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SUBJECT: Forwards response to NRC 791024 ltr re dedicated safe shutdown sys.Onsite power supply & possible new or rerouted bus work undergoing engineering analysis.Final design will be submitted by 800301.

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February 1, 1980

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Office of Nuclear Reactor Regulation
Attention: Mr. Albert Schwencer, Chief
Operating Reactors Branch No. 1
United States Nuclear Regulatory Commission
Washington, D.C. 20555

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
DOCKET NO. 50-261
LICENSE NO. DPR-23
RESPONSE TO QUESTIONS REGARDING SAFE SHUTDOWN CAPABILITY

Dear Mr. Schwencer:

The attached correspondence contains CP&L's response to information requested in your October 24, 1979 letter titled "Staff Position-Safe Shutdown Capability" concerning the Robinson dedicated shutdown system.

Some of the questions regarding procedures associated with this system cannot be completely answered at this time since portions of the dedicated shutdown system are still in the engineering phase. This information shall be submitted by October 31, 1980.

The information herewith submitted reflects the currently engineered concept of the dedicated shutdown system. Some portions of the design, i.e., the onsite power supply and any possible new or rerouted bus work, are still undergoing engineering analysis. The final design of these items will be supplied by March 1, 1980.

We feel that this system more than adequately fulfills the staff requirements for alternate shutdown capability.

As was stated previously, all information regarding procedures, tests and Technical Specifications for the dedicated shutdown system will be submitted when available but no later than October 31, 1980.

Please feel free to contact our staff should you have any questions regarding this submittal.

Yours very truly,

M A McDuffie
for E. E. Utley
Executive Vice President
Power Supply & Customer Services

A001 S 0/40

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Attachments

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8a. Provide a description of the systems or portions thereof used to provide the shutdown capability and modifications required to achieve the alternate shutdown capability if required.

RESPONSE

The functional and hardware requirements for achieving a safe shutdown condition are tabulated in the H. B. Robinson Unit No. 2 Fire Protection Program Review (APCSB 9.5.1), dated January 1, 1977. These requirements, which are directed at achieving and maintaining a hot-standby condition, are summarized on Table 1.

In the original plant configuration, fires occurring in some areas could impair the use of any or all of this equipment, primarily through destruction of power and control cables. Consequently, provisions have been made for the transfer of power and/or the control of select components to alternate sources to mitigate the consequences of a severe fire in these critical plant areas (i.e., Control Room, Cable Spreading Room, Emergency Switchgear Room, or Battery Room).

Figure 1 presents a simplified schematic diagram of the major functional elements of the auxiliary shutdown system modification; not all features of the integrated modification are shown on the figure. The modification, as described herein, is intended only to ensure the operability of those systems and components needed to achieve and maintain a hot-standby condition. The modification impacts the following existing and new plant features.

- Steam-driven feedwater pump shutoff valves
- Power-operated relief valves
- Component cooling pump A
- Service water pump D
- Charging pump A
- Alternate power supply for MCC-5

- Emergency DC power supply
- Dedicated shutdown instrumentation
- Switchgear mimic bus

Simplified schematic diagrams and descriptive summaries are provided for each of the above features. These diagrams and summaries are based on the reference design drawings listed on Table 2 and are available for review upon request.

Steam-Driven Feedwater Pump Shutoff Valves

A transfer switch panel (Figure 1) located in the Auxiliary Building enables the transfer of control for the steam-driven feedwater pump (FWP) shutoff valves V1-8A and V2-14A from the existing remote control signals to local control from the turbine deck panel (Figure 1). Simplified control diagrams for valves V1-8A and V2-14A are presented by Figures 2 and 3, respectively. The modification does not change the existing control voltage or power source alignment with the valves. The transfer to local control is annunciated in the Control Room.

Power-Operated Relief Valves

The turbine deck control panel also provides for disabling the existing remote control of steam generator power-operated relief valves RV1-1, RV1-2, and RV1-3; Figure 4 is a simplified diagram of the control transfer. When transferred to local control, the valves can be operated by using the existing valve controllers located on the turbine deck. The transfer to local control is annunciated in the Control Room.

Component Cooling Pump A Control Transfer

A transfer switch is provided on the charging pump room control panel to disable the existing remote control of component cooling pump (CCP) A and to transfer control of the pump to a local switch on the panel. Figure 5 is a simplified diagram of the control transfer scheme. The modification does not change the existing control voltage or power source alignment with the pump. The transfer to local control is annunciated in the main Control Room

Service Water Pump D

The normal supply for service water pump (SWP) "D" is 480V BUS E2, with control from the plant Control Room. To provide a power supply and controls independent of the control, cable spreading, and emergency switchgear rooms, bus duct no. 1 and manual circuit breakers 1 and 2 have been installed as shown on Figure 6. When properly aligned, these breakers provide an alternate power supply and control station for SWP "D". The breakers are provided with a Kirk key interlock, with breaker 1 normally closed, breaker 2 normally open (the status of breaker 2, through an auxiliary contact, is annunciated in the Control Room). The Kirk key interlock is a single key system, and the respective breaker must be tripped before the key can be removed. Consequently, simultaneous closure of both breakers is impossible. In a similar manner, service water discharge valve V6-12D, which isolates the SWP "D" from the service water header, is powered via an interlocked breaker and a local breaker with a mechanical interlock as shown on Figure 7. The valve is normally powered from MCC-#6 but the Kirk key breaker allows power from MCC-#5 to be presented to the local breaker. Thus, power train isolation is maintained and valve operation is available from the auxiliary shutdown power connections.

In the event of a control room, cable spreading room, or emergency switchgear room fire, breaker 1 is tripped and breaker 2 is closed. Service water pump "D" is then fed by its alternate power supply and is controlled from the auxiliary panel in the charging pump room. In this configuration, operation of SWP "D" is independent of the control room, cable spreading room, and emergency switchgear rooms, and is unaffected by any fire in these areas. In addition, operation of the service water discharge valve V6-12D is unaffected by fires in the control room, cable spreading room, and emergency switchgear room.

Charging Pump A

Alternate controls, independent of the control, cable spreading, and emergency switchgear rooms, have been provided for charging pump A. Since the normal power supply for this pump (480V bus ZA) is outside the emergency switchgear room, an alternate power source is not required.

The alternate controls for charging pump A, consisting of a control transfer switch and pushbutton control switches, are located on the charging pump room control panel. As shown on Figure 8, the pushbutton control switches are electrically functional only when the control transfer switch is in the "local" position. With the control transfer switch in the "local" position, operation of the charging pump A is not affected by any fire in the control, cable spreading, or emergency switchgear rooms.

Alternate Power Supply For MCC-5

The normal power supply for MCC-5 is 480V bus E1. To provide a power supply independent of the emergency switchgear room, bus duct 2 and manual circuit breakers 3 and 4 have been installed as shown on Figure 9. The circuit breaker and bus duct configuration is identical to that provided for service water pump "D" (breakers 3 and 4 are also Kirk key interlocked).

By tripping manual circuit breaker 3 and closing manual breaker 4, MCC-5 is supplied from its alternate power supply which is independent of the emergency switchgear, control, and cable spreading rooms. With this breaker alignment, a fire in any of these areas will have no effect on the operation of MCC-5.

Emergency DC Power Supply/Dedicated Shutdown Instrumentation

The modification provides an alternate DC control voltage source to the emergency switchgear. Figure 10 depicts the alternate supply transfer and emergency switchgear alignment. The new distribution panel B provides an alternate DC control voltage source to 4kV buses 3 and 4 via interconnections with bus 3 cubicle 21 and to 480V buses 2B and 3 via interconnections with bus 2B cubicle 12B. The new distribution panel A provides an alternate DC control voltage source to 4kV buses 1 and 2 via interconnections with bus 1 cubicle 7 and to 480V buses 1 and 2A via interconnections with bus 1 cubicle 1. The transfer to the alternate 125 VDC control voltage source is annunciated in the Control Room. In addition, the new 125 VDC panel A supports a 4KVA inverter located outside of the emergency switchgear room, in the 4KV switchgear room. The inverter supports dedicated shutdown instrumentation which is located in the charging pump room control panel. The dedicated shutdown instrumentation provides the following local displays at the charging pump room panel:

- Nuclear instrumentation
- Steam generator 1 level
- Steam generator 2 level
- Steam generator 3 level
- Pressurizer level
- Pressurizer pressure

With the exception of the nuclear instrumentation, duplicate shutdown instrumentation displays are provided at the turbine deck control panel.

The new DC panel A also provides 125 VDC at the turbine deck control panel. The 125 VDC at the turbine deck panel is not required for the shutdown modification and is available for future plant use.

It should be noted that the emergency DC power configuration shown on Figure 10 is based on the assumed availability of offsite power. In the event of a fire in the battery room (or cable spreading room) coincident with a loss of offsite power, a complete loss of site DC power may be experienced. The main consequence of this failure would be the inability to operate circuit breakers to line up alternate power sources (most breakers are DC-operated).

To mitigate the consequences of this potential situation a backup onsite power supply will be provided to power the shutdown-related loads. The breakers supplying the shutdown loads will be either manually operated or electrically (AC) operated. In accordance with Appendix A of BTP 9.5-1, the onsite power supply and the associated switchgear and appurtenances will be designed and procured to non-seismic Category I criteria, and will not be designed to meet single-failure criteria. This onsite power supply will be provided by October 31, 1980.

Switchgear Mimic Bus Control Panel

Local controls have been provided for all circuit breakers required for supply of power to shutdown-related switchgear. These controls consist of the following for each affected breaker:

- o Control transfer switch, which functionally disables and isolates the breaker remote control circuits.
- o Selector switch, electrically functional only when the control transfer switch is in the "local" position. This switch provides breaker close and trip control.

Figure 11 is a single-line diagram showing the breakers affected by this modification. All control transfer and selector switches associated with these breakers are located on the mimic panel, located in the 4160V switchgear room. Each breaker control circuit is configured as shown on Figure 11. The transfer of breaker operation to local control is annunciated in the main Control Room.

