Point Beach Nuclear Plant
Units 1 & 2

RESPONSE TO 10 CFR 50 APPENDIX R "ALTERNATE SHUTDOWN CAPABILITY"

4160V SWITCHGEAR ROOM

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2.0 Method of Investigation

2.1 Requirements

A fire could affect safe shutdown systems and impact public safety while the loss of function of systems used to mitigate the consequences of a design basis accident under post-fire conditions may not necessarily impact public safety. Therefore, the need to limit fire damage to safe shutdown systems is greater than the need to limit damage to those systems used to mitigate the consequences of a design basis accident. Levels of protection have been defined by 10 CFR 50 Appendix R according to the safety function of the structure, system or component. These are:

2.1.1 Hot Shutdown - One train of equipment necessary to achieve and maintain hot shutdown from the control room or emergency control station(s) must remain free of fire damage from a single fire including an exposure fire.

2.1.2 Cold Shutdown - Both trains of equipment needed to achieve and maintain cold shutdown may be damaged by a single fire, including an exposure fire. However, damage must be limited to the extent that at least one train can be repaired or otherwise made operable within 72 hours using onsite capability. When alternate shutdown capability is provided, damage shall be limited so that the systems can be made operable and cold shutdown can be achieved within 72 hours.

2.1.3 Design Basis Accidents - Both trains of equipment necessary for mitigation of the consequences following a design basis accident may be damaged by a single exposure fire. Repair capability is not necessary to satisfy Appendix R requirements.

2.2 Functional Requirements

The selection of safe shutdown functions is principally based on those identified in Nuclear Regulatory Branch Technical Position (BTP) APCSB 9.5-1 Section C.5.c. Other functions may exist under each of these broad headings. Examples of such functions are steam generator level control and steam generator pressure control which exist as a part of reactor heat removal. Steam generator level and pressure control are required during initial hot shutdown conditions. However, during certain portions of cooldown and all of cold shutdown, the Residual Heat Removal System is operable and these functions are not required. Other functions such as emergency power, process cooling, etc., are included in the miscellaneous supporting function definition.

In addition to the functions identified in BTP CMEB 9.5-1, a Reactor Coolant Pressure Control Function has been included. Although this function could be placed within the Reactor Coolant Make-up Function and Reactor Heat Removal Function, the specific goals achieved by the performance of this function are unique enough to warrant a separate function classification.

The specific safe shutdown functions necessary to satisfy Appendix R acceptance criteria are as follows:

(1) Reactor Reactivity Control Function

(2) Reactor Coolant Make-up Control Function

(3) Reactor Coolant Pressure Control Function

(4) Reactor Heat Removal Function

(5) Process Monitoring Function

(6) Miscellaneous Supporting Functions

2.2.1 Reactor Reactivity Control Function

After a reactor trip, the reactivity control function must be capable of achieving and maintaining at least a 1% reactivity shutdown margin from zero power hot shutdown to cold shutdown conditions. The function must be capable of compensating for any positive reactivity change as a result of xenon decay and decreasing reactor coolant temperature during cooldown. A safety sequence diagram, Figure 2-1, represents safe shutdown functions for reactivity control.

Initial reactivity control results from an automatic Reactor Protection System (RPS) trip or from operator initiation of a manual trip. The effects of fires on the RPS do not preclude the initiation of an automatic trip or control rod insertion because the system is designed to fail in the safe (scram) condition.

Following control rod insertion, hot subcritical conditions can be maintained for at least 24 hours with no addition of boron, assuming all rods are inserted into the core and the reactor trip occurs at worst case conditions (end of life and at 100% power), with xenon at steady-state level. As xenon decays, however, positive reactivity is added, requiring the addition of borated water from the Refueling Water Storage Tank (RWST) to maintain the required margin of shutdown reactivity. The cooldown transition from hot shutdown, and ultimately to cold shutdown, requires additional boration to compensate for the negative moderator temperature coefficient. The total quantity of borated water from the RWST (a minimum Technical Specification concentration of 2000 ppm) which must be injected into the Reactor Coolant System (RCS) to achieve the required cold shutdown margin is less than the quantity of borated water from the same source required to maintain pressurizer level within the operating band during cooldown (Reactor Coolant System volume shrinkage compensation). The Chemical and Volume Control System (CVCS) is capable of injecting this quantity of borated water into the Reactor Coolant System and maintaining the required shutdown reactivity margin throughout safe shutdown.

2.2.2 Reactor Coolant Make-up Control Function

The reactor coolant make-up control function must be capable of assuring that sufficient make-up inventory is provided to compensate for reactor coolant system fluid losses due to

leakage from the system and shrinkage during cooldown. Adequate performance of this function is achieved by maintaining pressurizer level within acceptable limits. A safety sequence diagram, Figure 2-2, represents safe shutdown functions for reactor coolant makeup control.

For the assumed fire scenario, reactor coolant make-up control is achieved by isolation of the normal and excess letdown CVCS paths and operation of the charging portion of the CVCS through the RCP seal injection path. Alternatively, the auxiliary charging path could be used.

Successful maintenance of RCS integrity is also necessary to achieve adequate inventory and pressure control. Spurious opening of primary boundary isolation valves such as pressurizer and reactor vessel vent valves, pressurizer power-operated relief valves (PORVs), and RHR isolation valves will be precluded or mitigated, and adequate maintenance of reactor coolant pump seal integrity achieved.

Control of pressurizer water level is achieved manually by controlling CVCS charging flow using local or remote pressurizer level indication.

2.2.3 Reactor Coolant Pressure Control

Reactor coolant pressure control is required to assure that the reactor coolant system is operated:

(1) Within the technical specifications for reactor coolant system pressure-temperature requirements;

(2) To prevent peak reactor coolant system pressure from exceeding 2735 PSIG (110% of system design pressure); and

(3) With a sufficient subcooling margin to minimize void formation within the reactor vessel during natural circulation decay heat removal conditions.

A safety sequence diagram, Figure 2-3, represents safe shutdown functions for reactor coolant pressure control.

Overpressure protection of the RCS prior to a controlled cool-down and depressurization is provided by the pressurizer safety valves. After alignment of the Residual Heat Removal System (RHR), at approximately 350°F and 425 psig, overpressure protection is provided by the RHR safety valves. The pressurizer safety valves and RHR safety valves, in conjunction with a controlled cooldown and a timely transfer to shutdown cooling at or around a Reactor Coolant System temperature of 350°F, will ensure that the RCS pressure-temperature limits are not exceeded. For adequate pressure control, isolation of the pressurizer auxiliary spray and normal letdown will occur as the result of operator action. Safety injection tank accumulators will also be manually isolated by operator action.

The establishment and maintenance of sufficient sub-cooling margin within the Reactor Coolant System is essential when

conducting a natural circulation cooldown. Pressurizer heaters may not be available but maintaining a constant charging pump flow rate while decreasing cooldown rate will raise system pressure. In the event that depressurization is required during cooldown, the preferred method will be to maintain pressurizer level constant and reduce pressure via ambient losses. If a more rapid means of depressurization is required, the auxiliary spray can be operated manually.

2.2.4 Reactor Heat Removal Function

The reactor heat removal function must be capable of removing both decay and sensible energy from the reactor core and primary systems at a rate such that overall system temperatures can be maintained within acceptable limits. This function shall also be capable of achieving cold shutdown conditions within a 72-hour period and maintain cold shutdown thereafter. A safety sequence diagram, Figure 2-4 represents safe shutdown functions for reactor heat removal.

Following a reactor trip with an assumed loss of off-site power, decay heat is initially removed by natural circulation within the Reactor Coolant System, heat transfer to the Main Steam System via the steam generators, and operation of the air-operated atmospheric steam dump valves or the Main Steam System code safety valves. With the main steam safety valves

alone, the RCS maintains itself close to the nominal no-load condition.

For decay heat removal via natural circulation a minimum of one steam generator is assumed to be available. This decay heat removal requires the ability to supply sufficient feedwater to a steam generator to make up for the inventory discharged as steam by the safety or relief valves. For maintenance of initial hot shutdown conditions, the secondary make-up flow required to a steam generator is less than 200 gpm and is supplied by the Auxiliary Feedwater System (AFW). The preferred feedwater source is the condensate storage tanks, with the Service Water System available as a backup. Feedwater may be supplied by the motor-driven auxiliary feed pumps or by the turbine-driven auxiliary feed pump.

Transition from hot shutdown conditions to cooldown is achieved by manual control of steam generator pressure. The removal of decay and sensible energy is achieved by the controlled operation of the steam generator atmospheric steam dump valve and continued operation of the Auxiliary Feedwater System. During this cooldown phase, an auxiliary feedwater flow of up to 200 gpm is required which can be supplied with the turbine-driven or motor-driven auxiliary feed pump.

As described above, the transition from hot shutdown to cooldown is achieved via operation of the Auxiliary Feedwater System and the atmospheric steam dump valves. After reduction

of reactor coolant system temperature below 350°F, the Residual Heat Removal System is used to establish long-term core cooling through the removal of decay heat from the Reactor Coolant System to the environment via the Residual Heat Removal System, Component Cooling Water System, and the Service Water System.

2.2.5 Process Monitoring Function

When information on process variables is required by operators in order to either modify system alignments or control safe shutdown equipment, such monitoring information must be available. The preferred mode of process monitoring is by direct indication of those plant process variables necessary for plant operators to perform and/or control the previously identified functions. A discussion of the necessary instrumentation by safe shutdown function is provided below.

For the fire scenarios assumed in this analysis, inventory make-up to the Reactor Coolant System will be from the Refueling Water Storage Tank through the reactor coolant pump seal injection lines or auxiliary charging line. As previously discussed, sufficient negative reactivity exists in the Reactor Coolant System (after rod insertion) for 24 hours without the need for additional boron. The negative reactivity inserted by the control rods and the RWST water injected by the CVCS (to compensate for the RCS volume decrease) will maintain the core subcritical while cooling down from hot full power to a cold shutdown condition, assuming no letdown is available.

Technical Specifications for Point Beach ensure that sufficient borated water is available to achieve the necessary cold shutdown reactivity margin. With boron addition under procedural control, no additional operator actions are expected to be necessary to ensure an adequate safe shutdown negative reactivity margin. However, core source range indication is available for core activity monitoring in the Control Room. An additional source range channel with indication at a remote location provides this information for areas requiring alternate shutdown.

Various process monitoring functions must be available to adequately achieve and maintain the reactor coolant makeup, pressure control and decay heat removal functions. For the assumed fire scenario, maintenance of hot shutdown requires that pressurizer level and RCS pressure instrumentation be available. Reactor Coolant System temperature is controlled during hot shutdown and cooldown by energy removal via the steam generators by manual operation of the atmospheric steam dump valves or self-actuation of the main steam code safety valves. In the natural circulation mode of operation, the difference between the hot leg and cold leg wide range temperatures (T_h-T_c) and steam generator pressure provides a direct indication of the existence of adequate natural circulation flow.

Operating personnel, monitoring RCS pressure and hot leg temperature (T_h) instrumentation, will control RCS pressure in such a manner that appropriate subcooling is maintained.

Pressurizer level control is achieved by monitoring pressurizer level instrumentation and manual control of CVCS charging flow.

Maintenance of hot standby also requires the control of the secondary system to compensate for variations in the primary system performance. Steam generator level and pressure instruments are available to assure adequate and controlled decay heat removal. Steam generator level control is achieved by manual manipulation of AFW system flow, using local or remote steam generator level indication. Control of secondary system pressure will be monitored by steam generator pressure indication.

The transition from hot shutdown to cooldown will utilize the instrumentation discussed above for monitoring of natural circulation conditions, subcooling margin, heat removal and compliance with the plant's pressure/temperature limits as it pertains to the low temperature overpressure protection of the Reactor Coolant System (cold leg temperature in conjunction with RCS pressure).

2.2.6 Miscellaneous Supporting Functions

The systems and equipment used to perform the previous functions may require miscellaneous supporting functions such as process cooling, lubrication and ac/dc power. These supporting functions shall be available and capable of providing the support

necessary to assure acceptable performance of the previously identified safe shutdown functions.

The various systems required to provide support to safe shutdown equipment or systems are:

(1) Component Cooling Water System
(2) Service Water System
(3) Emergency Power System

The following sections discuss each of the required safe shutdown systems and the support systems.

2.3 Safe Shutdown Systems

Various analytical approaches can be taken to assure that sufficient plant systems are available to perform the previously identified plant safety functions. Numerous plant systems are normally available, alone and in combination with other systems, to provide these required functions. However, the exact location and specific effects of exposure fires cannot be precisely determined. In general, recognizing the confined nature of fires in nuclear plant environments and the inherent operational flexibility and physical diversity of systems available to achieve safe shutdown, appropriate plant fire protection features limit the potential for fire damage to the extent that unaffected plant systems will be available to attain safe shutdown. An extensive effort would be required to identify the effects of postulated fires in all potential plant locations and on all the

plant systems which are available to support safe shutdown. As a conservative alternative to such an approach, a minimum set of plant systems (Safe Shutdown Systems) and components is identified in response to the requirements of Appendix R. This minimum set of components can achieve and maintain safe shutdown regardless of the location of the fire while assuming concurrent loss of off-site power. Demonstration of adequate protection of this minimum system set from the effects of postulated fires constitutes an adequate and conservative demonstration of the ability to achieve and maintain safe shutdown for the purposes of fire protection. Spurious operation of components within the systems, and interfacing systems, necessary to perform safe plant shutdown have been identified and addressed. (Reference Section 4.4.1 and Table 4-1)

The safe shutdown systems selected for Point Beach Nuclear Plant are capable of achieving and maintaining subcritical conditions in the reactor, maintaining reactor coolant inventory, achieving and maintaining hot conditions for an extended period of time, achieving cold shutdown conditions within 72 hours, and maintaining cold shutdown conditions thereafter.

2.3.1 Chemical and Volume Control System (CVCS)

The charging portion of the Chemical and Volume Control System (CVCS) accomplishes the following safe shutdown functions:

(1) Reactivity Control by injection of a soluble chemical neutron absorber (boron) into the RCS; and

(2) Reactor Coolant Makeup Control by maintaining water inventory.

Normal reactivity shutdown capability is provided by control rods, with boric acid addition used to compensate for xenon decay and plant cooldown. The control and shutdown rod groups ensure the reactor is at least 1% subcritical ($K_{eff} = 0.99$) following trip from any allowed operational condition, assuming the most reactive rod remains in the fully withdrawn position. This is conservative for the assumed fire scenario, which does not require the assumption of a stuck-rod condition.

When the unit is at power, the quantity of boric acid retained in its Refueling Water Storage Tank and ready for injection to the RCS always exceeds that quantity required to compensate for normal cold shutdown. This quantity also exceeds the quantity of boric acid required to bring the reactor to hot shutdown and to compensate for subsequent xenon decay. The availability of sufficient boron is required by plant Technical Specifications.

For the assumed post-fire scenario, make-up water to the Reactor Coolant System will be provided by the Chemical and Volume Control System from the Refueling Water Storage Tank (borated at a minimum of 2000 ppm).

Numerous CVCS flow paths are normally available for charging to the RCS (see Figure 2-5). For the assumed event, two separate and independent flow paths will provide redundancy for reactor coolant makeup and boration:

(1) The charging line to the reactor coolant pump seals, and

(2) The auxiliary charging line to the loop B cold leg.

For the assumed event, charging and boration will be accomplished by operating a minimum of <u>one</u> charging pump taking suction from the Refueling Water Storage Tank and injecting borated water through the RCP seal injection lines or the loop B cold leg to the RCS. Suction to the charging pump can be delivered from the RWST by manually opening [illegible] normally closed motor-operated valve.

Controlled leakage (letdown) from the Reactor Coolant System normally occurs via the seal leak-off return path and the normal and excess letdown paths. For the post-fire operational sequence, the normal and excess letdown paths will be isolated as a result of operator action to assure adequate inventory control.

Seal leak-off flow will be isolated from the volume control tank (VCT) by manually venting the instrument air supply to containment which will insure that the common seal return isolation valve closes and remains closed. This action diverts seal leak-off flow to the pressurizer relief tank (PRT) located inside containment.

The injection path from the charging pumps to the Reactor Coolant Pump seals contains only manually operated, normally

open valves. The auxiliary charging line contains one air-operated valve which is a special valve functioning as both an isolation valve and a relief valve (opens to provide flow to RCS cold leg with a 200 psid). The operation of one charging pump will ensure a minimum RCS charging flow of approximately 20 gpm (minimum flow for each charging pump).

Isolation of the volume control tank outlet (by closure of one motor-operated valve) during emergency makeup from the RWST and isolation of the seal return line to the seal water heat exchanger may be performed by local manual operation.

Pressurizer water level is maintained by operation of one positive displacement charging pump using pressurizer level instrumentation information.

Charging Pumps

Three charging pumps per unit inject coolant into the reactor coolant system. The pumps are the variable speed, positive displacement type. At full capacity, each pump is capable of delivering 60 gpm to the Reactor Coolant System. To ensure that the charging pump flow is always sufficient to meet both the seal water and minimum charging flow requirements, the pump has a variable control stop which does not permit pump flow lower than the specified minimum. This control stop is adjustable to permit higher minimum flow limits to be set if reactor coolant pump seal leakage increases during operation. At

minimum flow, each charging pump delivers approximately 20 gpm. The charging pumps require no external cooling water or lubricating oil supply.

In order to meet safe shutdown requirements in the event of a fire, electrical crossties are installed on the "A" and "B" charging pumps for each unit that allows these charging pumps to be powered from the opposite unit. These tie breakers ar mechanically interlocked to prevent tieing opposite unit safeguards buses together and to prevent supplying two charging pumps from the same bus breaker.

Refueling Water Storage Tank

In addition to its normal duty to supply borated water to the refueling cavity for refueling operations, the RWST provides borated water to all of the ECCS pumps.

The capacity of the refueling water storage tank is based on the requirement for filling the refueling cavity. This quantity is in excess of that required for safe shutdown. Technical Specification minimum volume of the RWST is 275,000 gallons of borated water at a minimum of 2000 ppm boron.

2.3.2 Reactor Coolant System

The Reactor Coolant System (RCS) consists of two similar heat transfer loops connected in parallel to the reactor vessel (see

Figure 2-6). Each loop contains a reactor coolant pump and a steam generator. In addition, the system includes a pressurizer with associated code safety and relief valves (PORVs). Reactor Coolant System instrumentation includes cold and hot leg temperatures (wide-range), pressure (wide-range) and pressurizer water level.

The natural circulation capability of the plant provides a means of decay heat removal when the reactor coolant pumps are unavailable. Natural circulation flow rates are governed by the amount of decay heat, component elevations, primary to secondary heat transfer, loop flow resistance and voiding. The conditions during natural circulation are related to maintaining adequate primary to secondary heat transfer, subcooling and inventory.

For this analysis of safe shutdown capability, one of the two RCS loops will be monitored to ensure that natural circulation is established and maintained.

While in natural circulation, adequate heat transfer and coolant flow are dependent on adequate inventory in both the primary and secondary systems. Maintaining water level within the operating band on the secondary side of the "U" tube steam generators and adequate level within the pressurizer are requirements for natural circulation. Confirmation of flow while in natural circulation is accomplished through the use of temperature indications. Those indications are cold leg

temperature (T_c), and hot leg temperature (T_h). T_c should attain a value which is a few degrees higher than the saturation temperature of the secondary inventory. T_h should attain a value which is less than at full power. When T_c and T_h attain the values described above, flow and heat transfer have been achieved in the associated RCS loops. The amount of subcooling within the RCS is maintained by monitoring RCS pressure and loop hot leg temperature (T_h).

Reactor Coolant System inventory control is based on the operation of the CVCS charging paths. High pressure seal water from the CVCS system is injected into the pumps through the lower radial bearing chamber to prevent leakage of high temperature reactor coolant along the pump shaft. The injection flow splits in the bearing chamber with a portion flowing up through the radial bearing and into the shaft seal chamber. The remaining portion flows down the shaft, through the RCP thermal barrier and into the Reactor Coolant System. An alternate charging flow path exists through the auxiliary charging line to the cold leg B loop.

Pressurizer Safety Valves

Overpressurization protection of the RCS is assured by two pressurizer code safety valves. The two pressurizer safety valves are spring-loaded, self-activated and have a set pressure of 2485 psig. The combined capacity of the valves is equal to

or greater than the maximum pressure surge resulting from a complete loss of load without reactor trip.

2.3.3 Main Steam System

For the post-fire scenario, maintenance of the steam generator inventory and control of steam generator pressure are required for both hot shutdown and subsequent primary and secondary system cooldown to support the decay and sensible heat removal function within the applicable operational limits.

The Main Steam (MS) system consists of two parallel flow paths, one from each steam generator to the main turbine of the unit. The secondary system will be isolated by operation of the main steam isolation valves.

In accordance with supporting FSAR analysis, control of one steam generator is sufficient to provide the reactor heat removal function during natural circulation conditions.

Maintenance of water level in the steam generator during the period of auxiliary feedwater operation (hot shutdown) involves remote or local manual positioning of the auxiliary feedwater flow control valves and operation of the turbine-driven auxiliary feed pump based on steam generator level information. Steam generator water level and pressure indication are available in the Control Room and on alternate shutdown panels located in the auxiliary feed pump areas.

The MS system is also designed to deliver motive steam to the turbine driver of the turbine-driven auxiliary feed pumps (see Figure 2-7). Steam to these turbines is supplied by branch connections upstream of the main steam isolation valves on both steam lines in each unit. Either line can supply sufficient steam to the auxiliary feed pump turbine, but two are provided for redundancy. These lines are connected with a normally closed motor-operated stop check valve in each line.

Safety Valves

A bank of four code safety valves are installed on each steam line outside containment and upstream of main steam isolation valves. The four safety valves (one set at 1085 psig, one at 1100 psig, two at 1125 psig) on each line are installed to protect the MS system against overpressure and to provide a combined relieving capacity greater than the maximum steam flow rate. During initial hot shutdown conditions the code safeties will provide adequate decay heat removal.

Air-Operated Atmospheric Steam Dump Valves

An atmospheric steam dump valve is provided on each steam line which is capable of releasing the sensible and decay heat to the atmosphere. The steam dump valves are used for plant cooldown by steam discharge to the atmosphere. The two steam dump valves have a total combined capacity of approximately 10%

of the maximum calculated steam flow. For the assumed fire scenario, one steam dump valve will be used to provide the Reactor Coolant System controlled cooldown.

Controls for steam generator atmospheric steam dump valve operation are provided in the Control Room and the valves can also be (handwheel) operated manually. During the hot shutdown transition to cold shutdown, the one steam dump valve per unit will be manually operated to remove decay heat from the RCS. Thus, the RCS temperature is controlled by maintaining the steam generator secondary water inventory at the temperature that corresponds to the saturation pressure.

2.3.4 Auxiliary Feedwater System

The Auxiliary Feedwater (AFW) System is required during hot shutdown to support RCS decay heat removal. For hot shutdown, secondary system (steam generator) inventory control is provided by the AFW system (see Figure 2-8). The AFW system consists of two turbine-driven and two motor-driven pumps. Each turbine-driven pump is dedicated to one unit, and valved to feed one or both steam generators in that unit. The motor-driven pumps are common to both units. One pump is valved to feed the A loop steam generator of one or both units. The other pump supplies feedwater to the B loop steam generators of one or both units. Cross-connect capability exists through normally locked closed valves such that either electric pump could supply feedwater to any of the four steam generators.

The AFW system is designed to deliver enough water to maintain sufficient heat transfer in the steam generators in order to prevent loss of primary water through the RCS pressurizer safety or relief valves.

Turbine-Driven Auxiliary Feed Pumps

The turbine-driven auxiliary feed pump (TDFP) is designed to deliver a sufficient flow to both steam generators of the unit with which it is associated and maintain steam generator water levels above the lower limit of the wide range level indicator. Each is a horizontal, six-stage, centrifugal pump driven by a single-stage atmospheric exhaust turbine. Upon opening the steam inlet valve, the turbine will function as a single speed machine.

Each auxiliary feed pump turbine has its own self-contained lube oil system utilizing ring lubricated, water jacketed ball bearings. Cooling water is supplied by the service water system. Service water flow is provided by the service water pumps or alternately by the diesel-driven fire pump. Manual operation of a strainer bypass valve ensures a path for water to be supplied to the lube oil coolers.

Both steam generators provide motive steam to the turbine driver for the auxiliary feed pump. The TDFP is capable of operating down to a steam pressure which corresponds to RCS

pressure and temperature at which the Residual Heat Removal System may be placed in service.

Motor-Driven Auxiliary Feed Pumps

The two motor-driven auxiliary feed pumps (MDFP) are shared by both units. One MDFP supplies the A steam generators of both units, while the other supplies the B steam generators of both units.

Each pump is a horizontal, eight-stage centrifugal pump. Cooling water is supplied by the service water pumps. The pumps require no other support services other than ac power.

Condensate Storage

Normal volume in each condensate storage tank (CST) is approximately 45,000 gallons. Should the CST supply become exhausted, the service water system may be used as an alternate water source. The service water isolation valves are located in the AFW pump area. Ample time is available post-fire for a local manual re-alignment of the normally closed valves that isolate service water from the suction of the auxiliary feed pumps.

2.3.5 Residual Heat Removal System

The Residual Heat Removal (RHR) System is designed to remove

decay and sensible heat from the core and reduce the temperature of the RCS during the cold shutdown phase.

The RHR system consists of two RHR heat exchangers, two RHR pumps and the associated piping, valving and instrumentation necessary for operational control of each unit (see Figure 2-9). The design residual heat load is based on the residual heat fraction of the full core MW (thermal) power level that exists 20 hours following reactor shutdown from an extended power run near full power.

During cold shutdown operations, reactor coolant flows from the RCS to the RHR pumps through the tube side of the RHR heat exchangers and back to the RCS. The heat load is transferred by the RHR heat exchangers to the Component Cooling Water System which is circulating on the shell side of the heat exchangers. The inlet line to the RHR system is located in the hot leg of reactor coolant loop A while the return line is connected to the cold leg of reactor coolant loop B. Two additional return lines connect to the reactor vessel above the core to provide the low head safety injection feature of the system.

Two motor-operated valves in series isolate the inlet line to the RHR system from the RCS. The return lines are isolated by check valves and motor-operated valves in each line. To avoid potential RCS boundary leakage at the high/low pressure interfaces, both of the motor-operated valves in the RHR suction line and the motor-operated valve in the discharge line are

kept closed (pre-fire condition) with the corresponding motor control center breakers in the open position.

An orificed minimum flow recirculation line from the downstream side of each residual heat exchanger to the corresponding pump's suction line is provided to assure that the RHR pumps do not overheat under low flow conditions.

The cooldown rate of the reactor coolant is controlled by regulating the flow through the tube side of the RHR heat exchangers. A bypass line, which serves both residual heat exchangers, is used to regulate and maintain a constant flow through the RHR system.

The RHR system can be placed in operation when the pressure and temperature of the RCS are less than 425 psig and 350°F, respectively. If one of the pumps and/or one of the heat exchangers is inoperative, safe cooldown of the plant is not affected; however, the time for cooldown is extended.

Residual Heat Removal Pumps

Two identical pumps per unit are installed in the Residual Heat Removal System. Each pump is sized to deliver sufficient reactor coolant flow through the residual heat exchangers to meet the unit cooldown requirements. In addition, to meet Appendix R requirements, spare cable is provided to supply

power to one RHR pump of each unit required for plant cooldown if power to redundant pumps is lost due to a fire.

RHR Safety Valves

The RHR system safety valves provide RCS overpressure protection whenever the RHR system is in operation. The valves are located inside containment on the common RHR inlet pipe, the B train low head safety injection flow path, and the le down line which provides relief capability for the A train low head safety injection flow path and the common RHR return pipe.

Accumulators

The manual isolation of the accumulators is assumed as a post-fire activity. The isolation valve at each accumulator is closed only when the RCS is intentionally depressurized below 1000 psig. If these valves' associated cables were damaged by fires, the isolation is assumed to be performed locally, governed by adequate plant procedures (post-fire).

2.3.6 Component Cooling Water System

The component cooling loop is designed to remove decay and sensible heat from the reactor coolant system, via the residual heat removal loop, during plant shutdown; to cool the letdown flow to the chemical and volume control system during power operation; and to provide cooling to dissipate waste heat from various primary plant components.

The component cooling loops of each of the two units are designed to operate independently with two component cooling pumps and one component cooling heat exchanger in each loop. The two remaining heat exchangers serve as shared standbys. The capability exists for employing any of the four component cooling pumps with either of the two units (see Figure 2-10).

During normal full power operation, one component cooling pump and one component cooling heat exchanger accommodate the heat removal loads. The standby pump and the shared heat exchangers provide 100% backup during normal operation. Two pumps and two heat exchangers are utilized to remove the decay and sensible heat during cooldown. If one of the pumps or two of the heat exchangers are not operative, safe shutdown of the plant is not affected; however, the time for cooldown is extended.

The two component cooling loops associated with one unit are interconnected downstream from the heat exchangers to effectively form an open loop supply header for both essential and nonessential loads. For the present analysis of safe shutdown, no isolation of nonessential loads is assumed to be required. However, in anticipation of a potentially large cooling demand, the operator can shift to the other unit's component cooling system by repositioning manually operated valves.

The essential loads, other than the residual heat removal heat exchangers, are normally valved open to the supply header and

discharge to the suction of the component cooling pump with which these are normally associated, so that component cooling water is circulated continuously through the essential loads during normal operation.

Each of the component cooling outlet lines from the residual heat removal heat exchangers has a normally closed motor-operated valve which may be electrically or manually opened during RHR cooldown.

A surge tank is connected to the suction side of the pumps, and makeup to the system is supplied to the surge tank from either the demineralized water system or the reactor makeup water system.

Component Cooling Pumps

The four component cooling pumps, which circulate component cooling water through the component cooling loop, are horizontal, centrifugal units. Normally two pumps are used with each unit during a plant cooldown, but any of the four pumps can be used with either unit. During the recirculation phase following a loss-of-coolant accident, one of the two component cooling water pumps associated with each unit delivers flow to the shell side of the residual heat removal heat exchangers. To satisfy Appendix R requirements, in the case of a fire damaging multiple CCW pumps, a dedicated spare motor and power cable are provided such that one pump can be made available for cooldown and maintenance of cold shutdown.

Component Cooling Heat Exchangers

Four component cooling heat exchangers are of the shell and straight tube (fixed tubesheet) type. Service water circulates through the tubes while component cooling water circulates through the shell side. Normally one heat exchanger is used with each unit with the two remaining as standbys.

2.3.7 Service Water System

The Service Water (SW) System provides cooling for the following safe shutdown equipment:

(a) Component cooling water heat exchangers;
(b) Emergency diesel generator heat exchangers;
(c) Auxiliary feed pump bearing oil coolers.

The system also provides a back-up supply of water to the AFW system in the event that the condensate storage tanks are depleted.

The Service Water System has also been designed to provide redundant cooling water supplies with isolation valves to the control room and cable spreading room air coolers, air compressors, spent fuel pool cooling system, and to the containment air recirculating cooling system.

This system also supplies water for the Emergency Diesel Room fire protection systems and containment hose reels. The design includes provisions for automatic isolation of nonessential components following an accident. Lake Michigan is the source of service water.

This system which is shared by both units (see Figure 2-11) consists of six motor-driven service water pumps and two main supply headers, with a strainer in each header. Each redundant header is served by three pumps and the system is normally operated with the headers cross-connected. A loop header system is provided by which each header supplies cooling water to nonessential services in one unit. Supply of service water for essential services is redundant and can be maintained in case of failure of one loop section header. These components, together with the associated heat exchangers, valving, piping and local instrumentation, complete the Service Water System.

The system is sized to ensure adequate heat removal based on highest expected temperatures of cooling water, maximum loadings and leakage allowances. The system is monitored and operated from the Control Room. Isolation valves are incorporated in all service water lines penetrating the containment.

Service Water Pumps

Six motor-driven centrifugal service water pumps are provided. During normal operation, each service water pump has a capacity of 6800 gpm. During an accident each has a capacity of 5500 gpm. Two service water pumps are connected to separate 480V buses, one per bus. The four remaining pumps are connected, two per bus, to two separate 480V buses. Two of the six pumps are capable of carrying the required normal cooling load for the two units.

The service water pumps are connected to the 480V buses that can be supplied by the emergency diesels in the event of loss of all outside power. For this condition, the service water system is designed to supply cooling water to only the required emergency systems. The pumps, which are located in the circulating water pumphouse, take suction directly from the lake and discharge to two below-ground pipelines leading to the ring header in the Class I section of the Control and Auxiliary Buildings. Supply lines are run to the containment from the Auxiliary Building from each side of the ring header. The return lines are manifolded by areas and are discharged to the condenser circulating water discharge pipe in either Unit 1 or Unit 2.

To preclude the possibility of an inadvertent blockage of cooling water flow, there are no automatically-operated valves in the service water system between the lake and the components

which require cooling following the fire. Automatically-operated valves are provided to isolate sections of the service water system not required to be in operation.

In the event of a loss of normal safeguards electrical power, each of the two emergency diesel generator units is sized to supply three service water pumps in addition to the other vital engineered safeguard loads in the unit in which the accident occurred and the loads required by the other unit to maintain a hot shutdown condition.

The service water lines to the Auxiliary Building primarily supply cooling water to the four component cooling water heat exchangers and the spent fuel pool heat exchangers. These heat exchangers are utilized to remove heat from the primary coolant system processes and components and from the spent fuel pool. The Residual Heat Removal System is employed during normal cooldown operations. It also is placed in service following a loss-of-coolant accident for cooling of the recirculated flow from the reactor containment sump. The spent fuel pool cooling system is not considered an essential load and the service water cooling for this system is interrupted during an accident condition if less than four of the six service water pumps are operating.

2.3.8 Emergency Power System

The Emergency Power System (EPS) includes an on-site emergency source which supplies power to essential safe shutdown equipment if the normal or the off-site power sources are not available.

The emergency power facilities consist of two General Motors Corporation, Electro-Motive Division, Model 999-20 diesel engine-generator units, each rated a 2,850 kW continuous, 0.8 power factor, 900 rpm, 4,160 volts, 3-phase, 60 cycle. The units have an emergency capability of 3,050 kW for a 30-minute period. Off-site power is not locked out upon emergency generator operation. Bus supply breakers from off-site power are tripped on loss of bus voltage, and they must be manually reclosed upon restoration of off-site power.

Each emergency diesel generator is capable of starting automatically and sequentially supplying the power requirement of one complete train of safeguards equipment for one reactor unit and providing sufficent power to allow the second reactor unit to be placed in a safe shutdown condition. The units are located in separate rooms in a Class 1 portion of the Control Building. Each emergency diesel generator is equipped with a completely independent and redundant starting system. The starting system consists of two banks of three air storage tanks with one air compressor system per bank. Each air compressor is powered from a 480V emergency bus. One of the

compressors can be powered by its own auxiliary diesel engine by manually changing a drive belt. Each air bank drives two air start motors. Either of the two banks is capable of starting the diesel and has sufficient capacity to crank the engine five times for the normal cranking duration.

Starting air is admitted from the storage tanks at a working pressure of 200 psi to the starting system through a two-way solenoid valve. A start circuit selector switch determines which solenoid valve and, in turn, which bank of starting motors will be activated. When the signal to start the diesel is initiated, a dc motor-driven fuel pump and booster pump will start, and the preselected solenoid valve will be energized to open. The starter motor pinions will engage and the starter motors will crank the engine.

The units use No. 2 fuel oil. A 550-gallon storage tank is located in the base of each of the units. An additional 550-gallon "day tank" is located adjacent to each unit. The day tanks can be manually cross-connected allowing either tank to supply either unit. An on-site underground emergency fuel oil storage tank has a capacity of 12,000 gallons. This capacity provides sufficient fuel to allow one diesel to operate continuously at full load for an additional 48 hours. An additional supply of fuel oil is maintained on the site in two above-ground 60,000 gallon storage tanks to supply the gas turbine and heating boilers. This oil is transferred by gravity feed to the 12,000 gallon underground emergency

storage tank. In addition, to satisfy the requirements of Appendix R, the 550-gallon "day tank" may be gravity fed from the 60,000 gallon bulk storage tanks by manually repositioning isolation valves.

Gas Turbine

In addition to the two rapid starting emergency generators, there is a gas turbine generator installed at the site. This unit is rated approximately 23.1 MVA and is normally used for allowing high line and equipment maintenance outage, spinning reserve, black plant startup, and for peaking purposes. This gas turbine unit is connected to the auxiliary electrical system such that it can be paralleled with or serve in lieu of the normal source of plant startup and safeguards power, thereby accomplishing its principal function of making it possible to restart the Point Beach Nuclear Plant in case of an area "blackout" in which off-site ac voltage is unavailable. The unit is capable of being started and ready to accept partial load in approximately three minutes and full load in approximately five minutes. The gas turbine can be used as a power source for safeguard buses during loss of off-site ac.

