C.5 Carbon Dioxide Suppression Systems** Particular consideration should also be given to: **(d)** offsetting requirements for venting during $C0_2$ injection to prevent over-pressurization versus sealing to prevent loss of agent. **(e)** design requirements from overpressurization **IV.B.4 Ventilation** **(i)** Where total flooding gas extinguishing systems are used, area intake and exhaust ventilation dampers should close upon initiation of gas flow to maintain necessary gas concentration. (See NFPA 12, "Carbon Dioxide Systems," and 12A, "Halon 1301 Systems.")
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.	**III.A Defense-in-Depth** A nuclear power plant must maintain its capability to combat a fire under any operating condition with fuel onsite. A single failure in the fire protection system or direct support systems should not impair both primary and backup plant fire protection capability. For example, to avoid such a consequence, the pumping portion of fire protection water supply systems should be redundant and independent, including associated power supplies and controls. Also, failure or inadvertent operation of the fire suppression system should not result in failure of safety related systems or components. **IV.A.4 Single Failure Criteria** A single failure in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be

	provided.
3.10.5 Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.	No similar requirement in APCSB BTP 9.5-1
3.10.6* Total flooding carbon dioxide systems shall not be used in normally occupied areas.	No similar requirement in APCSB BTP 9.5-1
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.	No similar requirement in APCSB BTP 9.5-1
3.10.8 Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.	No similar requirement in APCSB BTP 9.5-1
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.	**IV.C.5 Carbon Dioxide Suppression Systems** Particular consideration should also be given to: (c) possibility of secondary thermal shock (cooling) damage.
3.10.10 Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.	**IV.C.4 Halon Suppression Systems** Particular consideration should also be given to: (c) toxicity and corrosive characteristics of thermal decompositions products of Halon.
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*	No similar requirement in APCSB BTP 9.5-1

determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.	
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.	**I. Definitions** Fire Area - that portion of a building or plant that is separated from other areas by boundary fire barriers (walls, floors or roofs) with any openings or penetrations protected with seals or closures having a fire resistance rating equal to that of the barrier. Fire Barrier - those components of construction (walls, floors and roofs: that are rated by approving laboratories in hours for resistance to fire to prevent the spread of fire. Fire Rating - refers to the endurance period of a fire barrier or structure and defines the period of resistance to a standard fire exposure elapsing before the first critical point in behavior is observed. (Refer to NFPA 251). **IV.B.3 Electrical Cable Construction, Cable Trays and Cable Penetrations** **(d)** Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to the fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including the hose stream test.
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 3.11.3.4 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*	**IV.B.1 Building Design** **(j)** Floors, walls and ceilings enclosing separate fire areas should have minimum three-hour fire rating. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide fire resistance rating at least equal to that of the barrier itself. Door *openings* should be protected with equivalent rated doors, frames and hardware that have been tested and approved by a nationally recognized laboratory. Such doors should be normally closed and locked or alarmed with alarm and annunciation in the control room. Penetration for ventilation systems should be protected by a standard "fire door damper" where required. (Refer to NFPA 80, "Fire Doors and Windows.")

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.	
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.	**I. Definitions** Fire Area - that portion of a building or plant that is separated from other areas by boundary fire barriers (walls, floors or roofs) with any openings or penetrations protected with seals or closures having a fire resistance rating equal to that of the barrier. **IV.B.1 Building Design** **(j)** Floors, walls and ceilings enclosing separate fire areas should have minimum three-hour fire rating. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide fire resistance rating at least equal to that of the barrier itself. **IV.B.3 Electrical Cable Construction, Cable Trays and Cable Penetrations** **(d)** Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to the fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including the hose stream test.
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	No similar requirement in APCSB BTP 9.5-1

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.	