Design Criteria

Ginna Station

Spent Fuel Pool Cooling System

Rochester Gas and Electric Corporation

89 East Avenue

Rochester, New York 14649

EWR 1594

Revision 1

October 10, 1979

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42-92

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1.0 Summary Description of the Design

1.1 Summary

1.1.1 In 1976, new high density fuel storage racks were installed in the spent fuel pool to increase the number of spent fuel elements which can be stored on site. In order to effectively use the new racks it is necessary to increase the cooling capacity of the spent fuel pool cooling system (SFPCS).

1.1.2 The existing SFPCS consists of a single installed pump and heat exchanger with a cooling capacity of 9.3 million Btu/hr. with a pool temperature of 150°F and a lake temperature of 80°F. Backup cooling is provided by hosing in a skid-mounted heat exchanger and pump. The installed and skid-mounted systems can be operated in parallel to provide lower pool temperatures.

1.1.3 To provide for effective use of the new spent fuel pool rack capacity, and to provide a margin for future cooling requirements, a new 16 million Btu/hr cooling system will be installed. The existing cooling system and backup system will serve as backup to the new system.

1.1.4 The necessary modifications are shown schematically on the attached Figures 1 and 2. The general arrangement of equipment and piping is shown on Figure 3. Figure 4 provides a basic electrical one line diagram.

1.2 Functions

1.2.1 The new spent fuel pool cooling system and component design parameters are given in attached Tables I and II respectively.

1.2.2 Spent Fuel Cooling Pumps

1.2.2.1 The new spent fuel pool pump (SFP P-2) shall provide 100% of the design flow. It shall be a horizontal/centrifugal unit. All wetted surfaces shall be austenitic stainless steel.

1.2.2.2 The existing SFP pump (SFP P-1) and the skid mounted SFP backup pump (SFP P-3) are similar in capacity. Together they provide 100% of the flow required for backup cooling. These pumps are horizontal/centrifugal units. All wetted surfaces are austenitic stainless steel.

1.2.2.3 The existing suction lines in the vicinity of the spent fuel pumps shall be modified so that two separate

suction lines from the spent fuel pool combine into a common header from which the new pump, the existing pump and the skid mounted pump take suction.

1.2.3 Spent Fuel Pool Cooling Heat Exchangers

1.2.3.1 The new SFP heat exchanger (SFP HX-2) shall be the shell and U-tube type. SFP water will circulate through the tubes while service water will circulate through the shell. The SFP HX-2 shall be sized for 100 percent of the design heat load.

1.2.3.2 The existing SFP heat exchanger (SFP HX-1) and the skid mounted SFP backup heat exchanger (SFP HX-3) are similar in capacity, and are the shell and U-tube type. SFP water circulates through the tubes while service water circulates through the shell. These two heat exchangers can remove more than 100% of the design heat load when operated in parallel.

1.2.4 Spent Fuel Pool Instrumentation

1.2.4.1 Local pressure, temperature, and flow instrumentation is provided for testing and monitoring the performance of the pumps and heat exchangers.

1.2.4.2 A new level switch shall be provided in the spent fuel pool which will trip the new SFP pump (SFP P-2) in the event of low water level in the spent fuel pool.

1.2.4.3 A new, local, flow indicating switch shall be provided in the discharge piping of the new pump. This new flow switch shall include a control room annunciator that will alarm when SFP P-2 flow is low or when SFP P-2 is tripped.

1.2.5 Spent Fuel Pool Valves

Manual valves are provided for throttling and isolation of the SFPCS components and to isolate the cleanup and makeup system from the cooling system. Check valves are provided at the discharges of pumps SFP P-1 and SFP P-2 to prevent back flow. Valves are provided at the hose connections for the skid mounted backup components for reduced connection time. All valves in contact with SFP water are austenitic stainless steel.

1.2.6 Spent Fuel Pool Piping

1.2.6.1 All piping in contact with SFP water shall be austenitic stainless steel. The piping shall be of welded construction, except where flanged connections are required to facilitate maintenance and installation.

1.2.6.2 Hoses for the skid mounted SFP backup pump and SFP backup heat exchanger are Styrene Butadine Rubber (SBR). Hoses are provided with aluminum couplings.

1.2.7 Service Water System

1.2.7.1 Service water to the SFP HX-2 shall be supplied from the SW loop B supply header to the component cooling heat exchanger 1B (CC-HX-1B). The service water from the SFP HX-2 shall be discharged into the common SW discharge header from CC HX-1A and CC HX-1B.

1.2.7.2 Service water to SFP HX-1 and SFP HX-3 is supplied from the SW Loop A supply header to CC HX-1A. Service water from SFP HX-1 and SFP HX-3 is discharged into the common service water discharge header from CC HX-1A and CC HX-1B.

1.2.7.3 Existing motor operated valves provide automatic and remote manual isolation of the service water supply lines to CC HX-1A, CC HX-1B, and SFP HX-1. These valves close automatically upon coincidence of safety injection and loss of offsite power. Handwheels for manual operation are also provided.

1.2.7.4 A new air operated butterfly valve (AOV) shall provide automatic and remote manual isolation of the service water supply to SFP HX-2. This valve will close automatically in the event of safeguards actuation (safety injection) signal. The new handswitch shall be provided in the control room to remotely open or close the new AOV. A handwheel for manual operation shall be provided, and position indication both in the control room and locally shall be provided as well.

1.2.7.5 Hose connections isolated by butterfly valves shall be provided on the service water supply and return piping to and from CC HX-1A for the service water to and from SFP HX-3.

1.2.7.6 Local pressure, temperature, and flow instrumentation is provided for testing and monitoring the performance of the new SFP HX-2.

1.2.7.7 Radiation detectors, alarms, and recorders are provided to detect radioactivity in the service water in the event that tube leaks occur in SFP HX-1 or SFP HX-2.

1.3 Performance Requirements

1.3.1 The new spent fuel pool cooling system design parameters are given in Table 1. The conditions indicated as "Safety" are design conditions used for safety evaluation of the cooling system. The conditions indicated as "Normal" are design conditions used to assure lower pool temperature conditions after normal refueling outages.

1.3.2 The new spent fuel pool cooling system shall be designed to maintain the SFP water below 150°F with a "Safety" basis heat load of 16×10^6 Btu/hr. This heat load is based on storing fuel from all normal refuelings through 1998 plus a full core discharge at the end of 1999.

1.3.3 The new spent fuel pool cooling system shall be designed to maintain the SFP water below 120°F with a "Normal" basis heat load of 7.6×10^6 Btu/hr. This heat load is based on storing fuel from all normal refuelings through 1998 plus a normal 1/3 core removal at the end of 1999.