13,800 Volt System

The 13,800 volt system is divided into three buses. Bus number 1HX04, for Unit 1, is normally powered from high voltage station auxiliary transformer 1X03 with an alternate connection

to the tie bus, H01. Bus 1HX04 feeds low voltage station auxiliary transformer 1X04. In like manner, bus 2HX04, for Unit 2, is normally powered from transformer 2X03 with an alternate connection to bus H01. Bus 2HX04 feeds low voltage station auxiliary transformer 2X04. The gas turbine generator is connected to the tie bus, H01. Closing of the bus tie breakers into a common fault is prevented by trip and lockout interlocks in the breaker control circuits. The bus arrangement is shown on Figure 2-12.

4160 Volt System

The 4160V system is divided into six buses per unit. Two buses for Unit 1, numbers 1-A03 and 1-A04, are connected to the 13,800V system via bus main breakers and the low voltage station auxiliary transformer number 1-X04. Buses 1-A05 and 1-A06 are connected to buses 1-A03 and 1-A04 using manually closed tie breakers. Buses 1-A01 and 1-A02 are connected to the Unit 1 generator leads via bus main breakers and the unit auxiliary transformer, number 1-X02. Buses 1-A01 and 1-A03 or buses 1-A02 and 1-A04 can be tied together via bus tie breakers. All normal operating 4160V auxiliaries are split between buses 1-A01 and 1-A02. In addition, buses 1-A01 and 1-A02 each serve one 4160-480V station service transformer. Buses 1-A03 and 1-A04 serve buses 1-A05 and 1-A06 respectively, as well as buses 1-A01 and 1-A02 during startup, shutdown and after reactor trip.

Buses 1-A05 and 1-A06 each serve their respective 4160-480V station services transformer for the unit's 480V safeguards equipment and their respective 4160V safety injection pump. Thus, no transfer is required for the safeguards equipment in the event of a turbine generator trip. In addition to being served by buses 1-A03 and 1-A04, buses 1-A05 and 1-A06 are directly served by emergency diesel generators G01 and G02 respectively. Each emergency diesel generator will be started automatically and placed on-line upon undervoltage on either of its associated 4160V buses.

The six 4160V buses for Unit 2 have the same arrangement as described for Unit 1 (see Figure 2-13 through 2-16).

480 Volt System

The 480V system is divided into four buses per unit. The buses for Unit 1 are supplied from the 4160V buses though individual step down transformers as follows: 1-B01 from 1-A01, 1-B02 from 1-A02, 1-B03 from 1-A05 and 1-B04 from 1-A06. Tie breakers are provided between 480V buses 1-B01 and 1-B03, buses 1-B02 and 1-B04 and buses 1-B03 and 1-B04. The four 480V buses for Unit 2 have the same arrangement as described for Unit 1 (see Figure 2-17 and 2-18).

125 Volt dc System

A single system serves both units of the plant. The supply portion consists of 6 static battery chargers powered from the 480 V AC station safeguards buses and four 59 or 60-cell lead-calcium batteries. The 2 spare chargers (D09 & D109) allow removal of a normal charger for maintenance. The spare chargers can be energized from either station unit 480 V AC sources which are electrically interlocked to prevent simultaneous energization from both sources. The distribution portion of the system consists of 4 main battery buses with associated switchgear and 10 distribution panels. (see Figure 2-19)

Instrument Bus

The 120 volt AC instrument supply system consists of sixteen buses, divided among four channels. Each of the four channels are allocated four buses. The four channels are further subdivided into two bus groups, one group serving Unit 1 and the other serving Unit 2. Each channel is powered by three inverters. One inverter is dedicated to Unit 1 buses and a second inverter is dedicated to Unit 2 buses. The third inverter is a backup, and can swing between the Unit 1 and Unit 2 buses. Use of the swing inverter allows either dedicated inverter to be removed from service for maintenance (see Figure 2-20).

The function of the inverters is to convert 125 volt DC to 120 volt AC. The inverters are therefore powered from the 125 volt DC system. The three inverters powering any one instrument channel are powered individually from one of the main 125 volt DC buses.

2.4 Identification of Safe Shutdown System Components

Subsection 2.3 described the specific systems which will be used to achieve safe shutdown. This subsection discusses the method of selection of safe shutdown components for Point Beach Nuclear Plant.

For each system, plant flow diagrams, system descriptions, and one-line diagrams were used to identify the primary flow paths and operational characteristics that must be established to accomplish the desired safe shutdown function. From this information, a list was compiled of the components which participate in the system's performance of its safe shutdown function. These components are:

(1) Active components that need to change position to achieve system function.

(2) Passive components which are in the proper position; power loss will not result in a change of position but components may change position due to fire damage.

(3) Power-operated components which need to change position to establish system function, whose loss of motive power results in the component adopting the desired position but which may be affected by fire damage.

(4) Major mechanical components which support safe shutdown (heat exchangers and storage tanks).

From the analysis of the safe shutdown system flow paths, those components whose spurious operation would threaten safe shutdown system operability were also identified. This identification included those branch flow paths that must be isolated and remain isolated to assure that flow will not be substantially diverted from the primary flow path. Components that could be susceptible to spurious operations are identified in subsection 4.4.1.

A minimum equipment list was generated for safe shutdown devices including device identification, normal operating status, operating requirements for hot shutdown and cold shutdown, required supporting services and plant location.

The final safe shutdown component list developed for Point Beach Units 1 and 2 includes the components required to protect the safe shutdown capability from any credible fire in the Cable Spreading Room, or Control Room. These lists are provided in Table 2.1-1 and 2.1-2.

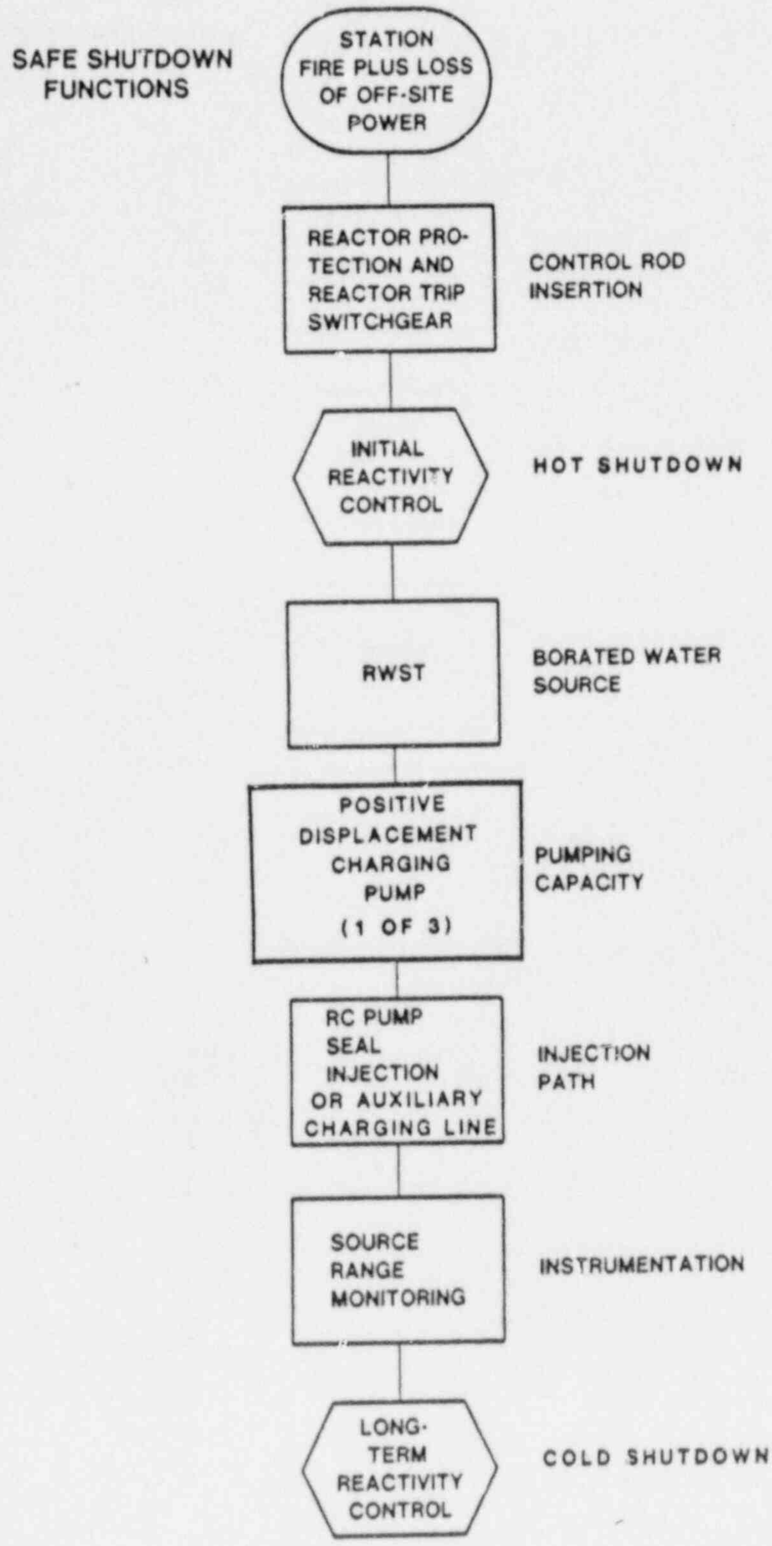


FIGURE 2-1

RCS REACTIVITY CONTROL

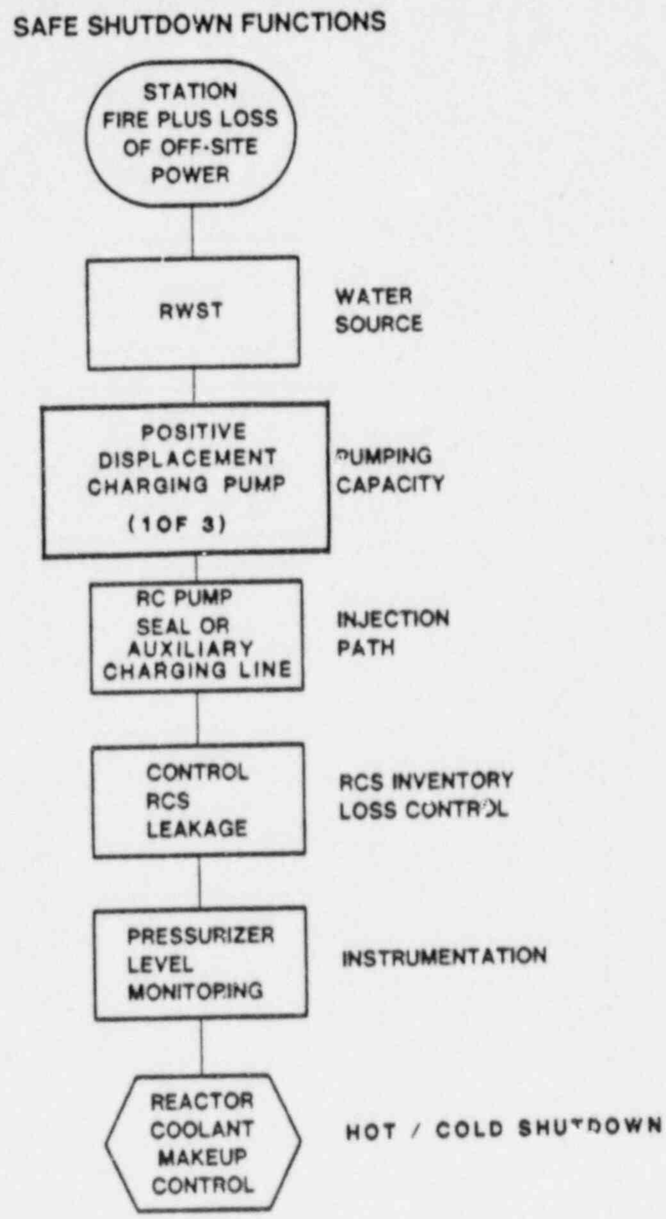


FIGURE 2-2

RCS MAKEUP CONTROL

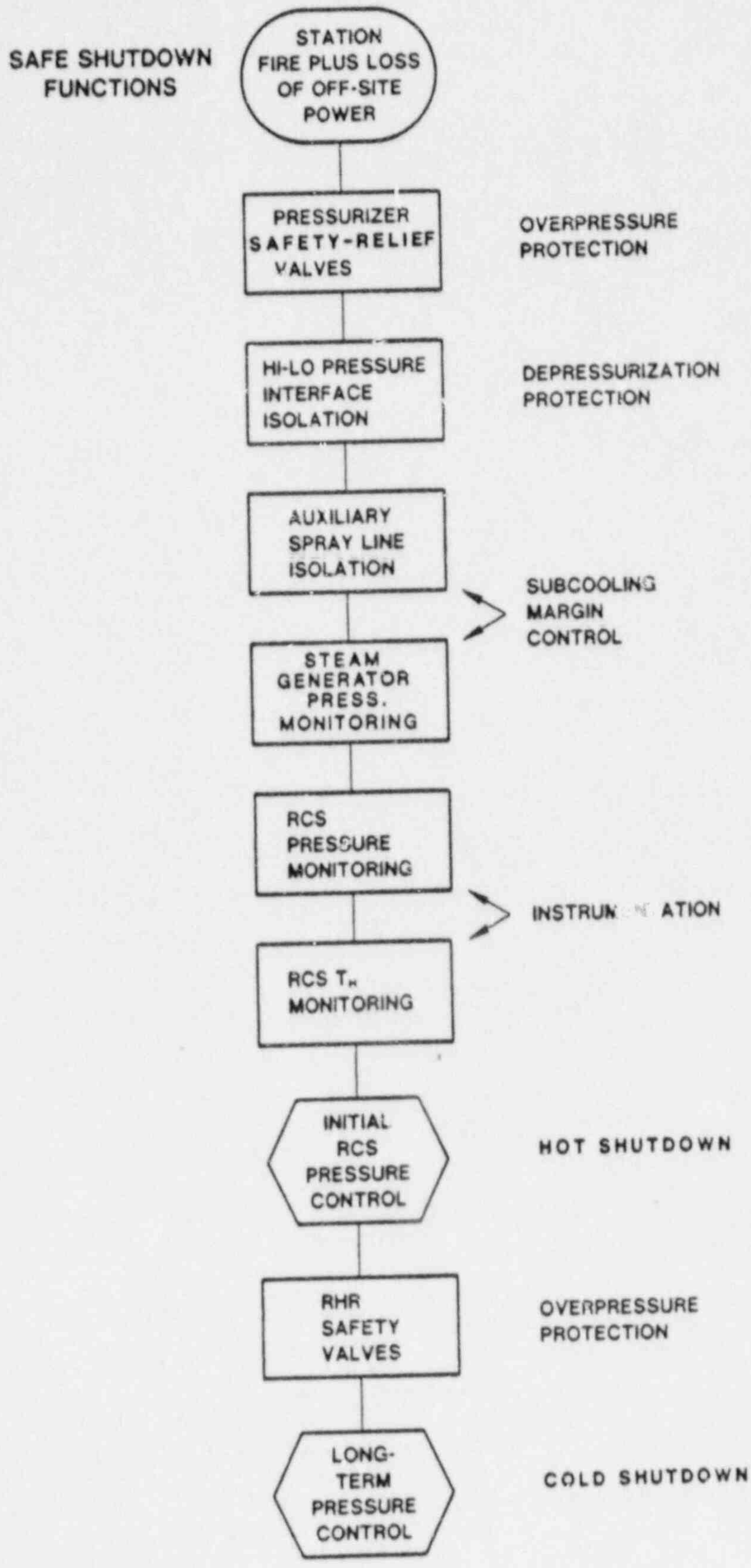


FIGURE 2-3

RCS PRESSURE CONTROL

SAFE SHUTDOWN FUNCTIONS

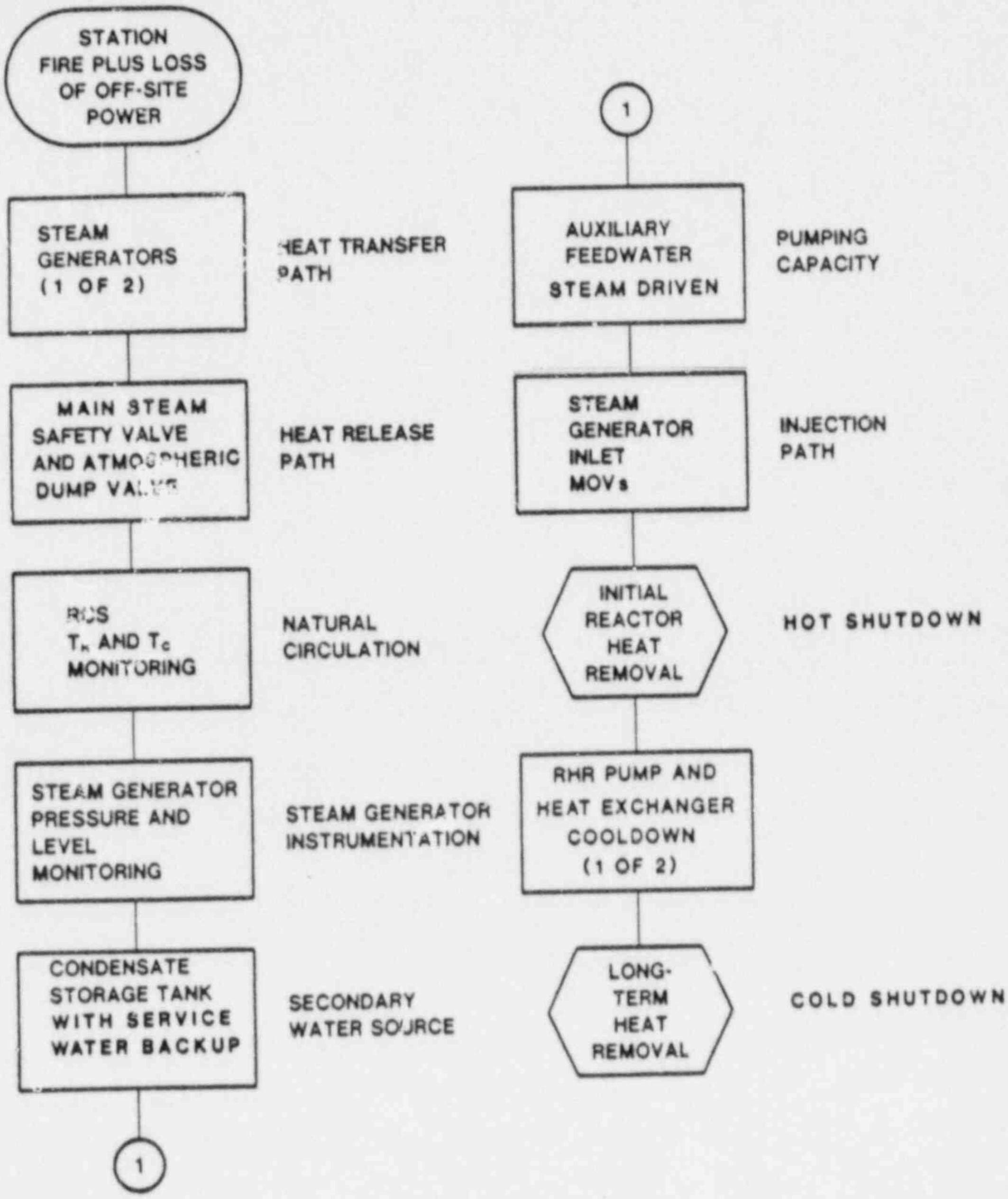
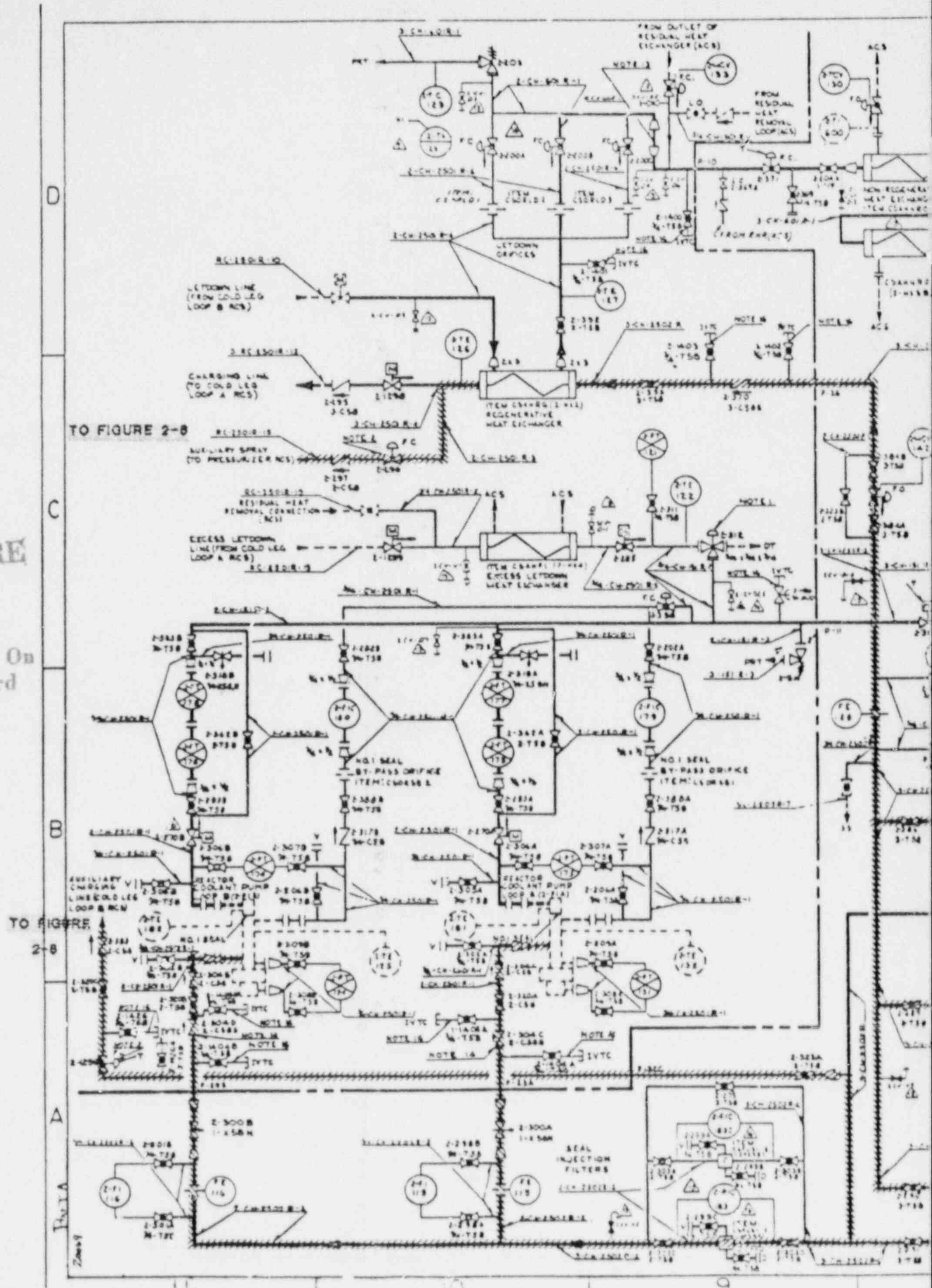


FIGURE 2-4

REACTOR HEAT REMOVAL


TO FIGURE 2-8
LETDOWN ORIFICES
LETDOWN LINE (FROM COLD LEG LOOP B RCS)
CHARGING LINE (TO COLD LEG LOOP A RCS)
REGENERATIVE HEAT EXCHANGER
AUXILIARY SPRAY (TO PRESSURIZER RCS)
RESIDUAL HEAT REMOVAL CONNECTION (RCS)
EXCESS LETDOWN LINE (FROM COLD LEG LOOP A RCS)
EXCESS LETDOWN HEAT EXCHANGER
NO. 1 SEAL BY-PASS ORIFICE
AUXILIARY CHARGING LINE (COLD LEG LOOP B RCS)
TO FIGURE 2-8
SEAL INJECTION FILTERS
D
C
B
A
11
10
9

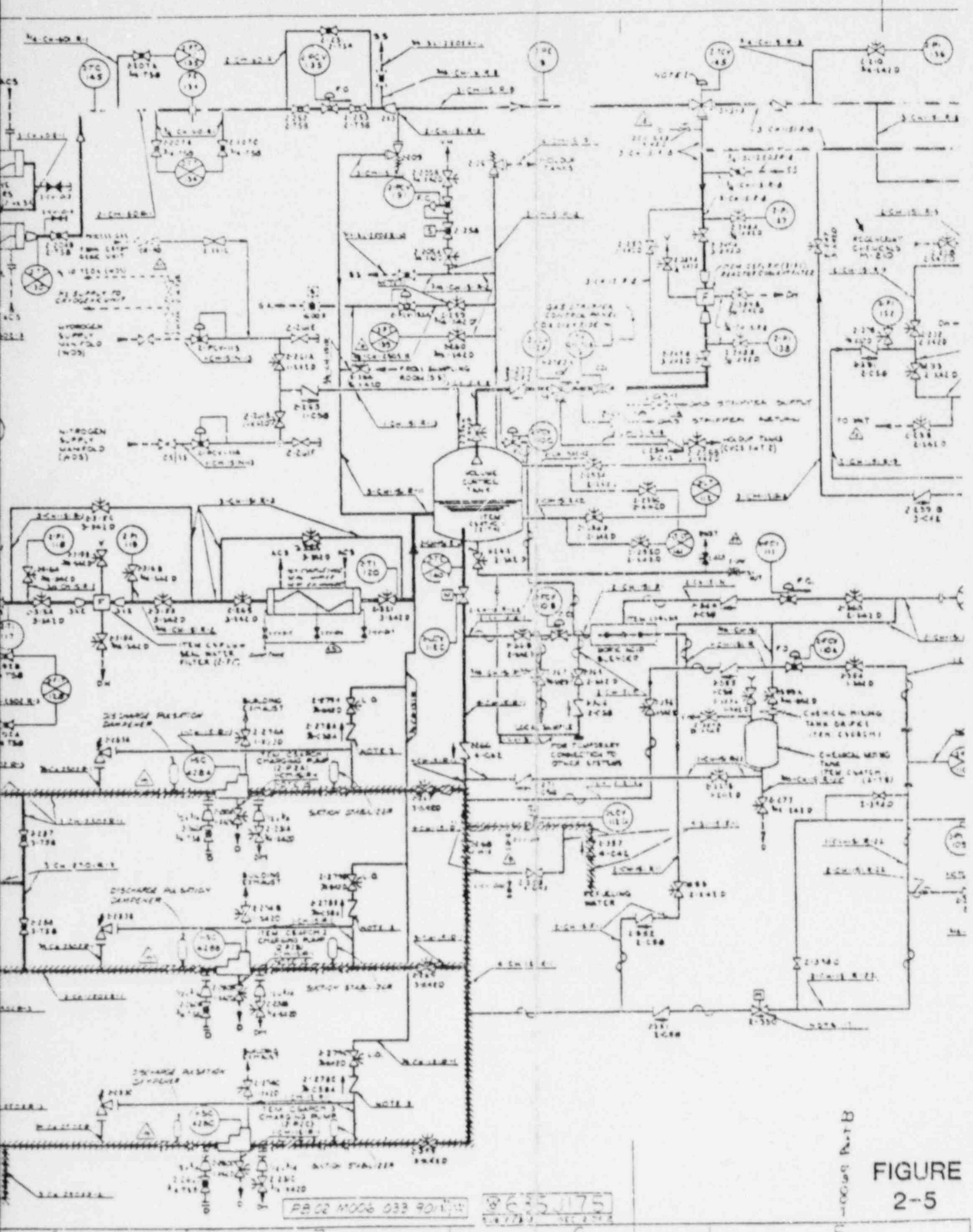
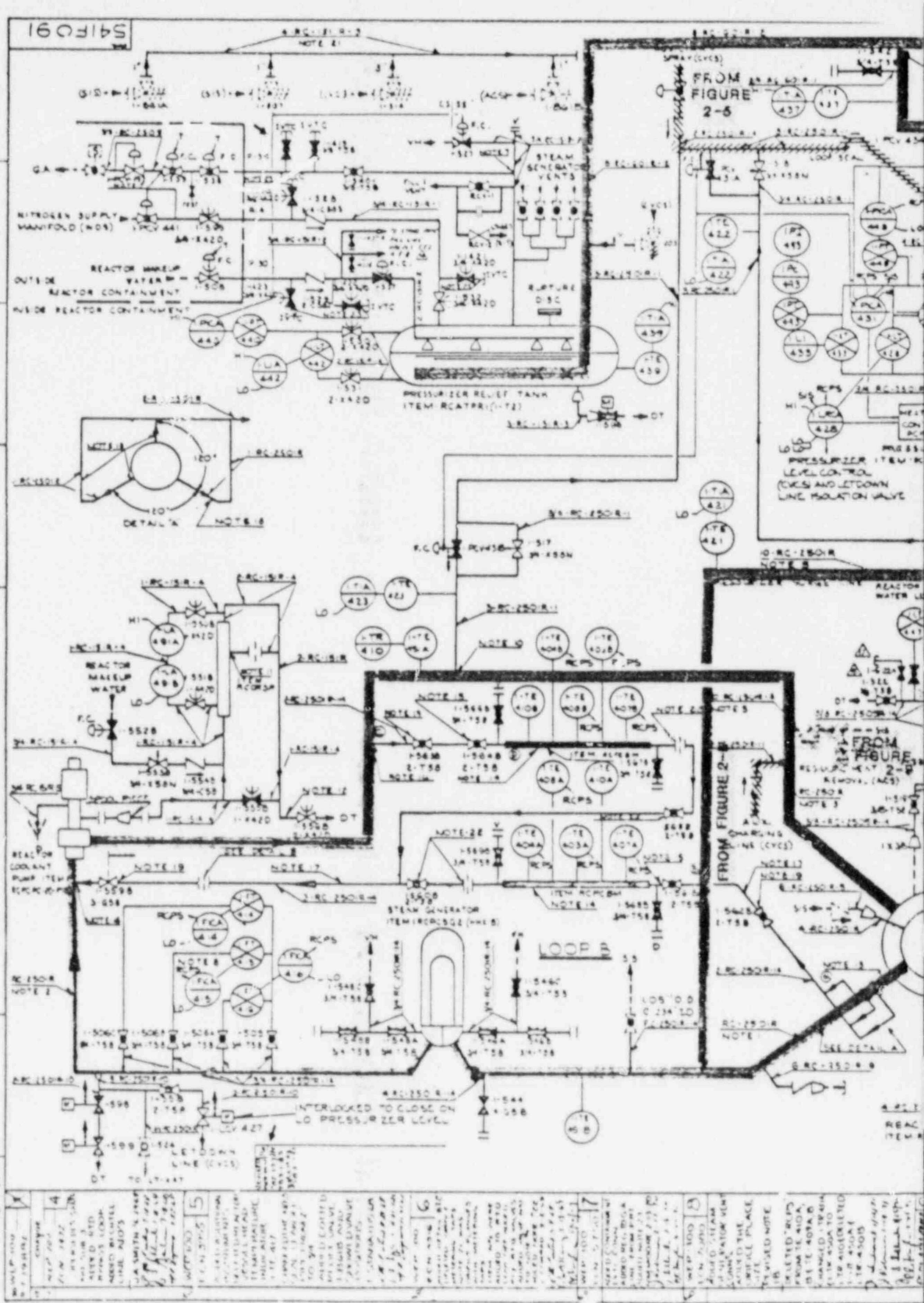


FIGURE 2-5

8803230233-01


FROM FIGURE 2-6
NITROGEN SUPPLY MANIFOLD (N2S)
REACTOR MAKEUP WATER
OUTSIDE REACTOR CONTAINMENT
INSIDE REACTOR CONTAINMENT
STEAM GENERATOR VENTS
RUPTURE DISC
PRESSURIZER RELIEF TANK
DETAIL 'A'
PRESSURIZER LEVEL CONTROL (CVCS) AND LETDOWN LINE ISOLATION VALVE
REACTOR MAKEUP WATER
STEAM GENERATOR
LOOP B
FROM FIGURE 2-8
CHARGING LINE (CVCS)
INTERLOCKED TO CLOSE ON LO PRESSURIZER LEVEL
LETDOWN LINE (CVCS)

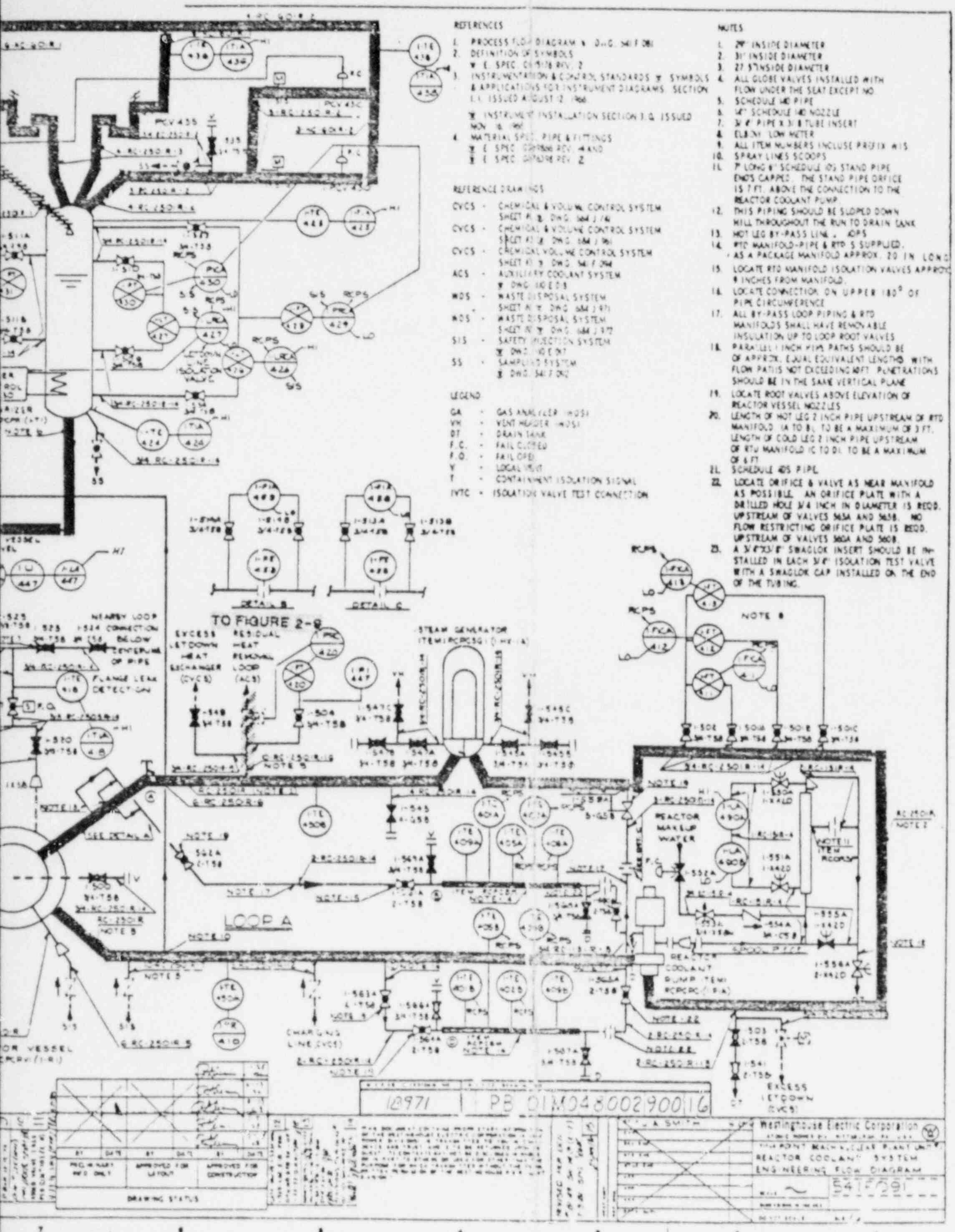
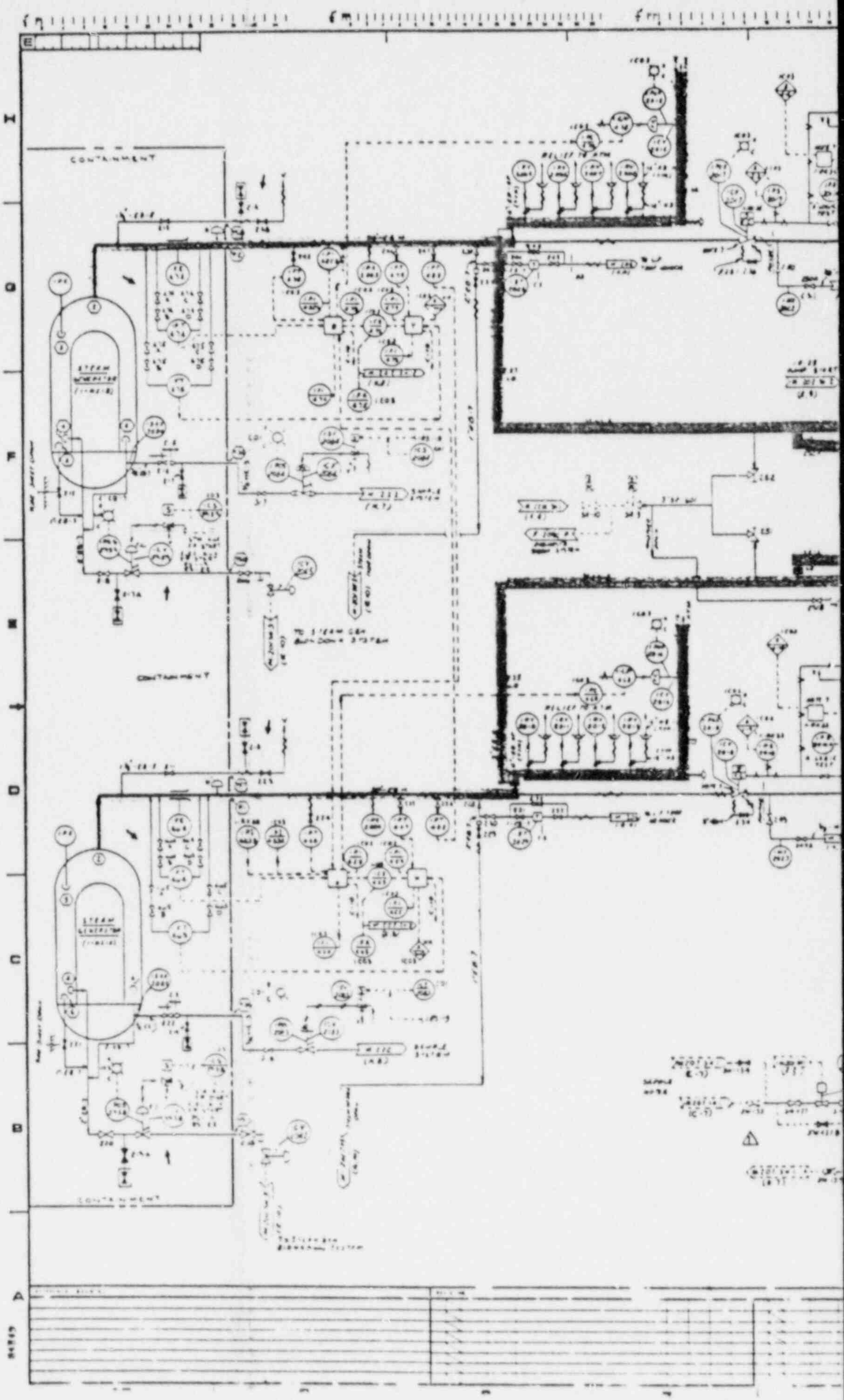


