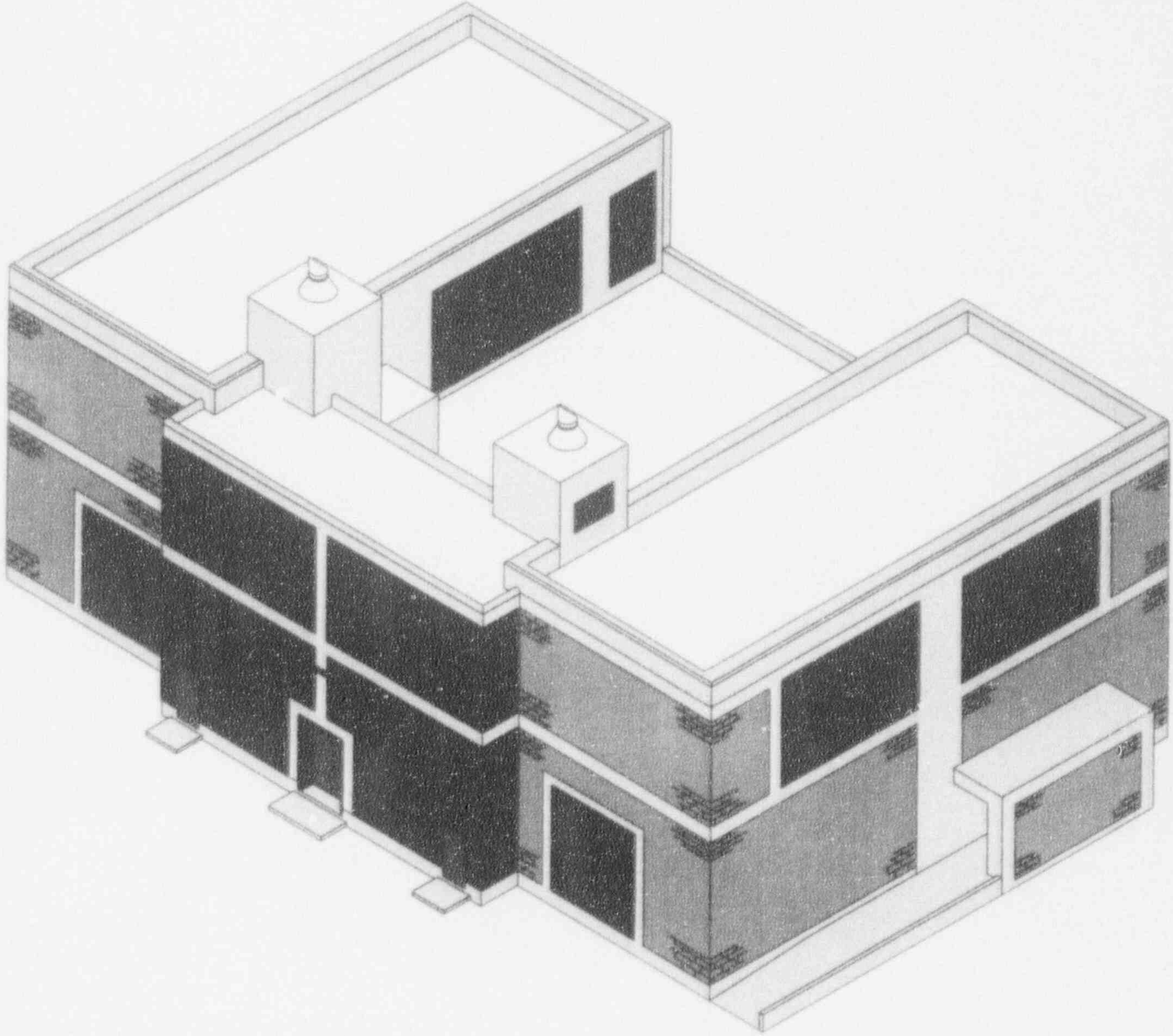
Point Beach Nuclear Plant

Diesel Generator Addition Project

Design Summary

Wisconsin Electric
POWER COMPANY



PBNP DIESEL PROJECT DESIGN SUBMITTAL

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PBNP DIESEL PROJECT DESIGN SUBMITTAL

1.0 INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Point Beach Nuclear Plant (PBNP) is located in east central Wisconsin on the west shore of Lake Michigan. Both PBNP Units 1 and 2 are pressurized light water moderated and cooled reactors designed by Westinghouse Electric Corporation. Each unit is licensed to generate 1518.5 MW reactor power. Unit 1 achieved commercial operation in December 1970, and Unit 2 achieved commercial operation in October 1972.

The Diesel Generator Addition Project (DGAP) involves the addition of two safety related emergency diesel generators (EDGs) at PBNP. Emergency power at PBNP is normally supplied through multiple ties from offsite power sources; however, two EDGs are currently installed in case of a loss of offsite power (LOOP). Each EDG is designed such that one EDG can supply sufficient power to safely control an accident in one unit and to safely shutdown the other unit, in the event of a LOOP. The new EDGs are capable of powering the same design loads as the existing EDGs, as well as being able to provide additional redundancy for the existing EDGs (See figures 1-1 and 1-2 for site layout). A 10 CFR 50.59 safety evaluation has been completed. This change to PBNP is not deemed to involve an unreviewed safety question because the probability of occurrence or the consequences of an accident or malfunction of equipment important to safety evaluated in the safety analysis report is not increased, the possibility for an accident or malfunction of a different type than any evaluated previously in the safety analysis report is not created, and the margin of safety as defined in the basis for any technical specification is not reduced.

This report is being submitted to the Nuclear Regulatory Commission (NRC) to support the Staff review of this project. A separate submittal containing the Safety Evaluation, proposed Technical Specification changes, and the Significant Hazards Analysis will be docketed under separate correspondence.

1.2 CONTENTS OF DESIGN REPORT

This DGAP design report provides the following:

a. Background information and descriptions of the existing PBNP emergency power system.

b. Information regarding the nuclear industry codes and standards utilized in the DGAP design process.

c. Information regarding hardware additions associated with the DGAP, including a new seismic Category I reinforced concrete Diesel Generator Building (DGB), two additional 2,848 KW safety related EDGs, two 35,000 gallon (approximate) EDG fuel oil storage tanks, additional EDG electrical distribution equipment and auxiliary equipment associated with the installation of the new EDGs.

d. Information regarding modifications to the existing emergency electrical distribution system.

e. Information regarding the implementation schedule for the DGAP, including a discussion of the interim emergency power system configurations that will be utilized during the installation process.

f. Information regarding the testing and subsequent operation of the new emergency diesel generators and the modified emergency power system.

This report contains the following sections:

a. Section 1.0 provides an introduction and background for the DGAP.

b. Section 2.0 provides a discussion of industry codes, standards and other criteria utilized in the design process.

c. Section 3.0 provides an overview of the existing emergency power distribution system and an overview of the upgraded emergency power distribution system which includes two additional diesel generators, G03 and G04, and upgraded 4160 v and 480 v electrical safeguards distribution systems.

d. Section 4.0 discusses the design and installation of the G03 and G04 safety related emergency diesel generators.

e. Section 5.0 discusses the design and installation of the new G03/G04 building and support systems.

f. Section 6.0 discusses the upgrade of the electrical safeguards interface of the new emergency diesel generators to the electrical safeguards distribution system.

g. Section 7.0 discusses the implementation plan for the addition of the emergency diesel generators and the electrical system upgrade. This includes interim configurations of the emergency power system that will be utilized during the DGAP installation process and plans to move the security fence so that it encloses the new diesel generator building.

1.3 DIESEL PROJECT PROGRAM OBJECTIVE AND GOALS

Wisconsin Electric (WE) has decided to install two additional safety-related EDGs at PBNP to enhance the two Units safety and reliability. The addition of the EDGs will allow the following primary objective to be met:

> The additional EDGs will enable the removal of any one diesel from service without entering a Technical Specification Limiting Condition for Operation (LCO). PBNP currently has a seven day Technical Specification Limiting Condition for Operation (LCO) if one of the two EDGs is taken out of service for some reason. This LCO requires both units at PBNP to be shutdown if the EDG has not been returned to service within seven days. If two additional EDGs are installed, one or two a EDGs could be removed from service without being in an LCO. This enhancement would preclude a dual unit outage that would currently be required if a diesel is taken out of service for more than seven days.

The following secondary objectives will also be met:

a. The additional EDGs will provide a larger margin between the accident condition loading requirements and the generating capacity of the EDGs. The 2000 hour design rating of the existing EDGs is 2850 kw and the 200 hour rating is 2963 kw, while the current initial (ie. first 1/2hour) accident loads on G01 and G02 are 2786 kw and 2909 kw, respectively. The loads decrease to 2584 kw for either diesel after the first 1/2 hour has passed. Installing two additional EDGs will increase the likelihood that more than one diesel would be operable after the onset of an accident. If more than one diesel is operable after the onset of an accident, some loads could be transferred to the extra EDG(s), thus eliminating the small margin between the diesel loading and the 200 hour rating.

b. The additional EDGs will provide excess emergency power generating capacity; which will result in the ability to provide power to some non-essential loads during accident conditions.

c. The additional EDGs will enhance safety at PBNP. The results of the *Point Beach Offsite Power System Probabilistic Safety Assessment* indicated that additional EDGs would reduce the likelihood of a core melt accident that could result from the failure of offsite power.

d. The new EDGs could be utilized as a qualified alternate ac power source instead of (or in addition to) the existing combustion gas turbine generator to address Station Blackout.

1.4 ELECTRICAL SAFEGUARDS MODIFICATIONS

The electrical safeguards modification includes the addition of two EDGs (GO3 and GO4) manufactured by General Motors Corporation, Electro-Motive Division. The EDGs will be radiator cooled and will be housed in a new Diesel Generator Building (DGB). The support systems required for the EDGs include fuel oil systems, starting air systems and ventilation systems. The associated control panels, auxiliary equipment, electrical distribution equipment, EDG day tanks, starting air and fuel oil storage and transfer components as well as the diesel engine radiators are also housed in the DGB.

1.5 DEFINITIONS

Class I

Those structures and components including instruments and control whose failure might cause or increase the severity of a loss-of-coolant accident or result in an uncontrolled release of excessive amounts of radioactivity. Also, those structures and components vital to safe shutdown and isolation of the reactor. Class I structures and components are designed to withstand all loadings including SSE and OBE seismic loads without loss of function.

Class II

Those structures and components which are important to reactor operation but not essential to safe shutdown and isolation of the reactor and whose failure could not result in the release of substantial amounts of radioactivity.

Class III

Those structures and components which are not related to reactor operation or containment and include all structures and components not included in Class I and Class II. Class III Structures and systems are typically designed in accordance with The Uniform Building Code.

Seismic II Over I:

All non-safety related systems and components and their supporting systems are designed to ensure that the SSE does not cause their structural failure in a manner that will result in damage to safety related systems or components.

1.6 REFERENCES

1) Point Beach Nuclear Plant, Final Safety Analysis Report, Wisconsin Electric Power Company, June 1992 FSAR Revision.

2) Seismic Monitoring Instrumentation, Point Beach Nuclear Plant, Work Order Requisition from C.W. Fay to R.W. Britt, August 19, 1986.

3) "Structural Design Criteria for the Point Beach Nuclear Plant," Revised July, 1967, Bechtel Corporation, San Francisco, California.

4) "Design Criteria for Nuclear Power Plants Against Tornados," B-TOP-3, Bechtel Corporation, San Francisco, California.

5) "Design of Structures for Missile Impact," BC-TOP-9A Rev. 2, September 1974, Bechtel Corporation, San Francisco, California.

6) "Structural Analysis and Design of Nuclear Plant Facilities," ASCE, 1980.

7) "Design Basis Document for the Diesel Generator Project," Wisconsin Electric Power Company, Point Beach Nuclear Plant, DBD No. 6704.001-DBD-001, Rev. 0, July 1992.

8) "Design Guide Number C-2.45 for Design of Structures for Tornado Missile Impact,"January 1982, Bechtel Corporation, San Francisco, California.

9) "Minimum Design Loads for Buildings and Other Structures," ASCE-7-88 (Formerly ANSI A58.1), American Society of Civil Engineers, 1988.

10) "Wind Forces on Structures," ASCE Paper 3269, Transactions of the American Society of Civil Engineers, Volume 126, Part II, 1961.

11) "Evaluation of the Need for Cathodic Protection of Underground Piping and Tubing Associated with the Diesel Generator Project", PBNP, December 9, 1992.

12) "Specification for Diesel Generator Building Subsurface Investigation" PBNP, WEPCO, UE&C Specification No. 6704-5-1 Section 02010, Rev. 1, 1992.

13) "Report of Foundation Investigation" Proposed Nuclear Power Plant, Point Beach Nuclear Power Station, Two Creeks, Wisconsin, For the Wisconsin Michigan Power Company, Dames & Moore, December 1966.

14) "Specification for Reinforcing Steel" PBNP, WEPCO, UE&C Specification No. 6704-1-1 Section 03200, Rev. 1, 1993.

15) "Effect of Tornado - Generated Missiles on the Diesel Generator Building, Calculation Set Number 6704.001-C-017, United Engineers and Constructors, Inc., 1992.

16) "Generation of Floor Response Spectra for the Diesel Generator Building," Calculation Set Number 6704.001-C-019, United Engineers and Constructors, Inc., 1992.

17) "Seismic and Quasi-static Analysis of the Diesel Generator Building," Calculation Set Number 6704.001-C-020, United Engineers and Constructors, Inc., 1992.

18) "Hand Calculation of Seismic and Thermal Stresses in Buried Piping," G.C.K. Yeh, Bechtel Power Corporation, Los Angeles, California.

19) "Specification for Cast-in-Place Concrete," PBNP, WEPCO, UE&C Specification No. 6704-1-1, Section 03300, Rev. 1, 1993.

20) "Specification for Ready Mixed Concrete," PBNP, WEPCO, UE&C Specification No. 6704-1-1, Section 03302, Rev. 1, 1993.

21) "Diesel Generator Building, Building Overpressurization Due to Tornado," PBNP, WEPCO, United Engineers and Constructors, Inc., Calculation Set No. 6704.001-C-015, March 1992.

22) "Diesel Generator Building Design," PBNP, WEPCO, United Engineers and Constructors, Inc., Calculation Set No. 6704.001-C-032, November 1992.

23) TVA Design Criteria for Seismic Qualification of Category I Fluid System Components and Electrical or Mechanical Equipment, DCN No. E6-90-D707, 12/30/75.

24) "DELETED"

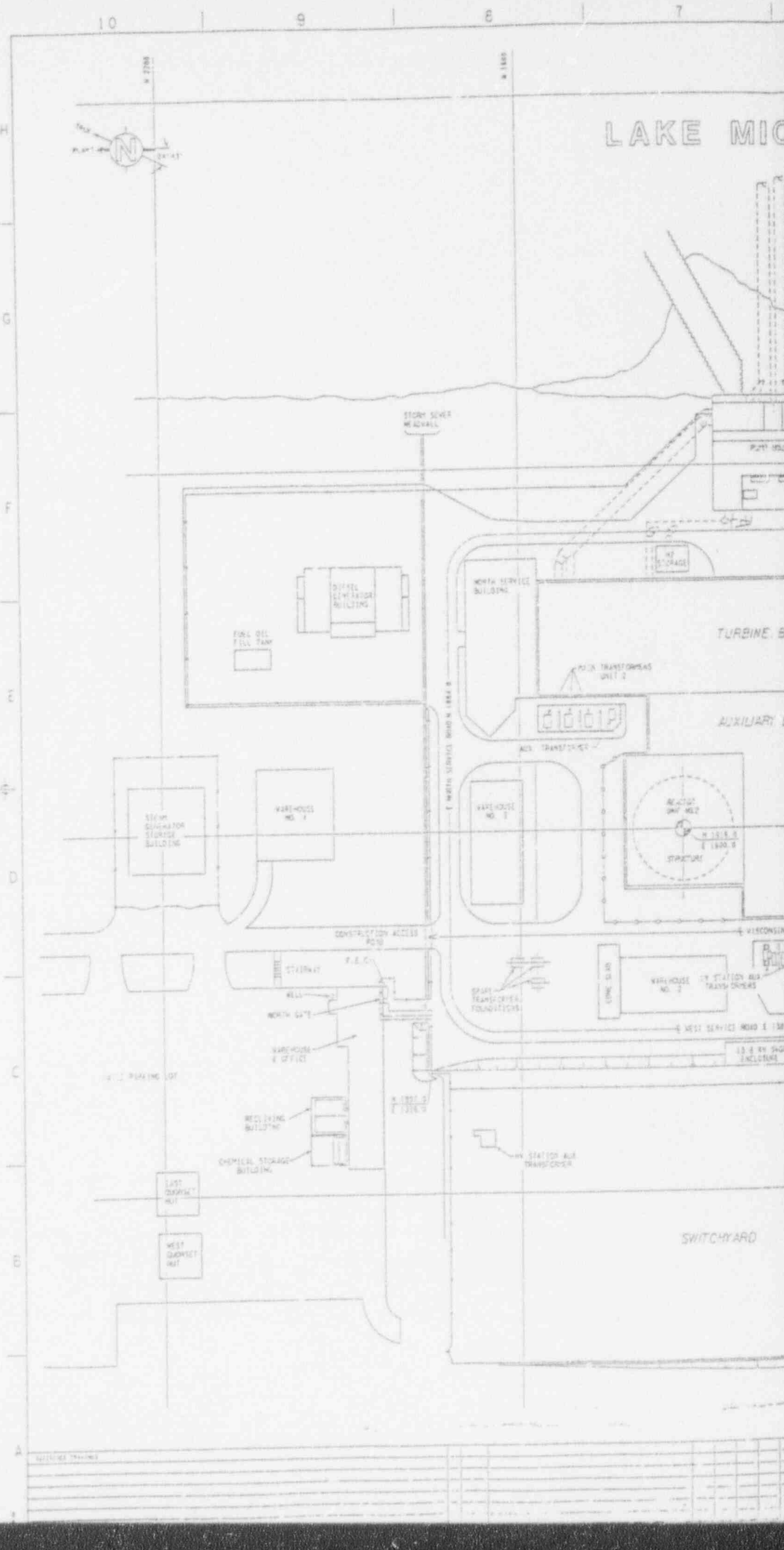
25) "Diesel Generator Building, Buried Piping - Stress Analysis," PBNP, WEPCO, United Engineers and Constructors, Inc., Calculation Set No. 6704.001-C-029, August 1992.

26) "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment," Seismic Qualification Utility Group, Rev. 2, 1992.

27) "DELETED"

28) Dockets 50-266 and 50-301, Implementatation of Regulatory Guide 1.97 for Emergency Response Capability PBNP, Units 1 and 2. Response from D.G. Eisenhut to Mr. H.R. Denton, September 1, 1983.

29) "Specification for 5 kv Power Cable" PBNP, WEPCO, UE&C Specification No. 6704.001-SP-E-018, Rev. 0, August 25, 1992.



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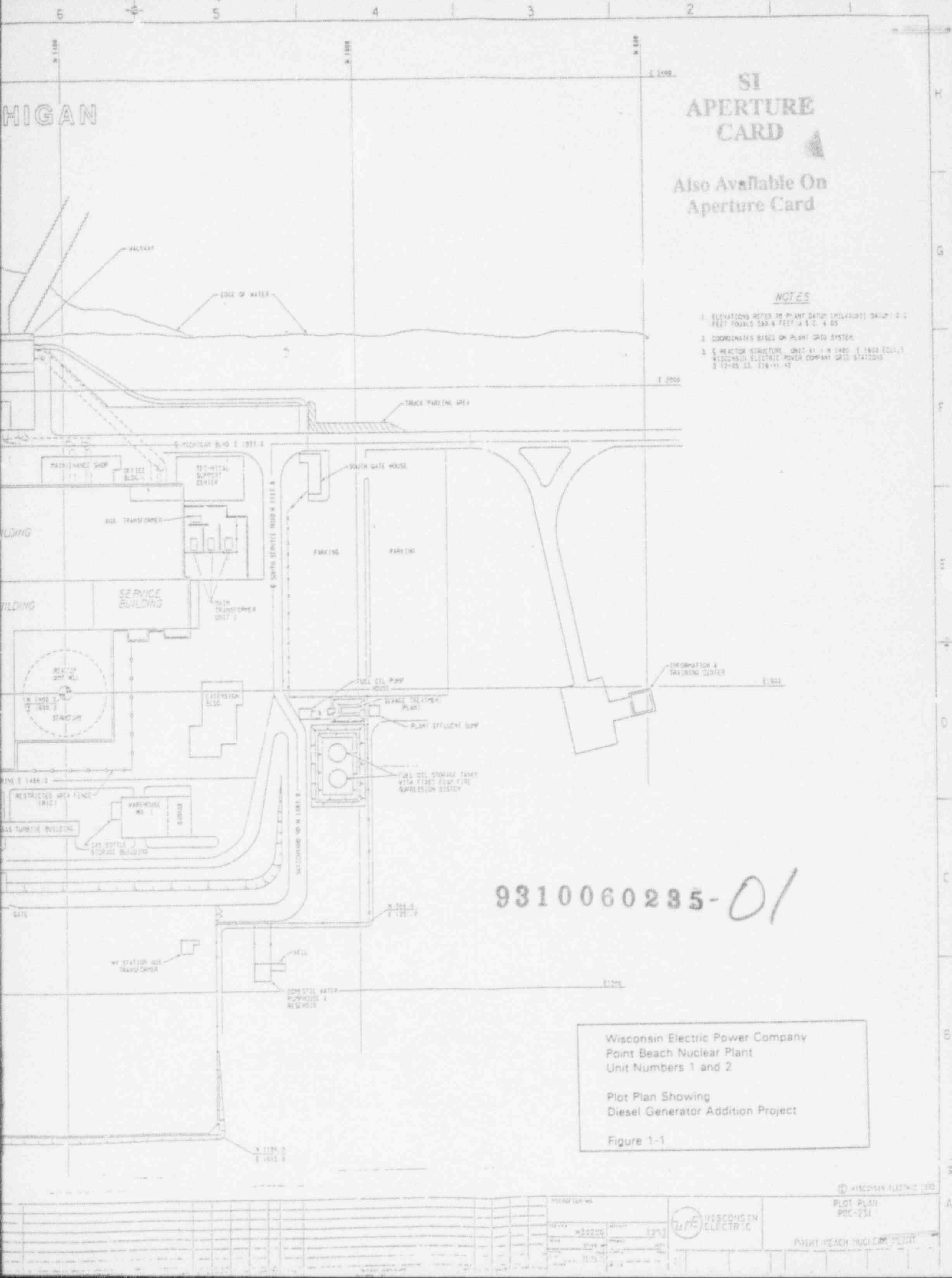
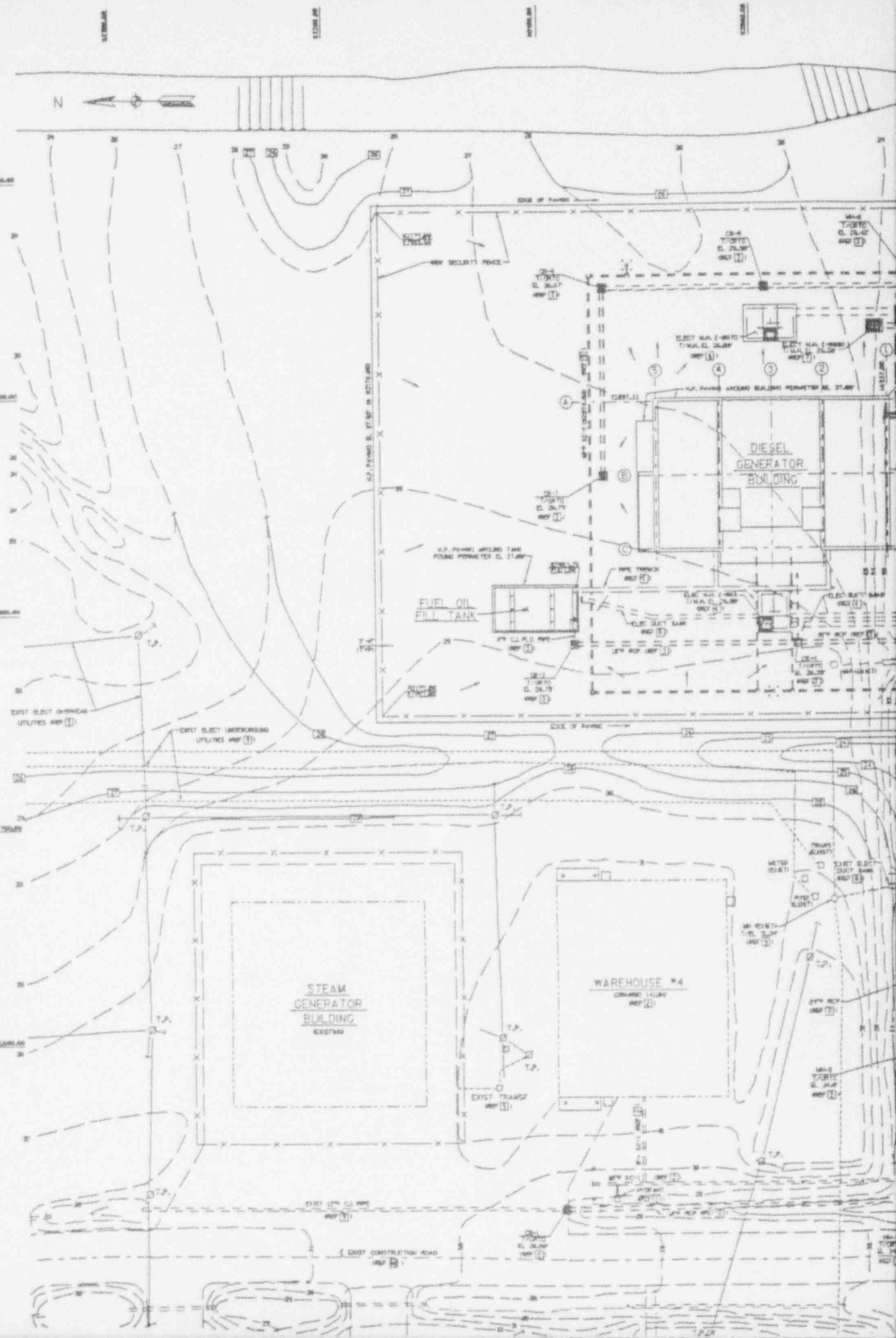
9
8
7
H
G
F
E
D
C
B
A
LAKE MIC
STORM SEWER HEADWALL
NORTH SERVICE BUILDING
DIESEL GENERATOR BUILDING
FUEL OIL FILL TANK
TURBINE BU
AUXILIARY B
WAREHOUSE NO. 4
WAREHOUSE NO. 3
WAREHOUSE NO. 2
STEAM GENERATOR STORAGE BUILDING
CONSTRUCTION ACCESS ROAD
STAIRWAY
NORTH GATE
RECEIVING BUILDING
CHEMICAL STORAGE BUILDING
EAST QUONSET HUT
WEST QUONSET HUT
SWITCHYARD



Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Plot Plan Showing
Diesel Generator Addition Project

Figure 1-1



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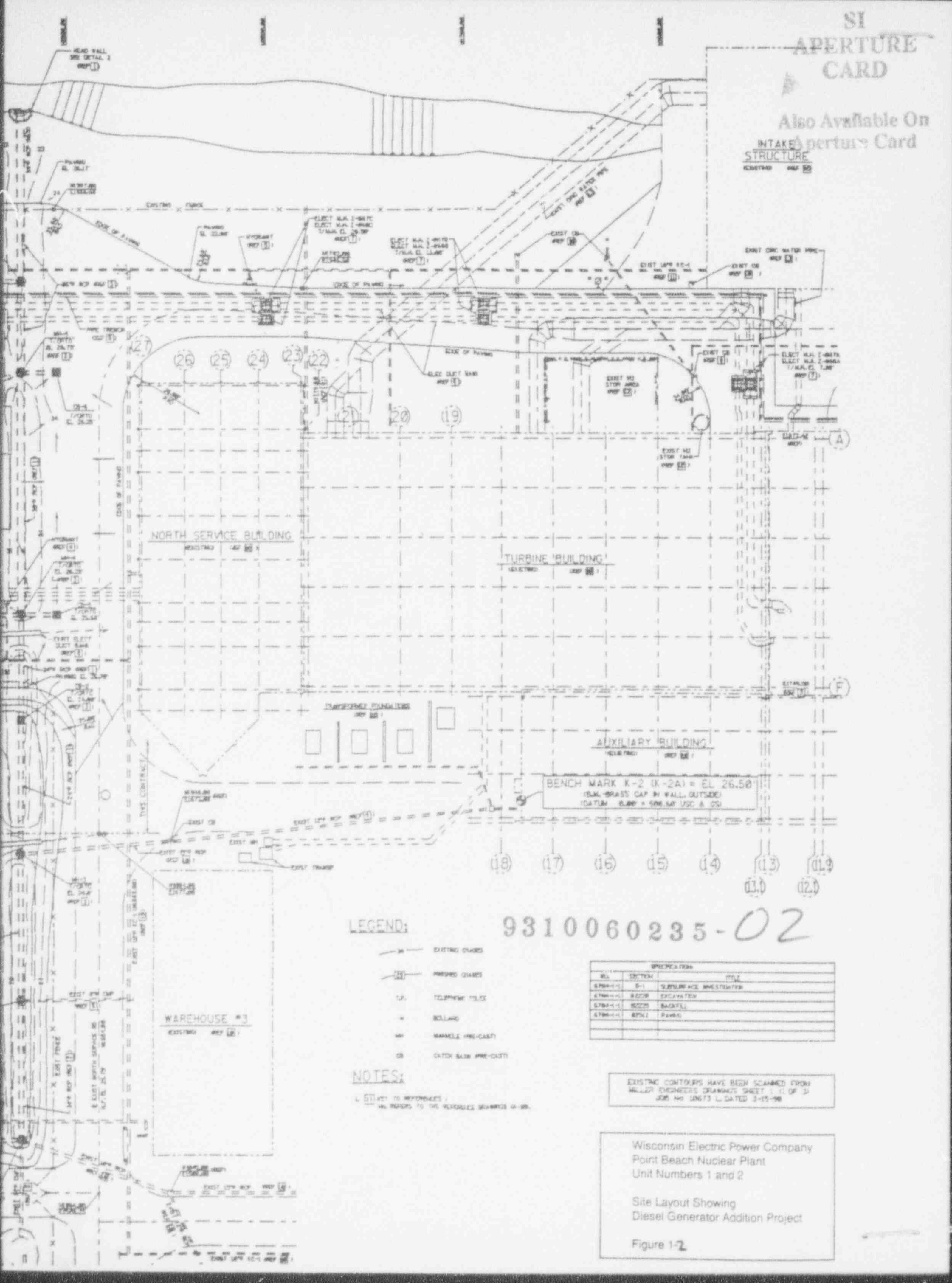
EDGE OF PAVING
NEW SECURITY FENCE
DIESEL
GENERATOR
BUILDING
FUEL OIL
FILL TANK
EXIST ELECT OVERHEAD
UTILITIES
EXIST ELECT UNDERGROUND
UTILITIES
STEAM
GENERATOR
BUILDING
WAREHOUSE #4
EXIST TRANSF
EXIST CONSTRUCTION ROAD
T.P.



Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Site Layout Showing
Diesel Generator Addition Project

Figure 1-2

2.0 DESIGN STANDARDS

2.1 NUCLEAR INDUSTRY CODES & STANDARDS

Where applicable, industry codes and standards used in the original design of PBNP have been utilized in the design of the DGAP. We believe that it is important to maintain a uniform design basis for each system, and that future modifications would be complicated if different portions of the same system were designed to different codes and standards. Consequently, because this project will result in significant modifications to numerous plant systems, original codes and standards have been utilized, where appropriate, to ensure consistency in system design.

Appendix A, "Industry Codes and Standards Compliance Matrix," lists applicable industry codes and standards that were used in this project. Original codes and standards were reviewed against current codes and standards to ensure that safety is not impacted by utilizing original codes and standards. Where appropriate, original codes and standards have been supplemented by requirements in current codes and standards. The results of this review are detailed in Appendix-A.

2.2 GENERAL DESIGN CRITERIA

PBNP was originally designed utilizing criteria listed in the Atomic Industrial Forum (AIF) letter, "Comments of Forum Committee on Reactor Safety on AECs Proposed Construction Permit Criteria," dated October 2, 1967. Applicable criteria from this letter have been utilized in the DGAP design. Additionally, applicable criteria in 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," have also been utilized in the design of the DGAP. These two sets of design criteria are cross referenced and discussed in Appendix-B, "General Design Criteria Compliance Matrix."

2.3 NRC STANDARD REVIEW PLANS

Applicable sections of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, LWR Edition," have been reviewed to determine the DGAPs design conformance with the guidance contained therein. The applicable sections of NUREG-0800 are discussed in Appendix C, "Standard Review Plan Compliance Matrix."

2.4 REGULATORY GUIDES

Applicable NRC Regulatory Guides have been reviewed to determine the DGAPs conformance with the guidance contained therein. Applicable Regulatory Guides are discussed in Appendix-D, "Regulatory Guide Compliance Matrix."

2.5 NUREG/CR 0660, "Enhancement of On-Site EDG Reliability"

The recommendations provided in NUREG/CR-0660 are addressed in the design. The specific approaches are discussed in the responses to the associated Standard Review Plans (e.g. SRP 9.5.8, Emergency Diesel Engine Combustion Air Intake and Exhaust Systems).

2.6 BUILDING CODES

2.6.1 Wisconsin Administrative Code

2.6.2 Uniform Building Code

2.7 QUALITY ASSURANCE

2.7.1 Design

All safety-related design and construction activities performed for the PBNP diesel project by WE and its suppliers will be performed in accordance with the Quality Assurance Program that meets the requirements of 10 CFR 50, Appendix B and the guidelines provided in ANSI N18.7-1976, except as specifically noted in Table 1.8-1 of the PBNP FSAR.

2.7.2 Procurement

Safety-related items and services will be procured from vendors with approved 10 CFR 50, Appendix B Quality Assurance Programs or dedicated in accordance with WE Quality Assurance Program. Commercial Grade Items (CGI) being dedicated will require that a Technical Evaluation (TE) be prepared, reviewed by WE Procurement Engineering, and approved by the WE Site Quality Assurance Group. The TE will identify the necessary critical characteristics and acceptance method(s) necessary to provide reasonable assurance the item being received is the item specified. Items being considered for dedication by WE include embedded unistrut, rebar, concrete, and the radiator fan motors. Additional items may be considered as they are identified during the project.

2.7.3 Installation

All safety-related installation activities will be controlled in accordance with 10CFR50 Appendix B Quality Assurance Program. Non-safety-related activities, including augmented quality, will be controlled with a Quality Program commensurate with the activities importance to safety or based on the activities potential impact on plant operations.

Installation activities will be controlled in accordance with a contractors approved Quality Assurance Program; however, when deemed necessary by Wisconsin Electric, activities will be controlled in accordance with the applicable requirements of the Wisconsin Electric Quality Assurance Program. This determination will be made based upon the activities impact or potential impact on plant operations. Satisfactory control of installation activities will be verified by frequent monitoring, specific scope surveillance, and program audits.

3.0 OVERVIEW: EXISTING DESIGN AND UPGRADED DESIGN

3.1 EXISTING SAFEGUARDS AUXILIARY POWER SYSTEM

3.1.1 G01 and G02 Diesel Generators and Auxiliary Systems

The existing PBNP EDGs, G01 and G02, and the safeguards electrical distribution system provide emergency power in the event of loss of offsite power in order to bring both units to a safe (hot) shutdown condition. This is achieved using automatic control logic. Each EDG, as a backup to the preferred offsite AC power supply, is capable of automatically starting and supplying the power requirements of one complete set of engineered safeguards features for one unit while providing sufficient power to allow the second unit to be placed in a safe shutdown condition. A Safety Injection (SI) signal in either unit will also initiate an automatic start of the diesels.

The existing design predates the physical and electrical separation requirements of IEEE 384. For example, the redundant trains of 4160 V switchgear in the safeguards electrical distribution system are located in the same room with no physical barrier between the two.

See Figure 3-1 for the one-line electrical diagram of the existing Safeguards AC electrical distribution system.

EDGs G01 and G02 consist of two General Motors Corporation, Electro-Motive Division units each rated at 2850 kw continuous (2000 hour basis), 0.8 power factor, 900 rpm, 4160 V, 3-phase, and 60 Hertz. Additional ratings are 2963 kw for 200 hours, 3000 kw for 4 hours and 3053 kw for a 30-minute period. The worst case plant loads placed on an EDG during a design basis accident (requiring safety injection of one unit and hot shutdown of the other in conjunction with loss of power to both units plus a failure of one EDG) result in approximately 290[illegible] kw for the automatically and manually-connected loads for the first half hour (which is less than the 200 hour rating). The loading then decreases to approximately 2600 kw for the duration of the accident (which is less than the 2000 hour rating). Table 3-A depicts the presently evaluated EDG G01 and G02 loads for the above scenario.

Each EDG is started by either one of two pairs of air motors. Each EDG has its own independent starting air system, including two banks of three air storage tanks and two compressor systems powered from separate Train A and Train B 480 V safeguards electrical distribution system motor control centers. By manually changing the pulley belt, one air compressor in each unit may be powered by its own independent auxiliary diesel engine. Each bank of air receivers has sufficient storage to crank the EDG five separate times for the normal cranking duration. Each EDG is capable of being started and readied to accept load in 10 seconds. The starting air system is redundant for each EDG.

Air is admitted from the starting air receivers at a working pressure of 200 psig to the EDG starting system through a two-way solenoid valve. A selector switch determines which solenoid valve and, in turn, which bank of air start motors will be activated first. When the signal to start the EDG is initiated, a motor-driven fuel pump will start, and the preselected solenoid valve will be energized to open. Once the starter motor pinions are engaged, the starter motors will crank the engine.

Cranking continues until either the engine starts or until a predetermined time period of 3 seconds has elapsed. At this time, should the engine fail to start, the start failure alarm will come on, followed by a start attempt by both banks of start motors. If the engine again fails to start, after 6 seconds, a startup attempt will be made by only the opposite bank of motors. Although sufficient air storage is provided to permit at least 5 starts before the tanks are exhausted, only 3 automatic start attempts will be made on an initiated start signal. If all three attempts are unsuccessful, both circuits will lock out. Operator action is required for additional start attempts.

The control voltage for the EDG starting system is supplied by the DC System and is backed up by a manually switched 125 V DC power supply from an alternate station battery.

To ensure a rapid start, each EDG is equipped with an immersion heater which furnishes heat to the engine cooling water when the engine is shut down. Coolant heated by the immersion heater circulates through the lube oil cooler by thermosyphon action to warm the lube oil. The warmed oil is circulated through the engine and turbocharger by the lube oil circulating pumps and is returned to the engine oil sump.

Automatic starting of each EDG (G01 and G02) is initiated by undervoltage on either of the two 4160 V buses (1-A05 or 2-A05 for G01 and 1-A06 or 2-A06 for G02) to which the EDG is associated. Automatic starting is also initiated by a safety injection (SI) signal.

3.1.2 Safeguards Electrical System

Figure 3-1 shows the existing safeguards electrical configuration. For an explanation of the existing system and its operation refer to section 6.0

3.1.3 Fuel Oil System

Sufficient fuel is stored in a storage tank located in the base of each EDG and an additional day tank for each EDG to permit a minimum of five hours operation at full load. An underground emergency fuel oil storage tank on site has a capacity of 12,000 gallons. This capacity provides sufficient fuel to allow one EDG to operate continuously at full load for an additional 48 hours. Transfer of fuel from the emergency tank to automatically maintain level in the EDG day tanks is accomplished by two motor-driven pumps. An additional supply of diesel oil is maintained on site in two 60,000 gallon bulk oil storage tanks used to supply the gas turbine and heating boilers. This oil can be transferred via gravity feed to the 12,000 gallon underground emergency fuel oil storage tank. With one 60,000 gallon tank and all the other tanks at minimum allowable levels, the oil capacity is sufficient for a total of approximately 128 hours of operation for the two diesels.

3.1.4 Diesel Generator Ventilation

The ventilation system for the existing diesel generator rooms and switchgear rooms will not be affected by the addition of the two new EDGs except for the power supplies to the fans G02 diesel room. These power supplies will be reconnected to make them A train supplies.

3.2 UPGRADED SAFEGUARDS AUXILIARY POWER SYSTEM

The upgraded safeguards auxiliary power system will include the addition of two new EDGs, G03 and G04, with all required support systems and safeguards auxiliary power system components. The support systems will include fuel oil, starting air and ventilation. The safeguards auxiliary power system components will include 4160 V switchgear buses, 480 V motor control centers, 125 V DC distribution panels, 120 v AC distribution panels, transformers and cabling.

Additionally, new fuel oil storage and transfer components which will be part of the new fuel oil system, will be added to support all four emergency diesel generators. These will include new EDG fuel oil storage tanks, fuel oil transfer pumps and a fuel oil fill tank.

See Figure 3-2 for the one-line electrical diagram of the modified Safeguards AC Electrical Distribution System.

3.2.1 G03 and G04 Diesel Generators and Auxiliary Systems

The new EDGs will consist of two General Motors Corporation, Electro-Motive Division units, each rated at 2848 kw continuous (2000 hour basis) 0.8 power factor, 900 rpm, 6900 V, 3-phase, and 60 Hertz. The 6900 V rating is with the generator windings wye connected. The required 4160 V rating will be obtained by connecting the windings in a delta configuration. Additional ratings are 2951 kW for 200 hours and 2987 kw for 4 hours.

The EDGs will be radiator cooled and will be independent of the existing plant cooling water system.

A new diesel generator building (DGB) will house the new EDGs (G03/G04), with the associated control panels, auxiliary equipment, electrical distribution equipment, EDG day tanks, starting air components, fuel oil storage and transfer components and the diesel engine radiators.

Each EDG is started by either one of two banks of air motors. Each bank consists of a pair of air motors, air start valves, air line lubricator, high flow air regulator, and air receivers that hold sufficient air for a minimum of 5 start attempts. The air receivers for each bank are fed from two common compressors, the normal supply compressor is electric driven and the backup compressor is driven by its own diesel engine. The two air banks are isolated from the air supply with check valves thus making them completely independent.

Air is admitted from the air receivers at a working pressure of 240 psig, through a high flow regulator that supplies air at 200 psig to the EDG air start valves. When the signal to start the engine is initiated, a motor driven fuel pump and a governor booster pump will start, and an air solenoid valve in each start bank will energize to open. The air solenoid valve allows pilot air pressure to engage the air motor drive pinions. Once the air motor pinions are engaged, the pilot air pressure causes a high flow air start valve to open admitting air to the air motors which crank the engine. The engine will crank until the engine reaches 100 rpm.

Should the air start motor pinions of both air tanks fail to engage the flywheel within .7 seconds, the air start system will depressurize for .7 seconds then attempt another start. Should the air motors crank the engine above 100 rpm without the engine starting the motors will deenergize and a second start attempt will be initiated when the diesel speed drops below 50 rpm, this will continue until either the engine starts or the air in the receivers is exhausted.

The control voltage for the EDG starting system is supplied by the DC system and is backed up by a manually switched 125 V DC power supply from an alternate station battery.

To ensure a rapid start, each EDG is equipped with an immersion heater which furnishes heat to the engine cooling water when the engine is shutdown. Coolant heated by the immersion heater circulates through the lube oil cooler by thermosyphon action to warm the lube oil. The warmed oil is circulated through the engine and turbocharger by the lube oil circulating pumps and is returned to the engine oil sump.

3.2.2 Safeguards Electrical System

As a part of the project to upgrade the safeguards electrical distribution system, existing EDG G02, presently providing emergency backup power to the Train B engineered safety features of both units, will be reassigned as the Unit 2 Train A normal emergency power source and as the Unit 1 Train A alternate emergency power source. EDG G01 will be assigned as the Unit 1 Train A normal emergency power source and the Unit 2 Train A alternate emergency power source.

The feeds to existing Train B 4160 V buses 1-A06 and 2-A06 from 4160V buses 1-A04 and 2-A04, respectively, will be rerouted to new Train B 1-A06 and 2-A06 buses located in the DGB. The existing 1-A06 and 2-A06 buses will become extensions of Train A buses 1-A05 and 2-A05, respectively. EDG G03 will be assigned as the Unit 1 Train B normal emergency power source and the Unit 2 Train B alternate emergency power source. EDG G04 will be assigned as the Unit 2 Train B normal emergency power source and the Unit 1 Train B alternate emergency power source.

The feeds from the existing 1-A06 and 2-A06 buses to the associated Station Service Transformers (SST) and SI pumps will be replaced with new feeds from the new 1-A06 and 2-A06 buses in the DGB.

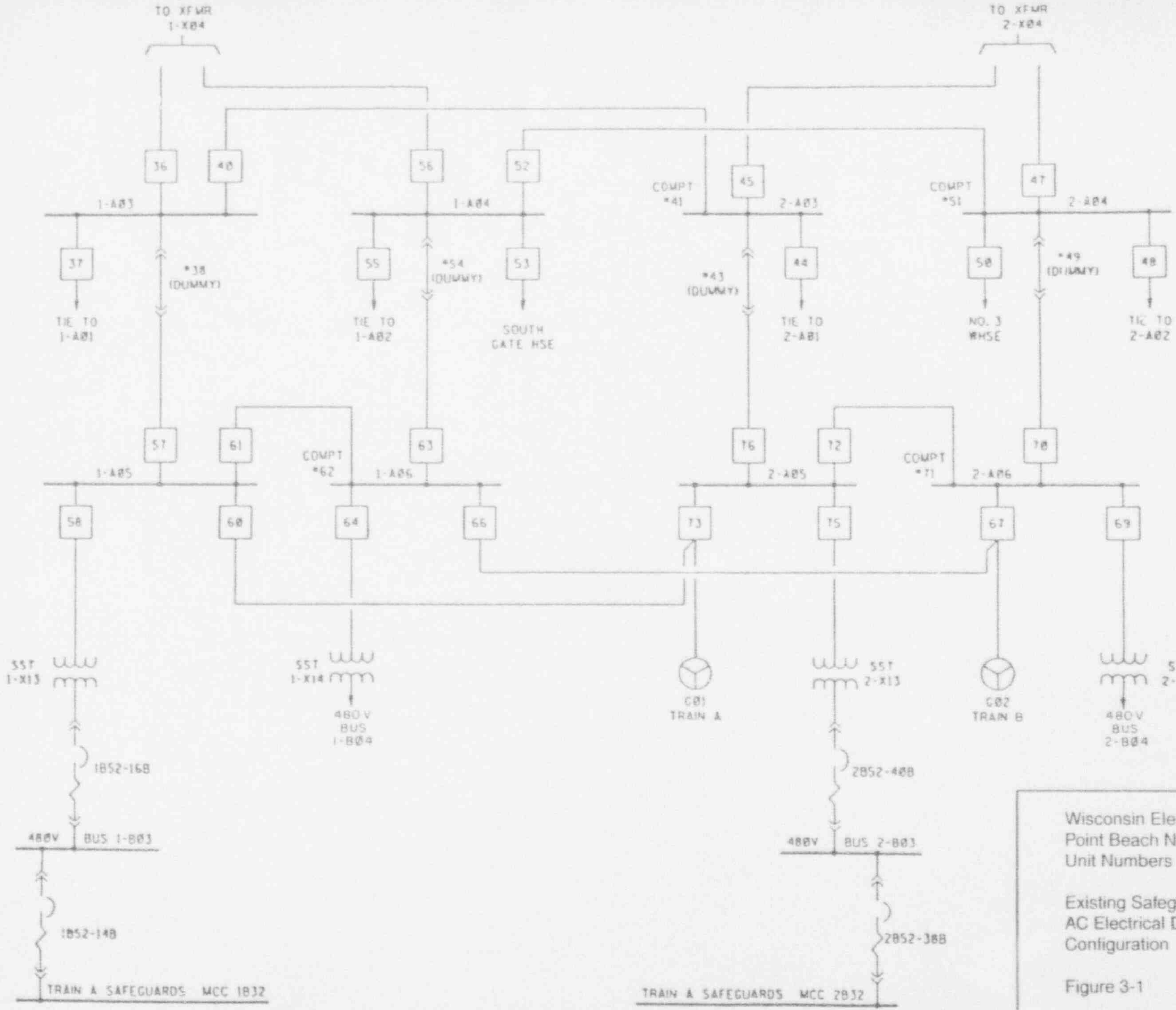
Relocation of the Train B 4160 V buses to the DGB and making the existing Train B buses extensions of the Train A buses resolves the existing separation discrepancy between the Train A and B 4160 V buses described in Section 3.1.

