ENCLOSURE 1

PROPOSED TECHNICAL SPECIFICATIONS

SEQUOYAH NUCLEAR PLANT
UNITS 1 AND 2

TVA-SQN-TS-57

3/4.8.2 ONSITE POWER DISTRIBUTION SYSTEMS

A.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 The following A.C. electrical boards shall be OPERABLE and energized with tie breakers open between redundant boards:

6900	Volt Shutdown Board 1A-A
6900	Volt Shutdown Board 1B-B
6900	Volt Shutdown Board 2A-A
6900	Volt Shutdown Board 2B-B
480	Volt Shutdown Board 1A1-A
480	Volt Shutdown Board 1A2-A
480	Volt Shutdown Board 1B1-B
480	Volt Shutdown Board 1B2-B
480	Volt Shutdown Board 2A1-A
480	Volt Shutdown Board 2A2-A
480	Volt Shutdown Board 2B1-B
480	Volt Shutdown Board 2B2-B
120	Volt A.C. Vital Instrument Power Board Channels 1-I and 2-I energized from inverters 1-I and 2-I connected to D.C. Channel I*.#
120	Volt A.C. Vital Instrument Power Board Channels 1-II and 2-II energized from inverters 1-II and 2-II connected to D.C. Channel II*.#
120	Volt A.C. Vital Instrument Power Board Channels 1-III and 2-III energized from inverters 1-III and 2-III connected to D.C. Channel III*.#
120	Volt A.C. Vital Instrument Power Board Channels 1-IV and 2-IV energized from inverters 1-IV and 2-IV connected to D.C. Channel IV*#.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With less than the above complement of A.C. boards OPERABLE and energized, restore the inoperable boards to OPERABLE status within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one inverter inoperable, energize the associated Vital Instrument Power Board within 8 hours; restore the inoperable inverter to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.1 The specified A.C. boards and inverters shall be determined OPERABLE and energized with tie breakers open between redundant boards at least once per 7 days by verifying correct breaker alignment and indicated voltage on the busses.

*Two inverters may be disconnected from their D.C. source for up to 24 hours for the purpose of performing an equalizing charge on their associated battery bank provide (1) the vital instrument power board is OPERABLE and energized, and (2) the vital instrument power boards associated with the other battery banks are OPERABLE and energized from their respective inverters connected to their respective D.C. source.

#D.C. Channel V may be substituted for any one channel of channels I-IV.

A.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.2 As a minimum, the following A.C. electrical boards and inverters shall be OPERABLE and energized:

2 - 6900 volt shutdown boards, either 1A-A and 2A-A or 1B-B and 2B-B,

4 - 480 volt shutdown boards associated with the required OPERABLE 6900 volt shutdown boards,

2 - 120 volt A.C. vital instrument power boards either Channels I and III or Channels II and IV energized from their respective inverters connected to their respective D.C. battery banks*, and 480 volt shutdown boards.

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the above complement of A.C. boards and inverters OPERABLE and energized, establish CONTAINMENT INTEGRITY within 8 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.2 The specified A.C. boards and inverters shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated voltage on the bus.

*Any one of the inverters may be connected to D.C. Battery Bank V.

D.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 The following D.C. vital battery channels shall be energized and OPERABLE:

CHANNEL I Consisting of 125 -volt D.C. board No. I, 125 - volt D.C. battery bank No. I*and a full capacity charger.

CHANNEL II Consisting of 125 - volt D.C. board No. II, 125 - volt D.C. battery bank No. II*, and a full capacity charger.

CHANNEL III Consisting of 125 - volt D.C. board No. III, 125 - volt D.C. battery bank No. III*, and a full capacity charger.

CHANNEL IV Consisting of 125 - volt D.C. board No. IV, 125 - volt D. C. battery bank No. IV*, and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one 125-volt D.C. board inoperable, restore the inoperable board to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one 125-volt D.C. battery bank and/or its charger inoperable, restore the inoperable battery bank and/or charger to OPERABLE status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

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* D.C. Battery Bank may be substituted for any other Battery Bank as needed.

SURVEILLANCE REQUIREMENTS

4.8.2.3.1 Each D.C. bus train shall be determined OPERABLE and energized with tie breakers open between redundant busses at least once per 7 days by verifying correct breaker alignment, indicated power availability from the charger and battery, and voltage on the bus of greater than or equal to 125 volts.

4.8.2.3.2* Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying that the parameters in Table 4.8-2 meet the Category A limits, and

2. Verifying total battery terminal voltage is greater than or equal to 129-volts on float charge.

b. At least once per 92 days and within 7 days after a battery discharge (battery terminal voltage below 110-volts), or battery overcharge (battery terminal voltage above 150-volts), by:

1. Verifying that the parameters in Table 4.8-2 meet the Category B limits,

2. Verifying there is no visible corrosion at either terminals or connectors, or the connection resistance of these items is less than 150×10^{-6} ohms, and

3. Verifying that the average electrolyte temperature of 6 connected cells is above 60 F.

c. At least once per 18 months by verifying that:

1. The cells, cell plates and battery racks show no visual indication of physical damage or abnormal deterioration,

2. The cell-to-cell and terminal connections are clean, tight and coated with anti-corrosion material,

3. The resistance of each cell-to-terminal connection is less than or equal to 150×10^{-6} ohms, and

4. The battery charger will supply at least 150 amperes at 125 volts for at least 4 hours.

*This surveillance includes battery bank V, but not charger V.

D.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.4 As a minimum, the following D.C. electrical equipment and boards shall be energized and OPERABLE:

2 - 125-volt D.C. boards either I and III or II and IV, and

2* - 125-volt battery banks and chargers, one associated with each operable D.C. board

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the above complement of D.C. equipment and board OPERABLE, establish CONTAINMENT INTEGRITY within 8 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.4.1 The above required 125-volt D.C. vital battery boards shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated power availability with an overall battery voltage of greater than or equal to 125 volts.

4.8.2.4.2 The above required 125-volt D.C. vital battery banks and chargers shall be demonstrated OPERABLE per Surveillance Requirement 4.8.2.3.2.

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* D.C. Battery Bank V may be substituted for any other Battery Bank.