It should be noted that Figures 10 and 11 describe the mimic bus panel as presently configured. The installation of the onsite power supply and its associated switchgear may require that minor changes be made to this panel in order to facilitate proper alignment of the alternate power sources when needed.

8b. System design by drawings which show normal and alternate shutdown control and power circuits, location of components, and that wiring which is in the area and the wiring which is out of the area that required the alternate system.

RESPONSE

A description of the systems used to provide normal and alternate shutdown capabilities is given in the response to question 8a.

All new components that provide alternate power or control capabilities for the dedicated shutdown system have been located so that alternate power sources or control stations will not be affected by any fire that could damage the normal shutdown systems. In addition, all conduits and cable for the dedicated shutdown systems have been routed through areas that will not be affected by fires that could damage systems normally required for shutdown.

In some cases existing power and control cables for the normal shutdown equipment have been rerouted to avoid hazardous areas. All new cable has been installed in rigid steel conduit routed through areas remote from cables presently used for the normal shutdown systems.

Location of all new control panels and equipment and the routing of all new wiring and conduits required for the dedicated shutdown system are shown in detail on the attached NUS Drawing 5137-E-6311, Sheets 1 through 7.

Block diagrams illustrating the interconnection of various components of each system are shown on Figure 13 & 14. These diagrams identify conduits of each system by number and can be used with the conduit layout drawings to follow the routing of each conduit. The block diagrams also identify each cable

in the conduits so that the location of the wiring shown in the interconnection diagrams can be determined.

Table 3 is a matrix which summarizes the location of all cables involved in the dedicated shutdown system and identifies the fire zones through which the cables for each system are routed.

8c. Demonstrate that changes to safety systems will not degrade safety systems (e.g., new isolation switches and control switches should meet design criteria and standards in FSAR for electrical equipment in the system that the switch is to be installed; cabinets that the switches are to be mounted in should also meet the same criteria (FSAR) as other safety related cabinets and panels; to avoid inadvertent isolation from the Control Room, the isolation switches should be key-locked, or alarmed in the Control Room if in the "local" or "isolated" position; periodic checks should be made to verify switch is in the proper position for normal operation; and a single transfer switch or other new device should not be a source for a single failure to cause loss of redundant safety systems).

RESPONSE

The engineered safety feature systems were designed in accordance with the applicable General Design Criteria (GDC) effective in 1968. The reactor protection system was also designed in accordance with applicable GDCs and IEEE 279, "Proposed Criteria for Nuclear Power Plant Protection Systems", August, 1968. No regulatory guides were available for incorporation into the original design criteria for the engineered safety features.

The auxiliary shutdown system modification does not impact the physical integrity of the auxiliary shutdown system components. The only penetrations into the existing system pressure boundary are for the installation of new impulse lines for new dedicated shutdown system instrumentation. The modification does not impact the system process and the auxiliary shutdown system will continue to meet all of the original mechanical and operational design criteria.

The electrical portion of the modification will comply with the original design criteria for engineered safety features as defined by applicable GDCs effective in 1968. The modification provides for:

Separation of Redundant Circuits

Where safety-related circuits have been modified, new wiring and components have been installed so that, as a minimum, the separation requirements of Regulatory Guide 1.75 are met. The basis for the modification (fire hazards analysis) dictated that power and control wiring for selected components (e.g., one charging pump, one service water pump) be rerouted so that cables serving redundant pumps would not pass through common fire areas.

Fault Isolation for Safety-Related Circuits and Power Supplies

Electrical isolation, in accordance with Regulatory Guide 1.75, is provided to ensure that external faults (fire-induced) will not degrade existing or new safety-related electrical systems.

Separation of Safety and Non-Safety-Related Circuits

Isolation devices and/or physical separation are provided to ensure that failures in non-safety-related circuits will not jeopardize adjacent safety-related circuits (see responses to items 8b, d, and e).

Annunciation in Main Control Room on Bypass or Assumption of Local Control

For those components provided with a "control transfer" feature, auxiliary contacts on each control transfer switch are used to provide annunciation (in the Control Room) when the component is switched out of its "remote control" mode.

This annunciation feature has been implemented for all auxiliary shutdown components having remote/local control capabilities, with the exception of the steam-driven feedwater pump steam shut-off valves. Implementation of this feature for these components will be completed no later than October 31, 1980.

Interlocks and Administrative Controls to Limit the Consequence of Faulted Conditions

Features such as Kirk key interlocks on selected circuit breakers prevent the inadvertent cross-connection or simultaneous faulting of redundant power supplies.

Seismic Installation in Safety-Related Areas or Safety-Related Cabinets

Interfaces with existing safety-related cabinets and new safety-related cabinets (e.g., charging pump room panel, transfer switch panels) and their included components have been designed to remain functional through a safe shutdown earthquake (SSE).

Single-Failure Criterion

All new safety-related components and safety-related interfaces are designed so that a single failure cannot cause the loss of redundant safety systems. The modifications generally affect only one of redundant equipment trains (e.g., one charging pump, one component cooling pump). The failure of one of these equipment trains will not initiate the failure of the redundant train; electrical and physical separation of the redundant trains have not been degraded as a result of the modification.

8d. Demonstrate that wiring, including power sources for the control circuit and equipment operation for the alternate shutdown method, is independent of equipment wiring in the area to be avoided.

RESPONSE

In conducting the fire hazards analysis, it was determined that several plant areas (fire zones) were critical in that cables for redundant shutdown-related components were routed through these areas. As a result, a severe fire in one of these areas could incapacitate redundant equipment trains by destroying power and control cables, or by destroying power supplies (switchgear, batteries). The areas of concern, as described in the response to question 8(a), are the battery room, emergency switchgear room, and cable spreading room.

In order to mitigate the consequences of a fire in any one of the above "critical" areas, it was directed that power and control cables for selected shutdown-related components be rerouted to avoid these areas.

Figures 13 and 14 are block diagrams which identify these cables and the conduits through which they are routed. By using these figures in conjunction with the attached NUS Drawing 5137-E-6311, the routing of the new cables can be verified.

The new power and control cables are routed so as to avoid the critical fire areas. The alternate power sources and local control panels are also independent of these areas.

Table 3 is a matrix which identifies the fire zones actually transversed by the dedicated shutdown cables.

8e. Demonstrate that alternate shutdown power sources, including all breakers, have isolation devices in control circuits that are routed through the area to be avoided, even if the breaker is to be operated manually.

RESPONSE

Detailed control wiring diagrams for existing and modified plant equipment involved in the dedicated shutdown systems are listed on Table 2. The following paragraphs discuss the methods used to isolate power and control circuits of the dedicated shutdown equipment from those used for normal shutdown.

Steam Driven Feedwater Pump Shutoff Valves V1-8A and V2-14A

Figures 2 and 3 are simplified control diagrams for these two valves. Transfer switches have been provided on a panel in the auxiliary building to transfer control of the valves to a control panel located on the turbine deck. When the transfer switches are moved to the "local" position all control circuits for these valves routed to the main control room or to auxiliary panel "FF" are effectively isolated from the dedicated shutdown circuits and the local control circuits.

In the event that a fire or other event causes a short circuit in the normal (remote) control circuits before the transfer switches are operated, the fuses in these circuits will open before damage can occur in the alternate control systems. These isolation fuses are coordinated with the fuses in the valve motor operator control circuits to ensure that the control power supply fuses do not open due to faults in the remote control cables. Additional fuses have been provided in the transfer switch panel to ensure that the motor operator control circuits are not damaged by faults in the local control circuits at the turbine deck control panel.

Component Cooling Pump A

Figure 5 is a simplified control diagram for component cooling pump A, showing the isolation devices for the control circuits. The transfer switch and fuses located in the charging pump room panel effectively isolate all circuits required for local control in the event of damage to existing controls in the main control room or the associated cables. The fuses are coordinated with control fuses at the circuit breaker to ensure that the breaker controls remain operative in the event of a fault in the remote control circuits.

Service Water Pump D

Figure 6 is a simplified control diagram for service water pump D. Manual circuit breakers 1 and 2 have been provided with interlocks to ensure that faults in the normal power supply will not affect the availability of the alternate supply system for this pump. The alternate control for this pump is located in the charging pump room control panel and is completely separate from the normal control system; therefore, isolation devices are not required for the remote controls.

Service Water Discharge Valve V6-12D

Figure 7 shows the control system modification for valve V6-12D. The normal supply for this valve operator is from MCC-6 and control from the main Control Room. The alternate power source and control location is from MCC-5 with a control switch at the charging pump room panel. Isolation of the circuits is accomplished by means of key interlocks of the power supply ACBs in MCC-6 and MCC-5 and the transfer switch which is located inside the auxiliary building. In addition, cables for the main and alternate control circuits are routed in areas remote from each other.

Charging Pump A

Figure 8 illustrates the modifications to the existing control circuits for this pump. The alternate control switch is located at the charging pump room panel and the normal remote control circuits are effectively isolated by means of the transfer switch. Coordinated fuses in the remote control circuits will isolate faulted parts of these remote control circuits from the alternate controls before the manual transfer is accomplished.

4KV and 480V Switchgear

The response to questions 8a and 8k describe the methods for providing power to the dedicated shutdown loads. Those breakers controlling the supply of off-site power to the dedicated shutdown loads are connected to a "local-remote" breaker control panel located in the 4KV switchgear room. Figure 12 gives a typical breaker control configuration for this panel. The control power cable from the cable spreading room runs through a "quick-blow" fuse in the control panel. The breaker to be operated is outfitted with a "slo-blow" fuse. In the event of a short in the normal control power cable, the "quick-blow" fuse would blow prior to the "slo-blow" fuse in the breaker. Thus the breaker could still be operated by switching the breaker "local-remote" switch to the "local" position. This switching is annunciated in the Control Room.

8f. Demonstrate that licensee procedure(s) have been developed which describe the tasks to be performed to effect the shutdown method. A summary of these procedures should be reviewed by the staff.

