TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

July 9, 1982

Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Ms. Adensam:

In the Matter of the Application of	)	Docket Nos. 50-390
Tennessee Valley Authority	)	50-391

Enclosed is information concerning TVA compliance with 10 CFR 50 Appendix R for Watts Bar Nuclear Plant. This information supports TVA's conclusion that Watts Bar is in compliance with Sections II and III of Appendix R with the exceptions, as noted, in Sections III.G.2, III.G.3, and III.N.4. The enclosure provides justification for these exceptions.

Following TVA's submittal of the Sequoyah Nuclear Plant 10 CFR 50 Appendix R Evaluation submitted by letter from L. M. Mills to A. Schwencer dated April 2, 1981, NRC requested additional inormation regarding safe shutdown capabilities. Information of a similar nature is being supplied as Appendix A to this submittal.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Licensing

Sworn to and subscribed before me
this 9th day of July 1982
Bryant M. Lowery
Notary Public
My Commission Expires 4/8/86

Enclosure
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

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ENCLOSURE

WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
10 CFR 50 APPENDIX R
EVALUATION

In accordance with the request by letter from Darrell G. Eisenhut to H. G. Parris, dated October 30, 1981, TVA has evaluated the Watts Bar Nuclear Plant design against the requirements of 10CFR50, Appendix R, Sections II and III. Based on this evaluation with exceptions noted in our response to Sections III.G.2., III.G.3., and III.N.4, we conclude that Watts Bar is in full compliance with Sections II and III. The following information is offered in support of this conclusion.

SECTION II.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 plantsite.

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;

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

- 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.

TVA Compliance

Section A.1 of the Watts Bar Nuclear Plant Fire Protection Program Reevaluation forwarded to the NRC by letter from J. E. Gilleland to R. S. Boyd dated April 18, 1977, describes the overall plant fire protection program.

The concept of defense-in-depth has been applied to the Watts Bar fire protection program to achieve the required high degree of fire safety for the plant. All aspects of the fire protection program fully comply with the requirements of section II.A.

SECTION II.B FIRE HAZARD ANALYSIS

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

TVA Compliance

TVA has performed a fire hazards analysis for Watts Bar Nuclear Plant in accordance with the requirements of Branch Technical Position ASB 9.5-1, 'Guidelines for Fire Protection for Nuclear Power Plants.' A safe shutdown analysis was included in this process. The fire hazards analysis, safe shutdown analysis, and resulting modifications have been documented in letters (1) from J. E. Gilleland to R. S. Boyd dated April 18, 1977, and (2) from L. M. Mills to A. Schwencer dated September 9, 1980.

TVA's fire hazards analysis for Watts Bar Nuclear Plant fully complies with the requirements of Section II.B.

SECTION II.C FIRE PREVENTION FEATURES

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.

1. In situ fire hazards shall be identified and suitable protection provided.

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 cannot be eliminated shall be controlled and suitable protection provided.

3. Fire detection systems, portable extinguishers, and standpipe and hose stations shall be installed.

4. Fire barriers or automatic suppression systems or both shall be installed as necessary to protect redundant systems of components necessary for safe shutdown.

5. A site fire brigade shall be established, trained, and equipped and shall be on site at all times.

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.

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

TVA Compliance

1. In situ fire hazards have been identified in the Watts Bar Fire Hazard Analysis and suitable protection provided through installation of detection and suppression systems.

2. During the design process transient fire hazards associated with normal operation, maintenance repair or modification activities were considered and minimized or eliminated to the extent practicable.

   In the 'Administrative Procedures, Controls, and Fire Brigade' section of the 1977 Comparison to Appendix A to the B.T.P. 9.5-1, TVA committed to implement administrative procedures to control transient fire loads. These are documented in the Division Procedure Manual and in Watts Bar's PHYSI-2 Fire Protection Plan.

3. Fire detection systems, portable extinguishers, and standpipe and hose stations have been provided as outlined in TVA's response to question 1 (table 1.1) of the September 9, 1980 submittal from L. M. Mills to A. Schwencer.

4. Tables 1.2 and 1.4 of the September 9, 1980, submittal listed circuits to be protected with fire barriers. These circuits are protected by automatic sprinkler systems. Additional discussion is provided in the compliance response to Section III.G.2.

5. The fire brigade structure, responsibility, training, and equipment requirements are contained in the Division Procedure Manual and in Watts Bar's PHYSI-2, Fire Protection Plan.

6. Fire detection and suppression systems have been designed and installed by qualified personnel. The maintenance and testing work is done by qualified plant personnel.

7. The Division Procedure Manual describes the fire protection systems test program. Detail test procedures are contained in applicable surveillance and maintenance instructions.

TVA fully complies with the requirements of Section IIC.

SECTION II.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.

TVA Compliance

A discussion of Watts Bar Nuclear Plant's alternate shutdown capability from the auxiliary control room has been provided in TVA's response to question 3 submitted to the NRC by letter from L. M. Mills to A. Schwencer dated September 9, 1980. An additional discussion is provided in the compliance response to Section III.L requirement of this report. TVA fully complies with the requirements of section II.D.

SECTION III.A WATER SUPPLIES FOR FIRE SUPPRESSION SYSTEMS

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

Each supply shall consist of a storage tank, pump, piping, and appropriate isolation and control valves. Two separate redundant suctions in one or more intake structures from a large body 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 areas that present a fire exposure hazard to safety-related area.

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 a vertical standpipe for other water services. 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.

TVA Compliance

The fire protection water supply consists of the high pressure fire pumps which take suction from Chickamauga Reservoir at the intake pumping station. Chickamauga Lake is considered an unlimited supply with respect to fire protection requirements. Tanks are not used as a source of fire protection water for Watts Bar Nuclear Plant.

The fire pumps are assigned trained designations with two pumps in train A and two in train B.

The train A fire pumps and train B fire pumps are separated from each other and other equipment by 3-hour fire rated barriers. Each pair of pumps on the same power train take suction from a separate sump which receives water through a settling baffle arrangement for all normal and flood reservoir levels. For water levels below minimum, normal flow is provided to the sump through a submerged line with a motor-operated valve supplied from the emergency power train corresponding to that train that powers the pumps in the sump. Therefore, the pumps are capable of operating during any lake condition from minimum level upon loss of downstream dam to the maximum design basis flood level.

The high pressure fire protection system is shared with the raw service water system; however, automatic isolation valves are provided to isolate the raw service water storage tanks from the high pressure fire protection system when any fire pump is started.

The flow rate and pressure of the system with two of four pumps running is more than adequate to provide 1,000 gpm for hose streams while flowing water at design capacity to the single largest sprinkler system or deluge system and simultaneously providing the raw service water system flow requirements.

The high pressure fire protection system also serves as backup water supply to the auxiliary feedwater system in the event of a flood above plant grade. Each pump is capable of supplying one half of the total flow required by the most demanding condition of a fire in a safety-related area or 100 percent of the auxiliary feedwater demand for both units during a flood above plant grade.

TVA's design fully complies with the requirements of Section III.A.

SECTION III.B SECTIONAL ISOLATION VALVES

Section 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 fire main loop for maintenance or repair without interrupting the entire water supply.

TVA Compliance

Watts Bar Nuclear Plant is a 2-unit plant with a single yard fire main loop serving both units. Sectional (isolation) valves are provided such that maintenance may be performed on the loop or portions of the loop for one unit without affecting the fire-fighting capability of either unit. The plant loop is cross-tied between units.

Therefore TVA fully complies with the intent of Section III.B.

SECTION III.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 shutdwn equipment.

TVA Compliance

As indicated in the response to section E of TVA's April 18, 1977 letter to Roger S. Boyd from J. E. Gilleland, TVA has provided all outside hydrants with curb valves off the fire main. TVA's design fully complies with the requirement of Section III.C.

SECTION III.D MANUAL FIRE SUPRESSION

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.

Access to permit effective functioning of the fire brigade shall be provided to all areas that contain or present an exposure fire hazard to structures, systems, or components important to safety.

Standpipe and hose stations shall be inside PWR containments and BWR containments that are not inerted. Standpipe and hose stations inside containment may be connected to a high quality water supply of sufficient quantity and pressure other than the fire main loop if plant-specific features prevent extending the fire main supply inside containment. For BWR drywells, standpipe and hose stations shall be placed outside the drywell with adequate lengths of hose to reach any location inside the drywell with an effective hose stream.

TVA Compliance

Hose stations in safety-related areas of the plant are located in accordance with NFPA 14 so that all safety-related equipment can be reached with at least one effective hose stream. Consideration was given in locating fire hose stations in areas having lesser projected potential fire loading as well as being readily accessible to ensure full hose coverage of all areas. Standpipe and hose systems are installed in the primary containment. The containment standpipe and hose system is described in TVA's response to question 34 submitted to the NRC by letter from L. M. Mills to A. Schwencer dated September 9, 1980. The standpipe and and hose systems at Watts Bar Nuclear Plant fully comply with the requirements of Section III.D.