FIGURE 2-6

8803230233-02


CONTAINMENT
STEAM GENERATOR
RELIEF TO ATM
SAMPLE SYSTEM
TO STEAM GEN BLOWDOWN SYSTEM

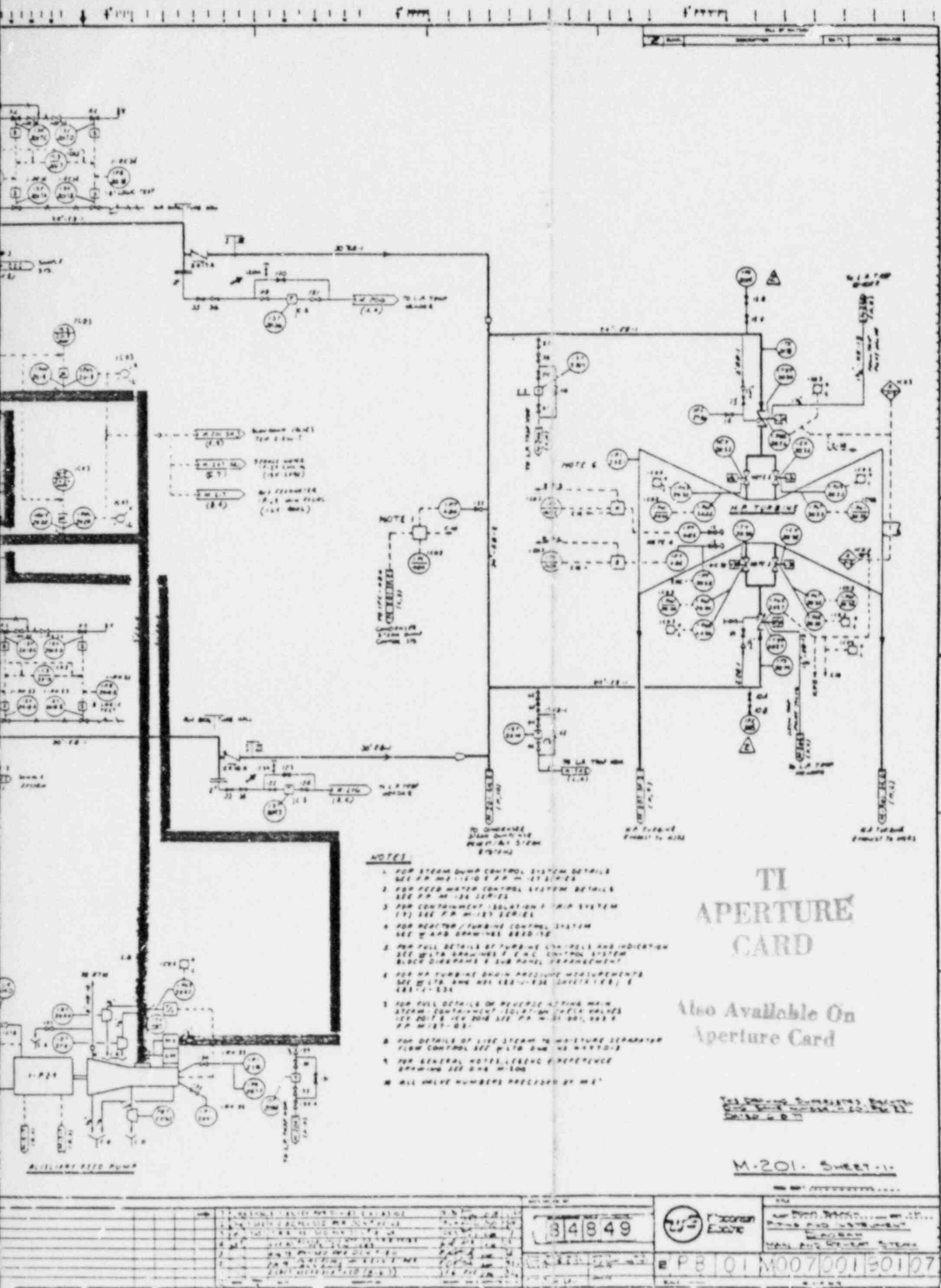
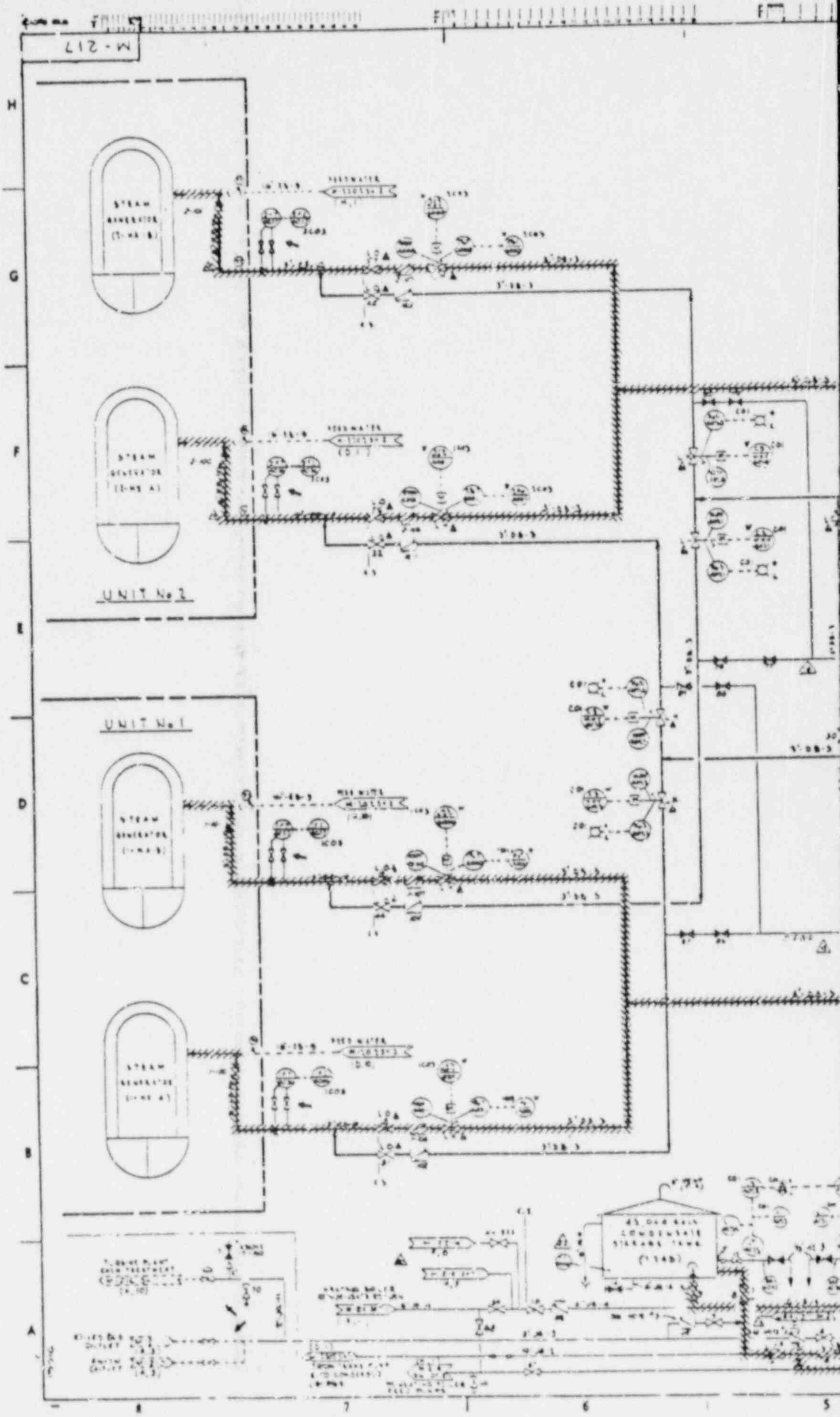


FIGURE
2-7

8803230233-03


M-217
STEAM GENERATOR
UNIT No 2
UNIT No 1
CONDENSATE STORAGE TANK

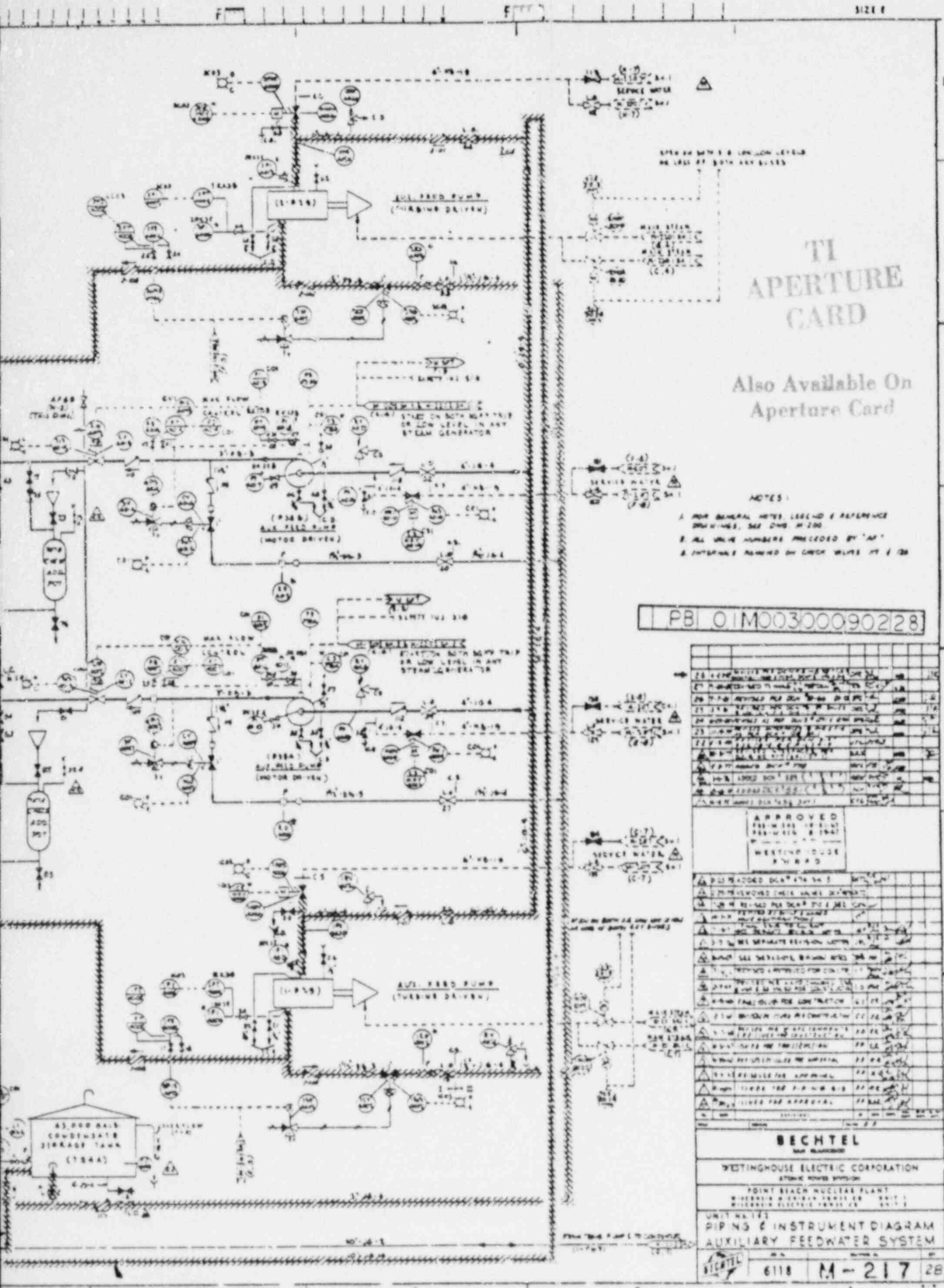
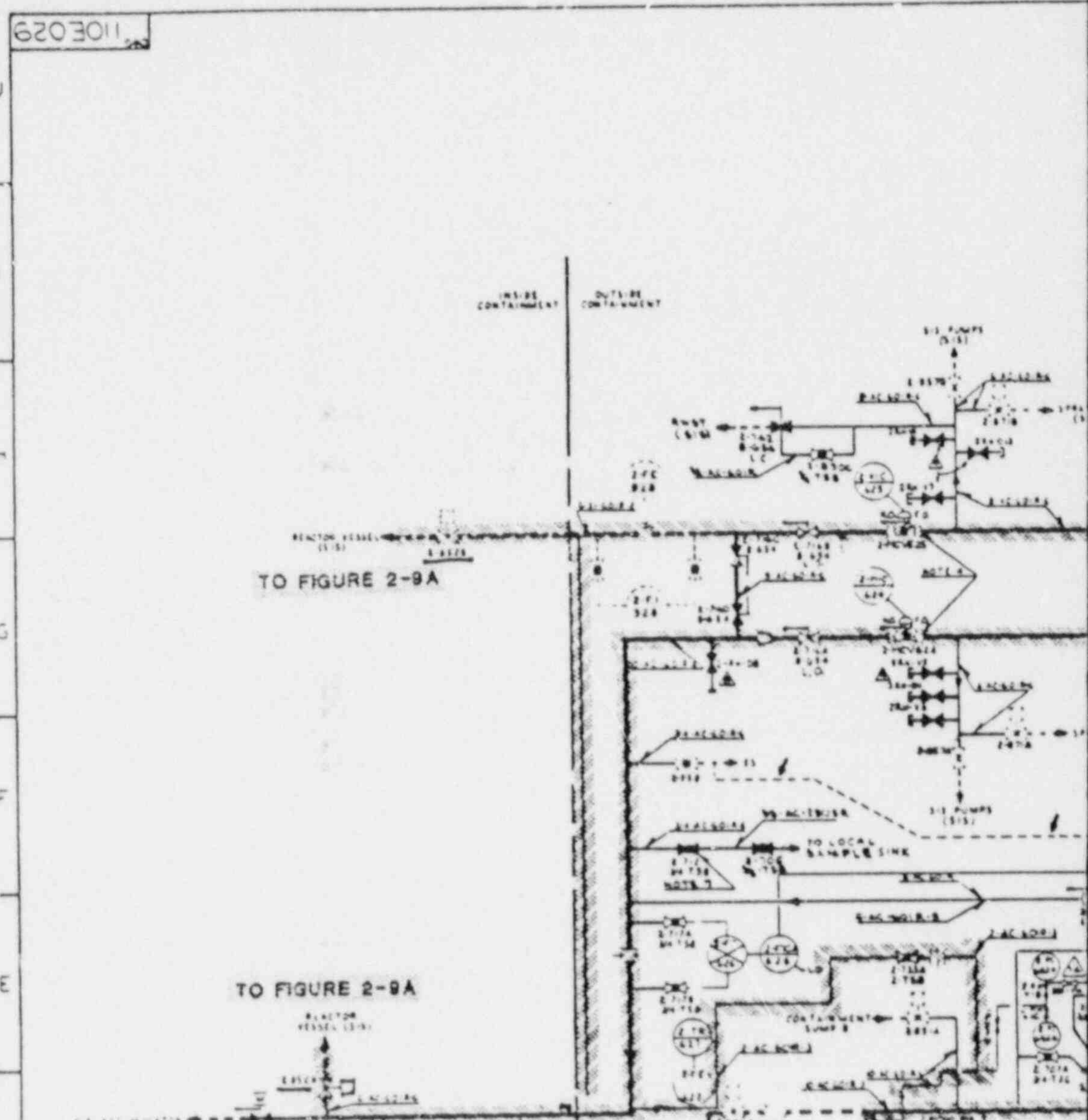


FIGURE 2-8

8803230233-04


TO FIGURE 2-9A
TO LOCAL SAMPLE SINK
TO FIGURE 2-9A
FROM FIGURE
2-6

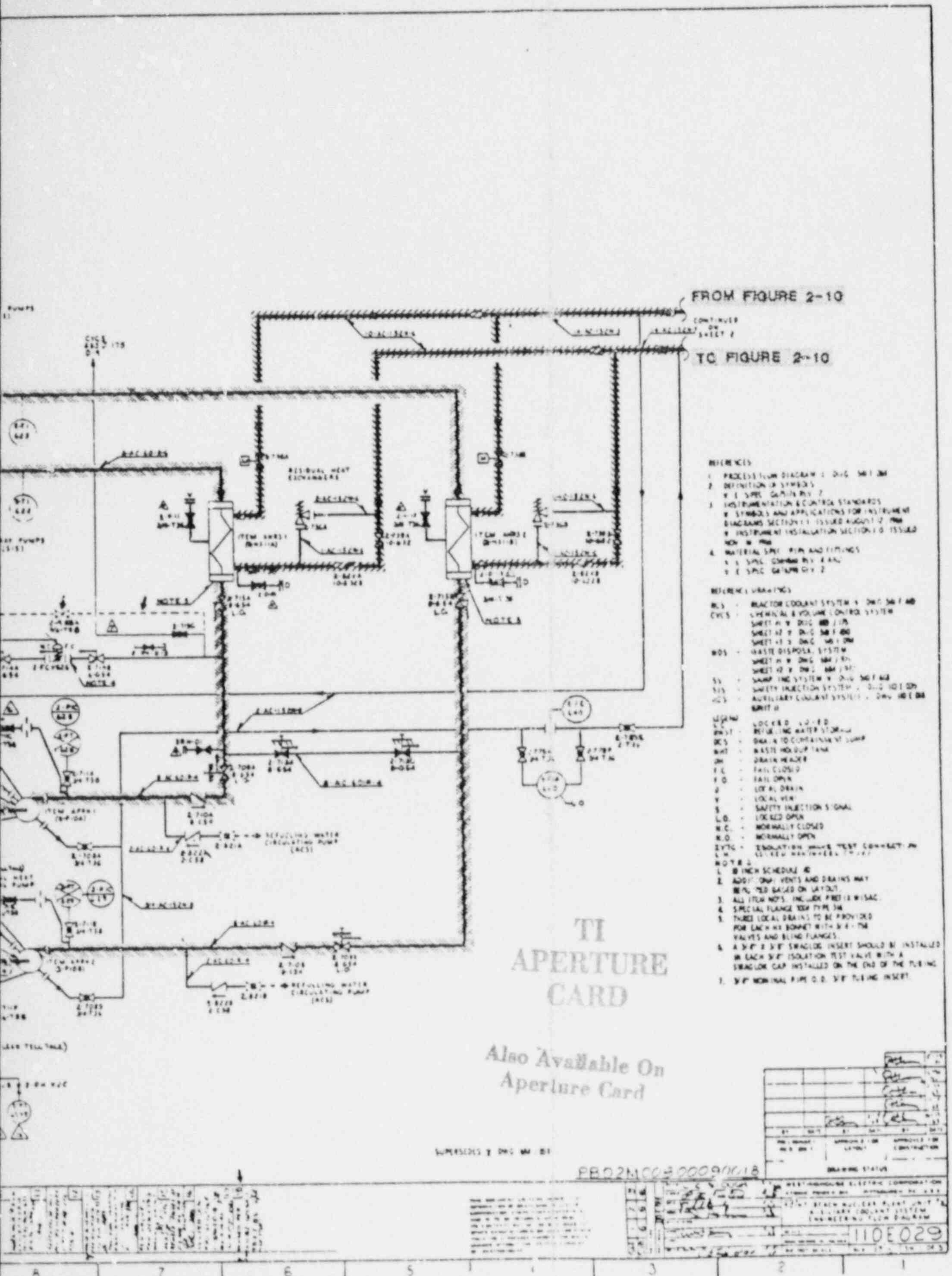
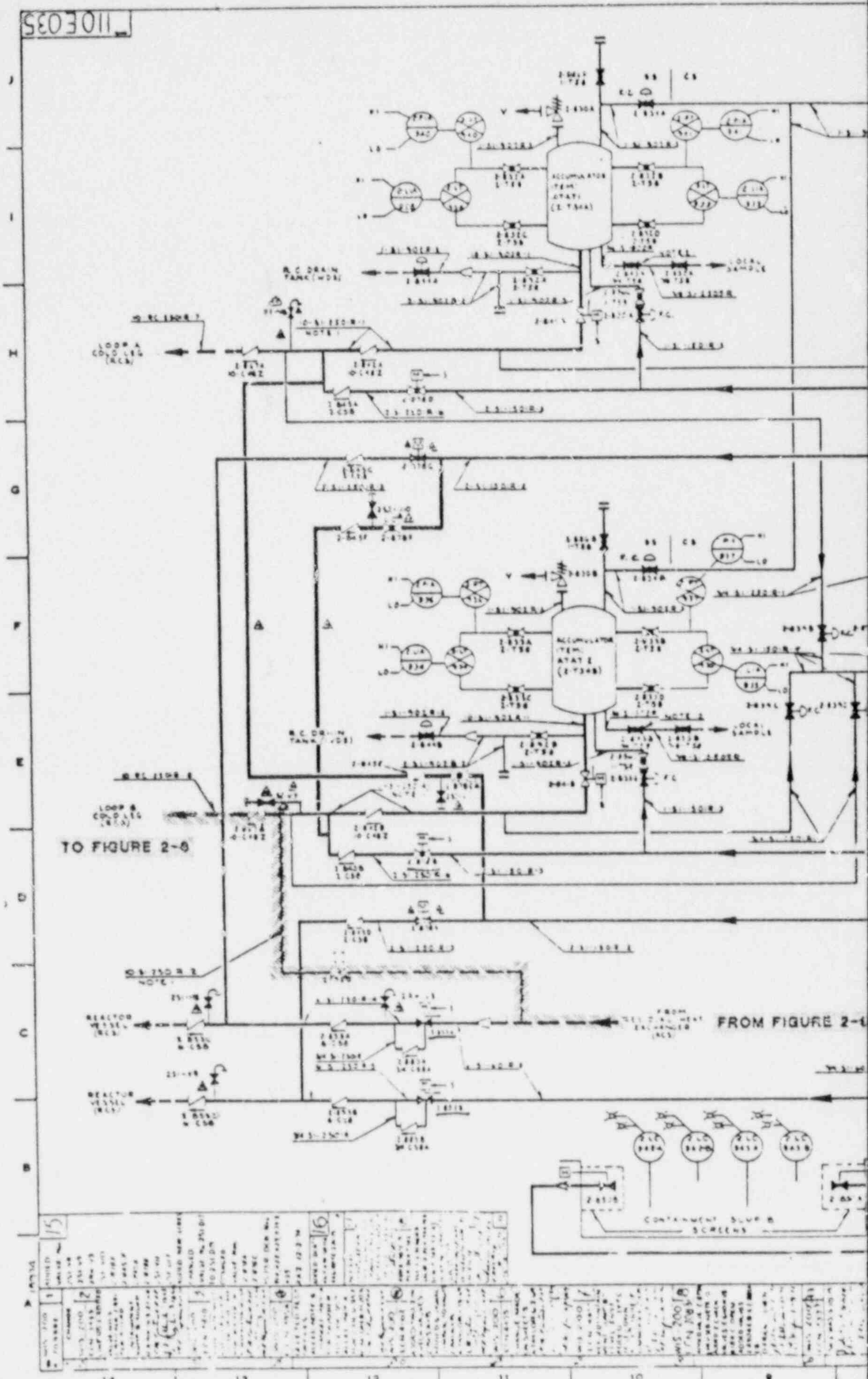


FIGURE
2-9



ACCUMULATOR
R.C. DRAIN TANK (WDS)
LOOP A COLD LEG (RCS)
LOOP B COLD LEG (RCS)
LOCAL SAMPLE
TO FIGURE 2-6
FROM FIGURE 2-
REACTOR VESSEL (RCS)
CONTAINMENT SUMP B SCREENS
J
I
H
G
F
E
D
C
B
A
14
13
12
11
10
9

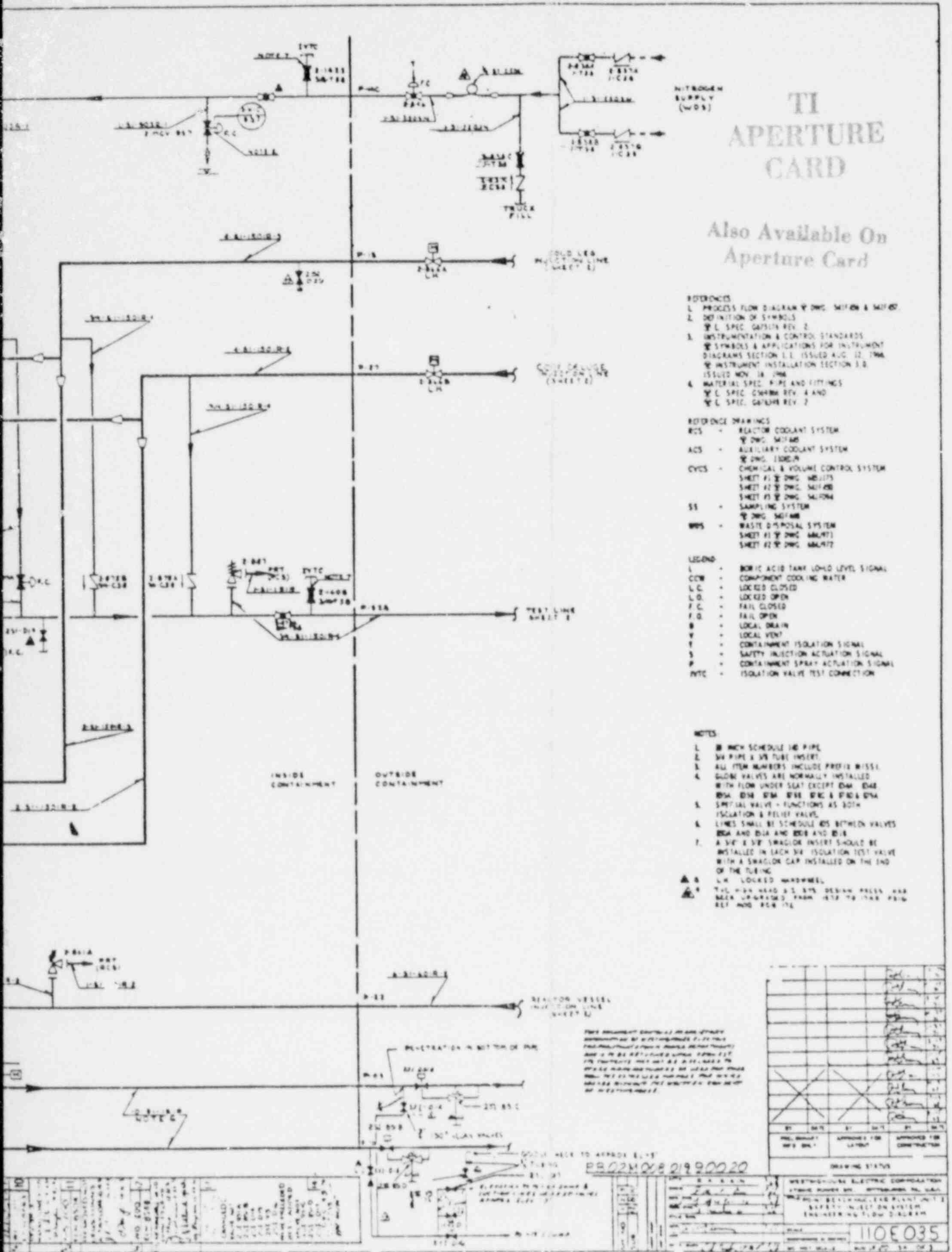
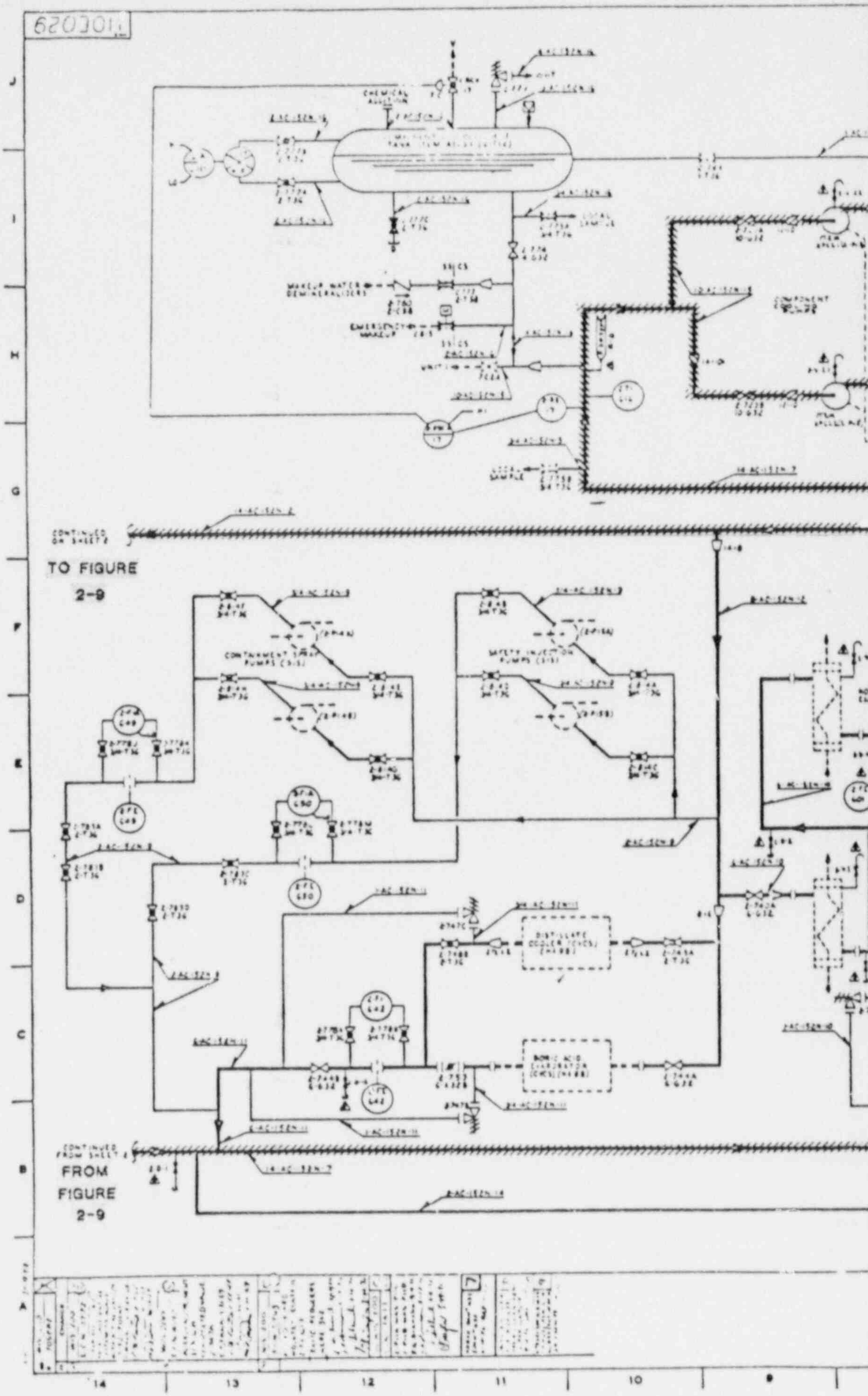