RESPONSE

Since all engineering and installation of the dedicated shutdown system has not been completed, it is not possible at this time to provide procedures on the operation of the new system. Procedures will be available by October 31, 1980, and will cover all actions to be taken to effect the shutdown method using the dedicated shutdown system

8g. Demonstrate that spare fuses are available for control circuits where these fuses may be required in supplying power to control circuits used for the shutdown method and may be blown by the effects of a cable spreading room fire. The spare fuses should be located convenient to the existing fuses. The shutdown procedures should inform the operator to check these fuses.

RESPONSE

The response to question 8e details which equipment, necessary for the operation of the dedicated shutdown system, is fused to prevent loss of all control capability due to the effects of a cable spreading room fire. Spare fuses will be located inside each dedicated shutdown control or switching panel and inside each breaker necessary to provide power for the dedicated shutdown system.

Since all valve positions, breaker positions and pump statuses are indicated visually by lights on control panels, a blown fuse common to both the normal and emergency control power supplies (such as in a 4KV or 480V breaker) would be indicated by a failure of the affected valve, breaker or pump to operate from the local control panel. Should this occur, the operation procedure for the dedicated shutdown system will contain instructions to the operator to inspect, and if necessary, replace the appropriate fuse(s). This procedure will be available by October 31, 1980.

8h. Demonstrate that the manpower required to perform the shutdown functions using the procedures of (f) as well as to provide fire brigade members to fight the fire is available as required by the fire brigade technical specifications.

RESPONSE

This dedicated shutdown system will require the use of two operations personnel. The fire brigade requirements are for five fire brigade members at all times. Existing requirements for normal shift complement require that no less than eight individuals be on site 24 hours a day for routine Unit No. 1 and Unit No. 2 operations. Each of these persons is included in the Fire Brigade training program which qualifies an individual to be on the Fire Brigade. Therefore, even allowing for the use of two operations persons for operating the dedicated shutdown system, this leaves at least six persons for fire brigade functions.

To ensure that the dedicated shutdown system may be operated expeditiously, all appropriate plant procedures will be revised by October 31, 1980, to indicate that two qualified operators will be dedicated to operate the system in the event of a fire in either the battery room, emergency switchgear room, cable spreading room or the Control Room.

8i. Demonstrate that adequate acceptance tests are performed. These should verify that: equipment operates from the local control station when the transfer or isolation switch is placed in the "local" position and that the equipment cannot be operated from the Control Room; and that the equipment operates from the Control Room but cannot be operated at the local control station when the transfer or isolation switch is in the "remote" position.

RESPONSE

This acceptance test will be provided as part of the dedicated shutdown modification package and will be completed by October 31, 1980.

8j. Technical Specifications of the surveillance requirements and limiting conditions for operation for that equipment not already covered by existing Tech. Specs. For example, if new isolation and control switches are added to the service water system, the existing Tech. Specs. surveillance requirements on the service water system should add a statement similar to the following: "Every third pump test should also verify that the pump starts from the alternate shutdown station after moving all service water isolation switches to the local control position".

RESPONSE

In lieu of revising separate portions of the existing Technical Specifications, a separate set of Technical Specifications concerning the operability and surveillance requirements for the Dedicated Shutdown System will be submitted by October 31, 1980.

8k. Demonstrate that the systems available are adequate to perform the necessary shutdown functions. The functions required should be based on previous analyses, if possible (e.g., in the FSAR, such as a loss of normal a.c. power or shutdown on a Group I isolation (BWR). The equipment required for the alternate capability should be the same or equivalent to that relied on in the above analyses.

RESPONSE

The operational functions required to achieve and maintain a shutdown condition are identified on Table 1 in the response to question 8(a). These functions correspond to those listed in Section 14.1.12 of the H. B. Robinson Unit 2 FSAR. The referenced section of the FSAR discusses the functions required for a shutdown following a loss of AC power; the same functions would be required for shutdown following a postulated fire. The operability of the shutdown functions in both cases presumes that offsite power is available.

The functions required for shutdown and the adequacy of the equipment provided to perform these functions are discussed below.

Monitor and Control Primary System Coolant Inventory

The Chemical and Volume Control System is provided with 3 charging pumps. As stated in Section 9.2.2 of the FSAR, one charging pump is adequate to provide full charging flow and the reactor coolant pump seal water supply during normal seal leakage. For this reason, the operability of one charging pump (A) was ensured by rerouting power and control circuits, and by providing an alternate control location (charging pump room panel).

In order to monitor primary coolant level and primary coolant system pressure, one channel each of pressurizer level and pressurizer pressure instrumentation have been provided on the charging pump room panel and turbine deck panel. By providing one dedicated channel for each parameter, primary coolant conditions can be adequately monitored. Consequently, dedicated process impulse lines, electrical cables, and power sources have been provided for the operation of this instrumentation. The impulse lines, cables (and power sources) have been located outside the "critical" fire areas.

Remove Decay Heat by Means of Feedwater Addition to the Steam Generators, With Atmospheric Venting of Steam

Section 14.1.12 of the FSAR describes an acceptable method of decay heat removal using the secondary system. The auxiliary feedwater pump (steam-driven) is utilized for steam generator feedwater, because the analysis of FSAR Section 14.1.12 postulated a loss of AC power. As discussed in the response to Question 8(a), power and control cables for the auxiliary feedwater pump steam shutoff valves have been rerouted to avoid the critical fire areas.

To effectively utilize the secondary system for decay heat removal, two steam generators must be fed; level instrumentation for all three steam generators has been provided at both local shutdown panels.

The referenced FSAR analysis takes credit for operation of the steam generator safety relief valves and power-operated relief valves in order to vent steam to the atmosphere. To ensure the availability of full steam-venting capability, the control circuits for the power-operated relief valves (3) were modified to allow local control, independent of any critical fire areas.

Monitor Reactor Coolant Neutron Level to Assure That Subcriticality is Maintained

While maintaining a hot-standby condition, reactor coolant neutron level can be adequately monitored by one startup range neutron channel. A dedicated instrument channel, connected to an existing detector, has been installed in the south cable vault. This channel, which is totally independent of the existing channels, is unaffected by fires in any of the previously mentioned critical areas. Cabling is not routed through any of these areas, and power is obtained from a source in the turbine building.

Required Auxiliary Services

Component Cooling Water:

As stated in Section 9.3 of the FSAR, one component cooling loop (pump and heat exchanger) will provide cooling for all components in the auxiliary and containment buildings. Consequently, the operability of one pump (A) has been ensured by rerouting of power and control cables and provision of an alternate (local) control capability.

Service Water:

To ensure the operability of one service water pump (D) and its associated discharge valve (V6-12D), power and control cables have been provided. Only one pumping train has been modified, because the cooling requirements are assumed to be lower than those specified in the FSAR (i.e., it is assumed that a LOCA does not occur coincident with the postulated accident). Although cooldown time is extended with reduced service water capacity, one pump will provide sufficient flow to permit hot-standby operation.

480-V AC, 125-V DC Electrical Power

Refer to the response to Question 8 (a). The power system modifications include the following:

- o Alternate AC power supply, using offsite power feed to turbine building.
- o Alternate DC power supply, using new dedicated DC power supplies in turbine building, fed from offsite power.
- o Switchgear "mimic bus" which allows local control of essential circuit breakers, to reconfigure distribution system to allow offsite power configuration to be used.
- o. Selective rerouting of control and power cables.

The switchgear allocation and DC power supply capacity associated with the alternate (offsite) power feed have been sized to support only the shutdown-related loads. The adequacy of the power supplies is supported by design calculations. In the shutdown mode, no loads other than the equipment essential to shutdown operation are connected to the designated buses.

The electrical power system modification is based on the assumption that offsite power will be available. In the event of simultaneous loss of offsite power and fire in a critical area, a total site blackout may occur. To allow recovery from such an occurrence, an onsite power supply will be provided.

81. Demonstrate that repair procedures for cold shutdown systems are developed and material for repairs is maintained on site.

RESPONSE

Repair procedures for achieving cold shutdown subsequent to a fire in either the cable spreading room, emergency switchgear room, battery room, or Control Room will be available by October 31, 1980. Also, by October 31, 1980, adequate materials for performing these repairs will be maintained in stock at the plant site.

TABLE 1

Functional and Hardware Requirements

For Achieving and Maintaining a Hot Standby Condition

Functional Requirement	Systems or Components Required
1. Monitor & control primary system coolant inventory	1. a) Charging pump b) Pressurizer level instrumentation c) Pressurizer pressure instrumentation
2. Remove decay heat by means of feedwater addition to the steam generators with atmospheric venting of steam	2. a) Auxiliary feedwater pump b) Steam generator level instrumentation c) Power-operated relief valves
3. Monitor reactor neutron level to assure that subcriticality is maintained	3. Startup range neutron channel
4. Provide auxiliary services (cooling water & electric power) required by the components that directly perform the above functions	4. a) Component cooling pump b) Service water pump and associated valves c) 480-V AC power d) 125-V DC power

TABLE 2

REFERENCE DRAWINGS

Drawing Number	Revision	Title
5137-E-6100		
SH. 1	1	Control Wiring Diagram for Service Water Pump D
2	1	
3	3	
4	1	
5137-E-6101		Control Wiring Diagram for Steam Driven FWP Steam Shutoff Valve V1-8A
SH. 1	2	
2	2	
5137-E-6106	2	Control Wiring Diagram, Charging Pump A
5137-E-6109	3	Interconnection Diagram, Annunciator DSA
5137-E-6110	3	Interconnection Diagram, Annunciator DSB
5137-E-6115		Control Wiring Diagram for Steam Driven FWP Shutoff Valve V2-14A
SH. 1	1	
2	1*	
3	2*	
5137-E-6116		
SH. 1	1	Control Wiring Diagram for Service Water Discharge Valve V6-12D
2	2	
3	2*	
5137-E-6211		Interconnection Diagram, Charging Pump Room Control Panel
SH. 1	3	
2	3	
3	2	
5137-E-6212		Interconnection Diagram, Turbine Deck Panel
SH. 1	2	
2	2	
5137-E-6213		Interconnection Diagram, Local/Remote CB Panels
SH. 1-8, 13-16, 19-24	2	
SH.9-12, 17,18	3	
5137-E-6215		Interconnection Diagram, Emergency DC Power Supply System
SH. 1,2	3*	
5137-E-6216	4*	Interconnection Diagram, Dedicated Shutdown Instrumentation

TABLE 2 (Continued)

REFERENCE DRAWINGS

Drawing Number	Revision	Title
5137-E-6217	1	Alternate Power Connection Diagram, MCC-5
5137-E-6218	2	Interconnection Diagram, Remote Transfer Switch Panel, V1-8A
5137-E-6219	2	Interconnection Diagram, Remote Transfer Switch Panel, V2-14A
5137-E-6220		Interconnection Diagram, Steam Dump Control System
SH. 1	2*	
2	3*	
5137-E-6311		
SH. 1	5	Reactor Auxiliary Building Ground Floor - Conduits
2	5	Reactor Auxiliary Building Upper Floor - Conduits
3	5	Charging Pump Room - Conduits
4	4	Turbine Generator Area Switchgear Room - Conduits
5	4	Mezzanine Deck - Conduits
6	4	Control Room - Conduits
7	1	Reactor Building - Conduits
5137-E-6313	3*	Charging Pump Room Control Panel Layout
5137-E-6314	3*	Turbine Deck Control Panel Layout
5137-E-6318	3	Mimic Bus Panel Layout
5137-E-6319	2	Transfer Switch Panel V1-8A and V2-14A

*-Indicates drawing presently undergoing revision.

