

B/B

APPENDIX 5.7

APPENDIX R--FIRE PROTECTION PROGRAM FOR
NUCLEAR POWER FACILITIES OPERATING PRIOR
TO JANUARY 1, 1979

Introduction

Appendix A5.7 now applies to both the Byron and Braidwood stations. In cases where the description of conformance is only applicable to one of the stations, this is so indicated by following the description with the station name in parentheses.

APPENDIX R--FIRE PROTECTION PROGRAM FOR NUCLEAR
POWER FACILITIES OPERATING PRIOR TO JAN. 1, 1979

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I. Introduction and Scope

This Appendix applies to licensed nuclear power electric generating stations that were operating prior to January 1, 1979, except to the extent set forth in paragraph 50.48(b) of this part. With respect to certain generic issues for such facilities it sets forth fire protection features required to satisfy Criterion 3 of Appendix A to this part⁵.

Criterion 3 of Appendix A to this part specifies that "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions."

When considering the effects of fire, those systems associated with achieving and maintaining safe shutdown conditions assume major importance to safety because damage to them can lead to core damage resulting from loss of coolant through boiloff.

The phrases "important," or "safety-related," will be used throughout this Appendix R as applying to all safety functions. The phrase "safe shutdown" will be used throughout this Appendix R as applying to both hot and cold shutdown functions.

Because fire may affect safe shutdown systems and because the loss of function of systems used to mitigate the consequences of design basis accidents under postfire conditions does not per se impact public safety, the need to limit fire damage to

Although Appendix R to 10 CFR 50 applies strictly to plants licensed to operate prior to January 1, 1979, the NRC has made conformance to 10 CFR 50 Appendix R a licensing requirement for Byron/Braidwood. See NRC question 600.01 (June 3, 1981).

The design basis of the Byron/Braidwood plant has from the beginning been that Hot Standby (as defined in the Technical Requirements Manual) is a "safe shutdown" condition, since the plant can be maintained in Hot Standby for an extended period of time from outside the control room.

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systems required to achieve and maintain safe shutdown conditions is greater than the need to limit fire damage to those systems required to mitigate the consequences of design basis accidents. Three levels of fire damage limits are established according to the safety functions of the structure, system, or component:

Safety Function Fire Damage Limits

Hot Shutdown...One train of equipment necessary to achieve hot shutdown from either the control room or emergency control station(s) must be maintained free of the damage by a single fire, including an exposure fire.'

Cold Shutdown...Both trains of equipment necessary to achieve cold shutdown may be damaged by a single fire, including an exposure fire, but damage must be limited so that at least one train can be repaired or made operable within 72 hours using onsite capability.

Design Basis Accidents...Both trains of equipment necessary for mitigation of consequences following design basis accidents may be damaged by a single exposure fire.

The most stringent fire damage limit shall apply for those systems that fall into more than one category. Redundant systems used to mitigate the consequences of other design basis accidents but not necessary for safe shutdown may be lost to a single exposure fire. However, protection shall be provided so that a fire

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within only one such system will not damage the redundant system.

II. General Requirements

A. Fire Protection Program

A fire protection program shall be established at each nuclear power plant. The program shall establish the fire protection policy for the protection of structures, systems, and components important to safety at each plant and the procedures, equipment, and personnel required to implement the program at the plant site.

The fire protection program shall be under the direction of an individual who has been delegated authority commensurate with the responsibilities of the position and who has available staff personnel knowledgeable in both fire protection and nuclear safety.

The fire protection program shall extend the concept of defense-in-depth to fire protection in fire areas important to safety, with the following objectives;

- to prevent fires from starting;

The applicant's fire protection program complies with these requirements as described below.

Administrative procedures define the requirements for fire prevention. The Fire Protection Report Section 2.3, "Fire Hazards Analysis" and Section 2.4, "Safe Shutdown Analysis" establish the components for safe shutdown. Prefire plans establish the components needed and the protection for the area.

Administrative Procedures define the responsibilities, procedures, and personnel for the Fire Protection Program.

Administrative Procedures identify the individual delegated the authority for establishing the fire protection program.

Administrative Procedures describe the organization and staff available to implement the program.

Comply. The B/B fire protection program includes these general objectives within it.

Administrative Procedures outline inspection requirements for spill prevention.

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Administrative Procedures control lumber plus other combustibles in the plant including safety-related areas.

Administrative Procedure control combustibles and flammable liquids.

Administrative Procedures address plant housekeeping and requires periodic instructions for fire hazards.

Administrative Procedures outline fire prevention when welding and cutting.

Administrative Procedures govern the handling and usage of combustible and flammable gas cylinders.

- to detect rapidly, control, and extinguish promptly those fires that do occur;

The detection system alarms in the main control room. The proper method of reporting fires is identified in Administrative Procedures.

The Fire Marshall, Chief and brigade respond during a fire in accordance with Administrative Procedures.

Governing Administrative Procedures provide for a Fire Watch or other compensatory measures in areas where detection or suppression systems are inoperable.

Implementation of the prefire plans for the station is in accordance with Administrative Procedures.

Fire extinguishing is described by Administrative Procedures. In addition, agreements have been made with the local fire department for assistance.

Administrative Procedures address the implementation of the Fire Marshall, Fire Chief and Fire Brigade, respectively, in a fire situation. Administrative Procedures address Fire Department response, notification, mutual aid agreements and expected chain of events during a fire.

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- to provide protection for structures, systems, and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

Fire Protection Operating Procedures outline the manual initiation of CO₂ with loss of power.