3.2.3 Fuel Oil System

The new fuel oil storage and transfer components will consist of two 35,000 gallon (approximate) EDG fuel oil storage tanks encased in concrete below the ground floor level of the DGB, transfer pumps located in the DGB and an above grade fuel oil fill tank. One storage tank will provide a minimum of five days supply of fuel to G01/G02 (Note that the maximum fuel consumption occurs with both engines operating at partial load). The other storage tank will provide a minimum of five days supply of fuel to G03/G04 assuming both engines are operating at partial load. To assure a seven day supply in either one of the storage tanks, provisions will be made to allow manually cross-tying the storage tanks. Diesel engine fuel oil transported to the site will be off-loaded initially to a fill tank. The fuel oil in the fill tank will be tested to ensure compliance with the diesel engine fuel oil specifications. After compliance is verified, the fuel oil in the fill tank will be gravity fed to the storage tanks.

3.2.4 Diesel Generator Ventilation

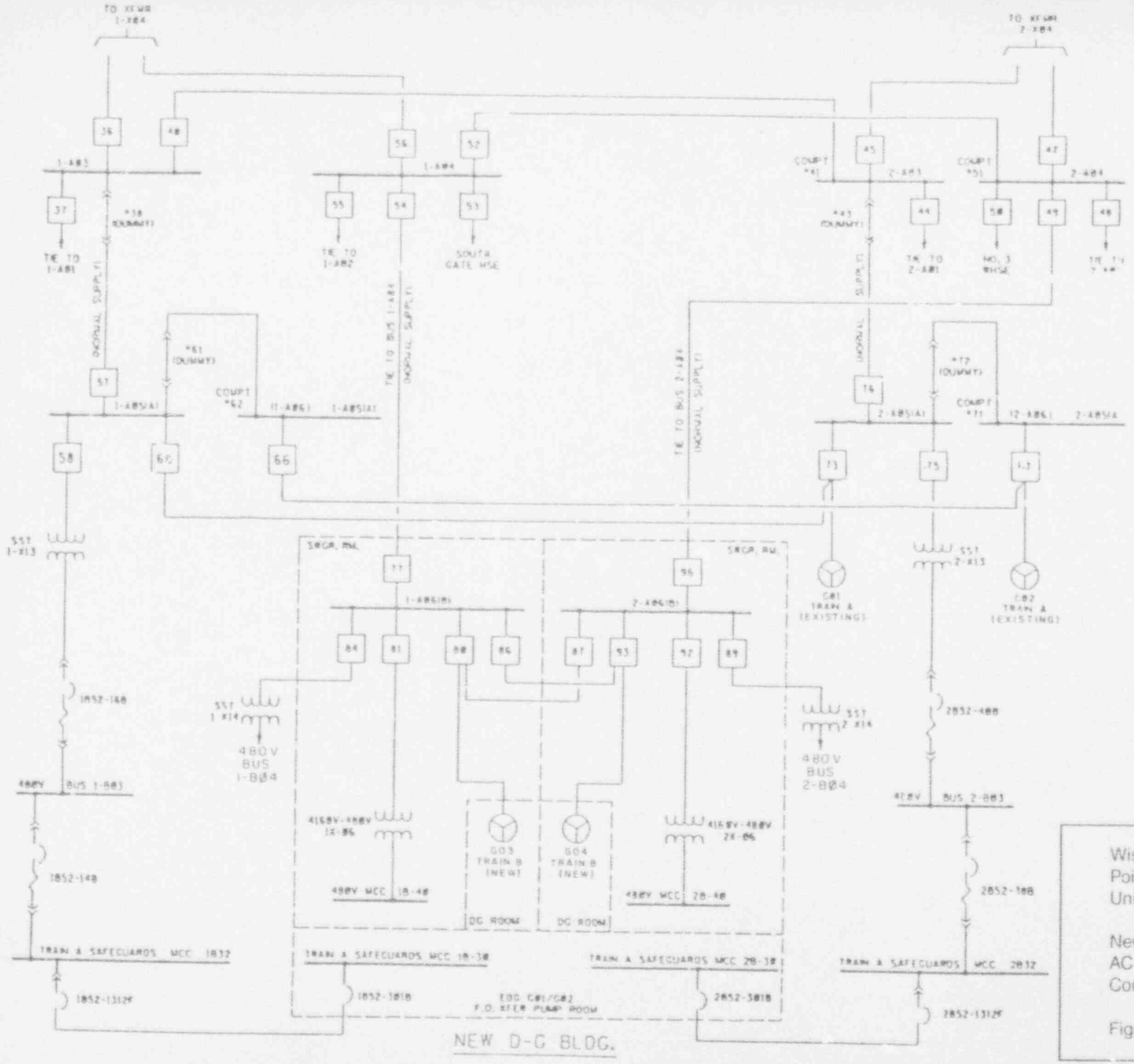
The diesel generator building ventilation system is described in section 4.3.7.



Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Existing Safeguards
AC Electrical Distribution System
Configuration

Figure 3-1



Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

New Safeguards
AC Electrical Distribution System
Configuration

Figure 3-2

FSAR
TABLE 8.2-1

EMERGENCY DIESEL GENERATOR LOADING
FOLLOWING LOSS OF COOLANT ACCIDENT

Injection Phase

Accident Unit and Common Loads	Rating (Each)	Load (KW) G01*	G01#	G02*	G02#
1 Safety Injection Pump	700 HP	560	560	560	560
1 Residual Heat Removal Pump	200 HP	141	141	141	141
3 Service Water Pumps	300 HP	718	718	718	718
2 Containment Fans	150 HP	249	249	249	249
1 Auxiliary Feedwater Pump	250 HP	207	207	207	207
1 Containment Spray Pump	200 HP	166	166	166	166
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	83	91
1 Emergency Lighting Xfmr	30 KVA	27	27	27	27
2 Diesel Room Fans	20 HP	24	24	24	24
1 XY06 Instrument Bus Xfmr	30 KVA	27	27	27	27
1 Battery Room Fan	12 HP	4	4	4	4
1 Boric Acid Heat Trace Xfmr	112 KVA			112	112
1 Station Service Xfmr Losses		22	10	14	23
	Subtotal	2435	2423	2539	2550
Non-Accident Unit Loads (Hot Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	91	83
1 Containment Accident Fan	150 HP	45	45	45	45
1 Station Service Xfmr Losses		3	10	11	5
	Total	2773	2768	2893	2896
Non-Accident Unit Loads (Cold Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Residual Heat Removal Pump	200 HP	141	141	141	141
1 Station Service Xfmr Losses		3	10	10	5
	Total	2786	2781	2897	2909

* Unit 1 Accident
\# Unit 2 Accident

The above injection phase loading will last for about 1/2 hour.

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TABLE 8.2-2

EMERGENCY DIESEL GENERATOR LOADING
FOLLOWING LOSS OF COOLANT ACCIDENT

Recirculation Phase

Accident Unit and Common Loads	Rating (Each)	Load (KW) G01*	G01#	G02*	G02#
1 Safety Injection Pump	700 HP	560	560	560	560
1 Residual Heat Removal Pump	200 HP	141	141	141	141
3 Service Water Pumps	300 HP	718	718	718	718
2 Containment Fans	150 HP	249	249	249	249
1 Component Cooling Pump	250 HP	207	207	207	207
1 Emergency Lighting Xfmr	30 KVA	27	27	27	27
2 Diesel Room Fans	20 HP	24	24	24	24
1 XY06 Instrument Bus Xfmr	30 KVA	27	27	27	27
1 Battery Room Fan	12 HP	4	4	4	4
1 Battery Charger	76 KVA	54	54	54	54
1 Battery Charger	112 KVA	75	75	75	75
1 Fuel Oil Transfer Pump	2 HP	2	2	2	2
1 Security Battery Charger	51 KVA	36	36	36	36
1 Instrument Air Compressor	100 HP	93	93	93	93
1 Station Service Xfmr Losses		15	7	8	14
	Subtotal	2232	2224	2225	2231
Non-Accident Unit Loads (Hot Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	91	83
1 Containment Accident Fan	150 HP	45	45	45	45
1 Station Service Xfmr Losses		4	10	10	5
	Total	2571	2569	2578	2571
Non-Accident Unit Loads (Cold Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Residual Heat Removal Pump	200 HP	141	141	141	141
1 Station Service Xfmr Losses		4	10	10	5
	Total	.584	2582	2583	2584

* Unit 1 Accident
\# Unit 2 Accident

The above recirculation phase loading is considered continuous with respect to emergency generator loading.

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4.0 DIESEL GENERATOR AND AUXILIARY SYSTEMS - DESIGN AND INSTALLATION

Two identical diesel generator sets, G03 and G04, will be installed on a concrete foundation, complete with all accessory components, connecting piping, wiring, and instrument tubing. G03 and G04 will be located in separate rooms of a reinforced concrete Seismic Category I structure. Each diesel generator system will be monitored to alert personnel of abnormal conditions. Annunciator alarm systems will be located in the main control room and on local control panels in the Diesel Generator Building.

The G03 and G04 units will be single-engine diesel generators as assembled by MKW Power Systems. The diesel engines are Model 645-E, 20-cylinder, manufactured by Electro-Motive Division (EMD) of General Motors, and have a closed cooling system using radiators. The generator is manufactured by Electric Products, Inc. (EPI).

The equipment will be specified, designed and manufactured to operate over a design life of 40 years with specified servicing. The diesel engine will comply with the manufacturer's qualified design for emergency standby operation required for nuclear power plant service. The rated operating speed will be 900 rpm.

The engine in each set will be directly coupled to a dual bearing generator. The generator and exciter will have a continuous rating of 2848 kw gross, and a voltage rating of 6900v when wye connected and 4160v when Delta connected at a frequency of 60 Hz. The generator will be connected in the Delta configuration. Each diesel generator will be capable of attaining rated frequency and voltage within 10 seconds after receipt of the starting signal. During the loading sequence steps, frequency and voltage will be maintained above minimum values of 95 percent and 75 percent, respectively. During recovery from transients caused by step load increases, or resulting from the disconnection of its largest single load, the speed of the diesel generator set will not exceed 1001 RPM which is nominal speed plus 75 percent of the difference between nominal speed and the overspeed trip setpoint. Each generator will be designed for isolated and parallel operation. The units will be free from harmful critical speeds within the normal operating range, up to and including automatic trip shutdown speed at 115 percent of rated operating speed (ie. 1035 RPM).

Acceleration, speed, and load will be controlled by means of the governor which meter controls the injection rack position and thus the flow of fuel into the combustion chambers.

4.1 SAFETY DESIGN CLASSIFICATION

4.1.1 Diesel Engine Auxiliary Systems

All interconnecting piping between equipment necessary for the operation of the diesel generator will be safety related. All other piping and components that are not necessary for diesel generator operability, such as drain, vent and fill lines will be classified as non-safety related.

The safety design classification for piping and equipment in each diesel engine auxiliary system is as follows:

System/Components	Safety Classification
Cooling Water System (both HT: High Temperature Cooling Circuit and LT: Low Temperature Cooling Circuits)	
a. *Radiator	Safety Related
b. Radiator Fans	Safety Related
c. *Expansion Tank	Safety Related
d. Reservoir/Storage Tank and Piping	Non-Safety Related
e. Transfer Pump	Non-Safety Related
f. Interconnecting Piping (Including Equipment Vent Lines)	Safety Related
g. Exp. Tank Fill, Overflow, Vent Beyond First Isolation and Drain Lines Valve.	Non-Safety Related
Fuel Oil System	
a. Day Tank	Safety Related
b. Interconnecting Piping	Safety Related
Starting Air System	
a. Compressor Unit	Non-Safety Related
b. Wet Air Receiver	Non-Safety Related
c. Air Dryer	Non-Safety Related
d. Starting Air Receiver	Safety Related
e. Interconnecting Piping	
1. Receiver to Engine	Safety Related
2. Compressor to Dryer	Non-Safety Related
3. Dryer to Receiver (refer to P&ID for break point)	Non-Safety Related
f. Vent & Drain Lines Beyond First Isolation Valve For Air Receiver.	Non-Safety Related
Lube Oil System	
a. Lube Oil Cooler	Safety Related
b. Lube Oil Circ. Pump	Non-Safety Related
c. AC Lube Oil Soakback Pump	Non-Safety Related
d. Engine/Aux. Interconnecting Piping	Safety Related
e. Lube Oil Tank Fill Line	Non-Safety Related
Combustion Air and Exhaust System	
a. Intake Air Filter	Safety Related
b. Intake Air Silencer	Safety Related
c. Exhaust Silencer	Safety Related
d. Interconnecting Piping	Safety Related

4.1.2 Electric Power Distribution and Controls

The electrical power distribution and controls system necessary for operation of safety related equipment including diesel generator units and engine room ventilation is Class 1E.

Diesel generator power is required in the event of a loss of offsite power, and is required to be available when an (SI) actuation signal is initiated.

The safety design classification for the electrical power distribution, instrumentation, and controls is as follows:

System/Components	Safety Classification
Electric Power Distribution & Controls	
a. 4160 Volt Switchgear	Safety Related
b. 4160V-480V Transformers	Safety Related
c. 480V MCC's 1-B30 and 2-B30	Safety Related
d. 480V MCC's 1-B40 and 2-B40*	Safety Related
e. 125 VDC Distribution Panels	Safety Related
f. 480V-120V Instrument Transformers	Safety Related
g. 120V Instrument Panels	Safety Related
h. 480V-120V Lighting Transformers	Non-Safety Related
i. 120V Lighting Panels	Non-Safety Related
j. Emergency Lighting Units	Non-Safety Related
k. Grounding & Lightning Protection	Non-Safety Related
l. Power and Control Circuits for Safety Related Equipment (including cables and raceways)	Safety Related
k. Power and Control Circuits for Alarms, Indication and Monitoring (including cables and raceways)	Non-Safety Related

* MCC's 1-B40 and 2-B40 have two sections, a safety related section and a non-safety related section. The non-safety related section is fed from the safety related section. See section 6 for further details.

4.1.3 Fuel Oil Storage and Transfer System

The fuel oil fill tank and associated piping are not part of the safety related storage tank pressure boundary and therefore will be designated as non-safety related.

The safety design classification for piping and equipment for the fuel oil storage system are summarized as follows:

System/Components	Safety Classification
Tanks	
a. Fuel Oil Storage Tanks	Safety Related
b. Fill Tank	Non-Safety Related
Pumps	
a. Transfer Pumps	Safety Related
Fuel Oil Piping	
a. Fuel Oil Transfer Piping System (except vent and drain lines)	Safety Related
b. Storage Tank Vent Lines	Safety Related
c. Storage Tank Drain Lines	Safety Related
d. Fuel Oil System Emergency Fill Connections	Safety Related
e. Receiving Tank Piping	Non-Safety Related
Instrumentation/Control	
a. Class 1E Pump Controls	Safety Related
b. Class 1E Day Tank Level Switches for Automatic Fuel Transfer	Safety Related
c. Receiving Tank Instrumentation	Non-Safety Related
d. Storage Tank Level Instrumentation for Indication and Alarm	Non-Safety Related
e. Sensing Lines For Day Tank Level and Transfer Pump Instrumentation	Safety Related
f. Instrumentation Lines After First Isolation Valve	Non-Safety Related
g. All other Instrumentation	Non-Safety Related

4.1.4 Diesel Generator Room Ventilation Systems

The diesel generator room normal mode ventilation equipment is provided for human comfort only.

The safety design classification for diesel generator room ventilation systems is as follows:

System/Components	Safety Classification
Diesel Generator Rm Ventilation Systems	
a. Emergency Mode Exhaust Fans	Safety Related
b. Emergency Mode Louvers	Safety Related
c. Emergency Mode Controls	Safety Related
d. Fuel Oil Transfer Pump Room Heaters	Safety Related
e. All Components of Ventilation System Other Than Those listed.	Non-Safety Related

4.2 SEISMIC DESIGN CLASSIFICATION

The OBE and SSE Seismic Response Spectra for the DGB will be used for those systems, equipment and components designated as seismic requiring seismic design and qualification. Systems, equipment and components designated as safety related will be designed and qualified as Seismic Class I. Systems, equipment and components not designated as safety related but whose failure may affect safety-related equipment, will be designed and qualified as Seismic Class I or Class II.

All other systems, equipment and components not designated as safety related will be designed and qualified in accordance with Class III requirements.

4.2.1 Diesel Engine Auxiliary Systems

The seismic design classification for piping and equipment in each diesel engine auxiliary system is as follows:

System/Components	Seismic Classification
Cooling Water System (Both HT: High Temperature Cooling Circuit and LT: Low Temperature Cooling Circuits)	
a. Radiator	Class I
b. Radiator Fans	Class I
c. Expansion Tank	Class I
d. Reservoir/Storage Tank and Piping	Class II
e. Transfer Pump	Class II
f. Interconnecting Piping (Including Equipment Vent Lines)	Class I
g. Exp. Tank Fill, Overflow, Vent Beyond First Isolation and Drain Lines Valve.	Class II
Fuel Oil System	
a. Day Tank	Class I
b. Interconnecting Piping	Class I
Starting Air System	
a. Compressor Unit	Class II
b. Wet Air Receiver	Class II
c. Air Dryer	Class II
d. Starting Air Receiver	Class I
e. Interconnecting Piping	
1. Receiver to Engine	Class I
2. Compressor to Dryer	Class II
3. Dryer to Receiver (refer to P&ID for break point)	Class II
f. Vent & Drain Lines Beyond First Isolation Valve For Air Receiver.	Class II
Lube Oil System	
a. Lube Oil Cooler	Class I
b. Lube Oil Circ. Pump	Class II
c. AC Lube Oil Soakback Pump	Class II
d. Engine/Aux. Interconnecting Piping	Class I
e. Lube Oil Tank Fill Line	Class II
Combustion Air and Exhaust System	
a. Intake Air Filter	Class I
b. Intake Air Silencer	Class I
c. Exhaust Silencer	Class I
d. Interconnecting Piping	Class I

4.2.2 Electric Power Distribution and Controls

Safety related electrical power distribution system components will be qualified in accordance with the seismic requirements for Class 1E Equipment.

Instruments, controls and associated sensing lines required for the operation of the diesel engine auxiliaries and engine room ventilation system will be qualified in accordance with seismic requirements for Class 1E equipment. Those instruments, controls and sensing lines that are required for alarming, indication and monitoring will not be qualified to Class 1E requirements.

The seismic design classification for the electrical power distribution, instrumentation, and controls is as follows:

System/Components	Seismic Classification
Electric Power Distribution & Controls	
a. 4160 Volt Switchgear	Class I
b. 4160V-480V Transformers	Class I
c. 480V MCC's 1-B30 and 2-B30	Class I
d. 480V MCC's 1-B40 and 2-B40*	Class I
e. 125 VDC Distribution Panels	Class I
f. 480V-120V Instrument Transformers	Class I
g. 120V Instrument Panels	Class I
h. 480V-120V Lighting Transformers	Class II
i. 120V Lighting Panels	Class II
j. Emergency Lighting Units	Class II
k. Grounding & Lightning Protection	Class II
l. Power and Control Circuits for Safety Related Equipment	Class I
k. Power and Control Circuits for Alarms, Indication and Monitoring	Class II

4.2.3 Fuel Oil Storage and Transfer System

The electrical power supply equipment, including pump controls and instrumentation associated with the storage tanks and transfer pumps will be Class 1E equipment. The storage tank level instrumentation for indication and alarm will not be Class 1E Equipment. The day tank level control switches to initiate automatic or manual operation of the transfer pumps will be qualified in accordance with seismic requirements for Class 1E equipment.

The fuel oil fill tank is not part of the safety related storage tank pressure boundary and therefore the power supply equipment, controls, instrumentation and circuits/raceway associated with the receiving tank are not Class 1E equipment.

All sensing lines for tank level and transfer pump instrumentation will maintain the integrity of the pressure boundary for conditions stipulated in Seismic Class I criteria.

The seismic design classification for the Fuel Oil Storage and Transfer System is as follows:

System/Component	Seismic Classification
Tanks	
a. Fuel Oil Storage Tanks	Class I
b. Fill Tank	Class III
Pumps	
a. Transfer Pumps	Class I
Fuel Oil Piping	
a. Fuel Oil Transfer Piping System (except vent and drain lines)	Class I
b. Storage Tank Vent Lines	Class I
c. Storage Tank Drain Lines	Class I
d. Fuel Oil System Emergency Fill Connections	Class I
e. Fill Tank Piping	Class III
Instrumentation/Control	
a. Class 1E Pump Controls	Class I
b. Class 1E Day Tank Level Switches for Automatic Fuel Transfer	Class I
c. Fill Tank Instrumentation	Class III
d. Storage Tank Level Instrumentation for Indication and Alarm	Class II
e. Sensing Lines For Day Tank Level and Transfer Pump Instrumentation	Class I
f. Instrumentation Lines After First Isolation Valve	
1. Within Class I or Class II Structures	Class II
2. Within Class III Structures	Class III
g. All other Instrumentation Located within Class I or Class II Structures	Class II
h. All other Instrumentation Located within Class III Structures	Class III

4.2.4 Diesel Generator Room Ventilation System

The seismic design classification for diesel generator room ventilation systems is as follows:

System/Components	Seismic Classification
Diesel Generator Rm Ventilation System	
a. Emergency Mode Exhaust Fans	Class I
b. Emergency Mode Louvers	Class I
c. Emergency Mode Controls	Class I
d. Fuel Oil Transfer Pump Room Heaters	Class I
e. All Components of Ventilation System Other Than Those listed.	Class II

4.3 SYSTEM DESIGN AND INSTALLATION

4.3.1 Diesel Generator Refurbishment

4.3.1.1 History

The diesel generators (DGs) that will be installed for this project were originally specified for the Tennessee Valley Authority (TVA) Nuclear Plant at Hartsville. The supplier for the DGs was chosen to be Morrison Knudson Power Systems in Rocky Mount, NC (They have since been purchased by Wartsila Diesel and are currently named MKW Power Systems). MKW's diesel and skid mounted auxiliaries were supplied by Electromotive Division (EMD) of General Motors out of LaGrange Illinois. The Generator was supplied by Electric Products Inc. (EPI). When the Hartsville plant was cancelled, the DGs were sold to General Public Utilities (GPU) for use at the Oyster Creek Nuclear Plant. The DGs were to be part of an upgrade project at Oyster Creek to provide additional Emergency power. The modification was cancelled in 1989 and GPU put the DGs up for sale. In early 1990, Wisconsin Electric purchased first one and then both of the DGs from Oyster Creek. Since this equipment had not been originally specified for Point Beach and since this equipment had been in storage for quite some time, Wisconsin Electric did a full inspection of the equipment. In order to assure that the engines and generator could be used for this project, the engine generators were returned to MKW Power Systems for refurbishment.

4.3.1.2 Diesel Engine Refurbishment

The diesel engines have had the following work performed on them since their purchase by Wisconsin Electric:

a. Reseal and convert 18:1 turbo to 17.9:1
b. New spring drive gear
c. Replace left rear cam bracket
d. Replace viscous damper with new gear damper
e. Add inspection port to exhaust manifold
f. Add new inner/outer eductor tube
g. Lube oil strainer drain modification
h. Lube oil strainer splash modification
i. Replace crankcase protector
j. Add crankcase pressure detector baffle
k. Replace lube oil cooler core
l. Add new necked down crab bolts
m. New AMOT elements
n. New expansion tank caps
o. Lube Oil modification
p. Reseal power assemblies,fuel pumps and injectors
q. Rebuild water pumps, air start motors, air start valves and air line lubricator
r. Inspect main bearings
s. New seals and gaskets
t. Replace flex tubing with stainless tubing and flex pipe with rigid pipe
u. Replace governor
v. Replace cylinder heads
w. Replace flywheel
x. Install new gauge, switch and annunciator panel

4.3.1.3 Generator Refurbishment

The generators have had the following work performed on them since the purchase by Wisconsin Electric:

a. Modifications of the bearings to replace a fiberglass insulation sleeve. This modification was recommended by and installed per the requirements of the original manufacturer.

b. Complete rewind of one of the stators due to low meager readings in 4 of the 8 poles.

c. Retest per IEEE 384 section 6.1.2.

4.3.1.4 Diesel Generator Control Panel Refurbishment

The control panels have had the following work performed on them since purchase by Wisconsin Electric:

a. Reconnection of the generator output from 6900v wye connection to 4160v delta connection.

b. Replacement of all gauges, Potential Transformers and Current transformers to support the change to 4160v.

c. Installation of generator protective relays.

d. Installation of new governor controls.

e. Modification to engine and generator controls to meet the Wisconsin Electric human factors control requirements.

All work has been designed, qualified and installed by the original panel manufacturer.

4.3.2 Diesel Engine Cooling System

4.3.2.1 Glycol Cooling System Design

Each engine will be provided with an independent closed glycol cooling system. The system cools the engine jacket, cylinder block, the aftercooler and the lube oil heat exchanger (cooler). The system will be provided with two engine-driven circulating pumps, an expansion tank, a water-to-air heat exchanger (radiator), a drain tank, and a three-way thermostatic valve.

In addition, the cooling system will be provided with a preheating circuit to facilitate quick startup of the diesel engine. The preheating circuit will consist of an electric immersion heater. The heater will be thermostatically controlled to maintain the water temperature in the lube oil cooler between 125°F and 155°F. Heat is transferred (thermosyphon) to the lube oil system through the lube oil heat exchanger (cooler) utilizing a lubricating oil AC electric circulation pump which circulates oil from the engine sump through the cooler and back to the sump (Reference Section 4.3.5).

During normal engine operation, the coolant temperature will be maintained at design temperature by a 3-way thermostatic valve which will either direct flow to, or bypass the radiator to maintain an engine coolant discharge temperature of 185°F.

The cooling system coolant expansion tank, which will be located on the second floor of the DGB, will maintain the required pump NPSH for the system circulating pumps. The cooling system flow to the pumps will be pressurized thus protecting the pumps from cavitation. The expansion tank will be adequately sized to provide for thermal expansion of the cooling water and provide makeup for minor system leaks at the pump shaft seals, valve stems, and other associated components. The 90-gallon expansion tank will provide an air vent for the venting of the glycol cooling system piping and components to remove air pockets which otherwise would be entrained in the system, resulting in poor heat transfer conditions in the radiator.

The radiator will be sized to remove the total glycol cooling system heat load given the worst design outdoor temperature of 95°F. It will utilize forced air in lieu of induced air cooling. Two fans will be turned on when the EDG receives a start signal regardless of the outside environmental conditions. Thermostatic controls will be utilized for a third redundant fan. Only two fans are required under worst case design heat loading conditions.

A glycol drain/overflow/fill tank will be provided for each EDG to collect overflow from the expansion tank, allow for drainage of the engine and store water to be used in filling the glycol cooling system. A fill line will be provided so that treated water can be added to the drain tank to replace any system losses. A manual AC electric pump will be provided to assist in transferring water from the drain tank to the engine. The capacity of the drain tank will be sufficient to allow draining the glycol cooling system minus the radiator and associated piping.

The glycol cooling system will utilize high quality makeup water from the existing plant demineralized water system. This is necessary to prevent formation of scale and to maintain a uniform heat transfer rate in the engine jackets. The cooling water will be treated with ethylene glycol mixed to a ratio of 50-50% by volume and a rust inhibiter.

4.3.2.2 Glycol Cooling System Installation

The installation requirements for the glycol cooling system will mount the radiators on the second floor of the DGB and provide interconnecting piping with instrumentation between the engine outlet nozzle and the radiator, from the radiator discharge to the lube oil cooler and from the expansion tank to the radiator discharge piping upstream of the jacket water pump suction. All other process piping is skid mounted.

All vent connections from the engine glycol cooling system piping, the lube oil cooler and the radiator will be routed to the expansion tank. The engine drain connection and the expansion tank overflow connection will be routed to the drain tank.

Figures 4-1 and 4-2 depict the glycol cooling systems for EDGs G03 and G04.

4.3.3 <u>Diesel Fuel Oil System</u>

4.3.3.1 Diesel Fuel Oil System Design

Each engine fuel oil system will consist of the fuel oil storage and transfer components (reference Section 4.4.2), a day tank, a 100% capacity engine-driven fuel pump, a 100% capacity backup DC motor-driven fuel pump, a duplex-type engine mounted filter, injector inlet filters, injectors, return fuel filters and a relief valve. The fuel pumps will take a suction from the day tank and deliver the fuel to the engine mounted filter. It then will pass through the filter elements to the fuel manifold supply line and injector inlet filter at each cylinder fuel injector. A small portion of the fuel supplied to each injector will be pumped into the cylinder, at a very high pressure, through the needle valve and spray tip of the injector. The quantity of fuel injected will depend upon the rotative position of the plunger as set by the injector rack and governor. The excess fuel not used by the injector, will flow through the injector, serving to lubricate and cool the working parts.

The unused fuel will leave each injector through a return fuel filter. This filter will protect the injector in the event of a backward flow of fuel into the injector from the return fuel line. From the return fuel filter in the injector, the excess fuel will pass through the fuel return line in the manifold to the relief valve inlet of the "return fuel" sight glass on the engine mounted fuel filter. This valve will restrict the return fuel, maintaining a back pressure on the injectors. The fuel will continue into the "return fuel" sight glass, filling the glass, down through the standpipe under the glass and through the return line back to the day tank.

The capacity of the day tank will be based on the fuel consumption of the engine, running continuously for a period of at least 120 minutes without makeup. The fuel consumption rate will be based on 100% rated (i.e. 2848 KW) load plus a margin of 10%. The day tanks will be located inside the DGB (in a separate room from the diesels) at an elevation that (1) ensures adequate net positive suction head to the fuel pumps and (2) maintains a positive static head on the fuel pumps.

4.3.3.2 Diesel Fuel Oil System Installation

The installation requirements for the Fuel Oil System will include providing interconnecting piping for the following:

a. From the day tank to the engine fuel pump inlet connections (two lines).

b. From the engine oil return line back to the day tank.

The G03 and G04 day tanks will be equipped with drain and overflow connections that will be tied together and routed back to storage tank T-175A. A missile-protected vent line will be provided on each day tank and vented to atmosphere. A flame arrestor will be installed in each vent line.

Level switches will be provided for each day tank to automatically refill the tank by actuating a fuel oil transfer Pump on low tank level and by annunciating failures of the automatic level control in order to maintain adequate level (reference Section 4.4.2).

Figure 4-3 depicts the fuel oil system for the G01 and G02 emergency diesel generators. Figure 4-4 depicts the fuel oil system for the G03 and G04 emergency diesel generators.

4.3.4 <u>Diesel Starting Air System</u>

4.3.4.1 Diesel Starting Air System Design

Each EDG will be provided with a starting air system that includes two independent and two redundant sets of air receivers connected to air start motors mounted on both sides of the cylinder block. The system will consist of an AC motor driven air compressor, a diesel-driven air compressor, an aftercooler, a wet air receiver, an air dryer and four receivers. Starting air will be simultaneously provided from all four air receivers (two connected to each side's air start motors) to start the EDG.

The starting air system components will be mounted separately. Either air compressor, together with the air dryer, will be capable of recharging the air receivers from minimum to normal engine standby pressures in approximately 30 minutes.

The air dryer will be of the heatless/desiccant type containing two towers that are connected in parallel. Both towers will be filled with a molecular sieve desiccant product where one tower is alternately in the drying phase while the other tower is regenerating. The dryer will provide dry starting air at a dew point of -40°F when the system is pressurized.

The starting air receivers will have the capacity to crank the EDG for a minimum of five start attempts from a cold start condition without recharging. All four receivers will normally provide air simultaneously to start the EDG; however, only one set of two receivers is necessary to meet the required acceleration to start loading the generator within 10 seconds or less (refer to section 3.2.1 for starting sequence).

Provisions will be made to automatically blow down any accumulated moisture in the wet air receiver located downstream of the compressor unit, and the pre-filter provided with the air dryer. The air receivers and pipe low points will be provided with drain connections to allow periodic manual draining of moisture content during startup and normal operation. Relief valves will be provided to protect the air receivers from overpressure.

4.3.4.2 Diesel Starting Air System Installation

The installation requirements for the starting air system will include providing interconnecting piping for the following:

a. From each air receiver outlet connection to the air strainer and starting air solenoid located on the engine skid.

b. From the compressors outlet connections to the dryer components.

c. From the dryer outlet to the air receivers.

Figures 4-5 and 4-6 depict the starting air systems for the G03 and G04 EDGs, respectively.

4.3.5 Diesel Lube Oil System

4.3.5.1 Diesel Lube Oil System Design

Each EDG engine will be equipped with a lube oil sump. During operation, oil will be drawn from the sump through a strainer by a scavenging oil pump which will pump the oil through a main lube oil filter (with internal relief bypass valve), to the lube oil cooler and then discharge into the main lube oil strainer section. Excess flow entering the strainer from the scavenging pump will flow over a dam in the strainer back into the engine sump.

4.3.5.2 Diesel Lube Oil System Installation

An engine pressure system pump will be provided consisting of two separate pumps in one housing as indicated below:

a. One pump section will deliver oil to the bearings, gears and turbocharger.

b. One pump section will deliver oil for piston cooling.

Additionally, two auxiliary AC motor driven pumps will be furnished. One pump will operate during engine operation and the other pump will operate during standby. The first pump will be used to circulate oil from the lube oil sump to provide lubrication to the turbocharger bearings (and carry away heat from the bearings after the engine is shutdown). The second pump will circulate oil through the lube oil cooler and main lube oil manifold to pick up heat during the standby condition (See Section 4.3.2).

4.3.6 <u>Diesel Combustion Air and Exhaust System</u>

4.3.6.1 Diesel Combustion Air and Exhaust System Design

Each EDG will have independent air intake and exhaust systems. The air intake portion will include an oil bath air intake filter and a silencer that will function in accordance with the engine manufacturer's recommendations. The air intake will be designed and located no less than 20 feet above grade and away from the exhaust line discharge so fresh outside air will be provided and dilution with exhaust products will not occur. The air intake will be designed to prevent entrained water from entering the engine air intake.

The air inlet piping will be reviewed by the engine manufacturer and design engineer to assure the engine's ability to start and run during site design basis tornado depressurization conditions.

The exhaust portion will include a manufacturer's recommended industrial-type exhaust silencer with multi-compartment construction to limit noise level.

4.3.6.2 Diesel Air Intake and Exhaust System Installation

Installation requirements for the air intake and exhaust system of each engine will include the following interconnecting process piping:

a. From the air intake filter discharge connection to the turbocharger inlet connection.

b. From the turbocharger outlet connection to the connection to the exhaust silencer.

c. From the exhaust silencer discharge end to atmospheric discharge.

The air intake and exhaust system piping will be sized so the total maximum pressure drop will be within the manufacturer's recommendation.

The exhaust piping will be arranged such that it slopes away from the engine with a drain at the low point to avoid possible clogging due to rain, snow, or ice during standby or operation of the system.

Expansion joints will be provided in the intake air and exhaust piping to accommodate piping thermal expansion and to minimize transfer of vibration to the piping systems.

Thermal insulation will be provided for the exhaust piping including silencer and expansion joints.

Figures 4-7 and 4-8 depict the air intake and exhaust system for EDGs G03 and G04, respectively.

4.3.7 Diesel Generator Room Ventilation System

4.3.7.1 Diesel Generator Room Ventilation System Design

4.3.7.1.1 EDG Standby

Each diesel generator room will have an exhaust fan that will run continuously during engine standby to (1) remove component and solar heat loads during the cooling season to maintain room temperatures below 105°F and (2) prevent fuel oil fume buildup.

Each fuel oil transfer pump room will have an exhaust fan to prevent fuel oil fume buildup.

Each diesel room and fuel oil transfer pump room will be provided with electric unit heaters to maintain a minimum temperature of 50°F during the heating season.

4.3.7.1.2 EDG Operating Modes

Each diesel room will have two thermostatically controlled exhaust fans (once-through cooling) that will operate to maintain the rooms below 120°F during engine operation. A smaller fan will initiate operation at 90°F with a larger fan coming on at 100°F. This sequencing, i.e., use of a small and large fan, will be done to avoid a large temperature drop in the room should the engine operate during periods of severe cold outside. Heating will not be required during engine operation due to the amount of heat lost to the room from the engine itself. Air will be admitted to the room via gravity dampers protected by constantly open chevrons. The chevron design will serve as a missile shield and allow room depressurization during a tornado to avoid large differential loads on the structure.

The fuel oil transfer pump and day tank rooms do not require ventilation fans under these conditions as the room temperature will not exceed the equipment qualification temperature (105°F). Safety related heaters are provided to assure the fuel oil is maintained above its cloud temperature.

4.3.7.2 Environmental Design

The diesel room heating and ventilation system will be sized based on an outdoor ambient temperature range of 95°F and (-)15°F. This range, which is consistent with the original PBNP ventilation design basis, exceeds the 99% summer and winter temperatures recorded by the American Society of Heating, Refrigeration and Air-Conditioning Engineers, Inc. (ASHRAE).

4.3.8 Piping Requirements and Materials

All interconnecting piping will be as a minimum ANSI 150 lbs. pressure class. All miscellaneous piping such as drains and vents will be rated for 150 lbs. or greater.

All piping joints and connections will be welded. Where required, flanges or screwed connections will be utilized at pump suctions, discharge connections, valves and flexible connections.

All piping material will be carbon steel, except the following:

Piping Systems	Material
a. Starting Air System Unloading Line	Stainless Steel 304
b. Fuel Oil Day Tank Overflow Lines	Stainless Steel 304

All tanks, except for the Starting Air Receivers, will be designed to atmospheric conditions. Tank material will be carbon steel.

The fuel oil day tank discharge nozzle connections will be bottom mounted. They will be extended inside the tank such that the accumulated residual sediment from the tank bottom will not be disturbed and carried into the engine cylinders.

The EDG and supporting systems will be arranged to provide sufficient space to allow for inspection, maintenance and testing per ASME Section XI. Maintenance envelope space requirements will be in accordance with vendor's recommendations as a minimum.

4.3.9 Electrical Power Distribution and Switchgear

4.3.9.1 Safeguards Electrical Distribution System Design

The safeguards electrical distribution system will provide power to the EDG G03/G04 auxiliaries and distribute power to the engineered safeguards features. The modified portion of the safeguards electrical distribution system will consist of Class 1E 4160 V AC switchgear, 480 V AC motor control centers, distribution panel boards and transformers (as required), and all interconnecting cable and raceway. The modified portion of the safeguards electrical distribution system will serve those safety-related building systems that are essential to EDG operation such as the diesel room and switchgear room exhaust fans. It will also provide power to non-Class 1E loads in the building such as the mechanical room air cooled condenser, diesel room heater and the mechanical room air handling unit.

The modified portions of the safeguards electrical distribution system and its components will be designed to have sufficient capacity to serve all loads identified at present, plus 15% spare capacity in terms of both load current and spare hardware for future loads. Separation between the safeguards trains, between voltage classes and between fire zones will be provided in accordance with the requirements of IEEE 384-1992 and 10 CFR 50 Appendix R. Refer to Section 6 for Separation Requirements.

Electrical interlocks or administrative controls will be utilized to prevent inadvertent paralleling of power sources in all cases where alternate feeds are provided.

4.3.10 Diesel Generator Controls, Indication and Alarms

4.3.10.1 Diesel Generator Controls, Indication and Alarms Design

Each EDG will be provided with a vertical control panel with the following five cubicles:

1. The C.T. and P.T. cubicle contains the current and potential transformers required to measure the generator output for voltage regulation, relaying, and metering.

2. The Transformer-Reactor cubicle will be used to house the transformers (EPT's) and reactors necessary for the generator to be self exciting.

3. The Voltage Regulator-Exciter cubicle will contain the necessary protective relaying in addition to the equipment required to regulate the output of the EDG.

4. The Metering Cubicle will contain the following:

    a) indicators that display EDG voltage, amperes, kwatts, kvars and frequency as well as normal bus and alternate bus voltage,
    b) EDG stator temperature indication,
    c) local control switches for the EDG, normal bus and alternate bus circuit breakers,
    d) Local/Remote control transfer switches for the circuit breaker and EDG controls,
    e) the instrumentation required to synchronize the EDG with both the normal and alternate buses,
    f) the governor control circuitry and,
    g) current transformers necessary for governor control, voltage regulation, relaying and metering. Generator neutral connections will be in the rear of this section necessary for the delta connection.

5. The Engine Control cubicle will contain an annunciator panel and the controls necessary to start and stop the EDG and control speed.

All AC power required will be provided by 480 v Motor Control Centers (MCC's) and/or 120 v ac distribution panels. Required Class 1E 125 V DC power will be provided from existing plant 125 V DC systems via new DC distribution panels.

4.3.10.2 Trips and Interlocks

All protective trips other than engine overspeed, 2/3 low lube oil pressure and generator differential overcurrent will be bypassed upon receipt of an automatic emergency start signal in response to a safety injection signal or safeguards bus undervoltage and will be annunciated in the Main Control Room.

Protective trips will be provided to automatically shut down the diesel engine and/or trip the EDG output breaker, and protect the EDG from possible damage or degradation during routine testing. Protective trips will be in accordance with vendor recommendations and will consist of the following:

- Overspeed	(Shutdown the EDG)
- Differential Overcurrent	(Shutdown the EDG)
- 2/3 Low Engine Lube Oil Pressure	(Shutdown the EDG)
- High Jacket Water Temperature	(Shutdown the EDG)
- Reverse Power	(Trip the EDG output breaker)
- Loss Of Generator Excitation	(Trip the EDG output breaker)
- Voltage Restrained Time Over Current	(Trip the EDG output breaker)
- Over Power	(Alarm only)
- Ground Fault	(Alarm only)

An annunciator panel will be provided on the engine control cubicle as well as on the EDG skid to alarm abnormal operating conditions and all trip functions. Redundant alarms will also be provided in the main control room for appropriate conditions. If an alarm is received on either the skid mounted annunciator or the Engine Control cubicle annunciator, a common alarm will be received in the Main Control Room as well as on the Engine Control cubicle or skid mounted annunciator, respectively.

4.3.11 Diesel Generator Operating Description

4.3.11.1 Local vs. Remote Operation

When the Local/Remote Control switches, located on the front door of the G03 and G04 Emergency Diesel Generator Control Panel Metering Cubicle, are in the remote position, control of the G03 and G04 EDGs will be transferred to the Main Control Room. Emergency start, manual start and stop, voltage adjust, speed control, output breaker control and synchronizing are among the controls that will be available in the Main Control Room.

When the Local/Remote Control switches are in the local position, control of the G03 and G04 EDGs will be from the DGB location only. All control signals from the Main Control Room will be isolated. All controls available in the Main Control Room will be available locally as well as maintenance functions control.

4.3.11.2 Operating Modes

The operating mode of each EDG will be determined by the positions of the following switches:

Description	Location
Maintenance Switch (Maintained) Positions: Auto Electric Governor Hydraulic Governor	EDG Control Panel (Local)
Local/Remote Switch (Maintained) Positions: Local Remote	EDG Control Panel (Local)
Mode Selector Switch (Maintained) Positions: Local Auto Exercise	Main Control Rm (Remote)
EDG Control Switch (Spring Return to Auto) Positions: Stop Auto Start	Main Control Rm (Remote)

The following is a brief description of the three operating modes that will be available for starting the EDG's:

1. Fast Start - The Fast Start mode will cause the EDG to obtain rated speed and voltage within ten (10) seconds from the receipt of the initiation signal. When the diesel is fast started (as a result of an emergency start/run signal), the high jacket water temperature trip is defeated along with the loss of excitation, reverse power, and overcurrent generator output breaker trips. The position of the local and remote switches can result in three different fast start scenarios.

   a. Automatic Initiation - Fast start will be initiated by bus undervoltage or a (SI) signal when the local/remote switch is in the "remote" or "local" position. Automatic initiation will be bypassed and this condition annunciated in the main control room if the mode selector switch is placed in the "local" position while the local/remote switch is in the "remote" position, or the maintenance switch is removed from the "auto" position.

b. Local Manual Initiation - The capability will be provided to initiate a fast start by depressing the "start" pushbutton on the EDG control panel when the local/remote switch is in the "local" position.

c. Remote Manual Initiation - The capability will be provided to initiate a fast start by placing the EDG control switch in the main control room in the "start" position while the local/remote switch on the EDG control panel is in the "remote" position and the mode selector switch in the main control room is in the "auto" position.

2. Idle Start - The idle start mode will cause the EDG to start and only obtain a speed of approximately 400-450 RPM. The generator field is also prevented from flashing. If an emergency start (auto fast start) signal is initiated while the EDG is idling, the diesel will automatically accelerate to obtain rated speed and generator output voltage. The position of the local and remote switches can result in two different idle start scenarios.

a. Local Idle Start - The capability will be provided to initiate an Idle Start by depressing the idle start pushbutton on the EDG control panel when the local/remote switch is in the "local" position. When the idle release pushbutton is depressed, the engine will accelerate to rated speed, the generator field will automatically flash, and the generator may be manually synchronized to either its normal or alternate safeguards bus.

b. Remote Idle Start - The capability will be provided to initiate an idle start by placing the mode selector switch in the main control room in the "exercise" position and placing the EDG control switch in the main control room in the "start" position when the local/remote switch is in the "remote" position. When the Idle release pushbutton is depressed, the engine will accelerate to rated speed, the generator field will automatically flash, and the generator may be manually synchronized to either its normal or alternate safeguards bus.