TABLE 3

LOCATION OF SAFE SHUTDOWN CABLING

Safe Shutdown Component	Circuit Classification	Fire Zone Areas 4	5	9	10	11	12	13	28	TB	WH	OS
Service Water Pump D & Valve V6-12D(2)	P	X	X							X		X
	C	X	X				X	X	X	X		X
Component Cooling Water Pump A	P		X							X		
	C	X					X(1)	X(1)		X		X
Charging Pump A	P	X							X	X	X	
	C	X								X	X	
Steam Driven Feedwater Pump & Valves V1-8A, V2-14A	P						X	X		X		X
Alternate Power Source for MCC-5	P		X			X	X	X		X		
Instrumentation for Shutdown(3)	P	X		X	X					X		

P - Power Cable
C - Control Cable
TB - Turbine Building
WH - Waste Holdup Tank Room
OS - Outside of Auxiliary Building or Roof

(1) Rerouting of cable out of this fire zone is planned but is not shown on current documentation.

(2) Normal supply for VC-12D is in Zones 20 and 19; alternate circuits are routed through Zones 5 and TB.

(3) Proposed new routing to enhance separation of redundant pumps.

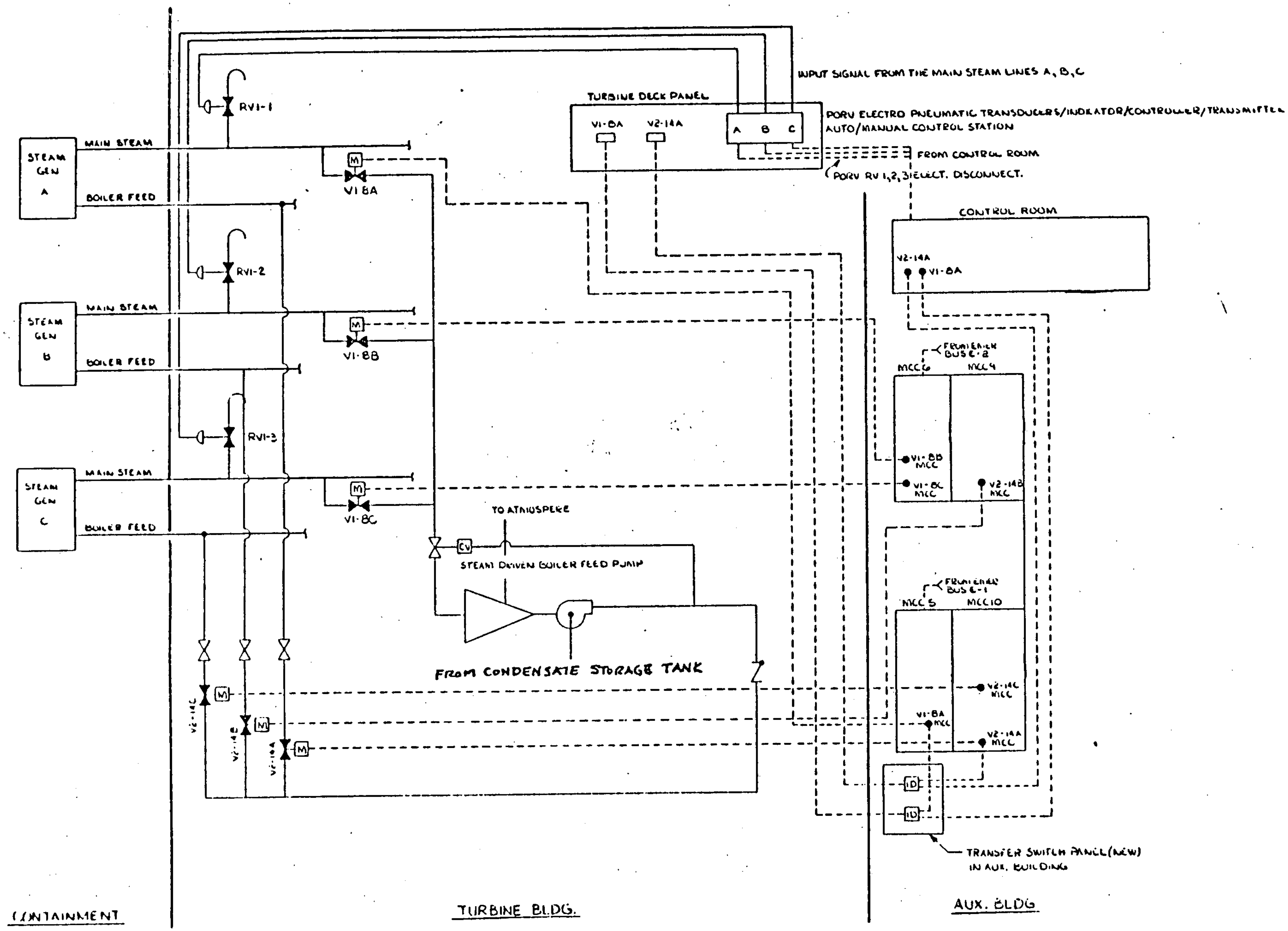
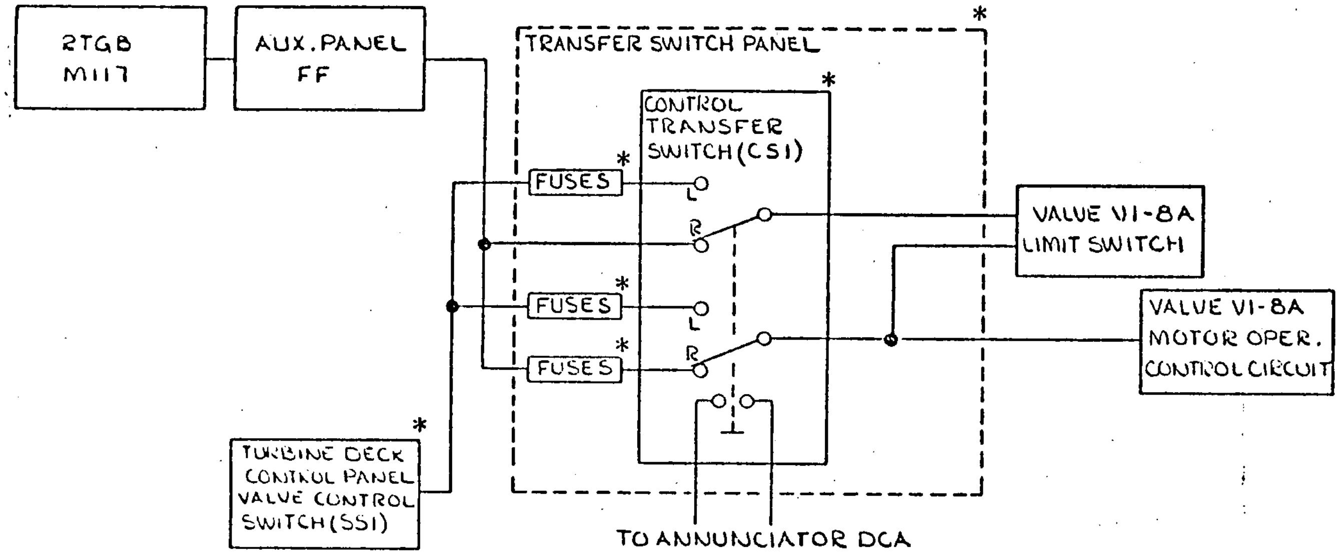