SECTION III.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.

TVA Compliance

Test requirements for hose are contained in Watts Bar's PHYSI-2 Fire Protection Plan.

TVA fully complies with the requirements of Section III.E.

SECTION III.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.

TVA Compliance

As a result of the Watts Bar Fire Hazard Analysis, TVA has provided an automatic fire detection system in all areas of the plant that contain or present an exposure fire hazard to safe shutdown or safety-related systems or components. A description and location of the fire detection system can be found in table 1.1 of TVA responses to NRC question 1, submitted to the NRC by letter from L. M. Mills to A. Schwencer dated September 9, 1980. In each local fire alarm panel, a vendor-supplied, 4-hour battery supply electrical source is provided. In addition, capability for connection to the onsite Class IE emergency power supply within four hours is provided as defined in the TVA response to question 6 of the September 9, 1980 submittal.

SECTION III.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:

   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

   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, shorts to ground, of redundant trains of systems necessary to achieve and maintain hot shutdown conditions are located within the same fire area outside of primary containment, one of the following means or 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 protected to provide fire resistance equivalent to that required of the barrier.

   b. Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustible 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

f. Separation of cables and equipment and associated non-safety circuits of redundant trains by a noncombustible radiant energy shield.

3. Alternative or dedicated shutdown capability and its associated circuits independent of cables, systems or components in the area, room or zone under consideration shall be provided:

   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

   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.

   In addition, fire detection and a fixed fire suppression system shall be installed in the area, room, or zone under consideration.

TVA Compliance

1. As a result of the Watts Bar Nuclear Plant of the Fire Hazard Analysis, fire suppression and detection systems have been added; compartmentation has been improved; fire retardant cable coatings have been added; and a number of safe shutdown circuits have been modified. These features were intended to limit fire damage so that one train of systems necessary to achieve safe hot shutdown from either the main control room or the auxiliary control stations are free from fire damage. In addition, systems required to achieve and maintain cold shutdown can either be repaired or casualty procedures implemented within 72 hours. All equipment which was relied upon to achieve safe plant shutdown in the analysis is capable of being powered from the onsite emergency diesel generators. Therefore, a fire concurrent with the loss of all offsite power has no adverse affect on the Watts Bar safe shutdown capability.

2. The response to NRC question 1 submitted to NRC by letter from L. M. Mills to A. Schwencer dated September 9, 1980, includes a safe shutdown logic diagram which identifies equipment and components necessary to achieve safe shutdown conditions in the event of fire. Tables 1.2, 1.3, and 1.4 in the response to question 1 identify the circuits which were to be relocated to provide a minimum of 20 foot of spatial separation from redundant counterparts (table 1.3) or protected by 1/2-hour fire-rated barriers (tables 1.2 and 1.4). Automatic fire detection and suppression is provided for the area through which the

conduits are routed. All exposed cables including nondivisional circuits are coated with Vimasco #2B fire retardant coating. The application of such coatings significantly reduces the ignitability and combustibility of cable insulation such that the requirements for no intervening combustibles between redundant divisions of equipment and circuits is accomplished.

TVA will provide 1-hour fire-rated barriers for those circuits identified in table 1.2 and 1.4 in order to satisfy the requirements in Section III.G.2.C.

TVA's analysis initially considered divisional circuits associated with electrical components relied on for safe shutdown only. Nondivisional associated circuits have more recently been evaluated and the following has been determined:

a. All nondivisional control power cables associated with the subject divisional circuitry are isolated at the power source by qualified isolators. These isolators protect the function of the safety equipment or circuits in the event of fire in the non-qualified circuit.

b. When a nonqualified signal is used in the subject circuitry, it provides an anticipatory or interlock signal for normal plant operation. In either case, the signals are arranged such that any failure of the nonqualfiied circuit, such as a short or open circuit, will not adversely affect the safety circuit function.

c. The only nondivisional cables routed to the components required to achieve and maintain cold shutdown as a result of fire are for monitor lights or similar functions. These cables are not terminated in the control circuit of the devices. Therefore, if these cables were destroyed by fire the only loss would be the contacts to which the monitor lights or similar circuit is connected. The control of or the safety function of the component will not be impaired.

In the annulus area of containment, closed head fixed water spray systems have been provided in the immediate vicinity of cable of redundant trains that come within 5 feet vertically or 3 feet horizontally of each other. The spray systems are activated by local fire detection systems.

Vimasco #2B fire retardant coatings have been applied to exposed surfaces of all cables in trays in areas outside primary containment that contain circuits of redundant trains. The application of such coatings significantly reduces the ignitability and combustibility of cable insulation such that the requirements for no intervening combustibles between redundant divisions of equipment and circuits is accomplished.

Conduits, where interdivisional interactions are within 20 feet or less, will be provided with 1-hour fire-rated barriers in the reactor building annulus.

Unit 1 Conduit No.	Unit 2 Conduit No.	Function
1PM5660D	2PM5660D	Protection sets
1PM5662F	2PM5662F	I, II, III, IV
1PM6420D	2PM6389F	conduits
1PM6389F	2PM6388F	ditto
1PM6694F	2PM5661F	ditto
1PM6397G	2PM6695E	ditto
1PM6695E	2PM6693G	ditto
1PM5663G	2PM6397G	ditto
1PM5661E	2PM6396G	ditto
1PM6692G	2PM6390F	ditto
1PM6399D	2PM6694F	ditto
1PM6390F	2PM6396G	ditto
1PM6693G	2PM5663G	ditto
1PM6388F		ditto

Train A penetrations 14 and 15 within the annulus are 20 feet or less from the train B penetrations 16 and 17 also within the annulus at the reactor building steel containment. The above identified penetrations are used to feed train A, train B, train A backup, and train B backup pressurizer heaters. One division of these cable tray splice boxes and the circuits associated with the splice boxes within the annulus will be provided with a 1 hour fire resistive barrier until 20 feet of spatial separation is achieved.

Cabletray Splice Boxes at Electrical Penetrations Unique Identification
1-CTP-293-14-A
1-CTP-293-15-A
1-CTP-293-15-B
1-CTP-293-17-B
2-CTP-293-14-A
2-CTP-293-15-A
2-CTP-293-16-B
2-CTP-293-17-B

Inside primary containment, a closed head fixed water spray system and fire detection system have been provided for each reactor coolant pump. Oil collection systems that meet the requirements of Section III.O will also be provided.

The features and proposed modifications discussed above comply with Section III.G.2 with the following exception:

> Literal compliance with the separation requirements for safe shutdown circuits inside containment has not been provided.

TVA requests an exemption from the above literal requirements based on the following.

TVA contends that adequate fire protection features have been provided inside primary containment. All circuits needed for safe shutdown during a fire are routed in conduit in this area. The only fixed exposure hazards for the shutdown circuits are the lube oil for the reactor coolant pumps and cable insulation in a small number of cable trays with solid bottoms and sheet metal covers. Redundant systems (fire suppression and oil collection) have been provided as protection against the lube oil hazard and the cable insulation is not an exposure threat because of a lack of any ignition sources.

Since transient combustibles are administratively precluded from containment area during power operation, there are no other conceivable fire threats to safe shutdown capability.

3. The unit 1 Auxiliary Instrument Room, unit 2 Auxiliary Instrument Room, and Cable Spreading Room are provided with automatic fire detection and fixed suppression. The main control room is provided with automatic fire detection.

   Refer to our compliance response to Section III.L requirement of this report for a detailed discussion of alternate shutdown systems.

   The features noted above comply with Section III.G.3 with the following exception.

   > Fixed fire suppression system has not been provided in the main control room.

   TVA requests an exemption from the above requirement based on the following.

The Main Control Room is a continuously manned area with manual fire fighting capabilities through the use of hose stations and portable extinguishers.

Automatic smoke detection is provided in the control room and within the control room consoles to provide the earliest possible indication of a fire.

The control room consoles contain only low-voltage cable, which minimizes the possibility of internally generated fires. The cables travel in covered gutters within the lower portions of the consoles. The consoles are provided with full access doors on the rear of the panels which affort access to the lower recessed portions of the consoles with an extinguisher or fire hose nozzle.

With early detection capability in the control room and the control room consoles, a fire can be detected and extinguished manually in the incipient stage with minimal effect on equipment and electrical circuits.

Refer to TVA response to NRC Fire Protection Concern No. 3, submitted by letter from L. M. Mills to E. Adensam dated November 10, 1981, for a discussion on cable concentrations in enclosed platforms below the main control room cabinets.

In the unlikely event that a fire occurs that develops beyond the capability of the extinguishing equipment, the main control room can be abandoned and reactor shutdown accomplished from the backup control room located in the auxiliary building.