TABLE 3.3-11

FIRE DETECTION INSTRUMENTS

Fire Zone	Instrument Location	Minimum Instruments Operable Ionization	Photoelectric	Thermal	Infrared
235	Ctrl. Rod Dr. Eqpt. Rm. El. 759	4			
236	Ctrl. Rod Dr. Eqpt. Rm. El. 759	4			
237	Mech. Eqpt. Rm. El. 749	1			
238	Mech. Eqpt. Rm. El. 749	1			
241	480-V XFMR Rm. 1A El. 749	3			
242	480-V XFMR Rm. 1A El. 749	3			
243	480-V XFMR Rm. 1B El. 749	3			
244	480-V XFMR Rm. 1B El. 749	3			
249	125-V Batt. Rm. I El. 749	1			
250	125-V Batt. Rm. I El. 749	1			
251	125-V Batt. Rm. II El. 749	1			
252	125-V Batt. Rm. II El. 749	1			
253	125-V Batt. Rm. III El. 749	1			
254	125-V Batt. Rm. III El. 749	1			
255	125-V Batt. Rm. IV El. 749	1			
256	125-V Batt. Rm. IV El. 749	1			
257	480-V Bd. Rm. 1B El. 749	4			
258	480-V Bd. Rm. 1B El. 749	4			
259	480-V Bd. Rm. 1A El. 749	4			
260	480-V Bd. Rm. 1A El. 749	4			
153	Add. Eqpt. Bldg. El. 740.5	4			
155	Refuel Rm. El. 734	19			
156	RB Access Rm. El. 734	2			
157	RB Access Rm. El. 734	2			
160	SG Blwdn. Rm. El. 734	4			
427	125V Batt. Rm. V El. 749	2			
428	125V Batt. RM. V El. 749	2			

3/4.8.2 ONSITE POWER DISTRIBUTION SYSTEMS

A.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.1 The following A.C. electrical boards and inverters shall be OPERABLE and energized with tie breakers open between redundant boards:

6900	Volt Shutdown Board 1A-A
6900	Volt Shutdown Board 1B-B
6900	Volt Shutdown Board 2A-A
6900	Volt Shutdown Board 2B-B
480	Volt Shutdown Board 1A1-A
480	Volt Shutdown Board 1A2-A
480	Volt Shutdown Board 1B1-B
480	Volt Shutdown Board 1B2-B
480	Volt Shutdown Board 2A1-A
480	Volt Shutdown Board 2A2-A
480	Volt Shutdown Board 2B1-B
480	Volt Shutdown Board 2B2-B
120	Volt A.C. Vital Instrument Power Board Channels 1-I and 2-I energized from inverters 1-I and 2-I connected to D.C. Channel I*.#
120	Volt A.C. Vital Instrument Power Board Channels 1-II and 2-II energized from inverter 1-II and 2-II connected to D.C. Channel II*#
120	Volt A.C. Vital Instrument Power Board Channels 1-III and 2-III energized from inverter 1-III and 2-III connected to D.C. Channel III*#
120	Volt A.C. Vital Instrument Power Board Channels 1-IV and 2-IV energized from inverter 1-IV and 2-IV connected to D.C. Channel IV*#

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With less than the above complement of A.C. boards OPERABLE and energized, restore the inoperable boards to OPERABLE status within 8 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one inverter inoperable, energize the associated Vital Instrument Power Board within 8 hours; restore the inoperable inverter to OPERABLE status within 24 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.1 The specified A.C. boards and inverters shall be determined OPERABLE and energized with tie breakers open between redundant boards at least once per 7 days by verifying correct breaker alignment and indicated voltage on the busses.

*Two invertes may be disconnected from their D.C. source for up to 24 hours for the purpose of performing an equalizing charge on their associated battery bank provided (1) the vital instrument power board is OPERABLE and energized, and (2) the vital instrument power boards associated with the other battery banks are OPERABLE and energized from their respective inverters connected to their respective D.C. sources.

#D.C. Chanel V may be substituted for any one channel of channels I-IV.

A.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.2 As a minimum, the following A.C. electrical boards and inverters shall be OPERABLE and energized:

2 - 6900 volt shutdown boards, either 1A-A and 2A-A or 1B-B and 2B-B,

4 - 480 volt shutdown boards associated with the required OPERABLE 6900 volt shutdown boards,

2 - 120 volt A.C. vital instrument power boards either Channels I and III or Channels II and IV energized from their respective inverters connected to their respective D.C. battery banks,* and 480 volt shutdown boards.

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the above complement of A.C. boards and inverters OPERABLE and energized, establish CONTAINMENT INTEGRITY within 8 hours.

SURVEILLANCE REQUIREMENTS

4.8.2.2 The specified A.C. boards and inverters shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and indicated voltage on the bus.

*Any one of the inverters may be connected to D.C. battery bank V.

D.C. DISTRIBUTION - OPERATING

LIMITING CONDITION FOR OPERATION

3.8.2.3 The following D.C. vital battery channels shall be OPERABLE and energized:

CHANNEL I — Consisting of 125 -volt D.C. board No. I, 125 - volt D.C. battery bank No. I* and a full capacity charger.

CHANNEL II — Consisting of 125 - volt D.C. board No. II, 125 - volt D.C. battery bank No. II*, and a full capacity charger.

CHANNEL III — Consisting of 125 - volt D.C. board No. III, 125 - volt D.C. battery bank No. III*, and a full capacity charger.

CHANNEL IV — Consisting of 125 - volt D.C. board No. IV, 125 - volt D. C. battery bank No. IV*, and a full capacity charger.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With one 125-volt D.C. board inoperable or not energized, restore the inoperable board to OPERABLE and energized status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With one 125-volt D.C. battery bank and/or its charger inoperable or not energized, restore the inoperable battery bank and/or charger to OPERABLE and energized status within 2 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

* *D.C. Battery Bank V may be substituted for any other Battery Bank as needed.

SURVEILLANCE REQUIREMENTS

4.8.2.3.1 Each D.C. bus train shall be determined OPERABLE and energized with tie breakers open between redundant busses at least once per 7 days by verifying correct breaker alignment, indicated power availability from the charger and battery, and voltage on the bus of greater than or equal to 125 volts.