Fire Protection Operating Procedures outline manual initiation of the charcoal filter deluge systems.

Fire Protection Operating Procedures outline manual initiation of Halon. These apply to areas where fire protection may fail to respond and allow for a longer duration.

The Fire Hazards Analysis 2.3 and Safe Shutdown Analysis 2.4 address components, structures, and safe shutdown capability.

Prefire plans address protection of equipment.

B. Fire Hazards Analysis

A fire hazard analysis shall be performed by qualified fire protection and reactor systems engineers to (1) consider potential in situ and transient fire hazards; (2) determine the consequences of fire in any location in the plant on the ability to safely shut down the reactor or on the ability to minimize and control and release of radioactivity to the environment; and (3) specify measures for fire prevention, fire detection, fire suppression, and fire containment and alternative shutdown capability as required for each fire area containing structures, systems, and components important to

A Fire Hazards Analysis was performed for the Byron/Braidwood stations and was included with the Fire Protection Report, filed with the NRC on October 31, 1977. This report documented conformance with BTP APCS 9.5-1, Appendix A, but did not specifically address safe shutdown capability, the subject of Appendix R.

The Applicant has performed Safe Shutdown Analyses for the Byron and Braidwood units which demonstrate the ability to safely shut down the units following a fire in any zone. The analyses are included in Section 2.4 of the Fire Protection Report.

The fire hazards analysis and the safe shutdown analysis were performed primarily by the architect/engineer for this plant. Engineering personnel from the AE's mechanical, electrical and structural

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safety in accordance with NRC guidelines and regulations.	<p>disciplines participated in these efforts. They are thoroughly familiar with the overall plant design and with the design of the many systems and components within the plant, including the reactor and related systems. Significant participation was also obtained from the applicant's engineering staff and the station personnel (fire marshall and operating staff). A qualified fire protection engineer participated in the preparation of the fire hazards analysis, and reviewed the final results. The participation by engineers from all of the relevant disciplines, and personnel experienced in operation as well as design ensures that the requirements set forth here have been met.</p> <p>Also see FPR Section 3.1.b.</p>	
C. Fire Prevention Features	Comply. The fire prevention program and plant features meet these requirements.	
<p>Fire Protection features shall meet the following general requirements for all fire areas that contain or present a fire hazard to structures, systems, or components important to safety.</p>		
<p>1. In situ fire hazards shall be identified and suitable protection provided.</p>	<p>Fire hazards were considered in the plant design as shown in the Fire Protection Report Section 2.3. In situ combustible materials have been identified for all fire zones in the plant and they are listed in Table 2.2-1 of the Fire Protection Report. Suitable protection has been provided for all plant areas. Table 2.2-3 also lists all detection and suppression available in each fire zone.</p>	
<p>2. Transient fire hazards associated with normal operation, maintenance, repair, or modification activities shall be identified and eliminated where possible. Those transient fire hazards that</p>	<p>The fire hazard analysis includes an allowance for transient combustibles in the combustible inventory for each fire zone unless the fire zone is a controlled access area. Specific transient materials which could be present are not identified; rather, a transient hazard equivalent in Btu content to one or more 55-gallon drums</p>	

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- cannot be eliminated shall be controlled and suitable protection provided.
- of lubricating oil is assumed and the Btu content is added to that of the identified in situ combustibles in calculating the fire zones fire load.
- Administrative controls relating to the control of transient combustibles are established as discussed in FPR Section 3.2.a through 3.2.c.
3. Fire detection systems, portable extinguishes, and standpipe and hose stations shall be installed.
- Byron/Braidwood Stations comply with exceptions as documented in the FPR Section 3.6.
4. Fire barriers or automatic suppression systems or both shall be installed as necessary to protect redundant systems or components necessary for safe shutdown.
- Redundant safe shutdown components and systems are not always separated by fire barriers and/or protected by automatic suppression systems. All deviations from this requirement are identified and justified in Appendix A5.8 and Generic Letter 86-10 evaluations.
5. A site fire brigade shall be established, trained, and equipped and shall be on site at all times.
- The site fire brigade is established as described in Administrative Procedures. Refer to Section III.H and III.I of this Appendix.
6. Fire detection and suppression systems shall be designed, installed, maintained, and tested by personnel properly qualified by experience and training in fire protection systems.
- Byron/Braidwood Stations fire protection and suppression systems are designed and constructed as described in FPR Section 3.1 of Paragraph 1.a., Responsibility for Fire Protection Program, Design Phase and 1.b. Construction and Operating Phase.
- Surveillance procedures are established for the maintenance and testing of fire detection and suppression systems.
- See also FPR Sections 3.1.a(3) and 3.1.a(5).
- Surveillance procedures have been established to ensure that fire barriers are in place and fire suppression systems are operable.
- See also FPR Section 3.2.j.

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7. Surveillance procedures shall be established to ensure that fire barriers are in place and that fire suppression systems and components are operable.

D. Alternative or Dedicated Shutdown Capability

In areas where the fire protection features cannot ensure safe shutdown capability in the event of a fire in that area, alternative or dedicated safe shutdown capability shall be provided.

Byron/Braidwood complies with this requirement. Specific plant areas for which alternate shutdown components or systems have been installed include the control room and the auxiliary electrical equipment room. Specific details for each room are described in Section 2.4 of the Fire Protection Report.

III. Specific Requirements

A. Water supplies for Fire Suppression Systems

Two separate water supplies shall be provided to furnish necessary water volume and pressure to the fire main loop.