FIGURE 2-9A

8803230233-06


6203011
TO FIGURE 2-9
FROM FIGURE 2-9

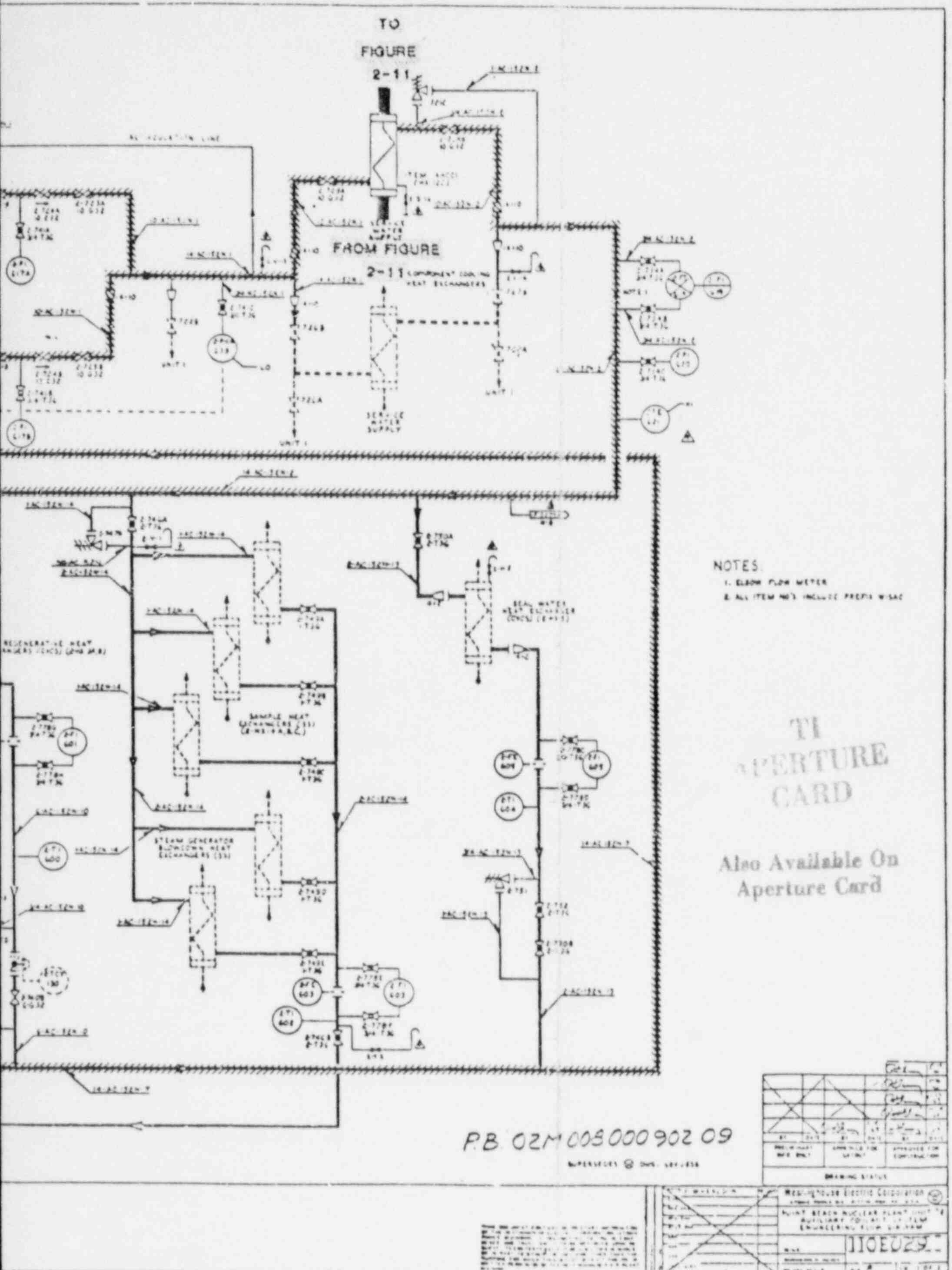
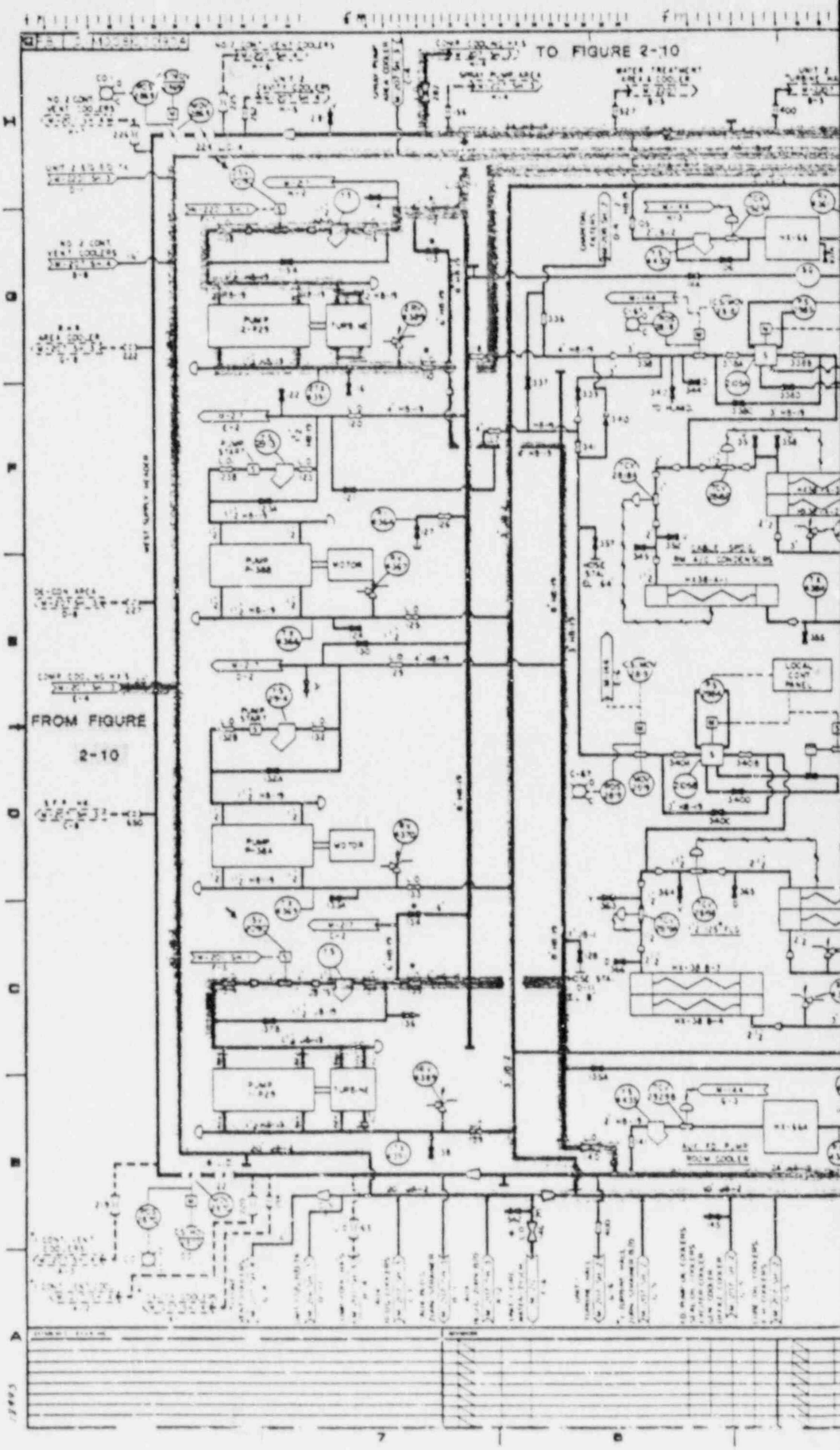


FIGURE 2-10

8803280233 -07


TO FIGURE 2-10
WATER TREATMENT
LOCAL CONT PANEL
MOTOR
MOTOR
FROM FIGURE
2-10

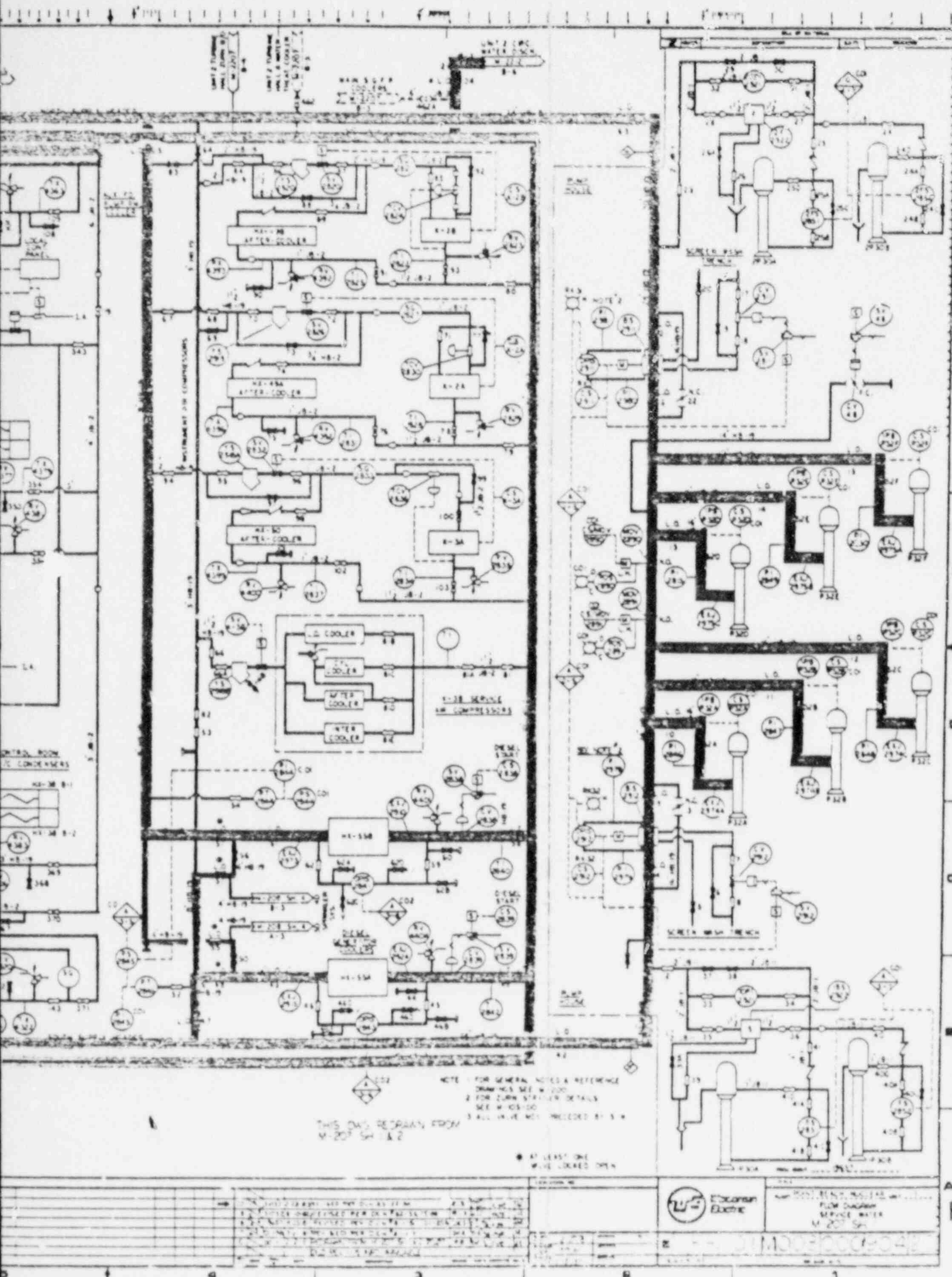
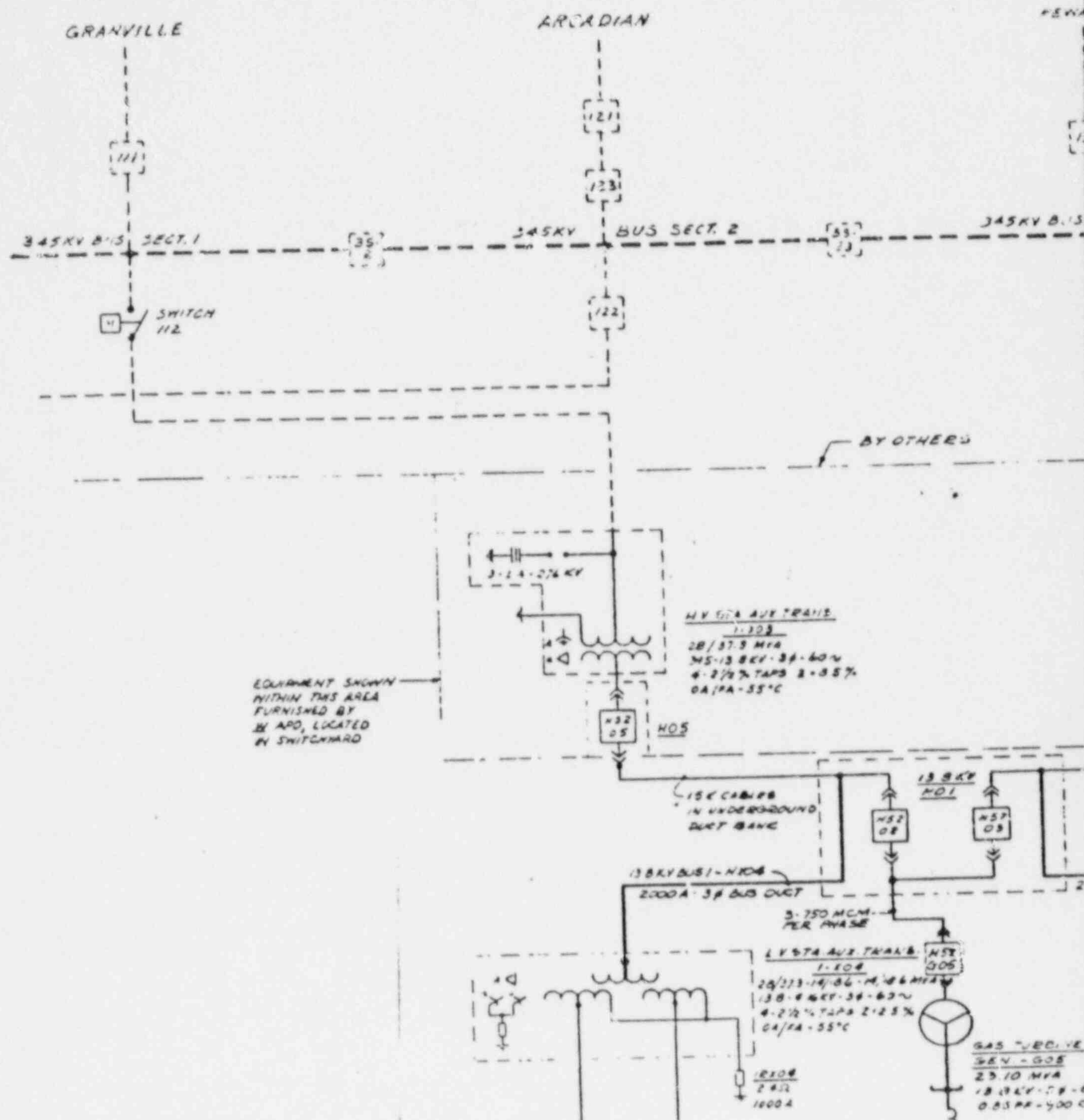


FIGURE 2-11

8803230233-08



GRANVILLE
ARCADIAN
111
121
123
345KV BUS SECT. 1
345KV
BUS SECT. 2
SWITCH
112
122
BY OTHERS
H.V. STA AUX TRANS.
28/37.3 MVA
345-13.8KV-3Ø-60~
OA/FA-55°C
EQUIPMENT SHOWN
WITHIN THIS AREA
FURNISHED BY
LOCATED
IN SWITCHYARD
H05
15K CABLES
IN UNDERGROUND
DUCT BANK
13.8KV
H01
13.8KV BUS 1-H104
2000A-3Ø BUS DUCT
3-750 MCM
PER PHASE
L.V. STA. AUX. TRANS.
1-X04
OA/FA-55°C
GAS TURBINE
GEN. - G05
23.10 MVA
1000A

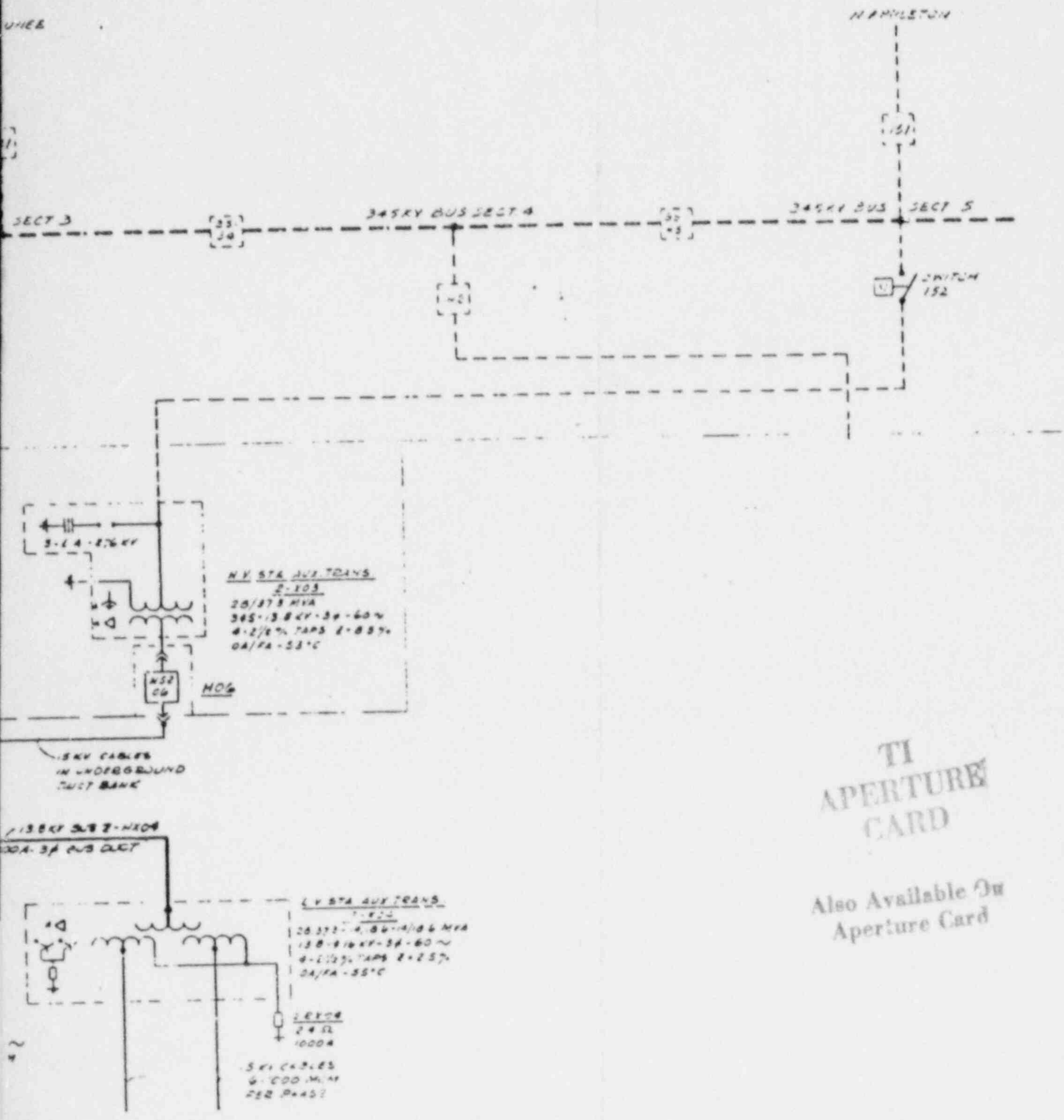
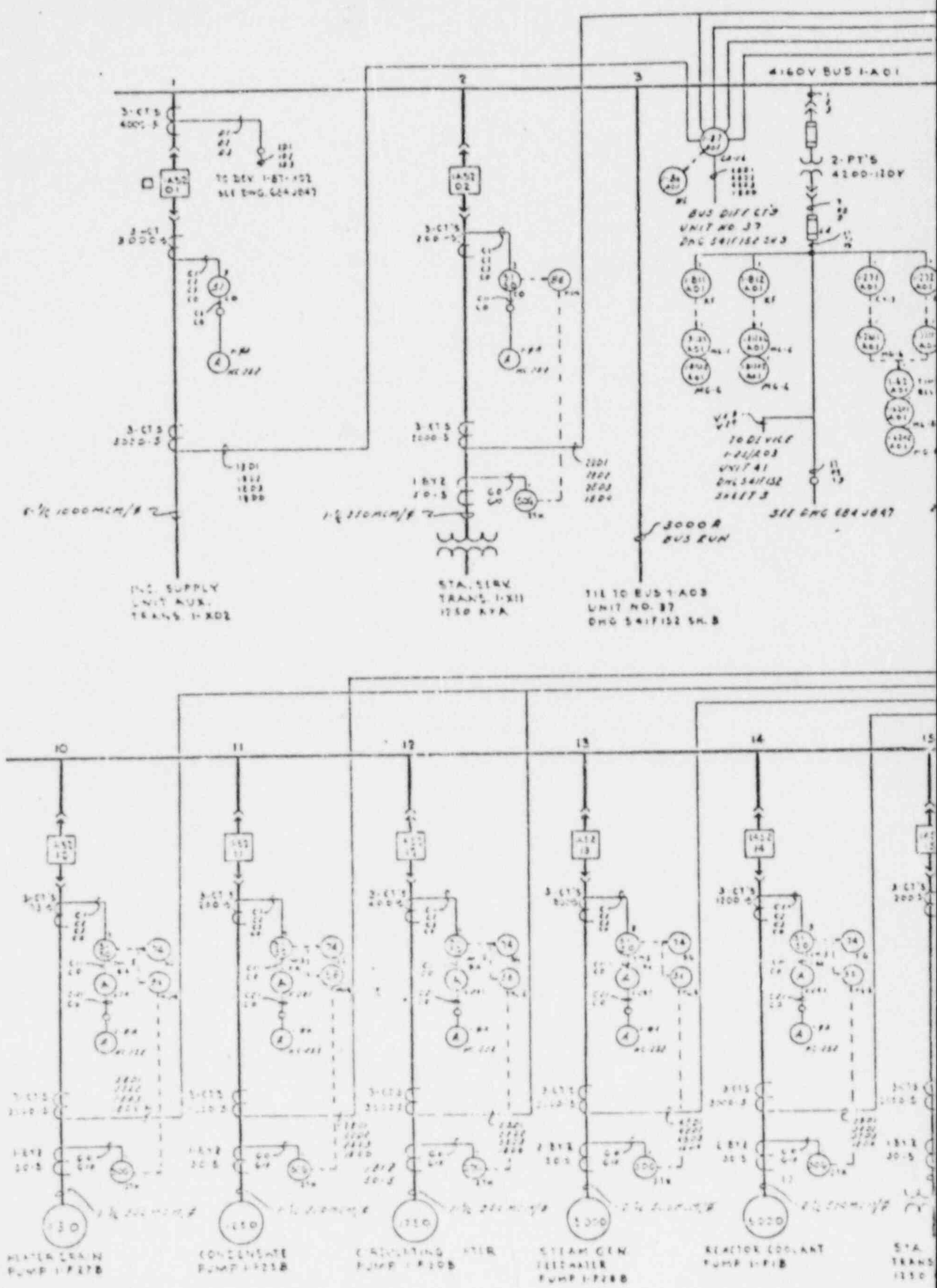


Fig. 2-12
13800V ONE LINE DIAGRAM

8803230233-09


4160V BUS 1-A01
2-PT'S
4200-120Y
BUS DIFF CT'S
UNIT NO. 37
DWG 541F152 SH 3
TO DEV. 1-87-102
SEE DWG. 6B4J047
TO DEVICE
UNIT 41
DWG 541F152
SHEET 3
SEE DWG 6B4J047
3000 A
BUS RUN
INC. SUPPLY
UNIT AUX.
TRANS. 1-X02
STA. SERV.
TRANS. 1-X11
1250 KVA
TIE TO BUS 1-A03
UNIT NO. 37
DWG 541F152 SH. 3
HEATER DRAIN
PUMP 1-P27B
CONDENSATE
PUMP 1-P25B
CIRCULATING WATER
PUMP 1-P20B
STEAM GEN
FEEDWATER
PUMP 1-P28B
REACTOR COOLANT
PUMP 1-P1B

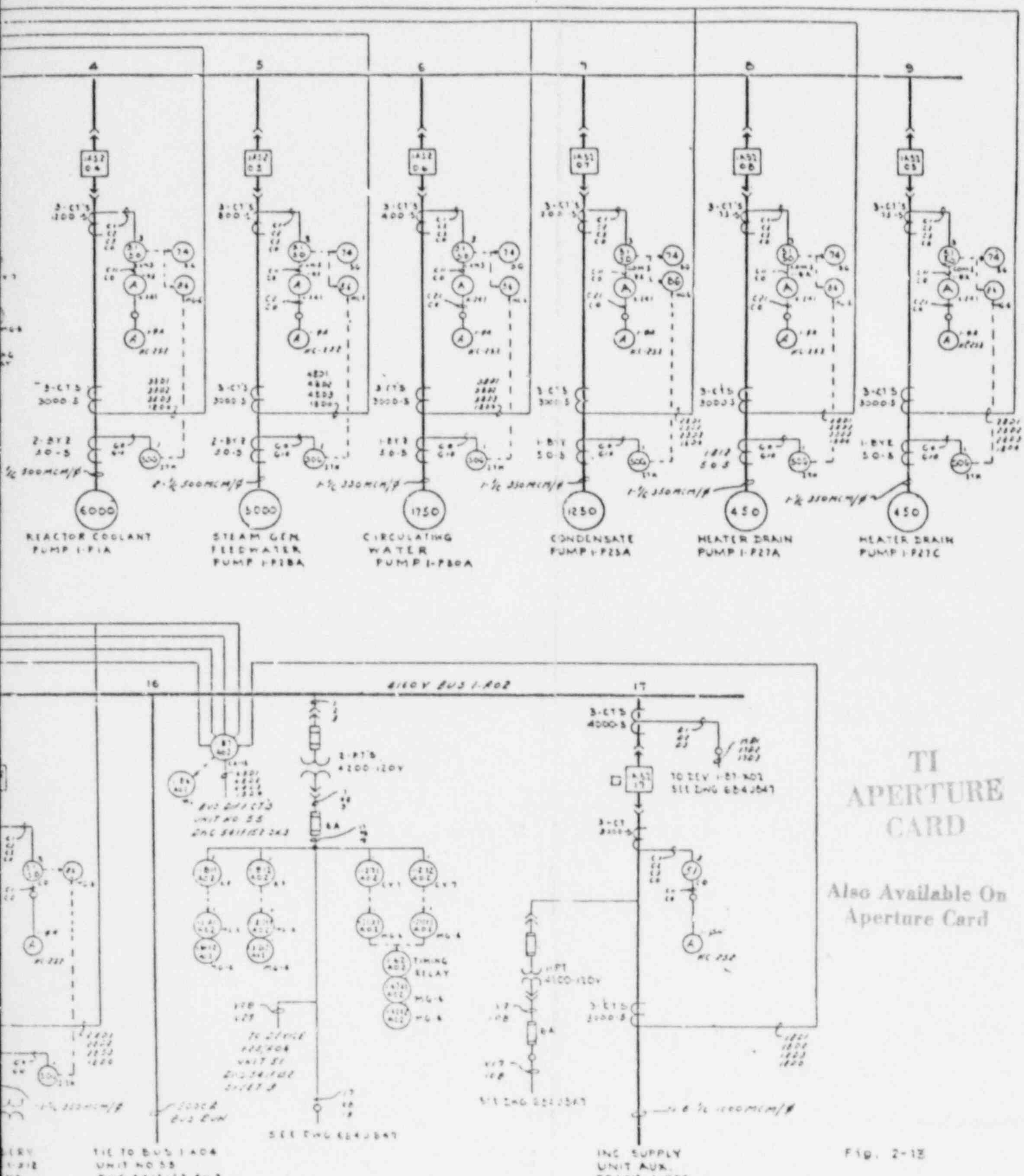
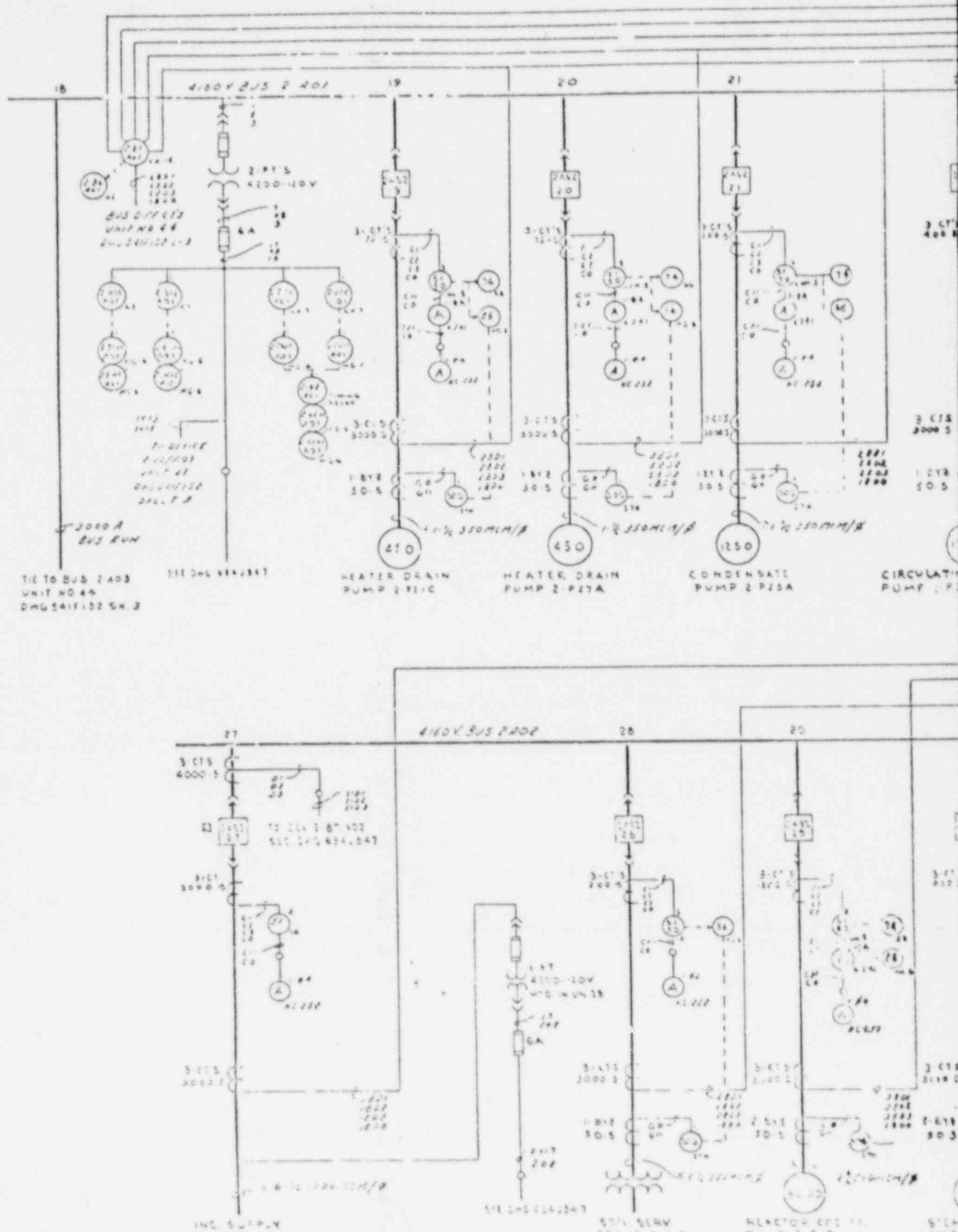


Fig. 2-13

4160 V ONE LINE DIAGRAM

8803230233-10



4160V BUS 2A01
18
19
20
21
HEATER DRAIN PUMP 2-P21C
HEATER DRAIN PUMP 2-P27A
CONDENSATE PUMP 2-P25A
450
450
1250
2000 A BUS RUN
4160V BUS 2A02
27
28
29

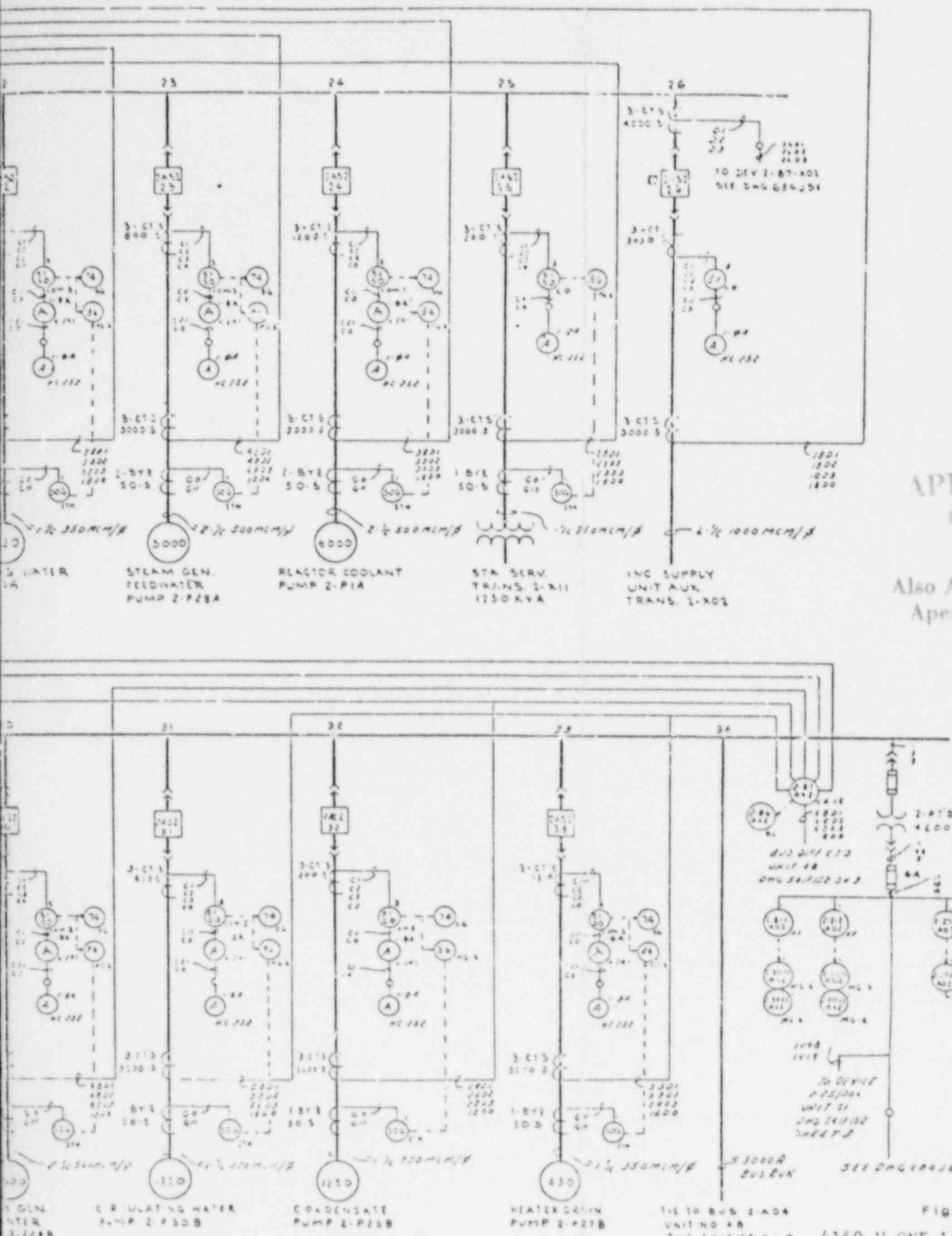
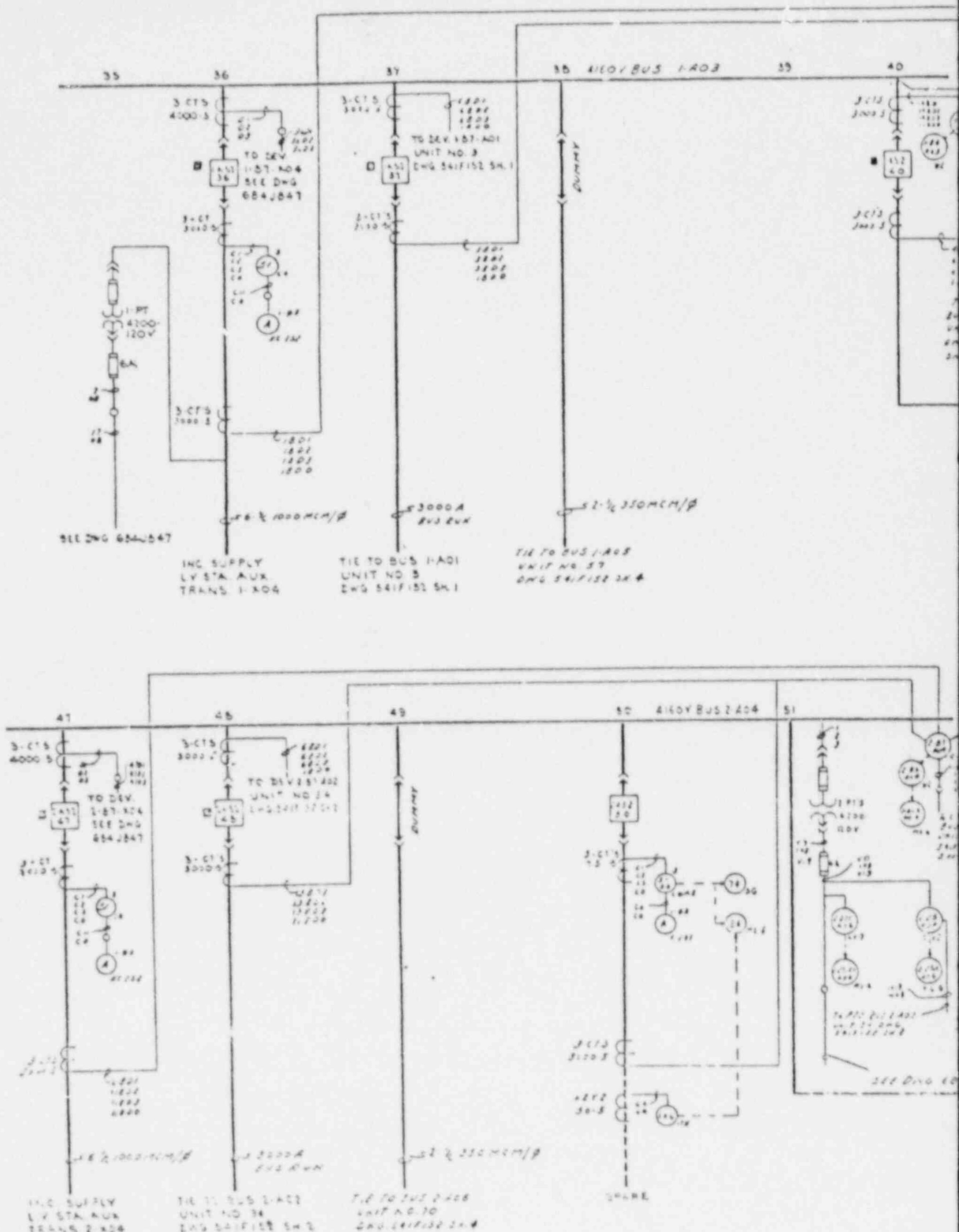