4.8.2.3.2** Each 125-volt battery bank and charger shall be demonstrated OPERABLE:

a. At least once per 7 days by:

1. Verifying that the parameters in Table 4.8-2 meet the Category A limits, and

** This surveillance includes Battery Bank V, but not charger V.

ELECTRICAL POWER SYSTEMS

D.C. DISTRIBUTION - SHUTDOWN

LIMITING CONDITION FOR OPERATION

3.8.2.4 As a minimum, the following D.C. electrical equipment and boards shall be and OPERABLE and energized:

2 - 125-volt D.C. boards either I and III or II and IV, and

2* - 125-volt battery banks and chargers, one associated with each operable D.C. board

APPLICABILITY: MODES 5 and 6.

ACTION:

With less than the above complement of D.C. equipment and board OPERABLE and energized, establish CONTAINMENT INTEGRITY within 8 hours.

*D.C. Battery Bank V may be substituted for any other Battery Bank.

SURVEILLANCE REQUIREMENTS

4.8.2.4.1 The above required 125-volt D.C. vital battery boards shall be determined OPERABLE and energized at least once per 7 days by verifying correct breaker alignment and voltage on the board with an overall battery voltage of greater than or equal to 125 volts.

4.8.2.4.2 The above required 125-volt D.C. vital battery banks and chargers shall be demonstrated OPERABLE per Surveillance Requirement 4.8.2.3.2.

*D.C. Battery Bank V may be substituted for any other Battery Bank.

TABLE 3.3-11 (Continued)

FIRE DETECTION INSTRUMENTS

FIRE ZONE	INSTRUMENT LOCATION	MINIMUM INSTRUMENTS OPERABLE Ionization	Photoelectric	Thermal	Infrared
241	480-V XFMR Rm. 1A, El. 749	3			
242	480-V XFMR Rm. 1A, El. 749	3			
243	480-V XFMR Rm. 1B, El. 749	3			
244	480-V XFMR Rm. 1B, El. 749	3			
245	480-V XFMR Rm. 2A, El. 749	3			
246	480-V XFMR Rm. 2A, El. 749	3			
247	480-V XFMR Rm. 2B, El. 749	3			
248	480-V XFMR Rm. 2B, El. 749	3			
249	125-V Batt. Rm. I, El. 749	1			
250	125-V Batt. Rm. I, El. 749	1			
251	125-V Batt. Rm. II, El. 749	1			
252	125-V Batt. Rm. II, El. 749	1			
253	125-V Batt. Rm. III, El. 749	1			
254	125-V Batt. Rm. III, El. 749	1			
255	125-V Batt. Rm. IV, El. 749	1			
256	125-V Batt. Rm. IV, El. 749	1			
257	480-V Bd. Rm. 1B, El. 749	4			
258	480-V Bd. Rm. 1B, El. 749	4			
259	480-V Bd. Rm. 1A, El. 749	4			
260	480-V Bd. Rm. 1A, El. 749	4			
261	480-V Bd. Rm. 2A, El. 749	4			
262	480-V Bd. Rm. 2A, El. 749	4			
263	480-V Bd. Rm. 2B, El. 749	4			
264	480-V Bd. Rm. 2B, El. 749	4			
269	Computer Rm. El. 685	4			
270	Computer Rm. El. 685			4	
271	Aux. Inst. Rm. El. 685	8			
272	Aux. Inst. Rm. El. 685			9	
273	Computer Rm. Corridor, El. 685	3			
276	Intake Pump Sta. El. 690 & 670.5	15			
277	ERCW Pump Sta. El. 704	21			
427	125-V Batt. Rm. V El. 749	2			
428	125-V Batt. Rm. V El. 749	2			

Description of the Proposed Electrical Power System
for the 125-Volt Fifth Vital Battery System

1.0 PURPOSE

One of the limiting conditions for operations at Sequoyah Nuclear Plant requires four channels of 125 volt dc vital power to be operable to provide control power. If one of the four vital power channels is in an inoperable status for more than 2 hours (due to maintenance or testing) both units of the plant may be shutdown. The fifth vital battery system is intended to serve as a temporary replacement for any one of the four primary 125-V dc vital batteries should a channel be inoperable. The system shall be designed to provide a temporary source of direct-current power for operation and control of essential systems and components under all modes of operation. The fifth vital battery system shall be designed and constructed to comply with IEEE 308, reference 4.1.2.

2.0 SCOPE

This document describes the design and equipment application for the fifth vital battery system at Sequoyah Nuclear Plant.

2.1 General Description

The fifth vital battery system shall consist of a 125-V dc battery along with the appropriate battery rack, charger, battery board, distribution panels, cabling, instrumentation, and protective devices necessary to ensure continued operation of the two unit plant should vital battery I, II, III, or IV become disabled for longer than the techncial specification period. This system shall provide (1) a highly reliable source of low noise direct-current power, (2) proper power distribution to any assigned primary vital battery board loads, and (3) sufficient capacity to supply the worse case loading conditions of any single primary vital battery system.

The primary vital battery system (consisting of vital batteries I, II, III, and IV and associated system components) is configured such that batteries I, II, III, and IV provide normal service to the vital 125-V dc system. The fifth vital battery distribution system shall be designed so that in the event a single primary vital battery is removed from service for any reason (testing, maintenance, etc.), the fifth vital battery may be substituted for it with no impact on the reliability of the 125-V dc vital power system.

2.2 System Configuration and Operation

The 125V dc fifth vital battery system shall be configured per drawing JDH0483, R2. The system conceptual design and operational philosophy are as follows:

Battery charger V, which shall be seismic Category I(L), shall function solely to recharge the fifth vital battery to and maintain it at the proper operating and equailze voltage levels: The charger shall experience no other loading at any time. This non-Class IE system component shall be

2.2 (Continued)

isolated from the remainder of the fifth vital battery system by two qualified isolators, the battery charger fuse and circuit breaker. During normal operation, the charger shall supply the fifth vital battery through battery board V, via the normally closed charger and battery breakers.

The fifth vital battery board shall contain a manually operated break-before-make (BBM) transfer switch (mechanically interlocked to preserve train separation) to permit system alignment to either distribution panel A or B. Each distribution panel shall contain a manually operated BBM transfer switch (mechanically interlocked to preserve channel separation) to permit system alignment to the selected primary vital battery board.