The B/B design complies with these requirements in Part A as described in Section 3.6.b and Appendix 5.4, Subsection A5.4.1 of the FPR.

Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. Two separate redundant suctions in one or more intake structures from a large body of water (river, lake, etc.) will satisfy the requirement for two separated water storage tanks. These supplies shall be separated so that a failure of one supply will not result in a failure of the other supply.

Each supply of the fire water distribution system shall be capable of providing for a period of 2 hours the maximum expected water demands as determined by the fire hazards analysis for safety-related areas or other

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areas that present a fire exposure hazard to safety-related areas.

When storage tanks are used for combined service-water/fire-water uses the minimum volume for fire uses shall be ensured by means of dedicated tanks or by some physical means such as vertical standpipe for other water service. Administrative controls, including locks for tank outlet valves, are unacceptable as the only means to ensure minimum water volume.

Other water systems used as one of the two fire water supplies shall be permanently connected to the fire main system and shall be capable of automatic alignment to the fire main system. Pumps, controls, and power supplies in these systems shall satisfy the requirements for the main fire pumps. The use of other water systems for fire protection shall not be incompatible with their functions required for safe plant shutdown. Failure of the other system shall not degrade the fire main system.

B. Sectional Isolation Valves

Sectional isolation valves such as post indicator valves or key-operated valves shall be installed in the fire main loop to permit isolation of portions of the main fire main loop for maintenance or repair without interrupting the entire water supply.

The B/B design complies with this requirement as described in Section 3.6.b(2) and Appendix 5.4, Subsection 5.4.1 of the FPR.

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C. Hydrant Isolation Valves	Valves shall be installed to permit isolation of outside hydrants from the fire main for maintenance or repair without interrupting the water supply to automatic or manual fire suppression systems in any area containing or presenting a fire hazard to safety-related or safe shutdown equipment.	The B/B design complies with this requirement as described in Section 3.6.b(3) and Appendix 5.4, Subsection 5.4.1 of the FPR.
D. Manual Fire Suppression	Standpipe and hose systems shall be installed so that at least one effective hose stream will be able to reach any location that contains or presents an exposure fire hazard to structures, systems, or components important to safety.	B/B complies with exceptions as noted in FPR Section 3.6.c(4) and Appendix 5.4, Subsection A5.4.7.
	Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present an exposure fire hazard to structures, systems, or components important to safety.	B/B complies. Access routes for fire fighting are listed in the Pre-Fire Plans.
	Standpipe and hose stations, shall be inside PWR containments and BWR containments that are not inerted. Standpipe and hose stations inside containment may be connected to a high quality water supply of sufficient quantity and pressure other than the fire main loop if plant-specific features prevent extending the fire main supply inside containment. For BWR drywells, standpipe and hose stations shall be placed outside the drywell with adequate lengths of hose to reach any location	B/B complies. See FPR Sections 2.3.1. 3.7.a, and Appendix 5.4, Subsection A5.4.7.

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inside the drywell with an effective hose stream.		
E. Hydrostatic Hose Tests		
Fire hose shall be hydrostatically tested at a pressure of 150 psi or 50 psi above maximum fire main operating pressure, whichever is greater. Hose stored in outside hose houses shall be tested annually. Interior standpipe hose shall be tested every three years.	Byron/Braidwood comply by satisfying the recommendations of NFPA 1962 and BTP CMEB 9.5.1. See also FPR Section 3.6.c(6).	
F. Automatic Fire Detection		
Automatic fire detection systems shall be installed in all areas of the plant that contain or present an exposure fire hazard to safe shutdown or safety-related systems or components. These fire detection systems shall be capable of operating with or without offsite power.	B/B complies. See FPR Section 3.6.a and Appendix 5.4, Subsection A5.4.8.	
G. Fire Protection of Safe Shutdown Capability		
1. Fire protection features shall be provided for structures, systems, and components important to safe shutdown. These features shall be capable of limiting fire damage so that:	Byron/Braidwood complies with this requirement. Certain plant configurations exist, each of which is described and justified below under the discussion for Section III.G.2 and Appendix A5.8, where separation of redundant safe shutdown components or systems is not as specified in Section III.G.2. Taking credit for the alternative separation and protection features identified in these deviations from the requirements of Section III.G.2, one train of systems necessary to achieve and maintain hot shutdown will remain free of fire damage, and systems required to achieve and maintain cold shutdown will either remain free of fire damage or will be repairable so that cold shutdown can be	
a. One train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage; and		

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- b. Systems necessary to achieve and maintain cold shutdown from either the control room or emergency control station(s) can be repaired within 72 hours.
2. Except as provided for Paragraph G.3 of this section, where cables or equipment, including associated non-safety circuits that could prevent operation or cause maloperation due to hot shorts, open circuits, or shorts to ground, or redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means of ensuring that one of the redundant trains is free of fire damage shall be provided:
- a. Separation of cables and equipment and associated non-safety circuits of redundant trains by a fire barrier having a 3-hour rating. Structural steel forming a part of or supporting such fire barriers shall be provided to provide fire resistance equivalent to that required of the barrier;
- b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a
- achieved within 72 hours, for each fire area in the plant.
- Deviations from the requirements of Section III.G.2 are described in Appendix A5.8 and Generic Letter 86-10 evaluations. In each case, a detailed description of the deviations is included, modifications (if any) implemented as a result of the deviation are described, and a justification for the deviation is provided.