1.3.4 The SFP HX-2 shall be sized to remove the Safety and Normal basis heat loads using service water at 80°F. The temperature rise shall not exceed 20°F and 15°F respectively, for the Safety and Normal basis heat loads.

1.3.5 The SFP P-1/SFP HX-1 (existing) and SFP P-3/SFP HX-3 (backup) cooling loops when operated in parallel are capable of removing more than 16×10^6 Btu/hr. with a pool temperature of 150°F and a service water temperature of 80°F.

1.3.6 Both of the backup cooling loops were designed to remove 7.93×10^6 Btu/hr. with a pool temperature of 150°F and service water at 80°F.

1.4 Control

1.4.1 Control for all pumps shall be from local control stations near the pumps. A mechanical interlock will be provided between the control stations of SFP P-2 and SFP P-1, to prevent simultaneous operation of both pumps with power supply from the safety buses. SFP P-3 is operated from a non-safety power source.

1.5 Modes of Operation

1.5.1 Operation of the spent fuel pool cooling system is manual and intermittent. The system is started, operated, and secured locally, as required, to maintain the SFP water temperature below 150°F. Normally the pool is maintained at lower temperatures.

1.5.2 In the event a full core is unloaded from the reactor and stored in the spent fuel pool, the new SFP P-2/ SFP HX-2 loop will be operated alone. The SFP P-1/ SFP HX-1 and SFP P-3/SFP HX-3 loops would be in place and available for backup cooling if required.

1.5.3 Normally either the SFP P-1/SFP HX-1 loop or the SFP P-2/ SFP HX-2 loop is operated alone to maintain desired pool temperatures. The SFP P-3/SFP HX-3 loop is connected and operated only when high heat loads are anticipated.

1.5.4 Following a safety injection signal, the new spent fuel pool pump SFP P-2 shall be shed from bus #16. After termination of safety injection, SFP P-2 can be manually started and powered from diesel generator No. 1B.

1.5.5 Following loss of offsite power coincident with safety injection, SFP P-1 sheds from bus #14. After termination of safety injection, SFP P-1 can be manually started and powered from diesel generator No. 1A.

1.5.6 In the unlikely event of the spent fuel pool pumps shedding, the cooling of the SFP water is interrupted. Consequently, the SFP water temperature increases, as specified in Table I, until approximately one hour after the safety injection when the SFP pumps can be manually started on the normal or standby power system.

1.5.7 In the event of low water level in the spent fuel pool, a new level switch will trip SFP P-2 pump.

2.0 Referenced Documents

The following documents are referenced herein. Their applicability or requirements for design are as specified in this criteria document.

2.1 USNRC Regulatory Guides

2.1.1 No. 1.26, "Quality Group Classifications and Standards for Water, Steam, and Radiowaste Containing Components for Nuclear Power Plants," Rev. 3, February 1976.

2.1.2 No. 1.29, "Seismic Design Classification," Rev. 3, September 1978.

2.1.3 No. 1.48, "Design Limits and Loading Combinations for Seismic Category I Fluid System Components," May 1973.

2.1.4 No. 1.60, "Design Response Spectra for Seismic Design of Nuclear Power Plants," Rev. 1, December 1973.

2.1.5 No. 1.61, "Damping Values for Seismic Design of Nuclear Power Plants," October 1973.

2.1.6 No. 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis,"Rev. 1, February 1976:

2.1.7 No. 1.100, "Seismic Qualification of Electric Equipment for Nuclear Power Plants, Rev. 1, August 1977.

2.2 American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code - 1977 Edition with Addenda through Winter 1978.

Section III - "Nuclear Power Plant Compents"
Section XI - "In Service Inspection"

2.3 American National Standards Institute (ANSI)

2.3.1 ANSI N45.2.1 - 1973, "Cleaning of Fluid Systems and Associated Components During Construction Phase of Nuclear Power Plants".

2.3.2 ANSI N45.2.2 - 1972, "Packaging, Shipping, Receiving, Storage and Handling of Items for Nuclear Power Plants".

2.3.3 ANSI N45.2.3 - 1973, "Housekeeping During the Construction Phase of Nuclear Power Plants".

2.3.4 ANSI N45.2.8 - 1975, "Supplemental Quality Assurance Requirements for Installation, Inspection, and Testing of Mechanical Equipment and Systems for the Construction Phase of Nuclear Power Plants".

2.4 Institute of Electrical and Electronic Engineers (IEEE)

2.4.1 IEEE-323-1974, "Standard for Qualifying Class IE Equipment for Nuclear Power Generating Stations".

2.4.2 IEEE-334-1974, "Standard for Type Tests of Continuous Duty Class IE Motor for Nuclear Power Generating Stations".

2.4.3 IEEE-336-1977, "Installation, Inspection and Testing Requirements for Instrumentation and Electric Equipment During the Construction of Nuclear Power Generating Stations".

2.4.4 IEEE-344-1975, "Recommended Practices for Seismic Qualification of Class IE Equipment for Nuclear Power Generating Stations".

2.4.5 IEEE-383-1975, "Standard for Type Test of Class IE Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations".

2.4.6 IEEE-384-1977, "Criteria for Independence of Class IE Equipment and Circuits".

2.5 American Institute of Steel Construction (AISC) "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings," November 1, 1978.

2.6 American Concrete Institute (ACI) ACI Standard 318-77, Building Code for Reinforced Concrete, 1977 Edition.

2.7 Tubular Exchanger Manufacturer's Association (TEMA), TEMA Standards, 1978 Edition.

2.8 Rochester Gas and Electric Fire Protection Evaluation, Gilbert Associates, Inc. Report 1936, March 1977.

2.9 Ginna Station Final Facility Description and Safety Analysis Report (FSAR).

3.0 <u>Seismic Category</u>

3.1 Consistent with Regulatory Guide 1.29 the new spent fuel pool cooling system is seismic category I.

3.2 Seismic boundaries are shown in Figure 1 and 2.

3.3 Table III defines the seismic categories of various components.

3.4 The existing spent fuel pool cooling loop is defined as seismic class II in the Ginna FSAR (Reference: FSAR Section 1.2.1).

3.5 The SFP P-3/SFP HX-3 backup cooling loop is non-seismic.

4.0 <u>Quality Group</u>

4.1 Consistent with Regulatory Guide 1.26 the new spent fuel pool cooling system components are assigned the quality groups as shown in Table III.

5.0 Code Class

5.1 The new spent fuel pool cooling system component ASME code classes are as shown in Table III.

6.0 Codes, Standards and Regulatory Requirements

The following requirements shall apply to the design and installation of the new spent fuel pool cooling system including the modifications of the existing system as indicated on Figures 1 and 2.