The procedure for the substitution of the fifth vital battery for a primary vital battery is as follows: First, the fifth charger must be disconnected from the fifth vital battery board via the charger breaker; second, the selected primary vital battery board must be aligned to its spare battery charger (1-S or 2-S) via the spare charger transfer switch (1-S or 2-S); third, the primary vital battery/primary vital battery board intertie breaker must be opened; fourth, the fifth vital battery board manual transfer switch must be aligned to the appropriate distribution panel feeder (A for batteries I and III, B for II and IV); fifth, the selected distribution panel manual transfer board must be aligned to the appropriate primary vital battery board feeder; and sixth, the selected primary vital battery board/fifth vital battery intertie breaker must be closed.

In this mode of operation the fifth vital battery shall be maintained at the required nominal voltage level by the appropriate spare vital battery charger and shall be available, as needed, to supply all loads connected to the primary vital battery board (refer to SQN-DC-V-11.2, "Sequoyah Nuclear Plant Design Criteria for 125-V Vital Battery System, Configuration and Operation"). The substitution of vital battery V for a primary vital battery shall in no manner degrade either the reliability or the capacity of the 125-V dc vital power system: All system requirements shall be satisfied and all parameters unchanged. (Note: To fulfill this requirement, the fifth vital battery and all associated cabling shall be sized such that the minimum primary vital battery board voltage with fifth vital battery connected is, under all circumstances, greater than or equal to the primary battery board voltage with the primary vital battery connected.)

The fifth vital battery discharge test alignment procedure is as follows: First, the battery charger V circuit breaker must be opened; second the fifth vital battery board manual transfer switch must be aligned to distribution panel A; third, the distribution panel A battery discharge breaker must be closed; and fourth, the battery discharge test trailer must be positioned and connected as if primary vital battery I were to be discharged.

Recharging of the fifth vital battery shall be accomplished via battery charger V.

2.2 (Continued)

Recharging of a primary vital battery (following a discharge test) shall be accomplished via its normal vital battery charger with the fifth vital battery connected to the appropriate spare vital battery charger.

2.3 Equipment Description

2.3.1 Vital Class 1E Battery

The 125-V dc fifth vital Class 1E battery shall consist of 60 lead-acid calcium grid cells suitable for stationary utility plant service. Each cell shall be of the sealed-type and shall be assembled in a shock absorbing clear plastic case. All case covers shall be bonded in place to form a leakproof seal and shall be equipped with explosion-resistant type vents.

2.3.2 Battery Charger [Category I(L)]

Battery charger V shall be of the constant voltage, current limiting, silicon-rectifier type and shall have output characteristics equal to or better than the following:

A. Output voltage adjustment -- 129 to 140-V dc.

B. Voltage regulation -- ±1% for simultaneous variations of ±7½% in alternating current supply voltage and ±2% in supply frequency.

C. Ripple amplitude -- 0.5% maximum.

The battery charger shall be provided with following features, characteristics and/or facilities:

A. Equalizing voltage adjustment and equalize timer.

B. Natural convection cooling system sufficient for continuous, full-load operation in the environment described in subsection 2.6.

C. Isolation transformers between supply and load circuits.

Battery charger instrumentation and alarms shall consist of at least the following:

A. Overvoltage, undervoltage, and failure relays for monitoring by the plant computer.

B. Voltmeter and ammeter for local indication.

The fifth battery charger capacity shall be sufficient to accomplish battery recharging in approximately 40 hours following a battery discharge test.

2.3.2 (Continued)

Battery charger V shall have no load other than the fifth vital battery and shall never substitute for a primary vital charger; therefore, its capacity need only be sufficient to recharge vital battery V as described.

2.3.3 Battery Rack (Category I)

Vital battery V shall be mounted in a two-step rack suitable for easy maintenance. The rack shall be designed to hold the battery in place while being acted upon by seismic forces described in subsection 3.8.

2.3.4 Battery Board (Class IE)

The fifth vital battery board shall be a Class 1E distribution center comprised of a battery breaker compartment complete with circuit breaker and fuse, a battery charger breaker compartment complete with circuit breaker and fuse, and a distribution panel A/B intertie compartment complete with a mechanically interlocked, manually operated transfer switch.

2.3.5 Distribution Panel A and B (Class IE)

The primary vital battery boards shall be supplied through two Class 1E distribution panels A and B. (Panel A, located in the train A 6.9-kV shutdown board room, shall supply battery boards I and III. Panel B, located in the train B 6.9-kV shutdown board room, shall supply battery boards II and IV.) Both distribution panels A and B shall be furnished with a mechanically interlocked, manually operated transfer switch. In addition, panel A shall be furnished with a battery discharge breaker compartment complete with breaker.

3.0 DESIGN REQUIREMENTS

3.1 Instrumentation

The fifth vital battery system shall be configured in such a manner as to use existing instrumentation on the primary vital battery boards to the greatest extent possible (see drawing BHR0683). In addition, the fifth vital battery system shall be provided with at least the following instrumentation:

A. Battery board bus voltmeter.

B. Battery board bus charge/discharge ammeter.

C. Battery system ground detection with alarm devices.

D. Main control room alarm for closure of any fifth vital battery system normally open breaker contacts shall be paralleled as follows (see drawing JDH0483, R2 for breaker identification) with a separate alarm for each combination:

1. Breakers 1, 4, and 5.

3.1. (Continued)

D. 2. Breakers 2, 6, and 7.

3. Breaker 3. (Note: A separate alarm of breaker 3 closure is not required if design prevents concurrent closure of breakers 3 and 4.)

3.2 Battery Capacity

The fifth vital battery shall have sufficient capacity to carry all the required plant emergency loads of a single primary vital battery for 30 minutes under accident conditions without benefit of a primary vital battery charger, and for 2 hours during nonaccident conditions under total plant blackout conditions (no onsite or offsite alternating-current power available). Battery sizing shall be in accordance with IEEE Standard 485 (reference 4.1.10).

3.3 Physical and Electrical Separation

The fifth vital battery system shall be designed to meet the physical and electrical separation requirements of TVA Design Criteria SQN-DC-V-12.2, Separation of Electric Equipment and Wiring.

3.4 Cable and Conduit

The fifth vital battery system cables and conduit (as listed below) shall conform to the following requirements per SQN-DC-V-12.2.

A. All conduits and cables routed from the fifth vital battery shall be designation, "S".

B. All conduits and cables routed from distribution panels A and B to the existing primary vital battery boards shall have the appropriate channel designations.