SECTION III.H FIRE BRIGADE

A site fire brigade trained and equipped for fire fighting shall be established to ensure adequate manual fire fighting capability for all areas of the plant containing structures, systems, or components important to safety. The fire brigade shall be at least five members on each shift. The brigade leader and at least two brigade members shall have sufficient training in or knowledge of plant safety-related systems to understand the effects of fire and fire suppressants on safe shutdown capability. The qualification of fire brigade members shall include an annual physical examination to determine the 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 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 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.

TVA Compliance

The fire brigade program requirements including responsibilities, personnel qualifications, training, and equipment are contained in the Division Procedure Manual and in the Watts Bar's PHYSI-2 Fire Protection Plan. TVA is in full compliance with the requirements of Section III.H.

SECTION III.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:

1. Instruction

   a. The initial classroom instruction shall include:

      (1) Indoctrination of the plant fire fighting plan with specific identification of each individual's responsibilities.

      (2) Identification of the type and location of fire hazards and associated types of fires that could occur in the plant.

      (3) The toxic and corrosive characteristics of expected products of combustion.

(4) Identification of the location of fire fighting equipment for each fire area and familarization 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 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.

NOTE--Items (9) and (10) may be deleted from the training of no more than two of the non-operations personnel who may be assigned to the fire brigade.

b. The instruction shall be provided by qualified individuals who are knowledgeable, experienced, and 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.

c. Instruction shall be provided to all fire brigade members and fire brigade leaders.

d. Regular planned meetings shall be held at least every three months for all brigade members to review changes in the fire protection program and other subjects as necessary.

e. Periodic refresher training sessions shall be held to repeat the classroom instruction program for all brigade members over a two-year period. These sessions may be concurrent with the regular planned meetings.

2. Practice

Practice sessions shall be held for each shift fire brigade on the proper method of fighting the various types of fires that could occur in a nuclear power plant. These sessions shall provide brigade members with experience in actual fire extinguishment and the use of emergency breathing apparatus under strenuous conditions encountered in fire fighting. These practice sessions shall be provided at least once per year for each fire brigade member.

3. Drills

a. Fire brigade drills shall be performed in the plant so that the fire brigade can practice as a team.

b. Drills shall be performed at regular intervals not to exceed three months for each shift fire brigade. Each fire brigade member should participate in each drill, but must participate in at least two drills per year.

A sufficient number of these drills, but not less 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 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 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 reasonable occur in the area selected, allowing for fire development due to the time required to respond, to obtain equipment, and organize for the fire, assuming loss of automatic suppression capability.

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

4. Records

Individual records of training provided to each fire brigade member, including drill critiques, shall be maintained for at least three 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.

<u>TVA Compliance</u>

Watts Bar's PHYSI-2, Fire Protection Plan, is currently being updated and the following comments are being added:

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

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

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

Watts Bar is in full compliance with Section III.I upon issuance of the revised PHYSI-2.

SECTION III.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.

TVA Compliance

Fixed, self-contained lighting consisting of fluorescent or sealed beam units with an individual 8-hour minimum battery power supply (see attachment A) are provided in areas that must be manned for safe shutdown and for access and egress routes to and from all fire areas containing equipment required for safe shutdown. This complies with the requirements of Section D.5.A of BTP 9.5-1 and exceeds the requirements for emergency lighting specified in Section III.J with respect to specific areas to be lighted. However, NRC has identified TVA's emergency lighting design as an open item in the draft Watts Bar Safety Evaluation Report (SER) as follows:

'By letter dated August 28, 1981, the applicant stated that the 1-1/2-hour fixed emergency seal-beam lighting units are modified throughout the plant with small capacity bulbs, so that a lighting duration of approximately 8 hours is provided. The staff finds this arrangement unacceptable because the amount of light in a given area is reduced below acceptable levels.

The staff will require the applicant to provide adequate illumination of not less than 1.0 ft-candle measured at the floor at all points of equipment operation needed for shutdown, as well as at all points on the floor, including angles and intersections of corridors, passageways, stairways to valves, and for routes to and from all of the areas. The staff will report on this item in a supplement to this SER.'

As stated in the TVA response to item 6 of the referenced letter dated August 28, 1981, the fixed self-contained emergency lighting units purchased for Watts Bar have a nameplate indicating a rating of 1-1/2 hours when supplying four 25 watt PAR 36 incandescent lamps. The units were supplied by the manufacturer as UL listed 8-hour rated packs with 2 seal beam halogen lamp heads (H7552 rated 6 volts, 10 watts). The manufacturer has provided a telex certifying the above (see Attachment A). A comparison of the horizontal illumination distribution of the 10 watt halogen lamp with the 25 watt incandescent lamp indicates that the two 10-watt lamps produce approximately the same illumination level as two of the 25 watt lamps.

The lighting levels established by NRC above are based on the National Fire Protection Association Life Safety Code (NFPA 101) and are intended as guidelines for emergency illumination levels in public buildings where the occupants may not be familiar with emergency egress routes from the building in the event of a fire and/or loss of normal lighting. It is TVA's position that operators and plant personnel required to respond to areas needed for operation of safe shutdown equipment are very familiar with these areas and with access and egress routes thereto and that not less than 1.0 footcandle measured at the floor at all points of equipment operation needed for shutdown, as well as at all points on the floor, including angles and intersections of corridors, passageways, stairways to valves, and for routes to and from all of the areas is excessive and does not enhance the overall safety of the plant.

TVA has attempted to provide an average of 0.5 footcandle illumination level to all the above specified areas as recommended in the Illuminating Engineers Handbook. A sufficiently wide path within a wide corridor or across large rooms providing access to critical areas has been provided but no attempt has been made to illuminate the entire corridor or room including all angles and intersections at a minimum level of 1.0 footcandle.

It is further TVA's position that the Watts Bar emergency lighting design fully complies with Section III.J and that the minimum 1.0 footcandle acceptance criteria established in the draft SER is excessive and unwarranted.

SECTION III.K ADMINISTRATIVE CONTROLS

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

1. Govern the handling and limitation of the use of ordinary combustible materials, combustible and flammable gases and liquids, high efficiency particulate air and charcoal filters, dry ion exchange resins, or other combustible supplies in safety-related areas.

2. Prohibit the storage of combustibles in safety-related areas or establish designated storage areas with appropriate fire protection.

3. Govern the handling of and limit transient fire loads such as combustible and flammable liquids, wood and plastic products, or other combustible materials in buildings containing safety-related systems or equipment during all phases of operating, and especially during maintenance, modification, or refueling operations.

4. Designate the onsite staff member responsible for the 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.

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.

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.

7. Maintain the periodic housekeeping inspections to ensure continued compliance with these administrative controls.

8. Control the use of specific combustibles in safety-related area. All wood used in safety-related areas 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 material, unless stored in approved containers, shall not be left unattended during lunch breaks, shift changes, or other similar periods. Loose combustible packing material such as wood or paper excelsior, or polyethylene sheeting shall be placed in metal containers with tight-fitting self-closing metal covers.

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 example, announcing location of fire over PA system, sounding fire alarms, and notifying the shift supervisor and the fire brigade leader of the type, size, and location of the fire.

11. Control 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.

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:

    a. Fire hazards in each area covered by the specific prefire plans.

    b. Fire extinguishants best suited for controlling the fires associated with the fire hazards in that area and the nearest location of the 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 of electrical hazards).

    e. Vital heat-sensitive system components that need to be kept cool while fighting a local fire. Particularly hazardous combustibles that need cooling should be designated.

    f. Organization of fire fighting brigades and the assignment of special duties according to job title so that all fire fighting functions are covered by a complete shift personnel complement. These duties include command control of the brigade, transporting fire suppression and support equipment to the fire scenes, applying the extinguishant to the fire, communication with the control room, and coordination with outside fire departments.

    g. Potential radiological and toxic hazards in fire zones.

h. Ventilation system operation that ensures desired plant air distribution when 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.

TVA Compliance

In the 'Administrative Procedures, Controls, and Fire Brigade' section of the 1977 Comparison to Appendix A to the B.T.P. 9.5-1, TVA committed to establish controls to minimize fire hazards. The program controls are contained in the Division Procedure Manual, and the implementation requirements are contained in Watts Bar's PHYSI-2, Fire Protection Plan. TVA fully complies with Section III.K.

SECTION III.L ALTERNATIVE AND DEDICATED SHUTDOWN CAPABILITY

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 a.c. power, and the fission product boundary integrity shall not be affected; i.e., there shall be no fuel clad damage, rupture of any primary coolant boundary, or rupture of the containment boundary.

2. The performance goals for the shutdown functions shall be:

   a. The reactivity control function shall be capable of achieving and maintaining cold shutdown reactivity conditions.

   b. The reactor coolant makeup function shall be capable of maintaining the reactor coolant level above the top of the core for BWRs and 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 is not available for 72 hours. Procedures shall be in effect to implement this capability.