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horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area; or

- c. Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area;

Inside noninerted containments one of the fire protection means specified above or one of the following fire protection means shall be provided:

- d. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards;
- e. Installation of fire detectors and an automatic fire suppression system in the fire area; or

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<p>f. Separation of cables and equipment and associated non-safety circuits of redundant trains by a noncombustible radiant energy shield.</p>		
<p>3. Alternative or dedicated shutdown capability and its associated circuits, independent of cables, systems or components in the area, room or zone under consideration, shall be provided;</p>	<p>Taking credit for the alternative separation and protection features described above for those plant areas which deviate from the requirements of Section III.G.2, Byron/Braidwood complies with this requirement.</p>	
<p>a. Where the protection of systems whose function is required for hot shutdown does not satisfy the requirement of paragraph G.2 of this section; or</p>		
<p>b. Where redundant trains of systems required for hot shutdown located in the same fire area may be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems.</p>		
<p>In addition, fire detection and a fixed fire suppression system shall be installed in the area, room, or zone under consideration.</p>		
<p>H. Fire Brigade</p>		
<p>A site brigade trained and equipped for fire fighting shall be established to ensure adequate manual fire fighting capability for all areas of the plant</p>	<p>Byron and Braidwood comply, except as noted below. The fire brigade will meet the requirements stated herein, except that exception is taken to the performance standards required by the</p>	

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containing structures, systems, or components important to safety. The fire brigade shall be at least five members on each shift. The brigade leader and at least two brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability. The qualification of fire brigade members shall include an annual physical examination to determine their ability to perform strenuous fire fighting activities. The shift supervisor shall not be a member of the fire brigade. The brigade leader shall be competent to assess the potential safety consequences of a fire and advise control room personnel. Such competence by the brigade leader may be evidenced by possession of an operator's license or equivalent knowledge of plant safety-related systems.

The minimum equipment provided for the brigade shall consist of personal protective equipment such as turnout coats, boots, gloves, hard hats, emergency communications equipment, portable lights, portable ventilation equipment, and portable extinguishers. Self-contained breathing apparatus using full-face positive-pressure masks approved by NIOSH (National Institute for Occupational Safety and Health approval formerly given by the U.S. Bureau of Mines) shall be provided for fire brigade, damage control, and control room personnel. At least 10 masks shall be available for fire brigade personnel. Control

annual physical examination. The wording "ability to perform strenuous fire fighting activities" is lacking in specific detail and is open to wide interpretation. The annual physical will demonstrate that fire brigade members are capable of performing unrestricted physical activity.

The Fire Protection Program Administrative Procedures sets forth the qualifications for the members of the fire brigade. These requirements set forth the training and physical condition of the members of the brigade. All brigade members complete the training course set forth by the Production Training Department Technical Training Section "Training Standard for Initial Training of Nuclear Station Fire Brigade Members." A competent fire brigade leader will respond to a fire.

The Braidwood off-site fire department is the primary responder in the event of a fire at the Braidwood Lake Screen House (LSH). The site Fire Brigade Chief may also respond to a fire at the LSH. The Custer Park Fire Department is the primary responder in the event of a fire at the Braidwood River Screen House. The Byron offsite fire department is the primary responder in the event of a fire at the Byron River Screen House (RSH). A Byron Station operator will also respond to a fire at the RSH.

Reference EC 361785.
Reference EC 368713

Comply. The Fire Protection Program Administrative Procedures provides the requirement of the Fire Brigade inventory to be performed and lists the equipment to be inventoried.

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room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or rated operating life shall be a minimum of one-half hour for the self-contained units.

At least two extra air bottles shall be located onsite for each self-contained breathing unit. In addition, an onsite 6-hour supply of reserve air shall be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air shall be used; compressors shall be operable assuming a loss of offsite power. Special care must be taken to locate the compressor in areas free of dust and contaminants.

Comply. The extra air bottles are included in inventory procedures for the fire brigade equipment. The 6-hour supply of reserve air is supplied by a bank of cylinders and/or bottles which is under the control of the Rad-Chem department. Compressors are not used to meet supply requirements for breathing air for the fire brigade.

I. Fire Brigade Training

The fire brigade training program shall ensure that the capability to fight potential fires is established and maintained. The program shall consist of an initial classroom instruction program followed by periodic classroom instruction, fire fighting practice, and fire drills.

The fire brigade training program meets the requirements presented herein.

The fire brigade training program is administered through a Training Standard for Nuclear Station Fire Brigade Members developed by the Braidwood Production Training Center.

1. Instruction

- a. The initial classroom instruction shall include:

- (1) Indoctrination of the plant fire fighting plan with

Byron and Braidwood comply with Parts a through e. See Fire Protection Administrative Procedures.

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- Specific identification of each individual's responsibilities.
- (2) Identification of the type and location of fire hazards and associated types of fires that could occur in the plant.
- (3) The toxic and corrosive characteristics of expected products of combustion.
- (4) Identification of the location of fire fighting equipment for each fire area and familiarization with the layout of the plant, including access and egress routes to each area.
- (5) The proper use of available fire fighting equipment and the correct method of fighting each type of fire. The types of fires covered should include fires in energized electrical equipment, fires in cables and cable trays, hydrogen fires, fires involving flammable and

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- Combustible liquids or hazardous process chemicals, fires resulting from construction or modifications (welding), and record file fires.
- (6) The proper use of communication, lighting, ventilation, and emergency breathing equipment.
- (7) The proper method for fighting fires inside buildings and confined spaces.
- (8) The direction and coordination of the fire fighting activities (fire brigade leaders only).
- (9) Detailed review of fire fighting strategies and procedures.
- (10) Review of the latest plant modifications and corresponding changes in fire fighting plans.

All brigade members get the leadership course.