3. Maintenance Start - The Maintenance start mode is used for manually starting the engine for maintenance purposes. All operations necessary for starting, field flashing, synchronizing, and loading the EDG will require to be performed manually. When the maintenance switch is not in the "auto" position, all auto start signals are blocked and the condition will be annunciated with a "Not in Auto" alarm.

a. Electric Governor Start - With the mode selector switch placed in any position, the local/remote switch placed in the "local" position, and the maintenance switch placed in the "electric governor" position, the EDG can be fast started or idle started as described above.

b. Remote Local Start, Maintenance Position - With the mode selector switch placed in the any position, the local/remote switch placed in the "local" position, and the maintenance switch placed in the "hydraulic governor" position, the diesel can be started at any speed between the hydraulic governor upper and lower limits.

c. Diesel Generator Isolation - With the mode selector switch placed in the "local" position, the local/remote switch placed in the "remote" position, and the maintenance switch placed in the "auto" position, the diesel can not be started. This capability is provided to prevent manual or automatic start.

4.3.11.3 Shutdown

Three shutdown modes will be provided, each of which automatically trip the generator output breakers. The following is a description of each:

a. Normal Shutdown - The capability will be provided to initiate a normal shutdown by placing the EDG control switch in the main control room in the "stop" position while the local/remote switch is in the remote position or by depressing the "normal stop" pushbutton on the engine control cabinet while the local/remote switch is in the "local" position. This shutdown results in a ten minute cooldown run at idle speed before the engine is shutdown. If an auto fast start signal is received during cooldown, the normal shutdown is defeated and the diesel will enter the automatic fast start mode of operation as described above. Any automatic fast start signal will have to be cleared before the EDG can enter a normal shutdown.

b. Emergency Shutdown - The capability will be provided to initiate an emergency shutdown by depressing the "emergency stop" pushbutton on the engine control cabinet. This feature will be available independent of the position of the local/remote switch. The emergency shutdown will also be activated by a 2 out of 3 low lube oil pressure, a generator differential, or overspeed during emergency operation. During an exercise run, the emergency shutdown will also be activated by high cooling water temperature.

c. Overspeed Trip - This type of shutdown results in an immediate shutdown of the EDG. The overspeed trip results in the injectors being mechanically held in the no fuel position using mechanical components independent of those used to control the injectors during a normal or emergency shutdown.

4.3.12 Cathodic Protection

The addition of the two new EDGs and associated auxiliary systems requires installation of additional underground piping and tubing for the transportation of fuel oil, water and air. Even though cathodic protection systems can provide an effective means for corrosion control, there are other corrosion retardation techniques available which provide the required level of protection.

An analysis of the DGAP underground piping systems materials indicates that the required level of protection can be provided utilizing alternate corrosion retardation techniques. Specific installation and testing requirements as well as epoxy-coal tar coating on carbon steel pipe; three different types of stainless steel alloys; copper pipe for certain applications, and cast iron pipe with polyethylene wrappings will be used for corrosion control. It has been determined that the added underground piping for the DGAP will have no harmful effects on the existing PBNP cathodic protection systems when the above described corrosion controls are utilized.

4.4 FUEL OIL STORAGE SYSTEM

4.4.1 Existing Fuel Oil Storage System

The existing fuel oil system that supports existing EDGs G01 and G02 consists of two 60,000 gallon bulk oil storage tanks, a 12,000 gallon emergency fuel tank, two fuel oil transfer pumps and two day tanks (one per diesel).

Fuel oil is gravity fed to the emergency fuel tank from the bulk oil storage tanks via a level control valve.

Fuel is transferred from the emergency fuel tank to both day tanks via the fuel oil transfer pumps. Level control on each day tank starts both transfer pumps and opens an isolation valve on the day tank experiencing low level. When high level is achieved, level controls shut the isolation valve to the day tank and trip the fuel oil transfer pumps.

Under the worst case accident condition, the bulk storage tanks are considered lost resulting in approximately two to three days of fuel available to EDGs G01 and G02.

The addition of the new fuel oil storage system (reference Section 4.4.2) will relegate this system to a backup role. Fuel oil will be supplied to EDGs G01/G02, under all design basis conditions, from the new system. The existing/old system will be isolated from the new system with dual valve isolation.

4.4.2 Upgraded Fuel Oil Storage System

4.4.2.1 System Description

The upgraded fuel oil system, which includes new fuel oil storage and transfer components, will provide long term storage of fuel for new EDGs G03 and G04 and existing EDGs G01 and G02. The fuel storage components of the upgraded EDG fuel oil system will consist of two safety related EDG fuel oil storage tanks and one non-safety related fuel oil fill tank. The transfer components will include transfer pumps, piping, instrumentation, and controls necessary for supplying fuel to the EDGs for seven days of continuous operation at rated load (i.e.; 2848 KW with one of the two EDGs supplied from each operable storage tank), without being replenished. The two storage tanks will be encased in concrete under the new diesel generator building. This configuration will provide protection to the tanks from tornado generated missiles and flood. It will also provide a 3-hour fire protection barrier between the tanks and the new EDGs and avoid the possibility of oil fume accumulation below the DGB.

A fuel oil fill tank will be provided to receive and hold fuel oil from delivery trucks for testing prior to placing oil in the fuel oil storage tanks. The fill tank will be located outdoors and mounted on a diked concrete pad northwest of the DGB. The storage tanks will be filled by means of gravity flow from the outdoor fill tank. The storage tank to be filled will be selected by manual valve operation.

Each storage tank will be dedicated to the two train associated EDGs. Two 100% capacity transfer pumps (sized for at least 6 times the engine fuel consumption rate at 2848 KW) will be connected to each storage tank with one pump supplying one of the four day tanks. The two day tanks of the same train are capable of being tied together which will allow one pump to feed two EDG Day Tanks. This provides system flexibility to ensure operability of all EDGs under all potential single active failures of the Fuel Oil Storage System.

4.4.2.2 Tank Capacity

4.4.2.2.1 Diesel Generator Fuel Oil Storage Tanks

Each EDG pair (G01/G02 and G03/G04) will be provided with onsite fuel oil storage that will have the capacity to allow operation of either EDG for seven days at maximum rated load or both EDGs at partial load for over five days. Manual cross-tie of the fuel oil storage tanks will extend the available fuel to seven days for any of the two diesels operating at full load. The conservative calculation method given in ANSI 59.51-1989 (Revision of ANSI N195-1976) will be used to determine the size of fuel oil storage requirements for each EDG.

In addition to level instrumentation, the level of each Fuel Oil Storage Tank will be able to be verified with a stick gauge which will be accessible through a nozzle in the transfer pump room.

4.4.2.2.2 Fuel Oil Fill Tank

The fill tank will be designed to receive and hold fuel oil until it has passed all required testing for use. The tank will have a usable capacity of 15,000 gallons which is equivalent to two regular fuel oil truck shipments of 7,500 gallons each.

4.4.2.3 Fuel Oil Transfer Pump Requirements

There will be four transfer pumps, one for each EDG. All pumps will be identical and have sufficient head and capacity to transfer oil to the associated day tank at a rate of at least six times the maximum race of fuel consumption. The pump will start when the day tank reaches the designated low liquid level which will be chosen at a level with approximately one hours worth of fuel left in the day tank. Additionally, the G03/G04 and G01/G02 day tanks will be provided with the capability to be cross-tied to allow one transfer pump to supply two day tanks. Note that the cross-tied day tanks will be installed at the same elevation to allow one set of instruments to monitor level in both tanks.

4.4.2.4 Process Piping

The fuel oil transfer piping will be capable of transferring oil at design temperature and pressure from the storage tanks to each day tank. The return lines from the G03 and G04 day tanks will be sized to handle continuous overflow by gravity to the storage tanks.

Sampling points will be provided at the fill tank as required by ASTM D4057 to assure the quality of the fuel prior to transfer to the storage tanks.

4.4.2.5 Electrical Power Supply and Controls

The safeguards electrical distribution system will supply 480V, 3-phase, 60 hertz power, with adequate capacity to supply the fuel oil transfer pumps drive motors. Safeguards Class 1E 120 V AC and 125 V DC power will be provided for all associated safety related day tank and transfer pump control and instrumentation circuitry. Non-Class 1E power will be provided for all indication and alarm circuitry.

Controls for the fuel tank transfer operation will be automatic, with provisions for manual override.

The storage tanks will be provided with high and low level alarms to be annunciated locally with a common alarm in the main control room. The storage tanks will be provided with level indication that will be displayed locally. On-off operation of the transfer pumps will be initiated automatically by level switches in the day tanks or manually by a control switch. The operating status will be monitored and alarmed.

The fill tank will be provided with a locally mounted level indicator and locally annunciated high and low level alarms with strobe light and speaker.

The temperature inside the storage tanks will be above the fuel oil cloud point temperature since the vault is located below grade and is primarily below the frost line under a heated structure; therefore, heat tracing will not be required.

4.4.2.6 Operation

Fuel oil shipments, received by truck delivery, will be held in the fill tank and tested for specification conformance. After specifications are verified by test, the fuel oil will be transferred to the storage tanks.

The fuel oil in each storage tank will periodically be tested for water content, sediment and viscosity. Algae growth in the storage tank will be inhibited by an additive furnished in the fuel oil.

4.4.3 Design Requirements

4.4.3.1 Tank Design

4.4.3.1.1 EDG Fuel Oil Storage Tank

The fuel oil storage tanks will be horizontal, cylindrical tanks made of materials compatible with the stored diesel fuel oil. Galvanized material will not be used. The tanks will be shop fabricated, will meet the requirements of NFPA 30, and will be designed and fabricated in accordance with the requirements of API 650. The fuel oil storage tanks will be encased in concrete.

4.4.3.1.2 Fuel Oil Fill Tank

The fuel oil fill tank will be a horizontal, steel cylindrical, shop-fabricated atmospheric tank designed and fabricated to the requirements of ASME VIII. The tank will be installed outdoors on a Non-Seismic Category I concrete pad with vertical concrete walls (diked). The dike is sized to contain the tank volumetric contents, should a leak or rupture occur, plus an additional volume equivalent to 10% of the tank contents. The tank will be located such that the outside tank surface is separated from any adjacent structure by at least 10 feet per NFPA 30.

4.4.3.1.3 General

All tank fill and outlet connections will be designed to avoid creating turbulence that may stir up the sediment accumulated at the bottom of the tank. All three tanks will be provided with a drain connection to remove sediment or water from the tank bottom.

Each storage tank will be provided with liquid level indication (analog loop) to be locally monitored.

The fill tank fill connection piping will be configured to avoid an uncontrolled spill by locating the fill connection inside the dike.

Fill inlet connections and vent outlet connections will be protected from flood conditions and will be positioned above the maximum probable flood level.

4.4.3.2 EDG Fuel Oil Storage Tank Enclosures

The storage tanks will be installed in two Seismic Category I reinforced concrete enclosures and encased in concrete. The enclosures will be located below grade level under the G03 and G04 EDG Diesel Rooms. The enclosures, in conjunction with the concrete encasement, will provide the required 3-hour rated fire protection barrier for enclosed fuel supply tanks, and in addition, will withstand the effects of tornado generated missiles, site flood, and buoyancy force considerations.

Leak-proof hatches will be provided on top of the enclosures for tank internal inspection access and to allow removal of tank internal strainers and baffles and other appurtenances. Level instrumentation will be top mounted.

The tanks will be lined with High Density Polyethylene (HPDE) for containing leakage of the tank contents. The lining will be piped to a sump, which will be monitored for leakage. Level instruments will be provided to alert operations to the presence of liquid in the sump.

4.4.3.3 Fuel Oil Transfer Pump Design

The transfer pumps will be of the rotary positive displacement type. The pump casing will be constructed of carbon steel or other materials that are compatible with diesel fuel oil. The transfer pumps will be located in the G01/G02 Transfer Pump Room located adjacent to the G03 diesel room and in the G03/G04 Transfer Pump Room located adjacent to the G04 diesel room. Elevation will ensure the available net positive suction head (NPSH) will conservatively envelop the required NPSH. The transfer pumps will be separated from the adjacent components/rooms by a 3-hour rated fire barrier.

4.4.3.4 Piping System

All piping, fittings, strainers, valves, and associated components and supports connecting the storage tanks, transfer pumps, day tanks, and the emergency truck fill station will be designed and fabricated to the requirements of ANSI B31.1, 1989 with enhanced requirements.

All piping and isolation valves protecting the safety-related pressure boundary will be located within the Category I diesel generator building where it is protected from tornado missiles and site flood conditions. Pipe supports will be designed to the requirements of ANSI B31.1, 1989 . Pipe support structural steel welds will be per AWS Code D.1.1.

All piping and components associated with the fill tank and connected beyond the safety-related piping pressure boundary isolation valves will be designed to the requirements of ANSI B31.1 and designated as non-safety related.

Sample stations will be provided in the transfer piping to the Day Tank, at the Day Tanks and also on the fill tank. All stations are located inside the Day Tank rooms or at the fill tank to allow convenient fuel test sample retrieval for the required chemical testing of stored fuel.

All fuel oil piping will be located inside concrete structures, over HDPE lined concrete slabs or buried underground in HDPE lined trenches with leak detection. Containment curbs as required (dikes) and sumps will be provided to collect all potential fuel leakage or spills to prevent ground contamination.

The transfer pumps and all fuel oil piping (except underground piping) will be designed to allow for inspection, maintenance and testing. Pump and valve maintenance envelope space requirements will be in accordance with manufacturer's recommendations. Flanges are permitted where required for maintenance (e.g. pump connections).

Piping material will be of carbon steel having a minimum ANSI pressure-temperature rating of 150 lbs.

Either storage tank will be able to receive fuel from the other storage tank while the first storage tank is feeding its associated day tanks utilizing manual connections not normally in place to avoid train cross tie concerns.

4.4.3.5 Electrical and Controls

Electrical power distribution will be accomplished by means of a 480 V AC, 3-phase, 3-wire, ungrounded system.

Overcurrent protection will be provided by means of fuses or molded case thermal-magnetic circuit breakers. Proper coordination of all overcurrent protection devices will be provided down to and including local panelboard(s).

Separation between redundant trains as well as that required between 1E and non-1E circuits will be provided (except as noted otherwise) in accordance with IEEE 384-1992, and 10 CFR 50, Appendix R. Refer to Section 6 for Separation Requirements.

All controls and instrumentation will be electric and/or electronic and will be designed to operate within their design basis environment. The fill tank level indicator located outside will be designed for -30°F to 120°F.

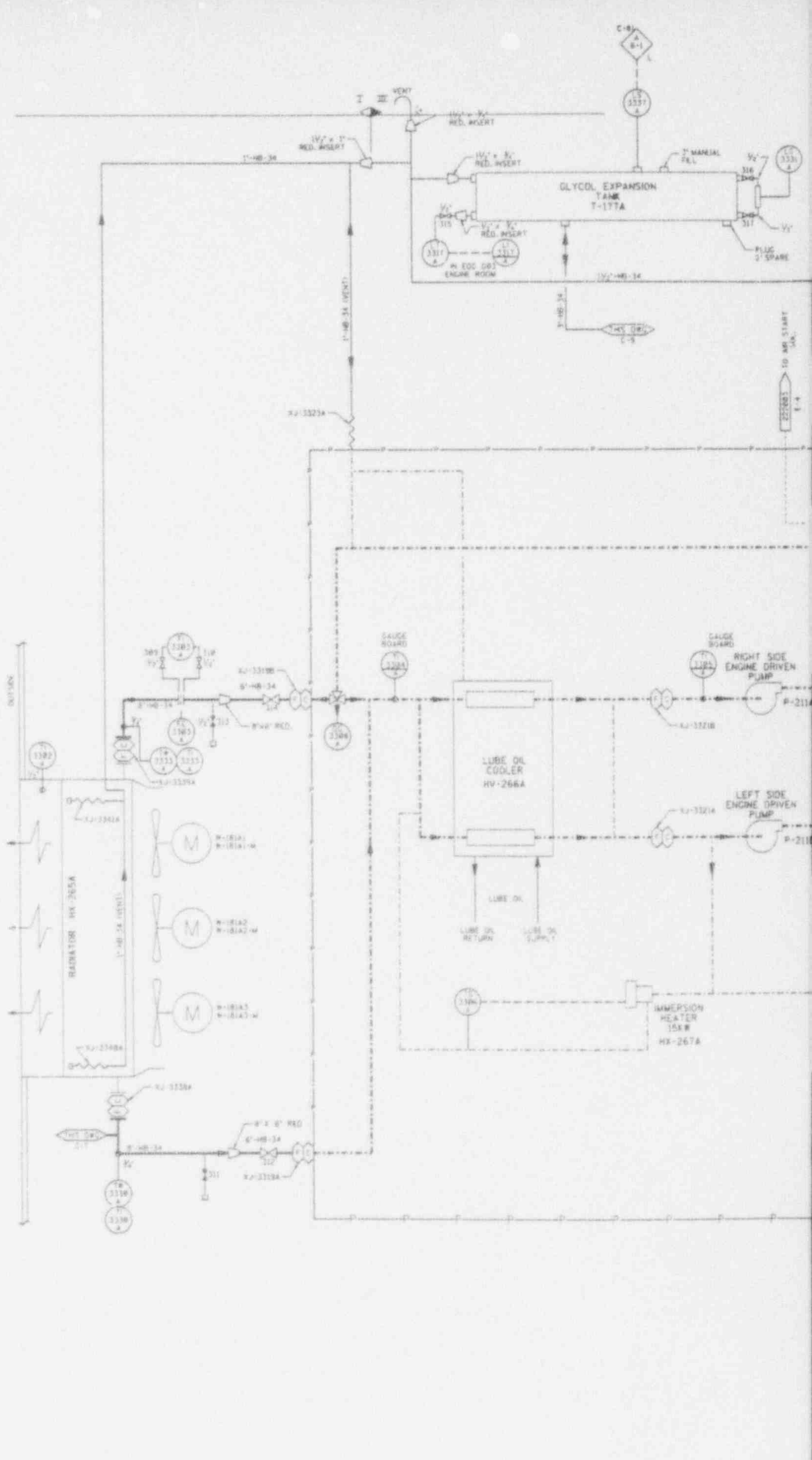
Transfer pump control switches, pressure indicators, storage tank level and day tank level indicators will be located in the transfer pump rooms.

The following conditions will be monitored and alarmed in the EDG control panel with a common trouble alarm in the main control room:

a. High and low storage tank levels.
b. High and low day tank levels.

4.4.3.6 Mechanical Design and Fabrication Codes

The design fabrication code for piping and equipment for the fuel oil storage components is identified in Appendix A, Design Codes.



GLYCOL EXPANSION
TANK
T-177A
VENT
RED. INSERT
3" MANUAL
FILL
PLUG
2" SPARE
ENGINE ROOM
1"-HB-34
1"-HB-34 (VENT)
XJ-3323A
GAUGE
BOARD
RIGHT SIDE
ENGINE DRIVEN
PUMP
LEFT SIDE
ENGINE DRIVEN
PUMP
LUBE OIL
COOLER
HV-266A
LUBE OIL
LUBE OIL
RETURN
LUBE OIL
SUPPLY
IMMERSION
HEATER
15KW
HX-267A
RADIATOR HX-265A
OUTSIDE
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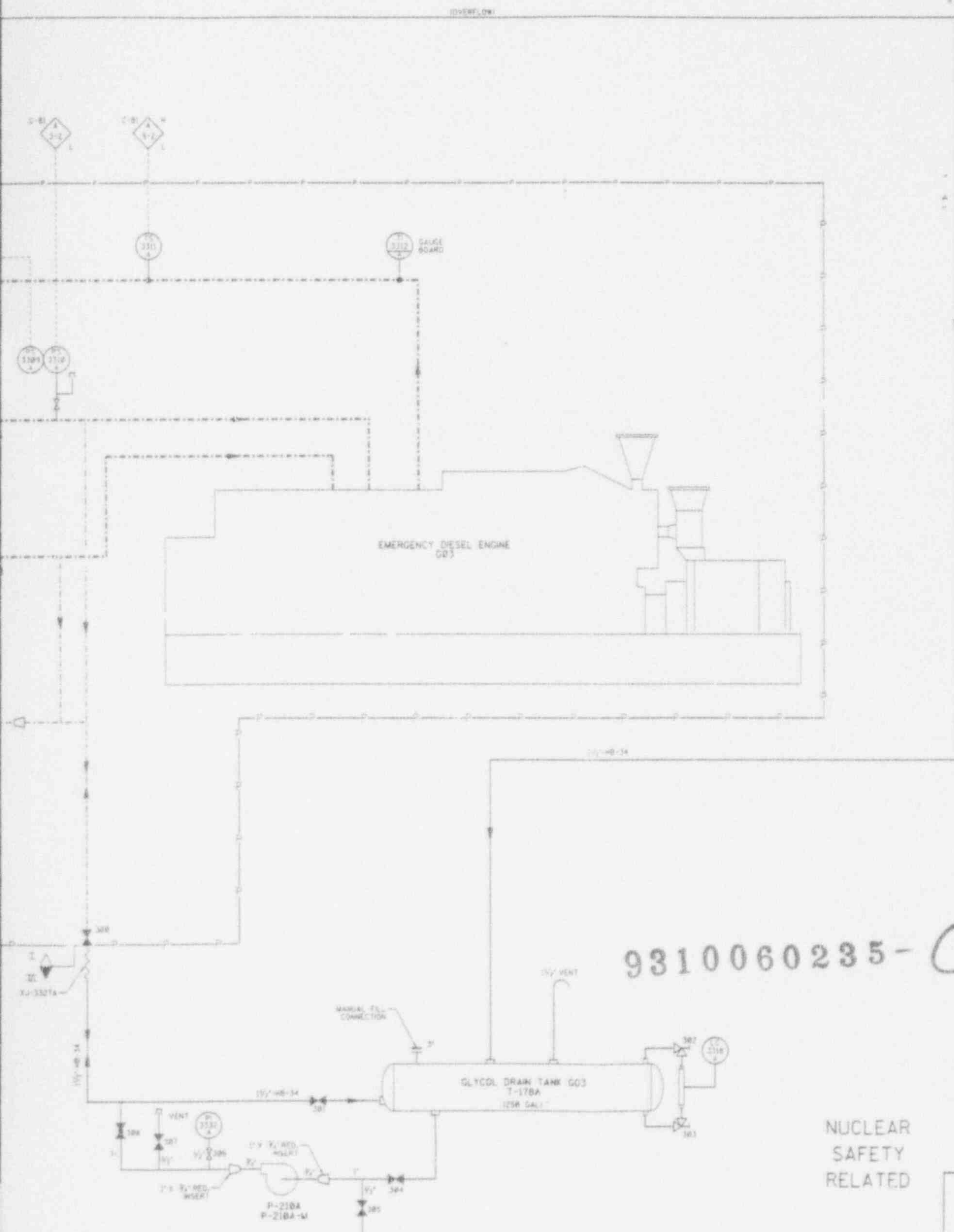
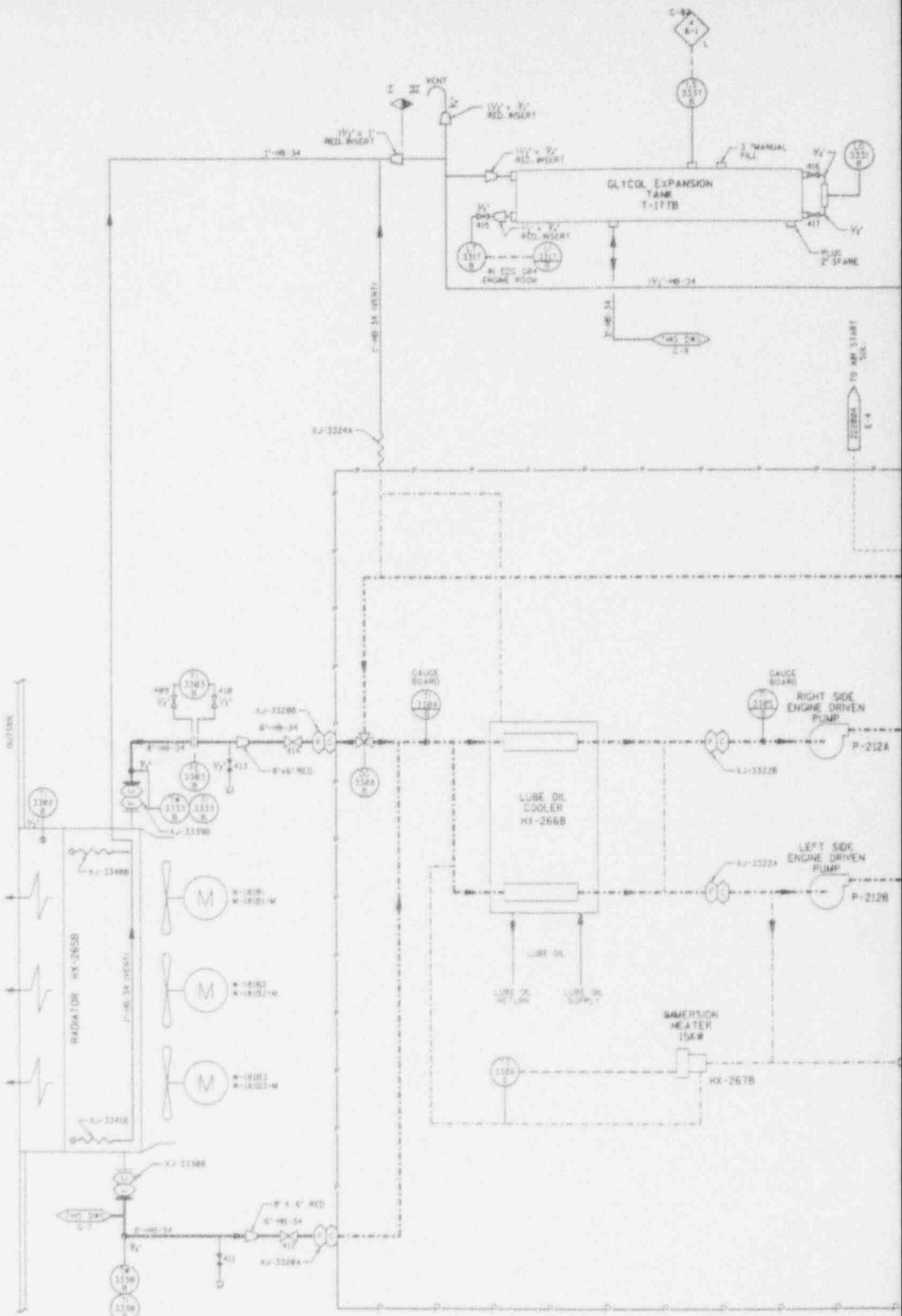


NUCLEAR
SAFETY
RELATED

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Glycol Cooling System
Diesel G03

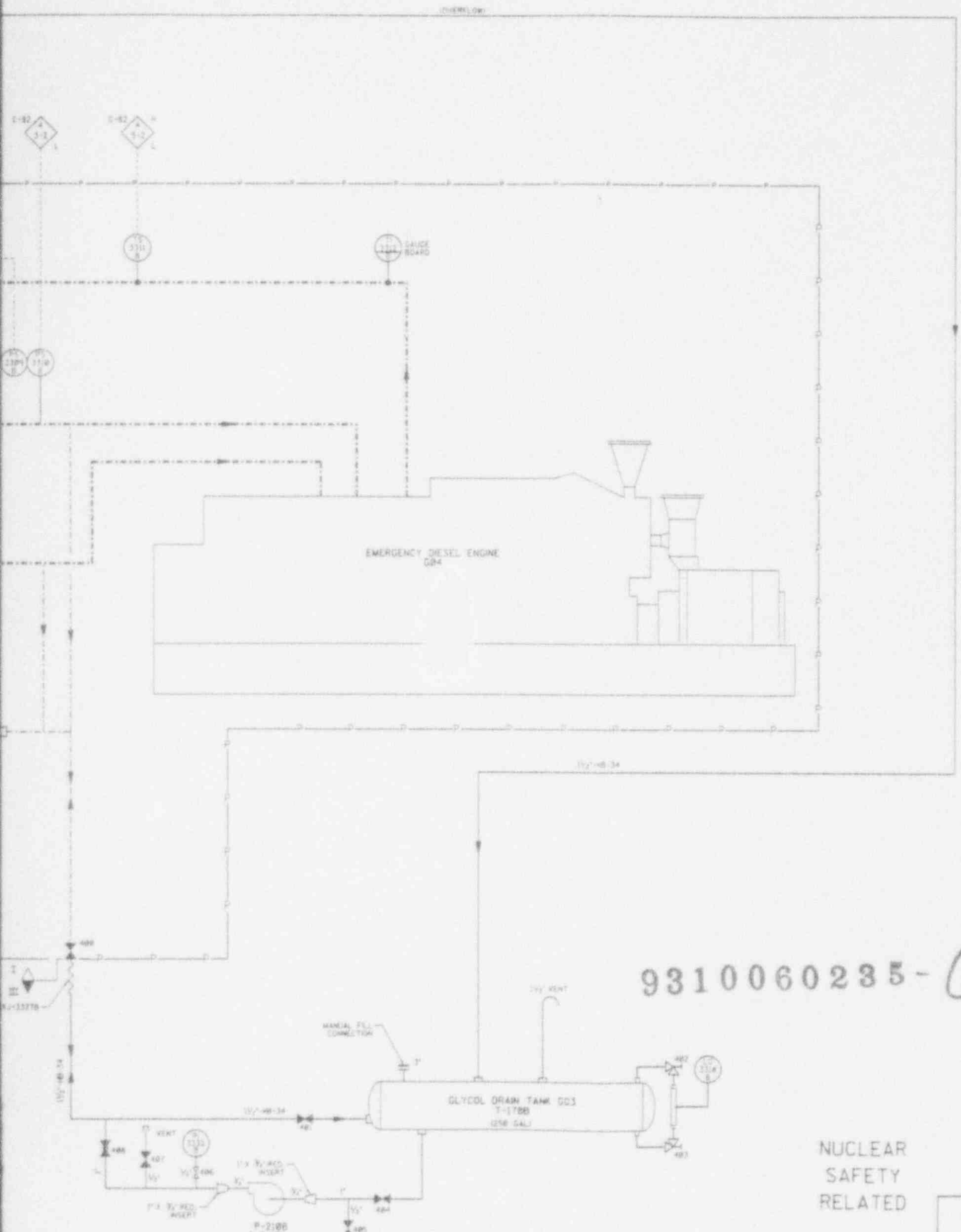
Figure 4-1



VENT
RED. INSERT
GLYCOL EXPANSION
TANK
T-177B
PLUG
2" SPARE
1"-HB-34
1"-HB-34 (VENT)
GAUGE BOARD
RIGHT SIDE
ENGINE DRIVEN
PUMP
P-212A
LUBE OIL
COOLER
HX-266B
LEFT SIDE
ENGINE DRIVEN
PUMP
P-212B
LUBE OIL
LUBE OIL RETURN
LUBE OIL SUPPLY
IMMERSION
HEATER
15KW
HX-267B
RADIATOR HX-265B
M
M
M
8"x6" RED.
8" x 6" RED
6"-HB-34

SI
APERTURE
CARD

Also Available On
Aperture Card



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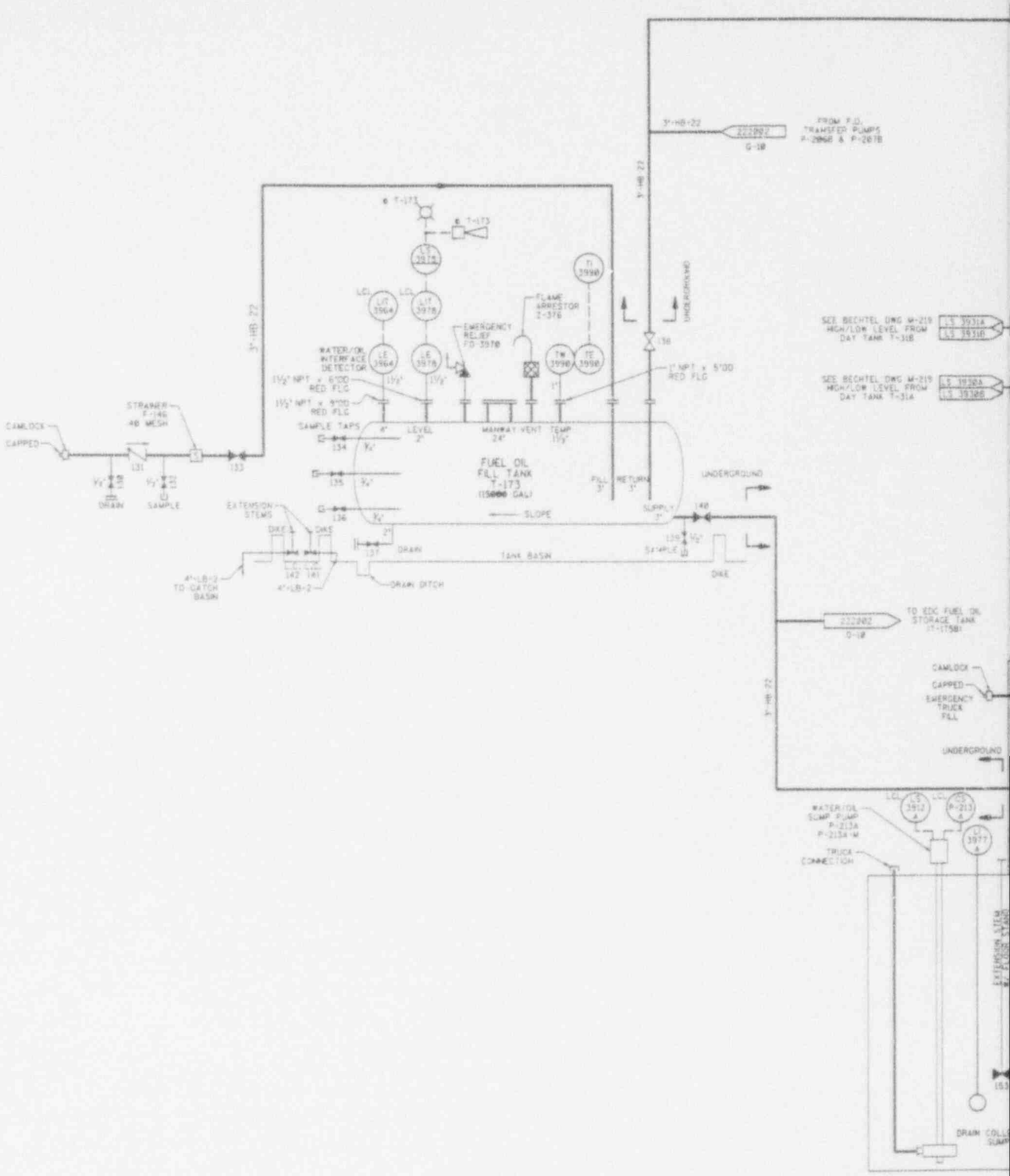
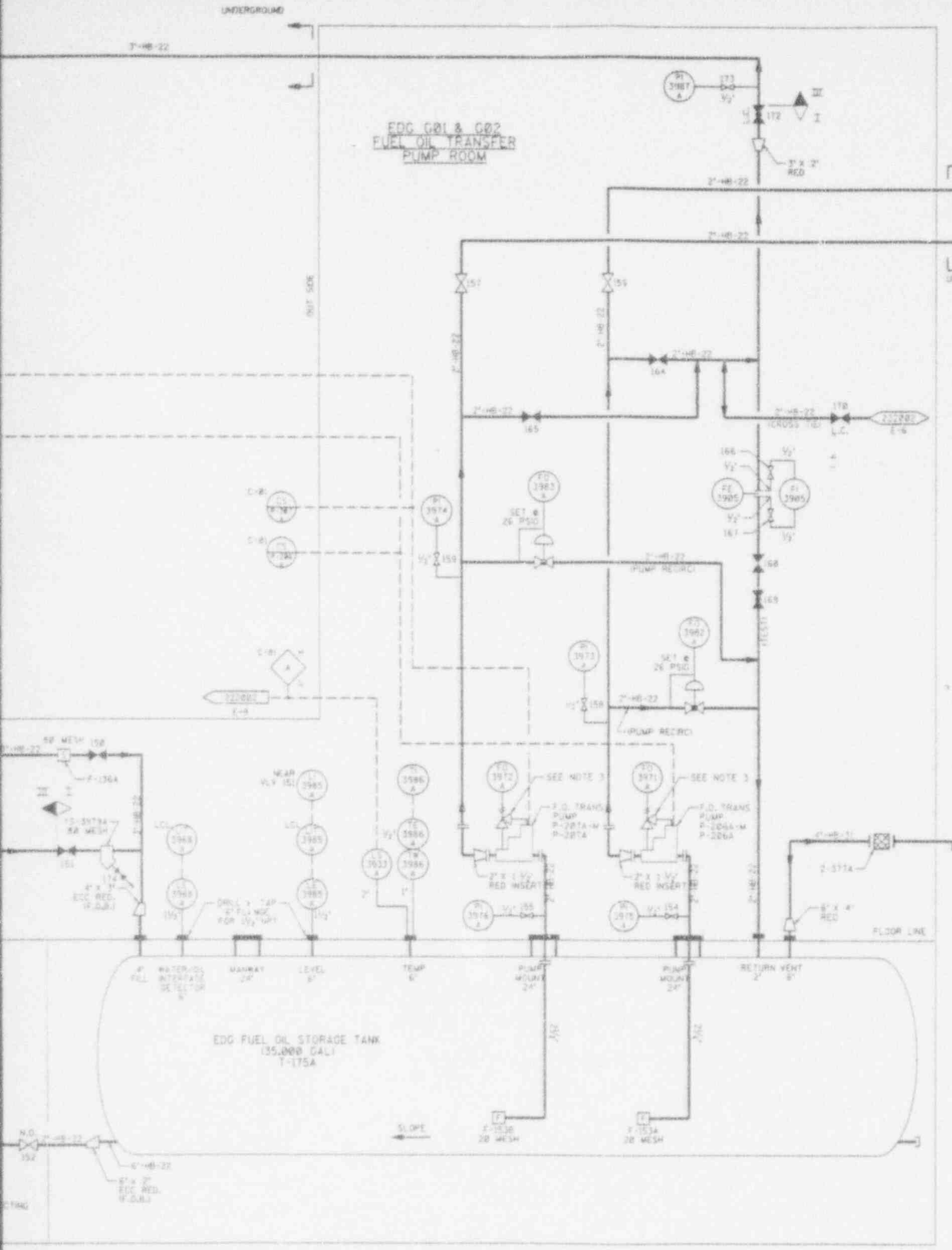
NUCLEAR
SAFETY
RELATED

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Glycol Cooling System
Diesel G04

Figure 4-2


3"-HB-22
222002
G-10
FROM F.O.
TRANSFER PUMPS
P-206B & P-207B
3"-HB-22
T-173
LT
3978
LCL
LIT
3964
LIT
3978
TI
3990
FLAME
ARRESTOR
Z-376
EMERGENCY
RELIEF
FO-3970
WATER/OIL
INTERFACE
DETECTOR
LE
3964
LE
3978
TW
3990
TE
3990
UNDERGROUND
136
1" NPT x 5"OD
RED FLG
SEE BECHTEL DWG M-219
HIGH/LOW LEVEL FROM
DAY TANK T-31B
LS 3931A
LS 3931B
SEE BECHTEL DWG M-219
HIGH/LOW LEVEL FROM
DAY TANK T-31A
LS 3930A
LS 3930B
1½" NPT x 6"OD
RED FLG
1½" NPT x 9"OD
RED FLG
STRAINER
F-146
40 MESH
CAMLOCK
CAPPED
SAMPLE TAPS
4"
LEVEL
2"
MANWAY
24"
VENT
TEMP
1½"
134
135
136
¾"
131
133
DRAIN
SAMPLE
FUEL OIL
FILL TANK
T-173
(15000 GAL)
FILL
3"
RETURN
3"
SUPPLY
3"
140
139
SLOPE
EXTENSION
STEMS
DIKE
137
DRAIN
TANK BASIN
SAMPLE
DIKE
142
141
4"-LB-2
TO CATCH
BASIN
4"-LB-2
DRAIN DITCH
222002
G-10
TO EDG FUEL OIL
STORAGE TANK
(T-175B)
3"-HB-22
CAMLOCK
CAPPED
EMERGENCY
TRUCK
FILL
UNDERGROUND
LCL
LS
3912
A
CS
P-213
A
LI
3977
A
WATER/OIL
SUMP PUMP
P-213A
P-213A-M
TRUCK
CONNECTION
EXTENSION STEM
153
DRAIN COLL
SUMP



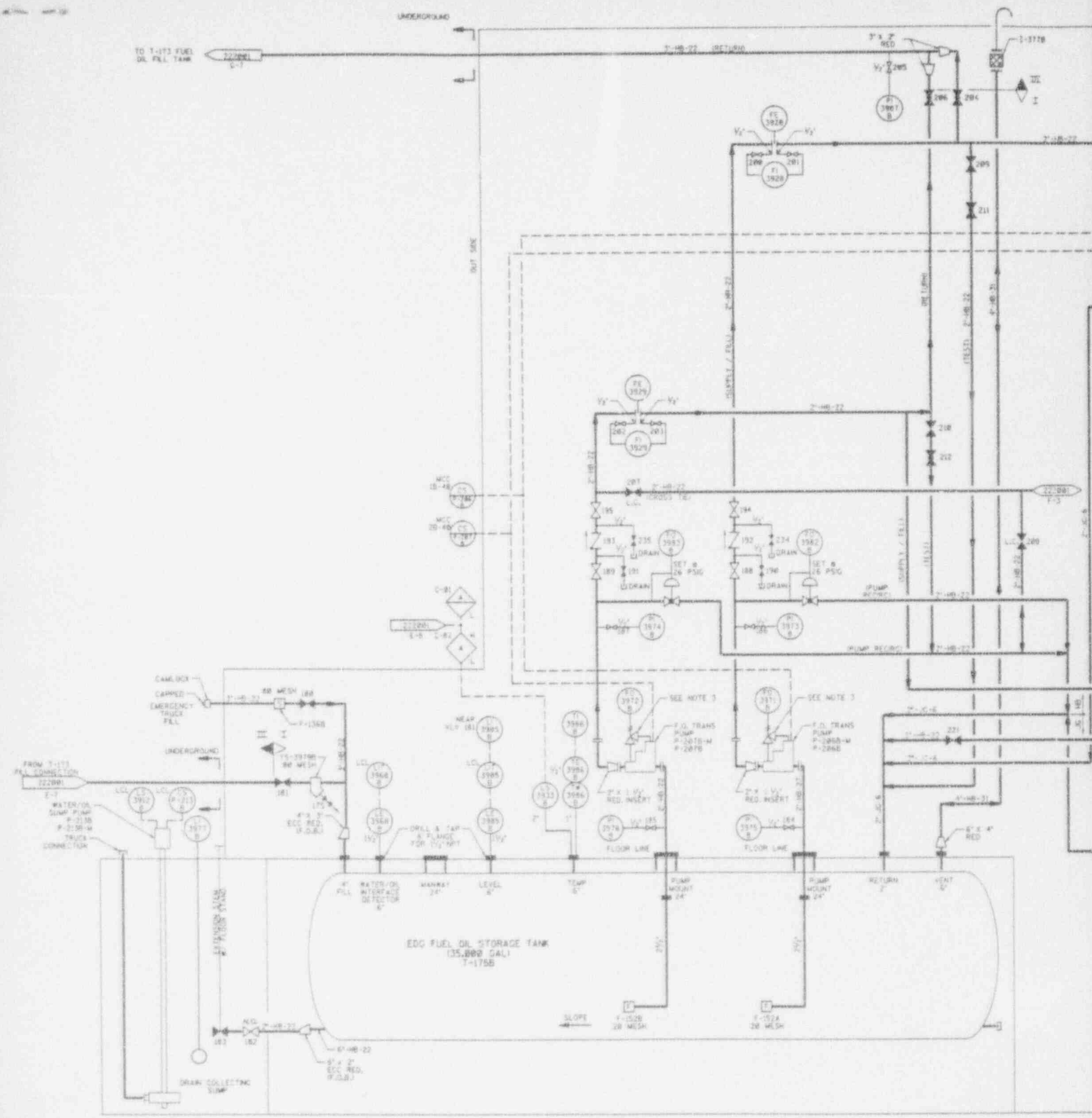
9310060235-05

NUCLEAR
SAFETY
RELATED

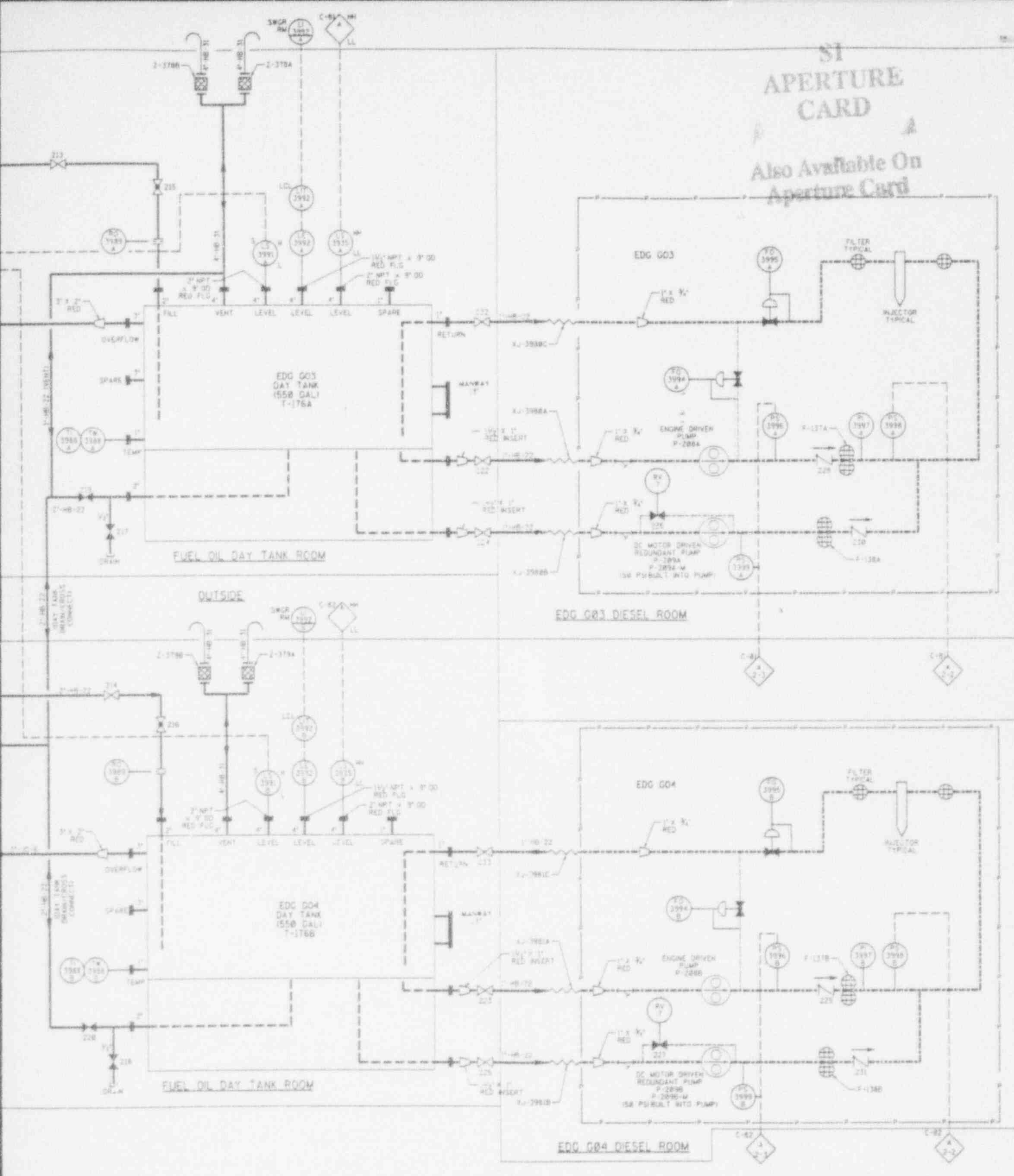
Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Fuel Oil System
Diesel G01, G02 & Fill Tank