Fig. 2-14

4160 V ONE LINE DIAGRAM

8803230233-11



35
36
37
38
4160V BUS 1-A03
39
40
3-CTS 4000:5
TO DEV 1-87-A04 SEE DWG 684J847
TO DEV. 1-87-A01 UNIT NO. 3 DWG 541F152 SH. 1
DUMMY
1-PT 4200-120V
6A
3000A BUS RUN
SEE DWG 684J847
INC. SUPPLY L.V. STA. AUX. TRANS. 1-X04
TIE TO BUS 1-A01 UNIT NO. 3 DWG 541F152 SH. 1
TIE TO BUS 1-A05 UNIT NO. 37 DWG 541F152 SH. 4
47
48
49
50
4160V BUS 2-A04
51
3-CTS 4000:5
TO DEV. 2-87-X04 SEE DWG 684J847
TO DEV 2-87-A02 UNIT NO. 34
DUMMY
SPARE
INC. SUPPLY L.V. STA. AUX TRANS. 2-X04
TIE TO BUS 2-A02 UNIT NO. 34 DWG 541F152 SH. 2
TIE TO BUS 2-A06 UNIT NO. 70 DWG 541F152 SH. 4

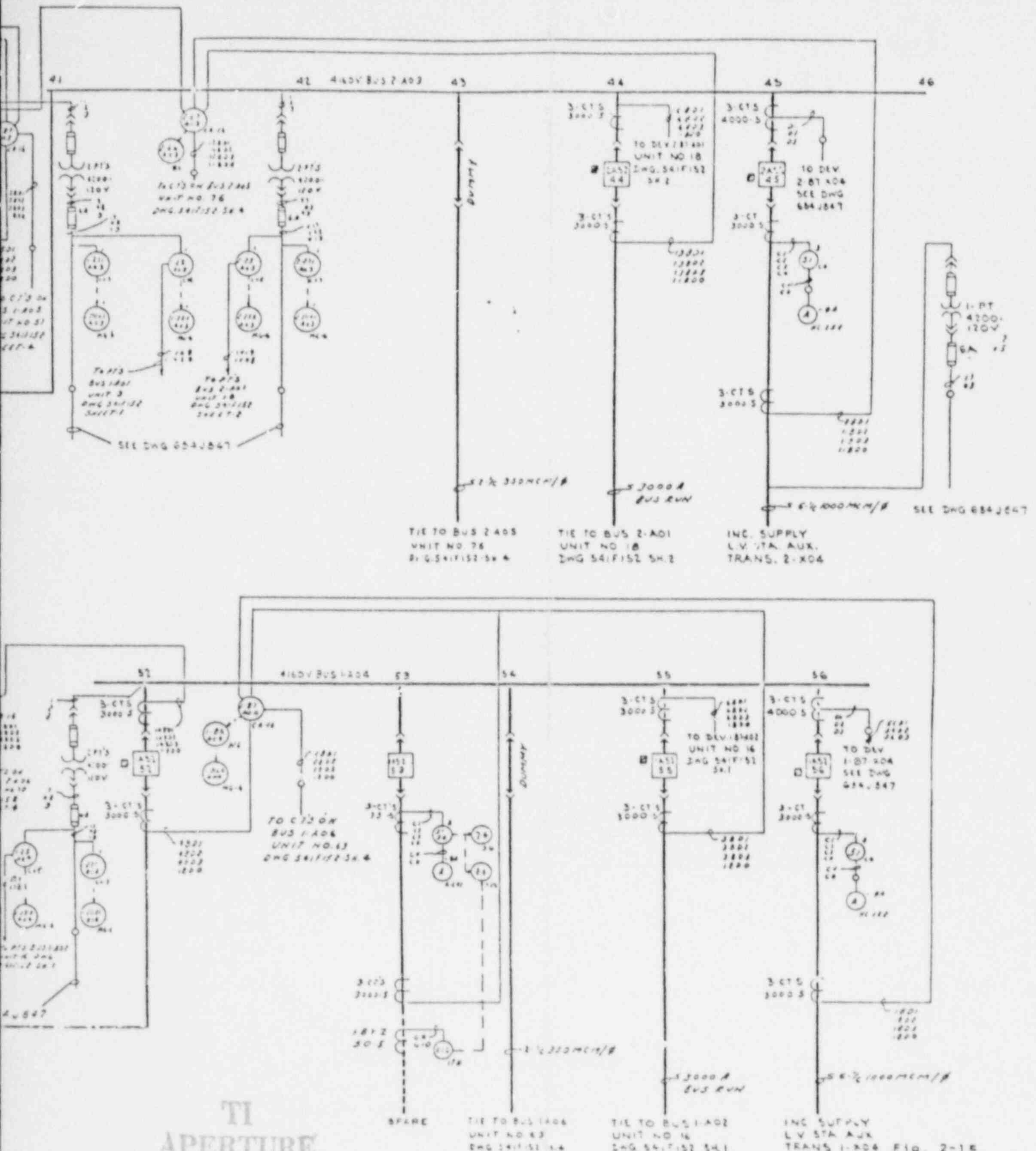
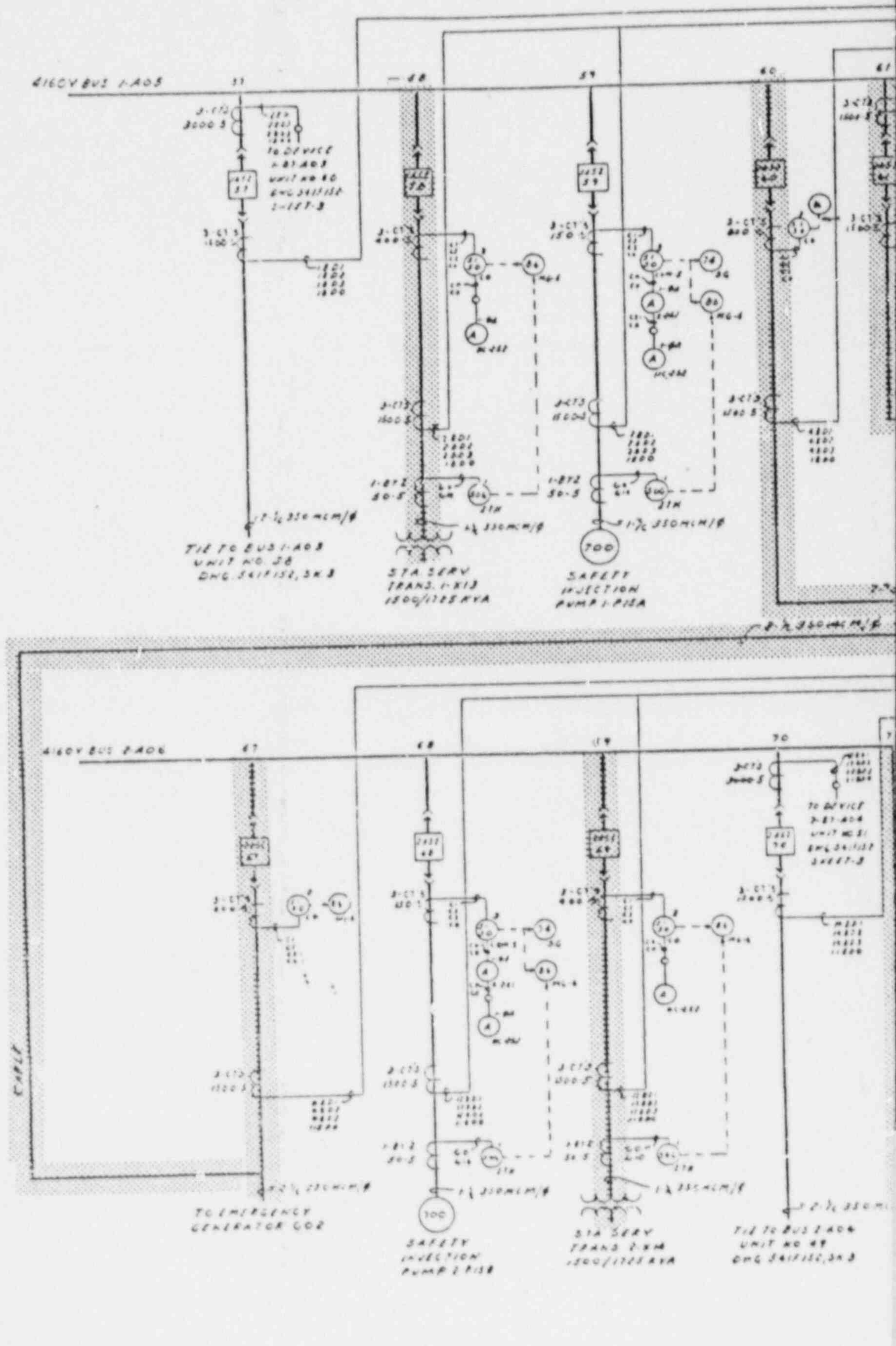


Fig. 2-15

4160 V ONE LINE DIAGRAM

8803230233-/2


4160V BUS 1-A05
TIE TO BUS 1-A03
UNIT NO. 28
DWG. 541F152, SH 3
STA. SERV
TRANS. 1-X13
1500/1725 KVA
SAFETY
INJECTION
PUMP 1-P15A
4160V BUS 2-A06
CABLE
TO EMERGENCY
GENERATOR G02
SAFETY
INJECTION
PUMP 2-P15B
STA. SERV
TRANS. 2-X14
1500/1725 KVA
TIE TO BUS 2-A04
UNIT NO. 49
DWG. 541F152, SH 3

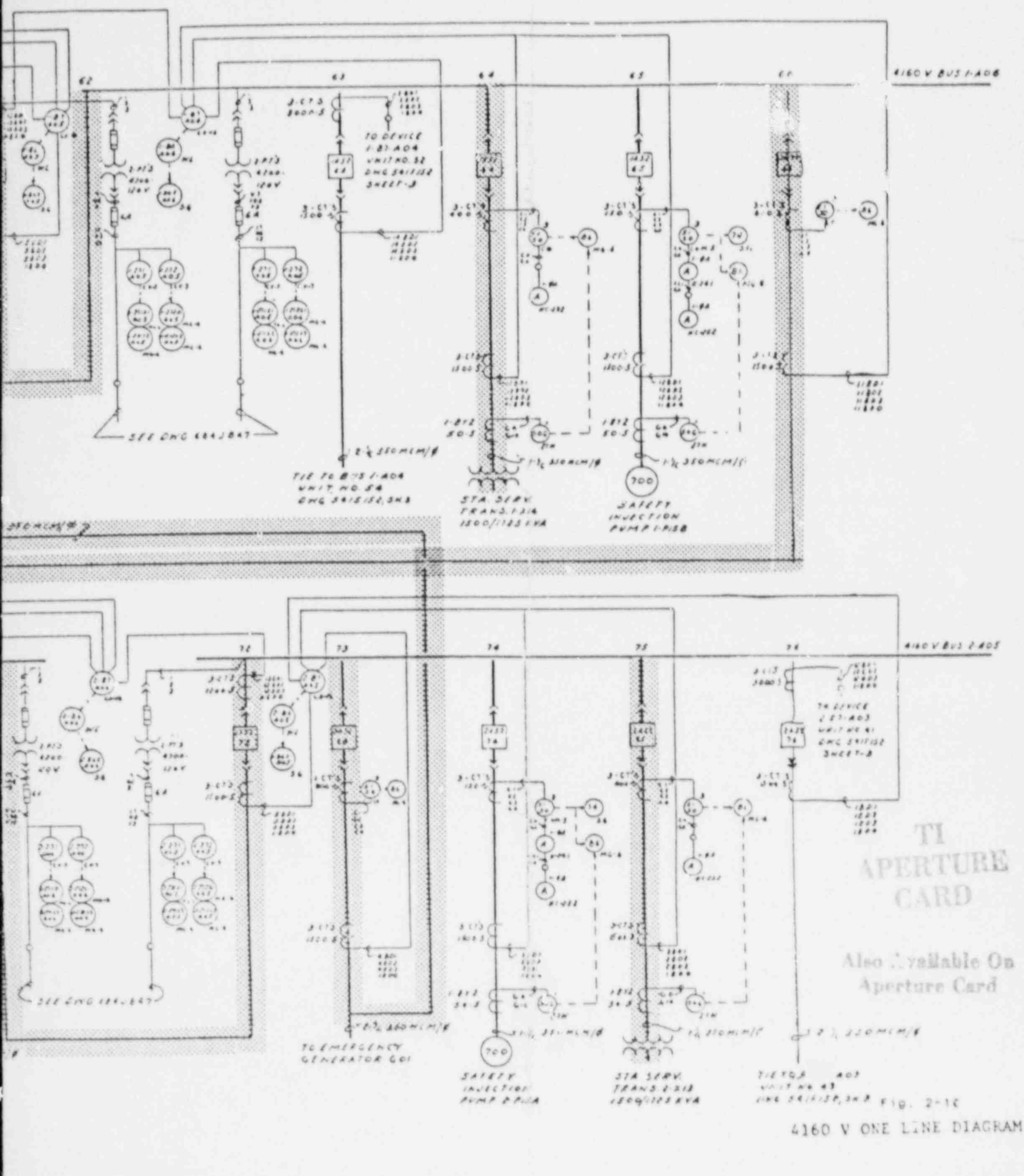
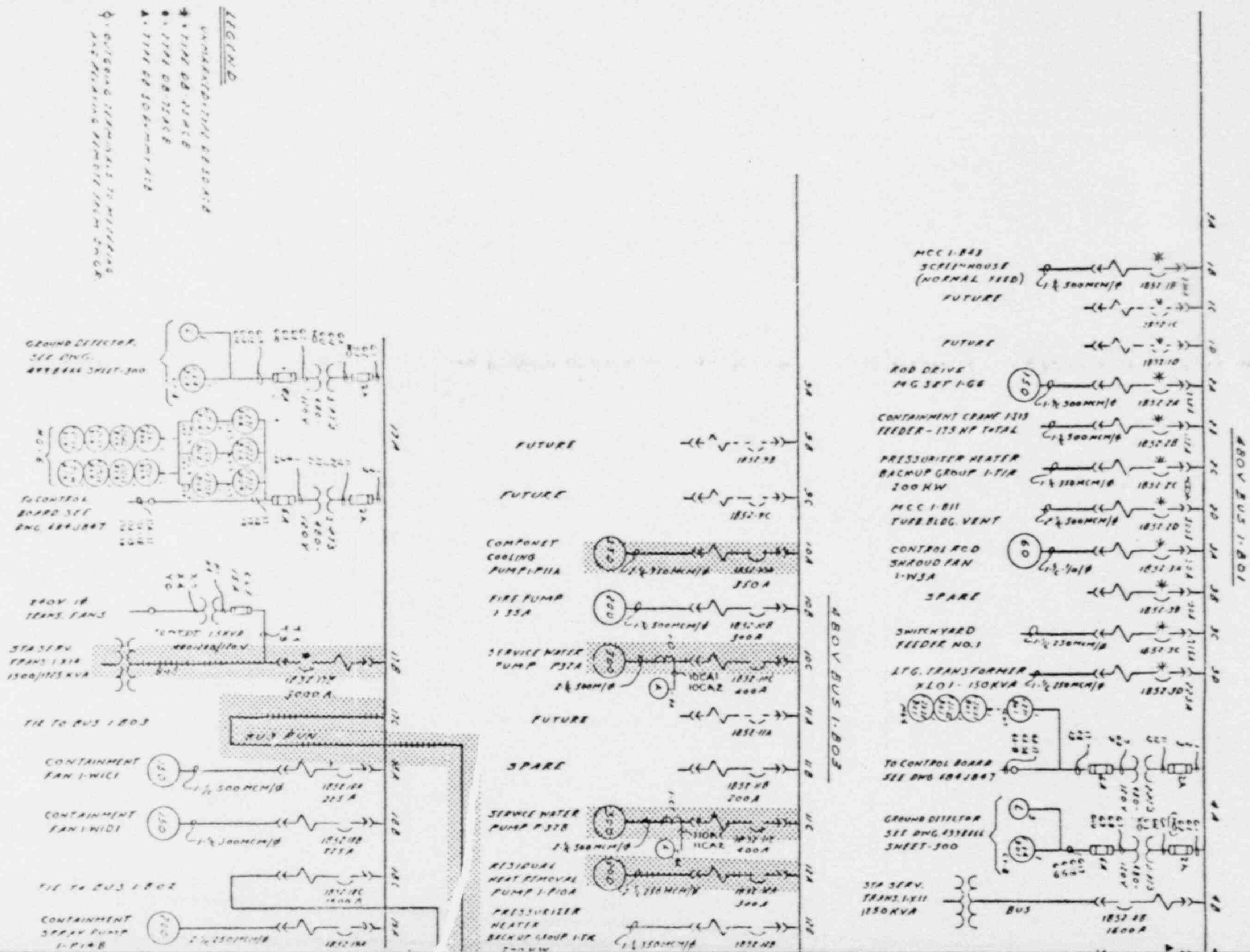


Fig. 2-16

4160 V ONE LINE DIAGRAM

8803250233-13



LEGEND
MCC 1-B43
SCREENHOUSE
(NORMAL FEED)
FUTURE
ROD DRIVE
MG SET 1-G6
CONTAINMENT CRANE 1-S13
FEEDER - 17.5 HP TOTAL
PRESSURIZER HEATER
BACKUP GROUP 1-T1A
200 KW
MCC 1-B11
TURB. BLDG. VENT
CONTROL ROD
SHROUD FAN
1-W3A
SPARE
SWITCHYARD
FEEDER NO. 1
LTG. TRANSFORMER
XL01 - 150KVA
TO CONTROL BOARD
SEE DWG 684J847
GROUND DETECTOR
480V BUS 1-B01
480V BUS 1-B03
COMPONENT
COOLING
PUMP 1-P11A
FIRE PUMP
SERVICE WATER
PUMP P32A
SERVICE WATER
PUMP P32B
RESIDUAL
HEAT REMOVAL
PUMP 1-P10A
PRESSURIZER
HEATER
CONTAINMENT
FAN 1-W1C1
CONTAINMENT
FAN 1-W1D1
TIE TO BUS 1-B03
TIE TO BUS 1-B02
CONTAINMENT
SPRAY PUMP
BUS RUN

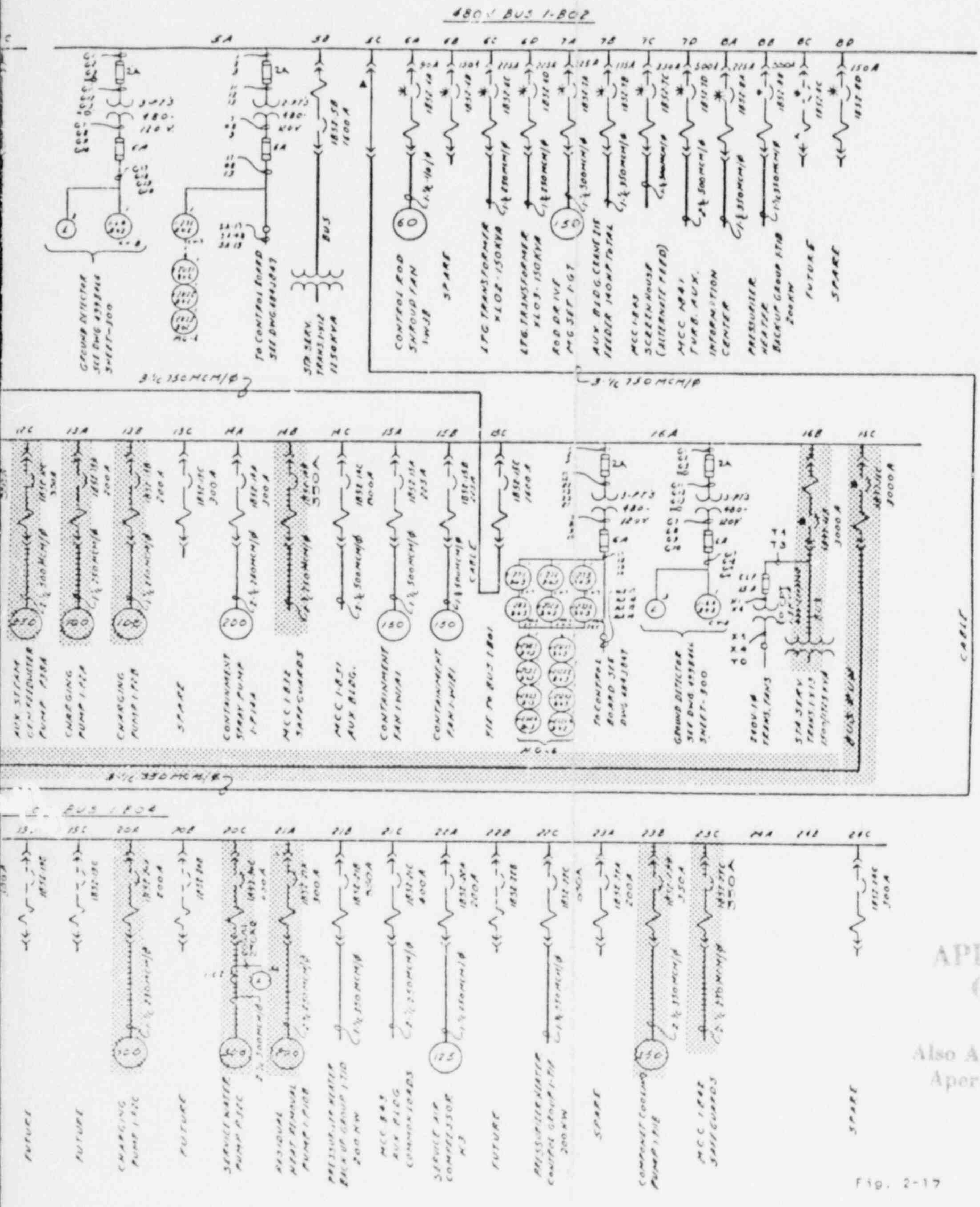
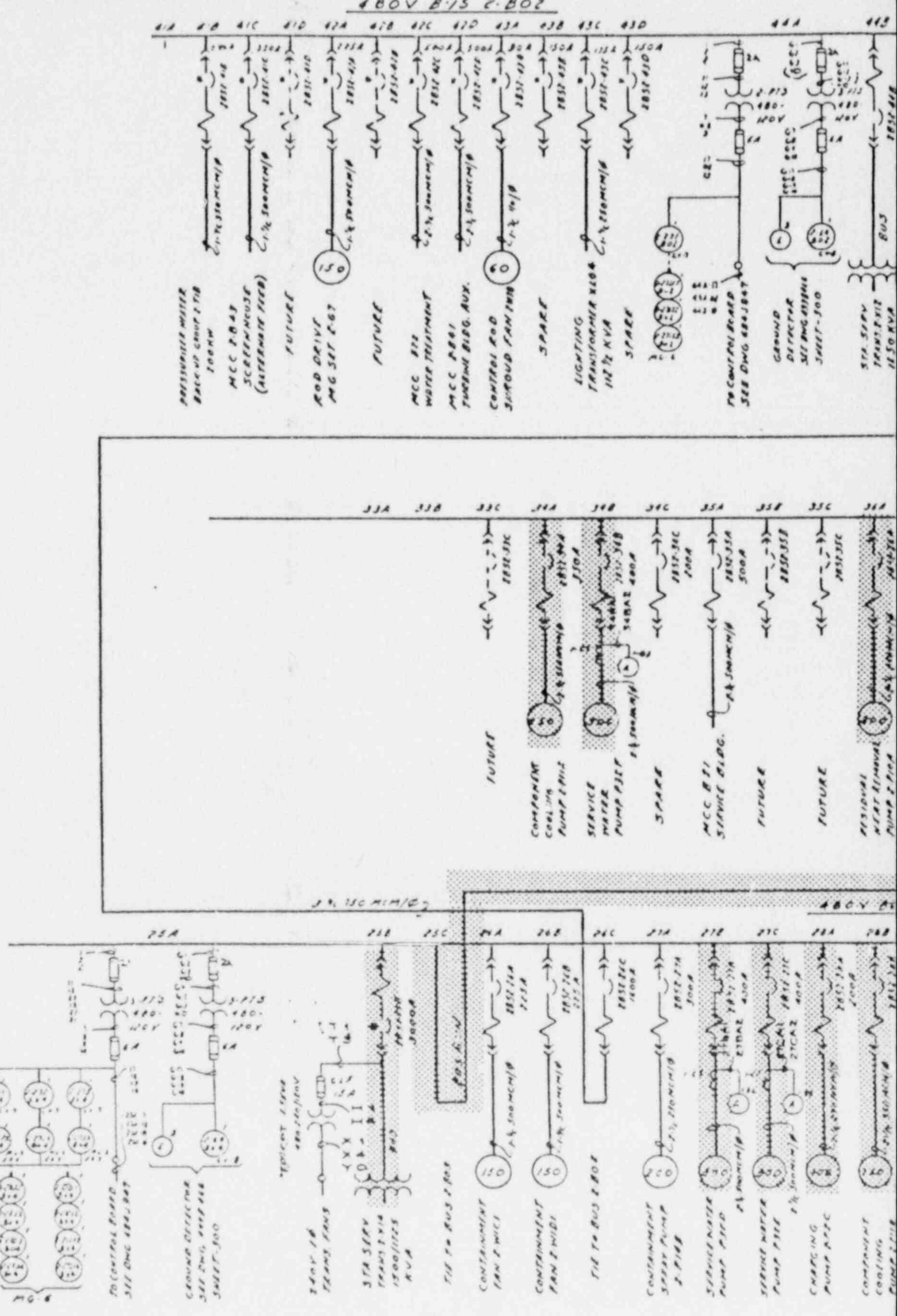


Fig. 2-17

480 V ONE LINE DIAGRAM



480V BUS 2-B02
ROD DRIVE MG SET 2-G7
FUTURE
SPARE
LIGHTING TRANSFORMER X10A 112½ KVA
CONTROL ROD SHROUD FAN 2M8
COMPONENT COOLING PUMP 2P11A
SERVICE WATER PUMP 2P27
MCC B71 SERVICE BLDG.
RESIDUAL HEAT REMOVAL PUMP 2P10A
480V
STA SERV TRANS 2X14
TIE TO BUS 2B04
CONTAINMENT FAN 2W1C1
CONTAINMENT FAN 2W1D1
CONTAINMENT SPRAY PUMP 2P18B
SERVICE WATER PUMP 2P27D
SERVICE WATER PUMP 2P27E
CHARGING PUMP 2P2C
MG-6

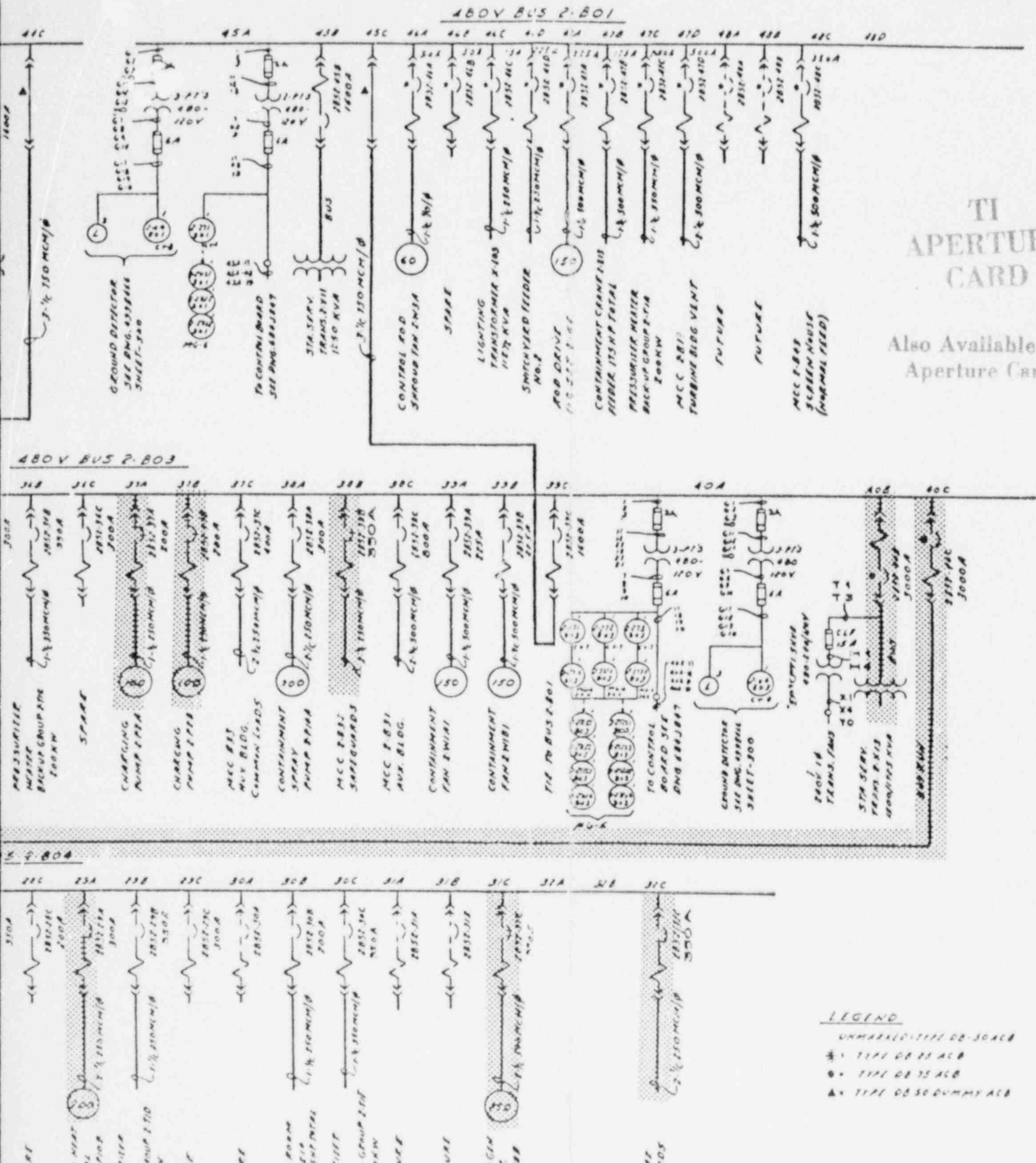
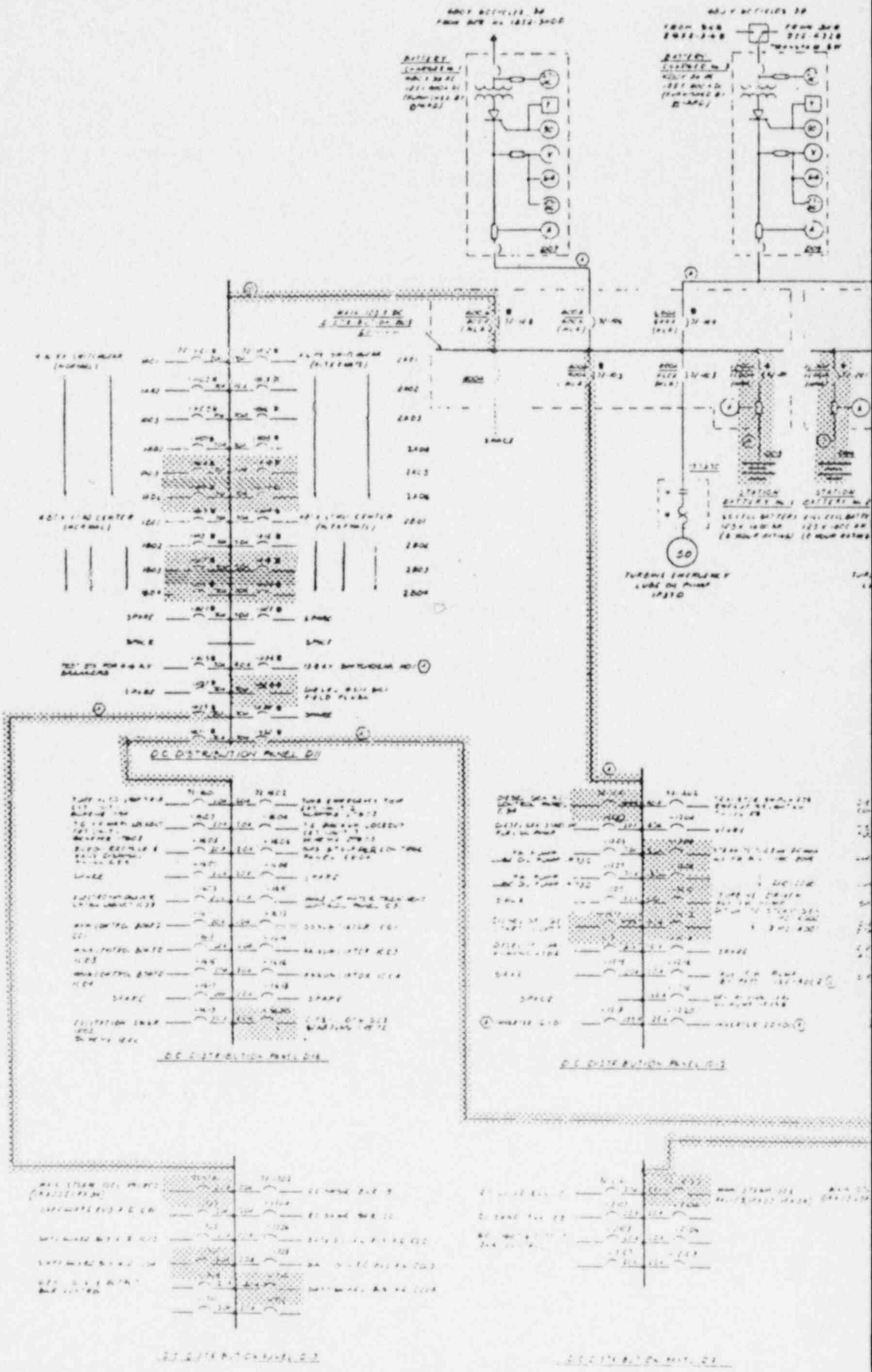