FIGURE 1
SIMPLIFIED DIAGRAM-FIRE PROTECTION
SHUTDOWN SYSTEM CONTROLS

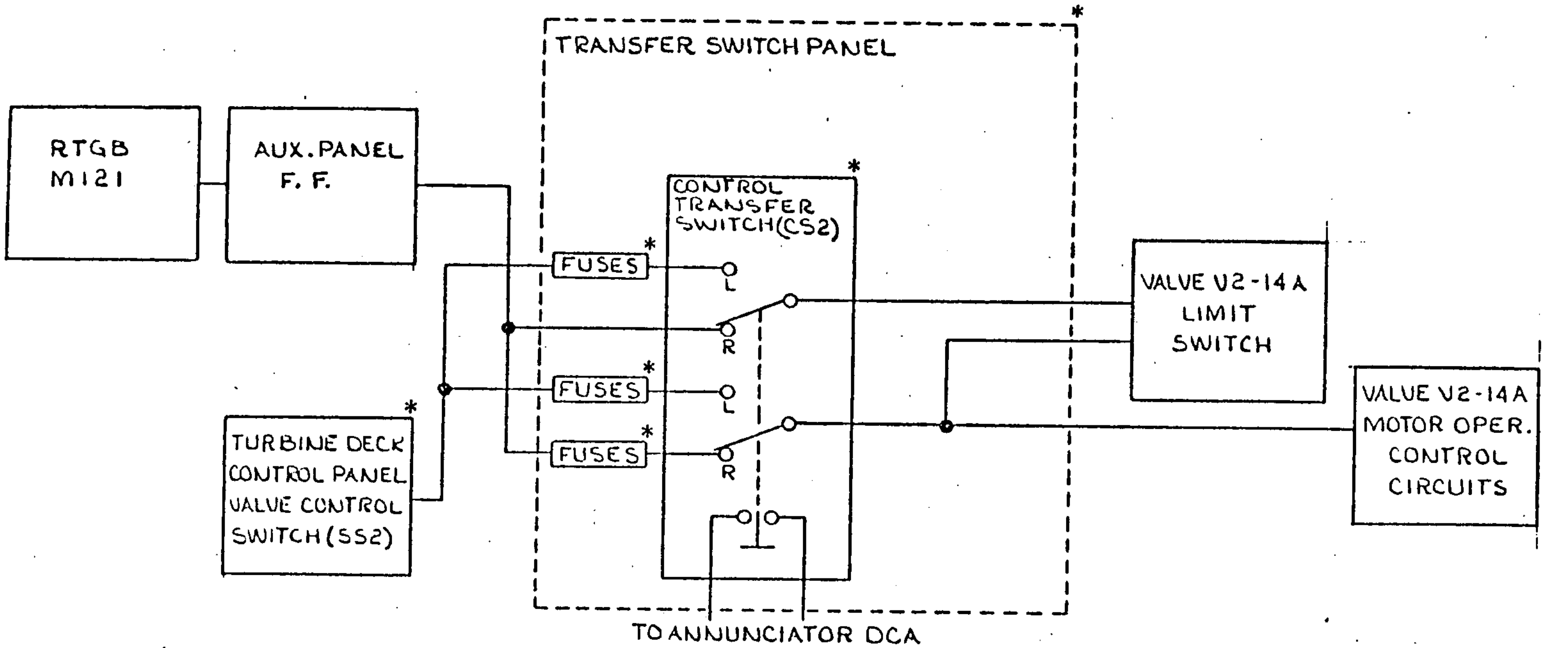


NOTES

1. SWITCH CS1 IS SHOWN IN REMOTE CONTROL POSITION
2. ASTERISK (*) DENOTES NEW COMPONENT
3. REFER TO NUS DRAWINGS 5137-E-6101, -6109, -6218, -6314 & -6318.

FIGURE 2

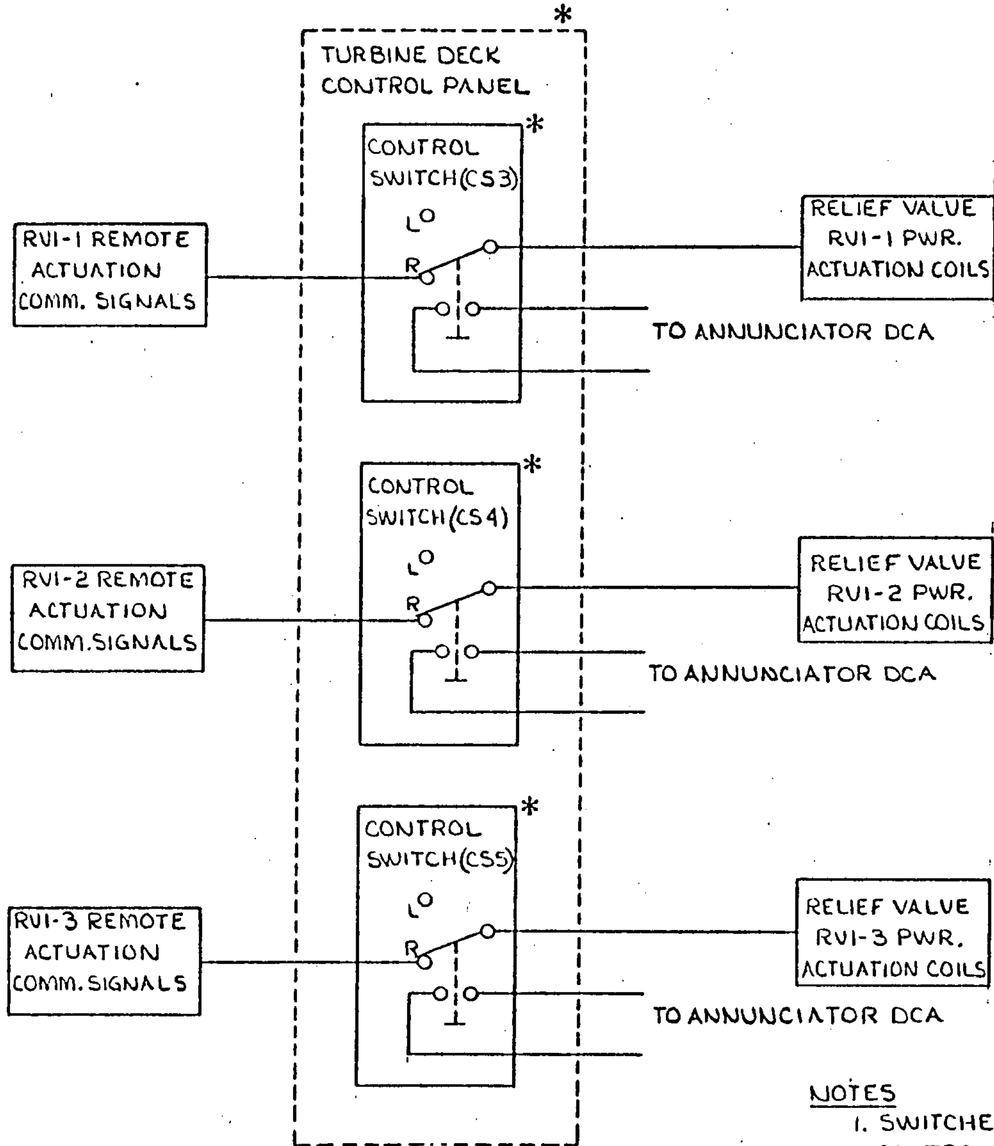
STEAM DRIVEN FWP STEAM SHUTOFF VALVE V1-8A



NOTES

1. SWITCH CS2 SHOWN IN REMOTE CONTROL POSITION
2. ASTERISK (*) DENOTES NEW COMPONENT
3. REFER TO NUS DRAWINGS 5137-E-6109, -6115, -6219, -6314, & -6319.

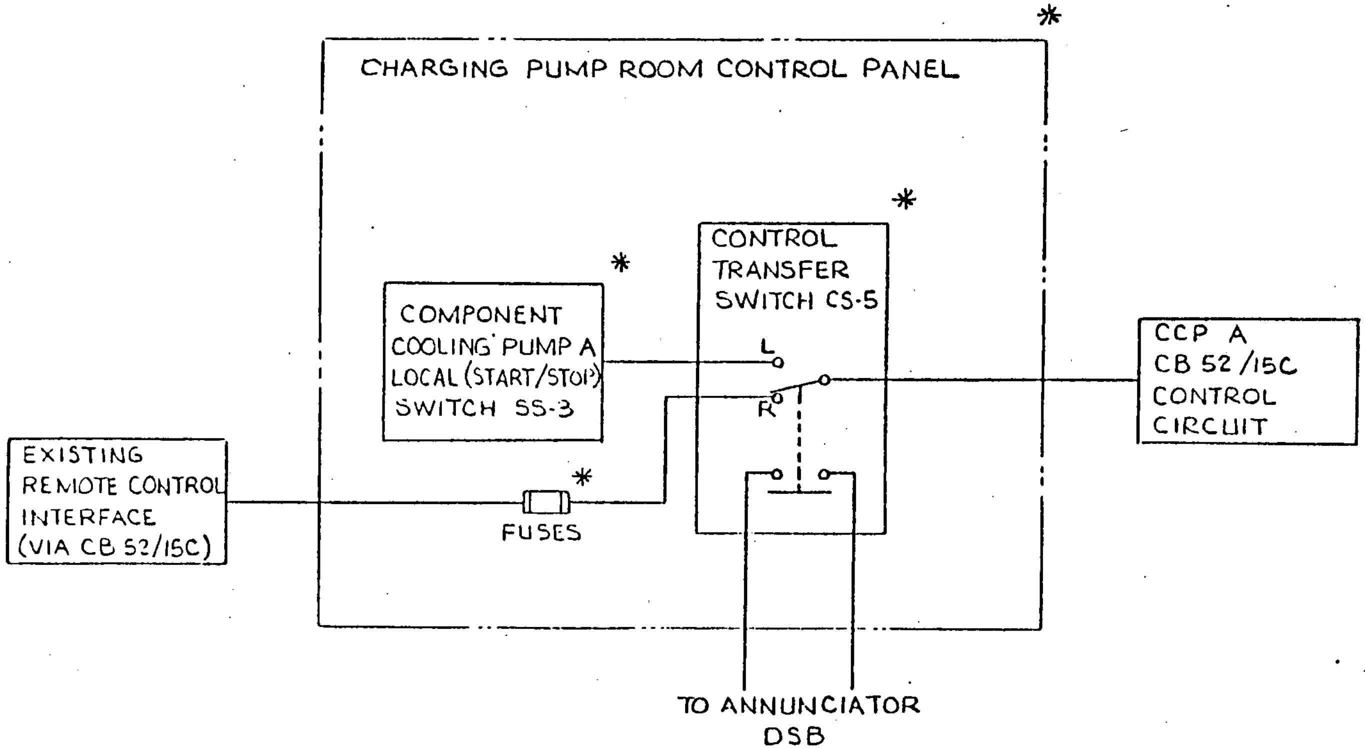
FIGURE 3
STEAM DRIVEN FWP STEAM SHUTOFF VALVE V2-14A



NOTES

1. SWITCHES SHOWN IN REMOTE CONTROL POSITION
2. ASTERISK (*) DENOTES NEW COMPONENT
3. REFER TO NUS DRAWINGS 5137-E-6109, -6220, & -6314.