6.1 The design, materials, fabrication, installation, examination and testing of the Quality Group C components shall be in accordance with the requirements of ASME Section III, Subsection ND, except that code stamping and third party inspection is not required for field fabrication and installation.

6.2 In addition to ASME Section III requirements, SFP HX-2, fabrication shall be in accordance with TEMA "R" standards.

6.3 The design, materials, fabrication, installation, examination and testing of seismic piping supports and anchors pump supports, and heat exchanger supports shall be in accordance with the requirements of ASME Section III, Subsection NF, except that code stamping and third party inspection for field fabrication and installation is not required.

6.4 The design, fabrication, and erection of structural steel modifications and additions not within the scope of ASME III Subsection NF shall be in accordance with the requirements of the AISC Specification.

6.5 Modifications and additions of concrete structures shall be designed and installed in accordance with the requirements of ACI 318.

6.6 Cleaning of the spent fuel pool cooling system shall be in accordance with the piping requirements of ANSI N45.2.1 to the extent practical.

6.7 Housekeeping during construction shall be in accordance with the requirements of ANSI N45.2.3.

6.8 Installation of the new spent fuel pool cooling system shall be in accordance with Sections 2, 3, and 4 of ANSI N45.2.8.

7.0 <u>Design Parameters</u>

7.1 The new spent fuel pool cooling system design parameters are given in Table I.

7.2 The new spent fuel pool cooling system component design parameters will be as given in Table II.

7.3 The new spent fuel pool cooling system (including the existing cooling and cleanup system) is shown in Figures 1 and 2.

8.0 <u>Load Conditions</u>

The following requirements shall apply to the design of the new spent fuel pool cooling system and system components.

8.1 The new spent fuel pool cooling system components and their supports shall be designed to sustain loads due to seismic accelerations and displacements, weight, pressure, and thermal expansion, as applicable.

8.2 Mechanical and electrical components and their supports designated as seismic category I or class 1E shall be designed to remain functional following the SSE.

8.3 The seismic ground response spectra shall be based on the requirements of USNRC Regulatory Guide 1.60 using peak accelerations of 0.2g for the SSE, and 0.08g for the OBE.

8.4 Floor response curves and seismic analyses shall be based on the damping values required by USNRC Reg. Guide 1.61.

8.5 The accelerations and displacements of the various modes determined during the seismic analyses (spectrum analyses) shall be combined as required by USNRC Reg. Guide 1.92.

8.7 Design and service load combinations are as specified in Table IV.

8.7.1 The stress limits as defined in ASME Section III shall be used for the load combinations in Table IV.

8.7.2 The spent fuel pool pump and valves with operators are active components. For these components, note no. 11 of USNRC Reg. Guide 1.48 shall apply.

8.7.3 Manually operated valves and check valves are considered non-active components.

8.8 Seismic qualification of new Class 1E components shall be in accordance with IEEE-344 requirements, as amended by USNRC Regulatory Guide 1.100.

9.0 Environmental Conditions

9.1 The new spent fuel pool cooling system shall be designed to withstand the following environmental conditions in the auxiliary building without impairment of operability.

	Normal	Accident
Ambient Temperature, °F	50-104	104
Ambient Pressure, psig	ATM.	ATM.
Relative Humidity, %	100	100
Radioactivity	-	17.5×10^6 rads

9.2 Instrumentation and controls located in the control room shall be designed to withstand the following environmental conditions.

	Normal	Accident
Ambient Temperature, °F	50-90	50-90
Ambient Pressure, psig	ATM.	ATM.
Relative Humidity, %	5-90	5-90
Radioactivity	None	None

10.0 Interface Requirements

10.1 The new spent fuel pooling cooling system shall be designed to be installed in parallel with the existing SFP cooling system without degradation of function of the existing SFP cooling system or service water systems.

10.2 The function and adequacy of existing structures shall not be degraded by the installation of the new SFP cooling system.

10.3 The existing electrical systems shall not be degraded by the addition of the new SFP cooling system.

10.4 Interfaces between seismic category I and non-seismic piping systems shall be designed in a manner which will not degrade the required function of the seismic system.

11.0 Material Requirements

Materials for the new spent fuel pool cooling system components will be as given in Table II. Component materials in contact with SFP water shall be austenitic stainless steel or an equivalent corrosion-resistant material. Component materials in contact with service water shall be carbon steel.

12.0 Mechanical Requirements

The new spent fuel pool cooling system components shall be designed to minimize any hydraulically induced vibrations.

13.0 Structural Requirements

13.1 Supports for the new spent fuel pool pump, heat exchanger, and piping system shall be designed to ASME Section III, Subsection NF, for load combinations shown in Table IV.

13.2 Supports for the new electrical components and conduits shall be designed to conventional engineering design standards for loads due to weight and seismic events.

13.3 Attachments or modifications to existing structures shall be reviewed to assure that they do not degrade the ability of the structures to perform their intended functions.

13.4 Any modifications to existing structural steel or concrete shall comply with applicable requirements of the appropriate AISC or ACI code.

14.0 Hydraulic Requirements

14.1 The new spent fuel pool pump and piping shall be designed to assure that adequate NPSH and cooling water flow are available for the removal of the design heat loads.

14.2 For the "Safety" basis heat load, and the "normal" basis heat load, the NPSHA shall be determined at a pool temperature of 150°F and 120°F, respectively. The NPSHA shall be based on the pool water level at the new level switch trip point for both heat loads.

14.3 The service water piping to the new spent fuel heat exchanger shall be designed to provide adequate flow for the removal of the design heat loads.

15.0 Water Chemistry Requirements

The water chemistry specifications for the spent fuel pool are given in Table V.

16.0 Electrical Requirements

16.1 Power supply for SFP P-2 shall be 480 V, 3 Ø, 60 Hz, from safety (essential) bus 16. To ensure that bus 16 loading is minimized during an event that requires safety injection, SFP P-2 shall be shed on safety injection signal, and it shall be manually reloaded.

16.2 A single line diagram for SFP P-2 is shown in Figure 4.

16.3 Insulation for SFP P-2 motor cables shall be qualified in accordance with IEEE-383.

16.4 The Class IE motor for SFP P-2 shall be of totally enclosed construction.

17.0 Operational Requirements

The SFP P-2 and SFP HX-2 shall be designed for continuous and intermittent operations.

18.0 Instrumentation and Control

18.1 The SFP P-2 shall be controlled by a local indicating switch. An interlock with the new level switch in the spent fuel pool will prevent the pump from operating when the pool water level is low.

18.2 The control stations for SFP P-2 and SFP P-1 shall be mechanically interlocked to prevent running both pumps similtaneously.