Fig. 2-18
480 V ONE LINE DIAGRAM


D.C. DISTRIBUTION PANEL D11
STATION BATTERY
TURBINE EMERGENCY LUBE OIL PUMP
SPARE

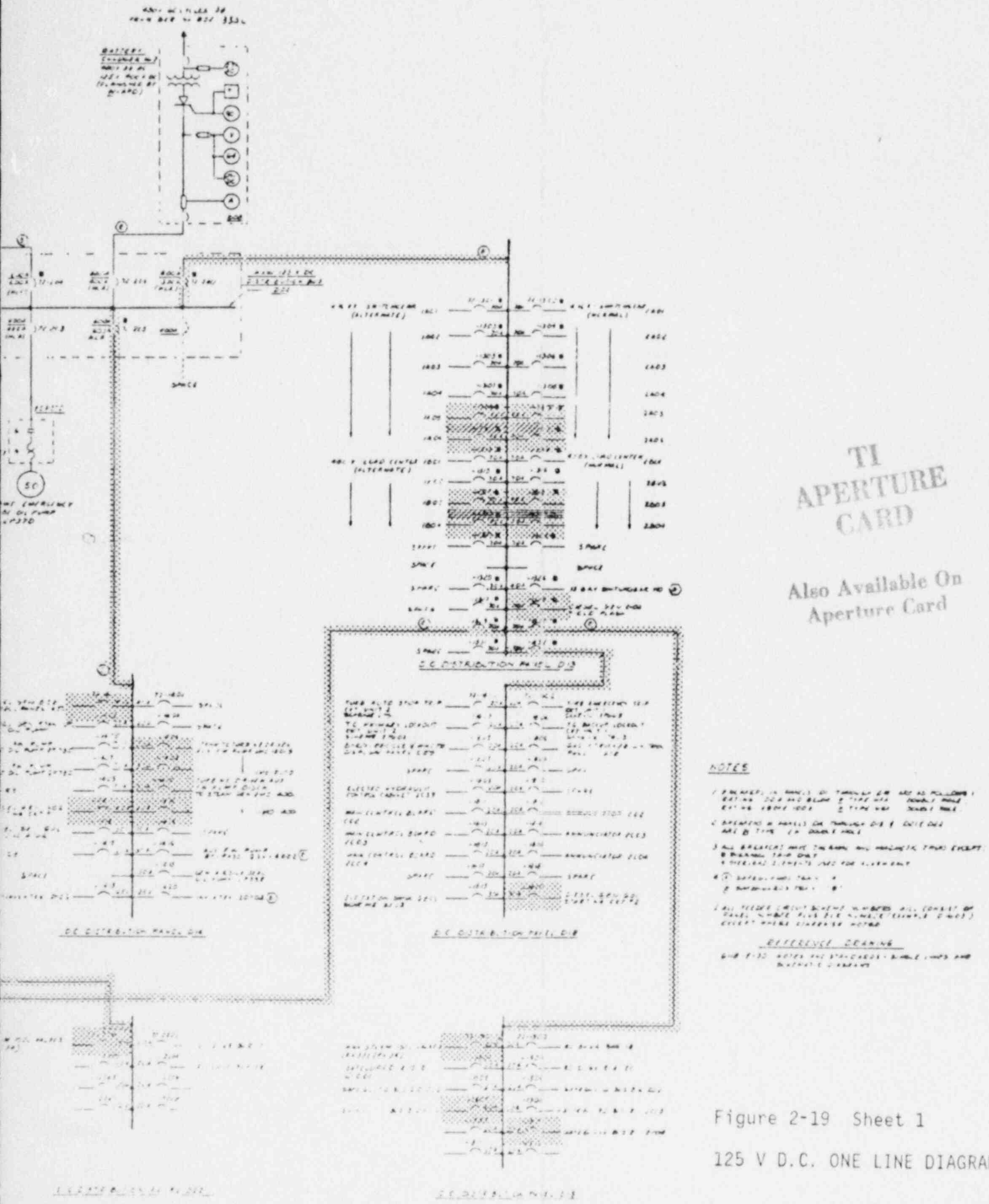
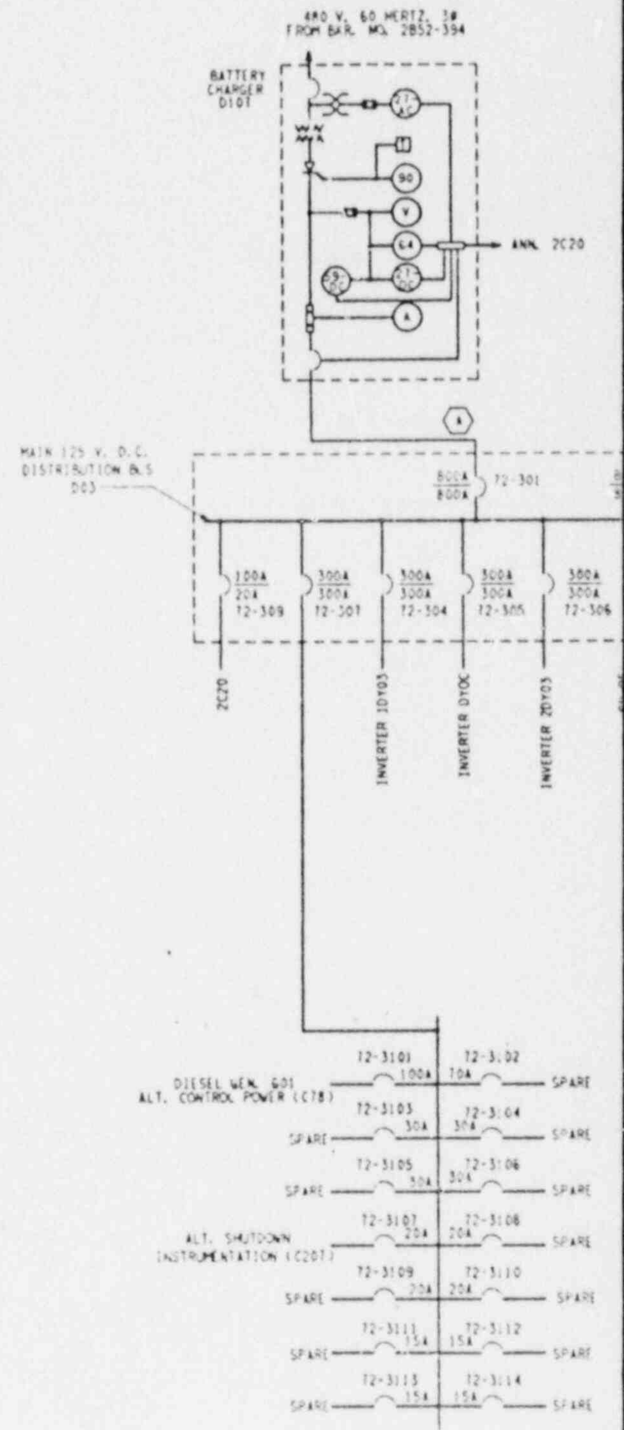
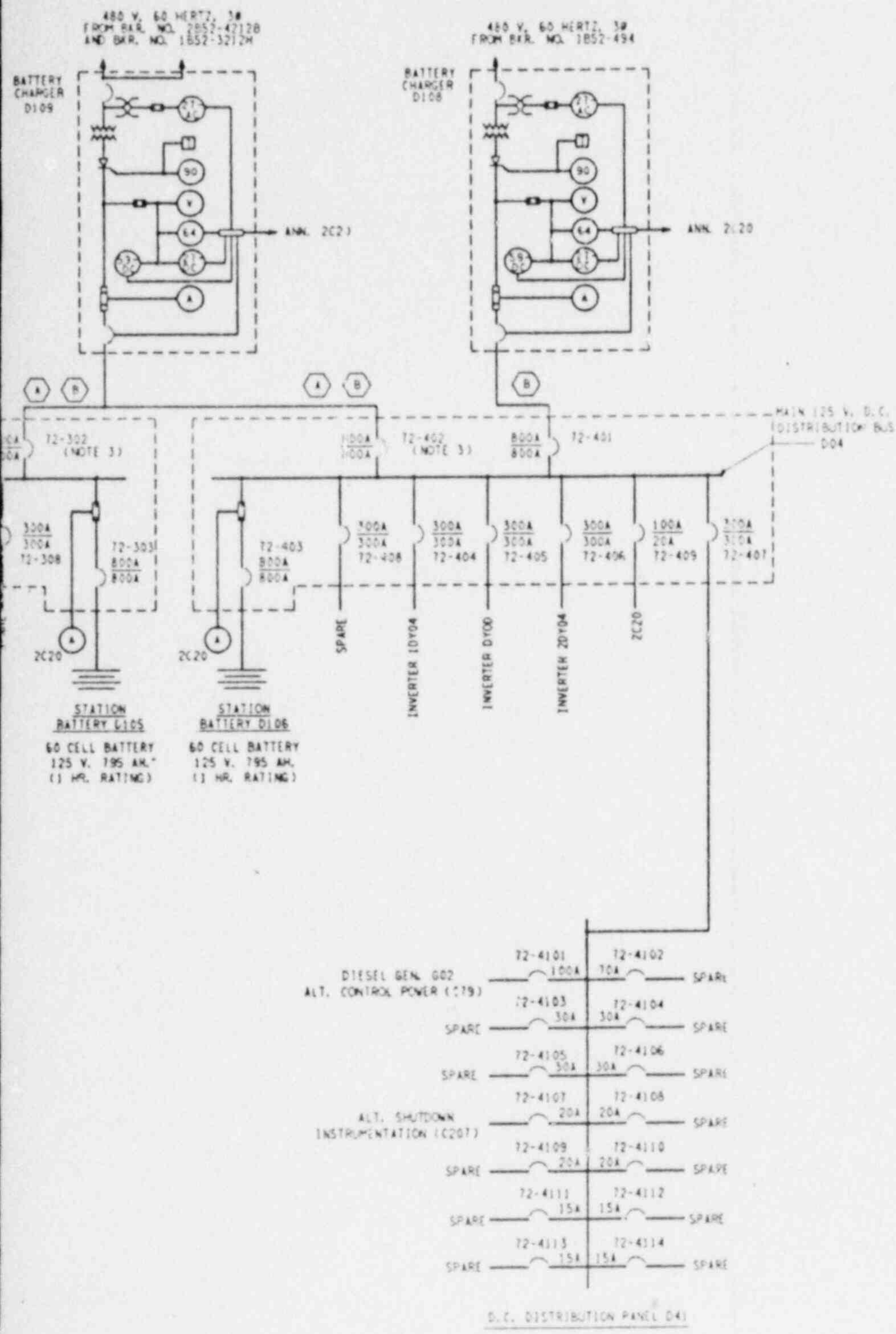


Figure 2-19 Sheet 1

125 V D.C. ONE LINE DIAGRAM



D.C. DISTRIBUTION PANEL D31



NOTES:
1. (A) SAFEGUARDS TRAIN "A"
   (B) SAFEGUARDS TRAIN "B"
2. ALL FEEDER CIRCUIT SCHEME NUMBERS WILL CONSIST OF PANEL NUMBER PLUS BKR. NUMBER. (EXAMPLE: D4101)
3. BREAKERS 72-302 AND 72-402 ARE KEY INTERLOCKED TO PREVENT BOTH FROM BEING CLOSED.

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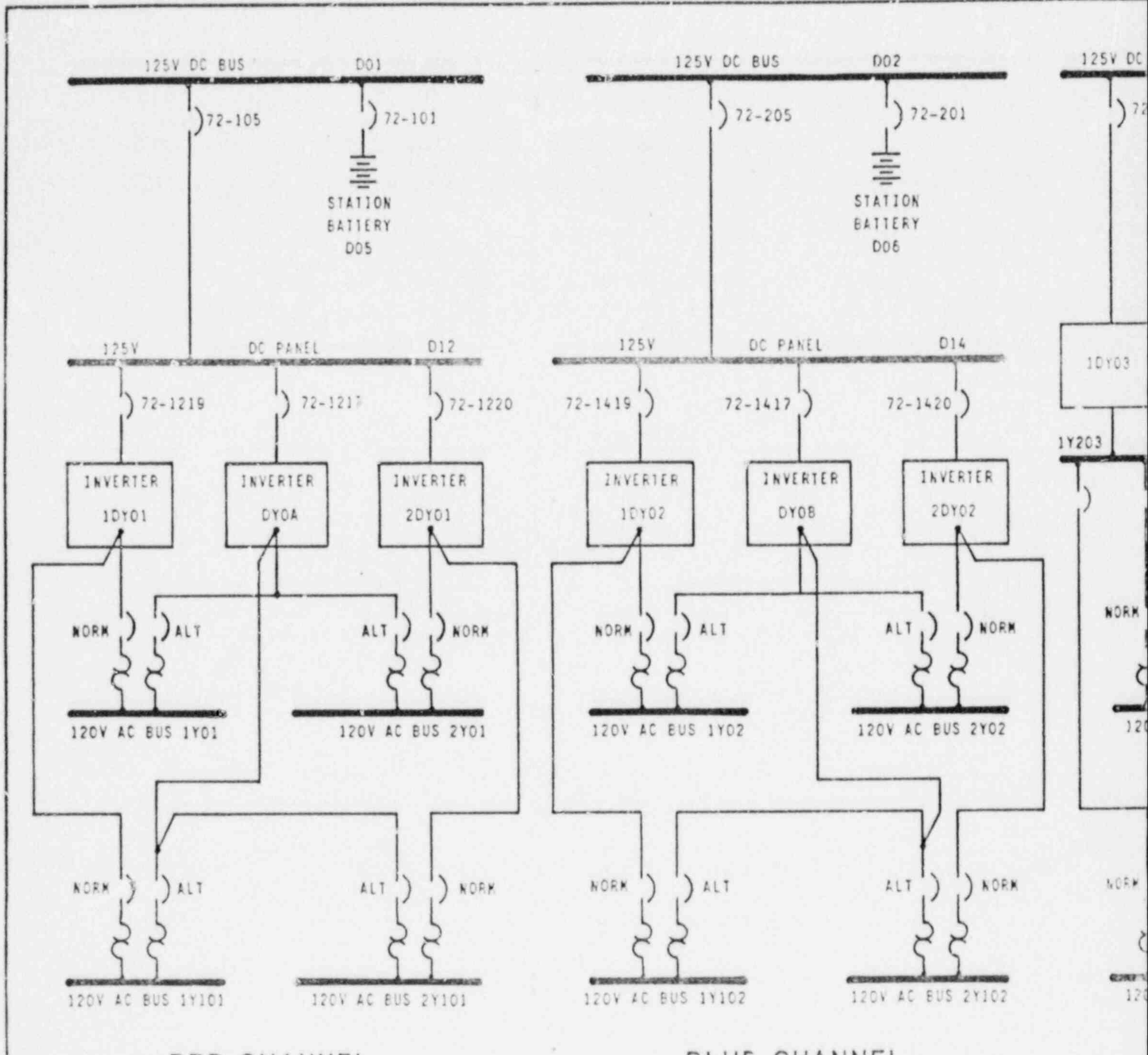
Aperture Card

Figure 2-19 Sheet 2

125 V D.C. ONE LINE DIAGRAM

8803230233 -17



REFERENCE DWG. STONE & WEBSTER 13754-EW-A-2

F025

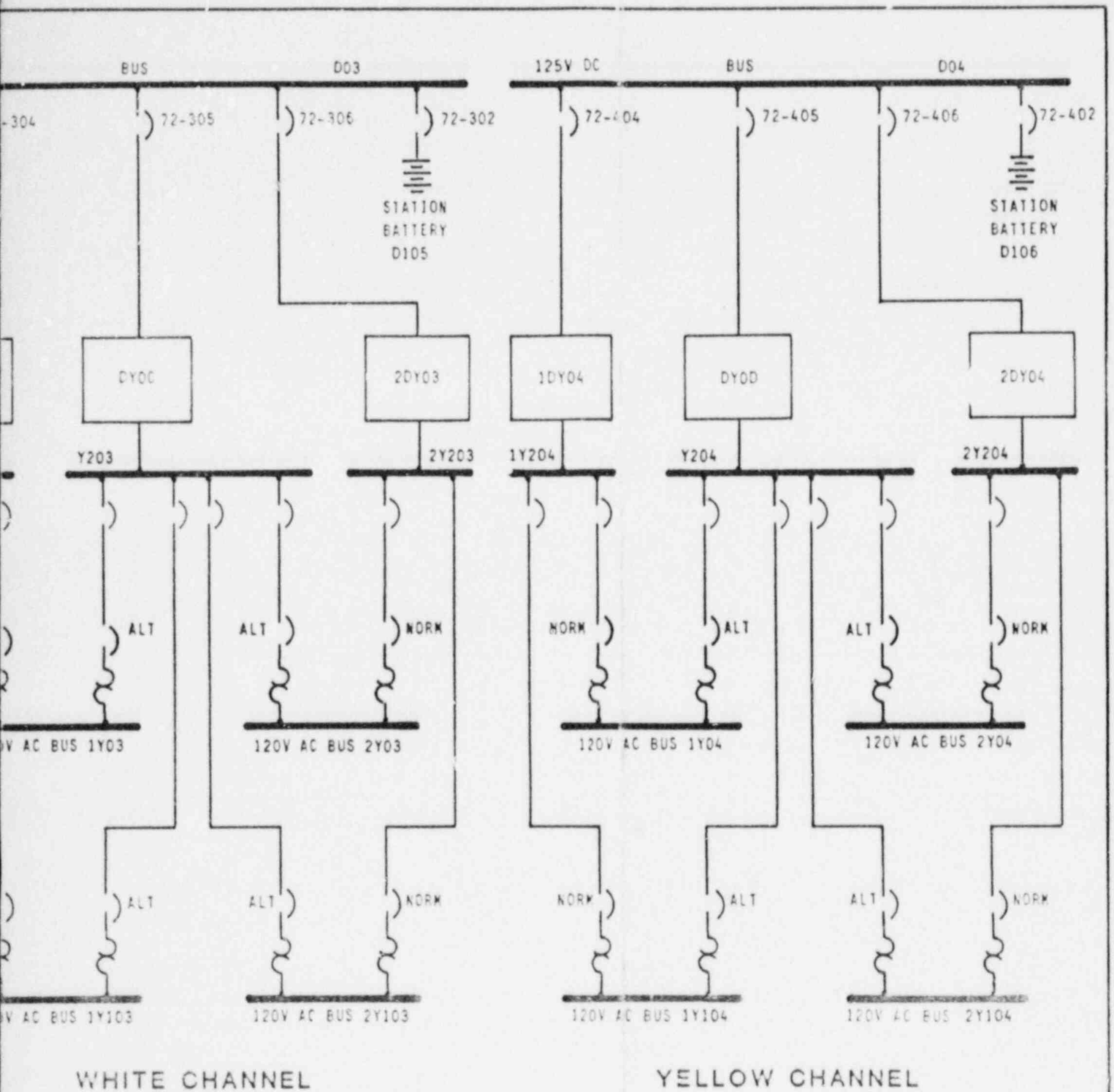


FIG. 2-20

INSTRUMENT BUS ONE LINE DIAGRAM

TABLE 2.1-1: POINT BEACH NUCLEAR PLANT
HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
1A52-58	AC/DC	STA. SERVICE TRANS. [1-X13] BREAKER	D11	1A05	D13	
1A52-60	AC/DC	EMERGENCY GENERATOR BREAKER	D11	G01	D13	
1A52-61	AC/DC	BUS TIE BREAKER	D11	1A05 to 1A06	D13	
1A52-64	AC/DC	STA. SERVICE TRANS. [1-X14] BREAKER	D13	1A06	D11	
1A52-66	AC/DC	EMERGENCY GENERATOR BREAKER	D13	G02	D11	
1-X13	AC/DC	STATION SERVICE TRANSFORMER		1A05		
1-X14	AC/DC	STATION SERVICE TRANSFORMER		1A06		
1B52-16B	AC/DC	STA. SERVICE TRANS. [1-X13] BREAKER	D11	1A05	D13	
1B52-16C	AC/DC	BUS TIE BREAKER	D11	1B03 to 1B04	D13	
1B52-17B	AC/DC	STA. SERVICE TRANS. [1-X14] BREAKER	D13	1A06	D11	
2A52-67	AC/DC	EMERGENCY GENERATOR BREAKER	D13	G02	D11	
2A52-69	AC/DC	STA. SERVICE TRANS. [2-X14] BREAKER	D13	2A06	D11	
2A52-72	AC/DC	BUS TIE BREAKER	D11	2A05 to 2A06	D13	
2A52-73	AC/DC	EMERGENCY GENERATOR BREAKER	D11	G01	D13	
2A52-75	AC/DC	STA. SERVICE TRANS. [2-X13] BREAKER	D11	2A05	D13	
2-X13	AC/DC	STATION SERVICE TRANSFORMER		2A05		
2-X14	AC/DC	STATION SERVICE TRANSFORMER		2A06		
2B52-25B	AC/DC	STA. SERVICE TRANS. [2-X14] BREAKER	D13	2A06	D11	
2B52-40B	AC/DC	STA. SERVICE TRANS. [2-X13] BREAKER	D11	2A05	D13	
2B52-40C	AC/DC	BUS TIE BREAKER	D11	2B03 to 2B04	D13	
D01	AC/DC	MAIN 125VDC DISTRIBUTION BUS		D05		
D02	AC/DC	MAIN 125VDC DISTRIBUTION BUS		D06		
D05	AC/DC	STATION BATTERY NO. 1				
D06	AC/DC	STATION BATTERY NO. 2				
D11	AC/DC	125VDC DISTRIBUTION PANEL		D01		

TABLE 2.1-1 (continued)

HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
D12	AC/DC	125VDC DISTRIBUTION PANEL		D01		
D13	AC/DC	125VDC DISTRIBUTION PANEL		D02		
D14	AC/DC	125VDC DISTRIBUTION PANEL		D02		
D16	AC/DC	125VDC DISTRIBUTION PANEL		D11		
D17	AC/DC	125VDC DISTRIBUTION PANEL		D11		
D18	AC/DC	125VDC DISTRIBUTION PANEL		D13		
D19	AC/DC	125VDC DISTRIBUTION PANEL		D13		
D21	AC/DC	125VDC DISTRIBUTION PANEL		D13		
D22	AC/DC	125VDC DISTRIBUTION PANEL		D11		
D105	AC/DC	STATION BATTERY				
D106	AC/DC	STATION BATTERY				
G01	AC/DC	DIESEL GENERATOR	D11,D12,D18		D31	
G02	AC/DC	DIESEL GENERATOR	D13,D14,D16		D41	
1-MOV4000	AFWS	AFW ISOLATION MOV [1-P29]	D14	D14		
1-MOV4001	AFWS	AFW ISOLATION MOV [1-P29]	D12	D12		
1-CV-4002	AFWS	AFW RECIRCULATION AOV	D12			
1-MOV4006	AFWS	SWS BACKUP FEEDWATER SUPPLY TO 1-P29	1B42	1B42		
1-P29	AFWS	AUX. FEED PUMP (TURBINE DRIVEN)				
2-MOV4000	AFWS	AFW ISOLATION MOV [2-P29]	D14	D14		
2-MOV4001	AFWS	AFW ISOLATION MOV [2-P29]	D12	D12		
2-CV-4002	AFWS	AFW RECIRCULATION AOV	D12			
2-MOV4006	AFWS	SWS BACKUP FEEDWATER SUPPLY TO 2-P29	2B42	2B42		
2-P29	AFWS	AUX. FEED PUMP (TURBINE DRIVEN)				
CV-4007	AFWS	AFW RECIRCULATION AOV	D11		D13	
MOV4009	AFWS	SWS BACKUP FEEDWATER SUPPLY TO P38A	1B32	1B32		

TABLE 2.1-1 (continued)

HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
CV-4014	AFWS	AFW RECIRCULATION AOV	D13		D11	
MOV4016	AFWS	SWS BACKUP FEEDWATER SUPPLY TO P38B	2B42	2B42		
MOV4020	AFWS	AFW ISOLATION MOV [P38A]	2B42	2B42		
MOV4021	AFWS	AFW ISOLATION MOV [P38B]	1B42	1B42		
MOV4022	AFWS	AFW ISOLATION MOV [P38A]	2B32	2B32		
MOV4023	AFWS	AFW ISOLATION MOV [P38B]	1B32	1B32		
P38A	AFWS	AUX. FEED PUMP (MOTOR DRIVEN)	D11	1B03	D13	
P38B	AFWS	AUX. FEED PUMP (MOTOR DRIVEN)	D13	2B04	D11	
CV4012	AFWS	AUX. FEED PUMP P38A FLOW CONTROL				
CV4019	AFWS	AUX. FEED PUMP P38B FLOW CONTROL				
1-LCV112B	CVCS	RWST CHARGING WATER SUPPLY ISOLATION MOV	1B32	1B32		
1-LCV112C	CVCS	VCT CHARGING WATER SUPPLY ISOLATION MOV	1B32	1B32		
1-P2A	CVCS	CHARGING PUMP	D11/D13	1B03	D13	
1-P2B	CVCS	CHARGING PUMP	D11	1B03	D13	
1-P2C	CVCS	CHARGING PUMP	D13	1B04	D11	
1-V200A	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			
1-V200B	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			
1-V200C	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			
2-LCV112B	CVCS	RWST CHARGING WATER SUPPLY ISOLATION MOV	2B32	2B32		
2-LCV112C	CVCS	VCT CHARGING WATER SUPPLY ISOLATION MOV	2B32	2B32		
2-P2A	CVCS	CHARGING PUMP	D11/D13	2B03	D13	
2-P2B	CVCS	CHARGING PUMP	D11	2B03	D13	
2-P2C	CVCS	CHARGING PUMP	D13	2B04	D11	
2-V200A	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			
2-V200B	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			

TABLE 2.1-1 (continued)

HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
2-V200C	CVCS	NORMAL LETDOWN ORIF. ISOLATION VALVE AOV	D17			
1T13	CVCS	REFUELING WATER STORAGE TANK				
2T13	CVCS	REFUELING WATER STORAGE TANK				
1-CV2015	MSS	SG ATM DUMP VALVE [1-HX1B] AOV	1Y03		2Y02	
1-CV2016	MSS	SG ATM DUMP VALVE [1-HX1A] ACV	1Y03		1Y03	
1-MOV2019	MSS	AFW PUMP [1-P29] STEAM SUPPLY MOV	D12	D12		
1-MOV2020	MSS	AFW PUMP [1-P29] STEAM SUPPLY MOV	D14	D14		
1-CV2017	MSS	MAIN STEAM ISOLATION VALVES	D17, D21			
1-CV2018	MSS	MAIN STEAM ISOLATION VALVES	D17, D21			
1-CV5958	MSS	SG BLOWDOWN AOV (1HX-1A)	D17			
1-CV5959	MSS	SG BLOWDOWN AOV (1HX-1B)	D17			
2-CV2015	MSS	SG ATM DUMP VALVE [2-HX1B] AOV	2Y03		2Y02	
2-CV2016	MSS	SG ATM DUMP VALVE [2-HX1A] AOV	2Y03		2Y03	
2-MOV2019	MSS	AFW PUMP [2-P29] STEAM SUPPLY MOV	D12	D12		
2-MOV2020	MSS	AFW PUMP [2-P29] STEAM SUPPLY MOV	D14	D14		
2-CV2017	MSS	MAIN STEAM ISOLATION VALVE	D19, D22			
2-CV2018	MSS	MAIN STEAM ISOLATION VALVE	D19, D22			
2-CV5958	MSS	SG BLOWDOWN AOV (2HX-1B)	D17			
2-CV5959	MSS	SG BLOWDOWN AOV (2HX-1A)	D17			
T24A	CS	CONDENSATE STORAGE TANK				
T24B	CS	CONDENSATE STORAGE TANK				
1-PCV430	RCS	PRESSURIZER PRESSURE RELIEF AOV	D19			
1-PCV431C	RCS	PRESSURIZER PRESSURE RELIEF AOV	D17			
2-PCV430	RCS	PRESSURIZER PRESSURE RELIEF AOV	D19			

TABLE 2.1-1 (continued)

HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL		ALTERNATE CONTROL	
			CONTROL	POWER	CONTROL	POWER
2-PCV431C	RCS	PRESSURIZER PRESSURE RELIEF AOV	D17			
1-TE451B	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM. LOOP 'B'		1Y101		C207 Note 1
1-TE451C	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM. LOOP 'B'		1Y101		C207 Note 1
1-PT483	PMS	'B' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		1Y01		C207 Note 1
1-LT470A	PMS	'B' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		1Y101		C207 Note 1
1-PT420	PMS	RCS PRESSURE TRANSMITTER (W.R.)		1Y101		C207 Note 1
1-LT426	PMS	PRESSURIZER LEVEL TRANSMITTER		1Y01		C207 Note 1
1-N40	PMS	FLUX MONITOR		1Y02		C207 Note 1
2-TE451B	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'B'		2Y101		C207 Note 1
2-TE451C	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'B'		2Y101		C207 Note 1
2-PT483	PMS	'B' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		2Y01		C207 Note 1
2-LT470A	PMS	'B' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		2Y101		C207 Note 1
2-PT420	PMS	RCS PRESSURE TRANSMITTER (W.R.)		2Y101		C207 Note 1
2-LT426	PMS	PRESSURIZER LEVEL TRANSMITTER		2Y01		C207 Note 1
2-N40	PMS	FLUX MONITOR		2Y02		C207 Note 1
1-TE450D	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'A'		1Y103		
1-TE450A	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'A'		1Y103		
1-PT469	PMS	'A' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		1Y03		
1-LT460B	PMS	'A' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		1Y103		
1-PT420A	PMS	RCS PRESSURE TRANSMITTER (W.R.)		1Y103		
1-LT427	PMS	PRESSURIZER LEVEL TRANSMITTER		1Y03		
2-TE450D	PMS	REACTOR COOLANT HOT LEG TEMP. ELM., LOOP 'A'		2Y103		
2-TE450A	PMS	REACTOR COOLANT COLD LEG TEMP. ELM., LOOP 'A'		2Y103		
2-PT469	PMS	'A' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		2Y03		
2-LT460B	PMS	'A' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		2Y103		

TABLE 2.1-1 (continued)

HOT SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
2-PT420A	PMS	RCS PRESSURE TRANSMITTER (W.R.)		2Y103		
2-LT427	PMS	PRESSURIZER LEVEL TRANSMITTER		2Y03		
P32A	SWS	SW PUMP	D11	1B03	D13	
P32B	SWS	SW PUMP	D11/D13	1B03	D13	
P32C	SWS	SW PUMP	D13/D11	1B04	D11	
P32D	SWS	SW PUMP	D13	2B04	D11	
P32E	SWS	SW PUMP	D13/D11	2B04	D11	
P32F	SWS	SW PUMP	D11/D13	2B03	D13	
CV2838	SWS	CONTROL VALVE G01 COOLING AOV	2Y05			
CV2839	SWS	CONTROL VALVE G02 COOLING AOV	1Y05			
1-SV2090	SWS	COOLING TO TURBINE-DRIVEN AFW PUMP LUBE OIL COOLER		1Y06		
2-SV2090	SWS	COOLING TO TURBINE-DRIVEN AFW PUMP LUBE OIL COOLER		2Y06		

Note 1: Instrumentation required for alternate shutdown. Alternate Power provided by station batteries through a dedicated inverter.

TABLE 2.1-2: POINT BEACH NUCLEAR PLANT

COLD SHUTDOWN COMPONENTS

			ELECTRICAL SOURCES			
			NORMAL		ALTERNATE	
COMPONENT	SYSTEM	DESCRIPTION	CONTROL	POWER	CONTROL	POWER
1A52-58	AC/DC	STA. SERVICE TRANS. [1-X13] BREAKER	D11	1A05	D13	
1A52-60	AC/DC	EMERGENCY GENERATOR BREAKER	D11	G01	D13	
1A52-61	AC/DC	BUS TIE BREAKER	D11	1A05 to 1A06	D13	
1A52-64	AC/DC	STA. SERVICE TRANS. [1-X14] BREAKER	D13	1A06	D11	
1A52-66	AC/DC	EMERGENCY GENERATOR BREAKER	D13	G02	D11	
1-X13	AC/DC	STATION SERVICE TRANSFORMER		1A05		
1-X14	AC/DC	STATION SERVICE TRANSFORMER		1A06		
1B52-14B	AC/DC	SAFEGUARD MCC-1B32 BREAKER	D11	1B03	D13	
1B52-16B	AC/DC	STA. SERVICE TRANS. [1-X13] BREAKER	D11	1A05	D13	
1B52-16C	AC/DC	BUS TIE BREAKER	D11	1B03 to 1B04	D13	
1B52-17B	AC/DC	STA. SERVICE TRANS. [1-X14] BREAKER	D13	1A06	D11	
1B52-23C	AC/DC	SAFEGUARD MCC-1B42 BREAKER	D13	1B04	D11	
2A52-67	AC/DC	EMERGENCY GENERATOR BREAKER	D13	G02	D11	
2A52-69	AC/DC	STA. SERVICE TRANS. [2-X14] BREAKER	D13	2A06	D11	
2A52-72	AC/DC	BUS TIE BREAKER	D11	2A05 to 2A06	D13	
2A52-73	AC/DC	EMERGENCY GENERATOR BREAKER	D11	G01	D13	
2A52-75	AC/DC	STA. SERVICE TRANS. [2-X13] BREAKER	D11	2A05	D13	
2-X13	AC/DC	STATION SERVICE TRANSFORMER		2A05		
2-X14	AC/DC	STATION SERVICE TRANSFORMER		2A06		
2B52-25B	AC/DC	STA. SERVICE TRANS. [2-X14] BREAKER	D13	2A06	D11	
2B52-32C	AC/DC	SAFEGUARD MCC-2B42 BREAKER	D13	2B04	D11	
2B52-38B	AC/DC	SAFEGUARD MCC-2B32 BREAKER	D11	2B03	D13	
2B52-40B	AC/DC	STA. SERVICE TRANS. [2-X13] BREAKER	D11	2A05	D13	
2B52-40C	AC/DC	BUS TIE SERVICE	D11	2B03 to 2B04	D13	

TABLE 2.1-2 (continued)

COLD SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
D01	AC/DC	MAIN 125VDC DISTRIBUTION BUS		D05		
D02	AC/DC	MAIN 125VDC DISTRIBUTION BUS		D06		
D05	AC/DC	STATION BATTERY NO. 1				
D06	AC/DC	STATION BATTERY NO. 2				
D11	AC/DC	125VDC DISTRIBTUION PANEL		D01		
D12	AC/DC	125VDC DISTRIBTUION PANEL		D01		
D13	AC/DC	125VDC DISTRIBTUION PANEL		D02		
D14	AC/DC	125VDC DISTRIBTUION PANEL		D02		
D16	AC/DC	125VDC DISTRIBTUION PANEL		D11		
D17	AC/DC	125VDC DISTRIBTUION PANEL		D11		
D18	AC/DC	125VDC DISTRIBTUION PANEL		D13		
D19	AC/DC	125VDC DISTRIBTUION PANEL		D13		
D21	AC/DC	125VDC DISTRIBTUION PANEL		D13		
D22	AC/DC	125VDC DISTRIBTUION PANEL		D11		
G01	AC/DC	DIESEL GENERATOR	D11,D12,D18			
G02	AC/DC	DIESEL GENERATOR	D13,D14,D16			
D105	AC/DC	STATION BATTERY				
D106	AC/DC	STATION BATTERY				
1-MOV738A	CCWS	CCWS TO RHR HX ISOLATION MOV	1B32	1B32		
1-MOV738B	CCWS	CCWS TO RHR HX ISOLATION MOV	1B42	1B42		
1-P11A	CCWS	CCWS PUMP	D11/D13	1B03	D13	
1-P11B	CCWS	CCWS PUMP	D13/D11	1B04	D11	
2-MOV738A	CCWS	CCWS TO RHR HX ISOLATION MOV	2B32	2B32		
2-MOV738B	CCWS	CCWS TO RHR HX ISOLATION MOV	2B42	2B42		

TABLE 2.1-2 (continued)

COLD SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
2-P11A	CCWS	CCWS PUMP	D11/D13	2B03	D13	
2-P11B	CCWS	CCWS PUMP	D13/D11	2B04	D11	
HX12A	CCWS	CCWS HEAT EXCHANGER				
HX12B	CCWS	CCWS HEAT EXCHANGER				
HX12C	CCWS	CCWS HEAT EXCHANGER				
HX12D	CCWS	CCWS HEAT EXCHANGER				
1-CV2015	MSS	SG ATM DUMP VALVE [1-HX1B] AOV	1Y03		2Y02	
1-CV2016	MSS	SG ATM DUMP VALVE [1-HX1A] AOV	1Y03		1Y03	
1-CV2017	MSS	MAIN STEAM ISOLATION VALVES	D17, D21			
1-CV2018	MSS	MAIN STEAM ISOLATION VALVES	D17, D21			
2-CV2015	MSS	SG ATM DUMP VALVE [2-HX1B] AOV	2Y03		2Y02	
2-CV2016	MSS	SG ATM DUMP VALVE [2-HX1A] AOV	2Y03		2Y03	
2-CV2017	MSS	MAIN STEAM ISOLATION VALVE	D19, D22			
2-CV2018	MSS	MAIN STEAM ISOLATION VALVE	D19, D22			
1-PCV430	RCS	PRESSURIZER PRESSURE RELIEF AOV	D19			
1-PCV431C	RCS	PRESSURIZER PRESSURE RELIEF AOV	D17			
2-PCV430	RCS	PRESSURIZER PRESSURE RELIEF AOV	D19			
2-PCV431C	RCS	PRESSURIZER PRESSURE RELIEF AOV	D17			
1-MOV852A	RHR	RHR INJECTION ISOLATION MOV	1B32	1B32		
1-MOV852B	RHR	RHR INJECTION ISOLATION MOV	1B42	1B42		
1-FCV626	RHR	RHR HXS BYPASS ISOLATION AOV	1Y01		1Y02	
1-HCV624	RHR	RHR HX FLOW CONTROL AOV	1Y02			
1-HCV625	RHR	RHR HX FLOW CONTROL AOV	1Y02			
1-HX11A	RHR	RHR HEAT EXCHANGER				

TABLE 2.1-2 (continued)

COLD SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
1-HX11B	RHR	RHR HEAT EXCHANGER				
1-MOV700	RHR	RHR/RCS BOUNDARY ISOLATION MOV	1B32	1B32		
1-MOV701	RHR	RHR/RCS BOUNDARY ISOLATION MOV	1B42	1B42		
1-MOV841A	SI	ACCUMULATOR ISOLATION	1B32	1B32		
1-MOV841B	SI	ACCUMULATOR ISOLATION	1B42	1B42		
1-P10A	RHR	RHR PUMP	D11/D13	1B03	D13	
1-P10B	RHR	RHR PUMP	D13/D11	1B04	D11	
2-MOV841A	SI	ACCUMULATOR ISOLATION	2B32	2B32		
2-MOV841B	SI	ACCUMULATOR ISOLATION	2B42	2B42		
2-MOV852A	RHR	RHR INJECTION ISOLATION MOV	2B32	2B32		
2-MOV852B	RHR	RHR INJECTION ISOLATION MOV	2B42	2B42		
2-FCV626	RHR	RHR HXS BYPASS ISOLATION AOV	2Y01		2Y02	
2-HCV624	RHR	RHR HX FLOW CONTROL AOV	2Y02			
2-HCV625	RHR	RHR HX FLOW CONTROL AOV	2Y02			
2-HX11A	RHR	RHR HEAT EXCHANGER				
2-HX11B	RHR	RHR HEAT EXCHANGER				
2-MOV700	RHR	RHR/RCS BOUNDARY ISOLATION MOV	2B32	2B32		
2-MOV701	RHR	RHR/RCS BOUNDARY ISOLATION MOV	2B42	2B42		
2-P10A	RHR	RHR PUMP	D11/D13	2B03	D13	
2-P10B	RHR	RHR PUMP	D13/D11	2B04	D11	
1-TE451B	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'B'		1Y101		C207 Note 1
1-TE451C	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'B'		1Y101		C207 Note 1
1-PT483	PMS	'B' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		1Y01		C207 Note 1
1-LT470A	PMS	'B' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		1Y101		C207 Note 1

TABLE 2.1-2 (continued)

COLD SHUTDOWN COMPONENTS

COMPONENT	SYSTEM	DESCRIPTION	ELECTRICAL SOURCES NORMAL CONTROL	NORMAL POWER	ALTERNATE CONTROL	ALTERNATE POWER
1-PT420	PMS	RCS PRESSURE TRANSMITTER (W.R.)		1Y101		C207 Note 1
1-LT426	PMS	PRESSURIZER LEVEL TRANSMITTER		1Y01		C207 Note 1
2-TE451B	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'B'		2Y101		C207 Note 1
2-TE451C	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'B'		2Y101		C207 Note 1
2-PT483	PMS	'B' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		2Y01		C207 Note 1
2-LT470A	PMS	'B' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		2Y101		C207 Note 1
2-PT420	PMS	RCS PRESSURE TRANSMITTER (W.R.)		2Y101		C207 Note 1
2-LT426	PMS	PRESSURIZER LEVEL TRANSMITTER		2Y01		C207 Note 1
1-TE450D	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'A'		1Y103		
1-TE450A	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'A'		1Y103		
1-PT469	PMS	'A' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		1Y03		
1-LT460B	PMS	'A' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		1Y103		
1-PT420A	PMS	RCS PRESSURE TRANSMITTER (W.R.)		1Y103		
1-LT427	PMS	PRESSURIZER LEVEL TRANSMITTER		1Y03		
2-TE450D	PMS	REACTOR COOLANT HOT LEG TEMP. ELEM., LOOP 'A'		2Y103		
2-TE450A	PMS	REACTOR COOLANT COLD LEG TEMP. ELEM., LOOP 'A'		2Y103		
2-PT469	PMS	'A' STEAM GENERATOR PRESSURE TRANSMITTER (W.R.)		2Y03		
2-LT460B	PMS	'A' STEAM GENERATOR LEVEL TRANSMITTER (W.R.)		2Y103		
2-PT420A	PMS	RCS PRESSURE TRANSMITTER (W.R.)		2Y103		
2-LT427	PMS	PRESSURIZER LEVEL TRANSMITTER		2Y03		
P32A	SWS	SW PUMP	D11	1B03	D13	
P32B	SWS	SW PUMP	D11/D13	1B03	D13	
P32C	SWS	SW PUMP	D13/D11	1B04	D11	
P32D	SWS	SW PUMP	D13	2B04	D11	

TABLE 2.1-2 (continued)

COLD SHUTDOWN COMPONENTS

			ELECTRICAL SOURCES			
			NORMAL		ALTERNATE	
COMPONENT	SYSTEM	DESCRIPTION	CONTROL	POWER	CONTROL	POWER
P32E	SWS	SW PUMP	D13/D11	2B04	D11	
P32F	SWS	SW PUMP	D11/D13	2B03	D13	
CV2838	SWS	CONTROL VALVE G01 COOLING AOV	2Y05			
CV2839	SWS	CONTROL VALVE G02 COOLING AOV	1Y05			

Note 1: Instrumentation required for alternate shutdown. Alternate power provided by station batteries through a dedicated inverter.