FIGURE 4
STEAM DUMP VALVE CONTROL

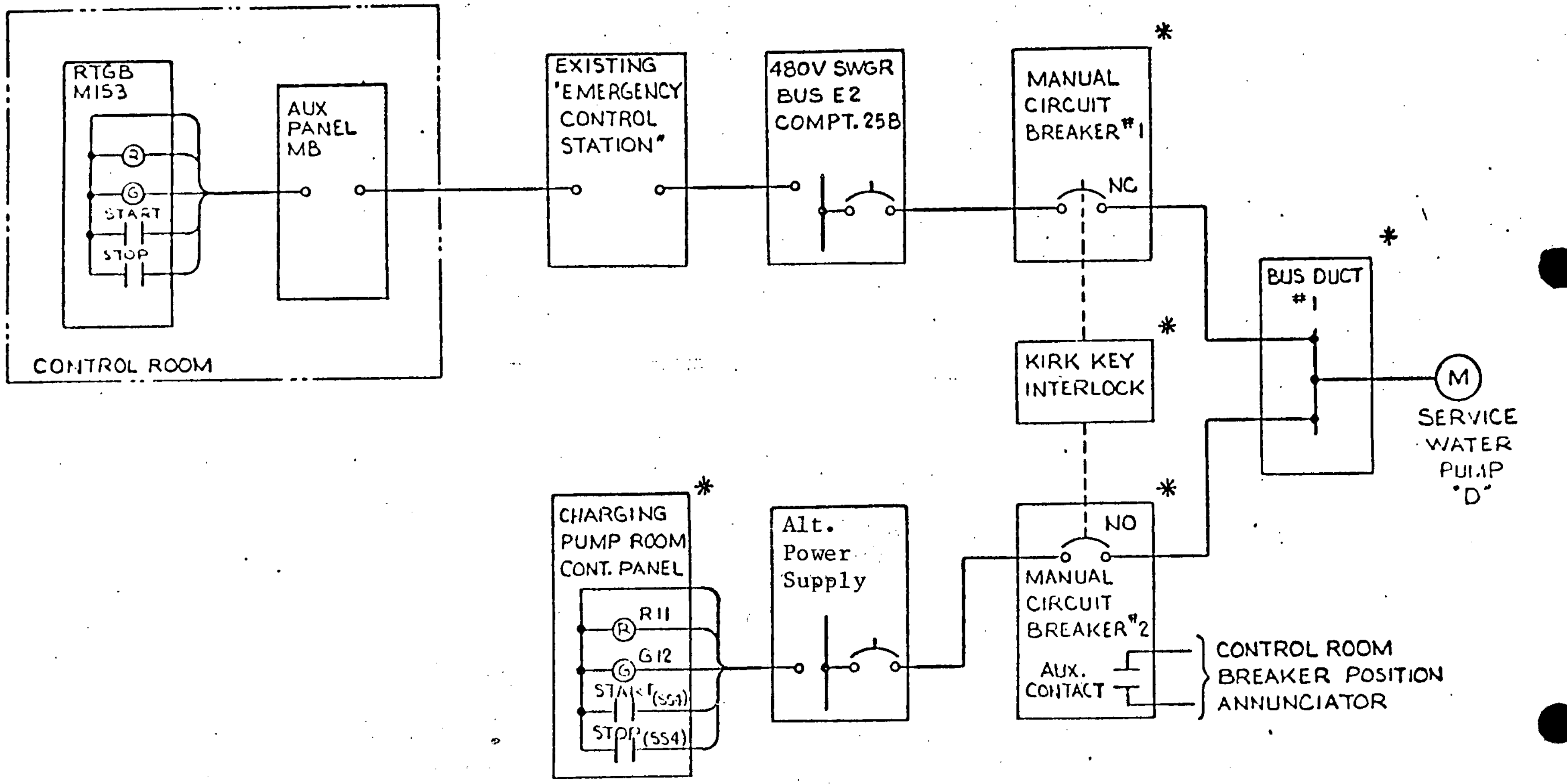


NOTES:

1. SWITCH CS-5 SHOWN IN REMOTE CONTROL POSITION
2. ASTERISK (*) DENOTES NEW COMPONENT
3. REFERENCE: NUS DRAWINGS 5137-E-6110, 5137-E-6211, AND 5137-E-6313

FIGURE 5
COMPONENT COOLING PUMP 'A' CONTROL TRANSFER

-37-



NOTES:

1. ASTERISK (*) DENOTES NEW COMPONENTS
2. REFER TO NUS DWG 5137-E-6000, SHT. 1-4 FOR WIRING DETAILS

FIGURE 6

SERVICE WATER PUMP "D"

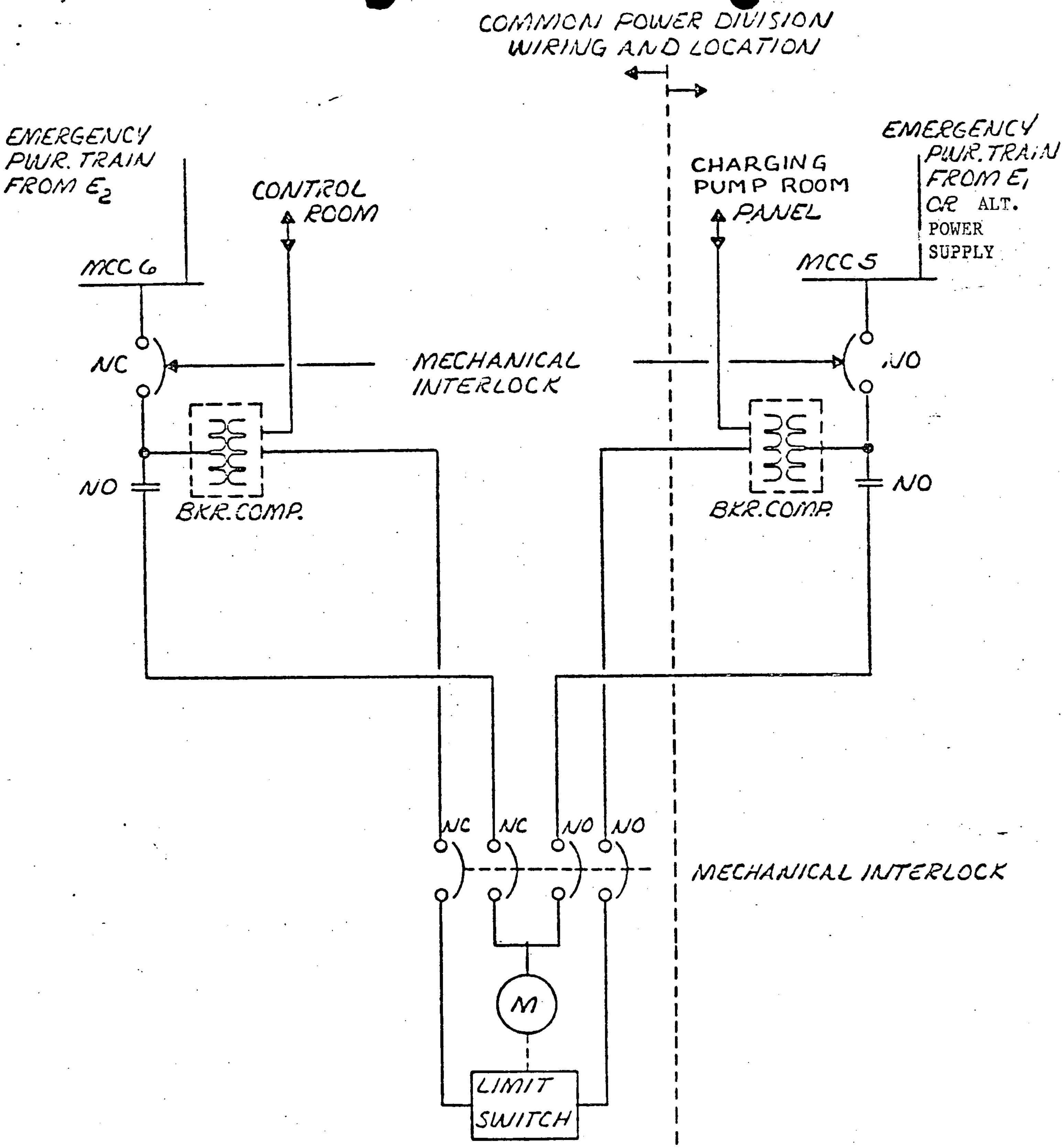
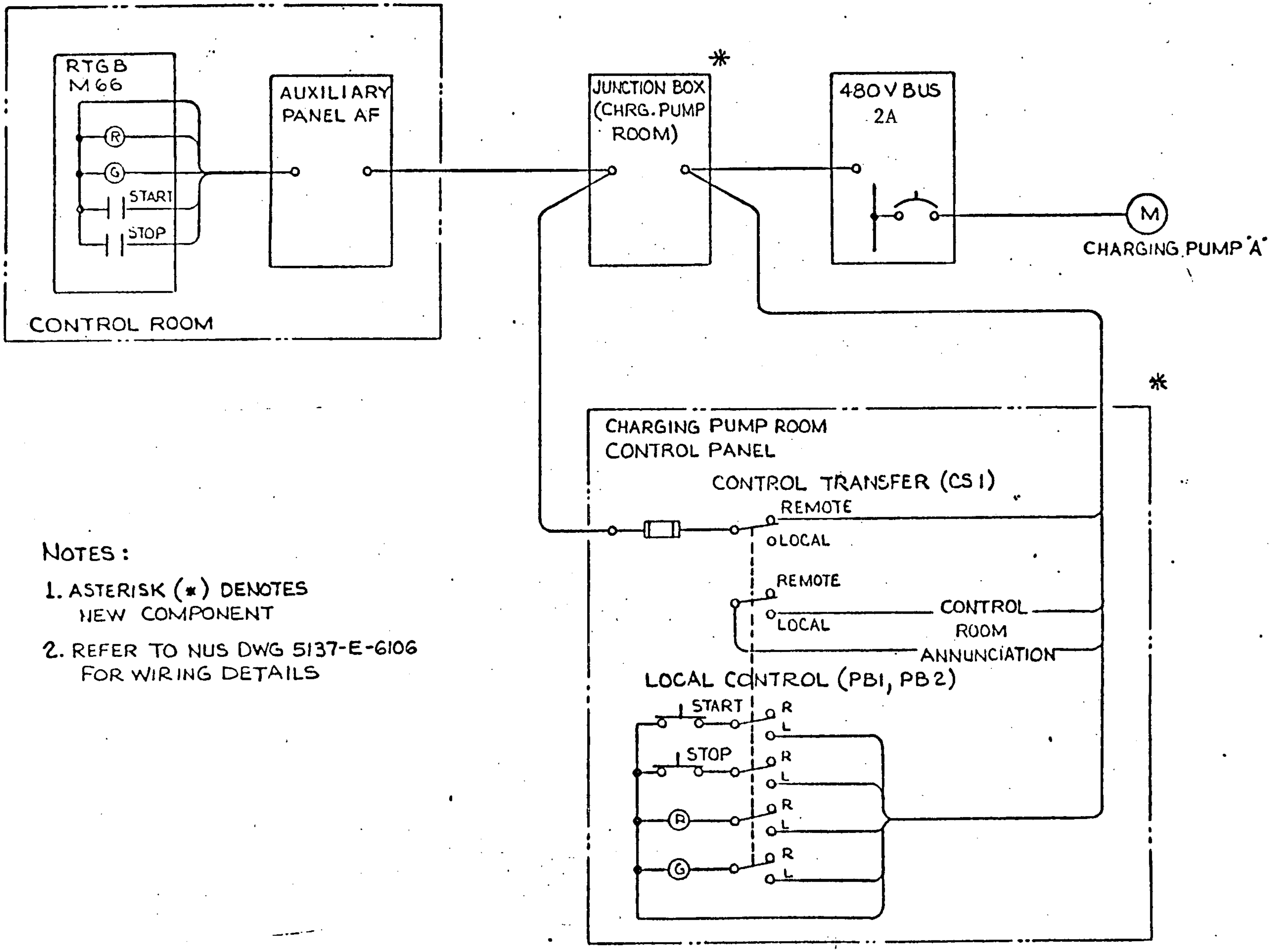