Training of fire-fighting strategies and procedures is included in the initial and continued training.

This subject is covered during fire brigade training.

NOTE: Items (9) and (10) may be deleted from the training of no more than two of the non-operations personnel who

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<p>may be assigned to the fire brigade.</p>		
<p>b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and suitably trained in fighting the types of fires that could occur in the plant and in using the types of equipment available in the nuclear power plant.</p>	<p>Licensed qualified instructors from the company training department or local fire department have provided the initial training of the fire brigade (Byron).</p> <p>The training of the fire brigade is conducted by a qualified member of the training department. State-certified members of the Fire Marshall's staff monitor this training (Braidwood).</p>	
<p>c. Instruction shall be provided to all fire brigade members and fire brigade leaders.</p>		
<p>d. Regular planned meetings shall be held at least every 3 months for all brigade members to review changes in the fire protection program and other subjects as necessary.</p>	<p>Comply. The Fire Protection Program sets forth the requirements to hold planned meetings quarterly for all brigade members to review changes in the fire protection program, etc.</p>	
<p>e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a two-year period. These sessions may be concurrent with the regular planned meetings.</p>	<p>Comply. Periodic refresher training is included in the Training Standard for Nuclear Station Fire Brigade Members.</p>	
<p>2. Practice</p>		
<p>Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions shall provide</p>	<p>Byron and Braidwood comply. Practice sessions in actual fire extinguishment and use of emergency breathing apparatus under strenuous conditions is accomplished through the annual fire extinguisher</p>	

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<p>brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting. These practice sessions shall be provided at least once per year for each fire brigade member.</p>	<p>training on live fires and annual smokehouse/live fire training.</p> <p>Practice sessions are also addressed in Administrative Procedures.</p>	
<p>3. Drills</p>		
<p>a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team.</p>	<p>Items 3a through 3e are accomplished by Administrative Procedures on Fire Drills. The type of drills and assessment of the drills are documented on a "Fire Drill Critique Record." Byron and Braidwood comply with parts a through e, except as noted.</p>	
<p>b. Drills shall be performed at regular intervals not to exceed 3 months for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year.</p>	<p>Comply except as noted below:</p>	
<p>A sufficient number of these drills, but not less than one for each shift fire brigade per year, shall be unannounced to determine the fire fighting readiness of the plant fire brigade, brigade leader, and fire protection systems and equipment. Persons planning and authorizing an unannounced drill shall ensure that the responding shift fire brigade members are not aware that a drill is being planned until it is</p>	<p>Byron/Braidwood Stations will perform fire brigade drill training such that the fire brigade drills once per quarter, so that each fire brigade member participates in at least two fire brigade drills per year. The brigade performs during the drill as a team. The members may not always be the same personnel.</p>	

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begun. Unannounced drills shall not be scheduled closer than four weeks.

At least one drill per year shall be performed on a "back-shift" for each shift fire brigade.

- c. The drills shall be preplanned to establish the training objectives of the drill and shall be critiqued to determine how well the training objectives have been met. Unannounced drills shall be planned and critiqued by members of the management staff responsible for plant safety and fire protection. Performance deficiencies of a fire brigade or of individual fire brigade members shall be remedied by scheduling additional training for the brigade or members.

Unsatisfactory drill performance shall be followed by a repeat drill within 30 days.

- d. At 3-year intervals, a randomly selected unannounced drill shall be critiqued by qualified individuals independent of the licensee's staff. A copy of the written report from such individuals shall be available for NRC review.
- e. Drills shall as a minimum include the following:
- (1) Assessment of fire alarm effectiveness, time required to notify and

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- assemble fire brigade and selection, placement and use of equipment, and fire fighting strategies.
- (2) Assessment of each brigade member's knowledge of his or her role in the fire fighting strategy for the area assumed to contain the fire. Assessment of the brigade member's conformance with established plant fire fighting procedures and use of fire fighting equipment, including self-contained emergency breathing apparatus, communication equipment, and ventilation equipment to the extent practicable.
- (3) The simulated use of fire fighting equipment required to cope with the situation and type of fire selected for the drill. The area and type of fire chosen for the drill should differ from those used in the previous drill so that brigade members are trained in fighting fires in various plant areas. The situation selected should simulate the size and arrangement of a fire that could reasonably occur in the area selected, allowing for fire development due to the time required to respond, to obtain

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equipment and organize for the fire assuming loss of automatic suppression capability.

- (4) Assessment of brigade leader's direction of the fire fighting effort as to thoroughness, accuracy, and effectiveness.

4. Records

Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least 3 years to ensure that each member receives training in all parts of the training program. These records of training shall be available for NRC review. Retraining or broadened training for fire fighting within buildings shall be scheduled for all those brigade members whose performance records show deficiencies.

Comply. Individual records of training for each brigade member are retained by the training department and will be available for review. The drill critique is retained in central file and will be available for review.

J. Emergency Lighting

Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.

B/B complies. Eight-hour, battery-powered emergency lights are provided for plant areas that need to be manned for safe shutdown and in access and egress routes thereto. Testing will demonstrate the 8-hour rating of these units.

K. Administrative Controls

Administrative controls shall be established to minimize fire hazards in areas containing structures, systems, and components important to safety.

Byron and Braidwood comply. Administrative controls will be in effect which will comply with the requirements of this section.