C. All conduits of one train routed through areas of the other train shall be protected with a minimum 1 hour rated fire barrier while in the alien train area.

3.5 Ventilation

To maintain hydrogen concentrations below 2% of room volume, the fifth vital battery room shall have a ventilation air flow rate of 1200 ft^3/min, with exhaust air routed directly to the outside. Redundant exhaust fans (1 each, trains A and B) shall be provided for the fifth vital battery room.

3.6 Environmental Conditions

All components of the fifth vital battery system shall be designed to operate continuously within specified tolerances in an environment with temperatures ranging between 60° and 104°F, and with an average relative humidity of 50% (with occasional exposures up to 95%). All environmental control system components necessary to meet these requirements shall be safety-related, seismic Category I, and shall be powered from Class 1E power sources.

3.7 Maximum Flood Provision

All components of the fifth vital battery system shall be located above the maximum possible flood level (elevation 721.0).

3.8 Seismic Requirements

The fifth vital battery system (excluding battery charger V) shall be capable of continuously performing its essential functions during and following the shock and vibration caused by the accelerations of the safe shutdown earthquake (SSE) specified in reference 4.3.3. Battery charger V shall be seismic Category I(L).

3.9 Quality Assurance Requirements

The fifth vital battery system (excluding battery charger V) shall be subject to all quality assurance procedures for design, specifications, testing, and installation of Class 1E systems. Battery charger V shall be subject to limited quality assurance procedures.

3.10 Environmental Qualification of Class 1E Components

All Class 1E components of the vital battery system shall comply with the requirements of IEEE 323.

4.0 REFERENCES

4.1 Design Input

4.1.1 IEEE 279, "IEEE Criteria for Nuclear Power Plant Protection System" (1971)

4.1.2 IEEE 308, "IEEE Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations" (1971)

4.1.3 IEEE 344, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"

4.1.4 Regulatory Guide 1.32

4.1.5 Regulatory Guide 1.6

4.1.6 IEEE 450, "Recommended Practice for Maintenance and Replacement of Large Stationary-Type Power Plant and Substation Lead Storage Batteries" (1972)

4.1.7 TVA Electrical Design Standard DS-E3.1.1, "Batteries and Chargers-Definitions and Capacities"

4.1.8 Regulatory Guide 1.53, "Application of the Single Failure Criterion to Nuclear Power Plant Protection System" (1973)

4.1.9 IEEE 484, "IEEE Recommended Practice for Installation Design and Installation of Large Lead Storage Batteries for Generating Stations and Substations"

4.1 (Continued)

4.1.10 IEEE 485, "IEEE Recommended Practice for Sizing Large Lead Storage Batteries for Generating Stations and Substations"

4.1.11 IEEE 535, "IEEE Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations"

4.1.12 IEEE 323, "IEEE Stnadard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations"

4.2 Background

4.2.1 Sequoyah Nuclear Plant FSAR, Chapter 8

4.3 Design Criteria

4.3.1 TVA Design Criteria SQN-DC-V-11.2, "125-V Vital Battery System"

4.3.2 NRC General Design Criteria 10CFR50 Appendix A for Nuclear Power Plants

4.3.3 TVA Design Criteria WB-DC-40-31.13, "Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment"

4.3.4 TVA Design Criteria SQN-DC-V-12.2, "Separation of Electric Equipment and Wiring"

4.4 Drawings (TVA Drawing No.)

4.4.1 45N202 Electrical Equipment General Arrangement

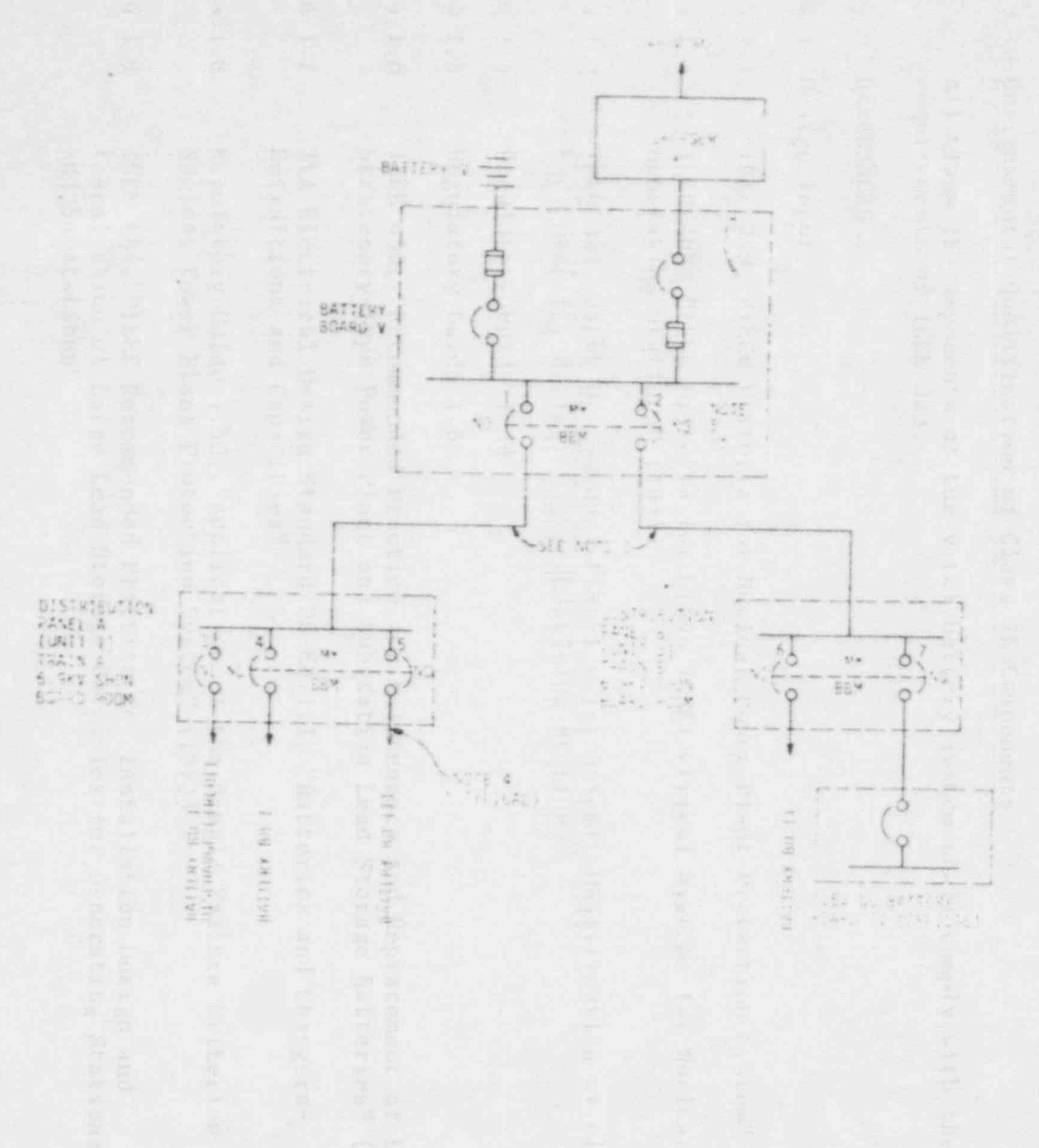
4.4.2 45N230 Electrical Equipment Battery and DC Equipment Room