4. If the capability to achieve and maintain cold shutdown will not be available because of fire damage, the equipment and systems comprising the means to achieve and maintain the hot standby or hot shutdown condition shall be capable of maintaining such conditions until cold shutdown can be achieved. If such equipment and systems will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. The number of operating shift personnel, exclusive of fire brigade members, required to operate such equipment and systems shall be onsite at all times.

5. Equipment and systems comprising the means to achieve and maintain cold shutdown 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 onsite and procedures shall be in effect to implement such repairs. If such equipment and systems used prior to 72 hour after the fire will not be capable of being powered by both onsite and offsite electric power systems because of fire damage, an independent onsite power system shall be provided. Equipment and systems used after 72 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 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.

TVA Compliance

TVA interprets Appendix R to require that alternative or dedicated shutdown capability be provided only if certain requirements of Section III.G are not satisfied. With the exception of the Main Control Room, the Spreading Room, and the Auxiliary Instrument Rooms located at elevations 755.0, 729.0, and 708.0, respectively, in the Control Building, the separation requirements of Section III.G.2 have or will be satisfied prior to initial fuel load for the first unit. TVA has identified four areas in the Watts Bar Control Building where postulated fires could jeopardize the plant's safe shutdown capabilities due to inadequate separation of redundant circuits. The areas are the Main Control Room, the Cable Spreading Room, and the two Auxiliary Instrument Rooms. Alternate shutdown capability for a fire in these areas is provided by the Auxiliary Control System.

Auxiliary control was designed to provide the necessary controls to place the plant in a safe shutdown condition from outside the Control Building. This system was provided in the original plant design for events requiring Main Control Room evacuation due to the presence of toxic gases. However, the capability provides an appropriate means for readily isolating the necessary safe shutdown equipment and controls from the Control Building during a fire.

Controls in the Auxiliary Control System are located in the Auxiliary Control Room or on various switchgear cabinets in the vicinity of this room. The controls are physically separated from wiring exposed to the Control Building environment. The separation is provided in some cases by instrument and control loops that are dedicated to the Auxiliary Control System and in other cases by the use of transfer switches that physically disconnect the required circuits from the wiring in the Control Building.

The Auxiliary Control Room is designed to be the central control point when operating in the auxiliary control mode. Systems requiring frequent manipulation have the necessary controls located in the Auxiliary Control Room along with their transfer switches. Adequate instrumentation is also provided for monitoring the condition of the plant. The Auxiliary Control Room is the central station for a redundant sound-powered telephone system linking it with various areas of the plant.

Whenever evacuation of the Main Control Room is necessary, the plant will be shut down following procedures outlined in the plant emergency operating instructions. Under these instructions the unit operator will go to the Auxiliary Control Room. Assistant unit operators will go to the switchgear cabinets.

All transfer switches are maintained contact types that break-before-make. This means that the auxiliary control devices will never be connected to fire damaged circuits in the Control Building.

The Auxiliary Control Room is divided into five independent compartments--a central control panel area and four transfer switch areas. These compartments are separated from each other by 1-1/2 hour fire-rated barriers. The central area contains controls for both trains of safety-related equipment. However, a fire in this area would not prevent safe shutdown from the Main Control Room since damage would be limited to circuits that are either inactive or deenergized when operating in the normal control mode. A fire in any one of the transfer switch areas would not prevent safe shutdown either since the room contains circuits for one train of safety-related equipment for a single unit.

Several steps will be taken to preclude inadvertent or unauthorized actuation of the transfer switches. If any switch is placed in the 'auxiliary' position, an annunciation will be received in the Main Control Room. There will also be a seal wire on each transfer switch that must be broken before the switch is placed in the 'auxiliary' position. Finally, there will be administrative procedures established to limit the number of employees having access to the areas containing the transfer switches.

The Watts Bar Auxiliary Control System is in full compliance with the requirements of Section III.L.

SECTION III.M FIRE BARRIER CABLE PENETRATION SEAL QUALIFICATION

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:

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.

TVA Compliance

TVA has described the fire barrier cable penetration seal design and qualification test in our response to NRC Question 12.B(iii) submitted by letter from L. M. Mills to A. Schwencer dated September 9, 1980. The design and qualification tests for the Watts Bar fire barrier cable penetration seals fully comply with the requirements of Section III.M.

SECTION III.N FIRE DOORS

Fire doors shall be self-closing or provided with closing mechanisms and shall be inspected semiannually to verify that automatic hold-open, release, and closing mechanisms and latches are operable.

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

1. Fire doors shall be kept closed and electrically supervised at a continuously manned location;

2. Fire doors shall be locked closed and inspected weekly to verify that the doors are in the closed position;

3. Fire doors shall be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or

4. Fire doors shall be kept closed and inspected daily to verify that they are in the closed position.

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.

TVA Compliance

Some fire doors are not locked or electrically supervised.

TVA requests an exemption from the inspection requirement of III.N.4 based on the following.

TVA maintains fire doors closed. TVA does not plan to implement the additional inspection requirements for fire doors. TVA has administrative procedures which require that a fire watch be posted on one or both side of an open penetration. The shift engineer is responsible for seeing that each fire watch position is continuously manned while penetrations are open.

Also, all plant employees receive instruction in General Employee Training I about the importance and proper operation of fire doors. Regularly scheduled maintenance is provided for fire doors in accordance with technical specification requirements.

We believe that these administrative procedures provide adequate supervision of the fire doors which is the intent of the requirements in Section III.N.

SECTION III.O REQUIREMENTS

The reactor coolant pump shall be equipped with an oil collection system if the containment is not inerted during normal operation. The oil collection system shall be so designed, engineered, and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake.

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 leak.

TVA Compliance

TVA has provided spray shields for the oil lift pumps and external lubricating oil piping associated with the reactor coolant pumps such that oil from the rupture of the identified pressurized component line will be contained. An oil collection basin is also provided at the access platform elevation of each reactor coolant pump to collect and drain away any combustible liquid and/or suppression system discharge.

The oil containment and collection system for the reactor coolant pumps is seismically supported and qualified to provide reasonable assurance that it will not fail during safe shutdown earthquake in a manner which could damage nuclear safety-related equipment to a degree that it cannot perform its intended functions. Any discharge is drained from the collection basin to the closed and vented containment floor and equipment drain sump located inside primary containment. A description of the containment floor and equipment drain sump is provided in figure 38.1-4 of the Watts Bar September 1980 Fire Protection Submittal forwarded to the NRC by letter from L. M. Mills to A. Schwencer dated September 9, 1980. During the review of the Sequoyah Nuclear Plant reactor coolant pump oil collection system for compliance with 10CFR50, Appendix R, Section III.O, it was determined that the spray shields provided for the oil lift pumps may not have been totally effective to prevent potential oil spray, associated with a line rupture or failure of a pressure containing component from contacting hot surfaces beneath the reactor coolant pump catch basin. In addition, the upper bearing oil coolers were determined to be under slight pressure during pump operation. The pressure may be such that in the event of a rupture or leak in the oil cooler oil could potentially spill outside the catch basin thereby contacting hot surfaces beneath the pump. TVA is in the process of correcting these conditions at Sequoyah Nuclear Plant. Since the reactor coolant pump designs are identical between Sequoyah and Watts Bar, TVA commits to provide the same modifications to the above described oil collection system at Watts Bar. With these modifications, the reactor coolant pump oil collection system will comply fully with the requirements of Section III.O.

ATTACHMENT A

EXID CCH RAND
6-23-82

ATT MR F W CHANDLER
CHIEF, ELEC ENGR BRANCH
T V A
KNOXVILLE, TN

AS DISCUSSED WITH MR R S GREEN, WE CERTIFY THAT THE FSS-2S-V-2-H7552 EMERGENCY LIGHTING UNITS PROVIDED AS PART OF CONTRACT NO 80K7-827656 WILL OPERATE FOR A MINIMUM PERIOD OF 8 HOURS.

THESE UNITS ARE EQUIPPED WITH 2 SEAL BEAM HALOGEN LAMP HEADS (H7552 RATED 6 VOLTS, 10 WATTS). THE BATTERY IS EXIDE ELECTRONICS' TYPE LEC-36 BATTERY RATED 6 VOLTS, 36 AMP-HOURS AT THE 8 HOUR RATE.

SIDNEY WORTZMAN
PRODUCT MANAGER
EXIDE ELECTRONICS
ENDES KXV

CNCT=00:02:24, XMIT=000038, RECV=000645, TIME=14:44:41, DATE=06/23/82
* REMOTE DISCONNECTION *

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APPENDIX A

ADDITIONAL INFORMATION
WATTS BAR NUCLEAR PLANT 1 AND 2 SAFE
SHUTDOWN IN THE EVENT OF FIRE

NRC Concern No. 1

Please provide a discussion of how hot shutdown will be achieved and maintained in the event of a fire in the auxiliary instrument room or any other area in which automatic functions can be rendered inoperable. This discussion should address the use of alternate instrumentation and controls methods, and all systems to which automatic function or control will be disabled.