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These controls shall establish procedures to:

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| <p>1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in safety-related areas.</p> | <p>Comply. Administrative Procedures on "Fire Prevention For Use of Lumber and Other Combustibles" govern the handling and limitation of ordinary combustible materials. Administrative Procedures on "Control of Flammable and Combustible Liquids" govern the handling and limitation of flammable gases and liquids. Administrative Procedures govern the handling and usage of combustible/flammable gas cylinders.</p> |
| <p>2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas with appropriate fire protection.</p> | <p>Comply. Routine fire prevention operator rounds are performed on each shift by the Equipment Operator or Equipment Attendant. Special periodic fire inspections are conducted in the storage areas inside or adjacent to safety-related structures or systems to identify any buildup of combustible material or other fire hazards.</p> <p>Periodic fire inspections are conducted. Administrative Procedures prohibit bulk storage of combustible materials inside or adjacent to safety-related buildings or systems during operation or maintenance periods.</p> |
| <p>3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safety-related systems or equipment during all phases of operating and especially during maintenance, modification, or refueling operations.</p> | <p>Comply. Byron will incorporate into administrative procedures provisions to control transient combustibles. The procedures will state that transient combustibles in safety-related areas, which are not in approved containers, shall not be left unattended.</p> <p>Administrative Procedures govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, compressed gas cylinders, or other combustible materials in buildings containing safety-related systems or equipment.</p> |

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| 4. | Designate the onsite staff member responsible for the inplant fire protection review of proposed work activities to identify potential transient fire hazards and specify required additional fire protection in the work activity procedure. | Same procedures as in Item 1 above govern. Comply. The station Fire Marshall is the designated staff member as set forth in Administrative Procedures. |
| 5. | Govern the use of ignition sources by use of a flame permit system to control welding, flame cutting, brazing, or soldering operations. A separate permit shall be issued for each area where work is to be done. If work continues over more than one shift, the permit shall be valid for not more than 24 hours when the plant is operating or for the duration of a particular job during plant shutdown. | Comply. The welding and flame cutting work is done at each station in accordance with NFPA 51B.

Administrative Procedures cover preparation and inspection for fire prevention when welding and cutting is performed. It also covers filling out cutting and welding permits and precautions during cutting and/or welding. |
| 6. | Control the removal from the area of all waste, debris, scrap, oil spills, or other combustibles resulting from the work activity, immediately following completion of the activity, or at the end of each work shift, whichever comes first. | Comply. Administrative Procedures on "Station Housekeeping Equipment Preservation Procedure," specifies that combustible material can not be left unattended in safety-related areas. |
| 7. | Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls. | Comply. Administrative Procedure assures that good housekeeping inspections are met. |
| 8. | Control the use of specific combustibles in safety-related areas. All wood used in safety-related areas | Comply, with exceptions below: |

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- during maintenance, modification, or refueling operations (such as lay-down blocks or scaffolding) shall be treated with a flame retardant. Equipment or supplies (such as new fuel) shipped in untreated combustible packing containers may be unpacked in safety-related areas if required for valid operating reasons. However, all combustible materials shall be removed from the area immediately following the unpacking. Such transient combustible materials, unless stored in approved containers, shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting shall be placed in metal containers with tight-fitting self-closing metal covers.
9. Control actions to be taken by an individual discovering a fire. For example, notification of control room, attempt to extinguish fire, and actuation of local fire suppression systems.
10. Control actions to be taken by the control room operator to determine the need for brigade assistance upon report of a fire or receipt of alarm on control room annunciator panel, for
- The reactor facility at Byron/Braidwood was designed to ensure that the probability of events such as fires and explosions and other potential consequences of such events will not result in undue risk to the health and safety of the public. Noncombustible and fire resistant materials were used throughout the facility wherever necessary to preclude such risks, particularly in areas containing critical portions of the facility such as containment, control room, and components of engineered safety features.
- Combustible materials are not used when substitutes are available. When combustible materials are used, they are treated with fire retardant material or they are controlled as to their fire hazard.
- The control and use of specific combustibles in safety-related areas is assured by Administrative Procedures on "Fire Protection for Use of Lumber and Other Combustibles."
- Exception is taken in regards to new fuel which is stored wrapped in polyethylene bags for cleanliness requirements.
- Comply. Administrative Procedures on "Fire and Emergency Notification and Evacuation Plan" states actions to be taken by an individual discovering a fire.
- Comply. Administrative Procedures on "Fire Protection Program", states actions to be taken by an individual discovering a fire.
- Comply. Administrative Procedures on "Fire and Emergency Notification and Evacuation Plan" states the actions to be taken by the control room operator on the report of a fire.

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| <p>example, announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.</p> | <p>Administrative Procedures also describe the sequence of events to take place in the event of a fire at the Braidwood Station. Operating procedures address "Plant Wide Fire Alarm Actuation."</p> |
| <p>11. Control actions to be taken by the fire brigade after notification by the control room operator of a fire, for example, assembling in a designated location, receiving directions from the fire brigade leader, and discharging specific fire fighting responsibilities including selection and transportation of fire fighting equipment to fire location, selection of protective equipment, operating instructions for use of fire suppression systems, and use of preplanned strategies for fighting fires in specific areas.</p> | <p>Comply. The actions to be taken by the fire brigade after notification by the control room operator of a fire is identified in Administrative Procedures.</p> |
| <p>12. Define the strategies for fighting fires in all safety-related areas and areas presenting a hazard to safety-related equipment. These strategies shall designate:</p> | <p>Comply, with exceptions noted below. Pre-fire plans have been developed which address the concerns listed here as described below.</p> |
| <p>a. Fire hazards in each area covered by the specific pre-fire plans.</p> | <p>Comply. The pre-fire plans identify major in situ combustibles for the areas they cover.</p> |
| <p>b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the</p> | <p>The pre-fire plans identify all automatic and manual suppression equipment in the area, and its location. The extinguishing methods provided are chosen to be the best available to cover identified in situ fire hazards.</p> |