18.3 Instrumentation

18.3.1 The types and locations of instrumentation for the spent fuel pool cooling system will be as shown in Table VI.

18.3.2 In-line instrumentation shall be seismic category I. The seismic category I boundary for indicating instrumentation shall be the root valve.

19.0 Access and Administrative Controls

Not applicable.

20.0 Redundancy, Diversity and Separation Requirements

20.1 Spent Fuel Pool Cooling Water System

Redundant cooling capability shall be provided as shown in Figure 1. The existing and skid mounted systems when operated in parallel provide backup cooling capability for the new cooling system.

20.2 Spent Fuel Pool Service Water System

As shown in Figure 2, the service water to SFP HX-2 shall be from service water loop B. The supply to SFP HX-1 and SFP HX-3 is from service water loop A.

20.3 Electrical Separation

20.3.1 Electrical separation between SFP P-2 and SFP P-1 motors and controls shall be maintained in accordance with IEEE-384 whenever existing plant design permits.

20.3.2 Where separation between groups cannot meet IEEE-384 criteria, separation shall be maintained as described in 20.3.3 (Ref.: Ginna FSAR, Section 8.2.2, Page 8.2-6B, "Separation of Redundant Circuits".).

20.3.3 The minimum physical dimensions between redundant power, control and instrument cable trays shall be 5 inches vertical separation and 2 inches horizontal separation. The minimum physical separation between redundant cables for power, control, and instrument systems shall be a galvanized sheet metal barrier in cable trays.

21.0 Failure Effects Requirements

21.1 Pipe Break

21.1.1 The design of the cooling system shall assure that the possibility of adverse effects resulting from steam environment, fluid jet impingement, and pipe whip caused by breaks in high and moderate energy piping in the Auxiliary Building does not prevent operation of the new cooling system.

21.1.2 Appropriate modifications including shields, barriers, restraints, etc. shall be installed if postulated pipe breaks are found to be detrimental to system performance.

21.2 Tornado

To minimize the damage due to potential tornado and external missiles, only the new spent fuel pool heat exchanger and a limited amount of piping, valves, and instrumentation shall be located above the operating floor of the auxiliary building.

21.3 Earthquake

The new spent fuel pool cooling system shall be designed to remain operational after the SSE.

21.4 Hurricane

The effects of hurricane were not considered in the original plant design.

21.5 Missiles - Internally Generated

21.5.1 The new cooling system is a low energy system. No missles are postulated due to failure of pressurized components.

21.5.2 The new and existing SFP pumps and motors will be evaluated to determine the potential of failure resulting in unacceptable damage to each other or to other safety related components. If necessary, barriers or other modifications shall be installed to prevent unacceptable damage.

21.5.3 Potential missiles resulting from high and moderate energy piping components and valve failures and failures of rotating equipment shall be evaluated to determine the potential of unacceptable damage to the cooling system. Only components and equipment in the area of the new system shall be evaluated. Barriers or other modifications shall be made, if practical, to protect the system from missiles.

21.6 Floods

Protection from flooding is provided by the design of the auxiliary building as described in Ginna FSAR, section 2.6.4 "Floods and Low Water", and Appendix 2C, "Probable Maximum Flood and Low Water Conditions".

21.7 Loss of Spent Fuel Pool Water

21.7.1 To protect against the possibility of complete loss of water in the spent fuel pool, the upper suction line penetrates the spent fuel pool near the top of the pool. The lower suction line penetrates the spent fuel pool approximately 5'-8" above the top of fuel to preclude the possibility of draining the pool and to assure a minimum water level of 5'-8" above the top of the fuel.

21.7.2 The spent fuel pool cooling water return line, which terminates at the bottom of the spent fuel pool, contains a vent hole near the normal spent fuel pool water level, so that the pool water cannot be siphoned.

21.7.3 Manual valves shall be provided to isolate non-seismic category I piping systems connected to the spent fuel pool cooling system in the event non-seismic category I piping systems fail.

21.8 The load center, local control panel, conduit supports and new pump motor shall be designed such that failure of these components does not degrade the capability of the existing spent fuel pool cooling system.

22.0 <u>Test Requirements</u>

22.1 The new system shall be hydrostatically tested to the extent practical in accordance with ASME Section III. An initial service leak test will be made for those areas of the system and connecting piping where a hydro test is impractical.

22.2 The new system shall be functionally tested to verify that proper operation of the cooling system is obtained. Test connections and instrumentation necessary to determine pressures, temperatures, and flows shall be provided.

22.3 The SFP P-2 pump shall be tested by the manufacturer to determine actual head, horsepower, and efficiency curves with varying flow.

22.4 The Motor Control Center and the local Class IE controls shall be qualified to the requirements of IEEE-323. The new SFP P-2 motor shall be qualified to the requirements of IEEE 323 or IEEE-334.

22.5 Functional testing of the new local control station, new spent fuel pool level switch and new motor control center shall be in accordance with IEEE-336 requirements.

23.0 Accessibility, Maintenance, Repair and Inservice Inspection Requirements

23.1 The new pump, motor, load center, heat exchanger, and valves shall be accessible for maintenance including heat exchanger tube bundle removal.

23.2 Access to existing plant equipment for routine maintenance and inspection shall not be adversely affected.

23.3 The new cooling system and service water piping modifications shall be designed to permit the performance of all tests and inspections required by ASME Section XI for Class 3 components.

24.0 Personnel Requirements

24.1 Not applicable.

25.0 Transportability Requirements

None.

26.0 Fire Protection Requirements

26.1 The design of the new spent fuel pool cooling system shall, as necessary, be compatible with the present fire protection requirements as outlined in GAI Report 1936.

26.2 Cable used in this modification shall meet the flame spread requirements of IEEE-383-1974.

27.0 Handling Requirements

27.1 The new system components and material to be used in seismic category I systems and structures shall be shipped, handled, and stored in accordance with the appropriate requirements of ANSI N45.2.2-1972.

27.2 Level B requirements of ANSI N45.2.2 shall apply for all new electrical components with the exception of the cables which shall meet Level D requirements.

27.3 Level B, C, and D requirements shall apply for other materials and equipment as indicated in ANSI N45.2.2.

28.0 Public Safety Requirements

None.

29.0 Applicability

None.

30.0 Personnel Safety Requirements

None.

31.0 Unique Requirements

None.