TVA RESPONSE

The following discussion illustrates how hot shutdown capability will be maintained in the event of loss of automatic control logic functions (ACLF) due to fire in the auxiliary instrument room (AIR), main control room (MCR), auxiliary control room (ACR), or local control panels. These locations house ACLF instrumentation appearing on the Fire Shutdown Logic Diagram (FSLD) The loss of any one of these locations can cause the loss of some but not all of the ACLF used in the event of fire.

Given below is a list of ACLF and information addressing alternate instrumentation and control methods.

I. Automatic Logic Speed Control for CVCS Reciprocating Charging Pump

The function is lost if the AIR or the MCR is lost in the postulated fire. If such a loss occurs, the alternate charging path identified on the FSLD (Centrifugal Charging Pumps) will be available by manual control for RCS makeup and RCP seal injection. The operator also has an option to regain control of the speed controller from the manual backup station on panel L-369. Therefore, it is not credible to lose RCS inventory control identified on the FSLD in the event of the loss of this automatic logic controller.

Note: Even in the event of failure of the automatic logic speed controller, flow within the setpoint range of 55 gpm - 98 gpm would be provided to the regenerative heat exchanger and RCP seal injection line.

II. Automatic logic controls to motor-driven auxiliary feedwater pump's (MDAFWP) outlet valves (PCV-3-122, -132).

In the event of the loss of this automatic control function, the alternate steam generator charging path identified on the FSLD, turbine-driven auxiliary feedwater pump (TDAFWP), will not be

affected by the postulated fire. A discussion of this has been provided in the Watts Bar safe shutdown submittal dated September 9, 1980. However, as an option, the operator can regain control of the function performed by the outlet valves. These techniques are discussed below in cases 1-4.

Case 1: Loss of AIR

The automatic function will be lost for both valves if the AIR is lost in the postulated fire. However, the operator may regain the automatic function in the ACR.

Case 2: Loss of MCR

The automtic function will be lost for both valves if the MCR is lost in the postulated fire. However, the operator may regain the automatic function in the ACR.

Case 3: Loss of ACR

The automatic function from the ACR will be lost if panel L-10 is lost in the postulated fire. However, the normal control from the MCR will be unaffected.

The automatic function for one of these valves will be lost if the valves' respective panels L-11A or L-11B is lost in the postulated fire. However, the operator can regain control manually at the valve using the valves' handjack.

Case 4: Local Panels L-214 and L-222

Automatic control for valve PCV-3-122 or PCV-3-132 will be lost if local panel L-214 or L-222, respectively, is lost in the postulated fire. However, normal operations of the opposite train will not be affected.

Therefore, the loss of the automatic control function, due to the postulated fire, will not prevent the operators from safely shutting the plant down.

III. Automatic Logic Controls to Steam Generator (SG) Level Control Valves (LCV-3-148, -156, -164, -171, -172, -173, -174, -175)

Valve operation requires the availability of the ACR transfer switch panels. If either one of the panels is lost, the redundant panel will prevent loss of AFW to any of the SGs. The ACR is divided by fire barriers such that a single fire would only affect one transfer switch panel. Therefore, it is not credible to lose the SG level control function.

IV. Automatic Logic Controls to SG Relief Valves (PCV-1-5, -13, -23, -30)

Valve operation requires the availability of the ACR transfer switch panels. If either one of the panels is lost, the redundant panel will prevent loss of AFW to any of the SGs. The ACR is divided by fire barriers such that a single fire would only affect one transfer switch panel . Only two of the SG relief valves are required to be operable for safe shutdown. Manual backup control stations are also provided in the steam valve rooms for manual control and has been demonstrated to be acceptable for control operations of the valves. Therefore, it is not credible to lose the control function of the SG relief valves.

V. Automatic logic control for the centrifugal charging pump discharge flow control valve (FCV-62-93).

Case 1: The automatic function will be lost if the AIR is lost in the postulated fire. However, independent manual control may be used from the MCR, ACR, or local panel L-112.

Case 2: The automatic function and the independent manual controls in the MCR and ACR will be lost if panel L-11B, in the ACR, is lost in the postulated fire. However, independent manual control may be used from local panel L-112.

Case 3: The automatic function and independent manual controls in the MCR, ACR, and local panel L-112 will be lost if panel L-112 is lost in the postulated fire. However, the alternate RCS charging path for RCP seal water injection on the FSLD (positive displacement charging pump's path) will not be affected by this fire. Therefore, it is not credible to lose RCS seal injection capability with the loss of this automatic control function.

Note: As an option, the operator can open the valve without regulating capability by manually terminating the electrical input signal at the valve or manually terminating the air supply to L-112. This is an effective method since FCV-62-93 is a fail open valve.

VI. Speed control for Turbine-Driven Auxiliary Feedwater Pump (TDAFWP).

The automatic logic control for the TDAFWP is not located in the MCR, ACR, or the AIR. Therefore, the postulated fire in these locations would not have an impact on this automatic function. However, the function may be lost in the event of fire at L-326A or L-381. These panels are located near the TDAFWP. A fire at this location will not have an impact on the alternate charging path (MDAFWP) for the SG inventory control. A discussion with regard to this matter has been provided in the Watts Bar safe shutdown submittal dated September 9, 1980. Therefore, it is not credible to

lose SG inventory control with the loss of this automatic logic control function.

Therefore, we conclude that no essential ACLF functions identified on the FSLD will be rendered inoperable by a fire. Alternate instrumentation and control methods have been provided to assure that the necessary functions will be available.

NRC Concern No. 2

Provide a discussion of the auxiliary control room (ACR) with respect to electrical isolation from the main control room (MCR), dedicated instrumentation which will monitor required system parameters (i.e., pressure, temperature, tank levels), and manual actions required to transfer control from the MCR to the ACR.

TVA RESPONSE

The Auxiliary Control System (ACS) is designed to provide necessary controls to establish and/or maintain the plant in a safe shutdown condition external to the control building. Controls in the ACS are physically separated from wiring exposed to the control building environment. The separation is provided in some cases by instrument and control loops dedicated to the ACS and other cases by use of a transfer switch that will physically disconnect the desired circuit from the wiring in the control building. The transfer switches are seal-wired and are annunciated in the Main Control Room (MCR) any time a switch is not in the normal mode.

The design is for the Auxiliary Control System (ACR) to be the central control point in the auxiliary control mode. All systems requiring frequent manipulation, such as auxiliary feedwater, have the necessary controls located in the ACR along with their transfer switches. Also, adequate system monitoring is provided in the ACR for the operator to monitor the condition of the plant. The ACR is the central point of redundant sound-powered telephone system linking it with various areas in the plant.

Upon evacuating the MCR, the operator will proceed to the ACR and operate the transfer switches located there to activiate the controls in the ACR. Assistant operators will proceed to the various switchgear cabinets and operate the transfer switches located there. The auxiliary control switches for all motor-operated valves and motors are also located on the switchgear. These switches are maintained contact and only require alignment one time. The assistant operators align all the switches per a check sheet.

Figures A-1 and A-2 (attached) are single line representations of typical air-operated control valves that have ACR controls. The auxiliary control board and the transfer switch panels are located in the ACR. The trains A and B transfer switch panels are separated from the auxiliary control board and each other by fire-rated barriers. For this type of circuit complete electrical isolation of the ACR from the MCR is accomplished by the transfer switch. The contacts of the transfer switch are break-before-make, which means that the MCR and the ACR control devices and power supplies are never connected together even for a moment.

Figure A-3 is a single-line representation of a typical motor-operated pump or valve which has auxiliary control. The control switch and transfer switch are both located in the same switchgear as the circuit breaker. When the transfer switch is in the "auxiliary" position, the MCR control devices are completely isolated. When the transfer switch is in the "normal" position, the auxiliary controls on the switchgear are disabled. The interlock is from a dedicated ACR instrument channel.

Figure A-4 shows a representation of a dedicated instrument channel. The I/I device is a current-to-current isolator. This shows that the instrument channels that are dedicated to auxiliary control and have an MCR interface are immune to MCR faults. Table A-1 gives the plant parameters that have indication in the ACR by a dedicated instrument channel or channels.

The manual actions required to transfer control from the MCR are to place all the transfer switches in the "auxiliary" position. There are several plant features which preclude inadvertent or unauthorized actuation of the transfer switches. There are administrative procedures as to the personnel that have access (keys) to the areas in which the transfer switches are located. When any transfer switch is placed in the "auxiliary" position, the MCR has an annunciator alarm. There is a seal wire on each transfer switch that will be broken when the switch is placed in the "auxiliary" position.