FIGURE 7
SERVICE WATER DISCHARGE VALVE V6-12D



NOTES:

1. ASTERISK (*) DENOTES NEW COMPONENT
2. REFER TO NUS DWG 5137-E-6106 FOR WIRING DETAILS

FIGURE 8
CHARGING PUMP "A"

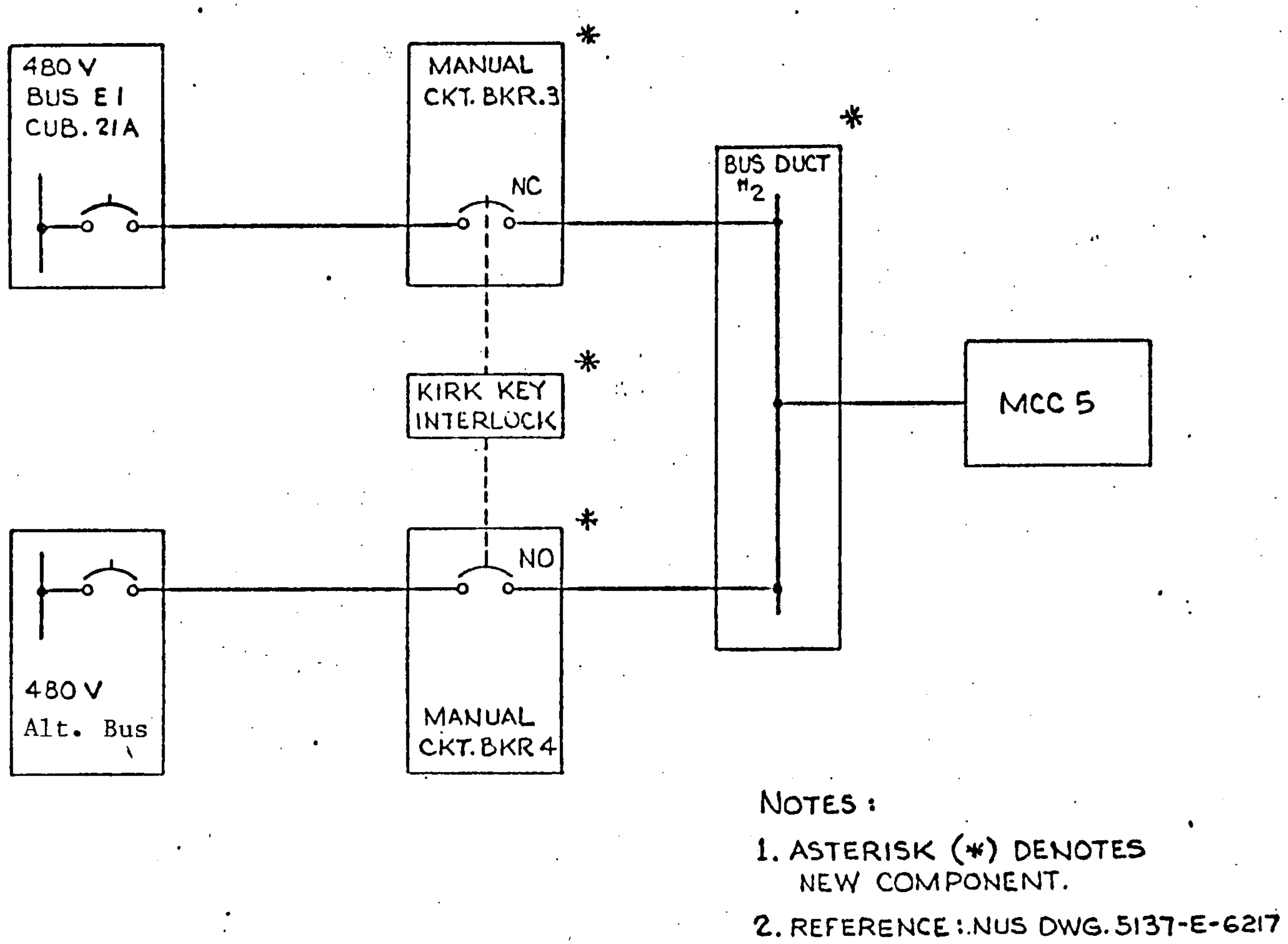
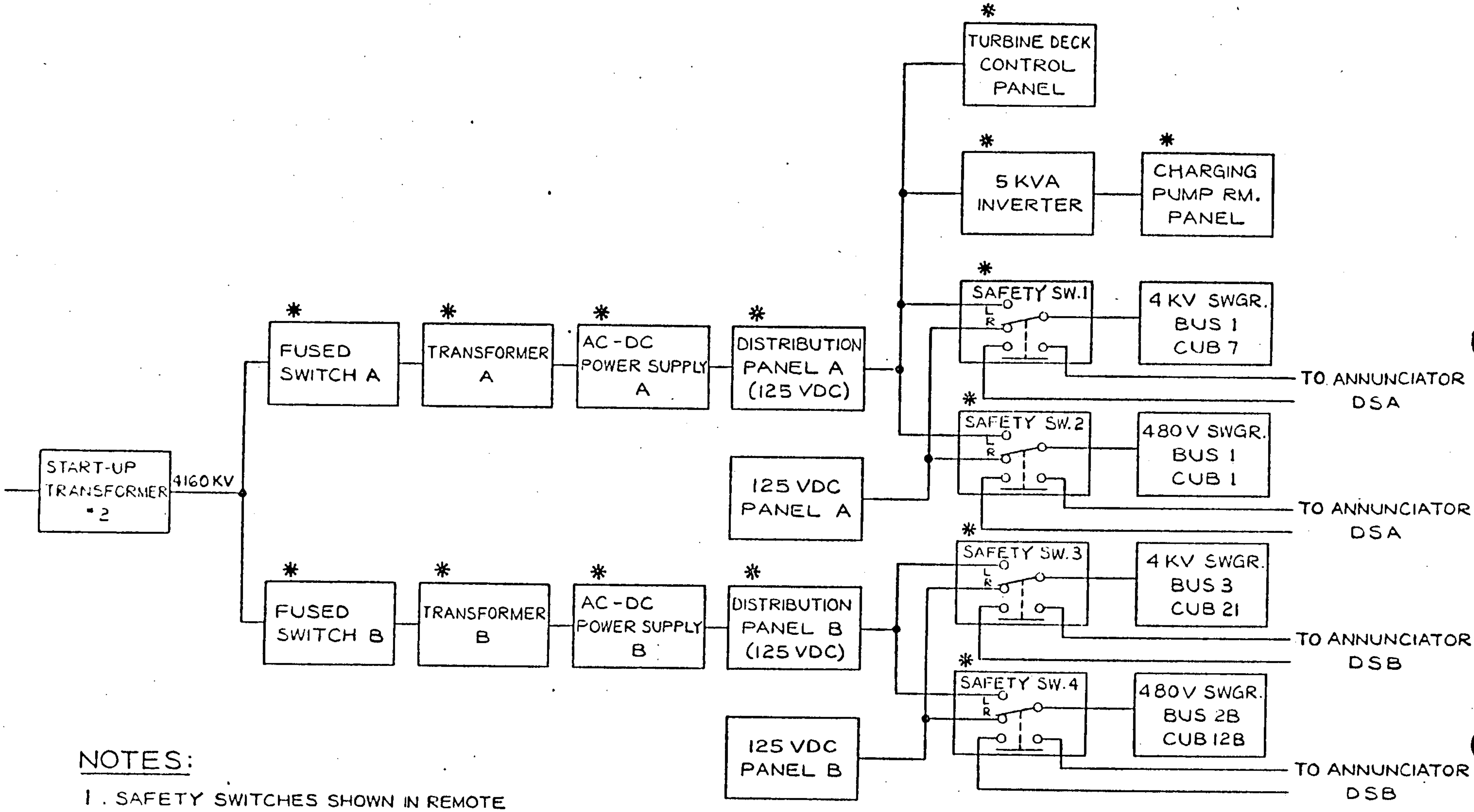