TABLE 1

SPENT FUEL POOL COOLING SYSTEM
DESIGN PARAMETERS

1.0	SFP storage capacity, assemblies		595
2.0	SFP water volume, ft^3 (water level 1'-4" from top of pool)		34,100
3.0	Design Heat Load Conditions		
		Safety	Normal
3.1	Initial decay heat, Btu/hr.	16×10^6	7.6×10^6
3.2	Maximum pool temperature, °F	150	120
3.3	SFP heat up rate, °F/hr. (assumes no cooling)	7.7	3.7
4.0	Service Water Requirements		
4.1	SW temperature, °F	80	80
4.2	Max. SW temp. increase, °F	20	15
4.3	SW flow, gpm (approx.)	1600	1000

TABLE II

SPENT FUEL POOL COOLING SYSTEM
COMPONENT DESIGN PARAMETERS

SFP P-2 (New)

Quantity	1
Design pressure, psig	150
Design temperature, °F	200
Design flow, gpm (approx.)	1,200
NPSH available, Ft. (approx.)	25
Design head, Ft. (approx.)	150
Material	Austenitic Stainless Steel
Design Code	ASME Section III, Class 3
Seismic Category	I

SFP HX-2 (New)

Quantity	1	
Design heat transfer, BTU/hr	16×10^6	
	Shell	Tube
Design pressure, psig	150	150
Design temperature, °F	200	200
Design flow, gpm (Approx.)	1600	1200
Inlet temperature, °F	80	150
Outlet temperature, °F	100 Max.	-
Fluid circulated	Service Water	SFP Water
Material	Carbon Steel	Austenitic Stainless Steel
Design Codes	ASME Section III, Class 2 and TEMA "F	
Seismic Category	I	

Spent Fuel Pool Water Piping/Valves (New)

Design pressure, psig	150
Design Temperature, °F	200
Material	Austenitic Stainless Steel
Design Code	ASME Section III, Class 3
Seismic Category	I

Service Water Piping/Valves (New)

Design pressure, psig	150
Design temperature, °F	200
Material	Carbon Steel
Design Code	ASME Section III, Class 3
Seismic Category	I

TABLE III

QUALITY GROUP, SEISMIC CATEGORY AND CODE CLASS

SPENT FUEL POOL COOLING SYSTEM COMPONENTS

COMPONENT	QUALITY GROUP	SEISMIC CATEGORY	ASME CODE CLASS
PUMP SFP P-2	C	I	Section III, Class 3
HEAT EXCHANGER SFP HX-2	C	I	Section III, Class 3
MOTOR FOR SFP P-2, LOAD CENTER, CONTROL STATION, LEVEL SWITCH LOCAL HAND STATION PIPING, NEW AND MODIFIED	N/A	Class IE	N/A
PIPING, NEW AND MODIFIED	C	I	Section III, Class 3
VALVES, NEW	C	I	Section III, Class 3
NEW INSTRUMENTATION In-line Instrumentation	C	I	Section III, Class 3
Indicating Instrumentation	D	Non-seismic	Manufacturer's Standards

TABLE IV

LOAD COMBINATIONS

Component	Service Limits			
	Design	Level A	Level B	Level C
Heat Exchanger	PD + DW + ML	PD + DW + ML + TL	PD + DW + ML + HL + OBE	PD + DW + ML + HL + SSE
Pump (Active)	PD + DW + ML	PD + DW + ML + HL + OBE	PD + DW + ML + HL + SSE	N.A.
Valves (Active)	PD + DW + ML	PD + DW + ML + HL + OBE	PD + DW + ML + HL + SSE	N.A.
Valves (Non-Active)	PD + DW + ML	PD + DW + ML + TL	PD + DW + ML + HL + OBE	PD + DW + ML + HL + SSE
Piping	PD + DW + ML	PD + DW + ML + TL	PD + DW + ML + HL + OBE	PD + DW + ML + HL + SSE

DW : Dead Weight
ML : Mechanical Loads
HL : Hydraulic Loads
TL : Thermal Loads
OBE : Operating Basis Earthquake
SSE : Safe Shutdown Earthquake
PD : Design Pressure

Note: There ar no Level D service limits.

TABLE V

SPENT FUEL POOL WATER CHEMISTRY SPECIFICATIONS

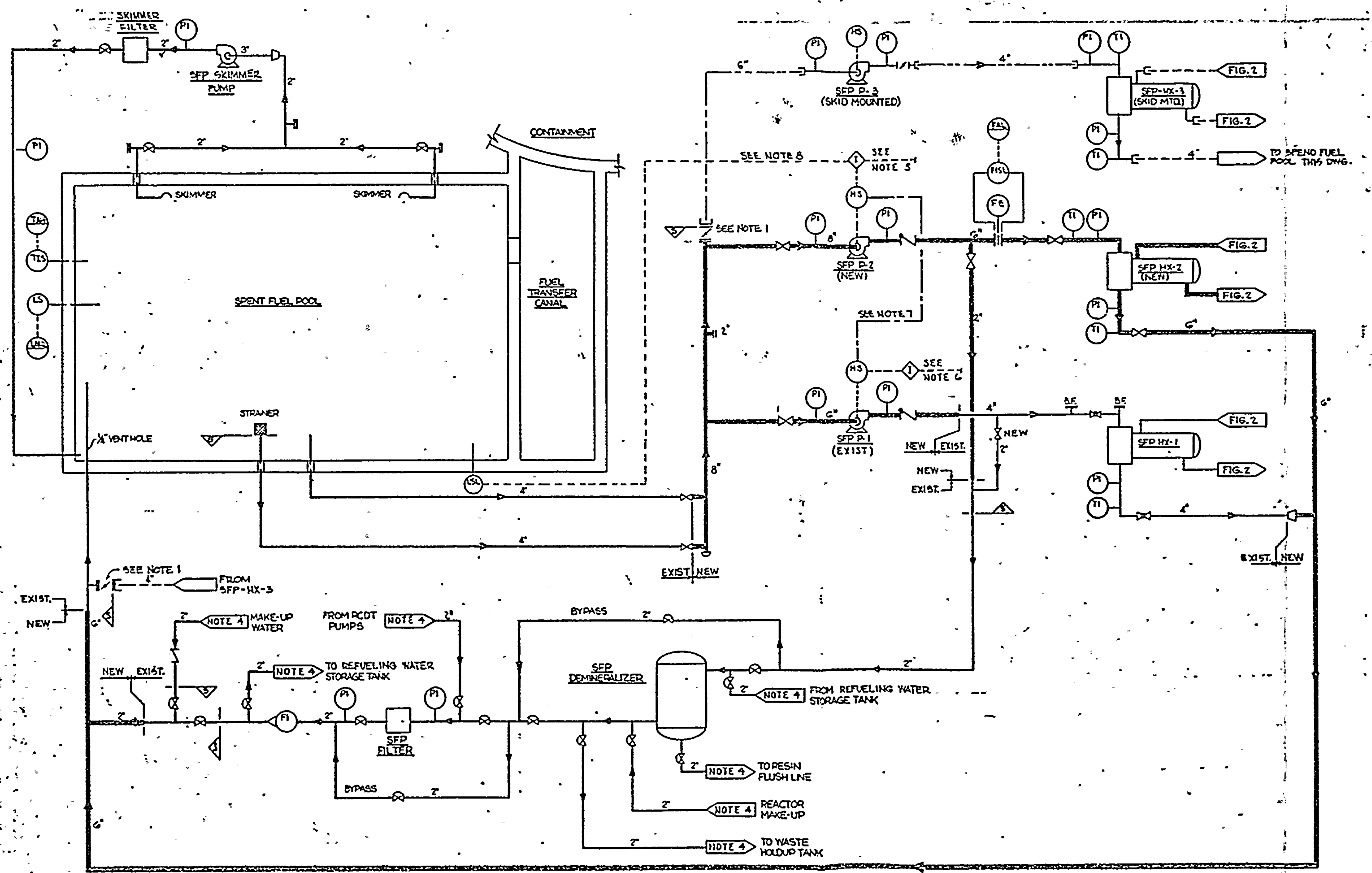
Characteristics	Normal Concentration (PPM)	Transient Limits (PPM)
Oxygen	Saturated	Saturated
Chloride	0.15	1.50
Fluoride	0.15	1.50
Boron Acid	2500 boron	2500 boron