3.0 Proposed Modifications For Alternate Shutdown Capability

3.1 Introduction

For the Point Beach Nuclear Plant 4160 volt switchgear room, compliance with the provisions of Section III.G.2 cannot be effectively or economically achieved due to the configuration of safe shutdown equipment, cables and associated circuits. For this area WE has determined that the appropriate technical approach necessary to comply with the provisions of Section III of Appendix R is to provide an alternate shutdown capability. This section provides information for the proposed plant modifications necessary to provide alternate shutdown capability for the 4160V switchgear room.

3.2 Scope

A postulated fire in the 4160 volt switchgear room could interrupt the transmission of electrical power from the emergency power diesel generators through the 4160 volt and 480 volt electrical systems to designated safe shutdown equipment. The following modifications are to be provided to meet the requirements of Section III.L.2 of Appendix R.

1. Power systems will be modified to provide an alternate power supply and a power transmission network to safe shutdown and supporting systems.

2. Electrical Systems will be modified to provide alternate safe shutdown capability for the following safe shutdown and supporting components.

   a. CVCS charging pumps
   b. Residual heat removal pumps
   c. Component cooling water pumps
   d. Service water pumps

3.3 Emergency Power System

Separation of buses 1A05, 1A06, 2A05 and 2A06 and associated cables in the 4160 volt switchgear room does not comply with the requirements of Section III.G.2 of Appendix R Therefore a postulated fire could affect power supplies from both diesel generators. The existing gas turbine generator described in Section 2.3.8 will provide power for the alternate shutdown capability.

3.3.1 Gas Turbine

The gas turbine and all starting and loading components, including control of the gas turbine output breaker, are located within the gas turbine building which is more than 75 feet remote from safety related structures and is independent of the 4160 volt switchgear room. Cables, which provide for instrumentation and gas turbine control in the control room, are external to the gas turbine building. These cables are also independent of the 4160 volt switchgear room. Therefore,

the gas turbine satisfies the guidance of Section 5.3.6 of Enclosure 2 to Generic Letter 86-10 without modification.

3.3.2 13,800 Volt System

The 13,800 volt system does not contain sufficient bus capacity to provide a path for alternate shutdown power. The system is being expanded to provide additional capacity and improved reliability. In the revised arrangement, bus number 1HX04 is replaced by bus H02 and bus number 2HX04 is replaced by bus H03. The gas turbine generator is connected to a new tie bus H01. The new bus H01 provides power to alternate shutdown transformer X08. Bus isolation capability adequate to prevent spurious supply of power to the 4160 Volt switchgear room is provided.

Existing breakers which must be operable in order to load the gas turbine are dependent upon 125 VDC control power which orginates in the 4160 volt switchgear room. Two sources of 125 VDC control power, one of which is independent of the 4160 volt switchgear room, are being provided for the modified 13,800 volt bus arrangement. The capability to operate bus tie breakers, gas turbine generator output breakers and alternate shutdown supply breakers from the control room will be provided. The modified 13,800 volt bus arrangement is shown on Figure 3-1.

3.3.3 480 Volt System

Buses in the normal 480 volt system are supplied through step down transformers from 4160 volt buses located in the switchgear room. A switchgear room fire event could disable all normal 480 volt power supplies. Two alternate shutdown buses B08 and B09 will be provided remote from and independent of the 4160 volt switchgear room. Buses B08 and B09 will be supplied from the 13,800 volt system through step down transformer X08. Bus B08 will provide the necessary power for Unit 1 safe shutdown systems and bus B09 will provide the necessary power for Unit 2 safe shutdown systems. The buses will be solidly connected with space provided for future installation of a tie breaker. The buses will also provide power to a distribution panel for plant services (battery charger, lighting, communications, etc.). Power will also be provided for the fire system jockey pump, service water strainer and lighting in the pumphouse. Undervoltage protection will be provided for each bus to monitor bus energization and to enhance safe equipment operation. The proposed 480 volt alternate shutdown bus arrangement is shown on Figures 3.2.1 and 3.2.2.

3.4 CVCS Charging Pumps

One charging pump is required for each unit in order to achieve safe shutdown. Cross tie breakers are provided between the A train charging pumps of each unit (1P2A-2P2A and 1P2B-2P2B) in order to

provide alternate shutdown capability for the cable spreading room. In the event of a limited fire in the cable spreading room, which could cause the loss of power to all three charging pumps of one unit, power to an A train charging pump can be restored by operation of the cross tie breakers. Cross tie capability is provided on two pumps to ensure alternate shutdown capability should a designated pump be out of service. The cross tie breakers are equipped with manual interlocks to prevent the supply of power from more than a single source at anytime.

A fire in the 4160 volt switchgear room could cause loss of power to all charging pumps for both units. A breaker will be provided at bus B08 to supply alternate power to charging pump 1P2A and a breaker will be provided at bus B09 to supply alternate power to charging pump 2P2A. Existing connections to the cross tie panels for these pumps will be modified to the configuration shown in Figure 3-3. Cable routing between buses B08 and B09 and the cross tie panels will be accomplished in a manner which will maintain existing charging pump power supply cable separation. Pump start capability will be provided at the switch panel location. The existing 1P2B-2P2B cross tie will be retained for cable spreading room alternate shutdown capability. The proposed charging pump alternate shutdown power supply arrangement is shown on Figure 3-3.

3.5 Service Water Pumps

Service water is necessary for cooling the turbine driven auxiliary feedwater pump bearings and for cooling the emergency diesels. In

the event that service water is unavailable, the diesel driven fire pump will supply the auxiliary feedwater pump turbines of both units with bearing cooling water. In the event of a 4160 volt switchgear room fire, all diesel generator output power distribution could be disabled. Therefore, the diese' generators will be shut down for this event. Thus, the service water system is not required to achieve safe hot shutdown in the event of a 4160 volt switchgear room fire.

Two service water pumps are necessary to achieve cold shutdown for both units. One breaker will be provided at each bus B08 and B09 to provide power for two service water pumps. Cross tie panels will be provided for a total of four service water pumps to receive power from the alternate shutdown buses. The cross tie panels will be equipped with a manual interlock to prevent the supply of power from more than a single source at any time.

All wiring between buses B08 and B09 and the service water pump cross tie panels will be independent of the 4160 volt switchgear room. A selector switch will be provided for each pair of service water pumps to ensure that a minimum of two pumps will be available in the event that a designated pump is out of service. Pump starting capability will be provided at the switch panels. The proposed service water pump power supply arrangement is shown on Figure 3-4.

3.6 Residual Heat Removal Pumps

As a result of a postulated fire in various fire zones, redundant RHR pump motor power cables could be damaged. Dedicated power cable

has been labelled and stored for use to reestablish RHR system operability. A repair procedure has been written to direct proper cable installation. The dedicated cable would be routed manually between the normal 480 volt system and the RHR pumps.

A fire in the 4160 volt switchgear room could cause loss of power to the normal 480 volt system and all RHR pumps of both units. A breaker will be provided at Bus B08 to supply alternate power to Unit 1 RHR pump 1P10A or 1P10B and a breaker will be provided at Bus B09 to supply alternate power to Unit 2 RHR pump 2P10A or 2P10B. Cross tie panels will be provided for all pumps of both units. The cross tie panels will be equipped with a manual interlock to prevent the supply of power from more than a single source at any time. A selector switch will be provided for each unit to ensure RHR system availability if one of the redundant pumps is out of service. Pump starting capability will be provided at the switch panel location. The cross tie panels for both units will be train separated by a 3-hour rated fire wall and all wiring between buses B08 and B09 and the selector switches will be independent of the 4160 volt switchgear room and one train of RHR pump normal power supply cables. Power supply cables for one train of RHR pumps for each unit will be provided with a 3-hour fire rated wrap between the cross tie panels and the pumps. The proposed RHR pump power supply arrangement is shown on Figure 3-5.

3.7 Component Cooling Water Pumps

As a result of a postulated fire in the area of the component cooling water pumps, operability of all four pumps could be affected. A spare CCW pump motor and dedicated power cables have been labelled and stored for use to reestablish CCW system operability. A repair procedure has been written to direct proper motor and power cable installation. The dedicated power cable would be routed manually between the normal 480 volt system and the CCW pump. Following installation of the alternate shutdown capability, the labelled and stored cables will no longer be required. The dedicated status and the installation procedure for these cables will be discontinued.

A fire in the 4160 volt switchgear room could cause loss of power to the normal 480 volt system and all CCW pumps of both units. A breaker will be provided at B08 to supply alternate power to Unit 1 CCW pump 1P11A or 1P11B and a breaker will be provided at bus B09 to supply alternate power to Unit 2 CCW pump 2P11A or 2P11B. Plug type connections will be provided at each pump and at a safety switch located in the adjacent fire area. Alternate shutdown power cable will be permanently installed between buses B08 and B09 and the safety switch panels. Dedicated cables will be provided for manual plug insertion connection between the safety switch and a CCW pump. Pump start capability will be provided at the safety switch panel location. The proposed CCW pump power supply arrangement is shown on Figure 3-6.

FIGURE 3.1
13.8 K.V. SYSTEM CONFIGURATION

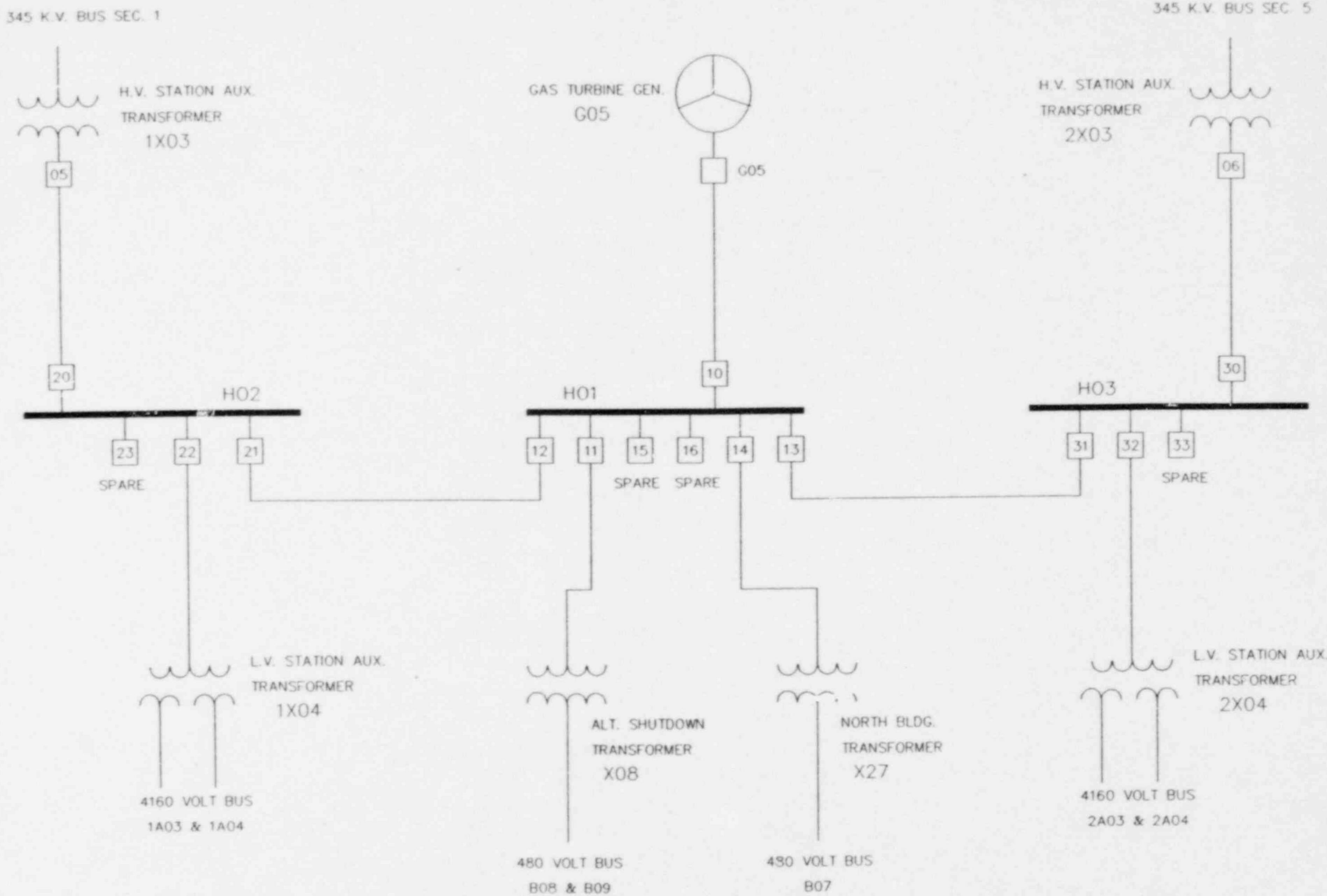
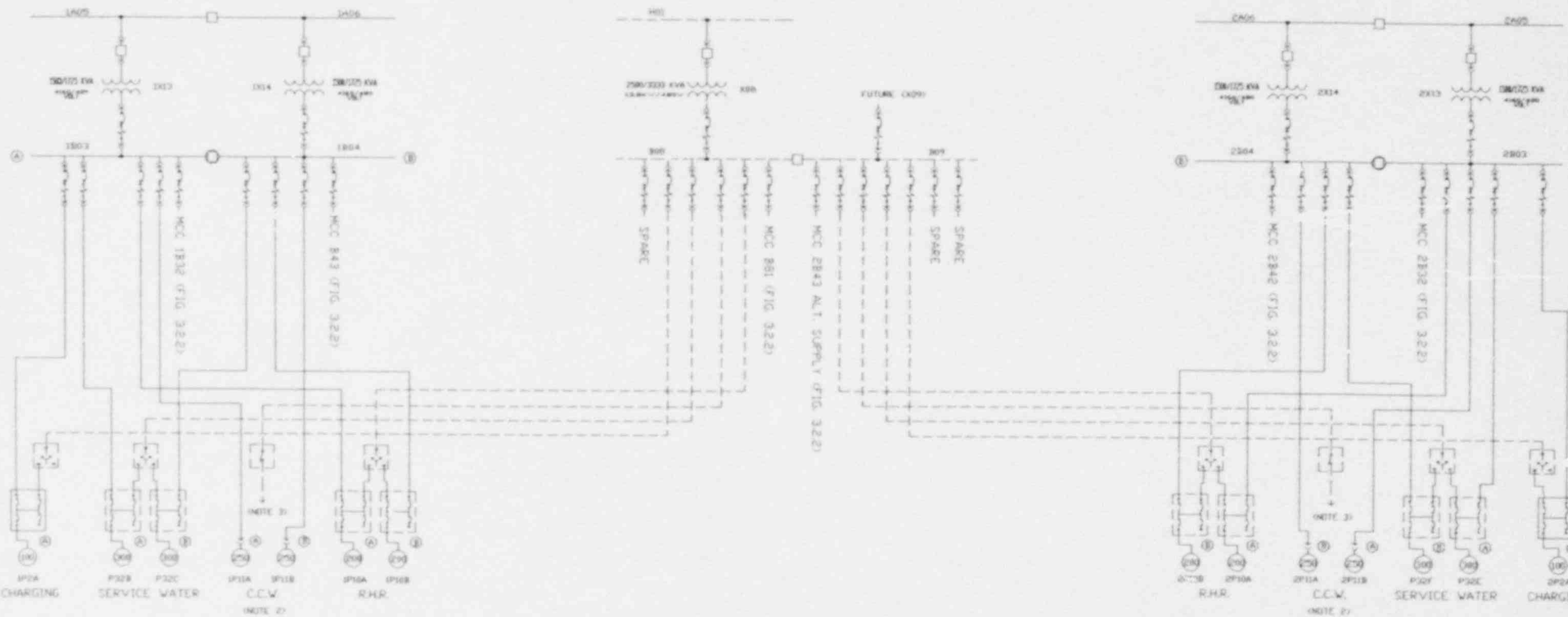


FIGURE 3.2.1

ALTERNATE SHUTDOWN SYSTEM



NOTES: 1) ALL LOADS SHOWN ARE REQUIRED FOR APPENDIX R SHUTDOWN CAPABILITY.

2) CCW PUMPS WILL UTILIZE PLUG-ENDED CABLES FOR ALL CONNECTIONS AT MOTORS.

3) ALTERNATE SUPPLY CABLE FOR C.C.W. PUMPS WILL BE COILED AT SAFETY SWITCH AND EXTENDED TO PUMP MOTOR WHEN NEEDED.

EQUIPMENT LEGEND:

CIRCUIT BREAKER PANELBOARD CONTAINING MOLDED CASE SWITCHES. SWITCHES ARE MECHANICALLY INTERLOCKED SUCH THAT ONLY ONE SOURCE MAY SUPPLY THE PANEL BUS AT A GIVEN TIME.

600 VOLT, 3-POLE, DOUBLE THROW SAFETY SWITCH. MANUALLY OPERATED, NON-FUSED TRANSFER SWITCH.

600 VOLT, 3-POLE, MANUALLY OPERATED SAFETY SWITCH.

A.G.S. FILE NO. JJH10

FIGURE 3.2.2
ALTERNATE SHUTDOWN SYSTEM

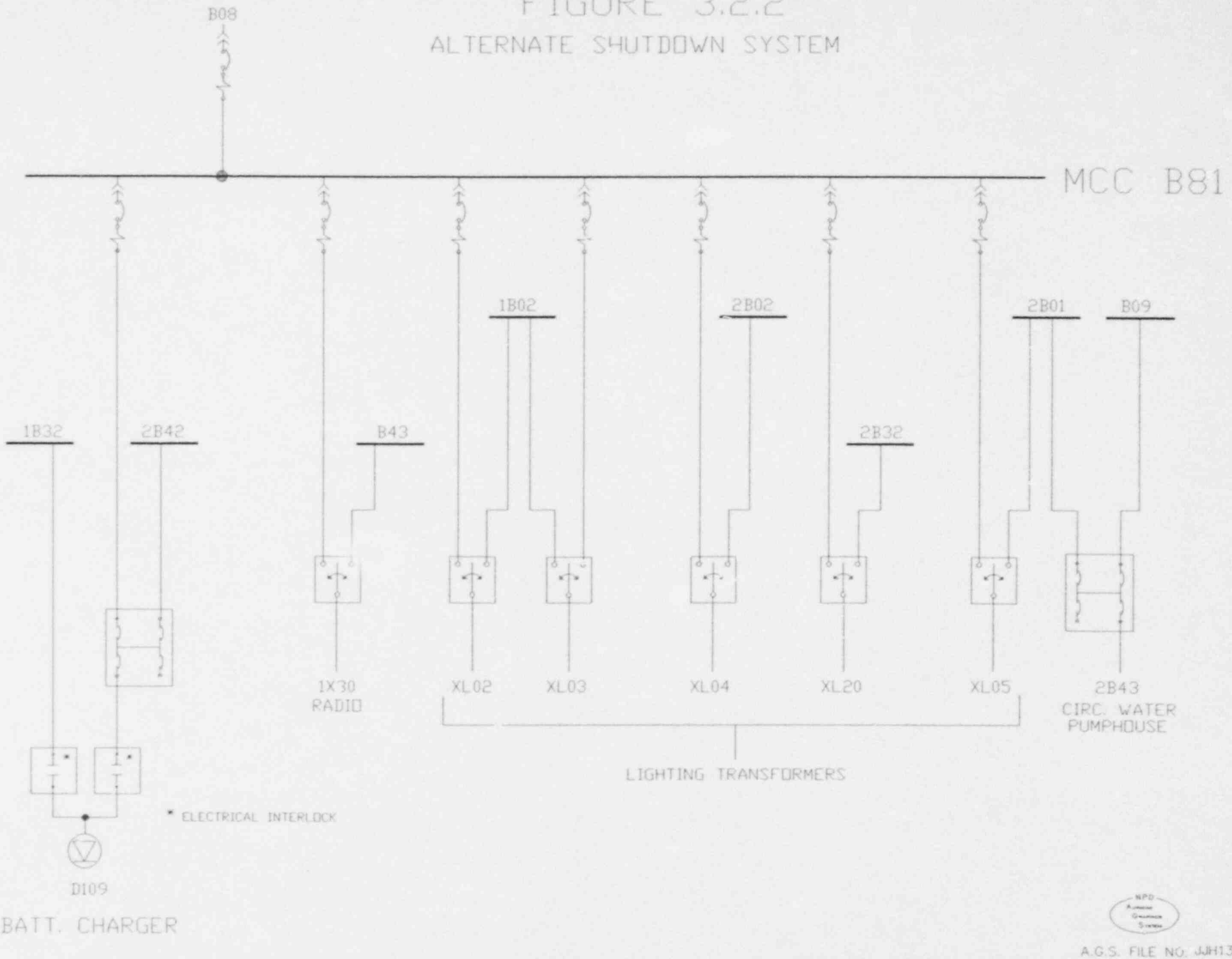


FIGURE 3.3
CHARGING SYSTEM

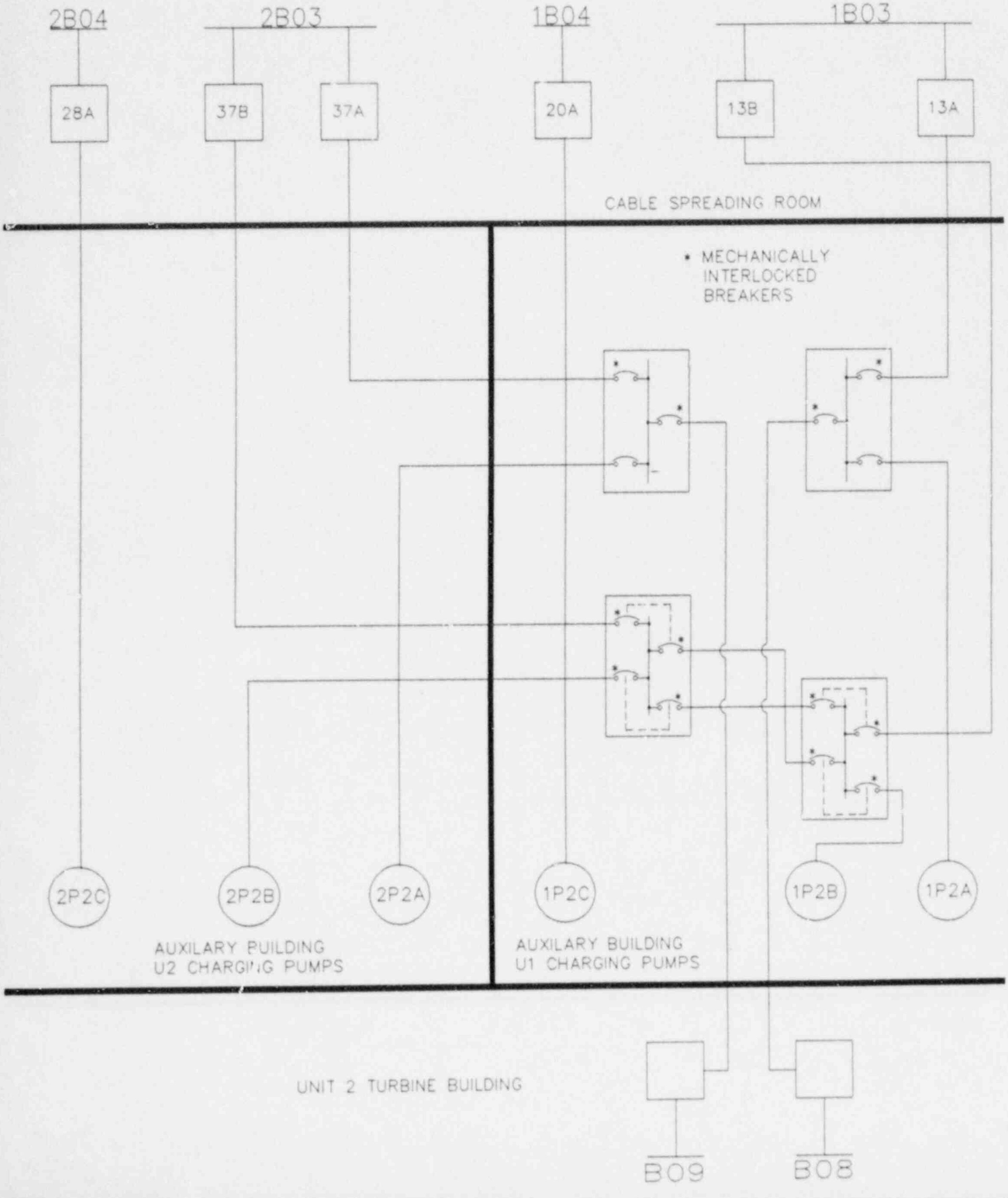


FIGURE 3.4
SERVICE WATER SYSTEM

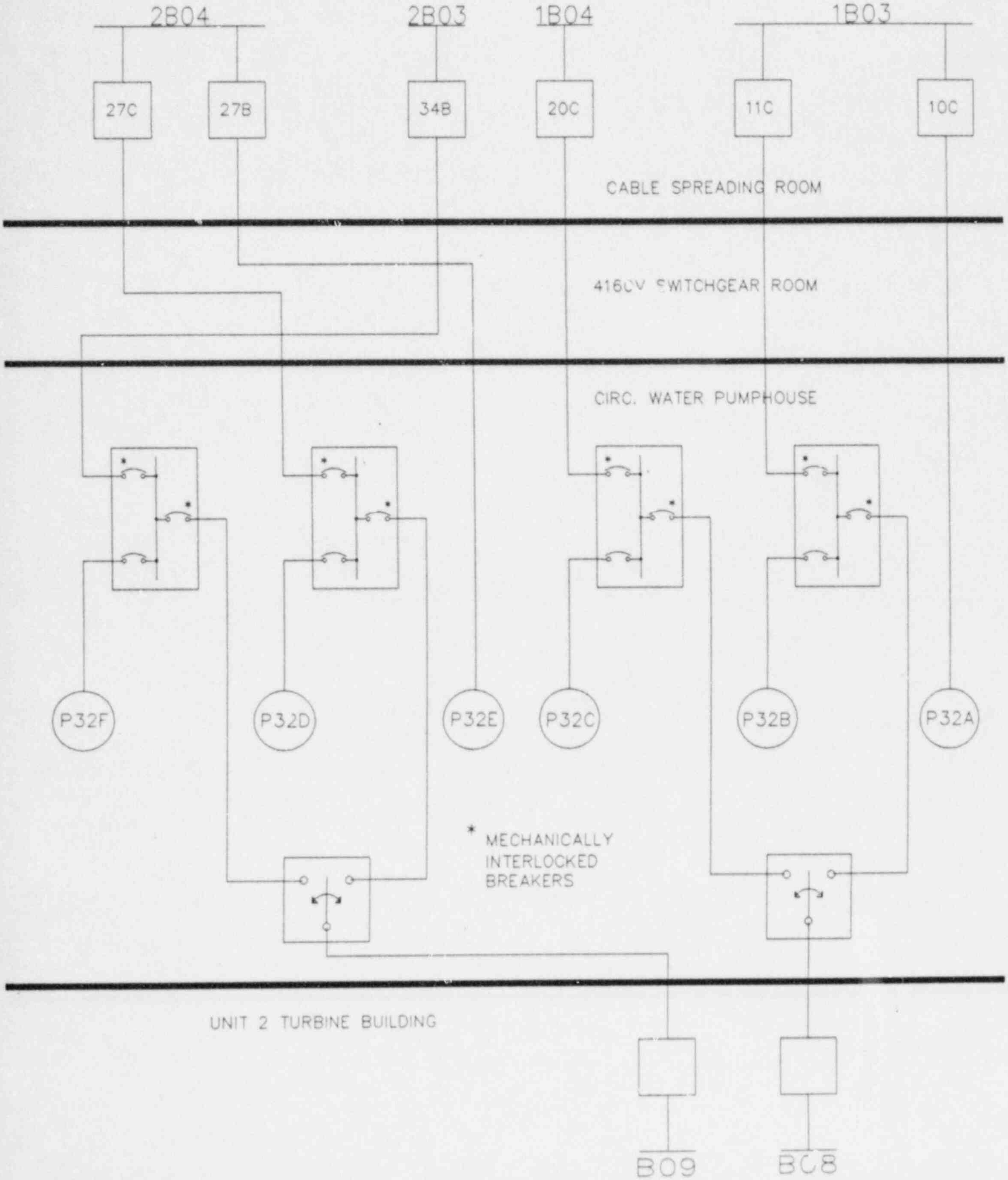


FIGURE 3.5
R.H.R. SYSTEM

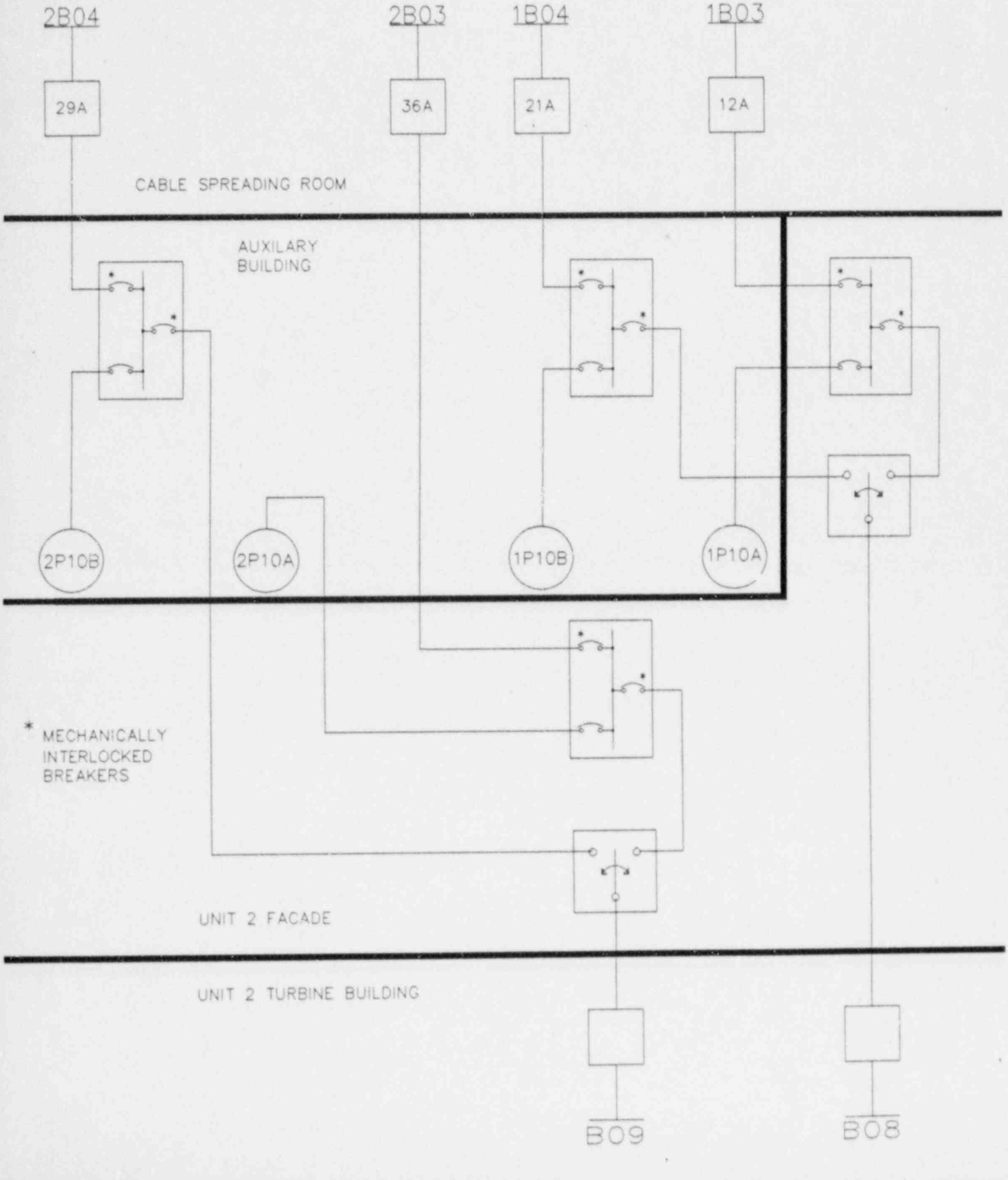
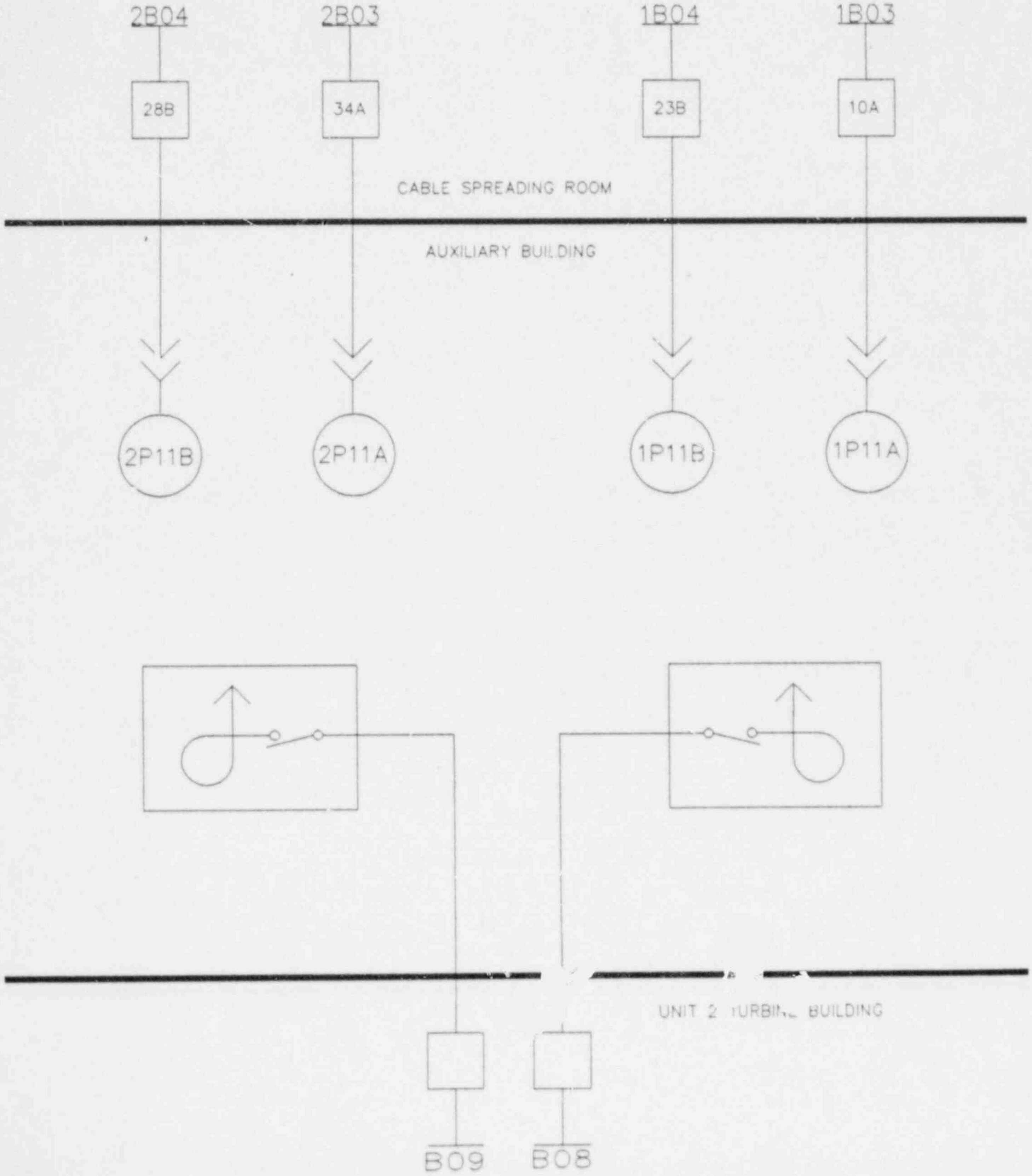


FIGURE 3.6
COMPONENT COOLING WATER SYSTEM



4.0 Safe Shutdown Scenario and Timetable

4.1 Introduction

The safe shutdown scenario provided in this section is based on a worst-case fire affecting the 4160 volt switchgear room which requires the use of alternative shutdown methods independent of the switchgear room. The equipment and personnel used in the scenario are the minimum necessary to achieve hot shutdown. For this scenario it is assumed per established Point Beach procedures that additional personnel will become available for operating, maintaining and repairing equipment necessary to perform plant cooldown and subsequently achieve cold shutdown. The scenario presented in this section will be integrated into safe shutdown procedures for Point Beach.