4.4.3 45W299 Electrical Equipment 125V Vital Battery V

4.4.4 45W363 Electrical Equipment 480V Board Room Layout

4.4.5 45W700-1 Key Diagram 120V AC and 125V DC Vital Power

4.4.6 45N703-1,2,3,4 Wiring Diagram 125V Vital Battery Boards I, II, III, IV, V



NOTES:

1. ALL ELECTRICAL EQUIPMENT IS CLASS IE EXCEPT CHARGER V WHICH IS CATEGORY I(L).
2. PROTECT ALL CONDUITS WHILE IN OPPOSITE TRAIN AREA WITH A MINIMUM 1-HOUR FIRE RATED BARRIER.
3. CONDUITS AND CABLES FROM BATTERY BOARD V TO TRAIN A AND B BOXES SHALL BE DESIGNATED "S".
4. CONDUITS AND CABLES TO EXISTING BATTERY BOARDS SHALL HAVE APPROPRIATE CHANNEL DESIGNATIONS.
5. ALARM SHALL BE PROVIDED IN MCR FOR CLOSURE OF ANY NORMALLY OPEN BREAKER, WITH THE ALARM CONTACTS COMBINED AS FOLLOWS:
   A) BREAKER NOS. 1,4,6
   B) BREAKER NOS. 2,5,7
   C) BREAKER NO. 3

SYMBOLS:

NORMALLY OPEN BREAKER

MANUALLY OPERATED TRANSFER SWITCH WITH MECHANICAL INTERLOCK

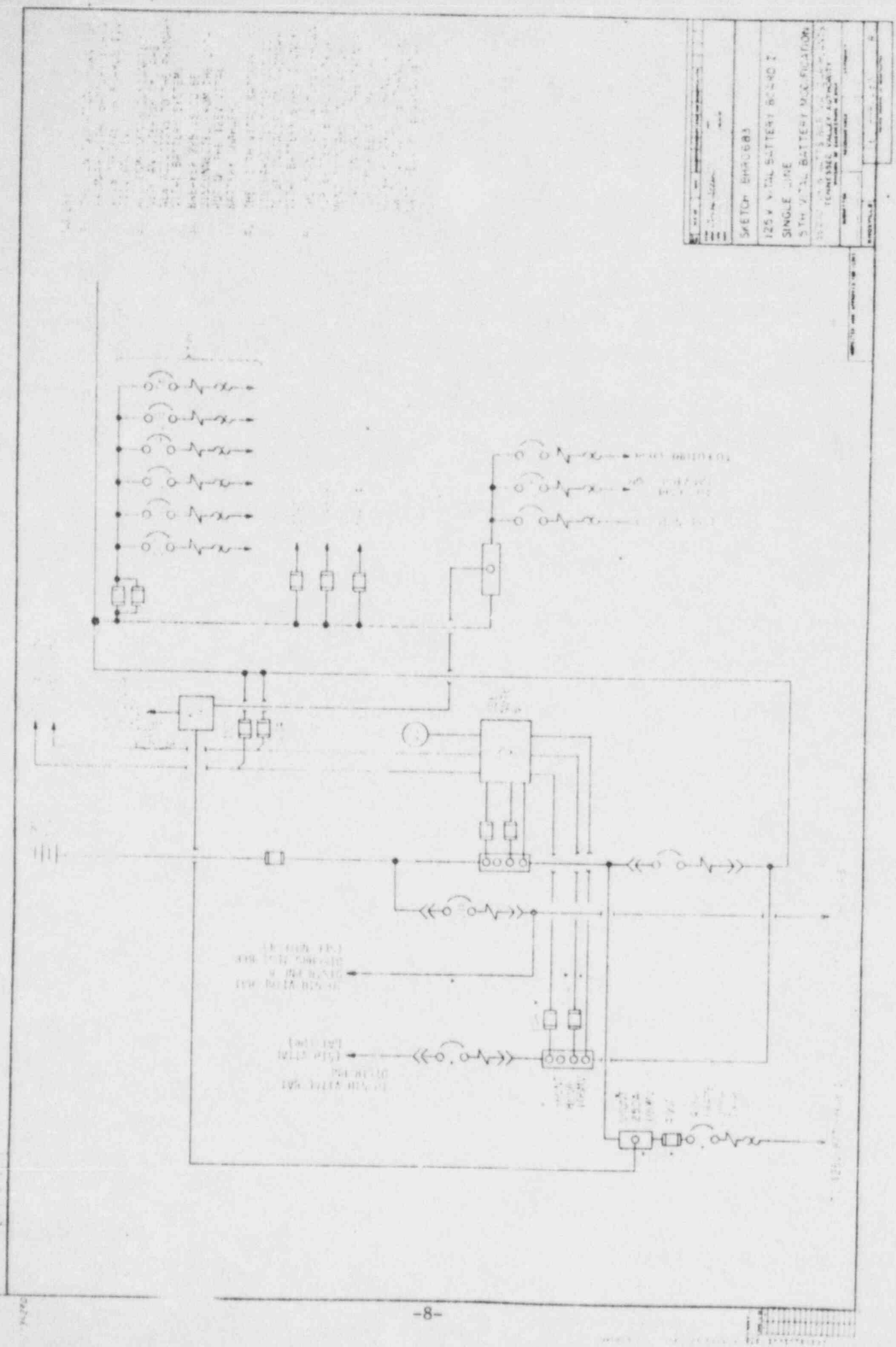
* DEVICE SHOWN INDICATES TRANSFER FUNCTION ONLY. OTHER TRANSFER ARRANGEMENTS/DEVICES MAY BE ACCEPTABLE.