TABLE VI

INSTRUMENTATION - TYPE & LOCATION

TYPE / LOCATION	FLOW	PRESSURE	TEMPERATURE	POOL WATER LEVEL	RADIOACTIVITY
PUMP, SFP P-1					
Suction	-	L	-	-	-
Discharge	-	L	-	-	-
PUMP, SFP P-2					
Suction	-	L	-	-	-
Discharge	L,A*	L	-	-	-
PUMP, SFP P-3					
Suction	-	L	-	-	-
Discharge	-	L	-	-	-
HEAT EXCHANGER, SFP HX-1					
Inlet, SFP Water	-	-	-	-	-
Outlet, SFP Water	-	L	L	-	-
Inlet, Service Water	-	L	-	-	-
Outlet, Service Water	L	-	-	-	A, MCB **
HEAT EXCHANGER, SFP HX-2					
Inlet, SFP Water	-	L	L	-	-
Outlet, SFP Water	-	L	L	-	-
Inlet, Service Water	-	L	L	-	-
Outlet, Service Water	L	L	L	-	A, MCB **
HEAT EXCHANGER, SFP HX-3					
Inlet, SFP Water	-	L	L	-	-
Outlet, SFP Water	-	L	L	-	-
Inlet, Service Water	-	L	L	-	-
Outlet, Service Water	-	L	L	-	-
SPENT FUEL POOL WATER LEVEL	-	-	L,A	A,***	

L: Local Indication
MCB: Main control board indication
A: Alarm in control room
* Low flow annunciation
** Connected to the plant computer
*** New level switch in the pool interlocked with SFP P-2



NOTES:

1. WHEN HOSE IS DISCONNECTED VALVE REMAINS AND BLIND FLANGE IS ADDED.
2. ALL NEW PIPING AND EQUIPMENT ARE SEISMIC CATEGORY I EXECPT AS NOTED.
3. ALL NEW PIPING AND EQUIPMENT ARE ASME SECTION III, CLASS 3 EXCEPT AS NOTED.
4. FOR AUXILIARY COOLANT SYSTEM P & I DIAGRAM REFER TO RG&E DRAWING NO. 33013-436.
5. TRIP ON SAFETY INJECTION (BUS 16)
6. TRIP ON BUS 14 UNDER VOLTAGE COINCIDENT WITH SAFETY INJECTION.
7. KEY LOCKED CONTROL STATIONS ARE KEYED ALIKE TO PREVENT SIMULTANEOUS OPERATION OF BOTH PUMPS
8. LEVEL SWITCH TRIPS PUMP SFP P-2 ON LOW SPENT FUEL POOL LEVEL.

2ND LEVEL REVIEW COMPLETED FORM

REV	ENGR	DATE
1	[illegible]	[illegible]

LEGEND

NEW PIPING & EQUIPMENT
EXIST. PIPING & EQUIPMENT
HOSE & COUPLING
SEISMIC CATEGORY I
ELECTRICAL SIGNAL
MECHANICAL INTERLOCK

REV	DESCRIPTION		
1	RELOCATED FLOW ORIFICE, CHANGED DIAPHRAGM VALVE TO GATE VALVE, ADDED LSL AT SPENT FUEL POOL, ADDED NOTES 7 & 8, REVISED LEGEND.	RIP	

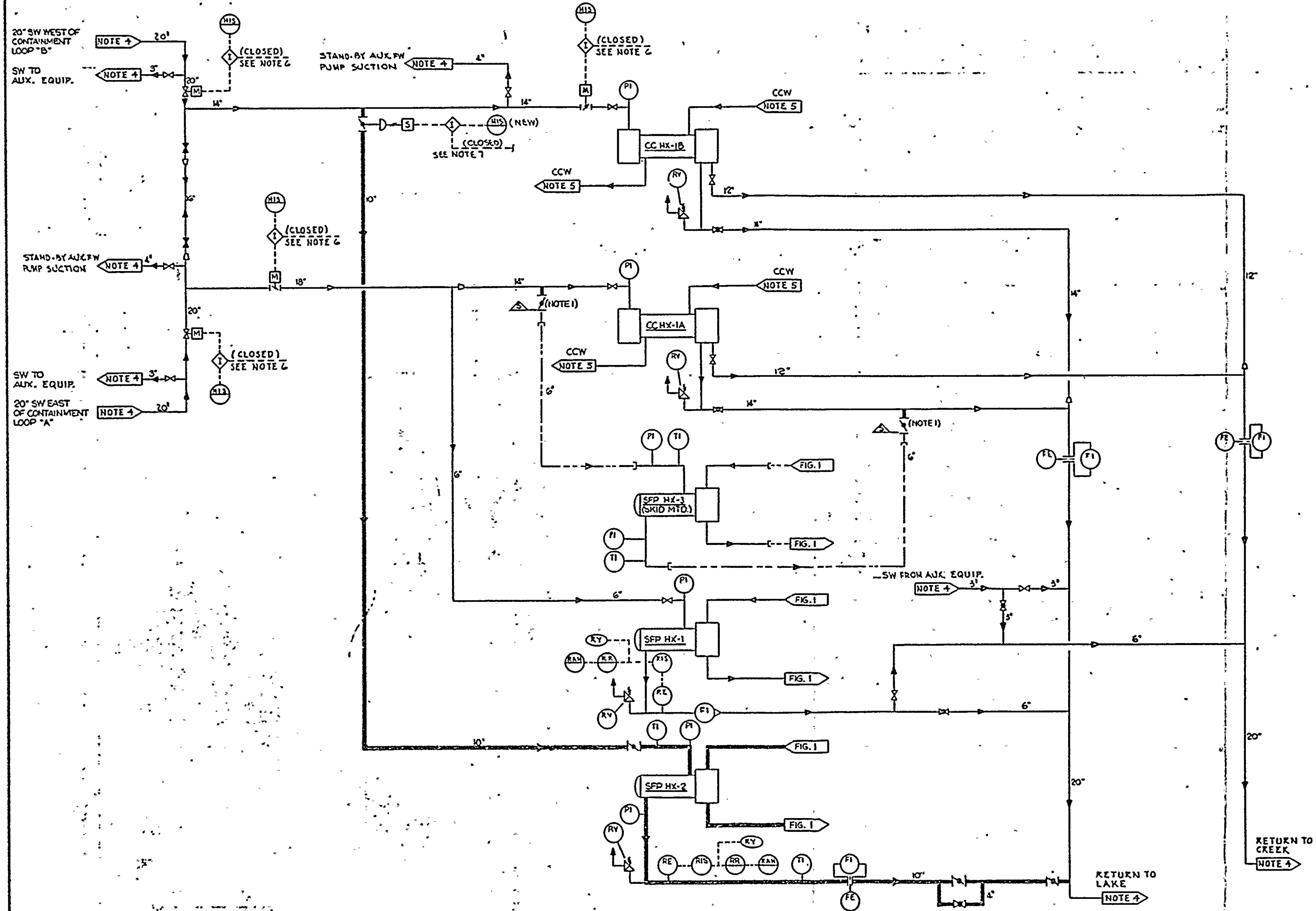
SCALE NONE
DRAWN BY SAL 10-2-79
CHECKED BY R. PATEL 10-25-79
CATALYTIC JOB NO. 36726