Figure 4-3



UNDERGROUND
TO T-173 FUEL OIL FILL TANK
2"-HB-22 (RETURN)
3" x 2" RED
EDG FUEL OIL STORAGE TANK
(35,000 GAL)
T-175B
F.O. TRANS PUMP
SEE NOTE 3
EMERGENCY TRUCK FILL
CAMLOCK
CAPPED
80 MESH
FROM T-173 FILL CONNECTION
WATER/OIL SUMP PUMP
TRUCK CONNECTION
DRAIN COLLECTING SUMP
FILL
WATER/OIL INTERFACE DETECTOR
MANWAY
LEVEL
TEMP
PUMP MOUNT
RETURN
VENT
FLOOR LINE
DRAIN
SLOPE
20 MESH
(PUMP RECIRC)
RED. INSERT
DRILL & TAP & FLANGE



LEGEND:

INDICATES LIMITS OF ENGINE SKID

INDICATES PIPING ON ENGINE SKID

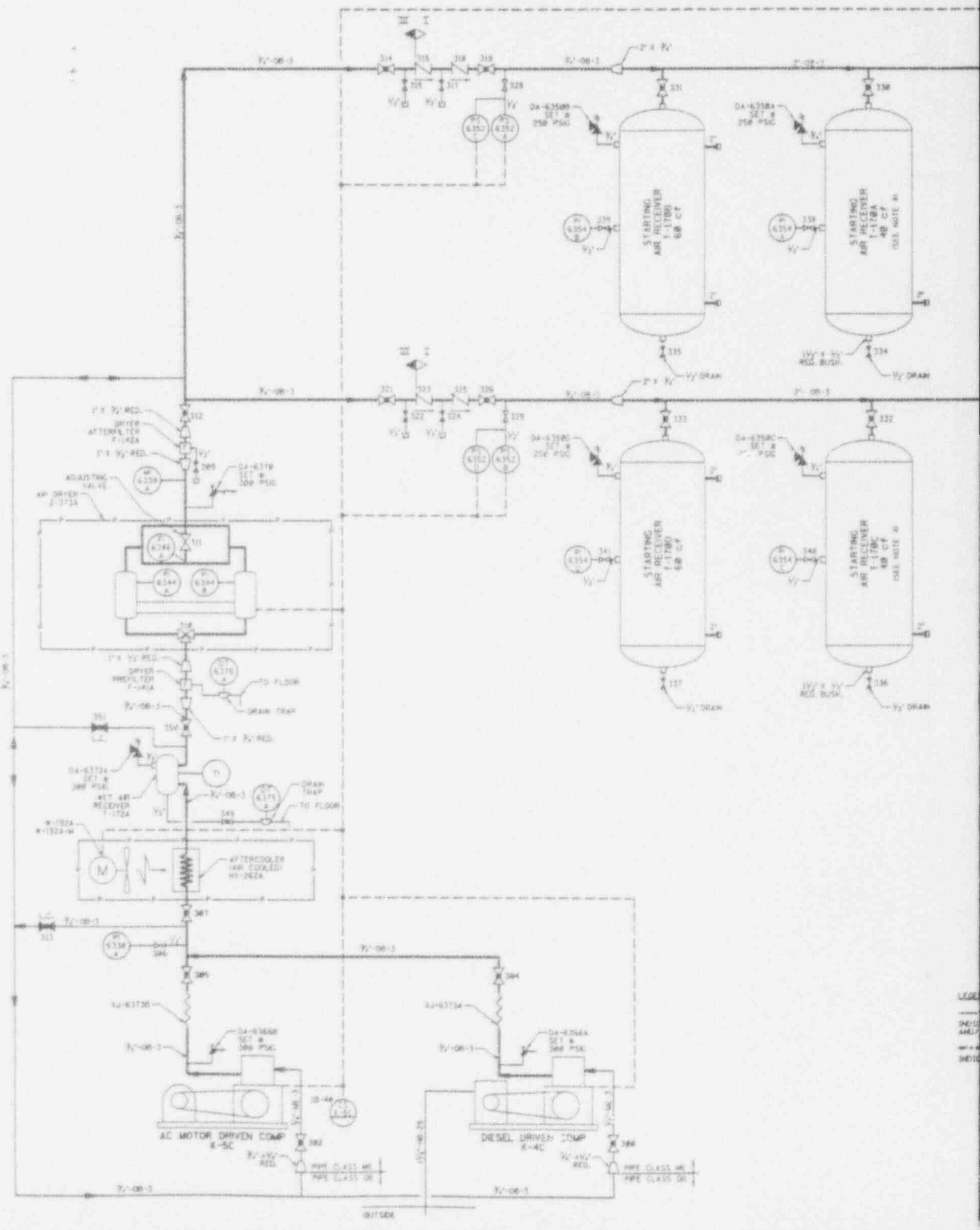
NUCLEAR
SAFETY
RELATED

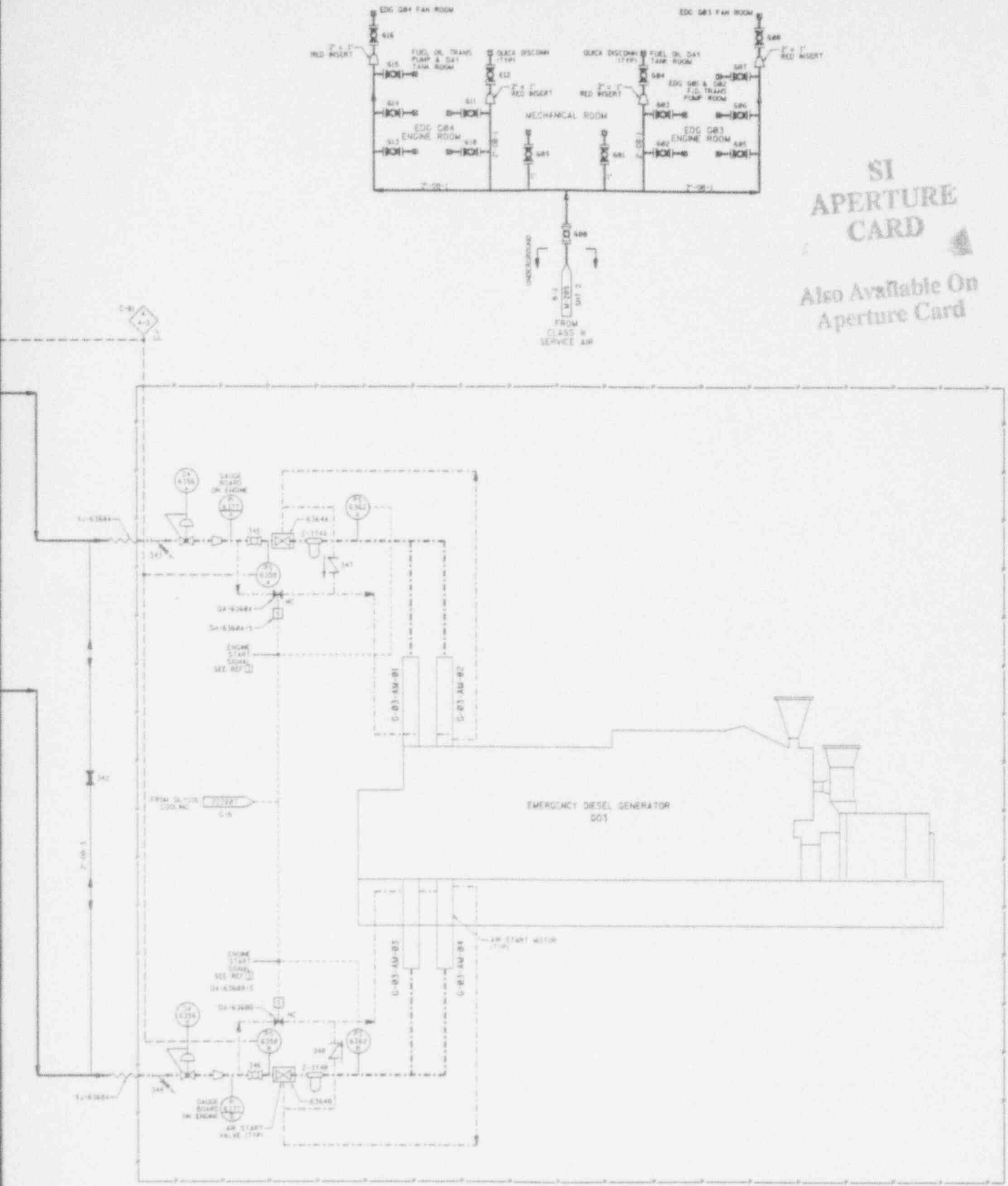
9310060235-06

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Fuel Oil System
Diesel G03 & G04

Figure 4-4


STARTING AIR RECEIVER
AC MOTOR DRIVEN COMP
DIESEL DRIVEN COMP
AFTERCOOLER (AIR COOLED)
WET AIR RECEIVER
DRYER AFTERFILTER
DRYER PREFILTER
ADJUSTING VALVE
DRAIN TRAP
TO FLOOR
OUTSIDE



...ATES LIMITS OF ENGINE SKID ...P EQUIPMENT

...ATES PIPING ON ENGINE SKID

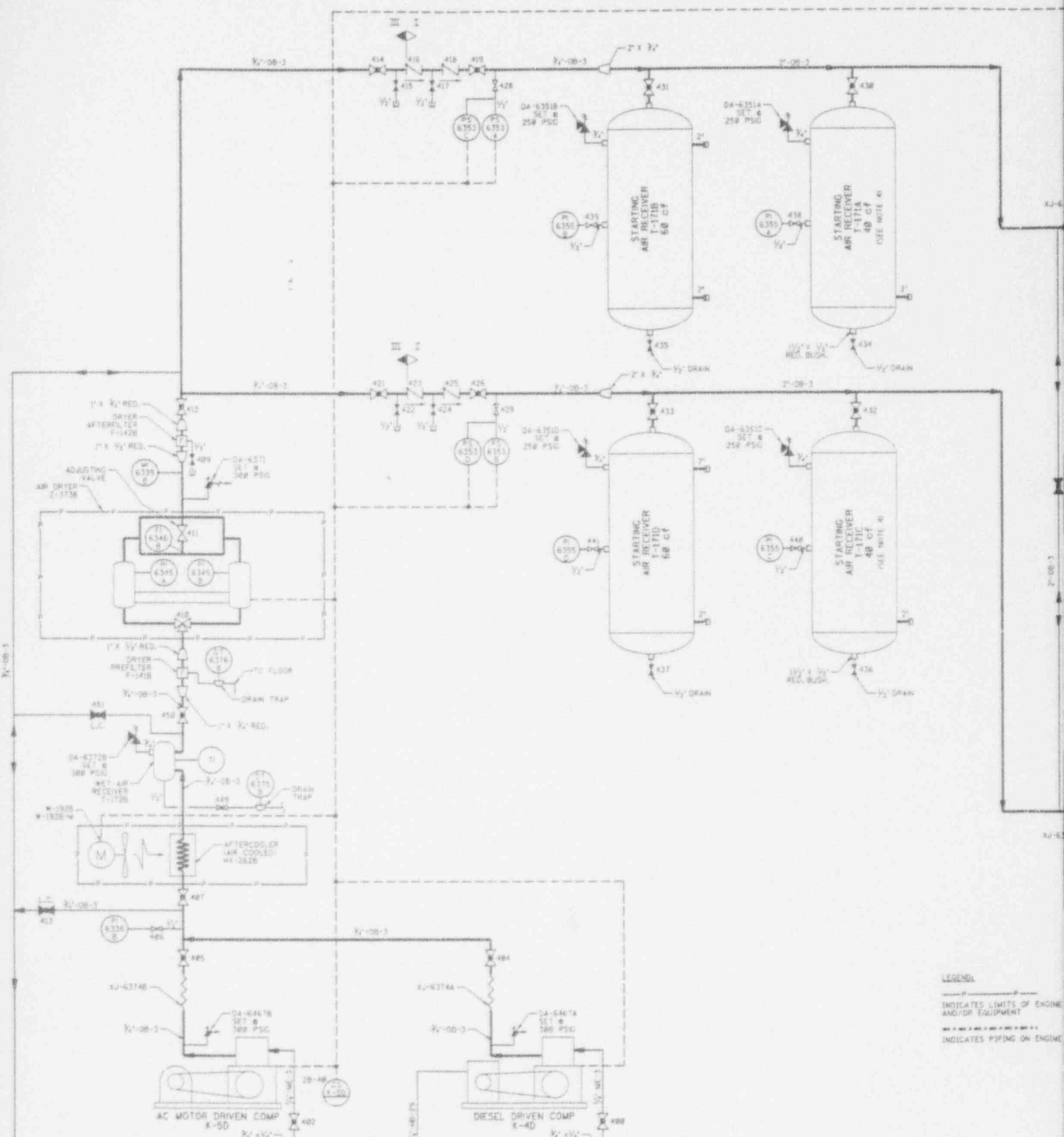
NUCLEAR SAFETY RELATED

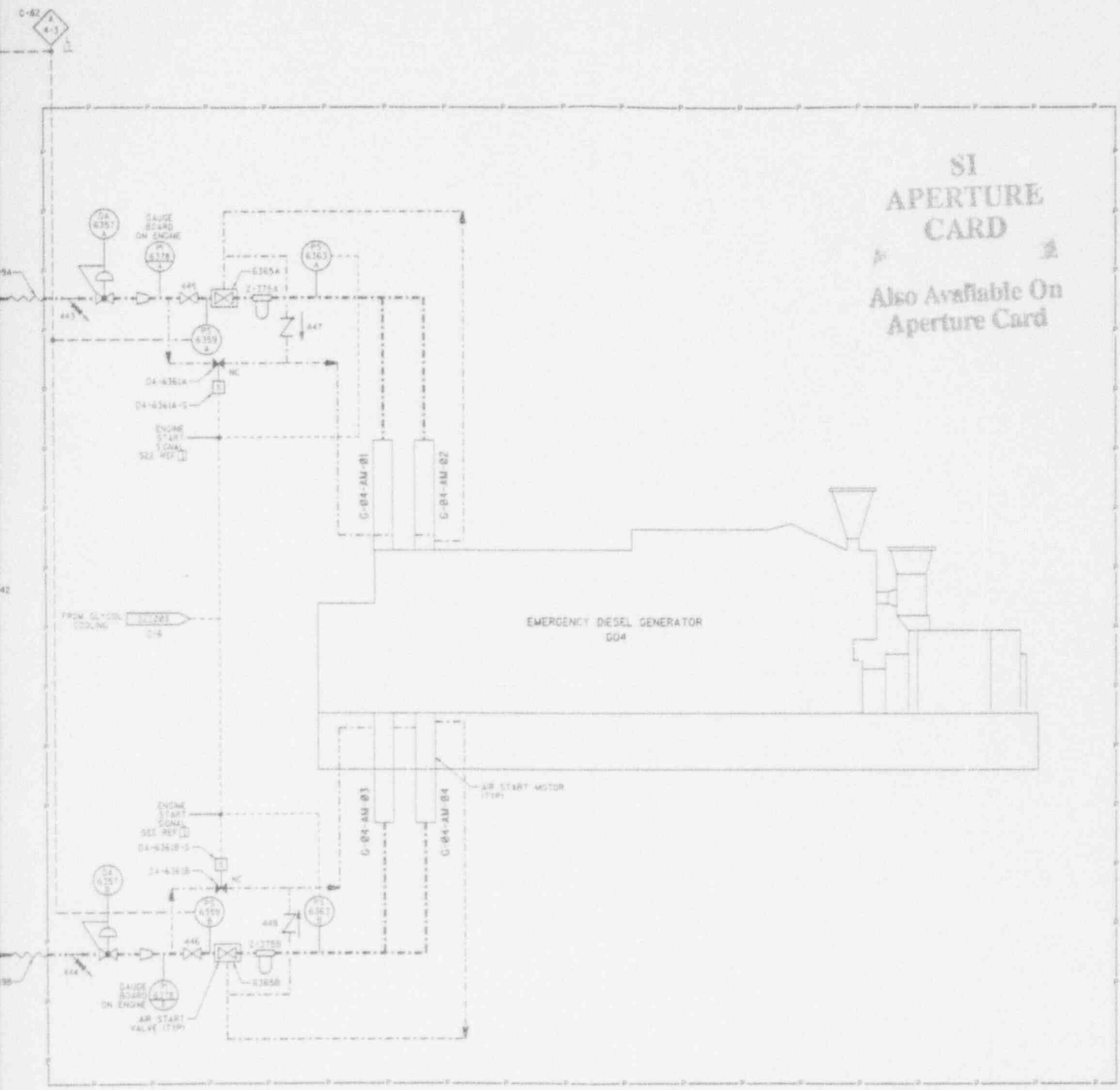
9310060235-07

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Starting & Service Air System
Diesel G03

Figure 4-5


STARTING AIR RECEIVER T-171B 60 cf
STARTING AIR RECEIVER T-171A 40 cf (SEE NOTE 4)
STARTING AIR RECEIVER T-171D 60 cf
STARTING AIR RECEIVER T-171C 40 cf (SEE NOTE 4)
½" DRAIN
RED. BUSH.
DRYER AFTERFILTER F-142B
ADJUSTING VALVE
AIR DRYER Z-373B
DRYER PREFILTER F-141B
TO FLOOR
DRAIN TRAP
WET AIR RECEIVER T-172B
AFTERCOOLER (AIR COOLED) HX-262B
AC MOTOR DRIVEN COMP K-5D
DIESEL DRIVEN COMP K-4D
PIPE CLASS WE
PIPE CLASS DB
OUTSIDE
MUFFLER
LEGEND:
INDICATES LIMITS OF ENGINE AND/OR EQUIPMENT
INDICATES PIPING ON ENGINE

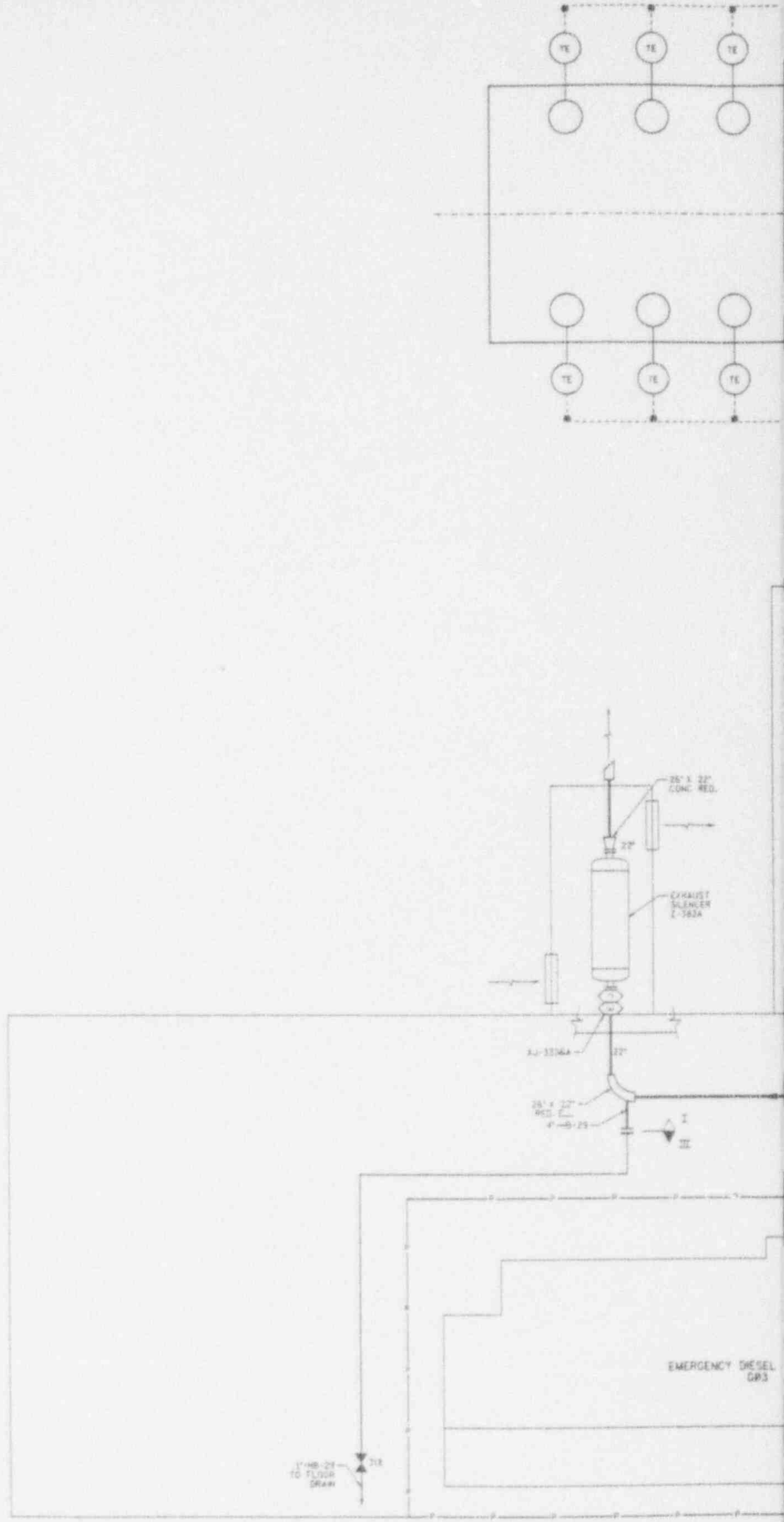


NUCLEAR
SAFETY
RELATED

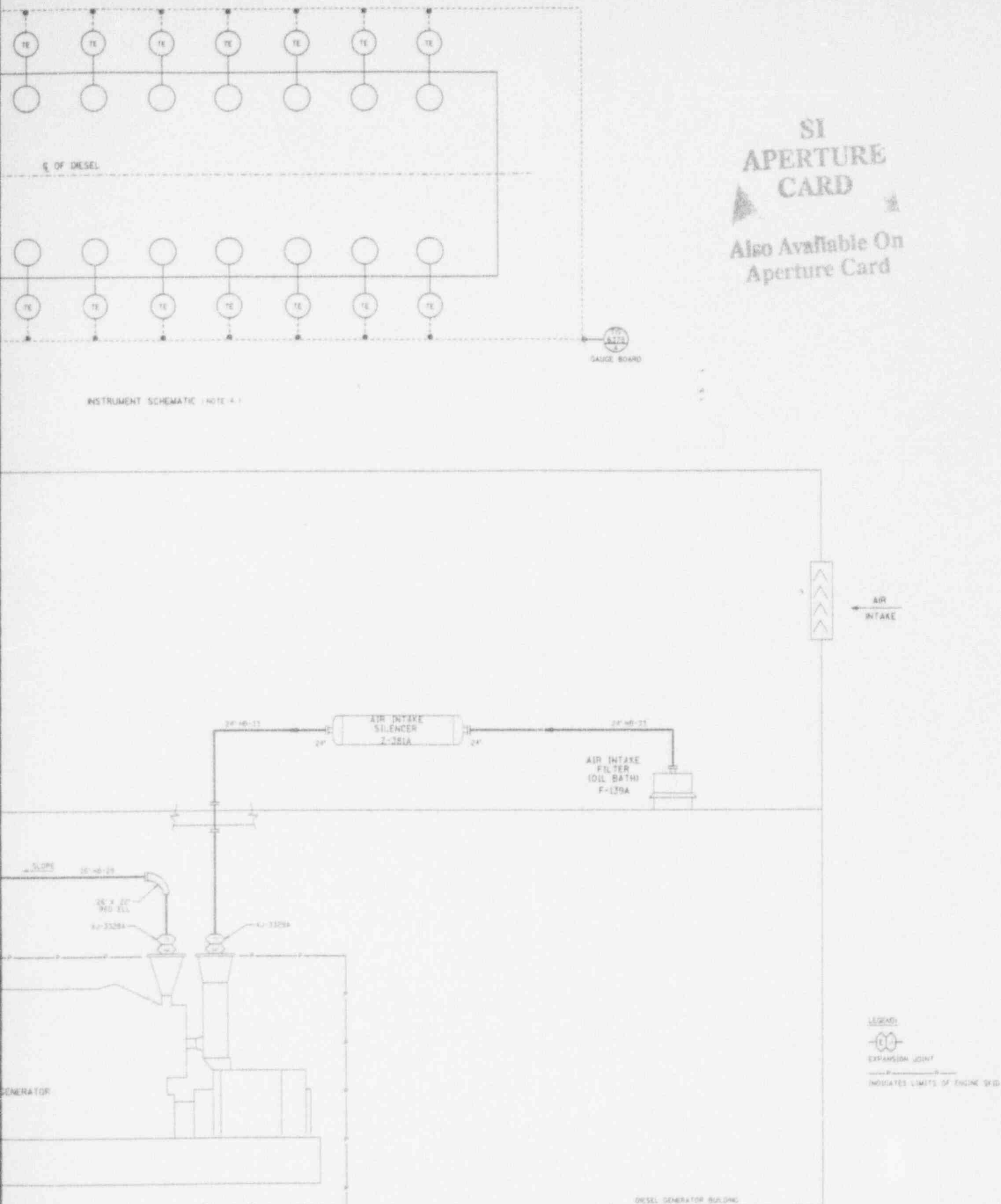
Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Starting Air System
Diesel G04

Figure 4-6



TE
26" X 22"
CONC RED.
22"
EXHAUST
SILENCER
Z-382A
22"
26" X 22"
RED. EL.
EMERGENCY DIESEL
GR3
TO FLOOR
DRAIN

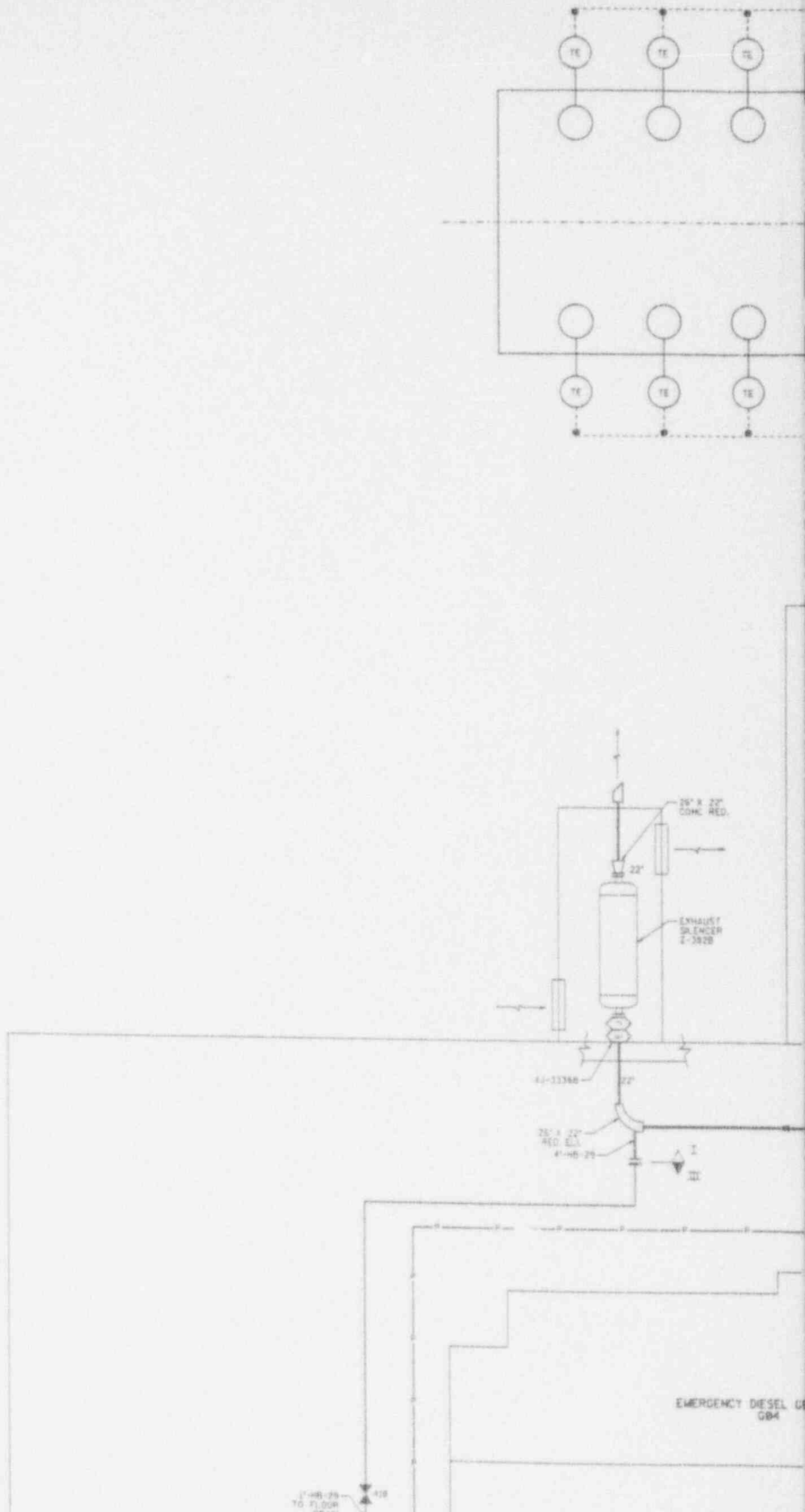


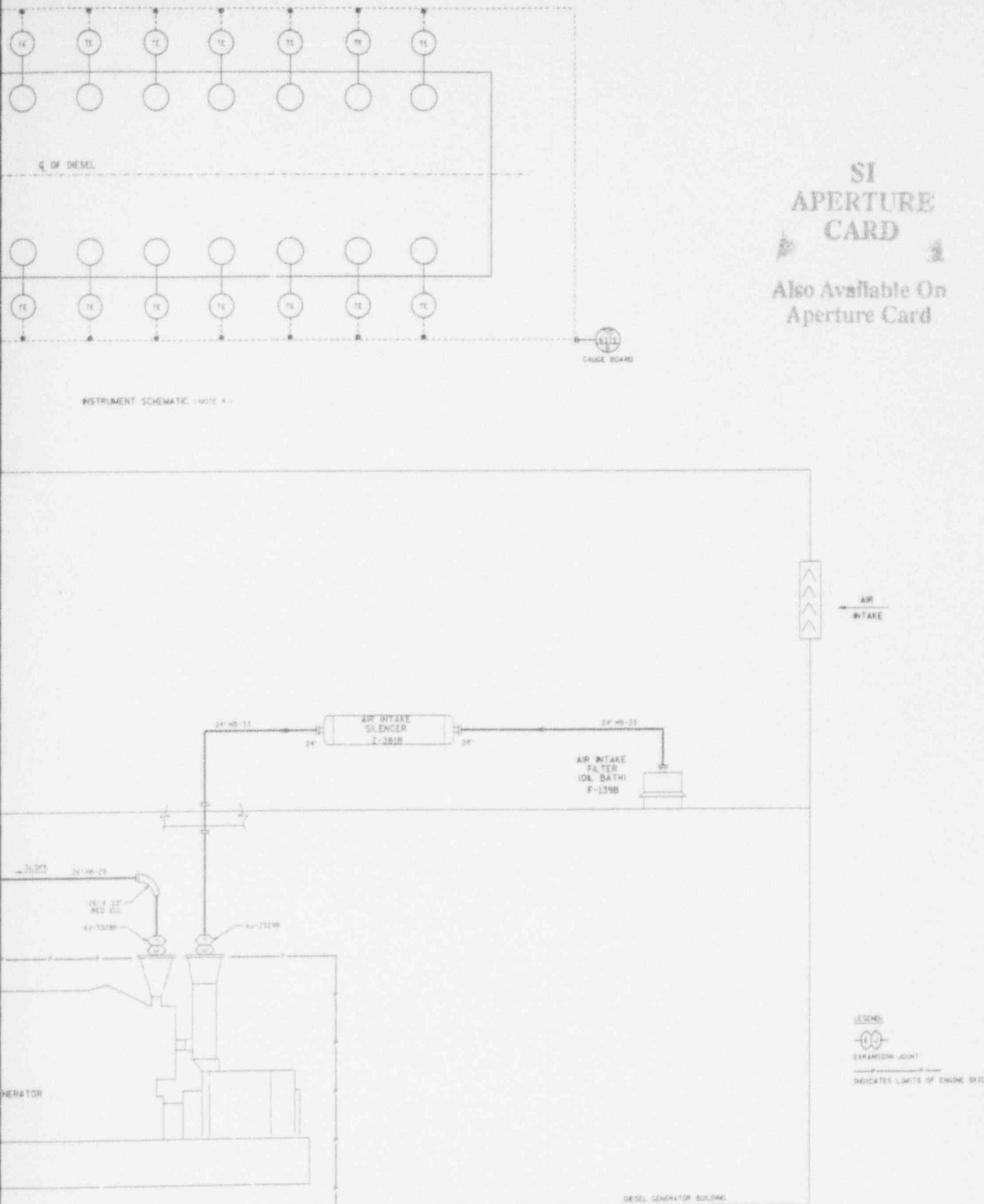
NUCLEAR
SAFETY
RELATED

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Air Intake & Exhaust
Diesel G03

Figure 4-7


TE
26" X 22"
CONC RED.
22"
EXHAUST
SILENCER
Z-382B
22"
26" X 22"
RED. EL.
4"-HB-29
1"-HB-29
TO FLOOR
DRAIN
EMERGENCY DIESEL G
G04



NUCLEAR
SAFETY
RELATED

9310060235-10

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
Flow Diagram
Air Intake & Exhaust
Diesel G04

Figure 4-8

5.0 NEW DIESEL GENERATOR BUILDING

The new Diesel Generator Building (DGB) will house two EMD diesel generators (G03 and G04), with associated control panels, auxiliary equipment, electrical distribution equipment, fuel oil and lube oil tanks, and diesel engine radiators.

The DGB will be a two-story Seismic Class I reinforced concrete structure, designed to withstand design basis load combinations. The DGB will be located approximately 30' north of the existing security fence and has approximate dimensions of 71 ft. x 110 ft. x 42 ft. high. Figures 5-1 through 5-9 depict the layout of the G03/G04 building.

5.1 SAFETY DESIGN CLASSIFICATION

The safety design classifications for the DGB systems are as follows:

5.1.1 Structures

The safety design classifications for the diesel generator structures are as follows:

Building/Structure	Seismic Classification
G03/G04 Diesel Generator Building	Safety Related
Stairway Enclosure	Non-Safety Related
Receiving Tank Structure	Non-Safety Related

5.1.2 Building Support Systems

Fire detection equipment and components will be classified as Fire Protection Related.

Fire suppression system equipment and components will be classified as Fire Protection Related.

Security control system components will be classified as Security Related.

The seismic design classification for the electrical/mechanical/HVAC building support systems is as follows:

System/Components	Safety Classification
Electrical Support Systems	
a. Lighting, Communication and Normal Power Distribution	Non-Safety Related
b. Class 1E Safeguards Power Distribution System Components Serving HVAC	Safety Related
c. Fire Detection Equipment and Components Within Class I and Class II Structures	Non-Safety Related
d. Fire Detection Equipment and Components Within Class III Structures	Non-Safety Related
e. Security Control System Components	Non-Safety Related
Mechanical Support Systems	
a. Plumbing, Service Air and Fire Suppression	Non-Safety Related
b. Fire Suppression System Components and Equipment	Non-Safety Related
c. All other piping within Class I or Class II Structures Unless Noted Otherwise	Non-Safety Related
HVAC Support Systems	
a. Components of the Fuel Oil Day Tank Rooms Exhaust System	Non-Safety Related
b. Non Emergency HVAC Components for the G03/G04 Electrical Equipment Rooms	Non-Safety Related
c. Controls for all Non Emergency HVAC Equipment and Components	Non-Safety related
d. Instrumentation for Indication and Alarm of All HVAC	Non-Safety Related
e. Class 1E Ventilation fans, modulating dampers, control switches, temperature sensors, transmitters and controllers for Emergency Ventilation	Safety Related

5.2 SEISMIC DESIGN CLASSIFICATION

The seismic design classifications for the DGB systems are as follows:

5.2.1 Structures

The seismic design classifications for the diesel generator structures are as follows:

Buildings/Structures	Seismic Classification
G03/G04 Diesel Generator Building	Class I
Stairway Enclosure	Class III
Fill Tank Structure	Class III

5.2.2 Electrical/Mechanical/HVAC Building Support Systems

Electrical, mechanical and HVAC systems and components designated as safety related will be designed and qualified as Seismic Class I. All systems, components and supporting systems not designated as safety related will be designed as Seismic Class I or Class II to ensure that an SSE would not cause any structural failure resulting in damage to safety related systems or components.

Safeguards power distribution system equipment and components will be qualified in accordance with the requirements of Class 1E equipment. Fire Detection equipment and components will be classified as Fire Protection Related. Security control system components will be classified as Security Related.

Fire suppression system equipment and components will be classified as Fire Protection Related.

Normal exhaust system components for the fuel oil day tank rooms and normal HVAC for the electrical equipment rooms will not be qualified as Class 1E type equipment. All components including ventilation fans, modulating dampers, control switches, temperature sensors, transmitters, controllers, etc. required for operation of the emergency ventilation system (fans, dampers, etc.) in the DGB will be qualified in accordance with seismic requirements for Class 1E equipment. Instrumentation that is required for alarming, indication and monitoring will not be qualified to Class 1E requirements.

The seismic design classifications for the electrical/mechanical/HVAC building support systems are as follows:

System/Component	Seismic Classification
Electrical Support Systems	
a. Lighting, Communication and Normal Power Distribution	Class II
b. Class 1E Safeguards Power Distribution System Components Serving HVAC	Class I
c. Fire Detection Equipment and Components Within Class I and Class II Structures	Class II
d. Fire Detection Equipment and Components Within Class III Structures	Class III
e. Security Control System Components	Class II
Mechanical Support Systems	
a. Plumbing, Service Air and Fire Suppression	Class II
b. Fire Suppression System Components and Equipment	Class II
c. All other piping within Class I or Class II Structures Unless Noted Otherwise	Class II
HVAC Support Systems	
a. Non-Safety Related (NSR) Components of the Fuel Oil Day Tank Rooms Exhaust System	Class II
b. NSR HVAC Components for the G03/G04 Electrical Equipment Rooms	Class II
c. Controls for all NSR HVAC Equipment and Components	Class II
d. Instrumentation for Indication and Alarm of All HVAC	Class II
e. Class 1E Ventilation fans, modulating dampers, control switches, temperature sensors, transmitters and controllers for Emergency Ventilation	Class I

5.3 BUILDING STRUCTURE DESIGN

5.3.1 Design Loads

The following loads have been considered in the design:

- Dead loads (Including liquid lateral pressure loads)
- Live loads (Including crane loads and earth pressure loads)
- Flood loads and uplift due to buoyant forces
- Construction loads
- Snow/rain loads
- Wind loads
- Tornado loads
- Earthquake loads
- Temperature loads
- Pipe reaction loads

All structures, mechanical and electrical equipment, and their respective appurtenances will be supported in accordance with their seismic design classification. Class I structures and components are designed to withstand all loadings including SSE and OBE seismic loads without loss of function. Class II structures are designed allowing a limited amount of plastic yielding during accident and seismic conditions. Class III Structures and systems are designed in accordance with The Uniform Building Code (UBC).

Supports for non-safety related items located in Seismic Class I or Class II structures will be designed in accordance with Seismic Class II requirements such that they do not fail under seismic conditions and endanger the operation of any adjacent safety related items.

All major loads to be encountered or to be postulated are listed below. All the loads listed, however, are not necessarily applicable to all the structures and their elements. Loads and the applicable load combinations for which each structure has to be designed will depend on the conditions to which that particular structure is subjected.

5.3.1.1 Dead Loads

Dead loads include the weight of framing, roofs, floors, walls, partitions, platforms and all permanent equipment. The vertical and lateral pressure of liquid will also be treated as dead load, as indicated in ACI 318 Codes.

Floors shall be checked for the actual equipment loads. For permanently attached small equipment, piping conduits and cable trays, an additional 50 psf dead load will be added where appropriate.

5.3.1.2 Live Loads

Live loads include floor area loads, equipment handling loads, and all other loads other than those specified. The floor area live load will be omitted from areas occupied by equipment whose weight is specifically included in dead load. Live load will not be omitted under equipment where access is provided (for example, elevated tank on legs). In no case will the live loads be less than those specified in the minimum design live load table stated below.

Earth pressure will be in accordance with the requirements of the UBC. In load combinations, earth pressure loads will be treated as live load in accordance with ACI 318 Code.

Crane loads will be treated as live load in accordance with requirements indicated in AISC Codes.

Minimum Design Live Loads

The following minimum design live loads will be used in the design of the diesel generator building and structures.

Buildings/Structures	Minimum Live Loads
1. Roof loads	
- Lower roof	200 psf
- Upper roof	65 psf
2. Stairs and walkways	100 psf
3. Railings	25 plf or 200 lbs. applied in any direction at top of railing
4. Platforms and gratings	100 psf
5. Ground Floor	250 psf
6. All other floors	200 psf

5.3.1.3 Flood Loads and Uplift Due to Buoyant Forces

Flood Loads

All of the Diesel Generator Building including all foundations and buried tanks are above the probable maximum flood elevation.

Uplift Due to Buoyant Forces

Uplift forces which are created by the displacement of groundwater by the structure will be accounted for in the design of the structure. In load combinations, loads due to water pressure from groundwater will be treated as a dead load. For structural and buoyancy calculations, the high groundwater table will be as follows:

a. Normal ground water El. 19'
b. Low ground water El. 15'
c. Design flood (Lake Surge) El. 8.42'

Elevations are based on plant elevation 0.00 which is equal to 581.5 feet USC & GS; 580.6 feet USC & GS (Milwaukee Datum); and 580.2 feet IGLD.

5.3.1.4 Construction Loads

Structures and components will be designed considering all applicable construction loads.

5.3.1.5 Snow/Rain Loads

The following snow and rain loads on the horizontal projected area of exposed structures and components will be used in design:

a. Snow load 30 psf
b. Rain load 65 psf

5.3.1.6 Wind Load

The wind loads for Class I structures will be determined from the fastest mile wind for a 100 year recurrence which is 108 mph for PBNP.

The wind loads for Class II structures will be determined from the fastest mile wind for a 50 year recurrence which is 100 mph PBNP.

The wind loads for Class III structures will be determined in accordance with Uniform Building Code (UBC).

Wind pressure, shape factors, gust factors and variation of winds with height for Class I and Class II structures shall be determined in accordance with the procedures given in the American Society of Civil Engineers, (ASCE) Paper No. 3269 "Wind Forces On Structures" (Ref. 10), Transactions of the American Society of Civil Engineers, Vol. 126, Part II (1961) or in accordance with the requirements in ANSI/ASCE 7-88 Minimum Design Loads for Building and Other Structures", whichever is most conservative.

5.3.1.7 Tornado Loads

Class I structures will be analyzed for tornado loading (not coincident with earthquake) on the following basis:

a. Differential pressure drop between the inside and the outside of structures of 3.0 psi positive pressure. The rate of pressure drop will be 1.0 psi/sec.

b. A lateral force caused by a funnel of wind having a peripheral tangential velocity of 300 mph and a forward progress of 60 mph. The applicable portions of ASCE Paper No. 3269 will be used, particularly for shape factors. The provisions for gust factors and variation of wind velocity with height do not apply.

c. Tornado driven missiles equivalent to an airborne 4 inch by 12 inch by 12 foot plank traveling end on at 300 mph (440 fps) or a 4000 lb automobile flying through the air at 50 mph (74 fps). Except for local crushing at the missile impact area, the allowable stresses to resist the effects of tornados shall be 90% of yield of reinforcing steel and 85% of the ultimate strength of concrete. Where elasto-plastic behavior of steel barriers is relied upon, a maximum ductility ratio of 20 is used.

Class I structures, systems and equipment located within Class I structures like the diesel generator building, safety related manholes, etc. need not be designed for the effects of tornados as they are protected by building structures which will be designed to withstand the effects of tornados. For information concerning the design of Dampers, Doors, and Barriers for Tornado generated loads, See Section 5.3.1.8 and SRP 3.5.2 of Appendix-B.

5.3.1.8 Earthquake Loads

The seismic design of the DGB will be as follows:

a. Seismic Class I structure earthquake loading is derived from an operating basis earthquake (OBE) at the site having a horizontal ground acceleration of 0.06 g. In addition, loading from a safe shutdown earthquake (SSE) having a horizontal ground acceleration of 0.12 g is used to ensure no loss of function. The vertical component of ground acceleration will be 2/3 of the magnitude of the horizontal component of ground acceleration for both the design (OBE) and maximum hypothetical (SSE) earthquakes.

b. Seismic Class II structure earthquake loading will be 60% of the loads determined using the 0.06 g design (OBE) earthquake.

c. Earthquake loading for Class III structures will be in accordance with Uniform Building Code requirements. This code specifies the location of the plant site to be in a Zone 0 earthquake area. However, Zone 1 earthquake loads will be conservatively used in the design of Class III structures.

Seismic forces resulting from design (OBE) or hypothetical (SSE) will be applied simultaneously in the vertical and any horizontal direction and the resulting stresses will be combined directly.

5.3.1.9 Temperature Loads

Temperature loads used in design will be those resulting from thermal effects during normal operating or shutdown conditions, based on the most critical transient or steady state condition.

5.3.1.10 Pipe Reaction Loads

Pipe reaction loads used in design will be those Pipe reactions resulting from normal operating or shutdown conditions, based on the most critical transient or steady state condition. Pipe reaction loads may include loads from "Normal Conditions," "Upset Conditions," "Emergency Conditions," and "Faulted Conditions" as applicable.