BBM=BREAK BEFORE MAKE

SKETCH 30HD483

PROPOSED CONCEPTUAL DESIGN FOR 5TH 125 V DC VITAL BATTERY SYSTEM

SEQUOYAH & WATTS BAR NUCLEAR PLANTS
TENNESSEE VALLEY AUTHORITY


SKETCH BHRC683
125V VITAL BATTERY BOARD I
SINGLE LINE
5TH VITAL BATTERY MODIFICATION
TENNESSEE VALLEY AUTHORITY

ATTACHMENT 2

SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

1. Is the probability of an occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the safety analysis report increase? No.

The addition of the fifth vital battery bank will not impact the design of the existing vital battery banks in such a manner as to increase the probability of an accident or malfunction previously evaluated in the FSAR. The fifth vital battery will not interface with any of the existing vital batteries.

2. Is the possibility for an accident or malfunction of a different type than evaluated previously in the safety analysis report created? No.

The newly installed equipment will be post-mod tested to assure that the connection of the fifth vital battery does not degrade the operation of the other four channels. IEEE Standards will be followed so that the new fifth vital battery system maintains train separation, provides qualified 1E power and does not degrade the operation of any system. Thus, this change will not create the possibility for an accident or malfunction of a different type than previously evaluated.

3. Is the margin of safety as defined in the basis of any technical specification reduced? No.

This modification will necessitate a change in the technical specifications, but the changes caused by the addition of the fifth vital battery will not cause a degradation of any operating system. The fifth vital battery will operate in the same manner as the existing four, providing qualified low noise 125V DC power. Since the fifth vital battery will be a substitution for a vital power source, the margin of safety is not reduced.

Based on the above Safety Analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10 CFR 50.92; and (2) there is reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the station on the environment as described in the NRC Environmental Statement.

ENCLOSURE 2

DESCRIPTION OF AND JUSTIFICATION
FOR
TECHNICAL SPECIFICATIONS

SEQUOYAH NUCLEAR PLANT
TVA-SQN-TS-57

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Significant Hazards Consideration Determination	Attachment 2

Description of the Change

This change will allow the fifth vital battery to be used to satisfy LCOs 3.8.2.1, 3.8.2.2, 3.8.2.3, and 3.8.2.4 for Sequoyah units 1 and 2 when one of the trained vital batteries (vital power channels) is out of service. The change will require installation of support systems, which are necessary to ensure the operability of the fifth vital battery (designated channel V), which will be operable at all times whether the fifth vital battery is in use as a substitute for a trained vital power channel or not.

The following LCOs will ensure the operability of required subsystems when the fifth vital battery is required. The surveillance requirement on the subsystems will be maintained when the fifth vital battery is substituted for vital power channels I-IV to maintain subsystem operability and operability of the fifth vital battery.

LCO 3.8.2.1	AC Electrical Boards Modes 1, 2, 3, 4
LCO 3.8.2.2	AC Boards and Inverters Modes 5, 6
LCO 3.8.2.3	DC Vital Battery Channels Modes 1, 2, 3, 4
LCO 3.8.2.4	DC Electrical Equipment Modes 5, 6
LCO 3.3.3.8	Fire Detection

The following subsystems will be installed to support the operations of the fifth vital battery:

Heating, Ventilation, and Air Conditioning
Fire Detection/Protection
125V DC Charger
Electrical Distribution Panels and Wiring

These systems are used at different times during the operation of the fifth power channel. The heating, ventilation and air conditioning, and the fire detection/protection are in operation at all times to maintain the integrity of the fifth vital battery and battery boards. The 125V DC charger is used to maintain the battery at maximum charge (float voltage and specific gravity maintained). It is disconnected from use when the fifth vital power channel is in substitution. The electrical distribution panels and wiring are used when the fifth vital power channel is in use as a substitution power source.

Reason for the Change

As currently designed, all four vital channels are required to satisfy the licensing design basis accidents while assuming a single failure. When any one of the four vital channels is declared inoperable, the action statement of LCO 3.8.2.3 allows only two hours to return all channels to operability. This time constraint limits the magnitude of any maintenance and/or repair work that can be completed while either nuclear unit is at power. Operating experience at Sequoyah has indicated that there is a significant probability of exceeding this two-hour limit and incurring the cost of lost production due to a forced two-unit shutdown.

The addition of the fifth vital battery will preclude this loss of production by providing an alternate power supply which can be substituted for any trained DC channel.

Design Description and Justification for the Change

TVA has designed and constructed the fifth vital battery in accordance with the applicable design criteria as noted and the design description in attachment 1. The fifth vital power channel is equivalent in operational capability to the existing vital power channels.

The basic concept of the design is to make maximum use of the existing class 1E components. This minimizes the amount of new controls in the main control room, and it provides the fifth channel with control and accident logic circuits which are currently on the plant surveillance program.

Once the fifth vital battery has been substituted for any of the other four vital batteries, the annunciation in the main control room will be an indication of conditions of the fifth channel. The substituted vital battery's annunciation and control will operate the fifth vital battery. This will prevent having to run new cabling for the operation of the fifth vital battery.

The switching required to substitute the fifth vital battery for any of the other four will require six different steps: (1) Disconnection of the fifth vital battery charger; (2) Connection of spare charger; (3) Disconnect the inoperable vital battery from battery board; (4) Align the fifth battery to the proper distribution panel; (5) Align the distribution panel to the inoperable battery board; and (6) Close the intertie breaker on the distribution panel.

The design provides separation of trained equipment by connection to only one distribution panel, each of which is trained. A simplified diagram of this is provided by sketch 1.