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- nearest location of these extinguishants.
- c. Most favorable direction from which to attack a fire in each area in view of the ventilation direction, access hallways, stairs, and doors that are most likely to be free of fire, and the best station or elevation for fighting the fire. All access and egress routes that involve locked doors should be specifically identified in the procedure with the appropriate precautions and methods for access specified.
- d. Plant systems that should be managed to reduce the damage potential during a local fire and the location of local and remote controls for such management (e.g., any hydraulic or electrical systems in the zone covered by the specific fire fighting procedure that could increase the hazards in the area because of overpressurization or electrical hazards).
- e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles
- The pre-fire plans identify available access routes for each zone. The most favorable direction or location to fight specific fires from are not identified. The fire brigade can best determine this upon reaching the scene of an actual fire.
- Important plant systems and components and potentially hazardous electrical components are identified in the pre-fire plans.
- Comply. Vital components have been defined in pre-fire plans.
- Particularly for large rooms and general areas, the number of possible fire locations are too numerous to attempt to develop specific strategies beforehand.

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- that need cooling should be designated.
- f. Organization of fire fighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by any complete shift personnel complement. These duties include command control of the brigade, transporting fire suppression and support equipment to the scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.
- g. Potential radiological and toxic hazards in fire zones.
- h. Ventilation system operation that ensures desired plant air distribution when the ventilation flow is modified for fire containment or smoke clearing operations.
- i. Operations requiring control room and shift engineer coordination or authorization.
- j. Instructions for plant operators and general plant personnel during fire.
- Byron and Braidwood comply. See Administrative Procedures at the stations. All fire brigade members receive all of the specialized training mentioned here.
- Comply. Potential radiological and toxic hazards are identified in the pre-fire plans.
- Comply. Ventilation system operation for smoke removal is addressed. Ventilation system design is such that fires in specific rooms will affect only the ventilation for that room or division.
- Fire fighting operations per se are not expected to require control room or shift engineer coordination.
- This is addressed by station procedures other than the pre-fire plans.

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L. Alternative and Dedicated Shutdown Capability		
<p>1. Alternative or dedicated shutdown capability provided for a specific fire area shall be able to achieve and maintain subcritical reactivity conditions in the reactor, maintain reactor coolant inventory, achieve and maintain hot standby' conditions for a PWR (hot shutdown' for a BWR) and achieve cold shutdown' conditions within 72 hours and maintain cold shutdown conditions thereafter. During the postfire shutdown, the reactor coolant system process variables shall be maintained within those predicted for a loss of normal ac power and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture or any primary coolant boundary, or rupture of the containment boundary.</p>	<p>Byron and Braidwood comply. Alternate shutdown components or systems are provided for all plant areas where the separation requirements of Section III.G cannot be met. The requirements stated herein are met as described in Section 2.4 of the Fire Protection Report.</p>	
<p>2. The performance goals for the shutdown functions shall be:</p> <p>a. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.</p> <p>b. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of</p>	<p>Byron/Braidwood complies with this requirement as described in Section 2.4 of the Fire Protection Report.</p>	<p>The performance goals listed have been implemented in conducting the Safe Shutdown Analysis.</p>

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- the core for BWRs and be within the level indication in the pressurizer for PWRs.
- c. The reactor heat removal function shall be capable of achieving and maintaining decay heat removal.
 - d. The process monitoring function shall be capable of providing direct readings of the process variables necessary to perform and control the above functions.
 - e. The supporting functions shall be capable of providing the process cooling, lubrication, etc., necessary to permit the operation of the equipment used for safe shutdown functions.
3. The shutdown capability for specific fire areas may be unique for each such area, or it may be one unique combination of systems for all such areas. In either case, the alternative shutdown capability shall be independent of the specific fire area(s) and shall accommodate postfire conditions where offsite power is available and where offsite power is not available for 72 hours. Procedures shall be in effect to implement this capability.
- Byron/Braidwood complies with this requirement. Refer to Section 2.4 of the Fire Protection Report for a description of safe shutdown capability for each fire zone.

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4. In the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be on site at all times.
5. Equipment and systems comprising the means to achieve and maintain cold shutdown conditions shall not be damaged by fire; or the fire damage to such equipment and systems shall be limited so that the systems can be made operable and cold shutdown achieved within 72 hours. Materials for such repairs shall be readily available on site and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hours after the fire will not be capable of being powered by both onsite and offsite electrical power systems because of fire
- B/B complies. Refer to Safe Shutdown Analysis, (Section 2.4 of FPR).
- Byron/Braidwood complies with this requirement provided credit is taken for alternative separation and protection features for certain plant areas described above under Section III.G.2.