ORIGINAL

GINNA STATION
ROCHESTER GAS & ELECTRIC CORP.
SCALE NONE

FIGURE 1
SPENT FUEL POOL COOLING SYSTEM
SFP WATER P & I DIAGRAM

JOB NO	DRAWING NO	REV
EWR-1594	33013 - 748	1



NOTES

1. WHEN HOSE IS DISCONNECTED VALVE REMAINS AND BLIND FLANGE IS ADDED.
2. ALL NEW PIPING AND EQUIPMENT ARE SEISMIC CATEGORY I EXCEPT AS NOTED.
3. ALL NEW PIPING AND EQUIPMENT ARE ASME SECTION III, CLASS 3 EXCEPT AS NOTED.
4. FOR STATION SERVICE COOLING WATER P&I DIAGRAM REFER TO RG&E DRAWING NO. 33013-529.
5. FOR AUXILIARY COOLANT SYSTEM P&I DIAGRAM REFER TO RG&E DRAWING NO. 33013-435 AND 33013-436.
6. MOTOR OPERATED ISOLATION VALVES CLOSE AUTOMATICALLY IN THE EVENT OF COINCIDENT SAFEGUARDS ACTUATION SIGNAL AND LOSS OF OFFSITE POWER.
7. NEW AIR OPERATED ISOLATION VALVE CLOSES AUTOMATICALLY IN THE EVENT OF SAFEGUARDS ACTUATION SIGNAL.

LEGEND:

- NEW PIPING & EQUIPMENT
- EXISTING PIPING & EQUIPMENT
- ELECTRICAL SIGNAL
- SEISMIC CATEGORY I
- HOSE & COUPLING

2ND LEVEL REVIEW COMPLETED FORM

REV.	ENGR	DATE
1	[illegible]	[illegible]

REV	DESCRIPTION		
1	CHANGED [illegible] ... RAM TO PX PANEL MOUNTED, REV. NOTE 7 & LEGEND.	[illegible]	[illegible]

SCALE	NONE	
DRAWN BY	SAL	12-21-78
CHECKED BY	R. PATEL	1-25-79
CATALYTIC APPROVAL	[illegible]	1-26-79
CATALYTIC JOB NO. 36726		