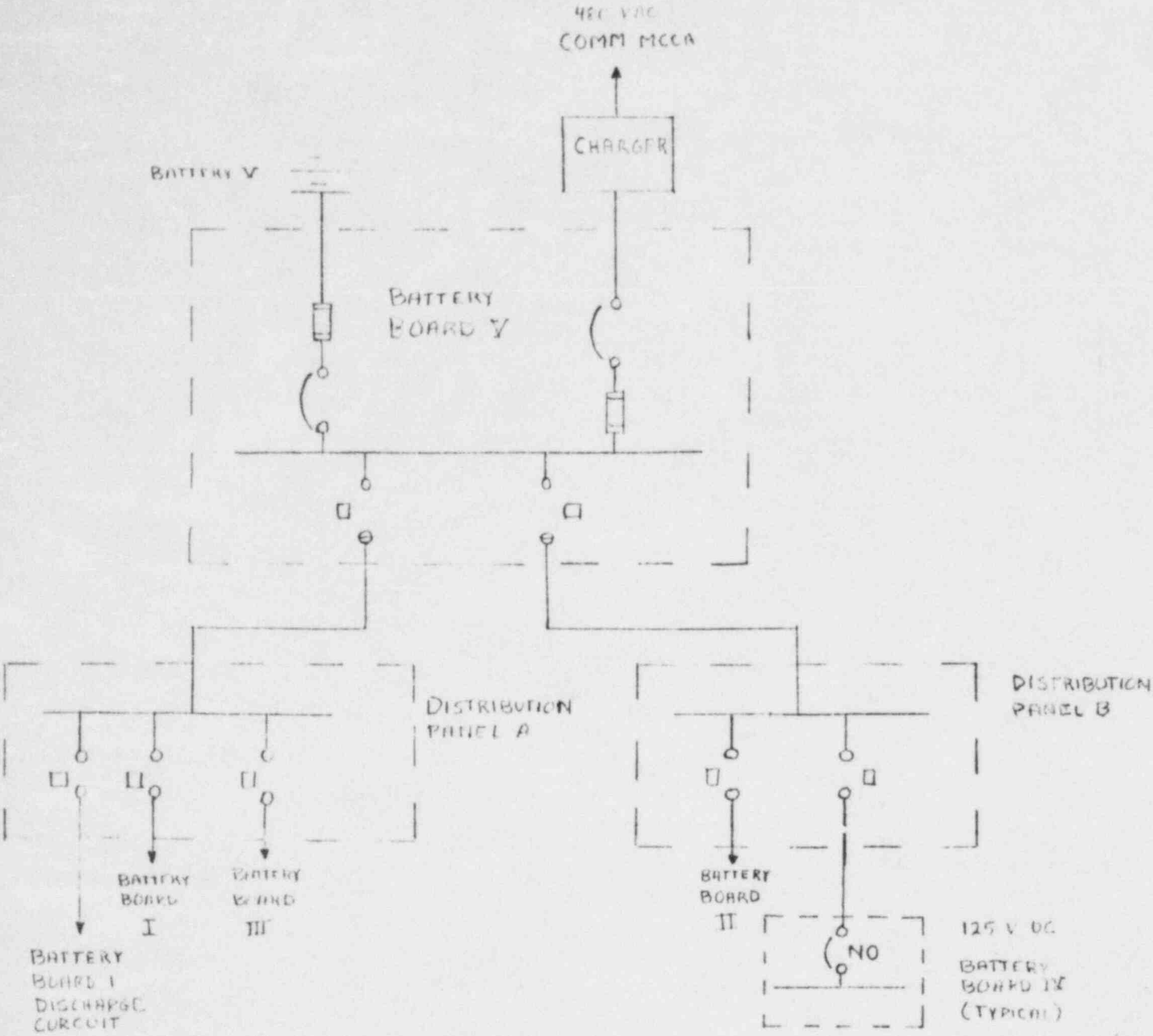
The fifth vital battery room will have supplied a ventilation and heating system to maintain the room within temperature specification at all times. The ventilation will run at all times through two supply headers and two exhaust headers through the ceiling of the room. Heating is supplied by 30 kW heaters located in the supply headers. The ventilation is used to maintain the hydrogen concentration below ignitable limits.

All surveillance requirements on the fifth vital battery and vital battery board will be used to verify operability of the fifth vital battery. Before initial use as a substitute for any of the vital channels, the fifth vital battery will be tested in a program to assure that the fifth battery can be substituted for any of the other four vital batteries. The post modification testing program described below will provide a baseline verification of the fifth vital battery design adequacy.

Post Modification Testing Program

TVA will demonstrate the adequacy of the fifth channel vital power source design by performing a series of post modification tests. The test program will first verify the adequacy of the support subsystems required for fifth vital battery operation. Then the fifth vital battery itself will be functionally tested in accordance with Regulatory Guide 1.32. A brief description of the post modification testing program is provided.

SKETCH 1



480 VAC
COMM MCCA
CHARGER
BATTERY V
BATTERY BOARD V
DISTRIBUTION PANEL A
DISTRIBUTION PANEL B
BATTERY BOARD I
BATTERY BOARD III
BATTERY BOARD II
BATTERY BOARD I DISCHARGE CURCUIT
125 V DC
NO
BATTERY BOARD IV (TYPICAL)

Post Modification Test (PMT) 31 will cover the following aspects of testing shown below:

After installation of the connection for the fifth vital battery on the existing boards, the boards will be tested to assure that the completed connection of wiring of the installation did not degrade the existing battery board's ability to function.

After installation of the batteries, they will be discnarge tested to assure that they can supply the rated amount of power.

After discharge, the battery bank will be recharge tested to assure that the bank recharges to rated voltage in allowable time.

After assurance that the fifth vital battery is in proper working order, the fifth channel is aligned up separately to the other four vital power channels to assure that the substitution of the fifth channel is operable.

Summary

The installation of the fifth vital battery system will prevent a two-unit shutdown when testing or repairing is to be done on any one of the four existing channels. The vital battery will be shown through post modification testing to perform as a suitable replacement for any of the other vital battery boards.

The support systems will perform their function to maintain the fifth battery board system in an operable condition to be a quick replacement for a failed battery.

Sequoyah operating experience has shown that the plant is vulnerable to the two-hour action statement of LCO 3.8.2.3 and that without this relief a significant probability exists that this action statement will result in a forced two-unit shutdown.

ATTACHMENT 1

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT UNITS 1 AND 2

DESCRIPTION OF THE PROPOSED
ELECTRICAL POWER SYSTEM FOR THE
125-VOLT FIFTH VITAL BATTERY SYSTEM

Description of the Proposed Electrical Power System
for the 125-Volt Fifth Vital Battery System

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