5.3.2 Structural Design Basis

5.3.2.1 General Design Criteria

The general design of the DGB will be as follows:

a. All steel structures will be designed by the elastic working stress method.

b. All reinforced concrete structures will be designed using the Ultimate Strength Design (USD) method.

c. Frost ranges from 5 to 6 feet below grade. Exterior footings and structures will be designed with a minimum 6 feet depth. Water lines will be designed with a minimum of 6 feet of cover.

d. Rainfall (approximate)

   1. Average annual 28"
   2. Maximum Annual 45"
   3. Maximum 24 Hours 6.17"

e. Snow fall averages approximately 45" per year. The maximum 24 hour snowfall is 15".

f. Temperature extremes range from +110 degrees Fahrenheit to -30 degrees Fahrenheit.

g. Wind

   1. Fastest wind with 50 year recurrence is 100 mph
   2. Fastest wind with 100 year recurrence is 108 mph

h. Groundwater table rises in a westerly direction from the elevation of Lake Michigan and lies generally 5 to 13 feet below the existing ground surface.

i. General Soil Conditions

   1. Rich organic top soil at elevation 25' to 30'
   2. Glacial till to elevation 10'
   3. Lake deposits elevation +10' to -30'
   4. Glacial till and glacial outwash elevation -30' to elevation -75'
   5. Rock (fractured dolomite) below elevation -75'

5.3.2.2 Seismic Design Criteria

The seismic design of the DGB will be performed utilizing the response spectrum method of analysis to determine the building responses. The seismic design of the equipment located within the building will be performed using the time history method of dynamic analysis.

5.3.2.2.1 Building Response

The response of the DGB due to seismic will be obtained using the response spectrum method. In this method, a mathematical model representing the building is developed and a modal analysis is performed to calculate the natural frequencies and mode shapes of the model. A ground response spectrum (A plot of acceleration vs frequency for an earthquake) is applied as a load to the model and the modal responses are calculated. The responses of the building (deflections, moments, shears, etc.) are then obtained by combining the modal responses.

The mathematic model of the DGB will consist of several stick elements representing the shear walls with nodes at each floor level. Each of these nodes will be connected by rigid link, representing the rigid diaphragm action of the floor slab. The foundation slab will be treated as a rigid member for in-plane and out-of-plane motions. Lumped mass location will be chosen at appropriate locations in the building (floors, attachment points of heavy pieces of equipment) to represent the structure mass. Properties including moments of inertia, cross-sectional areas, effective shear areas, etc. will be determined considering the dimensions of concrete walls between floors. These properties in turn will be used to calculate the stiffness characteristics of the individual stick elements between nodes. In order to incorporate the effect of the actual floor slab stiffness on the vertical response spectra, vertical spring mass systems will be attached, at the center of mass of each floor to represent the vertical flexibility of the slab at that elevation. The slab mass along with the equipment loads will represent the mass of the spring-mass system. The soil-structure interaction will be accounted for in the seismic analyses through the use of soil springs representing the six degrees of freedom (three translations and three rotations) of the rigid foundation mat.

The mathematical model will be input into the STARDYNE computer program, and the mode shapes and natural frequency will be determined. Then the modal accelerations, velocities and displacements are determined using the modal frequency and the appropriate input ground response spectra corresponding to the soil-structure modal damping. The modal responses then combined on the basis of absolute values to obtain the structural response.

The percentage of critical damping values for the OBE and SSE levels used will be as follows:

Earthquake	OBE	SSE
Type of Condition and Structure	% of Critical Damping	
Welded Steel Plate Assemblies	1%	2%
Welded Steel Framed Structures	2%	2%
Bolted Steel Framed Structures	2.5%	5%
Interior Concrete Equip. Supports	2%	2%
Reinforced Concrete Structures on Soil	5%	7.5%
Vital Piping Systems	2%	5%
Soil Damping	5%	5%

The input horizontal and vertical spectra for the seismic design of the DGB will be based on the PBNP FSAR for a maximum ground acceleration (zero period acceleration) of 0.06g for the Operating Basis Earthquake (OBE) and 0.12g for the Safe Shutdown Earthquake (SSE).

5.3.2.2.2 Floor Response Spectra

Response spectra curves for the analysis of equipment for the DGB will be obtained using time history method. In this method, the earthquake time history will be applied as the load to the base of the structural model and floor time histories for the three directions of motion (two horizontal and one vertical) will be determined. These floor time histories will be applied to a single-degree-of-freedom oscillator to determine the response spectra at each floor.

5.3.2.3 Tornado Design Criteria

The description of the tornado design criteria is included in subsection 5.3.1.7.

5.3.2.4 Flood Protection Design Criteria

The description of the flood protection design criteria is included in subsection 5.3.1.3.

5.3.3 <u>Construction Materials</u>

The principal construction materials for safety related structures are concrete, reinforcing steel and structural steel.

5.3.3.1 Concrete

Concrete design compressive strength will be as follows:

a. All structures 4000 psi

b. Mud mat and concrete fill 2500 psi

5.3.3.2 Reinforcing Steel

Reinforcing steel will be deformed billet steel, conforming to ASTM Designation A-615, Grade 60.

5.3.3.3 Structural Steel

Structural steel will conform to ASTM designation A-36.

5.3.4 Load and Load Combinations

The following loads will be used in the design and analysis of the G03/G04 Diesel Generator Building.

5.3.4.1 Normal Loads

Normal loads, which are those loads encountered during normal plant operation and shutdown are as follows:

a. D - Dead loads and their related internal moments and forces, including any permanent equipment loads.

b. L - Live loads or their related internal moments and forces, including any movable equipment loads and other loads which vary with intensity and occurrence.

c. T_o - Thermal effects and loads during normal operating or shutdown conditions

d. R_o - Pipe reactions during normal operating or shutdown conditions, based on the most critical transient or steady state condition.

5.3.4.2 Severe Environmental Loads

Severe environmental loads include the following:

a. E - Loads generated by the operating basis earthquake.

b. W - Loads generated by the design wind specified for the plant.

5.3.4.3 Extreme Environmental Loads

Extreme environmental loads include the following:

a. E' - Loads generated by the safe shutdown earthquake.

b. W_t - Loads generated by the design tornado specified for the plant. Tornado loads include loads due to the tornado wind pressure, tornado-created differential pressure, and to tornado-generated missiles.

5.3.4.4 Load Combinations For Safety Related Structures

5.3.4.4.1 Safety Related Concrete Structures

Load combinations for safety related concrete structures using the ultimate strength design method, will be in accordance with the following:

a. Load combinations for normal/service loads conditions:

(1) $1.4\ D + 1.7\ L$
(2) $1.4\ D + 1.7\ L + 1.87\ E$
(3) $1.4\ D + 1.7\ L + 1.7\ W$

Where thermal stresses due to T_o and R_o are present, the following combinations will also be considered:

(4) $(0.75)\ (1.4\ D + 1.7\ L + 1.7\ T_o + 1.7\ R_o)$
(5) $(0.75)\ (1.4\ D + 1.7\ L + 1.87\ E + 1.7\ T_o + 1.7\ R_o)$
(6) $(0.75)\ (1.4\ D + 1.7\ L + 1.7\ W + 1.7\ T_o + 1.7\ R_o)$

In addition, the following combinations will be considered:

(7) $1.2\ D + 1.87\ E$
(8) $1.2\ D + 1.7\ W$

b. For factored load conditions which represent extreme environmental, abnormal, abnormal/severe environmental, and abnormal/extreme environmental conditions, the following load combinations will be considered:

(9) $D + L + T_o + R_o + E'$
(10) $D + L + T_o + R_o + W_t$

Combination (10) and the corresponding structural acceptance criteria of Section 5.3.6 will be satisfied first without the tornado missile load in (10).

Where any load reduces the effects of other loads, the corresponding coefficient for that load will be taken as 0.9 if it can be demonstrated that the load is always present or occurs simultaneously with other loads. Otherwise the coefficient for that load will be taken as a zero.

Where the structural effects of differential settlement, creep, or shrinkage significant, they are be included with the dead load, D, as applicable.

5.3.4.4.2 Safety Related Steel Interior Structures

Load combinations for safety related steel interior structures using elastic working stress methods will be in accordance with the following:

a. Load combinations for normal/service load conditions:

(1) $D + L$
(2) $D + L + E$
(3) $D + L + W$

If thermal stresses due to T_o and R_o are present, the following combinations will also be considered:

(4) $D + L + T_o + R_o$
(5) $D + L + T_o + R_o + E$
(6) $D + L + T_o + R_o + W$

b. For factored load conditions the following load combinations will be considered:

(7) $D + L + T_o + R_o + E'$
(8) $D + L + T_o + R_o + W_t$

In the above factored load combinations, thermal loads can be neglected when it can be shown that they are secondary and self-limiting in nature and where the material is ductile.

Combination (8) and the corresponding structural acceptance criteria of Section 5.3.6 will first be satisfied without the tornado missile load in (8).

Where any load reduces the effects of other loads, the corresponding coefficient for that load will be taken as 0.9, if it can be demonstrated that the load is always present or occurs simultaneously with other loads. Otherwise, the coefficient for that load will be taken as zero.

Where the structural effect of differential settlement may be significant, it shall be included with the dead load, D.

5.3.4.5 Load Combinations For Non-Safety Related Structures.

5.3.4.5.1 Non-Safety Related Concrete Structures

Load combinations for non-safety related concrete structures using the ultimate strength design method will be in accordance with the following:

(1) 1.4 D + 1.7 L
(2) 1.4 D + 1.7 L + 1.87 E
(3) 1.4 D + 1.7 L + 1.7 W

where D, L, and W are as defined in subsections 5.3.4.1 and 5.3.4.2, except snow loads will be considered as a live load, L.

E for non-safety related structures will be the UBC earthquake specified for zone 1.

5.3.4.5.2 Non-Safety Related Steel Structures

Load combinations for non-safety related steel structures using elastic working stress methods will be in accordance with the following:

(1) D + L
(2) D + L + E
(3) D + L + W

where D, L, and W are as defined in subsections 5.3.4.1 and 5.3.4.2, except snow loads will be considered as a live load, L.

E for non-safety related structures will be the UBC earthquake specified for zone 1.

5.3.5 <u>Design and Analysis Procedures</u>

The design and analysis procedures utilized for structures, including assumptions on boundary conditions and expected behavior under loads, will be in accordance with the following:

a. For concrete structures, the procedures will be in accordance with ACI 318, "Building Code Requirements for Reinforced Concrete".

b. For steel structures, the procedures will be in accordance with the AISC, "Manual of Steel Construction".

5.3.6 Structural Acceptance Criteria

5.3.6.1 Safety Related Structures

For each of the loading combinations delineated in subsection 5.3.4.4 of this criteria, the following defines the allowable limits which constitute the structural acceptance criteria:

a. Concrete Load Combinations

Concrete Load Combinations	Limit
All Load Combinations	U

Where U is the section strength required to resist design loads based on the strength design methods described in ACI 318 Code.

b. Steel Load Combinations

Steel Load Combinations	Limit
Load Combinations (1), (2), (3)	S
Load Combinations (4), (5), (6)	S
Load Combinations (7), (8)	1.5S

Where S is the required section strength based on elastic design methods and the allowable stresses defined in Part 1 of the AISC "Specification For The Design, Fabrication, and Erection of Structural Steel For Buildings" except that the 1/3 increase in allowable stresses for steel due to seismic or wind loadings is not permitted.

5.3.6.2 Non-Safety Related Structures

For each of the loading combinations delineated in subsection 5.3.4.5 of this criteria, the following defines the allowable limits which constitute the structural acceptance criteria:

a. Concrete Load Combinations

Concrete Load Combinations	Limit
All Load Combinations	U

Where U is the section strength required to resist design loads based on the strength design methods described in ACI 318 Code.

b. Steel Load Combinations

Steel Load Combinations	Limit
All Load Combinations	S

Where S is the required section strength based on elastic design methods and the allowable stresses defined in Part 1 of the AISC "Specification For The Design, Fabrication, and Erection of Structural Steel For Buildings".

5.3.7 Structural/Architectural Fire Protection Requirements

5.3.7.1 Fire Area Boundaries

The DGB will be physically separated from the existing plant by being located 158' north of the Unit 2 turbine hall structures and 76' north of the nearest plant structure, the north service building.

Each of G03 and G04 EDGs will be located in separate rooms and separated from each other and other important train and unit specific equipment by reinforced concrete walls, floors and ceilings having a fire rating of at least 3 hours. The fuel oil day tanks for the G03 unit and the fuel oil day tank for the G04 units will be located in separate rooms having a fire rating of at least 3 hours. In addition, the G04 day tank room will also contain the G03 and G04 fuel oil transfer pumps. The fuel oil transfer pumps for the existing G01 and G02 EDGs will be located in a separate room with a 3-hour fire rating. Separate unit specific, 3 hour fire rated rooms constructed from reinforced concrete will also be provided for the G03 ventilation fans, G04 ventilation fans, G03 radiator and related equipment, G04 radiator and related equipment, G03 exhaust and silencer, G04 exhaust and silencer, 1A06, and 2A06.

Each redundant electrical train will be separated by 3-hour fire rated barriers. Fuel oil supply for each train will also be separated by 3-hour fire rated barriers.

Structural steel forming a part of or supporting a fire barrier wall or slab will be coated with fire proofing material to provide a fire rating equal or greater than the rating of the fire barrier.

Fire doors and door hardware for fire walls will have a minimum fire rating of 3-hours. Fire dampers in ventilation ducts are fire rated for 3-hours.

5.3.7.2 Fire Barrier Penetrations

Cable and cable tray penetrations as well as piping and ventilation duct penetrations through fire area boundaries, will be sealed with a penetration seal having a 3-hour fire rating. In addition, all other penetrations through the room boundaries that are fire area boundaries are sealed with 3-hour penetration seals Adequacy of these seal designs will be demonstrated by fire tests conducted in accordance with ASTM E-119.

5.3.8 Building Exterior Openings

Building exterior openings that serve as inlets or outlets for HVAC systems will be protected from tornado generated missiles with reinforced concrete or structural steel chevrons. In addition, these openings will be provided with screens to preclude entry of birds, leaves and other debris.

All access doors on the grade level except exit only doors will be secured by access-controlled security devices. Roof access doors on the second floor will be locked from the outside. All exterior doors will be equipped with door position monitoring devices. Exterior door openings will be protected from tornado generated missiles by reinforced concrete walls and slabs.

5.4 BUILDING ELECTRICAL DESIGN

5.4.1 Lighting

5.4.1.1 System Functions

Lighting for the DGB will be provided by the normal lighting system and the emergency lighting system. A description of the function of these systems follow.

5.4.1.1.1 Normal Lighting System Function

This system will provide general and local illumination for operating and maintenance activities.

5.4.1.1.2 Emergency Lighting System Function

This lighting will provide protection for personnel and allow continued safe plant operation in the event of normal lighting failure. It will consist of fixed self-contained battery pack lighting.

Fixed self-contained lighting with individual 8-hour minimum battery power supplies will be provided in areas that must be manned for safe shutdown (in the event of a fire) and in access and egress routes to these areas.

5.4.1.2 System Design

5.4.1.2.1 General System

The type of fixture and foot candle requirements for the various areas of the DGB will be as required by NFPA 70 and in accordance with the guidelines of the Illuminating Engineering Society (IES) Handbook 1984 reference volume and 1987 application volume.

Conduit for the lighting systems will be run embedded and exposed, and will be grounded (PVC conduit will not be grounded).

All lighting fixtures are to be pendant or surface mounted.

Lighting wire insulation will be type THW/THWN, rated at 90°C.

Separate neutrals will be run with each phase of branch circuits. Full-size neutrals will be used for feeder and branch circuits.

The combined voltage drop of both feeder and branch circuits will not exceed 5%.

5.4.1.2.2 Normal Lighting System

Normal Lighting fixtures will be 120 V fluorescent.

Fixtures will be switched from the lighting panelboard, using molded case circuit breakers rated for switching duty.

The normal lighting panels will be 208/120 V, 3-phase, 4-wire fed from the non-safety related (non-Class 1E) portion of the EDG Motor Control Centers (MCC) in the DGB. Approximately half of the normal lighting in a given room will be powered from the Unit associated panelboard with the remaining fixtures powered from the opposite Unit. This will provide minimum acceptable lighting levels in all areas in the event of loss of power to either panel.

5.4.1.2.3 Emergency Lighting and Exit Signs System

Emergency lighting will be incandescent and provided with self-contained 8-hour rated battery packs. The 120 v ac power to the units will come from the Unit associated panelboard for which the lighting unit covers. Therefore, the emergency lighting units will be monitoring the Unit associated power busses. Common areas are covered by either one or both units.

Exit lights will be incandescent and provided with self-contained 8-hour rated battery packs.

5.4.2 Power Distribution and Loads

5.4.2.1 System Function

The safeguards electrical distribution system will provide electrical energy to all building loads, both Class 1E and non-Class 1E. A 480 V MCC will be provided for each EDG. The two MCCs will utilize a split bus to segregate Class 1E and non-Class 1E loads. A breaker connecting the two bus sections will open on receipt of a safety injection signal and/or undervoltage on the Class 1E 4160 V switchgear, isolating the non-Class 1E loads.

5.4.2.2 System Design

Electrical power distribution will be accomplished by means of two 480 V AC, 3-phase, 3-wire, ungrounded delta systems (one for each EDG). Transformations from this service to 120 and 208 V AC will be provided by transformers mounted in the EDG MCCs.

Electrical supply equipment will have the capacity to supply the power requirements of all identified and anticipated loads plus a minimum of 15% spare capacity.

All power distribution components will be rated for 600 V AC and be suitable for application in a typical industrial environment. NEMA Class 1 enclosures will be provided as a minimum.

Wiring to non-Class 1E loads will be physically separated from wiring to Class 1E loads.

Non-Class 1E circuits for communication, fire detection and security systems will be routed in totally enclosed dedicated raceways; therefore, cable for these systems need not comply with IEEE 383. The remaining non-Class 1E circuits will use fire resistant cable which have passed the fire tests contained in IEEE 383.

Overcurrent protection will be provided by means of molded-case thermal-magnetic circuit breakers. Proper coordination of all overcurrent protection devices will be provided down to, and including, the local panelboard(s).

Convenience receptacles will be flush mounted 120 V AC, duplex with no covers. Alternate receptacles are powered from Unit 1 and Unit 2 diesel backed power.

Power receptacles (minimum of 5 powered by each EDG MCC) will be surface mounted, 480 V, 3-phase, 3 wire with ground.

5.4.3 Grounding and Lightning Protection

Load equipment, power supplies, raceways (except for PVC), and enclosures will be electrically interconnected and form a continuous path to Station ground.

Lightning protection will be provided for the DGB.

5.4.4 Communications

5.4.4.1 System Function

This system will provide dependable, convenient and rapid communication between all plant areas vital to the operation and maintenance of the plant and the protection of personnel. The existing Gaitronics Page/Public Address System will be extended to the new DGB.

5.4.4.2 System Design

The communications system will consist of:

a. Telephone system installed by an independent telephone contractor.

b. Page/Public Address System (Gaitronics).

c. The capability for future expansion of the plant radio system into the DGB will be provided.

5.4.5 Fire Detection/Alarm System

5.4.5.1 System Function

This system will detect a fire in the DGB and alarm locally and in the Main Control Room. Fire detection devices appropriate for the type of fire anticipated in each area will provide early warning of fire conditions. Water flow switches will identify sprinkler system operation. All initiating devices will alarm on the local fire detection and graphic annunciator panels located under the stairway outside the mechanical room (outside the DGB on the west side).

The local fire alarm panel will connect to the site fire alarm system. The smoke, heat and flow detectors will be combined into six zones for transmission of alarm and graphic signals to the main control room and site graphic annunciator panel.

5.4.5.2 System Design

The local fire alarm system will be designed according to the applicable sections of NFPA 72. It will be a non-coded, hard-wired, 24 VDC automatic fire detection and alarm system with Style B (Class B) electrical supervision. Alarm indicating devices will be Style Y electrically supervised. The system will be UL listed for fire protective signaling service.

The safeguards electrical distribution system will provide normal AC power to the local panel (a non-Class 1E load). A battery and battery charger in the local panel provides backup power for at least 24 hours after loss of normal AC power.

A local graphic annunciator panel with LED lights will show the status of all initiating devices (fire detection and water flow) and trouble conditions on the local system.

The local fire alarm system will produce a distinct and unique audible fire alarm in the DGB and audible and visual alarms and annunciation in the Main control room. The site graphic annunciator in the main control room will display DGB fire and trouble alarms. This graphic annunciator will identify the fire detection zones and sprinkler systems in alarm and show the general location of the fire in the building. The plant fire brigade will respond to the local annunciator panel at the DGB to identify the specific device in alarm.

Rate compensation thermal detectors will be used in the diesel generator rooms. Remaining areas of the building will use photoelectric smoke detectors to provide early warning of fire conditions. Fire detectors will be UL listed and located according to the applicable sections of NFPA 72E.

5.4.6 Security

Security for the DGB will be provided by the following systems.

5.4.6.1 Building Security System

The building security system will provide protection from unauthorized access into the DGB building. The security system will have the capability to monitor, alarm and store data pertinent to personnel access/egress into the building. This system will function during normal plant operation and during loss of off-site power, but is not required to operate following a design basis accident or a safe shutdown earthquake.

The building security system will consist of card readers, electric door strikes, position switches, security lighting and cables to interface with the existing plant security system. Normal entrance/exit doors will be monitored and controlled by the plant security computer. Operation of emergency exit doors will be monitored and alarmed.

5.4.6.2 Security Lighting System

Exterior yard and perimeter lighting will be provided similar to the existing lighting design. The external lighting system will satisfy the plant security illumination requirements of the WE Security Plan.

5.4.6.3 Security Fence System

A fence will be provided around the north, east and west sides of the yard that will include the DGB, the 15,000 gallon fuel oil fill tank. The south side of the yard will open up into the existing protected area security fence adjacent to the north service building (the existing security fence and intrusion detection system will be removed on the south side of the yard).

The perimeter will be monitored by an intrusion detection system which will be compatible with the existing plant security and computer systems.

5.4.6.4 Camera System

Cameras and camera towers will be provided similar to the existing cameras and will be compatible with the existing plant security and computer system.

5.4.6.5 Interim Security During Construction

During construction some work will be performed adjacent to the security fence. Additional security measures (e.g., additional security guards) will be implemented as required.

5.4.7 Radiation Monitoring

Radiation monitors are not being installed in the DGB since the entire area is classified as a mild environment.

5.5 BUILDING/MECHANICAL/HVAC DESIGN

5.5.1 Fire Protection System Function

5.5.1.1 System Function

The fire protection system, in conjunction with the fire detection system (reference Section 5.4.5) will provide the means to allow the site to fight a fire in the DGB, limit the fire to one area or zone and, minimize the loss of property due to fire.

5.5.1.2 System Design

Automatic and manual fire protection capability will be provided for the DGB. Automatic wet-pipe sprinkler systems will be installed in some areas to provide protection from major fire hazards in the building. Other areas will be protected with manual hose stations and hand-held extinguishers. Thermal fire detection will be installed in the diesel engine rooms. Photo-electric smoke detection will be provided throughout most of the remaining building areas to provide early warning in the event of fire conditions. Fire detection and water flow alarms will alarm locally and in the Control Room. Fire hydrants will be installed around the outside of the building for exterior fire fighting capability.

The DGB will be provided with fire protection in each area of the facility as follows:

Building/Area	Fire Protection System
G03 and G04 Engine Rooms	Wet Sprinklers (.30 gpm ft^2) & hose coverage
Fuel Oil Transfer Pump and Day Tank Room	Wet Sprinklers (.30 gpm ft^2) & hose coverage
C03 Fuel Oil Day Tank Room	Wet Sprinklers (.30 gpm ft^2) & hose coverage
Mechanical Room	Wet Sprinklers (.30 gpm ft^2) & hose coverage
Switchgear Rooms	Hose coverage
Equipment Rooms (Second Story)	Hose coverage
Fan Rooms (Second Story)	Hose coverage

5.5.1.3 Fire Protection Water Supply System

The automatic and manual fire protection system piping will be supplied from a new, 10 inch diameter, underground fire main looped around the DGB. The new fire main will be connected to the existing, 10 inch diameter, dedicated, site fire protection distribution piping network. Two redundant, 8" diameter feed mains will supply the building fire suppression systems from the new distribution loop. Two fire hydrants will be supplied from separate lateral fire mains for exterior protection.

The new fire main distribution system loop and redundant building feed mains will be provided with indicating type isolation valves to allow as much flexibility for service as possible, without impairing building fire suppression systems.

5.5.1.4 Wet Pipe Sprinkler Systems

The north and south sides of the DGB will be provided with independent sprinkler systems controlled by separate, indicating type, isolation valves. This is intended to provide the maximum sprinkler coverage for the building in the event that one system is taken out of service for maintenance or repair.

Each sprinkler will be a hydraulically calculated, wet-pipe sprinkler system. These will be provided with separate water flow switches that will alarm locally and in the Control Room when there is water flow in the system.

5.1.5.5 Manual Hose Stations

1-1/2 inch, manual hose stations, with 100 feet of fire hose and adjustable, no-shock, fog nozzles, will be provided to protect all areas on each elevation.

Sprinkler systems and hose stations will be provided with separate indicating type isolation valves that will allow each to be isolated independently.

5.5.1.6 Portable Fire Extinguishers

Portable fire extinguishers will be provided to protect all areas of the DGB. The type and capacity of each extinguisher will be selected on the basis of the specific hazard in each room.

5.5.2 <u>Plumbing/Drains</u>

5.5.2.1 System Function

The DGB will be provided with floor drains to route all normal drains to the site drainage system and potentially oily/contaminated waste spills to sumps adjacent to each Diesel Room. The sumps will be sized to contain the maximum quantity of oily waste spills corresponding to the capacity of the single largest system and will be sized to accommodate a simultaneous discharge of fire water including 500 gpm from a fire hose for 10 minutes per NFPA-850 and 30 minutes of sprinkler water flow. Sump pumps will be used for transfer of oil spills or water collected in the sumps.

5.5.2.2 System Design

Drain piping will be designed to meet the American Water Works Association (AWWA) and other appropriate building codes and industrial standards, consistent with existing plant systems. Roof drain piping and drain piping from the second floor of the diesel generator areas not subject to oily or chemical discharges will discharge to the site drainage system. All other general area drain piping will run to the DGB sumps adjacent to each diesel room.

The building sumps are located adjacent to the Diesel Rooms. All drain piping from areas associated with G03 are routed to the sump adjacent to the G03 diesel room. Conversely, the same is done for the G04 areas. This avoids communication between the G03 and G04 diesel rooms.

A sump pump will be used to transfer fluids from the sumps for controlled disposal. The sumps will be provided with indicators to monitor the liquid level in the sump.

Fire protection water released because of system actuation or use of a fire hose will be drained to the building sumps.

5.5.3 Heating, Ventilation, and Air Conditioning (HVAC)

5.5.3.1 System Function

The DGB HVAC System will provide heating, air conditioning and ventilation and will provide for removal of solar and component heat loads to maintain the housed components within their qualification and operating limits during all plant conditions. It will also provide sufficient air flow to prevent build-up of fuel oil fumes.

The DGB HVAC System will be comprised of the following subsystems:

a. Diesel Rooms Exhaust Systems for Engine Operation

b. Diesel Rooms Exhaust Systems for Engine Standby

c. Switchgear Rooms and Mechanical Room Heating, Cooling, and Ventilation System for Normal Operation (Offsite Power Available and no SI)

d. G03 and G04 Switchgear Rooms Emergency Exhaust Systems

e. G03 Fuel Oil Day Tank Room Exhaust System

f. G04 Fuel Oil Transfer Pump and Day Tank Room Exhaust System

g. G01/G02 Fuel Oil Transfer Pumps Room Exhaust System

The HVAC system controls will consist of temperature sensor switches and controllers to control air flows and electric heaters in order to maintain required temperatures in the building.

The diesel room exhaust fans (except the fans which operate in standby), the switchgear rooms/mechanical room air handling unit and the switchgear rooms emergency exhaust fans will be operated by temperature sensors which will turn the components on and off.

The exhaust fans in the day tank and fuel oil transfer pumps room plus the diesel room exhaust fans operating in standby will run continuously to maintain fume levels below the minimum allowable levels.

5.5.3.2 System Design

The HVAC system capacities will be based on an outdoor ambient temperature range of 95°F and -15°F. This is beyond the 99% occurrence range from ASHRAE. The HVAC steady state heat load calculations do not take credit for passive heat sinks (concrete walls and floors) and thermal lag. Therefore, the HVAC desig.. conditions are conservative, and brief upper temperature excursions for a few hours will not significantly affect equipment operability.

5.5.3.2.1 Fuel Oil Transfer Pumps and Day Tank Rooms

The fuel oil transfer pumps and day tank rooms each will have an exhaust fan to maintain a minimum continuous air flow of 1 cfm per square foot of floor area in order to prevent possible build-up of a flammable atmosphere during standby conditions. Electric unit heaters are provided to maintain a minimum temperature of 50°F under all normal and emergency conditions. Because of minimal heat load, fans will not be required to maintain a maximum temperature of 105°F.

5.5.3.2.2 Diesel Rooms

Each diesel room will have a standby exhaust fan which will maintain a minimum continuous air flow of 1 cfm per square foot of floor area in order to prevent possible buildup of a flammable atmosphere and a maximum diesel room temperature of 105°F during EDG standby. Unit heaters will maintain a minimum temperature of 50°F during EDG standby.

Each diesel room will have two thermostatically controlled safety related exhaust fans to maintain the diesel room below 120°F during EDG operation. The fans will be set to come on at staggered temperatures to minimize step load additions to the EDG and to minimize the possibility of large temperature drops in the room if the exhaust fans come on in cold weather conditions.

5.5.3.2.3 Switchgear Rooms and Mechanical Room

During EDG standby conditions, i.e., offsite power available, the temperature will be maintained between 65°F and 85°F in both the G03 and G04 switchgear rooms and the mechanical room by a common air handling unit and associated supply ductwork. This will maintain a reasonable working environment and minimize the introduction of outside air thereby reducing the amount of dirt introduced into the electrical areas.

Should the air handling unit fail or the site experience a loss of offsite power or SI, an emergency exhaust fan will be provided in each switchgear room to maintain the room temperature below 105°F.

The emergency exhaust fans will be thermostatically controlled to come on at 90°F. They will receive supply air from openings into the second floor radiator rooms.

5.5.3.2.4 Second Floor Areas

The second floor areas will consist of the Fan Rooms which house the diesel room, day tank room and transfer pump room exhaust fans and the equipment rooms which house the radiator and combustion air intake components. Because of the equipment housed in these areas, no ventilation systems will be required.

5.5.3.2.5 Emergency Exhaust Fan Design

All diesel room and switchgear room safety related exhaust fans (the transfer pumps and day tank rooms do not require safety related ventilation) will be vane axial type, belt driven by TEFC motors. Each switchgear room will have one 100% capacity fan while each diesel room will have a 30% and a 70% capacity fan. This ratio is to protect the diesel room from very cold temperatures should the EDG be running during cold weather.

5.5.3.2.6 HVAC Capacities

Capacities of individual system ventilation fans and all other components will be indicated on design drawings or specifications.

5.5.3.2.7 HVAC Electrical Equipment

All safety related electrical equipment for the DGB HVAC systems will be powered from safeguards electrical distribution system Class 1E buses. Non-safety-related electrically driven HVAC equipment will be powered from the non-Class 1E portion of the safeguards electrical distribution system.

5.5.3.2.8 HVAC Missile Protection

All components of each ventilation system will be protected from tornado generated missiles including the building ventilation intakes and exhausts.

5.5.3.2.9 Fire Protection

Fire dampers with a 3-hour fire rating will be provided in all openings penetrating 3-hour fire rated walls/floors/ceilings. No connection will exist between the HVAC system and the fire alarm system. An HVAC smoke control system will not be provided; however, the exhaust fans are available for this function. Operator action will be required to shutdown the HVAC system or start the exhaust fans for smoke removal when necessary during a fire.

5.5.3.2.10 HVAC Intake and Exhaust Elevation

The intake and exhaust openings for the DGB ventilation system will be located at an elevation higher than the maximum probable flood level.

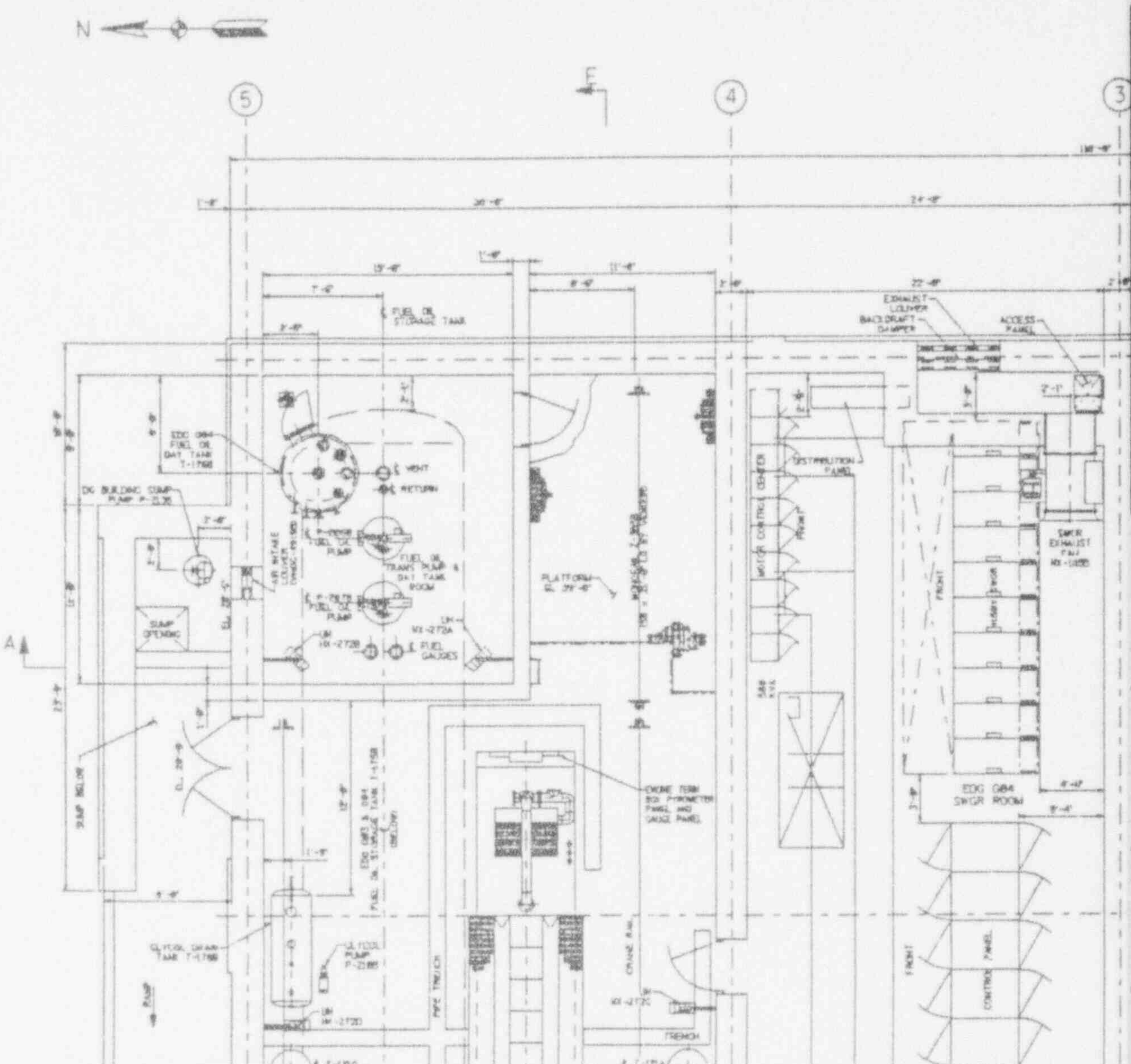
Intake openings will be located at an elevation sufficiently away from and below the EDG exhaust to prevent exhaust gas recirculation intake.

5.5.4 Station Air Requirements

Station air for maintenance needs will be provided for the new DGB, serving non-safety related functions only. The supply of air will be from a connection to the Unit 2 station air system located in the North Service Building. This air system normally operates at 95 psig. Suitable maintenance hose stations will be provided where required in the DGB.

5.5.5 Potable Water

Potable water for an eyewash station will be provided in the mechanical room (non-safety related function). The potable water will be obtained from a tap into the site potable water system inside the north service building.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EDG G84 SWGR ROOM
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MECHANICAL ROOM
WET AIR RECEIVER
WATER DETECTOR
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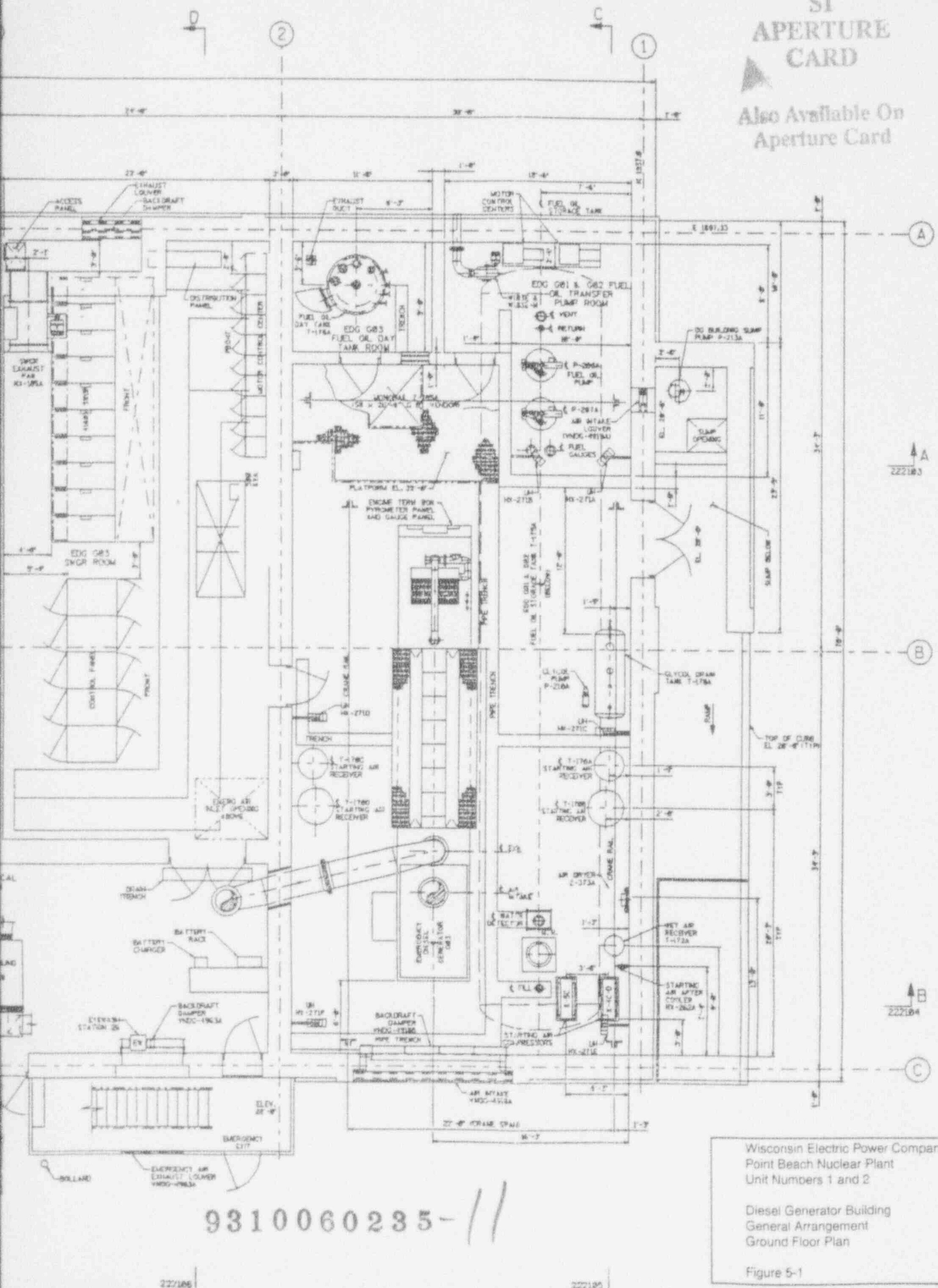
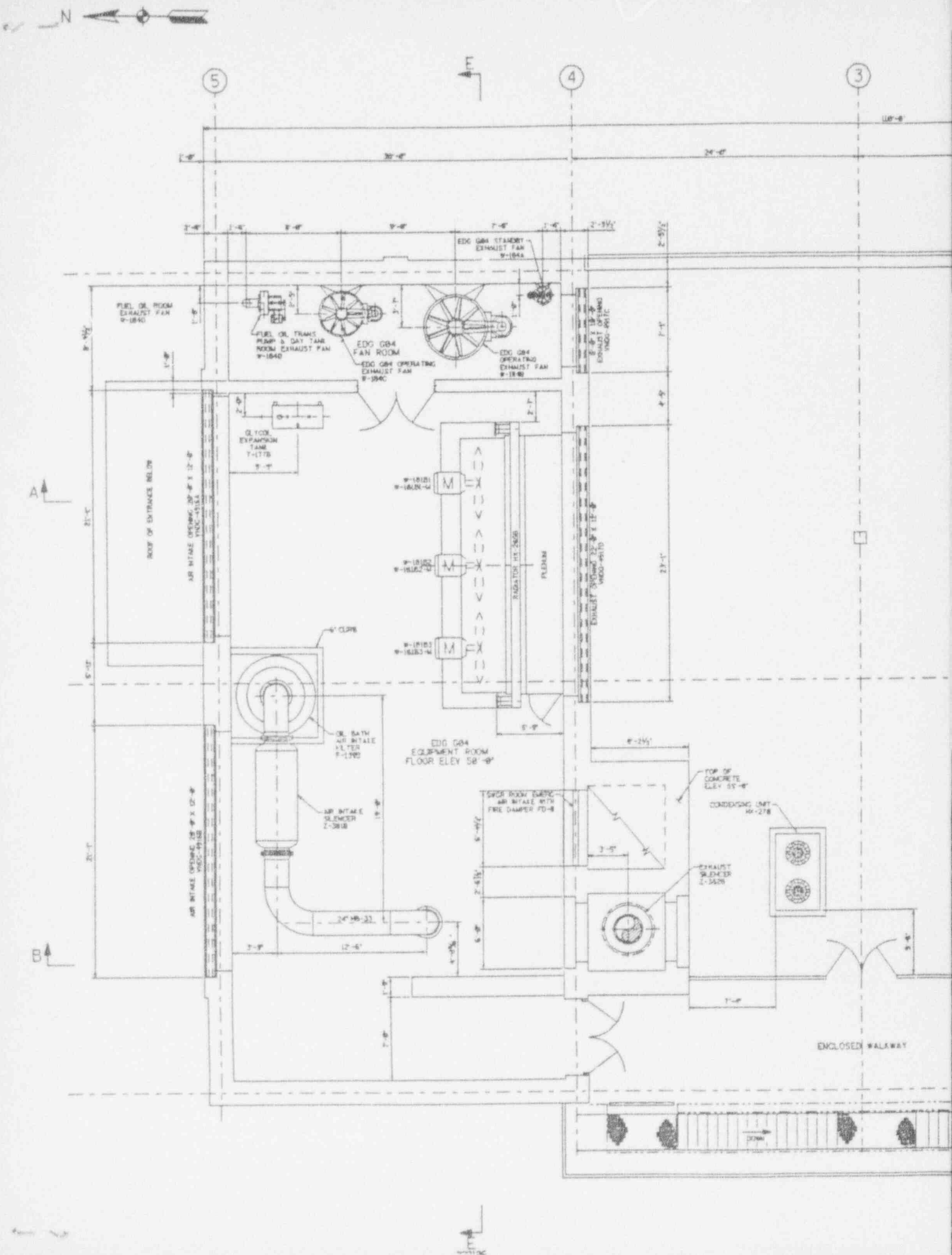


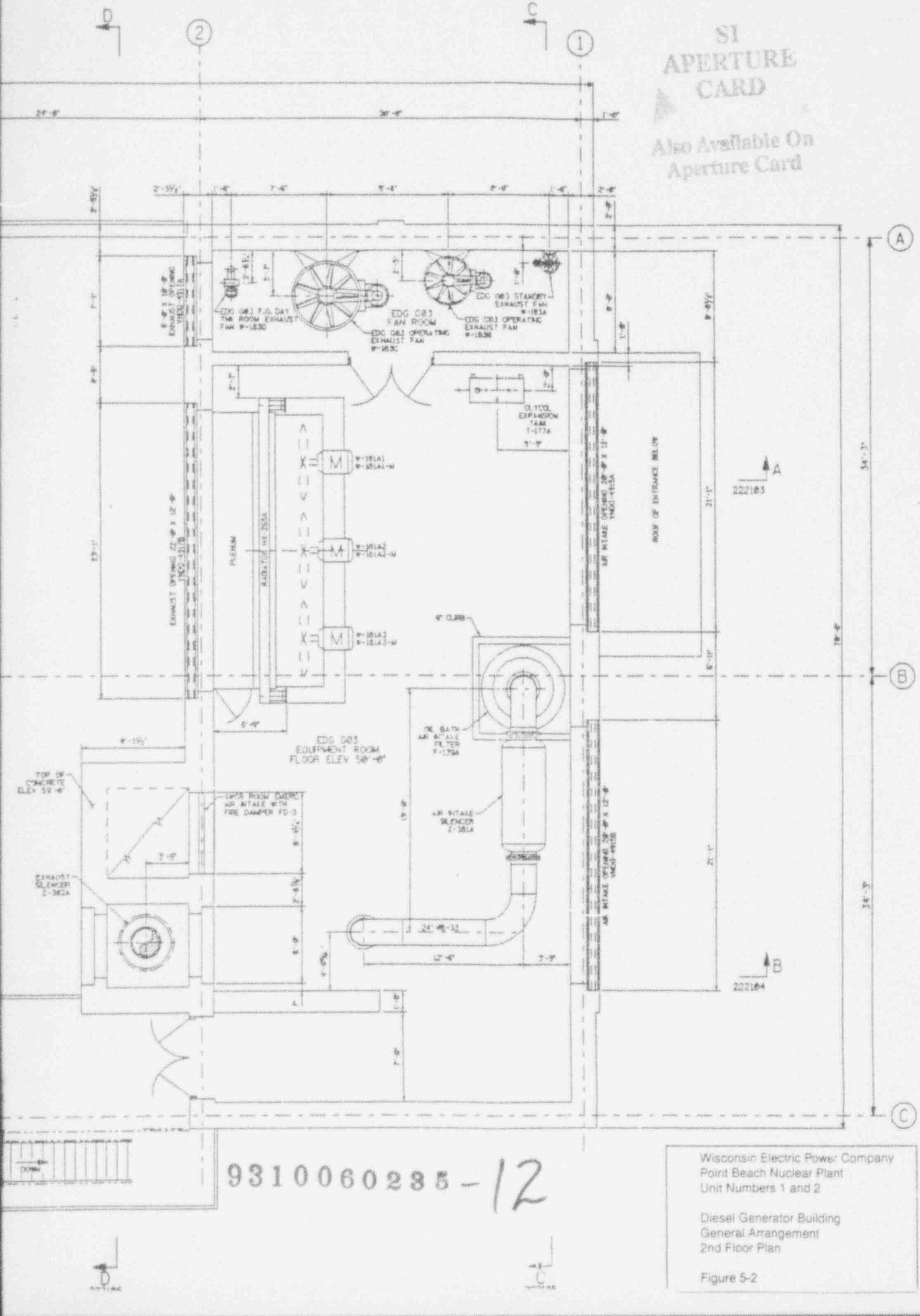
Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
Ground Floor Plan