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- damage an independent onsite power system shall be provided. Equipment and systems used after 72 hours may be powered by offsite power only.
6. Shutdown systems installed to ensure postfire shutdown capability need not be designed to meet seismic Category I criteria, single failure criteria, or other design basis accident criteria, except where required for other reasons, e.g., because of interface with or impact on existing safety systems, or because of adverse valve actions due to fire damage.
7. The safe shutdown equipment and systems for each fire area shall be known to be isolated from associated non-safety circuits in the fire area so that hot shorts, open circuits, or shorts to ground in the associated circuits will not prevent operation of the safe shutdown equipment. The separation and barriers between trays and conduits containing associated circuits of one safe shutdown division and trays and conduits containing associated circuits or safe shutdown division cables from the redundant division, or the isolation of these associated circuits from the safe shutdown equipment, shall be such that a postulated fire involving associated circuits will not prevent safe shutdown.
- Byron/Braidwood complies with this requirement. The only equipment which has been installed to ensure postfire safe shutdown capability is the Fire Hazards Panel which includes certain instruments which would otherwise be unavailable following a fire in either the control room or the auxiliary electrical equipment room. This panel is described in Subsection 2.4.2.16 of the Fire Protection Report. Its design complies with the requirements stated herein.
- There are no associated circuits as defined in IEEE 384-1974 at B/B. Associated circuits as defined in NRC's April 6, 1982, clarification letters to Generic Letter 81-12 are addressed in Subsection 2.4.1 of the Fire Protection Report.

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<p>M. Fire Barrier Cable Penetration Seal Qualification</p> <p>Penetration seal designs shall utilize only noncombustible materials and shall be qualified by tests that are comparable to tests used to rate fire barriers. The acceptance criteria for the test shall include:</p> <ol style="list-style-type: none"> 1. The cable fire barrier penetration seal has withstood the fire endurance test without passage of flame or ignition of cables on the unexposed side for a period of time equivalent to the fire resistance rating required of the barrier; 2. The temperature levels recorded for the unexposed side are analyzed and demonstrate that the maximum temperature is sufficiently below the cable insulation ignition temperature; and 3. The fire barrier penetration seal remains intact and does not allow projection of water beyond the unexposed surface during the hose stream test. 	<p>B/B complies. See FPR Sections 3.5(a) (3)(a) through (c) and Appendix 5.2, Subsection A5.2.2. Fire-rated penetration seals in fire-rated assemblies separating safety-related fire areas or separating portions of redundant systems important to safe shutdown within a fire area are inspected by Surveillance Procedures. See contractors test reports for details on the acceptability of seals.</p>	
<p>N. Fire Doors</p> <p>Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.</p>	<p>Byron/Braidwood complies. See FPR Section 3.5.a (5).</p>	

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One of the following measures shall be provided to ensure they will protect the opening as required in case of fire:

1. Fire doors shall be kept closed and electrically supervised at a continuously manned location;
2. Fire doors shall be locked and inspected weekly to verify that the doors are in the closed position;

All fire doors have automatic closures. Cable spreading rooms have electrically supervised doors alarming in the control room.

Personnel will walk down fire doors, which are unlocked or nonelectrically supervised, once per day at Braidwood and every 7 days at Byron. Locked doors will be surveilled once per week at Braidwood and every 31 days at Byron. Electrically supervised fire doors will be surveilled monthly at Braidwood and every 92 days at Byron.

The Byron surveillance frequency is based on historical analysis of plant specific records (document identification number DG99-000873).

3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or
4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position.

The fire brigade leader shall have ready access to keys for any locked fire doors.

Areas protected by automatic total flooding gas suppression systems shall have electrically supervised self-closing fire doors or shall satisfy option 1 above.

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<p data-bbox="233 282 646 332">0. Oil Collection System for Reactor Coolant Pump</p> <p data-bbox="289 353 646 449">The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation.</p>	<p data-bbox="785 282 936 308">B/B complies.</p> <p data-bbox="785 330 1251 449">A drip pan system which meets the guidelines of Appendix R to 10 CFR 50 has been designed for the reactor coolant pump (RCP) motors for the Byron/Braidwood Stations.</p>	

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The oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake.⁹

Such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the reactor coolant pump lube oil systems. Leakage shall be collected and drained to a vented closed container that can hold the entire lube oil system inventory. A flame arrester is required in the vent if the flash point characteristics of the oil present the hazard of fire flashback. Leakage points to be protected shall include lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines, and plugs, flanged connections on oil lines, and lube oil reservoirs where such features exist on the reactor coolant pumps. The drain line shall be large enough to accommodate the largest potential oil break.

Seven drip pans will be installed on each pump. These seven pans will collect oil drips from all potential leakage points and route this oil to a safe collection point. The following seven pans are installed on each pump:

- a. A drip pan inside the motor housing below the lower motor bearing.
- b. A drip pan under the bottom of the oil cooler.
- c. A drip pan around the oil cooler under the upper flange.
- d. A drip pan which encloses the oil lift pump.
- e. A drip pan under the oil level alarm and sight gauge.
- f. A drip pan under the flange on the oil line from the RCP motor to the oil cooler inlet.
- g. A drip pan under the flange on the oil line from the oil cooler outlet to the RCP motor; this pan also encompasses the oil drain valve connection.

The pans are designed such that all external piping connections are above the pans. A piping system collects all the oil drips and seepage and routes the oil to closed containers in the containment which are sized to collect the amount of oil expected to be collected between outages. In the event of a major leak, an overflow line from the containers will transfer the oil directly into the containment oil collection vault. In the unlikely event the vault is overfilled, the oil would back up into the containment floor drain sump. Under no conditions would the oil drain into an area which is not closed.

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A spare RCP motor is located on elevation 401 feet 0 inch in the Fuel Handling Building at Braidwood. The RCP assembly contains 240 gallons of lubricating oil. An oil collection system is not provided. Except during a periodic preventative maintenance surveillance to rotate the motor, the oil is not normally pressurized.

This configuration does not present a similar fire hazard as an inservice RCP inside containment. The hazard presented by the spare RCP configuration without an oil collection system has been evaluated, and the design features are adequate for the level of hazard.