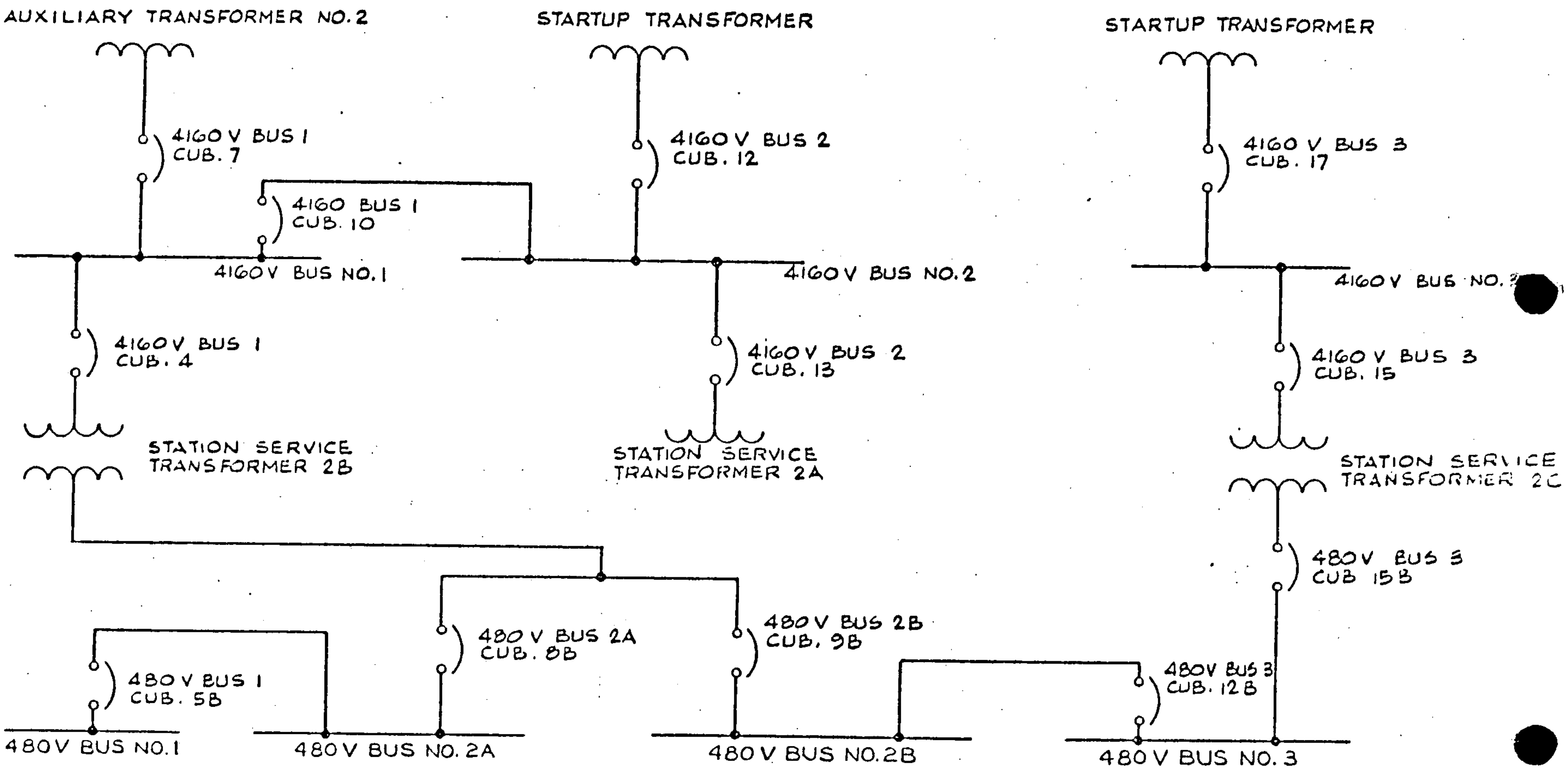
FIGURE 9
ALTERNATE POWER FOR MCC 5



NOTES:

1. SAFETY SWITCHES SHOWN IN REMOTE CONTROL POSITION.
2. ASTERISK (*) DENOTES NEW COMPONENT.
3. REFER TO NUS DRAWINGS 5137-E-6109, -6110, -6213 & -6215.

FIGURE 10
EMERGENCY DC POWER SUPPLY

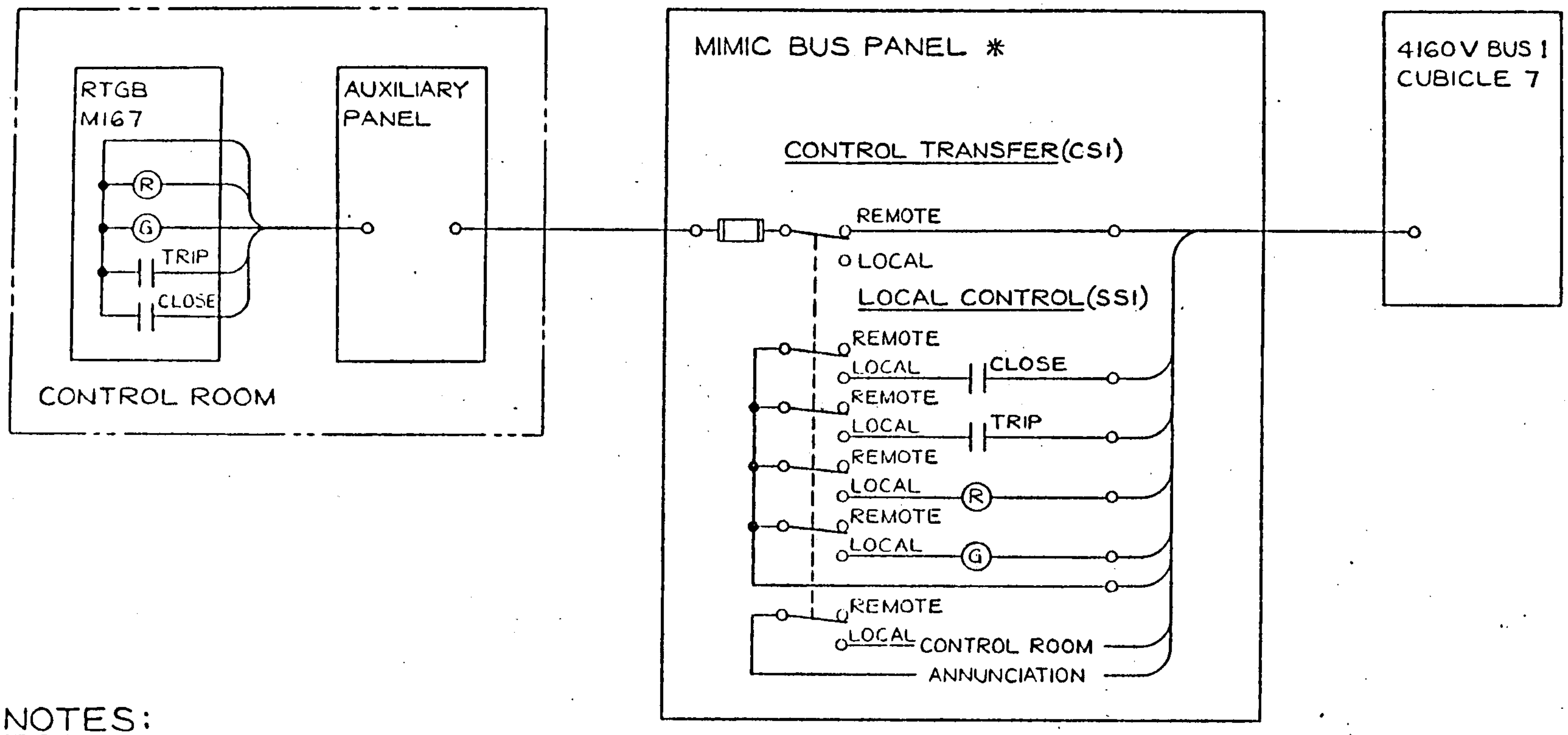


NOTES:

1. A REMOTE / LOCAL CONTROL TRANSFER SWITCH AND LOCAL CONTROL SWITCH IS PROVIDED ON THE MIMIC PANEL FOR EACH OF THE ABOVE BREAKERS AS SHOWN ON FIGURE SQ2-11.

2. REFERENCE NUS DWG. 5137-E-6318.

FIGURE 11
SWITCHGEAR MIMIC PANEL CONTROLS



NOTES:

1. THIS SCHEMATIC TYPICAL FOR BREAKER CONTROLS ON THE MIMIC BUS PANEL.
   ALSO APPLIES TO THE FOLLOWING BREAKERS:

CIRCUIT BREAKER	MIMIC BUS PANEL CONT. SWS.
4160 V BUS 1, CUB. 10	CS4, SS4
4160 V BUS 2, CUB. 12	CS2, SS2
4160 V BUS 3, CUB. 17	CS3, SS3
480 V BUS 2A, CUB. 8B	CS8, SS8
480 V BUS 2B, CUB. 9B	CS9, SS9
480 V BUS 1, CUB. 5B	CS11, SS11
480 V BUS 3, CUB. 12B	CS12, SS12
480 V BUS 3, CUB. 15B	CS10, SS10
4160 V BUS 1, CUB. 4	CS5, SS5
4160 V BUS 2, CUB. 13	CS6, SS6
4160 V BUS 3, CUB. 15	CS7, SS7

2. ASTERISK (*) DENOTES NEW COMPONENT.

3. REFER TO NUS DWG. 5137-E-6213, SHEETS 1 THRU 24 FOR WIRING DETAILS.

FIGURE 12

TYPICAL MIMIC PANEL BREAKER CONTROLS