Figure 5-1

9310060235-11


N
EDG G04 STANDBY EXHAUST FAN
FUEL OIL ROOM EXHAUST FAN
FUEL OIL TRANS PUMP & DAY TANK ROOM EXHAUST FAN
EDG G04 FAN ROOM
EDG G04 OPERATING EXHAUST FAN
EDG G04 OPERATING EXHAUST FAN
GLYCOL EXPANSION TANK
ROOF OF ENTRANCE BELOW
RADIATOR
PLENUM
OIL BATH AIR INTAKE FILTER
EDG G04 EQUIPMENT ROOM FLOOR ELEV 50'-0"
AIR INTAKE SILENCER
TOP OF CONCRETE
CONDENSING UNIT
EXHAUST SILENCER
ENCLOSED WALKWAY

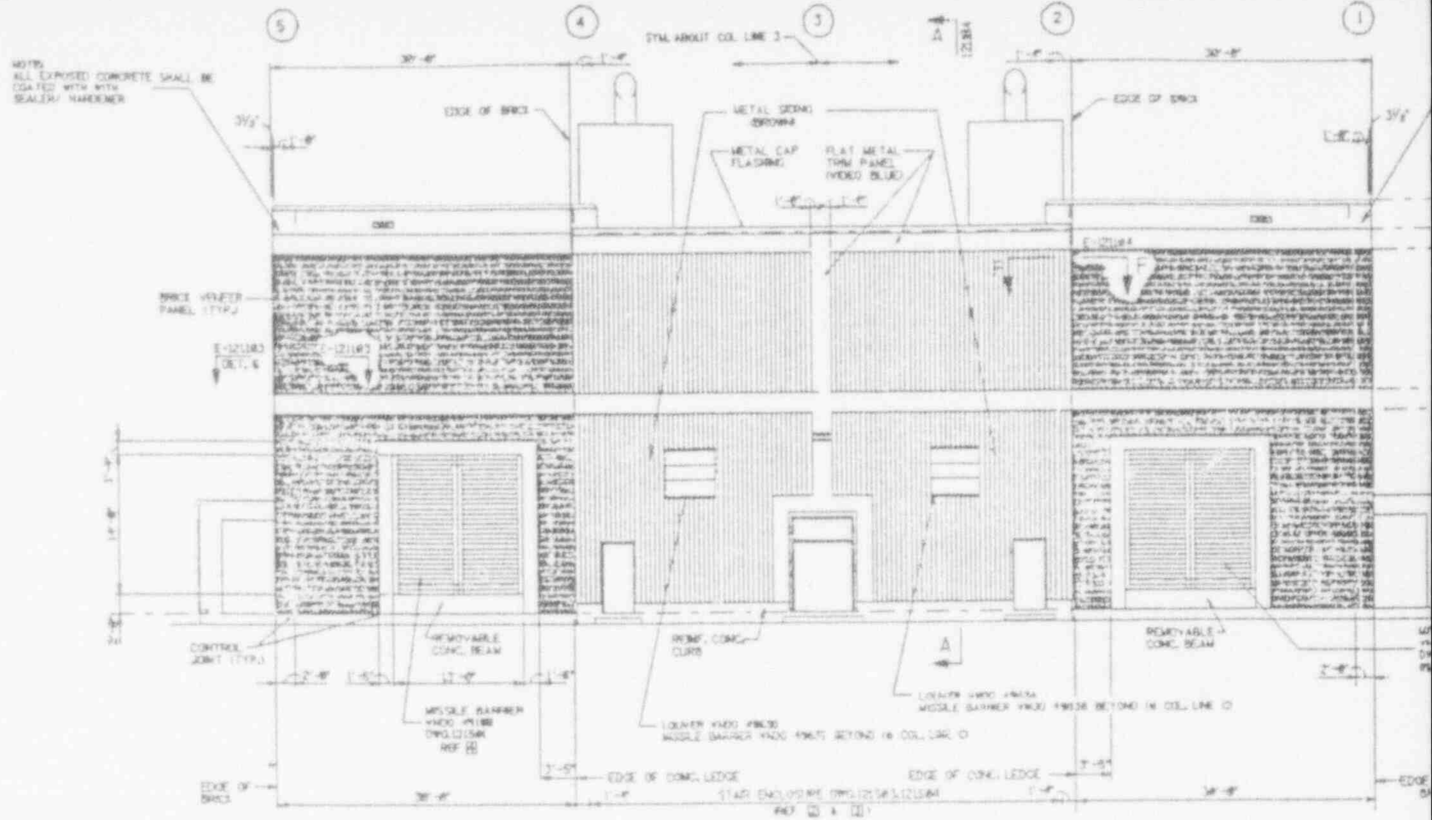


Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
2nd Floor Plan

Figure 5-2

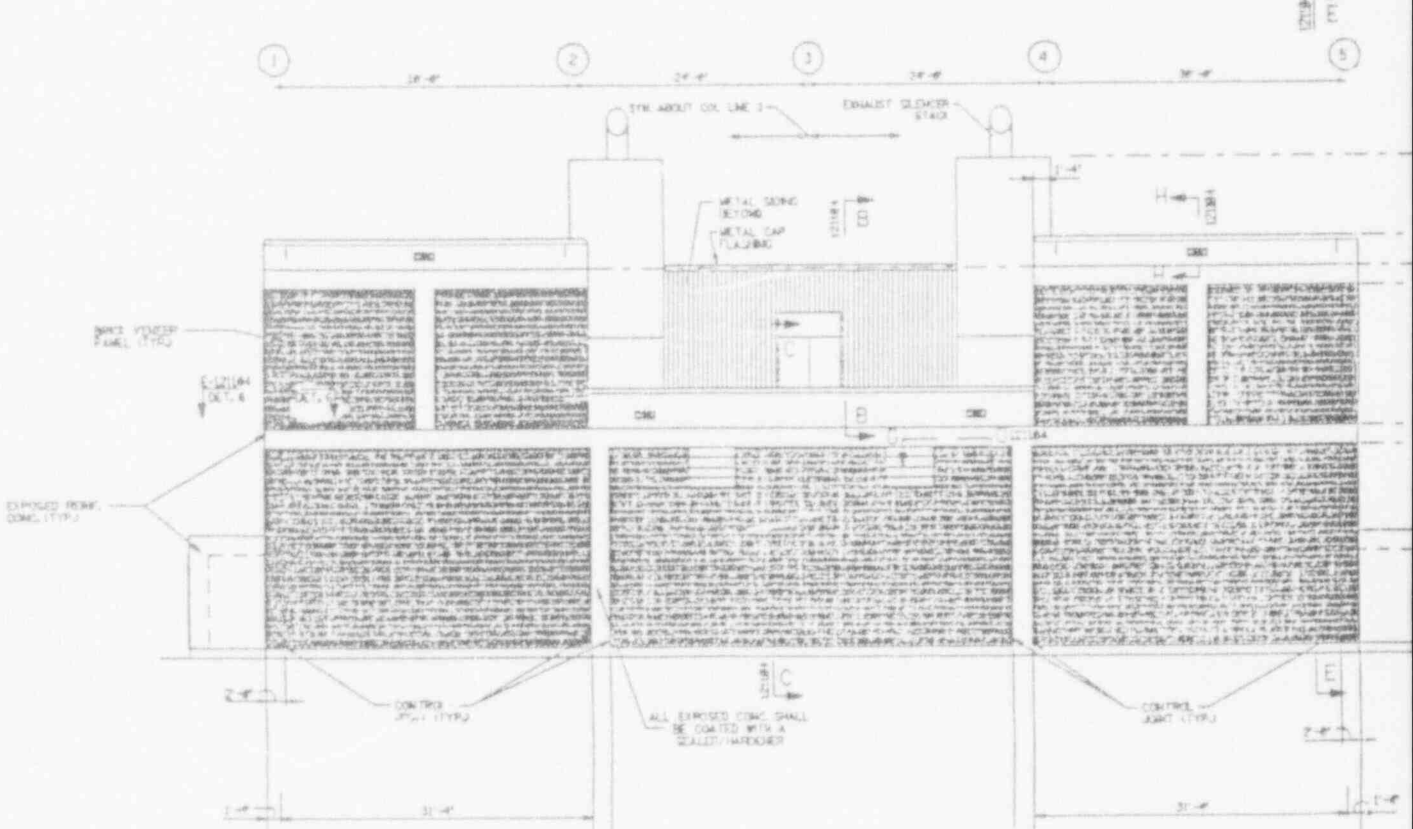
9310060235-12



WEST ELEVATION

NOTE: SEE CONTROL JOINT DETAIL ON DWG. 121184.

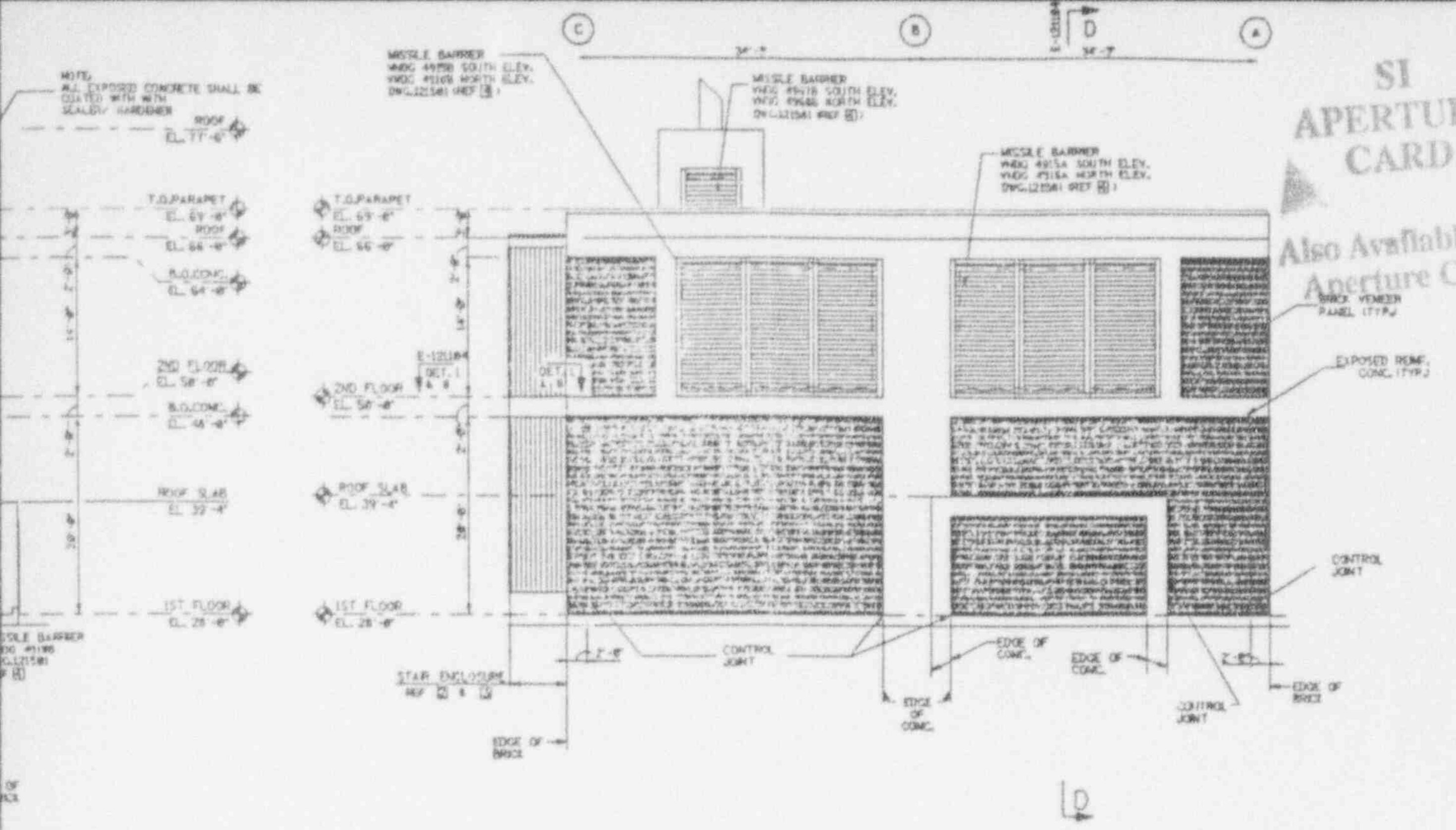
SCALE: 3/32" = 1'-0"



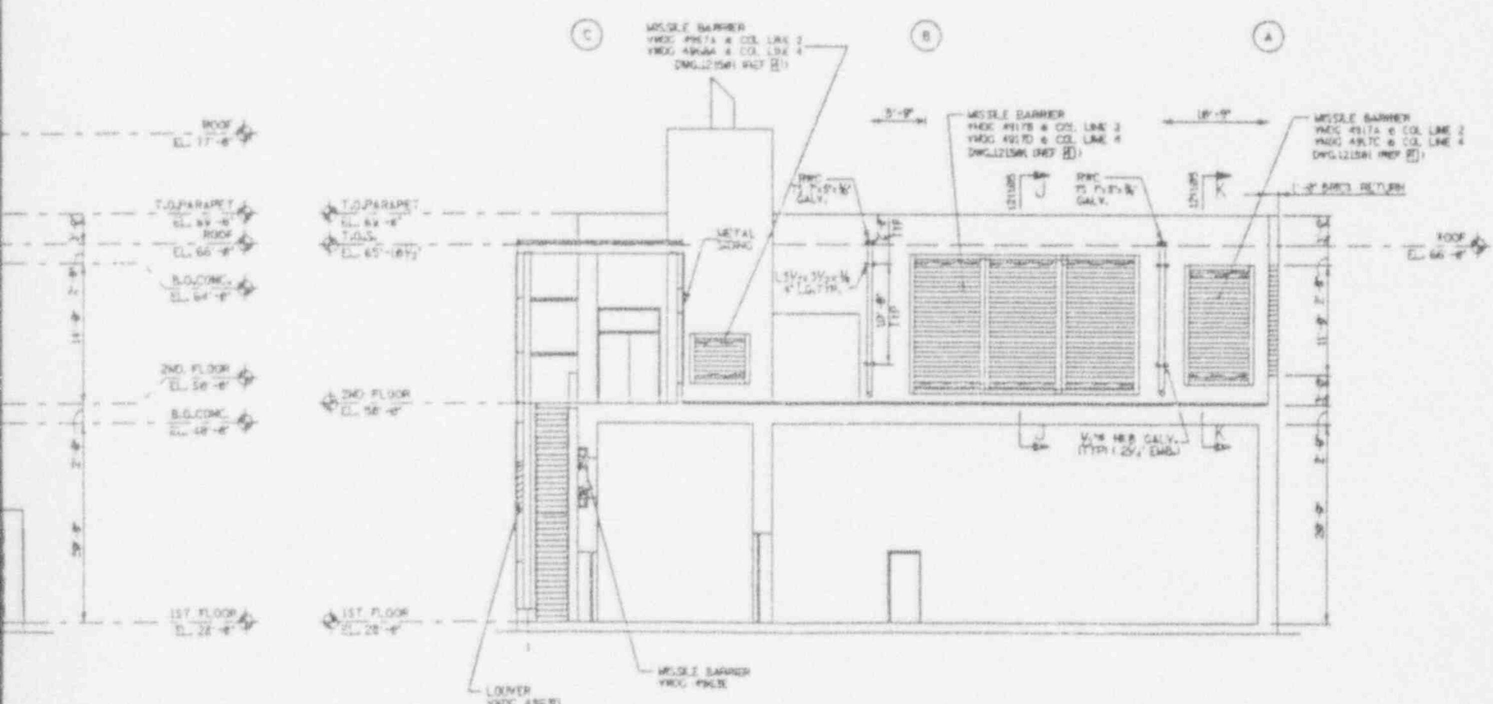
EAST ELEVATION

NOTE: SEE CONTROL JOINT DETAIL ON DWG. 121184.

SCALE: 3/32" = 1'-0"



SOUTH ELEVATION (NORTH ELEVATION OPPOSITE HAND)



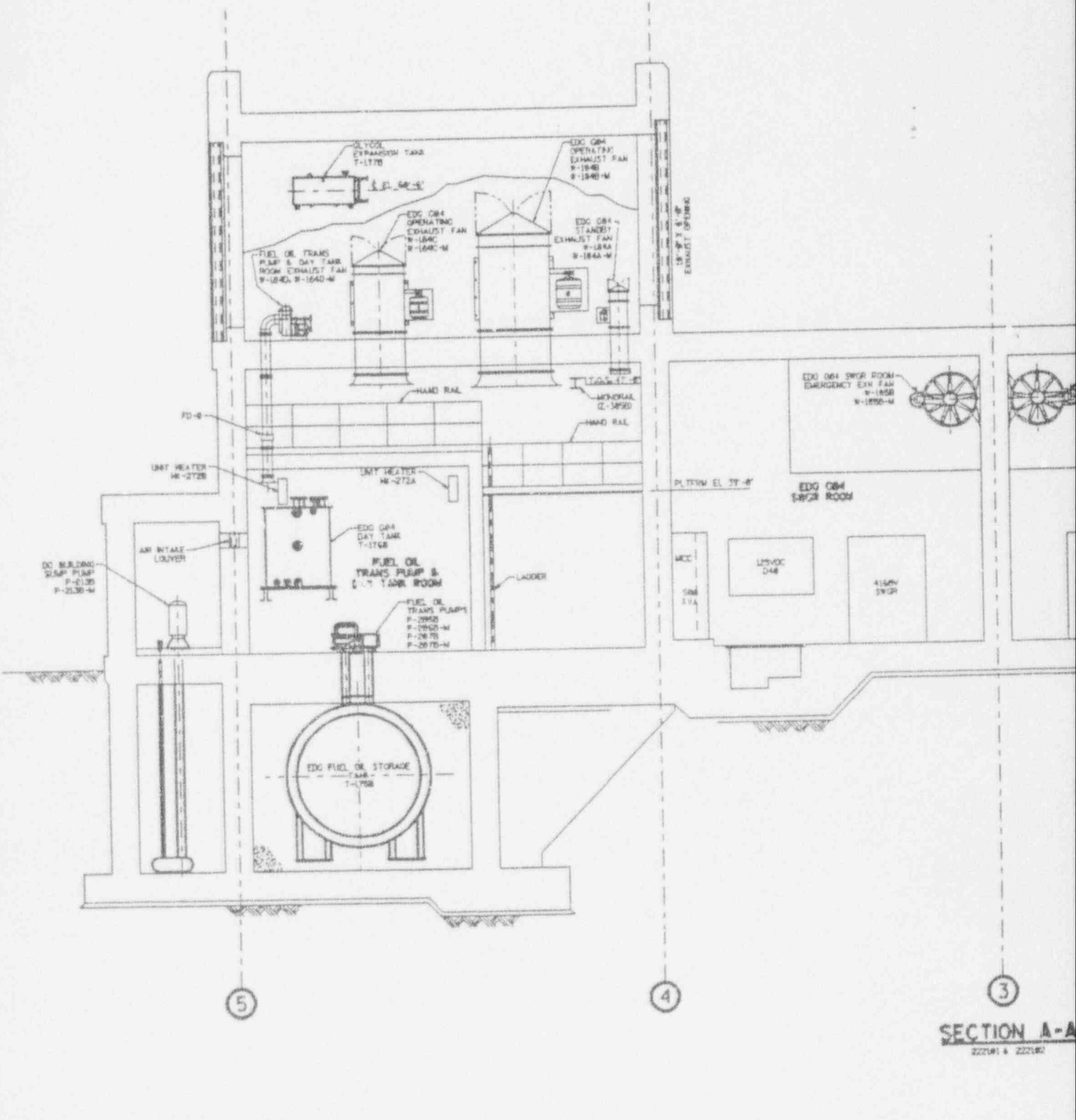
ELEVATION AT COL. LINE 4 (COL. LINE 2 OPPOSITE HAND)

9310060235-13

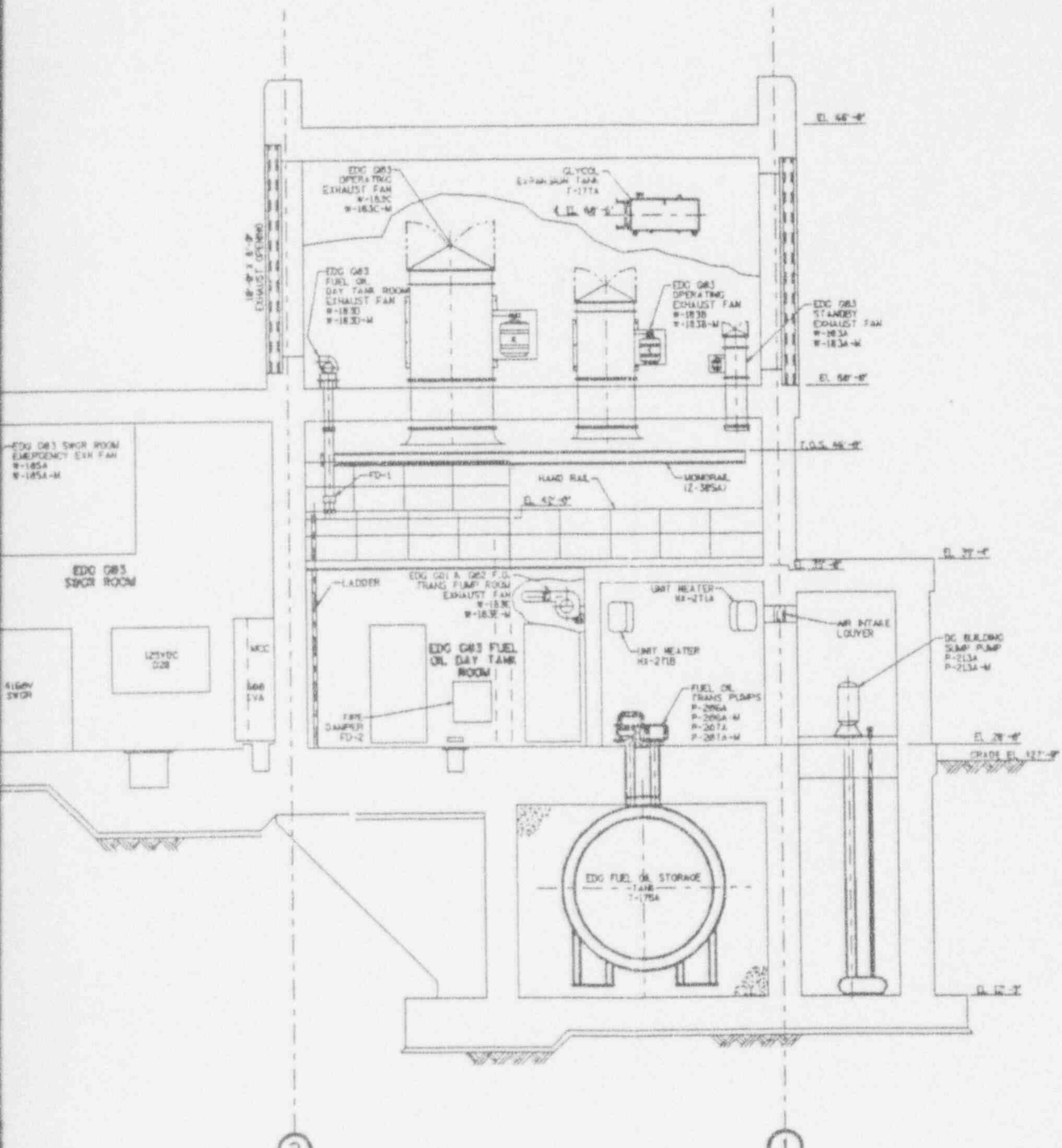
Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building Elevations

Figure 5-3


GLYCOL
EXPANSION TANK
EDG GB4
OPERATING
EXHAUST FAN
EDG GB4
STANDBY
EXHAUST FAN
EXHAUST OPENING
FUEL OIL TRANS
PUMP & DAY TANK
ROOM EXHAUST FAN
HAND RAIL
MONORAIL
HAND RAIL
UNIT HEATER
UNIT HEATER
EDG GB4 SWGR ROOM
EMERGENCY EXH FAN
PLTFRM EL
EDG GB4
SWGR ROOM
EDG GB4
DAY TANK
FUEL OIL
TRANS PUMP &
DAY TANK ROOM
AIR INTAKE
LOUVER
DG BUILDING
SUMP PUMP
LADDER
MCC
125VDC
4160V
SWGR
FUEL OIL
TRANS PUMPS
EDG FUEL OIL STORAGE
TANK
5
4
3

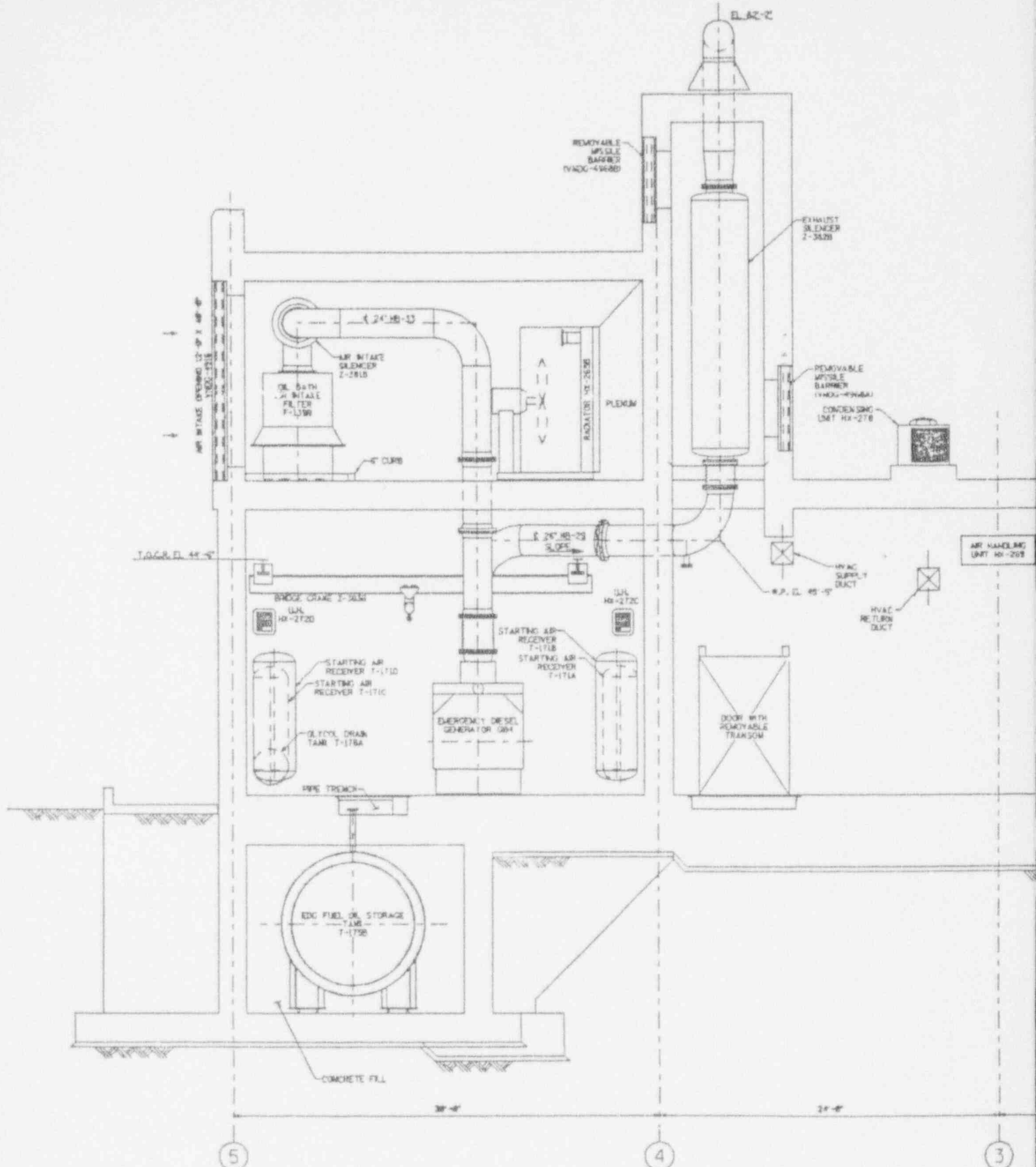
SECTION A-A



Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

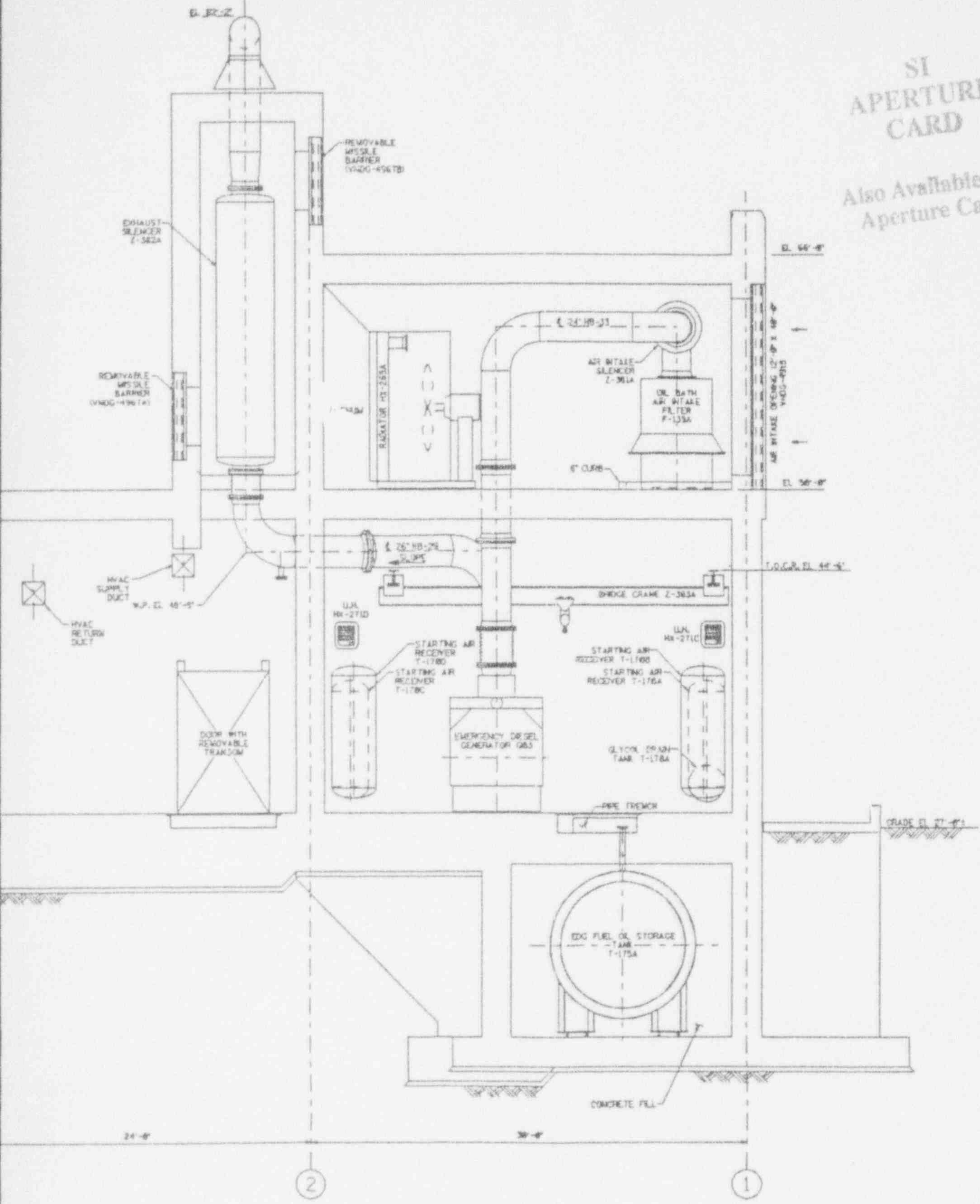
Diesel Generator Building
General Arrangement
Section A-A

Figure 5-4



SECTION

222181 & 22

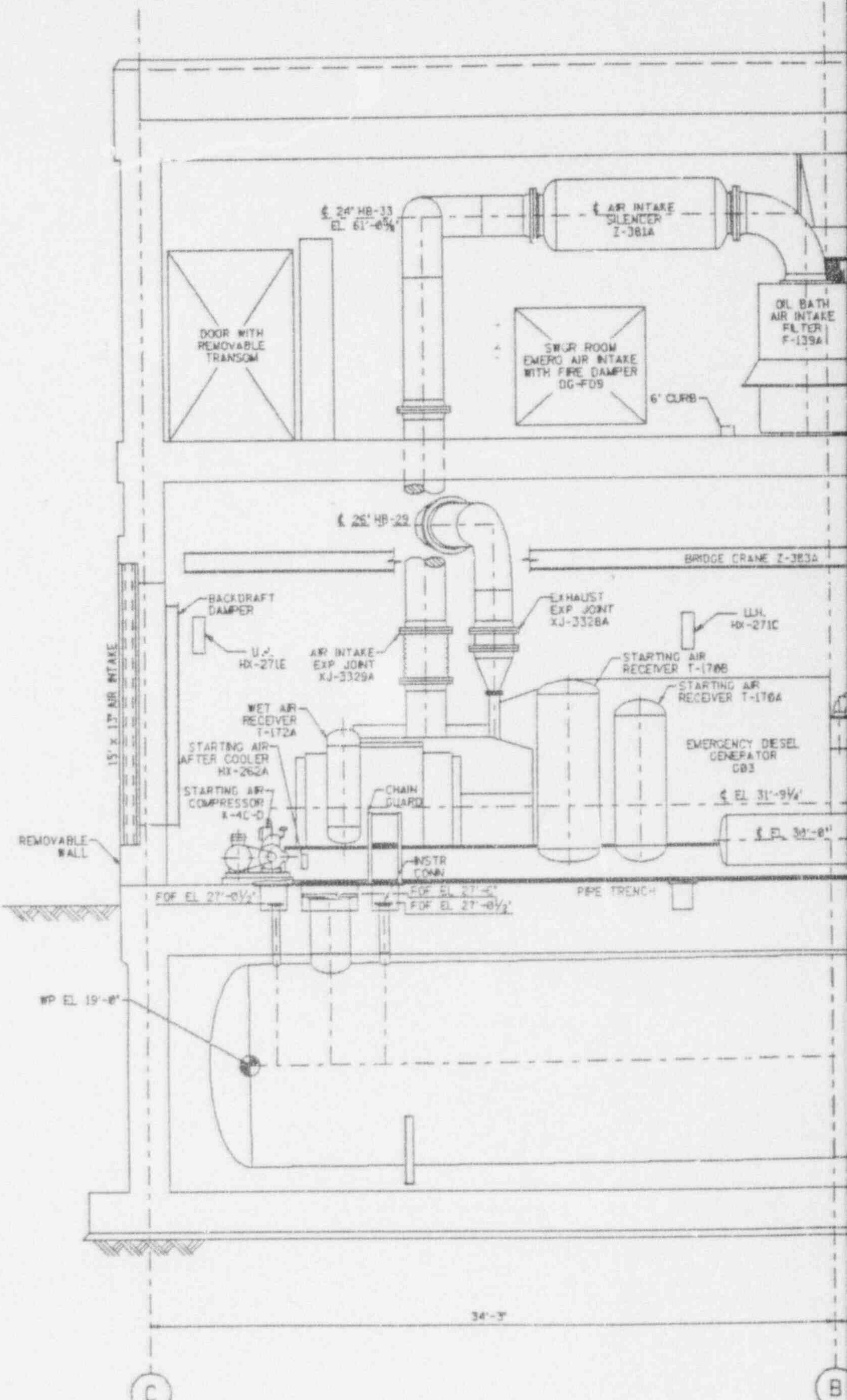


9310060235-15

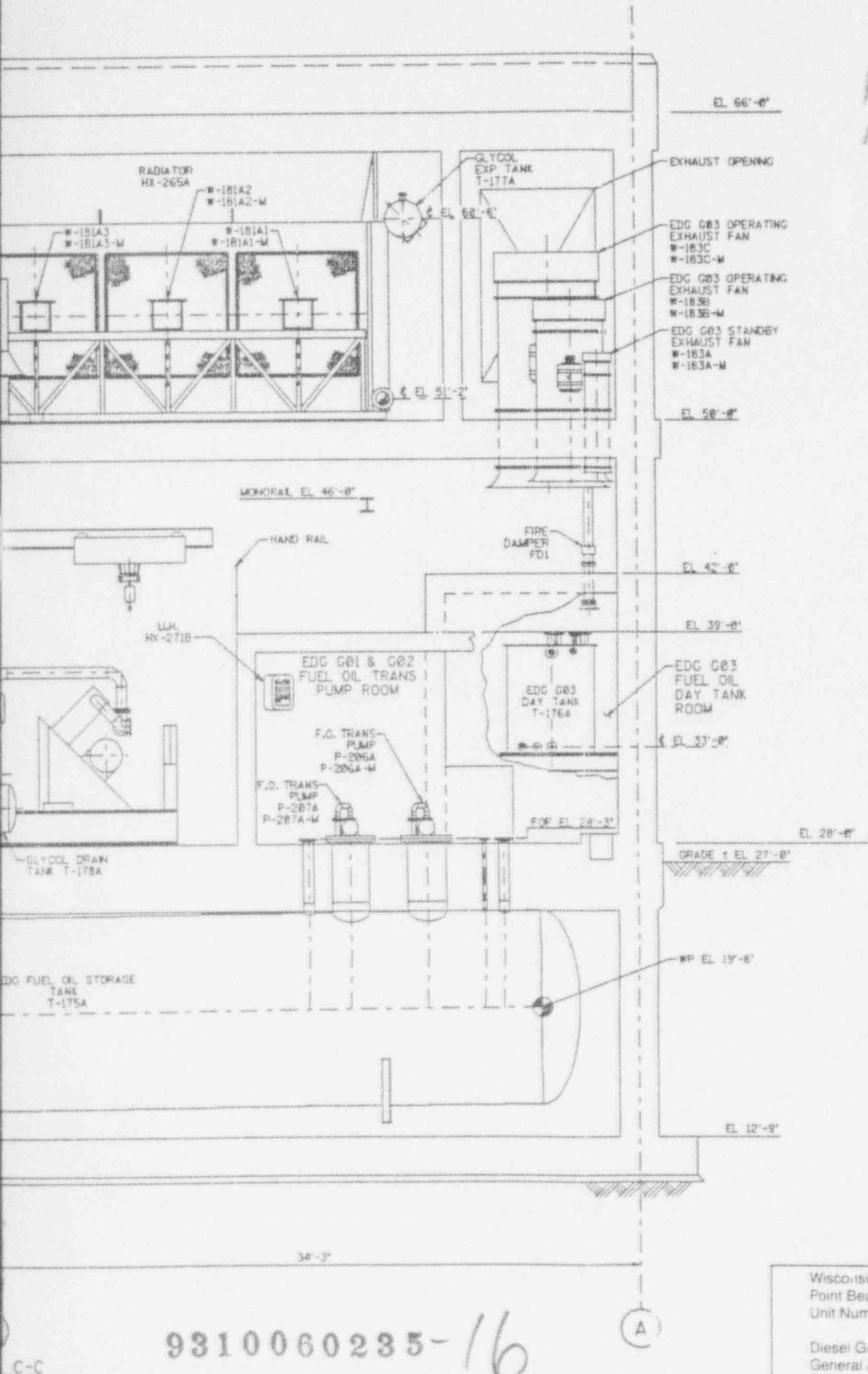
Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
Section B-B

Figure 5-5


℄ 24" HB-33
℄ AIR INTAKE SILENCER Z-381A
OIL BATH AIR INTAKE FILTER F-139A
DOOR WITH REMOVABLE TRANSOM
SWGR ROOM EMERG AIR INTAKE WITH FIRE DAMPER DG-FD9
6" CURB
℄ 26" HB-29
BRIDGE CRANE Z-383A
BACKDRAFT DAMPER
U.H. HX-271E
AIR INTAKE EXP JOINT XJ-3329A
EXHAUST EXP JOINT XJ-3328A
U.H. HX-271C
STARTING AIR RECEIVER T-170B
STARTING AIR RECEIVER T-170A
WET AIR RECEIVER T-172A
STARTING AIR AFTER COOLER HX-262A
STARTING AIR COMPRESSOR K-4C-D
CHAIN GUARD
EMERGENCY DIESEL GENERATOR G03
℄ EL 31'-9¼"
℄ EL 30'-0"
15' x 13' AIR INTAKE
REMOVABLE WALL
INSTR CONN
FOF EL 27'-0½"
FOF EL 27'-6"
FOF EL 27'-0½"
PIPE TRENCH
WP EL 19'-0"
34'-3"
C
B

SECTION

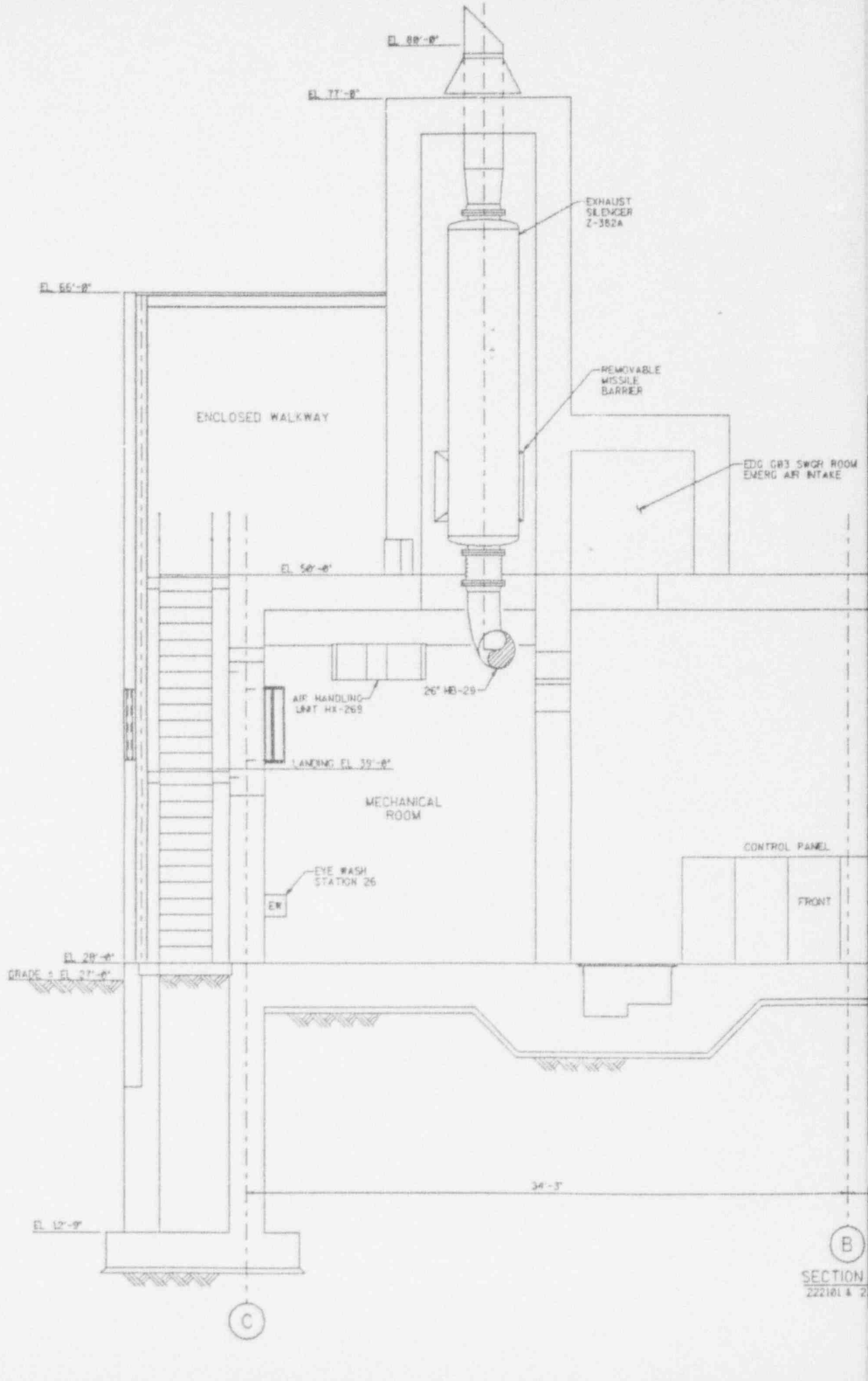


9310060235-16

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
Sections C-C

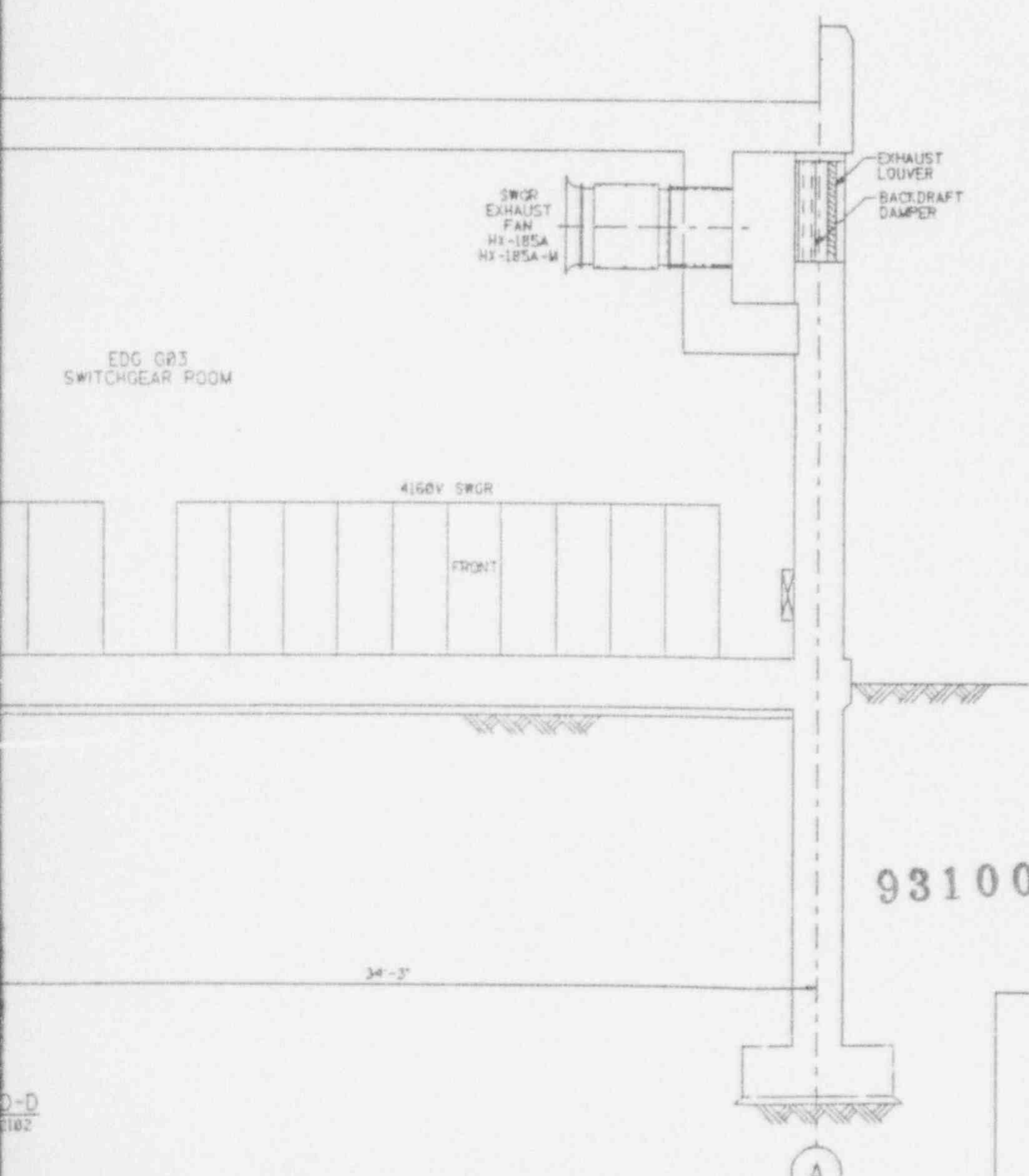
Figure 5-6



EL 88'-0"
EL 77'-0"
EXHAUST SILENCER Z-382A
EL 66'-0"
REMOVABLE MISSILE BARRIER
ENCLOSED WALKWAY
EDG G03 SWGR ROOM EMERG AIR INTAKE
EL 50'-0"
26" HB-29
AIR HANDLING UNIT HX-269
LANDING EL 39'-0"
MECHANICAL ROOM
CONTROL PANEL
FRONT
EYE WASH STATION 26
EW
EL 28'-0"
GRADE ± EL 27'-0"
34'-3"
EL 12'-9"
B
C
SECTION
22210L & 2