TABLE A-1
AUXILIARY CONTROL ROOM
DEDICATED INSTRUMENT CHANNELS

Reactor Coolant System Pressure (2 narrow range, 1 wide range)
Reactor Coolant System Temperature (4 T^{hot}, 1 per loop)
Pressurizer Water Level (2 channels)
Auxiliary Feedwater Pumps Discharge Pressure (1 per pump)
Turbine-Driven Auxiliary Feedwater Pump Discharge Flow
Steam Generator 1,2,3,4 Auxiliary Feedwater Flow (1 per steam generator)
Steam Generator 1,2,3,4 Level (1 per steam generator)
Steam Generator 1,2,3,4 Pressures (1 per steam generator)
Containment Pressure
Volume Control Tank Level
Charging Header Flow
Charging Header Pressure
Letdown Heat Exchanger Outlet Temperature
RCS Pressurizer Relief Tank Level
RCS Pressurizer Relief Tank Pressure
Safety Injection System Accum. Tanks 1,2,3,4 Pressure (1 per tank)
RHR Injection or Recirculation after LOCA Flow
RHR Pumps Discharge Flow (1 per pump)
ERCW Supply Headers Flow (1 per header)

CCS Heat Exchangers Inlet Pressure (1 per heat exchanger)
CCS Surge Tank Demineralized Water Inlet Level
CCS Surge Tank Demineralized Water Outlet Level
CCS Supply Header to RHR Heat Exchanger Flow (1 per heat exchanger)
CCS Supply Header to Miscellaneous Equipment Heat Exchangers Flow
RHR Heat Exchangers Outlet Temperature (1 per heat exchanger)
Source Range Neutron Flux

RHR - Residual Heat Removal System
ERCW - Essential Raw Cooling Water System
CCS - Component Cooling System
RCS - Reactor Coolant System

NRC Concern No. 3

Provide a list of system parameters which must be monitored to assure proper plant conditions during hot shutdown and cold shutdown operation. Provide a list of instrumentation/alarms which will monitor these system parameters and component functions in the event of fire (e.g., pressurizer pressure indicator, cold leg/hot leg temperature, steam generator pressure and level, pump running indicators, condensate storage tank level). Verify that the applicable indicators are available in the MCR, ACR, and other remote shutdown boards.

TVA RESPONSE

The parameters listed below are identified in the Fire Shutdown Logic Diagram (FSLD) as being essential for hot and cold shutdown:

Steam Generator Level
Steam Generator Pressure
Pressurizer Level
Pressurizer Pressure

Therefore, sufficient instrumentation (alarms, indicators, records, etc.) regarding these parameters have been verified to be available to the operator in the MCR and, separately, in the ACR in the event of a fire within the plant.

The following intruments will be protected from fire by Kaowool blankets from the reactor building wall to the MCR wall:

Steam Generator Level Instrument Loops in MCR required by FSLD

SG #1	LT-3-38,39,42,43
SG #2	LT-3-51,52,55,56
SG #3	LT-3-93,94,97,98
SG #4	LT-3-106,107,110,111

Steam Generator Pressure Instrument Loops in MCR required by FSLD

SG #1	PT-1-2A,2B,5
SG #2	PT-1-9A,9B,12
SG #3	PT-1-20A,20B,23
SG #4	PT-1-27A,27B-30

Pressurizer Level Instrument Loops in MCR required by FSLD

LT-68-339,335,320

Pressurizer Pressure Instrument Loops in MCR Required by FSLD

PT-68-340,334,323,322

The following instruments will also provide sufficient data regarding the parameters required to function by the FSLD in the ACR. This instrumentation will be available in the event of a fire in the MCR. See the response to concern No. 2 for MCR-ACR isolation.

Steam Generator Level Instrument Loops in ACR required by FSLD

SG #1	LT-3-164
SG #2	LT-3-156
SG #3	LT-3-148
SG #4	LT-3-171

Steam Generator Pressure Instrument Loops in ACR required by FSLD

SG #1	PT-1-1C
SG #2	PT-1-8C
SG #3	PT-1-19C
SG #4	PT-1-26C

Pressurizer Level Instrument Loops in ACR required by FSLD

LT-68-326C, 325C

Pressurizer Pressure Instrument Loops in ACR Required by FSLD

PT-68-337C, 342C

The parameters given below are not required by the fire shutdown logic to be available for the operator in the event of a fire within the plant. However, the parameters instrument loops have been wrapped in Kaowool blankets. Therefore, these parameters will be available to the operator in the MCR.

Reactor Coolant System Temperature

TE-68-2A,2B: Loop 1 Hot Leg RTD Manifold Temperature
*TE-68-1: Loop 1 Hot Leg Temperature
TE-68-18: Loop 1 Hot Leg Temperature

TE-68-25A, 25B: Loop 2 Hot Leg RTD Manifold Temperature

*TE-68-43: Loop 3 Hot Leg Temperature
TE-68-44A,44B: Loop 3 Hot Leg Manifold Temperature
TE-68-60: Loop 3 Cold Leg Temperature

TE-68-67A,67B: Loop 4 Hot Leg RTD Manifold Temperature.

*Instrument loops also available in the ACR.

Reactor Coolant System Flow

FT-68-6A,6B,6D: Loop 1 Coolant Flow
FT-68-29A,29B,29D: Loop 2 Coolant Flow
FT-68-48A,48B,48D: Loop 3 Coolant Flow
FT-68-71A,71B,71D: Loop 4 Coolant Flow

Steam Generator Steam Header Flow Loops

SG #1: FT-1-3A,3B
SG #2: FT-1-10A,10B
SG #3: FT-1-21A,21B
SG #4: FT-1-28A,28B

Miscellaneous Pressure Instrument Loops

PT-68-66: RCS Loop #4 Hot Leg Pressure
PDT-30-42,43: Containment Pressure

Miscellaneous Level Instrument Loops

LT-63-51,53 SIS RWST Level
LT-63-176,177,179,180,181,182,183 Containment Level

Given below are additional instrument loops and their respective parameters located in the ACR. The instrument cables between the reactor building and the ACR wall are not protected from fire. However, these instruments are not required by the FSLD to function in the event of fire in the ACR or between the ACR and reactor building. This instrumentation would be used only in the event of a fire in the MCR and is electrically independent of the instruments located in the MCR.

Instrument Loop	Parameter
PT-1-1C,-8C,-19C,-26C	Steam Generators Nos. 1, 2, 3, 4, respectively, pressure. 0-1200 psig
PDT-3-122C, 132C	Auxiliary Feedwater Pumps A&B differential pressure 1000-1600 psid
FT-3-142C	Turbine Driven Auxiliary Feedwater Pump Flow 0-1000 gpm

FT-3-147C,-155C,-163C,-170C	Steam Generators Nos. 1, 2, 3, 4, respectively, Auxiliary Feedwater Flow. 0-440 gpm.
LT-3-148,-156,-164,-171	Steam Generators Nos. 1, 2, 3, 4, respectively, Level 0-233 in water column
PT-30-30C	Containment Pressure -1-+9 psig
TE-62-80C	Letdown Htx Outlet Temp 50-150 F
PT-62-92C	Charging Header Pressure 0-3000 psig
FT-62-93C	Charging Header Flow 0-200 gpm
LT-62-129C	Volume Control Tank level 0-100%
PT-63-59C,-83C,-102C,-120C	SIS Accumulator Tanks Nos. 1, 2, 3, 4, respectively, Pressure 0-700 psig
FT-63-173C	RHR Hot Leg Injection or Recirc After LOCA Flow 0-7000 gpm
FT-63-91C,-92C	RHR Pumps Discharge Flow 0-4500 gpm
FT-67-61C, 62C	ERCW Supply Headers A&B Flow 0-19,500 gpm
TE-68-1C,-24C,-43C,-65C	RCS Loops Nos. 1, 2, 3, 4, respectively, Hot Leg Temp 0-650 F
PT-68-311C	RCS PRT Pressure 0-10 psig
LT-68-312C	RCS PRT Level 0-100 in water column
LT-68-325C,-326C	RCS Pressurizer Level 0-525 in water column
PT-68-336C,-337C	RCS Pressurizer Presure 1700-2500 psig

PT-68-342C	RCS Pressurizer Pressure 0-3000 psig
PT-70-17C,-24C	Component Cooling System (CCS) Htx A&B Inlet Pressure 0-120 psig
LT-70-63C,-99C	CCS Surge Tank Level 0-100%
FT-70-159C,-165C	CCS Flow to RHR Htx A&B 0-6000 gpm
FT-70-164C	CCS Misc Eqpt Supply Hdr Flow 0-5000 gpm
TE-74-38C,-40C	RHR Htx A&B Outlet Temp 0-650 F
RE-90-210	Source Range Neutron Flux $1-10^6$

Therefore, we conclude that essential instrumentation, as required by the FSLD, and other desirable instrumentation will be available to the operator in the MCR or ACR. This instrumentation will provide the operators with sufficient parameter data to obtain and maintain hot and cold shutdown.