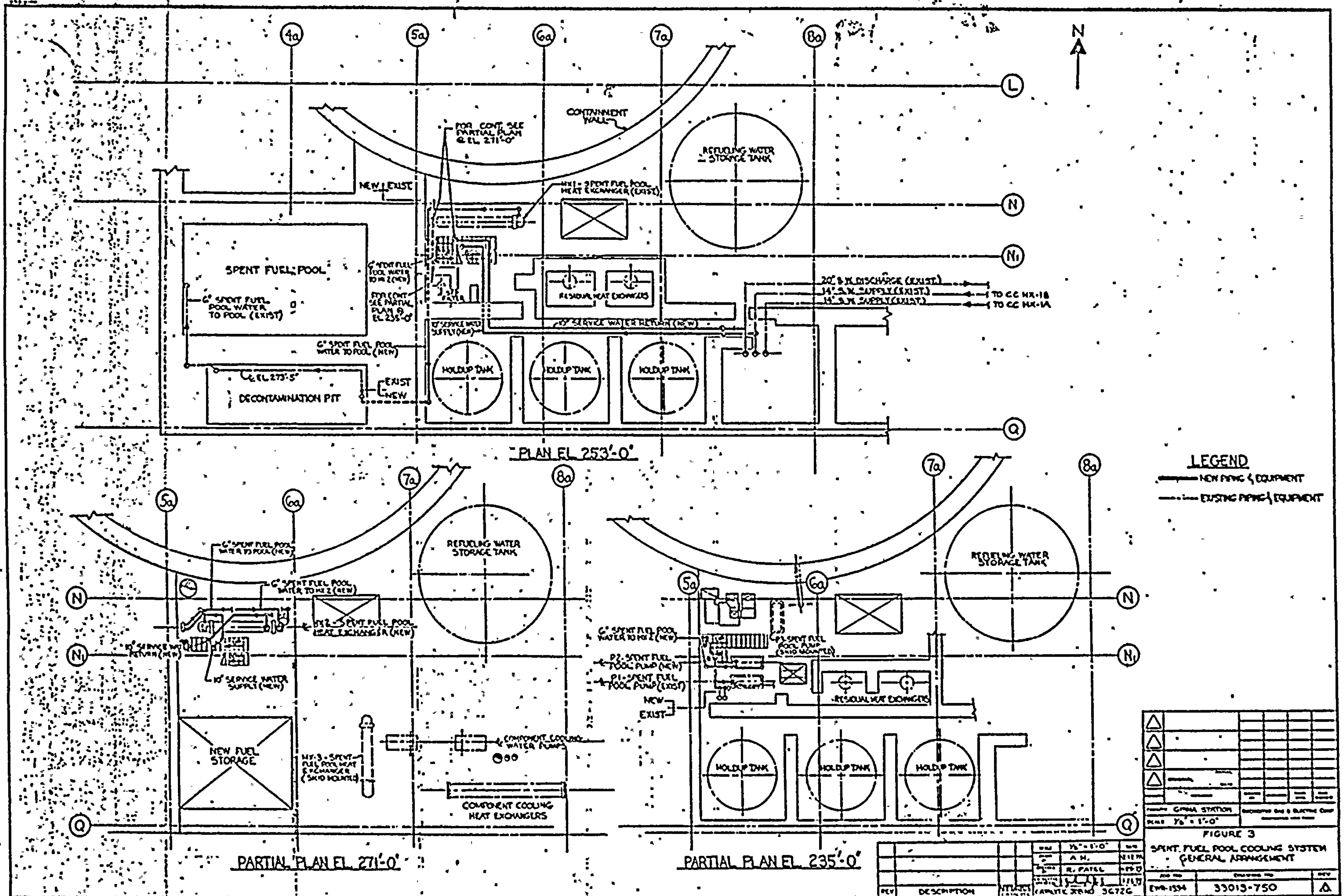
FACILITY GINNA STATION — ROCHESTER GAS & ELECTRIC CORP., ROCHESTER, NEW YORK

SCALE NONE

FIGURE 2

SPENT FUEL POOL COOLING SYSTEM SERVICE WATER P&I DIAGRAM

JOB NO.	DRAWING NO.	REV
EWR 1594	33013-749	1



PLAN EL. 253'-0"
CONTAINMENT WALL
FOR CONT. SEE PARTIAL PLAN @ EL. 271'-0"
REFUELING WATER STORAGE TANK
NEW | EXIST
HX1 - SPENT FUEL POOL HEAT EXCHANGER (EXIST)
SPENT FUEL POOL
6" SPENT FUEL POOL WATER TO POOL (EXIST)
6" SPENT FUEL POOL WATER TO POOL (NEW)
RESIDUAL HEAT EXCHANGERS
20" S.W. DISCHARGE (EXIST)
14" S.W. SUPPLY (EXIST)
14" S.W. SUPPLY (EXIST)
TO CC HX-1B
TO CC HX-1A
10" SERVICE WATER RETURN (NEW)
10" SERVICE WATER SUPPLY (NEW)
HOLDUP TANK
DECONTAMINATION PIT
EXIST
NEW
PARTIAL PLAN EL. 271'-0"
6" SPENT FUEL POOL WATER TO POOL (NEW)
6" SPENT FUEL POOL WATER TO HX 2 (NEW)
HX2 - SPENT FUEL POOL HEAT EXCHANGER (NEW)
10" SERVICE WATER RETURN (NEW)
10" SERVICE WATER SUPPLY (NEW)
NEW FUEL STORAGE
HX-3 - SPENT FUEL POOL HEAT EXCHANGER (SKID MOUNTED)
COMPONENT COOLING WATER PUMPS
COMPONENT COOLING HEAT EXCHANGERS
PARTIAL PLAN EL. 235'-0"
6" SPENT FUEL POOL WATER TO HX 2 (NEW)
P2 - SPENT FUEL POOL PUMP (NEW)
P1 - SPENT FUEL POOL PUMP (EXIST)
P3 - SPENT FUEL POOL PUMP (SKID MOUNTED)
RESIDUAL HEAT EXCHANGERS
LEGEND
NEW PIPING & EQUIPMENT
EXISTING PIPING & EQUIPMENT
GINNA STATION
ROCHESTER GAS & ELECTRIC CORP.
SCALE 1/8" = 1'-0"
FIGURE 3
SPENT FUEL POOL COOLING SYSTEM GENERAL ARRANGEMENT
EWR-1554
33013-750
REV
DESCRIPTION
A.H.
R. PATEL

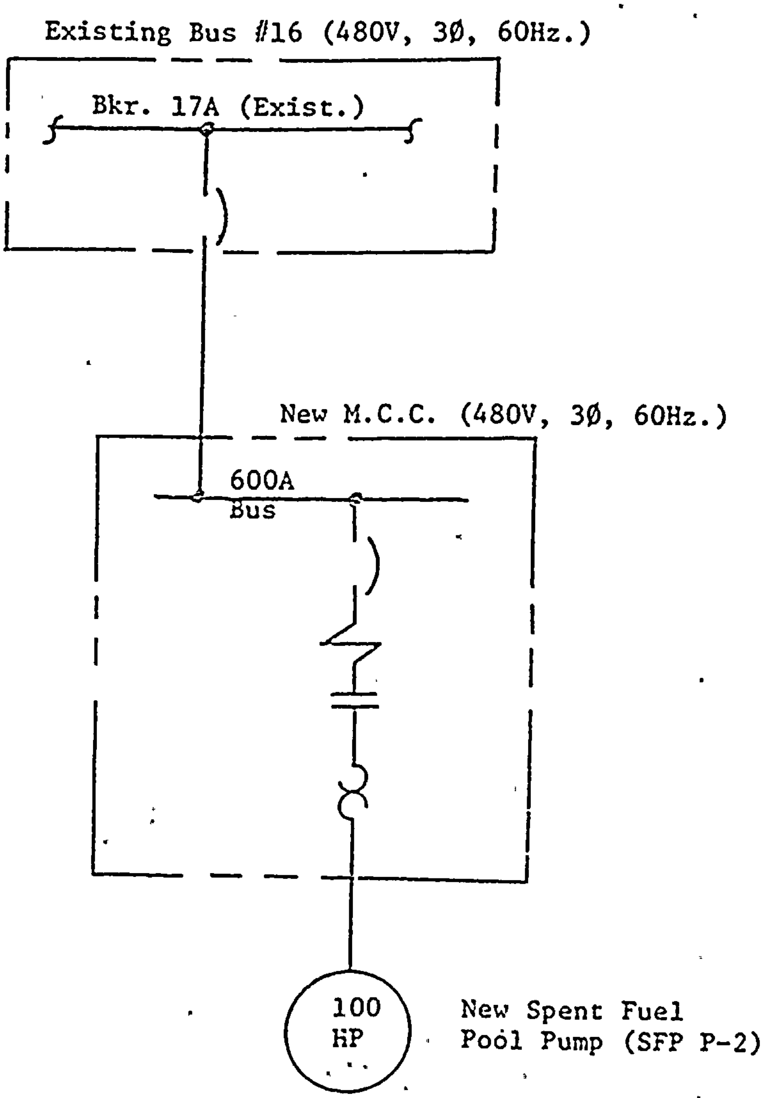


FIGURE 4

SPENT FUEL POOL COOLING SYSTEM

ONE LINE DIAGRAM