SI
APERTURE
CARD

Also Available On
Aperture Card

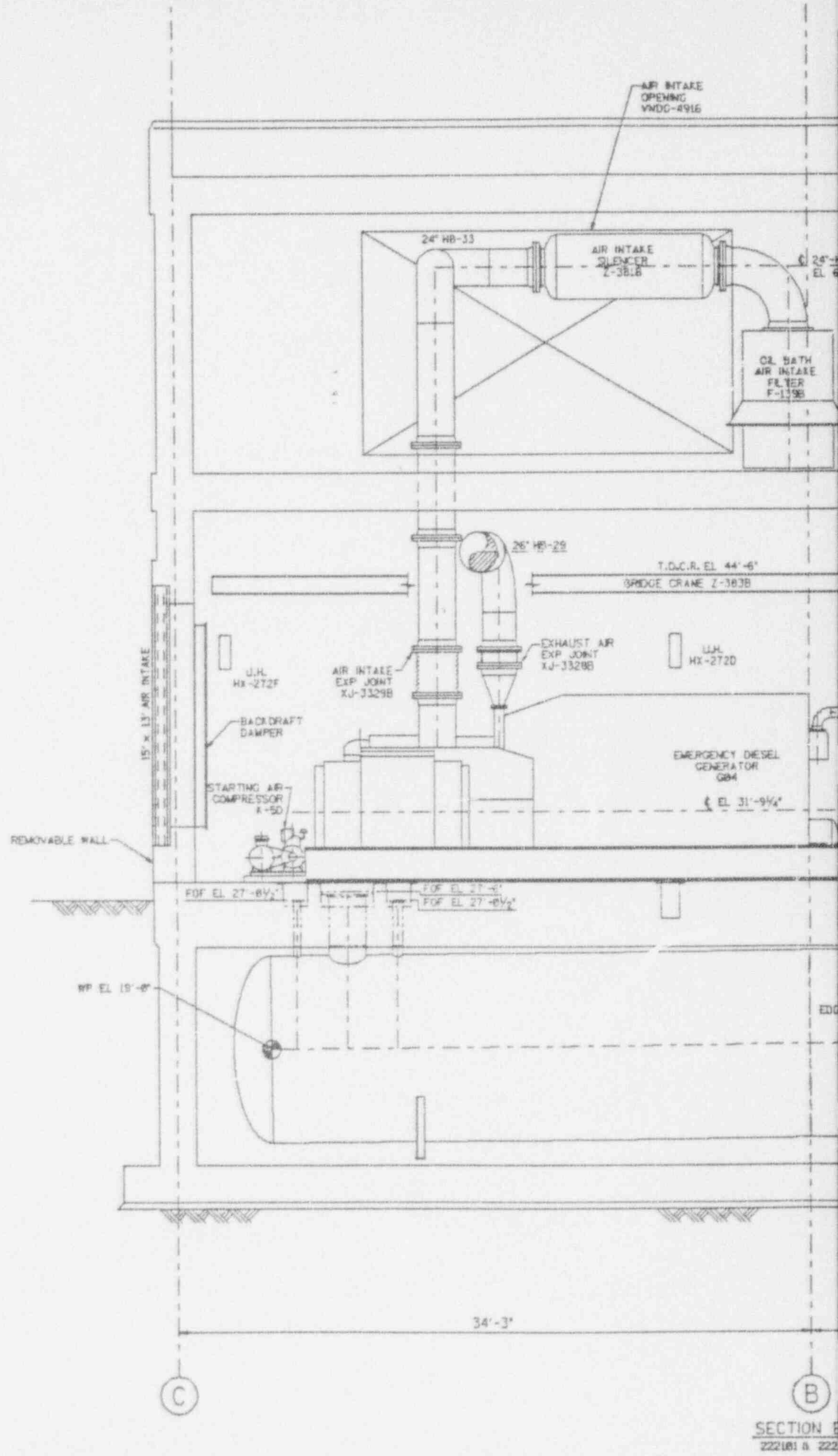


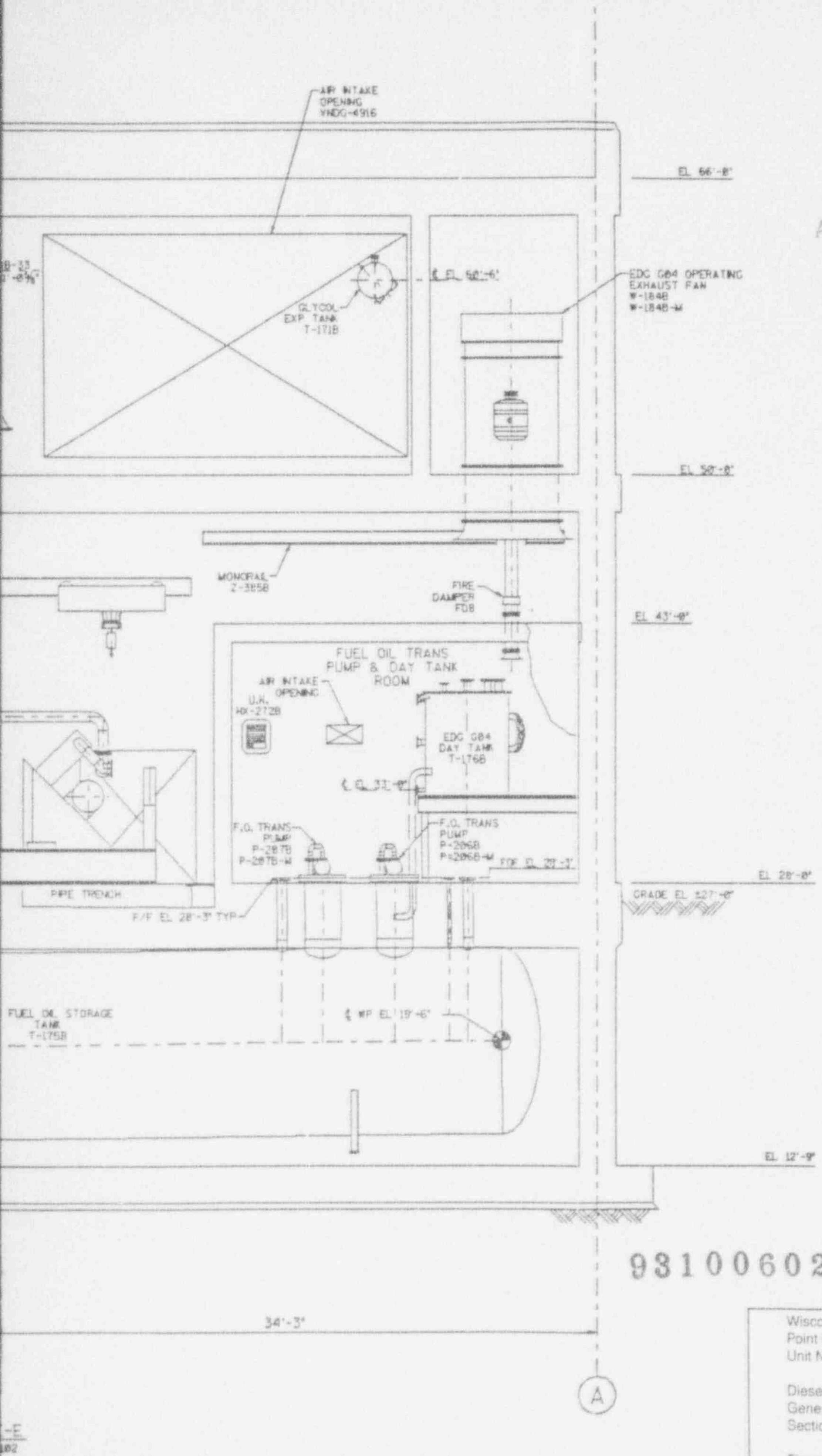
9310060235-17

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
Sections D-D

Figure 5-7


AIR INTAKE OPENING VNDG-4916
24" HB-33
AIR INTAKE SILENCER Z-381B
OIL BATH AIR INTAKE FILTER F-139B
26" HB-29
T.O.C.R. EL 44'-6"
BRIDGE CRANE Z-383B
15' x 13' AIR INTAKE
U.H. HX-272F
U.H. HX-272D
EXHAUST AIR EXP JOINT XJ-3328B
AIR INTAKE EXP JOINT XJ-3329B
BACKDRAFT DAMPER
EMERGENCY DIESEL GENERATOR G84
℄ EL 31'-9¼"
STARTING AIR COMPRESSOR K-5D
REMOVABLE WALL
FOF EL 27'-8½"
FOF EL 27'-4"
FOF EL 27'-8½"
WP EL 19'-8"
34'-3"
C
B
SECTION



SI APERTURE CARD

Also Available On Aperture Card

9310060235- 18

Wisconsin Electric Power Company
Point Beach Nuclear Plant
Unit Numbers 1 and 2

Diesel Generator Building
General Arrangement
Sections E-E

Figure 5-8

6.0 DIESEL GENERATOR INTERFACE AND ELECTRICAL SAFEGUARDS UPGRADE

The scope of the EDG interface and electrical safeguards upgrade includes the following:

- Electrical tie-in of the new B-Train engineered safeguards features buses 1-A06 and 2-A06 to the existing electrical distribution system.
- Electrical tie-in of the G03 and G04 EDGs to the new 1-A06 and 2-A06 buses.
- Resupply the B-Train engineered safeguards features loads (safety injection pumps and station service transformers) from the new 1-A06 and 2-A06 buses.
- Electrical tie-in of the new B-Train MCC's required to power the G03 and G04 auxiliaries and DGB loads to the new 1-A06 and 2-A06 buses.
- Electrical tie-in of the 125 V DC panels for the G03 and G04 EDG's to the existing plant DC systems.
- Change EDG G02 from Train B to A.
- Expansion of the Train A safeguards electrical distribution system 4160 V switchgear for both Unit 1 and Unit 2 to include what is now the Train B switchgear.
- Electrical tie-in of the new A-Train MCC's required in the DGB to power the EDG G01 and EDG G02 fuel oil transfer pumps to the existing safeguards electrical distribution system.
- Modification of control room panels C01 and C02 to accommodate the additional controls and indication required for EDGs G03 and G04 and their auxiliaries.

6.1 EMERGENCY DIESEL GENERATOR/PLANT INTERFACE DESIGN

6.1.1 General Description

Figures 3-1 and 3-2 illustrate the existing and modified 4160 V Safeguards AC electrical distribution systems, respectively.

6.1.2 Existing Emergency Power Source Configuration

In the existing design, two separate emergency power sources consisting of a normal emergency offsite source and a standby emergency onsite source are provided to each of the plant's 4160 V safeguards buses.

6.1.2.1 Normal Emergency Source

The normal emergency power source for auxiliaries associated with safeguards is supplied from the Wisconsin Electric Power Company's 345 KV transmission system via the high voltage and low voltage station auxiliary transformers.

High voltage station auxiliary transformer 1-X03 provides power to low voltage station auxiliary transformer 1-X04 which in turn provides power to Unit 1 4160V buses 1-A03 and 1-A04 through two separate windings. Buses 1-A03 and 1-A04 in turn provide power to the Unit 1 4160 V safeguards buses, 1-A05 and 1-A06, respectively.

High voltage station auxiliary transformer 2-X03 provides power to low voltage station auxiliary transformer 2-X04 which in turn provides power to Unit 2 4160V buses 2-A03 and 2-A04 through two separate windings. Buses 2-A03 and 2-A04 in turn provide power to the Unit 2 4160V safeguards buses, 2-A05 and 2-A06, respectively.

6.1.2.2 Standby Emergency Source

Two EDGs G01 and G02, common to both units, are connected to the engineered safeguards features buses of both units to supply emergency shutdown power in the event of loss of power from low voltage station auxiliary transformer 1-X04 or 2-X04. The standby emergency onsite source for Train A buses 1-A05 and 2-A05 is EDG G01. Similarly, the standby emergency onsite source for Train B buses 1-A06 and 2-A06 is EDG G02.

Each existing EDG (G01 or G02) is capable of supplying power, in the event of a loss of off-site power (LOOP), to all the necessary safeguards equipment of one unit in an accident condition, plus the loads needed to place the other unit in a safe (hot) shutdown condition. Table 3-A depicts the presently evaluated EDG G01 and G02 loads for the above scenario.

Each EDG is automatically started by either of the following events:

a. Loss of voltage on either or both of the associated 4160V buses (buses 1-A05 or 2-A05 for G01 and buses 1-A06 or 2-A06 for G02);

b. Initiation of a safety injection signal from the associated Train (G01 starts on a Train A SI signal from either unit and G02 starts on a Train B SI signal from either unit).

A degraded voltage condition (not as severe as undervoltage) for 50 seconds will be detected by 3 relays connected phase to phase to a 4160V safeguards bus. To prevent spurious actuation due to failure of one relay, operation of any two relays will trip the normal emergency supply breaker from A04. The resulting undervoltage will then start the associated EDG.

With a loss of voltage on any of the four 4160V safeguards buses, the automatic voltage restoring sequence is as follows:

a. Trip the normal emergency supply breaker and/or the tie breaker to the opposite train of the same unit (A05 to A06 tie breaker).

b. Trip all 480V safeguards bus feeder breakers except for the component cooling pump motor, auxiliary feedwater pump motor, and the feeder breaker to the safeguards motor control center.

c. Start the associated EDG.

d. After the EDG comes up to speed (as sensed by the EDG tach generator) and voltage (as determined by generator field being present), close the EDG output breaker and re-energize the safeguards bus.

e. Upon re-energization of the safeguards bus, safeguards loads are sequenced on in the event of a safeguards actuation.

After voltage is re-established on the subject 4160-volt bus, the EDG continues to run (loaded or unloaded) until manually shutdown.

Running loads, which are not de-energized by the load shed sequence and have maintained contact circuitry in their starting circuits, will subsequently be re-energized when bus voltage is restored.

Motors not running prior to the loss of voltage condition will not start upon restoration of voltage, until manual or subsequent automatic action is initiated.

If there is a requirement for engineered safeguards features operation coincident with bus undervoltage, closing of the EDG output breaker as described in step "d" is followed by sequential starting of the engineered safeguards features equipment.

6.1.2.3 125 V DC Power System

The safety-related 125 volt DC system consists of four main distribution buses: D01, D02, D03, and D04. Distribution buses D01 and D03 are A Train buses while D02 and D04 are B Train. Each bus is powered by a battery charger and backed up by a station battery. All four main DC distribution buses are common to both units.

Each of the existing EDG's have a normal and an alternate DC power source as follows:

EDG G01	D01 (Normal)	D03 (Alternate)
EDG G02	D02 (Normal)	D04 (Alternate)

Each of the 4160V safeguards buses have a normal and an alternate DC power source as follows:

1-A05	D01 (Normal)	D02 (Alternate)
1-A06	D02 (Normal)	D01 (Alternate)
2-A05	D01 (Normal)	D02 (Alternate)
2-A06	D02 (Normal)	D01 (Alternate)

Manual action must be taken to place any [illegible] DC source into service. Interlocks are provided to disallow energiz[illegible]y circuit from its normal and alternate DC source simultaneously.

6.1.3 <u>Modified Emergency Power Source Configuration</u>

The planned modification will provide separation between the A and B trains of 4160V switchgear that meets current regulatory requirements. This will be accomplished by moving Train B for both Units to the DGB. The new switchgear line-ups will each include two EDG output breakers, one from a normal standby emergency source and one from an alternate standby emergency source. The normal and alternate standby emergency sources for the Unit 1 Train B switchgear (1-A06) will be G03 and G04, respectively. The normal and alternate standby emergency sources for the Unit 2 Train B switchgear (2-A06) will be G04 and G03, respectively. The existing B train of 4160V switchgear for each Unit, which includes an EDG G02 output breaker, will be made an extension of the A train of 4160V switchgear for the same Unit. EDG G02 will be reassigned to Train A and will be the normal standby emergency source for the Unit 2 Train A switchgear 2-A05 and the alternate standby emergency source for the Unit 1 Train A switchgear 1-A05. EDG G01 will continue to serve as the normal standby emergency source for the Unit 1 Train A switchgear and will become the alternate standby emergency source for the Unit 2 Train A switchgear.

6.1.3.1 Normal Emergency Source

The normal emergency sources for Unit 1 safeguards buses 1-A05 and 1-A06 will be the two windings of Transformer 1-X04. The normal emergency sources for Unit 2 safeguards buses 2-A05 and 2-A06 will be the two windings of Transformer 2-X04. Therefore, the normal emergency sources for the safeguards buses will remain unchanged.

New Unit 1 and 2 Train B 4160V safeguards switchgear will be installed in the new Category I DGB. This will be accomplished using two new 4160V safeguards switchgear line-ups to replace the existing Unit 1 and 2 safeguards switchgear buses 1-A06 and 2-A06. The new 1-A06 and 2-A06 buses will consist of indoor type switchgear rated 5KV, 60Hz, 3 phase, with 2000A metal clad bus assembly and 350 MVA class circuit breakers having 125V DC control. Each switchgear line-up will consist of nine breaker cubicles and an additional relay and metering cubicle arranged in ten vertical sections. The nine breakers will consist of:

1-1200A for normal emergency supply from 1-A04/2-A04

1-1200A for normal EDG supply (normal standby emergency source)

1-1200A for alternate EDG supply (alternate standby emergency source)

1-1200A for Station Service Transformer feeder

1-1200A for Safety Injection Pump feeder

1-1200A for local 480V AC MCC feeder

3-1200A spare feeders

The existing connections between existing buses 1-A04 and 1-A06 and between 2-A04 and 2-A06 will be replaced with new connections between the existing A04 buses and the new A06 buses. The present Unit 1 and 2 Train B 4160 V safeguards loads will be reconnected to the new A06 switchgear.

The existing Unit 1 and 2 4160 V Train A safeguards switchgear 1-A05 and 2-A05 will be extended to include the existing Train B switchgear by replacing the existing 1200A tie breaker between the Train A and B switchgears with a direct connection after the new Train B switchgear and diesel generators have been installed. The 1200A tie breakers removed will be installed in the A04 buses in place of the existing dummy breakers to feed the new A06 buses. The existing A06 1200A normal emergency supply breakers from the A04 buses, station service transformer feeder breakers, and safety injection pump feeder breakers will be spared, resulting in a total of three 1200A spare breakers on each unit's A05 bus. This will allow each of the Train A buses to have a normal and an alternate standby emergency power supply (along with the normal emergency power supply) and provide space for future growth of the Train A switchgear. The existing normal emergency power source for the existing Train A 1A05 and 2A05 buses will remain unchanged.

6.1.3.2 Standby Emergency Source

Separate normal and alternate standby emergency source EDGs for each of the four 4160V safeguards buses will be provided. The alternate standby emergency source for a given safeguards bus is the normal standby emergency source EDG for the opposite Unit in the same train.

The standby emergency sources for Unit 1 safeguards buses 1-A05 and 1-A06 will normally be EDG's G01 and G03 (normal standby emergency source), and EDG's G02 and G04 (alternate standby emergency source), respectively. The standby emergency sources for Unit 2 safeguards buses 2-A05 and 2-A06 will normally be EDG's G02 and G04 (normal standby emergency source), and EDG's G01 and G03 (alternate standby emergency source), respectively.

Selection of the EDG that will automatically energize a 4160 V safeguards bus upon an undervoltage condition is made by placing the associated EDG output breaker control switch in the Auto position. The alternate standby emergency supply that will not automatically energize the bus will have its output breaker control switch key locked in the Pull-Out position.

The differences between operation of the existing and modified Safeguards Electrical Distribution System are as follows:

a. The normal standby emergency power source for each of the four 4160 V safeguards buses (two for each Unit) is supplied by a separate EDG.

b. The EDG that serves as the normal standby emergency power source for a train in one Unit is available as the alternate standby emergency power source for the same train in the other Unit.

c. There no are longer tie breakers between the 4160 V safeguards buses for each Unit to open on bus undervoltage. (Existing Technical Specifications requires the A05 to A06 cross-tie breakers to be removed from their cubicles during operation).

d. Two EDGs are started when voltage is lost on a safeguards bus (the normal and alternate EDG's) instead of one. Loading of the preselected EDG is automatic. Loading of the EDG that was not preselected must be manually initiated.

The load on the EDGs following LOCA, coupled with a loss of normal emergency power to both units, is summarized in Table 6-B. Page 1 of Table 6-B summarizes loading during the injection phase and Page 2 summarizes loading during the recirculation phase. In determining this loading, it is assumed that only one EDG is available. The worse case loading for any of the four EDG's would occurs on the B Train EDG's during the injection phase of a LOCA on one Unit with the other Unit in cold shutdown. This loading is 2905 KW lasting for less than 1/2 hour which is less than the 200 hour rating (2951 KW) of the new EDG's. After the first half hour, the worse case loading is reduced to 2581 KW which is less than the 2848 KW continuous (2000 hour) rating.

Upon loss of bus voltage or a sustained degraded bus voltage condition on the 4160 V safeguards buses in Units 1 or 2, a number of events will take place to restore proper voltage to the safeguards loads. These events include tripping the normal emergency supply breaker, automatic starting of the EDGs, automatic load shedding and a subsequent reloading using the emergency power sources. The existing control scheme will control these events. The only difference is that two EDGs will be started instead of one when an undervoltage condition is sensed on any of the four 4160 V safeguards buses. Both the normal and alternate EDG for the bus will be started.

When the EDG is up to speed (as sensed by an electric speed switch for EDG's G03 and G04) and up to voltage (as sensed by a voltage relay on the EDG output for G03 and G04), it will be connected to its normal bus which has lost power, the other EDG will run unloaded until stopped manually if power to its normal bus is still available. Prior operator action will be required for automatic connection of an EDG to its alternate bus. This prevents automatic connection of two EDGs to a single bus.

The offsite normal emergency source and onsite standby EDG existing and proposed voltage restoration sequences are summarized in Table 6-A.

6.1.3.3 125 V DC Power System

Two new Train B 125 V DC distribution panels D28 and D40 will be installed in the DGB to provide control power and DC auxiliary power for EDG G03 and EDG G04, respectively. D28 and D40 will also provide DC control power to the new 4160 V switchgear 1-A06 and 2-A06, respectively. DC panel D28 will be supplied from existing DC panel D02 while D40 will be supplied from existing DC panel D04. The new distribution panels will have an alternate feed that will come from the opposite distribution panel (ie. the alternate feed to D28 will be D40 and the alternate feed to D40 will be D28). Interlocks will be provided to disallow the panels from being energized by their normal and alternate feeders simultaneously. The new DC distribution panels will be 2 wire, ungrounded, with 250 VDC, 200A Main Bus, and 10,000A short circuit current withstand rating.

Each of the EDG's will have a normal and an alternate DC power source as follows:

EDG G01	D01 (Normal)	D03 (Alternate)
EDG G02	D03 (Normal)	D04 (Alternate)
EDG G03	D28 (Normal)	D40 (Alternate)
EDG G04	D40 (Normal)	D28 (Alternate)

Each of the 4160 V safeguards buses have a normal and an alternate DC power source as follows:

1-A05	D01 (Normal)	D02 (Alternate)
1-A06	D28 (Normal)	D40 (Alternate)
2-A05	D03 (Normal)	D01 (Alternate)
2-A06	D40 (Normal)	D28 (Alternate)

Manual action must be taken to place any alternate DC source into service. Interlocks are provided to disallow energizing any circuit from its normal and alternate DC source simultaneously.

6.2 MODIFIED 480 V CONFIGURATION - SAFEGUARDS BUSES

The configuration of the existing 480V safeguards switchgear buses will not be modified except the power source for the two 480V B Train buses will come off the new A06 buses rather than the old A06 buses.

Two new Train A 480V MCC's will be installed in the DGB to supply the EDG G01 and EDG G02 fuel oil transfer pumps and associated fuel oil transfer pump room safety-related heaters. These two new MCC's (1-B30 and 2-B30) will be supplied from existing safeguards MCC's 1-B32 and 2-B32, respectively. The two new MCCs will be of the indoor type, rated at 600 V, 60Hz, 3 phase, 3 wire, with 600A horizontal bus and 300A vertical bus, and a 22,000A short circuit current withstand rating.

Two new Train B MCC's will be installed in the DGB to supply the EDG G03 and EDG G04 auxiliaries as well as the DGB loads such as lighting. These two new MCC's (1-B40 and 2-B40) will be supplied from the new 4160 V switchgear buses 1-A06 and 2-A06 via two new 4160 V - 480 V dry type transformers 1-X06 and 2-X06, respectively. Each new B Train MCC will be divided into two sections, a Class 1E section and a non Class 1E section. The non Class 1E section will be fed from its associated Class 1E section via a circuit breaker that will be tripped on an undervoltage signal from the associated 4160 V bus. All safety related loads in the DGB will be fed from the safety related portion of the MCC's. The two new MCCs will be of the indoor type, rated at 600 V, 60Hz, 3 phase, 3 wire, with 600A horizontal bus and 300A vertical bus, and a 22,000A short circuit current withstand rating.

6.3 MAIN CONTROL ROOM "C01" AND "C02" PANEL MODIFICATION

The existing controls for the 345 KV switchyard and the 13.8 KV system will be relocated to the rear of control room panel C02 (common to both units) to make room for the controls required for EDGs G03 and G04 and their associated 4160 V buses. Status indication for the 345 KV switchyard and the 13.8 KV system will be duplicated on the front and back of C02.

Control room panel C01 will be modified to incorporate the modified fuel oil system. This will include the addition of fuel oil transfer pump controls for G01 and G02 only (the G03 and G04 transfer pump control will be in the DGB).

6.4 CABLE AND RACEWAY DESIGN

6.4.1 Scope

The EDG/Existing Plant Interface cable and raceway design scope can be divided into two parts. The part that involves the existing plant components and systems and the part that involves new plant components and systems.

The design, which will modify the existing plant, will maintain or improve the present safeguards electrical distribution system reliability and availability. Any design that affects existing plant components or systems and any design that adds new components or systems within the existing plant will be in conformance with the PBNP FSAR as a minimum.

6.4.2 Cable and Raceway Separation

6.4.2.1 General Requirements

Cable and wire used to interconnect equipment will be certified by the manufacturer as passing an approved flame test which meets the intent of IEEE 383-1974. This requirement does not apply to wire internal to factory assembled devices or pieces of equipment (such as the internal wiring of a computer display terminal). Custom assembled equipment such as control boards or switchgear assemblies will be specified with flame resistant wiring which meets the intent of IEEE 383-1974.

6.4.2.2 Specific Requirements - Diesel Generator Building

Cable and raceway separation and segregation within the DGB will conform to the requirements of IEEE 384-1992 except for the requirements of physical separation distances between Class 1E and non-Class 1E circuits within control switchboards (Reference sections 6.6 and 6.7 of IEEE 384-1992).

Cable and raceway interconnections between the DGB and the existing plant facilities including all duct runs and other raceway systems (excluding cables and raceways routed within existing plant facilities) will be separated and segregated in accordance with the requirements of IEEE 384-1992.

Safety related (Class 1E) cables will be segregated into two distinct Train B divisions, one for EDG G03 (and its auxiliaries) serving Unit 1, and one for EDG G04 (and its auxiliaries) serving Unit 2. Safety related (Class 1E) cables will also be segregated into two distinct Train A divisions for power and control of the G01 and G02 Fuel Oil Transfer Pumps.

Cables designated as non-safety related (non-Class 1E) will be segregated from the safety related cables by routing them in raceways which only contain non-safety related cables.

Separation between raceways and cables will be such that conformance to the requirements of Appendix R as they presently apply to PBNP will be maintained.

6.4.2.3 Specific Requirements - Existing Plant Areas

New safety related cables of redundant trains/channels will be run in separate raceways.

Where it is necessary to install new raceways in the cable spreading room, the Main Control Room and computer rooms the following separation distances between redundant raceways will be maintained:

a. One inch in the horizontal direction and 3 inches in the vertical direction where separation is between two open cable trays (ladder type), an open cable tray and a cable in free air, or two cables in free air.

b. One inch in the horizontal direction and one inch in the vertical direction where separation is between two enclosed trays (solid bottom with cover), an enclosed tray and a conduit, or between two conduits.

c. One inch in the horizontal direction and three inches in the vertical direction where separation is between an enclosed tray and an open tray, between an enclosed tray and a free air cable, and between a conduit and a free air cable. Where the enclosed tray or conduit is below the open tray or free air cable, the vertical separation may be reduced to one inch.

Where it is necessary to install new raceways in all other plant areas which contain only instrumentation and control cables, the separation distances required for raceways in the cable spreading room, the Main Control Room and the computer rooms will be maintained.

Where it is necessary to install new raceways in all other plant areas which contain low voltage power cables less than or equal to 2/0 AWG in size (one or both raceways), the following separation distances between redundancy raceways will be maintained:

a. Six inches in the horizontal direction and twelve inches in the vertical direction where separation is between two open cable trays (ladder type), an open cable tray and a cable in free air, or two cables in free air.

b. One inch in the horizontal direction and one inch in the vertical direction where separation is between two enclosed trays (solid bottom with cover), an enclosed tray and a conduit, or between two conduits.

c. Six inches in the horizontal direction and twelve inches in the vertical direction where separation is between an enclosed tray and an open tray, between an enclosed tray and a free air cable, and between a conduit and a free air cable. Where the enclosed tray or conduit is below the open tray or free air cable, the vertical separation may be reduced to one inch. Where the open tray or cable in free air consists only of instrumentation and control cables the horizontal distance may be reduced to one inch and the vertical distance to three inches.

Where it is necessary to install new raceways in all other plant areas which contain low voltage power cables larger than 2/0 AWG in size, or medium voltage power circuits, the following separation distances between redundant raceways will be maintained:

a. Three feet in the horizontal direction and five feet in the vertical direction where separation is between two open cable trays (ladder type), an open cable tray and a cable in free air, or two cables in free air.

b. One inch in the horizontal direction and one inch in the vertical direction where separation is between two enclosed trays (solid bottom with cover), an enclosed tray and a conduit, or between two conduits.

c. Three feet in the horizontal direction and five feet in the vertical direction where separation is between an enclosed tray and an open tray, between an enclosed tray and a free air cable, and between a conduit and a free air cable. Where the enclosed tray or conduit is below the open tray or free air cable, the vertical separation may be reduced to one inch. Where the open tray or cable in free air consists only of instrumentation and control cables the horizontal distance may be reduced to one inch and the vertical distance to three inches.

Where the separation distances above cannot be maintained, appropriate barriers will be installed. Justification of the adequacy of proposed barriers will be included in the design documents.

6.4.2.4 Electrical Cable Requirements

Class 1E circuit design will comply with the general requirements listed below:

a. All Class 1E insulated cable will be qualified in accordance with IEEE 383 and Regulatory Guide 1.131 (see Appendix D, Regulatory Guides, for discussion).

b. Only copper conductor will be used.

c. Cables will be properly sized to required ampacity and voltage drop.

6.4.2.5 Cable Tray and Conduit Requirements

Tray and conduit systems will comply with the general requirements listed below:

a. Exposed galvanized steel conduit and embedded PVC conduit will be used.

b. Instrument cables will not share raceways with power or control cables.

c. New Class 1E raceway (those raceways containing safety related cables) will be seismically supported raceways.

d. Existing plant cable trays and raceways to which new cables are added will have their supports evaluated to verify continued acceptability.

e. The design will ensure that Class 1E, Seismic Category I systems and components are not prevented from performing their safety related functions by seismically induced physical interaction with non-Safety Related non-seismic Category I systems or components. Supports for non-safety related items will be designed and installed such that they do not fail under seismic conditions and endanger the operation of any adjacent safety related items. This interaction will be identified as Seismic II/I.

   Seismic II/I supports will not fail during an SSE to the degree that they degrade, to an unacceptable level, the ability of Class 1E systems to perform their required function.

   New installations in the existing plant will be evaluated to identify any potential Seismic II/I concerns.

   Certain non-Seismic Category I components whose weight and configuration are such that even if their support failed, the nature and force of their impact would not prevent Class 1E components from performing their safety related function may be excluded by analysis from Seismic II/I considerations.

f. Protection of Class 1E tray and conduit from potential pipe break failure hazards, missile hazards, hot pipe concerns, and seismic interaction of closely spaced components will be provided by barriers, restraints, separation distance, orientation, or the appropriate combination thereof.

TABLE 6-A

EXISTING & PROPOSED VOLTAGE RESTORATION SEQUENCE

EXISTING VOLTAGE RESTORATION SEQUENCE

	BUS 1-A05	BUS 1-A06	BUS 2-A05	BUS 2-A06
Normal Emergency Source	1-X04 1-A03	1-X04 1-A04	2-X04 2-A03	2-X04 2-A04
Standby Emergency Source	G01	G02	G01	G02

MODIFIED VOLTAGE RESTORATION SEQUENCE

	BUS 1-A05	BUS 1-A06	BUS 2-A05	BUS 2-A06
Normal Emergency Source	1-X04 1-A03	1-X04 1-A04	2-X04 2-A03	2-X04 2-A04
Standby Emergency* Source (Normal)	G01	G03	G02	G04
Standby Emergency* Source (Alternate)	G02	G04	G01	G03

* The Normal and Alternate Standby Emergency Source must be selected manually. The selected source is automatically loaded on bus undervoltage.

EMERGENCY DIESEL GENERATOR LOADING
FOLLOWING LOSS OF COOLANT ACCIDENT

Injection Phase

Accident Unit and Common Loads	Rating (Each)	Load (KW) G01/G02 *	G01/G02 #	G03/G04 *	G03/G04 #
1 Safety Injection Pump	700 HP	560	560	560	560
1 Residual Heat Removal Pump	200 HP	141	141	141	141
3 Service Water Pumps	300 HP	718	718	718	718
2 Containment Fans(See Note Below)	150 HP	164	164	164	164
1 Aux. Feedwater Pump	250 HP	207	207	207	207
1 Containment Spray Pump	200 HP	166	166	166	166
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	83	91
1 Emergency Lighting Xfmr	30 KVA	27	27	27	27
2 Diesel Room Fans	20 HP	24	24		
1 XY06 Instrument Bus Xfmr	30 KVA	27	27	27	27
1 Battery Room Fan	12 HP	4	4	4	4
1 B.A. Heat Trace Xfmr	112 KVA			112	112
1 Station Service Xfmr Losses		22	10	14	23
1 Diesel Generator Aux. MCC		8	8	102	102
Subtotal		2358	2346	2532	2549
Non-Accident Unit Loads (Hot Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	91	83
1 Containment Accident Fan	150 HP	45	45	45	45
1 Station Service Xfmr Losses		3	10	11	5
Total		2696	2691	2886	2889
Non-Accident Unit Loads (Cold Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Residual Heat Removal Pump	200 HP	141	141	141	141
1 Station Service Xfmr Losses		3	10	10	5
Total		2709	2704	2890	2902

* Unit 1 Accident
\# Unit 2 Accident

The above injection phase loading will last for about 1/2 hour.

Note: The containment fan KW is different than those provided in FSAR Table 8.2-1, since it is calculated based on actual Brake Horsepower. The FSAR changes to this table is pending.

Proposed Revision

EMERGENCY DIESEL GENERATOR LOADING
FOLLOWING LOSS OF COOLANT ACCIDENT

Recirculation Phase

	Rating	Load (KW)			
		G01/G02		G03/G04	
Accident Unit and Common Loads	(Each)	*	#	*	#
1 Safety Injection Pump	700 HP	560	560	560	560
1 Residual Heat Removal Pump	200 HP	141	141	141	141
3 Service Water Pumps	300 HP	718	718	718	718
2 Containment Fans (See Note Below)	150 HP	164	164	164	164
1 Component Cooling Pump	250 HP	207	207	207	207
1 Emergency Lighting Xfmr	30 KVA	27	27	27	27
2 Diesel Room Fans	20 HP	24	24		
1 XY06 Instrument Bus Xfmr	30 KVA	27	27	27	27
1 Battery Room Fan	12 HP	4	4	4	4
1 Battery Charger	76 KVA	54	54	54	54
1 Battery Charger	112 KVA	75	75	75	75
1 Fuel Oil Transfer Pump**	3 HP	0	0	0	0
1 Security Battery Charger	51 KVA	36	36	36	36
1 Instrument Air Compressor	100 HP	93	93	93	93
1 Station Service Xfmr Losses		15	7	8	14
1 Diesel Gen. Aux. MCC		11	11	105	105
	Subtotal	2156	2148	2219	2225
Non-Accident Unit Loads (Hot Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Charging Pump	100 HP	83	83	91	83
1 Containment Accident Fan	150 HP	45	45	45	45
1 Station Service Xfmr Losses		4	10	10	5
	Total	2495	2493	2572	2565
Non-Accident Unit Loads (Cold Shutdown)					
1 Component Cooling Pump	250 HP	207	207	207	207
1 Residual Heat Removal Pump	200 HP	141	141	141	141
1 Station Service Xfmr Losses		4	10	10	5
	Total	2508	2506	2577	2578

* Unit 1 Accident
\# Unit 2 Accident
** These loads are included under Diesel Gen. Aux. MCC

The above recirculation phase loading is considered continuous with respect to emergency generator loading.

Note: The containment fan KW is different than those provided in FSAR Table 8.2-1, since it is calculated based on actual Brake Horsepower. The FSAR changes to this table is pending.

Proposed Revision

7.0 IMPLEMENTATION PLAN

7.1 INSTALLATION PLAN

7.1.1 Control Panel Modifications

This work includes the modifications to the main control room control panels to rearrange the existing controls and add the new diesel generator controls. Work began during the spring 1993 Unit 1 refueling outage and is scheduled to continue through the spring 1994 Unit 1 refueling outage.

7.1.2 Diesel Building Installation

This work includes the installation of all Civil, Mechanical and Electrical components in the new building and the installation of the underground electrical ductbank and fuel oil piping up to the existing security fence.

7.1.3 Plant Interface Installation

This work includes the installation of all Civil, Mechanical and Electrical components within the existing plant security fence up to the existing plant equipment.

7.1.4 Shore Protection Installation

This work includes the extension of the existing shore protection to the north. The extension will be installed to provide shore protection for the new diesel generator building installation. Work is scheduled to be completed by October of 1994.

7.1.5 Security Modifications

This work includes the installation of a new security fence, cameras, card readers, lighting and intrusion detection around the new diesel generator facility. This also includes the removal of the existing fence between the existing plant and the new diesel generator facility. Work is scheduled to be completed by October of 1994.

7.1.6 Tie-in of G04

This work includes the connection of all power and control cables to allow G04 to provide emergency power to the 2A06 safeguards bus. It also includes the removal of the G02 connection to the 2A06 bus. This work is scheduled to be completed during the 1994 fall Unit 2 refueling outage. Upon completion of this work, Point Beach will have 3 operable Emergency Diesel Generators. The configuration will be as follows: G01 connected to 1A05 and 2A05, G02 connected to 1A06, and G04 connected to 2A06.

7.1.7 Tie-in of G03

This work includes the connection of all power and control cables to allow G03 to provide emergency power to the 1A06 safegaurds bus. It also includes the removal of the G02 connection to the 1A06 bus. This work is scheduled to be completed during the 1995 spring Unit 1 refueling outage. Upon completion of this work, Point Beach will have 3 operable Emergency Diesel Generators. The configuration will be as follows: G01 connected to 1A05 and 2A05, G03 connected to 1A06, and G04 connected to 2A06.

7.1.8 Retraining of G02

This work includes changing all items associated with G02 in order to declare it an "A" train diesel. This work also includes the connection of all power and control cables to allow G02 to provide emergency power to the 2A05 safegaurds bus. This work is scheduled to be completed during the fall 1995 Unit 2 refueling outage. Upon completion of this work, Point Beach will have 4 operable Emergency Diesel Generators connected in their final configuration.

7.2 PREOPERATIONAL/STARTUP TESTING

7.2.1 Original Testing

The original testing for the diesel generators was completed in 1976 per the requirements of IEEE Std 387-1974. The modifications performed on the DGs as outlined in section 4.?.1 above have impacted the original qualifications. A review of the modifications by the original manufacturer has concluded that all of these modifications are considered "minor" as defined in IEEE 387. The basis for this conclusion is listed below. However, Wisconsin Electric believes that even though these changes are classified as minor, there are sufficient changes to warrant retesting of the diesel generators as outlined below in sections 7.2.2 and 7.2.3.

7.2.1.1 Modififcation Descriptions

1) Engine Cooling System Modifications
   a. Replace heat exchanger with radiator (electric motor driven fans).
   b. Use glycol in cooling water.
   c. Replace existing engine cylinder heads with EMD "Diamond 6" type.

2) Governor Replacement
   a. Replace EGA with 2301A.
   b. Replace EGB-C actuator with EGB-P.

3) Change Generator Output Voltage from 6900V to 4160V.
   a. Change generator from wye to delta connection.
   b. Replace PT's to accommodate lower voltage.

4) Flywheel Replacement
   a. Replace standard flywheel with larger inertia flywheel.

5) Turbocharger Rebuild
   a. Upgrade to high capacity turbocharger.

7.2.1.2 Definition of Major and Minor Changes

Paragraph 7.6 of IEEE 387-1984 requires that changes to a previously diesel generator unit shall be analyzed to determine if the degree of change is major or minor. Major changes require requalification while minor changes require analysis or testing (or both) for qualification. Examples of modifications that may change the capability or performance of a previously qualified diesel generator are listed as:

Governor
Overall system flywheel effect
Excitation system characteristics
Type of Coolant

Major changes are listed as:

Differences in the number of cylinders
Changes in stroke or bore
Brake mean effective pressure
Speed
Unique or different diesel generator configuration

Minor changes are listed as:

Component part substitutions

7.2.1.3 Classification Rational

1) Engine Cooling System Modification

The engine cooling system modifications are considered to be "minor". The performance of the cooling system can be verified by performing site load testing. The design of the cooling system does not affect the capability of the diesel generator to start and accept load; therefore, it should not be necessary to have to perform the Start and Load Acceptance Tests of paragraph 7.2.2 (300 start test).

2) Governor Replacement

The governor replacement is considered to be "minor". The new EGB-P actuator is the same basic governor as the original EGB-C actuator except for the electric coil. The new "P" actuator requires a proportional voltage signal from the 22301A electric governor to change engine speed/load while the "C" actuator used a compensating voltage signal from the EGA electric governor. The response time to load or speed change is the same for both actuators. In addition, a diesel generator with an EGB-P actuator and a 2301 electric governor has already been 300 start tested by Power Systems; therefore, it is not necessary to have to requalify the system. The performance of the new governor system can be verified by performing the Performance Tests of paragraph 6.2.1.2.a (IEEE 387) and a transient load acceptance test. The transient load acceptance test will consist of block loads of 0-25%, 0-50%, 0-75% and 0-100% of rated continuous load which would be applied and rejected to demonstrate governor response.

3) Change Generator Output Voltage from 6900V to 4160V

Changing the generator output voltage from 6900V to 4160V is considered to be "minor". This modification requires component parts substitutions. Components sized for 6900V are substituted with components sized for 4160V which are the same manufacturer and type as the original components; therefore, the characteristics and response of the generator/excitation system will not be affected. Performance of the generator/excitation system can be verified while performing the Performance Tests and transient load acceptance tests listed for the Governor Replacement.

4) Flywheel Replacement

The flywheel replacement is considered to be "minor". This is a component part substitution recommended by the engine manufacturer (EMD). The original flywheel is replaced with a larger inertia flywheel to improve the torsional characteristics of the engine-generator system. This is a result of a 10CFR21 notification issued by Power Systems in 1988 which addressed a torsional vibration concern for a specific combination of EMD 20-645E4 engines and two bearing generators. San Onofre Nuclear Plant and Knolls Atomic Power Laboratories have previously performed the flywheel replacement. The Knolls Atomic diesel generators are identical to the Wisconsin Electric diesel generators, therefore, performance of this replacement has already been verified.