NRC Concern No. 4

In many instances, one control/actuation signal will cause the actuation of several functional components. Verify that the depressurization of the primary side via interfacing system will not occur due to the actuation of system components resulting from the fire induced generation of spurious signals from associated circuitry. Your discussion should include the means of preventing RHR isolation valve actuation, uncontrolled letdown, pressurizer PORV actuation, or operation of any valve or component which would prevent the system(s) from performing its functional objectives.

TVA RESPONSE

Pathways by which the primary system potentially could be depressurized due to spurious fire induced signals are as follows:

1. RCS to RHR system via opening of the RHR isolation valves.

2. RCS to pressurizer relief tank via the pressurizer PORV's.

3. RCS to containment and/or pressurizer relief tank via the reactor vessel head vent system solenoid valves.

4. Reactor coolant pump seal failure due to a loss of seal cooling.

5. RCS to CVCS via the normal letdown or excess letdown paths.

TVA is investigating the potential for fire induced depressurization via these pathways and will describe the means of preventing the depressurization in a supplemental response by August 15, 1982.

NRC Concern 5

Verify that procedures which describe tasks that are to be performed to effect the shutdown method have been developed and are available to appropriate plant personnel. Also, demonstrate that the manpower required to perform the shutdown functions in accordance with your procedures, as well as to provide fire brigade members to fight the fire is available as required by the fire brigade technical specifications.

TVA RESPONSE

Emergency operating procedures will be developed and made available to the appropriate plant personnel in order to ensure performance of all shutdown functions. Adequate manpower will be available to effect a shutdown as well as providing fire brigade requirements.

COPY.WW

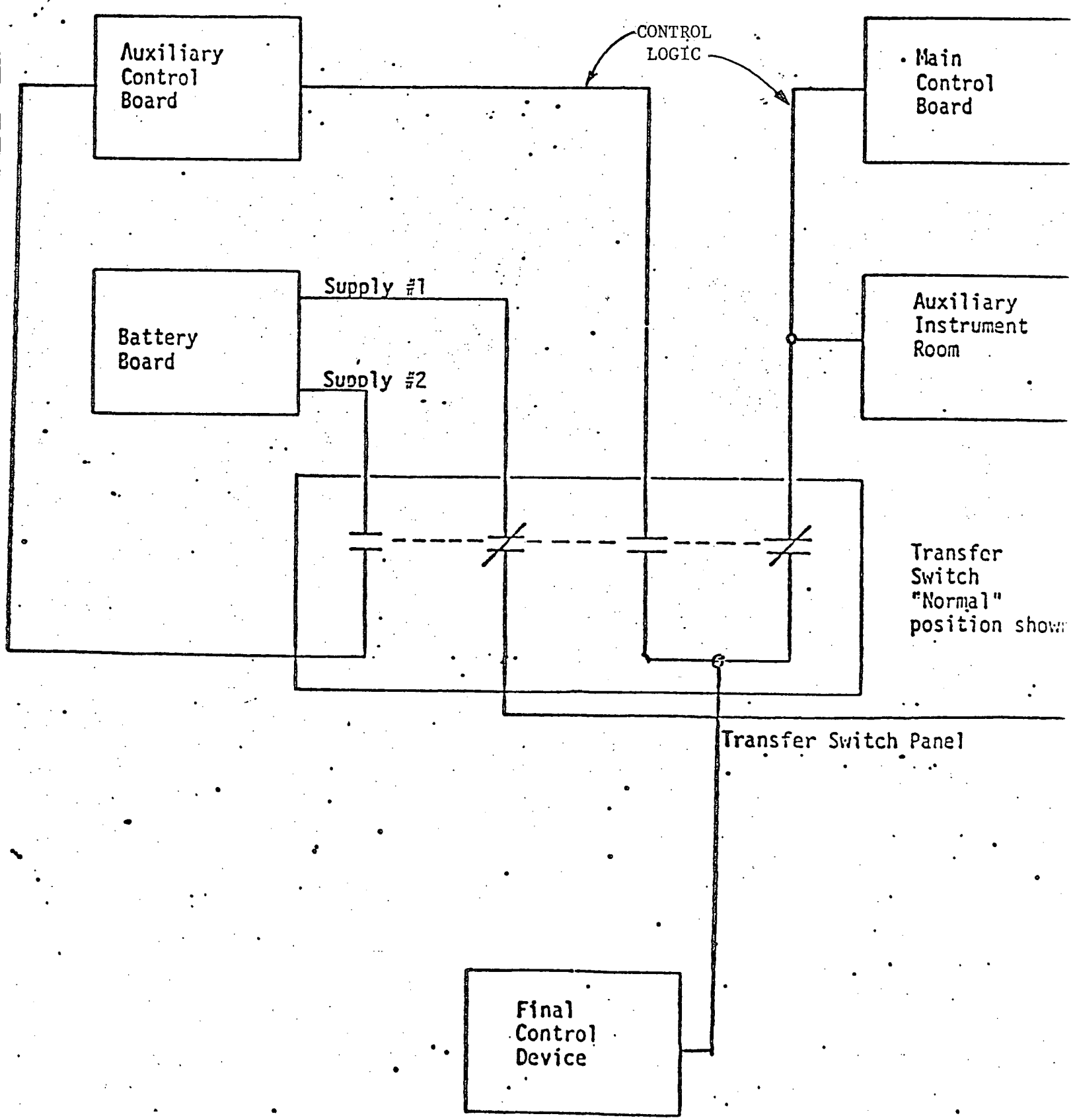

Auxiliary Control Board
CONTROL LOGIC
Main Control Board
Battery Board
Supply #1
Supply #2
Auxiliary Instrument Room
Transfer Switch "Normal" position shown
Transfer Switch Panel
Final Control Device

Figure A -2

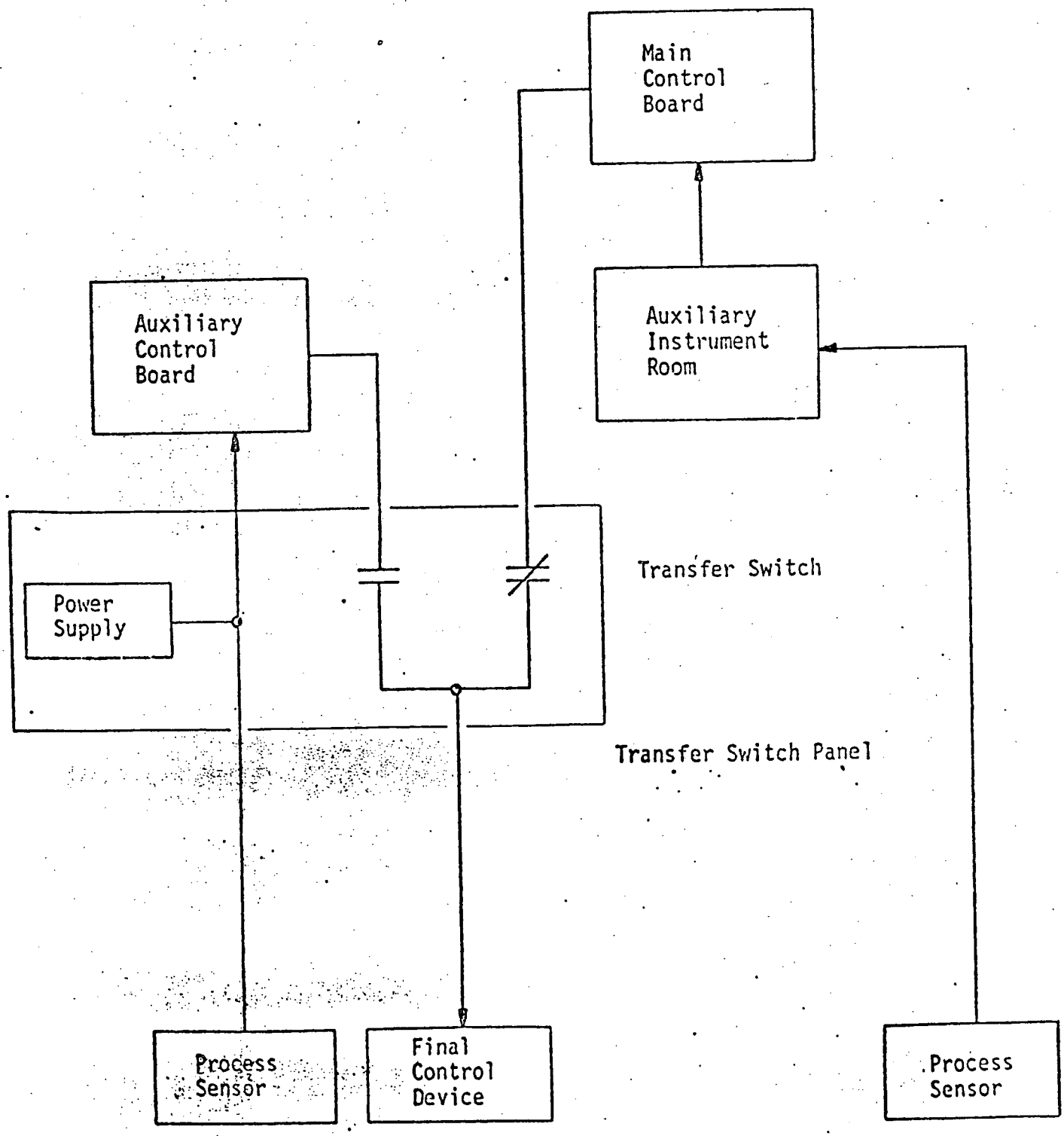

Main
Control
Board
Auxiliary
Control
Board
Auxiliary
Instrument
Room
Power
Supply
Transfer Switch
Transfer Switch Panel
Process
Sensor
Final
Control
Device
Process
Sensor