4.2 Assumptions

Previous discussions highlight the components required for achieving safe shutdown using the following assumptions:

(1) The units are operating at 100% power upon the occurrence of a fire.

(2) The reactors are tripped either manually or automatically.

(3) As a limiting condition the loss of off-site power causes the 345kV to 4kV breakers to open. These breakers must be manually closed which precludes the possibility of off-site power spuriously returning and energizing the 4kV switchgear.

(4) No additional single failures are considered other than the loss of off-site power and those directly attributable to the fire.

(5) No equipment required for safe shutdown is assumed to be out-of-service.

(6) All MSIV's will go closed.

(7) All motor operated valves will be available for manual operation when de-energized.

(8) All required mechanical components (valves etc.) are assumed operable and free of damage due to fire.

(9) Electrically dependent components (pumps, MCC's etc.) will have power cables available. No control power will be assumed available.

4.3 Manual Action and Repairs

There are two issues regarding allowable repairs and cold shutdown. These are:

(1) Allowable repairs to achieve safe shutdown; and

(2) Allowable time to achieve cold shutdown.

Both issues grew out of a lack of definition for the term "repairs" and apparent inconsistencies in requirements for repair and shutdown activities relative to the 72-hour limit. The principal aspects of these issues are as follows:

Repair

(1) Repair activities may not be credited in assuming hot shutdown system availability;

(2) Manual operation of valves, switches, and circuit breakers is not considered to be a repair activity and, hence, is allowable for hot shutdown systems;

(3) Fuse removal or replacement (under most circumstances) is considered to be a repair activity and is not allowed for maintaining hot shutdown system availability or for mitigating the consequence of potential spurious operation of components; and

(4) Modifications, e.g., wiring changes, are allowed to cold shutdown systems and/or components which are not used for hot shutdown or are not used to mitigate the consequences of fire or fire suppressant-induced maloperations that directly affect hot shutdown systems. These repairs must be achievable prior to the maloperations causing an unrecoverable plant condition.

Time

(1) The sum of repair time and time to achieve cold shutdown must be less than or equal to 72 hours when alternate shutdown capability is provided;

(2) Repair time only must be less than or equal to 72 hours when alternate shutdown capability is not provided; and

(3) Off-site power is assumed to be restored after 72 hours.

The manual activities necessary to support cold shutdown are allowed a wider latitude reflecting the greater amount of time and resources available to achieve that condition. Thus, fuse removal for isolation is permissible. Equipment replacement is also permissible if it can be demonstrated as feasible. In this context, feasibility is judged on an individual-case basis considering procedures, available materials, analysis of entry time, and task durations. Repairs must also be of sufficient quality to ensure safe operation. Operation of alternate shutdown systems requires operator training and the availability of written procedures to conduct an orderly transfer of control between the remote stations and the Control Room.

4.4 Activities to be Accomplished

Within the first hour post-fire, the following general activities must be accomplished to ensure hot shutdown conditions. By performing the actions identified within the designated time frame, neither unit will reach an unrecoverable plant condition.

Communication will be established between the operators performing the described activities. Radios, sound powered phones or the plant public address system will be used to provide coordination to ensure the proper sequence of actions and to maintain control of information regarding required plant parameters.

4.4.1 Spurious Operation of Components

Cables that are not part of safe shutdown circuits may be damaged by the effects of postulated fires. Cable damage may subsequently result in spurious operation of equipment directly affecting the ability to achieve safe shutdown due to hot shorts, open circuits, or shorts to ground. Because of this, associated non-safe shutdown circuits should be isolated from safe shutdown circuits or action taken to prevent spurious operation from affecting the ability to reach and maintain safe shutdown.

Spurious operations may be conceptually divided into two classes:

1) Maloperation of safe shutdown equipment due to control circuit interlocks between safe shutdown and other circuits, and
2) Maloperation of equipment which is not defined as part of the safe shutdown systems but which could prevent the accomplishment of a safe shutdown function.

The systems and components identified as being required for safe shutdown and their cable routings were reviewed to determine those components subject

to potential spurious operations in accordance with the guidance contained in NRC Generic Letter 86-10. This component list was then reviewed to insure the high pressure system boundary valves at the high-low pressure system interfaces of those systems required for safe shutdown were included where necessary.

These high-low pressure system interface boundary valves are of particular concern because spurious operation of these valves could challenge low pressure system integrity and result in an uncontrolled loss of primary system inventory.

The high-low pressure interface boundary valves were further classified as:

1) The valve can be shut against primary system pressure or would not cause loss of the low pressure system integrity, or
2) The valves cannot be shut against primary system pressure or may result in loss of low pressure system integrity.

Where a passive component such as the letdown orifice is the high-low pressure interface, the upstream isolation is considered the high-low pressure boundary

isolation and evaluated in accordance with the requirements of Generic Letter 86-10 as a high-low pressure interface.

After the above classifications were made, the potential spurious operations were reviewed to determine possible resolutions. These resolutions can be separated into three possible categories. These are:

1) Providing a means to isolate equipment when not normally needed (e.g., pre-fire isolation)
2) Provide a means to detect spurious operations and develop procedures to defeat the maloperation, or
3) Modify power and control circuits to prevent spurious operations.

Table 4.7-1 lists the equipment and components subject to spurious operations. The valves constituting the high pressure system isolations at the high-low pressure interfaces are also identified. For each component the concern presented by spurious operations and the corrective action taken are also identified.

4.4.2 Steam Generator Inventory Control

Sufficient water must be available in the secondary system to provide for initial primary system heat removal. The steam generator code safety valves provide the path for initial heat removal and the auxiliary feed pumps replace the water lost due to steam relieved through the safeties. The following components are required to establish steam generator inventory control:

1. Turbine-Driven Auxiliary Feed Pump
2. Turbine-Driven Auxiliary Feed Pump Steam Inlet Valves
3. Turbine-Driven Auxiliary Feed Pump Recirculation Valves
4. Turbine-Driven Auxiliary Feed Pump Discharge Valves
5. Plant Process Monitoring System (Instrumentation)
6. Turbine Driven Auxiliary Feed Pump Bearing Cooling Water

4.4.3 Support Systems

The auxiliary feed pump turbine bearings require cooling water within the first thirty minutes of operations to avoid bearing failure. In the event that service water is not available, the diesel driven fire pump will supply the auxiliary feed

pump turbines of both units with cooling water. Thus, bearing cooling water will be available whenever the turbine-driven auxiliary feed pump is started.

The gas turbine generator provides power for establishing hot shutdown conditions. Breakers can be manually operated to provide power to service water pumps which normally provide cooling water to the auxiliary feed pump turbine bearings.

4.4.4 Primary System Inventory

Primary system inventory control and boration to cold shutdown requirements is accomplished using charging pumps and borated water from the refueling water storage tank (RWST). The suction valve from the RWST will be manually opened after de-energizing the respective valve control power circuit in the Cable Spreading Room. The volume control tank outlet valve will be shut. The breakers for the charging pumps will be closed manually.

4.4.5 Plant Monitoring System

Maintenance and control of various plant operating modes requires indication of certain plant parameters. A minimum set of instruments provides an alternate

method of indication and for each unit includes: pressurizer level, reactor coolant system pressure, hot and cold leg temperature, steam generator level and pressure, and neutron flux level.

4.4.6 Safe Shutdown Procedures

Using the assumptions and considerations previously presented, a safe shutdown process is presented describing the actions necessary to achieve hot and cold safe shutdown. The process assumes a fire of sufficient severity to require alternate operation of equipment independent of the 4160 volt switchgear room. It is assumed that plant operations will utilize all plant systems available post-fire to perform a controlled cooldown to cold shutdown. The actions presented herein are predicated on the assumption that only the minimum set of safe shutdown equipment is available. It is also assumed that only three operators are available to perform the initial actions to reach hot shutdown. Either as a result of the fire brigade being dismissed or the personnel call-in procedure, other operators will be available to perform cooldown and repairs required for cold shutdown.

A timeline developed from the required operator actions discussed in the following sections demonstrates that

the time requirements of Appendix R can be met. This timeline is depicted in figure 4.1. Operator actions are summarized in table 4.2.

4.4.6.1 Actions Required to Achieve Hot Shutdown

The actions required to achieve hot shutdown conditions will be accomplished with three operators (1, 2 and 3) within approximately the first hour after the fire alarm is sounded. Before leaving the Control Room, operators 1 and 3 will close the main steam isolation valves (MSIVs) and place the manual/auto station for the main steam atmospheric steam dump valves in the manual position for their respective units. Operator 1 will then proceed to the 84 ft elevation to secure the instrument air at the MSIV and verify closed or close the valves for Units 1 and 2. While on the 84' elevation, Operator 1 will disable in the closed position the main steam atmospheric dump valves for Units 1 and 2. This action will preclude any spurious opening of these valves as a result of fire-induced control circuit failures. Operator 1 will now establish auxiliary feedwater flow using turbine-driven feed pumps. A fire in the 4160V Switchgear Room could have adversely affected the automatic starting capability of the auxiliary feedwater

pumps. The turbine-driven auxiliary feed pumps are independent of AC power, however, the steam inlet valves and discharge valves are DC controlled. The DC control power to these valves will be de-energized to prevent spurious operation of the valves.

Operator 2 will proceed to the Cable Spreading Room and perform the following actions:

(1) In DC panel D-12 open the following breakers:

(a) 1208 (2MOV-2019)
(b) 1206 (1MOV-2019)
(c) 1212 (2MOV-4001)
(d) 1210 (1MOV-4001)

(2) In DC panel D-14 open the following breakers:

(a) 1408 (1MOV-2020)
(b) 1406 (2MOV-2020)
(c) 1412 (1MOV-4000)
(d) 1410 (2MOV-4000)

Operator 3 will proceed to the auxiliary feedwater pump room and open and gag open valves 1CV-4002 and 2CV-4002.

These actions will ensure minimum recirculation of water when the turbine driven auxiliary feedwater pumps are started.

Operator 1 will proceed to the 46 ft elevation and check closed (or close) steam supply valves 1MOV-2020 and 2MOV-2020 and open steam supply valves 1MOV-2019 and 2MOV-2019. The valves, thus aligned, will provide motive steam to the turbine-driven auxiliary feed pumps of each unit from the "B" steam generators. Operator 1 will now proceed to elevation 26 ft pipeway 2 and 3 and isolate and vent instrument air to the containment. This will ensure that the pressurizer PORVs, the letdown orifice valves and the steam generator blowdown valves all close on loss of instrument air. Isolation of containment instrument air will prevent any spurious electrical signal from affecting the position of these valves.

Operator 1 will then proceed directly to the auxiliary feed pump room on the 8 ft elevation. The following actions will be performed at each turbine-driven auxiliary feed pump bay:

(1) Establish cooling water flow to the turbine bearings.

(2) Establish steam generator feed flow to the "B" steam generator.

(3) Transfer instrumentation to the local station.

Providing cooling water flow to the turbine is essential to prevent bearing failure. Service water pumps (normal cooling water) or the diesel-driven fire pump will supply turbine bearing cooling water. Manual valve manipulation at the auxiliary feed pumps will establish the parallel cooling water path from the diesel driven fire pump. The diesel-driven fire pump will auto-start on low fire main pressure and provide cooling water to the turbine-driven auxiliary feed pump bearings. Operator 1 will have controlled feed flow established to both units in approximately 22 minutes.

The "B" steam generators of each unit are being supplied with feed flow and are providing motive steam to the auxiliary feed pump turbines. The alternate instrumentation monitors the "B" steam generator, thus one steam generator in each unit is used to monitor, control and maintain the unit in a safe hot shutdown condition.

Operator 2 while in the Cable Spreading Room will electrically isolate the remaining potentially

spurious components. The following sequence of activities will be accomplished by Operator 2 in the Cable Spreading Room.

A. Open breakers 1101 through 1120 in DC panel D-11. The following breakers are significant to this scenario.

(1) 1109 Control Power (normal) to 1A05
1110 Control Power (normal) to 2A05
[1111 Control Power (alternate) to 1A06]
[1112 Control Power (alternate) to 2A06]

(2) 1117 Control Power (normal) to 1B03
1118 Control Power (normal) to 2B03
[1119 Control Power (alternate) to 1B04]
[1120 Control Power (alternate) to 2B04]

(3) 1123 Control Power to Control Panel 1C20

(4) 1124 Control Power to Control Panel 2C20

B. Open breakers 1301 through 1320 in DC panel D-13. The following breakers are significant to this scenario.

(1) 1309 Control Power (alternate) to 1A05
1310 Control Power (alternate) to 2A05
[1311 Control Power (normal) to 1A06]
[1312 Control Power (normal) to 2A06]

(2) 1317 Control Power (alternate) to 1B03

1318 Control Power (alternate) to 2B03

[1319 Control Power (normal) to 1B04]

[1320 Control Power (normal) to 2B04]

(3) 1323 Control Power to Control Panel 1C20

(4) 1324 Control Power to Control Panel 2C20

C. Open the following main supply breakers in the 480V switchgear cabinets.

(1) In 1-B03 open 16B

(2) In 1-B04 open 17B

(3) In 2-B03 open 40B

(4) In 2-B04 open 25B

The breakers above, once open, will isolate the 480 V switchgear from the 4160 V switchgear room.

Operator 2 will then return to the control room and perform the following actions:

(1) Open and lock out main generator breakers 122 and 142.

(2) Open and lock out breakers 20 and 21 on bus H02

(3) Open and lock out breakers 30 and 31 on bus H03.

These actions will prevent the spurious supply of power to the 4160 V switchgear room.

(4) Close breakers 10 and 11 on bus H01, start the gas turbine and observe it to energize the H01, B08 and B09 buses.

Operator 2 will proceed to the Unit 2 electrical equipment room where he will align MCC B81 to provide alternate power for lighting and communications.

The isolation of DC control power in the cable spreading room will not disable all channels of primary system instrumentation. Operator 2 will return to the control room to monitor available instrumentation and gas turbine operation.

Operator 3 will proceed from the auxiliary feedwater pump room to the Diesel Generator Rooms (G01 and G02) and will ensure the diesel generator cannot start spuriously. If the diesel is already operating, he will stop the diesel and isolate the fuel oil supply to prevent a spurious restart. Operator 3 will then proceed to the charging pump area.

Operator 3, is to provide manual alignment of potentially spurious components and line-up components for charging pump flow in both units by performing the following actions.

(1) Open (or check open) the RWST suction valves to the charging pumps for both units.

(2) Close (or check closed) manual isolation valves for the auxiliary spray line in both units. This action prevents charging through the auxiliary spray line which could affect primary system pressure control.

(3) Proceed to the 26 ft elevation and isolate the volume control tank from the charging pump suction for Units 1 and 2. This action will preclude the possibility of boron dilution and allow only borated water from the RWST to be pumped through the charging pumps.

(4) Proceed to the Unit 1 charging pump area to properly align the breakers for the charging pumps. By design, the cross-tie breakers are interlocked to prevent one charging pump from being powered by two independent power sources or for one power source to provide power to two charging pumps simultaneously. Operator 3

will go to Units 1 and 2 "A" charging pump cross-tie panels and align the breakers to the alternate power supply. Once aligned Units 1 and 2 "A" charging pumps can be powered from buses B08 and B09 respectively.

(5) Operator 3 will transfer to the local position the plant monitor instrumentation at the Unit 2 local shutdown panel and do likewise for Unit 1.

The above actions completed by Operators 1, 2, and 3 will have established the following:

1. Auxiliary feed flow to the "B" steam generator in each Unit. The steam generator code safety valves are providing initial primary system heat removal.

2. Borated water flow through a charging pump in each unit to the reactor coolant pump seals and, if system conditions allow, through the auxiliary charging lines to the cold leg.

3. The gas turbine generator in operation and essential electrical busses energized.

4. Cooling water flow to each auxiliary feed pump turbine. (Note: prior to service water pump operation the diesel driven fire pump provides bearing cooling flow for each auxiliary feed pump turbine)

5. Safe shutdown instrument indication for both units. (Hot and cold leg temperature, steam generator level and pressure, reactor coolant system pressure, pressurizer level and neutron flux level).

6. Potentially spurious components that could affect hot safe shutdown in each unit are in a safe condition.

   A. Pressurizer PORV's are shut
   B. Pressurizer Vent Valves are shut
   C. Reactor Vessel Head Vent Valves shut
   D. Steam Generator Atmospheric Dump Valves are shut
   E. Auxiliary Spray Valves are isolated
   F. VCT outlet valves are shut
   G. RWST suction valves are open

H. Normal letdown system isolation valves are shut

I. The excess letdown valves are shut

J. The steam generator blowdown valves are shut

K. The electrical distribution is aligned in such a way that spurious return of offsite power could not affect safeguards busses, and the diesel generators are prevented from starting.

The safe hot shutdown conditions provided by the above described actions can be maintained until operators become available from fire brigade dismissal or procedural call-in for cooldown to cold shutdown conditions.

4.4.6.2 Actions Required to Achieve Cold Shutdown

The safe shutdown scenario, thus far presented, has assumed a fire has occurred in the 4160 Volt Switchgear Room which requires use of alternate methods for hot safe shutdown systems. This assumption was made to demonstrate hot safe shutdown capability outside of the 4160 Volt Switchgear Room using alternate shutdown methods. The fire

occurring in the Switchgear Room would also require the repair or re-powering of cold shutdown components. The remainder of this section will explain the alternate methods used to achieve cold shutdown outside the 4160 Volt Switchgear Room. Other sections provide the potential repair actions required to achieve cold shutdown in the event a fire has occurred in other plant areas (i.e. other than the Control Room or the previously established limited fire damage areas) where evaluation has shown that fire damage will be limited to one division of safe shutdown systems or repairable cold shutdown systems.

After establishing hot safe shutdown conditions, which will be achieved in approximately 1-1/2 hours, a plant cooldown will commence. At that time additional operators will be available to assist in the cooldown. The cooldown phase requires additional systems and components and also requires manual operation of valves. The component cooling water system, service water system and residual heat removal system will be required for the cooldown.

The actions required to achieve cold shutdown are summarized as follows:

(1) Start two SW pumps; one powered from bus B08 and one from bus B09.

(2) Manually operate the "B" Steam generator atmospheric dump valves to remove residual heat from the primary system.

(3) Line up and initiate component cooling water system operation (minimum of one pump for both units required with associated heat exchanger).

(4) Line up and provide manual control of auxiliary spray (as necessary) to decrease reactor coolant system pressure.

(5) Line up and initiate residual heat removal system operation.

Primary system cooldown can be initiated by dispatching two operators to manually control each of the "B" steam generator atmospheric dump valves. The total flow capacity of each valve is approximately 5% of maximum calculated steam flow. By

controlled release of steam to the atmosphere and continued feed flow from auxiliary feed pumps, primary system heat is removed. The operators at the steam dump valves and at the auxiliary feed station will be in communication with each other to coordinate the rate of cooldown. The cooldown rate will be controlled to within Technical Specification limits or will be controlled within the limits of safe shutdown system capabilities.

Approximately 160 gallons per hour, per reactor coolant pump, would return to the pressurizer relief tank as a result of seal water return flow. The reactor coolant pump seal return lines are isolated by a containment entry and local closing of valves. Though not presenting a short-term problem, this action is performed to prevent filling the PRT.

The cooldown using the atmospheric steam dumps and the auxiliary feed pumps will proceed until the pressure and temperature have reached residual heat removal system operating conditions (425 psig and 350°F). The auxiliary spray line can be manually controlled to lower the primary system pressure, if necessary.

The component cooling water pumps and heat exchangers and the service water pumps are required to support RHR system operation. Manual valve operation will be required to align the systems.

The component cooling water system can be placed into operation to support cold shutdown by providing power to one of the four pumps and manually opening the inlet valve on the appropriate residual heat removal heat exchanger. Component cooling water flow is from the CCW pump through the CCW heat exchangers which are cooled by the service water system to the RHR heat exchangers back to the suction of the CCW pumps. Any unnecessary heat loads can be manually isolated to provide maximum cooling capacity to the RHR heat exchangers.

The residual heat removal system can then be placed in operation. As a result of fire induced damage, valves may have changed position requiring a check of the system valve line-up before system operation. Both of the RCS suction isolation valves and the discharge isolation valve in each unit are shut with the associated breaker locked-open. The containment sump isolation valves (1MOV-851A, 1MOV-851B, 2MOV-851A, 2MOV-851B) in each unit require verification that

they are in the closed position. The RHR heat exchanger discharge isolation valves (1HCV-624, 1HCV-625, 2HCV-624, 2HCV-625) are normally open, fail open, air operated valves. If not open, the appropriate valve can be failed in the open position to provide flow back to the cold leg. Thus aligned, the RHR pumps provide primary system heat removal with reactor coolant flowing from the "A" loop hot leg through the RHR pump and RHR heat exchanger back to the "B" loop cold leg.

4.4.6.3 Maintenance Procedures

Appendix R allows the repair of equipment and components necessary to achieve cold shutdown as long as cold shutdown can be established in accordance with paragraph 2.1.2.

The CCW pumps are located in a configuration which could be susceptible to damage from a single fire outside the 4160V switchgear room. The pumps are not needed for safe hot shutdown and only one pump is needed for attaining cold shutdown. A spare CCW pump motor has been obtained to be used as a replacement for repair to meet the cold shutdown requirements of

Appendix R. MI 18.5, Instructions for Emergency Replacement of a Component Cooling Pump Motor, governs the repair action.

The possibility exists that a fire outside the 4160V switchgear room could damage power cables to redundant RHR pumps. MI 21.7, Installation for Emergency Replacement of Power Supply Cables to RHR and CCW Motors, has been prepared to direct replacement of damaged power cable to a RHR pump. Power cable has been dedicated for this replacement.

TABLE 4-1: POINT BEACH NUCLEAR PLANT
POTENTIAL SPURIOUS MALFUNCTIONS THAT COULD AFFECT
SAFE SHUTDOWN

Potential Spurious Component	System	Effect of Malfunction	Resolution
1(2) MOV 2019	MSS	Closing would result in loss of steam supply to the turbine-driven auxiliary feed water pump.	Manual opening of the valve after deenergizing dc-power to the valve (2)
1(2) MOV 2020	MSS	Opening would result in steam being supplied to the Turbine-driven auxiliary feed water pumps from both steam generators.	Manual closing of the valve after deenergizing dc-power to the valve (1)
1(2) CV 2015 1(2) CV 2016	MSS	Opening of the main steam atmospheric dump valves would result in uncontrolled cooldown.	Isolate instrument air and bleed valve positioner air to insure that valves remain shut (1)
1(2) CV 2017 1(2) CV 2018	MSS	Opening of the MSIVs would result in a loss of secondary system inventory during hot shutdown.	Isolate instrument air and bleed valve positioner air to insure the valves remain closed (1)
1(2) CV 5958 1(2) CV 5959	MSS	Opening of the Steam Generator blowdown valves would result in a loss of secondary system inventory during hot shutdown.	Isolate and depressurize instrument air to containment
1(2) V 200A 1(2) V 200B 1(2) V 200C	CVCS	Opening would result in loss of primary system inventory.	Isolate and depressurize instrument air to containment
1(2) MOV 1299	CVCS	Opening will result in loss of primary coolant through excess letdown lines.	One hour fire rated cable will preclude spurious operation (3)
1(2) MOV 285	CVCS	Redundant to MOV 1299. Operation could result in loss of RCS inventory.	No action taken. Protection for MCV 1299 will prevent loss of inventory if valve spuriously operates (1) (3)

TABLE 4-1 (continued): POINT BEACH NUCLEAR PLANT
POTENTIAL SPURIOUS MALFUNCTIONS THAT COULD AFFECT
SAFE SHUTDOWN

Potential Spurious Component	System	Effect of Malfunction	Resolution
1(2) V 296	CVCS	Operation when charging pumps are running could result in cooling of the pressurizer and depressuring the RCS.	Shut manual isolation valve 1(2) V 384A (1)
1(2) MOV 851A,B 1(2) MOV 856A,B	RHR	Opening of these valves could result in draining the RWST to containment sump B.	Operator will insure MOV 856A,B are in the closed position (1)
1(2) MOV 700 1(2) MOV 701 1(2) MOV 720	RHR	Opening could result in loss of RCS inventory.	Power is normally removed and breakers locked open (3) (4)
1(2) PCV 430 1(2) PCV 431C		Opening of PORVs would result in loss of RCS inventory.	Isolate and depressurize instrument air to containment (1) (3)
1(2) RC 570A,B 1(2) RC 580A,B 1(2) RC 575A,B	RCS	Opening would result in loss of RCS inventory.	Power is normally removed. (3)
1(2) MOV 598 1(2) MOV 599	RCS	Opening of the RCS/Drain tank boundary isolations would result in a loss of RCS inventory.	Power is normally removed and breakers locked open. (3)
1(2) SV 2090	SW	Service Water to the Turbine-driven AFW pump lube oil cooler may shut resulting in overheating and pump damage.	Manual opening of strainer bypass valve will allow fire water backup to provide the necessary cooling.
1 A52-59 1 A52-65 2 A52-74 2 A52-68	AC/DC	Spurious closing of these breakers could energize safety injection pumps P15A and P15B if off-site power returned.	Manual trip of 13.8 KV breakers will prevent power supply to 4 KV buses.

TABLE 4-1 (continued): POINT BEACH NUCLEAR PLANT POTENTIAL SPURIOUS MALFUNCTIONS THAT COULD AFFECT SAFE SHUTDOWN

Notes:

1. Post-fire action. Operator has sufficient time to prevent potential spurious operation or detect spurious operation and take action to correct the malfunction.

2. These valves provide isolation at a high-low pressure interface. The letdown orifices provide the actual interface, prevent overpressurization of the low pressure system and limit inventory loss.

3. These valves are isolations at a high-low pressure system interface.

4. Redundant high-low pressure interface isolation is provided by a check valve.

Operator No. 1

WISCONSIN ELECTRIC

ASSUMED 4160 V SWITCHGEAR ROOM

Leave Control Room

(Time in Min

0 5 10 15 20 25 30

BEFORE LEAVING THE CONTROL ROOM PLACE - MANUAL/AUTO STATION

PROCEED TO ELEVATION 84' - ISOLATE AIR TO MAI
- ISOLATE AIR TO ATM

PROCEED TO ELEVATION 46'

PROCEED TO ELEVATION

FIRE SCENARIO FOR APPENDIX R

utes)

35 40 45 50 55 60

FOR ATMOSPHERIC DUMP VALVES IN MANUAL POSITION - UNITS 1 & 2

N STEAM ISOLATION VALVES - UNITS 1 & 2
OSPHERIC DUMP VALVES - UNITS 1 & 2

- MANUALLY CLOSE LOOP A STEAM SUPPLY MOV - UNITS 1 & 2
- MANUALLY OPEN LOOP B STEAM SUPPLY MOV - UNITS 1 & 2

26' PIPEWAY 2 & 3 - ISOLATE AIR TO CONTAINMENT AIR HEADER - UNITS 1 & 2

PROCEED TO ELEVATION 8' AUXILIARY FEEDWATER PUMP AREA
- MANUALLY OPEN AUXILIARY FEEDWATER PUMP DISCHARGE VALVE 10% TO STEAM GENERATOR B - UNITS 1 & 2
- MANUALLY CLOSE AUXILIARY FEEDWATER PUMP DISCHARGE VALVE TO STEAM GENERATOR A - UNITS 1 & 2
- VERIFY COOLING WATER TO AUXILIARY FEEDWATER PUMP TURBINE BEARINGS - UNITS 1 & 2
- TRANSFER INSTRUMENTATION TO LOCAL ALTERNATIVE OPERATING STATION - UNITS 1 & 2

ESTABLISH AND MAINTAIN LEVEL IN STEAM GENERATOR B WITH MANUAL CONTROL OF FEEDWATER DISCHARGE VALVE - UNITS 1 & 2

FLOW RATE CONTROLLED - MONITOR PRIMARY PLANT PARAMETERS - UNITS 1 & 2

FIGURE 4-1
OPERATOR NO. 1 TIMELINE

Operator No. 2

WISCONSIN ELECTRIC

ASSUMED 4160 V SWITCHGEAR ROOM F

Leave Control Room

(Time in Minu

0 5 10 15 20 25 30

PROCEED TO CABLE SPREADING ROOM ELEVATION 26' - PERF

PERFORM PROPER LINE-UP OF 480V BREAKERS

PROCEED TO CONTROL ROOM EL

START GAS TU

PRO

S

IRE SCENARIO FOR APPENDIX R

tes)

35 40 45 50 55 60

ORM PROPER LINE-UP OF 125V DC BREAKERS (1? TOTAL - UNIT 1; 10 TOTAL - UNIT 2)

(2 TOTAL - UNIT 1; 2 TOTAL - UNIT 2)

EVATION 44' - PERFORM PROPER LINE-UP OF 345 KV BREAKERS
(2 TOTAL)
- PERFORM PROPER LINE-UP OF 13.8 KV BREAKERS
(6 TOTAL)

RBINE AND BRING ON BUS

CEED TO UNIT 2 ELECTRICAL EQUIPMENT ROOM - LINE-UP DISTRIBUTION PANEL
SWITCHES TO PROVIDE ALTERNATE LIGHTING AND COMMUNICATIONS POWER
(7 TOTAL)

PROCEED TO CONTROL ROOM - MONITOR PRIMARY PLANT PARAMETERS -
UNITS 1 & 2

FIGURE 4-1
OPERATOR NO. 2 TIMELINE

Operator No. 3

WISCONSIN ELECTRIC

ASSUMED 4160 V SWITCHGEAR ROOM F

Leave Control Room

(Time in Min

0 5 10 15 20 25 30

PROCEED TO AUXILIARY FEEDWATER PUMP AREA - OPEN
UNITS 1 & 2

PROCEED TO DIESEL GENERATOR ROOMS

PROCEED TO CHARGING

P

IRE SCENARIO FOR APPENDIX R

tes)

35 40 45 50 55 60

MINIMUM RECIRCULATION VALVE FOR STEAM - DRIVEN AUXILIARY FEEDWATER PUMP -

- SECURE FUEL SUPPLY TO PREVENT SPURIOUS START - UNITS 3D & 4D

PUMP AREA ELEVATION 8' - OPEN RWST TO CHARGING PUMP SUCTION - UNITS 1 & 2

- CLOSE MANUAL ISOLATION VALVE TO NORMAL CHARGING PATH - UNITS 1 & 2

ROCEED TO ELEVATION 26' - CLOSE VOLUME CONTROL TANK DISCHARGE TO CHARGING PUMPS - UNITS 1 & 2

PROCEED TO CHARGING PUMP AREA ELEVATION 8' - LINE-UP BREAKER FOR UNIT 1 CHARGING PUMP 1P2A

LINE-UP BREAKER FOR UNIT 2 CHARGING PUMP 2P2A
- TRANSFER INSTRUMENTATION TO LOCAL ALTERNATIVE
- VERIFY PROPER CHARGING PUMP OPERATION

ESTABLISH/MONITOR PRESSURIZER LEVEL AND MONITOR REACTOR COOLANT SYSTEM PRESSURE - UNITS 1 & 2

Monitor Primary Plant Parameters - Units 1 & 2

FIGURE 4-1
OPERATOR NO. 3 TIMELINE

WISCONSIN ELECTRIC PO
ASSUMED 4160 V SWITCHGEAR ROOM FIR

(Time in Hou

0 1 2 3 4 5 6 7 8 9 10 20 30

▲ FIRE STARTS IN 4160 V SWITCHGEAR ROOM - DETECTION SYSTEM ACTUATES

▲ LOSS OF OFF-SITE POWER REACTOR AND TURBINE TRIP

FIRE DURATION - FIRE BRIGADE DETERMINES EXTENT OF DAMAGE - FIRE BRIG

▲ FIRE BRIGADE ARRIVES AT FIRE SCENE

▲ OPERATOR STARTS TURBINE-DRIVEN AUXILIARY FEEDWATER PUMP

OPERATOR STATIONED AT ALTERNATE OPERATING STATION FEEDS

OPERATOR ISOLATES SPURIOUS COMPONENTS ELECTRICALLY

OPERATOR CHECKS POSITION OF SPURIOUS COMPONENTS - MANUALLY ALIGNS SAFE SHU

OPERATOR MANUALLY STARTS AND LOADS GAS TURBINE GENERATOR

▲ CHEMICAL AND VOLUME CONTROL SYSTEM CONTROLLING PRIMARY SYSTEM INVENTORY -

OPERATORS ASSESS FIRE DAMAGE TO COLD SHUTDOWN CIRCUITS - I

OPERATOR TO PERFORM MANUAL BREAKER LINEUP THROUGH BUS

▲ PLACE INTO OPERATION ADDITIONAL SERVICE WATER PUMPS (

CONTINUE PLANT COOLDOWN - REMOVE DECAY HEAT VIA ST

▲ ESTABLISH COMPONENT COOLING WATER FLOW (MINIMUM OF

▲ CONTAINMENT ACCESS AVAILABLE - 1) ISOLATE SAFE
2) VERIFY ISOLA

RHR SY
SYST

WER COMPANY
E SCENARIO FOR APPENDIX R

rs)

40 50 60 70 80

ADE OPERATORS RELEASED

B STEAM GENERATORS TO CONTROL DECAY HEAT

TDOWN SYSTEMS

OPERATOR MONITORS PRIMARY PLANT PARAMETERS

DENTIFY DAMAGED CIRCUITS - DEVELOP CORRECTIVE ACTION

TIES TO POWER SAFFGUARDS BUSES (IF AND AS APPROPRIATE)

MINIMUM OF 2 REQUIRED)

EAM GENERATOR B FEED AND MANUAL OPERATION OF ATMOSPHERIC DUMP VALVES

1 REQUIRED)

TY INJECTION TANK ACCUMULATORS: RCS > 1000 PSIG
TION OF LETDOWN ORIFICES AND ISOLATE REACTOR COOLANT PUMP SEAL RETURN LINES

STEM LINE-UP - ENSURE POTENTIALLY SPURIOUS COMPONENTS ARE CHECKED AND
EM IS ALIGNED PROPERLY

USING AUXILIARY SPRAY, AS NECESSARY,
- DEPRESSURIZE IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS
AND PROCEDURES

START RHR SYSTEM WHEN RCS REACHES 350° AND 425 PSIG

ESTABLISH COOLDOWN WITH RHR SYSTEM AND COOLDOWN TO ≤ 200°
REACTOR IN COLD SHUTDOWN

FIGURE 4-2
72 HOUR TIMELINE