Figure A-3

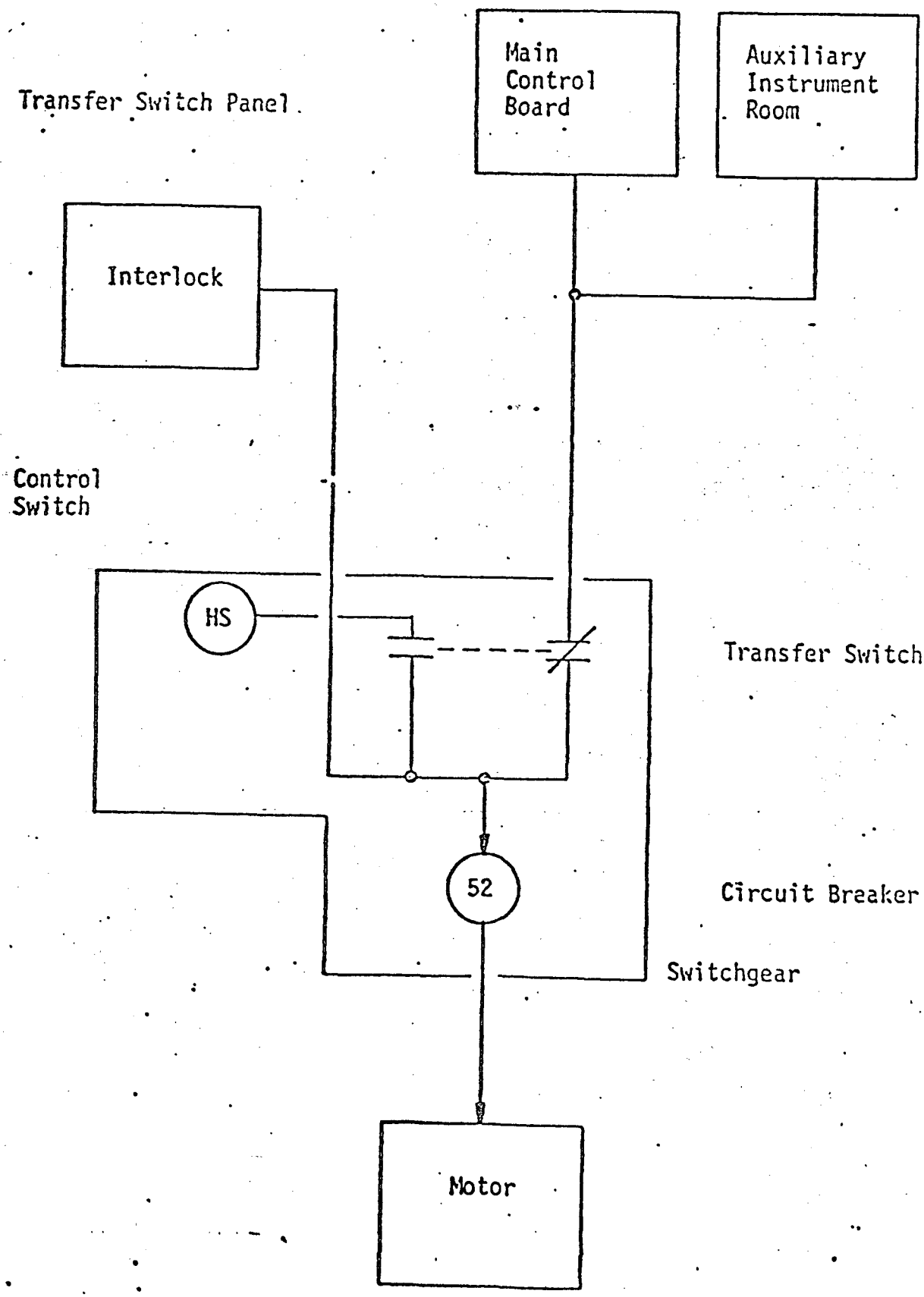
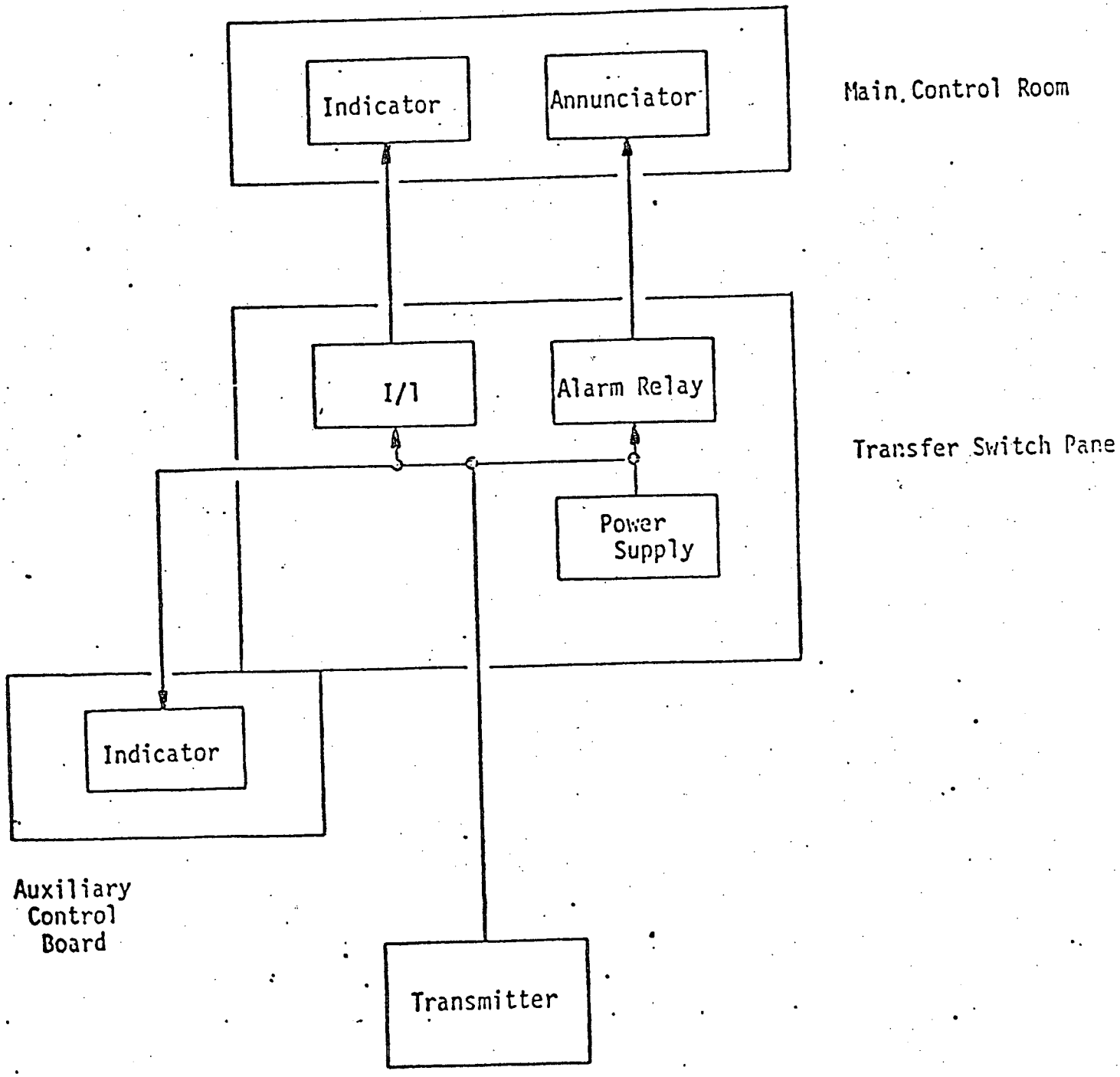

Main
Control
Board
Auxiliary
Instrument
Room
Transfer Switch Panel
Interlock
Control
Switch
HS
Transfer Switch
52
Circuit Breaker
Switchgear
Motor

Figure A-4


Indicator
Annunciator
Main Control Room
I/1
Alarm Relay
Transfer Switch Pane
Power Supply
Indicator
Auxiliary Control Board
Transmitter