5) Turbocharger Rebuild

The turbocharger rebuild is considered to be "minor". This is a component part substitution recommended by the engine manufacturer (EMD). The high capacity turbocharger was introduced in 1981 and is recommended to reduce the maintenance interval for the turbocharger. High capacity gears are used within the turbocharger to improve gear wear during light load operation of the engine. This is a standard upgrade which has been implemented by many nuclear plants for their safety related diesel generators. Performance of this upgrade has, therefore, already been verified.

7.2.2 <u>Factory Acceptance Testing</u>

Factory Acceptance testing will be completed per ANSI/IEEE Std 387-1984 section 6.2 and Reg. Guide 1.9 Rev. 3 as follows:

Engine Tests

1. Performance tests per paragraphs 6.2.1.2 a through d of the IEEE Std.

2. Single-Load Rejection Test equal to our largest single load.

3. Full-Load Rejection Test.

4. Transient Test

   0 - 25% Load Step
   0 - 50% Load Step
   0 - 75% Load Step
   0 - 100% Load Step

5. Start and Load Acceptance Test consisting of 30 successful starts in lieu of the IEEE recommended 300 start test.

6. Load Acceptance Test (Load Profile Test). See table below for information.

Motor	Size (hp)	Voltage Rating	Normal Sequence	Sequence A	Sequence B
Safety Injection Pump	700	4160V	0	0	0
RHR Pump	200	480V	5	4	7
Aux Feedwater Pump	250	480V	10	12	9
Service Water + Containment Spray Pumps	300 + 200	480V	15	14	17
Service Water Pump	300	480V	20	22	19
Service Water Pump	300	480V	25	24	27.5
Containment Cooling Fan	150	480V	30	33	29
Containment Cooling Fan	150	480V	35	34	38.5
CCW + RHR Pump	250 + 200	480V	60	60	60
Base load (Resistive)	240kva*	480V	0	0	0
Comp Cooling Water Pump	250	480V	0	0	0
Radiator Fan Motors (2)	40 + 40	480V	0	0	0

* This load may be adjusted so that the total load equals 2950 kw.

7. Margin Test per the IEEE Std.

8. Endurance Test.

Generator Tests

Per section 6.2.2 Of ANSI/IEEE Std 387-1984

7.2.3 Site Acceptance Testing

Site Acceptance testing will be completed per ANSI/IEEE Std 387-1984 section 6.3 and Reg. Guide 1.9 Rev. 3 as follows:

1. Start Test
2. Load-Run Test
3. Fast-Start Test
4. Loss-of-Offsite-Power (LOOP) Test
5. Safety-Injection-Actuation-Signal (SIAS) Test
6. Combined SIAS and LOOP Test
7. Hot Restart Test
8. Synchonizing Test
9. Protective Trip Bypass Test
10. Test Mode Change-Over Test
11. Redundant Unit Test

WISCONSIN ELECTRIC POWER COMPANY

DIESEL GENERATOR ADDITION PROJECT - MECHANICAL/PROCESS
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes (Note 4)	Component To Be Installed Design Codes (Notes 5 & 6)	Current Industry Design Codes	Remarks
Diesel Engine Fuel Oil					
Storage Tanks*	Storage Tank 12,000 Gallon T-72	NFPA-30-1969 UL-58-6th Ed.	NFPA-30-1987 UL-58-1985 API 650-1988	ASME-III-1989	See Note 7.
Fuel Oil Day* Tanks	Day Tanks T31A, B	DEMA-1958 (Note 5)	NFPA-30-1987 API-650-1988	ASME-III-1989	See Note 8.
Valves**	Valves	USASI (ANSI-B31.1-1967)	ANSI-B31.1-1989 ANSI-B16.34-1988 NFPA-30-1987	ASME III-1989	See Note 9.
Flexible Hose*	Flexible Hose	ANSI B31.1-1967	ANSI-B31.1-1989 NFPA-30-1987	ASME III-1989	See Note 9.
Fittings**	Fittings	ANSI-B31.1-1967	ANSI-B31.1-1989 ANSI-B16.9-1986 ANSI-B16.11-1980 NFPA-30-1987	ASME III-1989	See Note 9.
Pipe**	Pipe	ANSI-B31.1-1967	ANSI-B31.1-1989 NFPA-30-1987	ASME III-1989	See Note 9.
Flame Arrestor **	Flame Arrestor	ANSI B31.1-1967	NFPA-30-1987 UL-525-1984 ANSI-B31.1-1989	NFPA-30-1987 UL-525-1984 ANSI-B31.1-1989	See Note 7 and Note 9.
Strainers**	Strainers	ANSI B31.1-1967	ANSI-B31.1-1989	ANSI-B31.1-1989	See Note 9.
Fuel Oil ** Transfer Pumps	F.O. Supply Pumps 70A, B 60 psi	HI-1965, USASI, ASME (Note 10)	API 676-1980 HI-1983	ASME III-1989	See Note 7.
Flanges*	Flanges	ANSI-B31.1-1967	ANSI-B31.1-1989 ANSI-B16.5-1985	ASME III-1989	See Note 9.

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DIESEL GENERATOR ADDITION PROJECT - MECHANICAL/PROCESS
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes (Note 4)	Component To Be Installed Design Codes (Notes 5 & 6)	Current Industry Design Codes	Remarks
COMBUSTION AIR					
Filter* (Oil Bath)	Filter	DEMA-1958 (Note 5)	DEMA-1972 (Note 5)	DEMA-1972 (Note 5)	See Note 11.
Silencer*	Silencer	DEMA-1958 (Note 5)	DEMA-1972 (Note 5)	DEMA-1972 (Note 5)	See Note 11.
Pipe*	Not Used	N/A	ANSI-B31.1-1989	ASME III-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Fittings*	Not Used	N/A	ANSI-B31.1-1989 ANSI-B16.9-1986	ASME III-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Flexible* Connection	Not Used	N/A	DEMA-1972 (Note 5)		The utilized codes are consistent with the function of the component and with similar components in other systems.
Flanges*	Flanges	DEMA-1958 (Note 5)	ANSI-B31.1-1989 ANSI-B16.5-1985	ASME III-1989	See Note 8.

WISCONSIN ELECTRIC POWER COMPANY

DIESEL GENERATOR ADDITION PROJECT - MECHANICAL/PROCESS
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes (Note 4)	Component To Be Installed Design Codes (Notes 5 & 6)	Current Industry Design Codes	Remarks
EXHAUST					
Silencer*	Silencer	DEMA-1958 (Note 5)	DEMA-1972 (Note 5)	DEMA-1972 (Note 5)	See Note 11.
Pipe*	Pipe	ANSI-B31.1-1967	ANSI-B31.1-1989	ASME III-1989	See Note 9.
Fittings*	Fittings	ANSI-B31.1-1967	ANSI-B31.1-1989	ASME III-1989	See Note 9.
Expansion Joints*	Expansion Joints	DEMA-1958 (Note 5)	DEMA-1972 (Note 5)		See Note 11.
Flanges*	Flanges	ANSI-B31.1-1967	ANSI-B31.1-1989 ANSI-B16.5-1985	ASME III-1989	See Note 9.

WISCONSIN ELECTRIC POWER COMPANY

DIESEL GENERATOR ADDITION PROJECT - MECHANICAL/PROCESS

DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes (Note 4)	Component To Be Installed Design Codes (Notes 5 & 6)	Current Industry Design Codes	Remarks
JACKET WATER					
Radiator Fans*	Not Used	N/A	AMCA-99-1983 AMCA-211-1987 UL-507-1977	AMCA-99-1983 AMCA-211-1987 UL-507-1977	To be verified by MKP/WE.
Flanges*	Not Used	N/A	ANSI-B31.1-1989 ANSI-B16.5-1985	ASME III-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Radiator*	Not Used	N/A	ASME VIII-1989	ASME III-1989	To be verified by MKP/WE.
Expansion* Joints	Not Used	N/A	ANSI-B31.1-1989 EJMA		The utilized codes are consistent with the function of the component and with similar components in other systems.
Pipe**	Not Used	N/A	ANSI-B31.1-1989	ASME III-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Fittings**	Not Used	N/A	ANSI-B31.1-1989 ANSI-B16.9-1986	ASME III-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Expansion Tank*	Expansion Tank	DEMA-1958	ASME VIII-1989	ASME III-1989	See Note 8.

WISCONSIN ELECTRIC POWER COMPANY

DIESEL GENERATOR ADDITION PROJECT - MECHANICAL/PROCESS
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes (Note 4)	Component To Be Installed Design Codes (Notes 5 & 6)	Current Industry Design Codes	Remarks
AIR START/SERVICE AIR					
Reservoirs**					
Starting Air*	T60A-D T61A-D (Air Start)/	ASME, ASI	ASME VIII-1989	ASME III-1989	See Note 8.
Valves**	Valves	ANSI-B31.1-1967	ANSI-B31.1-1989 ANSI-B16.34-1988	ASME III-1989	See Note 9.
Pipe**	Pipe	ANSI-B31.1-1967	ANSI-B31.1-1989	ASME III-1989	See Note 9.
Fittings**	Fittings	ANSI-B31 [illegible] 967	ANSI B31.1-1989 ANSI B16.11-1980	ASME III-1989	See Note 9.
Quick Disconnects**					
Starting Air*	Not Used	N/A	ANSI B31.1-1989	ANSI B31.1-1989	The utilized codes are consistent with the function of the component and with similar components in other systems.
Flexible Hose**					
Starting Air*	Flexible Hose	DEMA-1958	ANSI B31.1-1989	ASME III-1989	See Note 8.
HVAC/SERVICES					
Axial Fans**	Axial Fans	AMCA ASHRAE NEC	AMCA-99-1983 AMCA-211-1987 UL-507-1977	AMCA-99-1983 AMCA-211-1987 UL-507-1977	See Note 7.
Unit Heaters**	Unit Heaters	NEMA UL	NFPA-70-1990 UL-1025-1980	NFPA-70-1990 UL-1025-1980	See Note 7.

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
4160V* Switchgear 1A06, 2A06	4160V Switchgear 1A05, 2A05	Westinghouse DH type that was fabricated with latest standards when purchase order was placed.	ANSI C37.2-1991 C37.04-1979 C37.09-1979 C37.09C-1984 C37.09E-1985 C37.010-1989 C37.010D-1984 C37.011-1979 C37.20.2-1987 C37.82-1987 C37.011-1979 C37.012-1991 C37.90-1989 C37.97-1979 C37.100-1981	ANSI C37.2-1991 C37.04-1979 C37.09-1979 C37.09C-1984 C37.09E-1985 C37.010-1989 C37.010D-1984 C37.11-1979 C37.20.2-1987 C37.82-1987 C37.011-1979 C37.12-1991 C37.90-1989 C37.97-1979 C37.100-1981	The new design codes meet or exceed the original design basis (See Note 6)
			NEMA SG2-1986 SG4-1990	NEMA SG2-1986 SG4-1990	

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
4160V Diesel* Generator G03, G04	4160V Diesel Generator G01, G02	NEMA ASA NEC NFPA	ANSI C50.10-1977 C50.12-1981 IEEE 1-1986 43-1974 115-1983 115A-1987 275-1981 NEMA MG1-1987 NFPA 70-1990		MK Power/WE to provide compliance of current design codes.

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
500KVA* 4160V/480V Transformer 1X06, 2X06	1750KVA* 4160V/480V Transformers X13, X14	IEEE NEMA	ANSI C57.12.01-1989 C57.12.50-1981 C57.12.70-1978 C57.12.91-1979 NEMA ST20-1987 UL 1561-1986 IEEE 344-1987	ANSI C57.12.01-1989 C57.12.50-1981 C57.12.70-1978 C57.12.91-1979 NEMA ST20-1987 UL 1561-1986 IEEE 344-1987	The new design codes meet or exceed the original design basis (See Note 6). The componant to be installed will be dry type. Existing PBNP equivalent components are not dry type.

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
480V MCC* 1B40, 2B40	480V MCC* 1B32, 2B32 1B42, 2B42	IEEE NEC NEMA	IEEE 649-1980 344-1975 344-1987 NEMA AB 1-1986 AB 3 FU 1-1986 ICS2-1988 ICS2.3-1990 ICS6-1988 KS1-1990 UL 489-1986 508-1986 845-1988	IEEE 649-1980 344-1987 NEMA AB 1-1986 AB 3 FU 1-1986 ICS2-1988 ICS2.3-1990 ICS6-1988 KS1-1990 UL 489-1986 508-1986 845-1988	The new design codes meet or exceed the original design basis (See Note 6). Some control components may be qualified in accordance with IEEE 344-1975

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
480V Motors** W-181A1-M & B1-M W-181A2-M & B2-M W-181A3-M & B3-M W-185A-M & B-M W-183B-M & C-M W-184B-M & C-M	480V Motors** W12A W12B W12C W12D	NEMA ASA IEEE	IEEE 1-1986 43-1974 85-1973 112-1984 117-1974 275-1981 NEMA MG1-1987 MG2-1990 NFPA 70-1990	IEEE 1-1986 43-1974 85-1973 112-1984 117-1974 275-1981 NEMA MG1-1987 MG2-1990 NFPA 70-1990	The new design codes meet or exceed the original design basis (See Note 6 and Note 13).
5KV Cables*	Tinned or lead alloy coated annealed copper with heat, Ozone and moisture resistant Butyl Rubber Insulated cable DG to Bus connection and SI Pumps Power Cable, etc.	IEEE IPCEA NEMA ASA ASTM	AEIC CS6-1987 ASTM B3-1990 B8-1986 ICEA P-32-382-1969 IEEE 383-1974 NEMA WC8-1988 WC26-1990 NFPA 70-1990 UL 1072-1986	AEIC CS6-1987 ASTM B3-1990 B8-1986 ICEA P-32-382-1969 IEEE 383-1974 NEMA WC8-1988 WC26-1990 NFPA 70-1990 UL 1072-1986	The new design codes meet or exceed the original design basis (See Note 13 and Note 14).

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DIESEL GENERATOR ADDITION PROJECT - ELECTRICAL
DESIGN CODES (NOTES 1 & 2)

Component To Be Installed (Note 3)	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
125V DC * Distribution Panel D-28, D-40	125V DC Distribution Panel D-31, D-41	ASA IEEE NEMA UL W-P-115a W-C-375a	IEEE 344-1975 344-1987 NEMA 250-1985 AB1-1986 FU1-1986 ICS2-1988 PB1-1990 NFPA 70-1990 UL 50-1988 67-1988 198L-1987	IEEE 344-1987 NEMA 250-1985 AB1-1986 FU1-1986 ICS2-1988 PB1-1990 NFPA 70-1990 UL 50-1988 67-1988 198L-1987	The new design codes meet or exceed the original design basis (See Note 6). Some control componants may be qualified in accordance with IEEE 344-1975.
600V Power & Control Cable ** 1B-40, 2B-40 MCC to Class 1E Motors, etc.	600V Power & Control Cable	IEEE IPCEA NEMA ASE ASTM	IEEE 383-1974 NEMA WC7-1982 WC8-1988 UL 44-1991 NFPA 70-1993	IEEE 383-1974 NEMA WC7-1982 WC8-1988 UL 44-1991 NFPA 70-1993	The new design codes meet or exceed the original design basis (See Note 6).

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DIESEL GENERATOR ADDITION PROJECT - ARCHITECTURAL, CIVIL AND STRUCTURAL
DESIGN CODES AND STANDARDS (NOTES 1 & 2)

Component To Be Installed	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
Reinforced Concrete *	Reinforced Concrete	ACI 318-63	ACI 318-89	ACI 349-90	The State-of-The Art Architectural, Civil and Structural Codes and Standards, latest revisions, are used for design and construction of the Diesel Generator Building structure. The requirements of these Codes and Standards in essence meet and/or exceed the requirements of those used in the original Point Beach Nuclear Plant Non-containment Category I Structures. In cases where any relaxation to the requirement of the outdated Codes may exist in the updated versions, such relaxations are based on extensive research, experience and study and does not affect the level of safety. Specifically a review of the applicable sections of ACI 318-63, ACI 318-89 and ACI 349-90 for the design of the Diesel Generator Building was made to identify the major differences between the codes that have effect on the design. The results of this review are given in Note 16 and Note 17 of this document. Note that the comparison between the ACI codes is not meant to be in detail or complete, and it does not cover sections of the codes that are not applicable to the DGB. For compliance of the Diesel Generator Building design and construction with the requirements of U.S. NRC Standard Review Plan, and Regulatory Guides see the SRP and Regulatory Guides Compliance Summary Matrices.
			ACI 318R-89	ACI 349R-90	
		ACI 613-54	ACI 211.1-91	ACI 211.1-91	
			ACI 212.3R-91	ACI 212.3R-91	
			ACI 226.3R-87	ACI 226.3R-87	
		ACI 613A-59	ACI 301-89	ACI 301-89	
			ACI 302.1R-89	ACI 302.1R-89	
		ACI 614-59	ACI 304R-89	ACI 304R-89	
			ACI 304.2R-91	ACI 304.2R-91	
			ACI 304.4R-89	ACI 304.4R-89	
		ACI 605-59	ACI 305R-91	ACI 305R-91	
		ACI 604-56	ACI 306R-88	ACI 306R-88	
			ACI 308-81 (1986)	ACI 308-81 (1986)	
			ACI 309R-87	ACI 309R-87	
			ACI 309.1R-81 (1986)	ACI 309.1R-81 (1986)	
			ACI 309.2R-90	ACI 309.2R-90	
			ACI 311.4R-88	ACI 311.4R-88	
			ACI 311.5R-88	ACI 311.5R-88	
		ACI 315-57	ACI 315-80 (1991)	ACI 315-80 (1991)	
			ACI 315R-80 (1988)	ACI 315R-80 (1988)	
		ACI 347-63	ACI 347R-88	ACI 347R-88	
			CRSI-1990	CRSI-1990	
			CRSI-1992	CRSI-1992	
			SP-2 (1992)	SP-2 (1992)	
			SP-66 (1988)	SP-66 (1988)	
			NRMCA	NRMCA	
		ASTM A185-61T	ASTM A185-90a	ASTM A185-90a	
		ASTM A15-62T, A408, A432	ASTM A615-90	ASTM A615-90	
			ASTM C29/C29M-91	ASTM C29/C29M-91	
		ASTM C31-62T	ASTM C31-91	ASTM C31-91	
		ASTM C33-61T	ASTM C33-90	ASTM C33-90	
		ASTM C39-61	ASTM C39-86	ASTM C39-86	
		ASTM C40-66	ASTM C40-84 (1991)	ASTM C40-84 (1991)	
			ASTM C42-90	ASTM C42-90	
			ASTM C70-79 (1985)	ASTM C70-79 (1985)	
			ASTM C78-84	ASTM C78-84	
		ASTM C88-63	ASTM C88-90	ASTM C88-90	
		ASTM C94-62	ASTM C94-91a	ASTM C94-91a	

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DIESEL GENERATOR ADDITION PROJECT - ARCHITECTURAL, CIVIL AND STRUCTURAL
DESIGN CODES AND STANDARDS (NOTES 1 & 2)

Component To Be Installed	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
Reinforced Concrete *	Reinforced Concrete		ASTM C109-91	ASTM C109-91	
			ASTM C114-88	ASTM C114-88	
		ASTM C117-65	ASTM C117-90	ASTM C117-90	
		ASTM C127-59	ASTM C127-88	ASTM C127-88	
		ASTM C128-59	ASTM C128-88	ASTM C128-88	
		ASTM C131-66	ASTM C131-89	ASTM C131-89	
		ASTM C136-63	ASTM C136-84a	ASTM C136-84a	
			ASTM C138-81	ASTM C138-81	
		ASTM C142-66	ASTM C142-78 (1990)	ASTM C142-78 (1990)	
		ASTM C143-66	ASTM C143-90a	ASTM C143-90a	
		ASTM C150-62	ASTM C150-92	ASTM C150-92	
		ASTM C171-63	ASTM C171-91	ASTM C171-91	
		ASTM C172-54	ASTM C172-90	ASTM C172-90	
			ASTM C173-78	ASTM C173-78	
			ASTM C191-92	ASTM C191-92	
			ASTM C192-90a	ASTM C192-90a	
			ASTM C227-90	ASTM C227-90	
			ASTM C231-91b	ASTM C231-91b	
			ASTM C233-90	ASTM C233-90	
		ASTM C260-60T	ASTM C260-86	ASTM C260-86	
		ASTM C289-66	ASTM C289-87	ASTM C289-87	
			ASTM C295-90	ASTM C295-90	
		ASTM C309-58	ASTM C309-91	ASTM C309-91	
			ASTM C311-91	ASTM C311-91	
			ASTM C470-87	ASTM C470-87	
		ASTM C494-62T	ASTM C494-90	ASTM C494-90	
			ASTM C511-85 (1991)	ASTM C511-85 (1991)	
			ASTM C566-89	ASTM C566-89	
		ASTM C350-62T	ASTM C618-92a	ASTM C618-92a	
			ASTM C666-90	ASTM C666-90	
			ASTM C1064-86	ASTM C1064-86	
			ASTM D75-87	ASTM D75-87	
		ASTM D1190-64	ASTM D1190-74 (1980)	ASTM D1190-74 (1980)	
		ASTM D1751-65	ASTM D1751-83 (1991)	ASTM D1751-83 (1991)	
			ASTM D4791-89	ASTM D4791-89	
			ASTM E96-92	ASTM E96-92	

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DIESEL GENERATOR ADDITION PROJECT - ARCHITECTURAL, CIVIL AND STRUCTURAL
DESIGN CODES AND STANDARDS (NOTES 1 & 2)

Component To Be Installed	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
Steel *	Steel	AISC 6th Ed.(1963)	AISC 9th Ed. (1989)	AISC 9th Ed. (1989)	The latest edition of AISC (9th Ed.) is used for design and construction of the steel work inside the Diesel Generator Building. Standard Review Plan 3.8.4 recommends the use of AISC for design of safety related structures. The requirements of the 9th Edition of AISC are similar with the 6th Edition of the Code. The 9th Edition of AISC contains additional requirements for design of certain structural elements. There are also relaxations to the requirements of the 6th Edition of the Code in certain cases and applications. Such relaxations are based on extensive research, experience, study, quality of workmanship and better quality assurance and does not affect the level of safety of the structures designed to the latest edition of the code. Specifically, a review of the applicable sections of the AISC 6th Edition and 9th Edition was made to identify any differences. The results of this review are given in Note 18 of this document. Note that the comparison between the codes is not meant to be in detail or complete, and it does not cover sections of the codes that are not applicable to the DGB. For compliance of the Diesel Generator Building design and construction with the requirements of U.S. NRC Standard Review Plan, and Regulatory Guides see the SRP and Regulatory Guides Compliance Summary Matrices.
		AISI 1963	AISI 1991	AISI 1991	
		ASTM A233-64	AWS A5.1-91	AWS A5.1-91	
		ASTM A233-64	AWS A5.5-91	AWS A5.5-91	
		ASTM A558-65	AWS A5.17-89	AWS A5.17-89	
			AWS A5.18-79	AWS A5.18-79	
		ASTM A558-65	AWS A5.20-79	AWS A5.20-79	
		ASTM A558-65	AWS A5.23-90	AWS A5.23-90	
			AWS B2.1-84	AWS B2.1-84	
		AWS D1.0-66	AWS D1.1-92	AWS D1.1-92	
			AWS A2.4-86	AWS A2.4-86	
			AWS D1.3-89	AWS D1.3-89	
			ASTM A1-84	ASTM A1-84	
			ASTM A6/A6M-91b	ASTM A6/A6M-91b	
		ASTM A36-66	ASTM A36/A36M-91	ASTM A36/A36M-91	
		ASTM A53-63	ASTM A53-90b	ASTM A53-90b	
			ASTM A123-89a	ASTM A123-89a	
		ASTM A307-65	ASTM A307-91	ASTM A307-91	
		ASTM A325-62	ASTM A325-91c	ASTM A325-91c	
		ASTM A354-64	ASTM A354-90	ASTM A354-90	
			ASTM A370-91a	ASTM A370-91a	
			ASTM A446/A446M-89	ASTM A446/A446M-89	
			ASTM A449-91a	ASTM A449-91a	
		ASTM A490-64	ASTM A490-91a	ASTM A490-91a	
			ASTM A500-90a	ASTM A500-90a	
			ASTM A525-91b	ASTM A525-91b	
			ASTM A526/A526M-90	ASTM A526/A526M-90	
			ASTM A529/A529M-89	ASTM A529/A529M-89	
			ASTM A563-91c	ASTM A563-91c	
			ASTM A569/A569M-91a	ASTM A569/A569M-91a	
		ASTM E164-65	ASTM E164-90	ASTM E164-90	
			ASTM E165-91	ASTM E165-91	
		ASTM E109-63	ASTM E709-91	ASTM E709-91	
			CMAA #74	CMAA #74	

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DIESEL GENERATOR ADDITION PROJECT - ARCHITECTURAL, CIVIL AND STRUCTURAL
DESIGN CODES AND STANDARDS (NOTES 1 & 2)

Component To Be Installed	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
Soil *	Soil	ASTM C136-63 AASHO T180-57	ASTM C136-84a ASTM D422-63 (1990) ASTM D698-91 ASTM D854-91 ASTM D1556-90 ASTM D1557-91 ASTM D1586-84 ASTM D1587-83 ASTM D2166-90 ASTM D2167-84 (1990) ASTM D2216-90 ASTM D2435-90 ASTM D2487-90 ASTM D2844-89 ASTM D2850-87 ASTM D2922-91 ASTM D4318-84 ASTM D4428/D4428M-84 ASTM G51-77 (1984) ASTM G57-78 (1984)	ASTM C136-84a ASTM D422-63 (1990) ASTM D698-91 ASTM D854-91 ASTM D1556-90 ASTM D1557-91 ASTM D1586-84 ASTM D1587-83 ASTM D2166-90 ASTM D2167-84 (1990) ASTM D2216-90 ASTM D2435-90 ASTM D2487-90 ASTM D2844-89 ASTM D2850-87 ASTM D2922-91 ASTM D4318-84 ASTM D4428/D4428M-84 ASTM G51-77 (1984) ASTM G57-78 (1984)	

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DIESEL GENERATOR ADDITION PROJECT - ARCHITECTURAL, CIVIL AND STRUCTURAL
DESIGN CODES AND STANDARDS (NOTES 1 & 2)

Component To Be Installed	Existing PBNP Equivalent Component	Existing PBNP Equivalent Component Design Codes	Component To Be Installed Design Codes	Current Industry Design Codes	Remarks
Wind Pressure	Wind Pressure	ASCE 3269	ASCE 7-88 (1990)	ASCE 7-88 (1990)	ASCE 7-88 formerly was called ANSI 58.1. ASCE Paper 3269 is the basis of ANSI 58.1. ASCE 7-88 requirements for wind pressure are more conservative than the requirements of ASCE 3269.
Tornado Pressure Tornado Missiles	Tornado Pressure Tornado Missiles	ASCE 3269 B-TOP-3 (Ref.4) BC-TOP-9A, Rev. 2 (Ref.5)	ASCE 3269 B-TOP-3 BC-TOP-9A, Rev. 2	ASCE 3269 N/A BC-TOP-9A, Rev. 2	
Seismic	Seismic	PBNP FSAR (Ref.1)	PBNP FSAR	PBNP FSAR	
General	General	Wisconsin Administration Code (1966) ANSI N45.2.5 ANSI N45.2.6 PBNP-SDC-1967 (Ref.3)	Wisconsin Administrative Code (1991) ANSI N45.2.5 ANSI N45.2.6 AWS D14.1-85 PBNP-SDC-1967 AISC Detailing for Steel Construction, 1983 AISC Engineering for Steel Construction, 1984	Wisconsin Administrative Code (1991) ANSI N45.2.5 ANSI N45.2.6 or ANSI/ASME NQ-1-1983 AWS D14.1-85 N/A AISC Detailing for Steel Construction, 1983 AISC Engineering for Steel Construction, 1984	"General" in columns 1 and 2, refers to the codes, standards, and other references applicable to steel and concrete structures.

NOTES:

1) List of Codes and Standards

AASHO	
T180	Method of Testing Compaction
ACI	
211.1	Standard Practice for Selecting Proportion for Normal, Heavy Weight and Mass Concrete
212.3R	Chemical Admixtures for Concrete
226.3R	Use of Fly Ash in Concrete Mixtures
301	Specifications for Structural Concrete for Buildings
302.1R	Guide for Concrete Floor and Slab Construction.
304R	Guide for Measuring, Mixing, Transporting and Placing Concrete
304.2R	Placing Concrete by Pumping Methods
304.4R	Placing Concrete with Belt Conveyors
305R	Hot Weather Concreting
306R	Cold Weather Concreting
308	Standard Practice for Curing Concrete
309R	Guide for Consolidation of Concrete
309.1R	Behavior of Fresh Concrete During Vibration
309.2R	Identification and Control of Consolidation - Related Surface Defects in Formed Concrete
311.4R	Guide for Concrete Inspection
311.5R	Batch Plant Inspection and Field Testing of Ready-Mixed Concrete
315	Details and Detailing of Concrete Reinforcement
315R	Manual of Engineering and Placing Drawings for Reinforced Concrete Structures
318/318R	Building Code Requirements for Reinforced Concrete and Commentary
347R	Guide to Formwork for Concrete
604	Recommended Practice for Winter Concreting
605	Recommended Practice for Hot Weather Concreting
613	Recommended Practice for Selecting Proportions for Concrete
613A	Recommended Practice for Selecting Proportions for Structural Lightweight Concrete
614	Recommended Practice for Measuring, Mixing, and Placing Concrete
AEIC	
CS5	Specification for Thermoplastic and Crosslinked Polyethylene Insulated Shielded Power Cables Rated 5 through 35KVA
CS6	Specification for Ethylene Propylene Rubber Insulated Shielded Power Cables Rated 5 through 69KV
AISC	
AISC 9th	Manual of Steel Construction, Allowable Stress Design
	Specification for Structural Steel Buildings, Allowable Stress Design and Plastic Design, with Commentary
	Code of Standard Practice for Steel Buildings and Bridges
	Specification for Structural Joints Using ASTM A325 or A490 Bolts
	Detailing for Steel Construction, Fisrt Edition 1983
	Engineering for Steel Construction, 1984
AISI	
AISI 1991	Specification for Design of Cold-Formed Steel Structural Members
ANSI	
B16.5	Pipe Flanges and Flanged Fittings
B16.9	Factory-Made Wrought Steel Buttwelding Fittings
B16.11	Forged Steel Fittings, Socket-Welding and Threaded

B16.34	Valves - Flanged, Threaded and Welding End
B30.10	Hooks
B30.11	Monorails and Underhung Cranes
B30.16	Overhead Hoists (Underhung)
B31.1	Power Piping
C2	The National Electrical Safety Code
C37.2	Electrical Power System Device Function Numbers
C37.03	Power Switchgear Supplement Definition
C37.04	Rating Structure of AC High Voltage Circuit Breakers Rated on Symmetrical Current Basis (with Supplement 04C)
C37.09	Test Procedure for AC High Voltage Breakers Rated on a Symmetrical Current Bases (Supplement 09C and 09E)
C37.010	Application Guide for AC High Voltage Circuit Breaker (Supplement 010B, and 010D)
C37.011	Application Guide for Transient Recovery Voltage for AC High Voltage Circuit Breaker Rated on Symmetrical Current Basis
C37.11	Electrical Control for AC High Voltage Circuit Breakers Rated on a Symmetrical Bases and Total Current Bases
C37.12	AC High Voltage Circuit Breakers Rated on a Symmetrical Current Bases
C37.82	Qualification of Switchgear assemblies for Class 1E Application in Nuclear Power Generating Stations
C37.97	Guide for Protective Relay Application to Power System Buses
C37.90	Standards for Relays and Relay Systems Associated with Electric Apparatus
C37.100	Power Switchgear, Definition
C50.10	Synchronous Machines, General Requirements
C50.12	Requirements for Salient Pole Synchronous Generators
C57.12.01	Dry Type Distribution and Power Transformers
C57.12.70	Terminal Marking and Connection for Distribution and Power Transformers
C57.12.50	Distribution Transformers
C57.12.91	Test Code for Dry Type Distribution and Power Transformers
HST-4M	Performance Standard for Overhead Electric Wire Rope Hoists
MMA MH27.1	Specifications for Underhung Cranes and Monorail Systems
N45.2.5	Supplementary Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel During Construction Phase of Nuclear Power Plants
N45.2.6	Qualification of Inspection, Examination and Testing Personnel for Nuclear Facilities

<u>API</u>

650	Welded Steel Tanks for Oil Storage
676	Positive Displacement Pumps-Rotary

<u>ASCE</u>

ASCE-7	Minimum Design Loads for Buildings and Other Structures (Formerly ANSI A58.1)
ASCE-3269	Wind Forces on Structures

<u>ASME</u>	American Society of Mechanical Engineers
III	Boiler & Pressure Vessel Code; Nuclear Power Plant Components
VIII	Pressure Vessels

<u>ASTM</u>

A1	Standard Specification for Carbon Steel Tee Rails
A6/6M	Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use
A36	Standard Specification for Structural Steel
A47	Standard Specification for Ferritic Malleable Iron Castings
A53	Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
A105	Specification for Forgings, Carbon Steel for Piping Components
A106	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service
A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153	Zinc Coating (Hot Dip) on Iron and Steel Hardware

A167	Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
A185	Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
A213/A213M	Seamless, Ferritic and Austenitic Alloy-Steel Boiler, Superheater, and Heat-Exchanger Tubes
A216	Specification for Steel Castings, Carbon Suitable for Fusion Welding for High-Temperature Services
A233	Welding Electrodes (Discontinued)
A240	Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Fusion-Welded Unfired Pressure Vessels
A269	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A307	Standard Specification for Carbon Steel Bolts and Studs, 60,000 Psi Tensile Strength
A312/A312M	Seamless and Welded Austenitic Stainless Steel Tubing for General Service
A325	Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 Ksi Minimum Tensile Strength
A354	Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
A370	Standard Methods and Definitions for Mechanical Testing of Steel Products
A446	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
A449	Standard Specification for Quenched and Tempered Steel Bolts and Studs
A490	Specification for Heat Treated Steel Structural Bolts, 150 Ksi Tensile Strength
A500	Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
A516	Carbon Steel Plates for Pressure Vessels for Moderate and Lower Temperature Service
A525	General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
A526	Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality
A529	Structural Steel with 42 ksi (290 MPa) Minimum Yield Point (1/2 in. (13 mm) Maximum Thickness)
A536	Standard Specification for Ductile Iron Castings
A558	Flax and Wire Combinations for Submerged-Arc Welding (Discontinued)
A563	Standard Specification for Carbon and Alloy Steel Nuts
A569	Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality
A572	High Strength Low Alloy Columbium-Vanadium Steel of Structural Quality
A615	Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
A641	Zinc-Coated (Galvanized) Carbon Steel Wire
A781/781M	Specification for Castings, Steel and Alloy, Common Requirements for General Industrial Use
B3	Standard Specification for Soft or Annealed Copper Wire
B8	Standard Specification for Concentric Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
B33	Standard Specification for Tinned Soft or Annealed Copper Wire for Electrical Purposes
B61	Specification for Steam or Valve Bronze Castings
B68	Seamless Copper Tube, Bright Annealed
B88	Seamless Copper Water Tube
C29	Test Method for Unit Weight and Voids in Aggregate
C31	Test Methods of Making and Curing Concrete Test Specimens in the Field
C33	Specification for Concrete Aggregates
C39	Test Method for Compressive Strength of Cylindrical Concrete Specimens
C40	Test Method for Organic Impurities in Fine Aggregates for Concrete
C42	Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
C70	Test Method for Surface Moisture in Fine Aggregate
C78	Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)
C88	Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
C94	Specification for Ready-Mixed Concrete
C109	Test Method for Compressive Strength of Hydraulic Cement Mortar
C114	Test methods for Chemical Analysis of Hydraulic Cement
C117	Test Method for Material Finer Than No. 200 (75 micrometers) Sieve in Mineral Aggregates by Washing
C127	Test Method for Specific Gravity and Absorption of Course Aggregate
C128	Test Method for Specific Gravity and Absorption of Fine Aggregate
C131	Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
C136	Standard Method for Sieve Analysis of Fine and Coarse Aggregates
C138	Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete
C142	Test Method for Clay Lumps and Friable Particles in Aggregates

C143	Test Method for Slump of Hydraulic Cement Concrete
C150	Specification for Portland Cement
C171	Specification for Sheet Materials for Curing Concrete
C172	Practice for Sampling Freshly Mixed Concrete
C173	Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
C191	Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
C192	Test Method of Making and Curing Cement Test Specimens in the Laboratory
C227	Test Method for Potential Alkali Reactivity for Cement-Aggregate Combinations (Mortar-Bar Method)
C231	Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
C233	Methods of Testing Air-Entraining Admixture for Concrete
C260	Specification for Air-Entraining Admixtures for Concrete
C289	Test Method for Potential Reactivity of Aggregates (Chemical Method)
C295	Guide for Petrographic Examination of Aggregates for Concrete
C309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
C311	Method for Sampling and Testing Fly Ash or Natural Pozzolah for Use as a Mineral Admixture in Portland Cement Concrete
C350	Fly Ash in Concrete
C470	Specification for Molds for Forming Concrete Test Cylinders Vertically
C494	Specification for Chemical Admixtures for Concrete
C511	Specifications for Moist Cabinets, Moist Rooms and Water Storage Tanks Used in the Testing of Hydraulic Cement and Concrete
C516	Specification for Vermiculite Loose Fill Insulation
C566	Test Methods for Total Moisture Content of Aggregate by Drying
C618	Specification for Fly Ash and Raw or Calcined Natural Pozzolah for Use as a Mineral Admixture in Portland Cement Concrete
C665	Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing
C666	Test Method for Resistance of Concrete to Rapid Freezing and Thawing
C1064	Test Methods for Temperature of Freshly Mixed Portland Cement Concrete
D75	Particles for Sampling Aggregates
D422	Method for Particle-Size Analysis of Soils
D698	Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort
D751	Method of Testing Coated Fabrics
D854	Standard Test Method for Specific Gravity of Soils
D1190	Specification for Concrete Joint Sealer Hot-Poured Elastic Type
D1556	Standard Test Method for Density and Unit Weight of Soil In-Place by the Sand-Cone Method
D1557	Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
D1586	Penetration Test and Split-Barrel Sampling of Soils
D1587	Sampling Method of Thin Walled Tube Sampling of Soils
D1682	Test Methods for Breaking Load and Elongation of Textile Fabrics
D1751	Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
D2166	Unconfined Compressive Strength of Cohesive Soil
D2167	Standard Test Method for Density and Unit Weight of Soil In-Place by the Rubber-Balton Method
D2216	Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock
D2435	Test Method for One-Dimensional Consolidation Properties of Soils
D2487	Standard Test Method for Classification of Soils for Engineering Purposes
D2844	Test Method for Resistance R-Value and Expansion Pressure of Compacted Soils
D2850	Test Method for Unconsolidated, Undrained Strength of Cohesive Soils in Triaxial Compression
D2863	Test Method for Measuring the Minimum Oxygen Concentration to Support Candle Like Combustion of Plastics (Oxygen Index) (new distribution transformer, DC distribution panel, MCC).
D2922	Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
D3786	Test Method for Hydraulic Bursting Strength of Knitted Goods
D4318	Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
D4428	Crosshole Seismic Testing
D4491	Test Methods for Water Permeability
D4791	Standard Test Method for Flat or Elongated Particles in Coarse Aggregate
E8	Methods of Tension Testing of Metallic Materials

E96	Test Methods for Water Vapor Transmission of Materials
E109	Dry Powder Magnetic Particle Inspection
E164	Practice for Ultrasonic Contact Examination of Weldments
E165	Practice for Liquid Penetrant Examination
E709	Practice for Magnetic Particle Examination
G51	Test Method for pH of Soil for Use in Corrosion Testing
G57	Method for Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method
AWS	
A2.4	Standard Symbols for Welding, Brazing, and Non-Destructive Examination
A5.1	Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
A5.5	Specification for Low-Alloy Steel Covered Arc Welding Electrodes
A5.17	Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding
A5.18	Specification for Carbon Steel Filler Metals for Gas Shielded Arc Welding
A5.20	Specification for Carbon Steel Electrodes and Flux-Cored Arc Welding
A5.23	Specification for Low-Alloy Steel Electrodes and Fluxes for Submerged Arc Welding
B2.1	Standard for Welding Procedure and Performance Qualification
D1.1	Structural Welding Code - Steel
D1.3	Structural Welding Code - Sheet Steel (MCC)
D14.1	Industrial and Mill Crane and Other Material Handling Equipment (Crane)
CAGI	Compressed Air and Gas Institute
CMAA	
74	Crane Manufacturers Association of American, "Specifications for Top Running and Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist"
CRSI	Concrete Reinforcing Steel Institute Reinforced Concrete Manual of Standard Practice, 25th Ed., DA4, 1990 Recommended Practice for Placing Reinforcing Bars, 1992
DEMA	Diesel Engine Manufacturers Association
EJMA	Expansion Joint Manufacturers Association
EOCI	Electric Overhead Crane Institute
HMA	Hoist Manufacturers Association"
HI	Hydraulic Institute
IEEE	
1	General Principles for Temperature Limits in the Rating of Electric Equipment
43	Recommended Practice for Testing Insulating Resistance of Rotating Machines
85	Standard Test Procedure for Airborne Sound Measurements on Rotating Electrical Machinery
112	Standard Test Procedure for Polyphase Induction Motors and Generators
115	Test Procedures for Synchronous Machines
115A	Standard Procedures for Obtaining Synchronous Machine Parameters by Standstill Frequency Response Testing
117	Standard Test Procedure for Evaluation of System of Insulating Materials for Random Wound AC Electric Machinery
275	Recommended Practice for Thermal Evaluation of Insulation System for AC for AC Electric Machinery
649	IEEE Standard Criteria for Qualifying Class 1E Motor Control Centers for Nuclear Power Generating Stations

ICEA	
P32.382	Short Circuit Characteristics of Insulated Cable
NEMA	
AB1	Molded Case Circuit Breakers
FU1	Low Voltage Cartridge Fuses
ICS2	Industrial Control Devices, Controllers and Assemblies
ICS2-3	Instruction for the Handling, Installation, Operation, and Maintenance of Motor Control Centers
ICS6	Enclosure for Industrial Controls and Systems
KS1	Enclosed and Miscellaneous Distribution Equipment Switches
MG1	Motors and Generators
MG2	Safety Standards for Construction and Guide for Selection, Installation and Use of Electric Motors
PB1	Panel Boards
SG4	Alternating Current High Voltage Circuit Breakers
SG5	Power Switchgear Assemblies
ST20	Dry-Type Transformers for General Applications
WC8	Ethylene-Propylene-Rubber Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy
WC26	Wire and Cable Packaging
250	Enclosure for Electrical Equipment (1000 Volt Maximum)
NEPIA	Nuclear Energy Property Insurance Association
NFPA	National Fire Protection Association
30	Flammable and Combustible Liquid Code
37	Stationary Combustion Engines and Gas Turbines
70	National Electrical Code
NRMCA	National Ready-Mixed Concrete Association
	National Ready-Mixed Concrete Association Standards
MMA	Monorail Manufacturers Association
NBS	National Bureau of Standards, U.S. Department of Commerce
PS-1	Softwood Plywood, Construction and Industrial
SP	Special Publications
SP-2	ACI Manual of Concrete Inspection
SP-66	ACI Detailing Manual
TEMA	Tubular Exchanger Manufacturers Association
UL	
44	Electric Wire and Cables
50	Cabinets and Boxes
58	Steel Underground Tanks
67	Panelboards
198L	DC Fuses for Industrial Use
489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
508	Industrial Control Equipments
525	Flame Arrectors for Use on Vents of Storage Tanks for Petroleum and Gas
845	Motor Control Centers
1072	Medium Voltage Power Cables

1561 Dry Type General Purpose and Power Transformers

USASI(ASI) U.S. American Standards Institute

General Design Codes and Other References

Wisconsin Administrative Code, Building Code, Department of Industry, Labor and Human Relation, 1991

Structural Design Criteria for the Point Beach Nuclear Plant, (PBNP-SDC), 1966, Revised 1967, Bechtel Corporation. (Reference 3)

Design Criteria for Nuclear Power Plants Against Tornado, B-TOP-3, March 1970, Bechtel Corporation. (Reference 4)

Design of Structures for Missile Impact, BC-TOP-9A, Rev. 2, September 1974, Bechtel Corporation. (Reference 5)

Point Beach Nuclear Plant, Final Safety Analysis Report, (PBNP-FSAR), Manual 74, June 1992, WEPCO. (Reference 1)

2) D/G skid mounted components are designed to Industry Standards (Diesel Engine Manufacturers Association (DEMA)) and are not addressed in this evaluation.

3) * Safety Related Item
** Partially Safety Related Item

4) Additional requirements were included in some of the original specifications which exceed the requirements in the referenced Codes and/or Standards.

The additional requirements are as follows:

Component	Additional Requirements
Fuel Pumps	Seismic design without loss of function. Shop test at rated conditions and hydrotest to HI stds.
Diesel (Day Tank (Filters, Silencers, Flanges, Expansion Joints, Air Reservoirs, Flexhose, Air Compressor, Diesel Engine (Air Compressor Driven))	Seismic Class 1 design Note that the purchase specification states: "Each unit, engine, generator, exciter, coupling and base plate shall be designed...". This has been taken to include all D/G manufacturer supplied components.
7 Day Tank	Seismic design, Engineer review of coating, shop inspection.
Pipe, Fittings	Weld end prep to Bechtel/Westinghouse drawings; review welding, fabrication, testing, cleaning, bending, forming, repair, and heat treatment procedures; traceability of tests and examinations; welding restrictions; branch reinforcement approval; bending restrictions. Certification that spool pieces would be capable of withstanding 150% of design pressure (hydro test not required); mill test reports (specification indicates that mill test reports are to be kept on file for 5 years but does not specifically state that mill test reports are required).
Demin. Water Tanks (existing-coated C.S.)	Seismic design, coating tests, procedure approval.

5) DEMA does not give fabrication guidance. The component was provided by the diesel manufacturer and fabricated to the standards of the diesel manufacturer.

6) The "Current Industry Design Codes" would be enhanced with the additional requirements which were included in the Specifications for "Existing PBNP Equivalent Component Design Code" (for example, See Note 4 above for Mechanical) and any other requirements determined to be appropriate to assure a quality product consistent with current approaches. These include (as appropriate):

- Material Certification
- A Program consistent with ANSI N45.2
- NDE as appropriate to the component
- Certification of Welders and NDE Personnel
- Seismic and Environmental Qualification
- Performance/Integrity Testing

7) The use of the most recent commercial codes and standards as opposed to the original is necessitated by the ability to procure components which would be manufactured to the latest editions. It has been determined that, for the standards relevant to this note, a comparison is not required with the edition utilized in the original plant design as any reduction that may have occurred in conservatisms will be compensated for by improved QA (See Note 10) and as a result of improved technology e.g., fabrication and welding techniques which if implemented as required would maintain the same or better margin of safety.

8) The utilized codes/standards for the Diesel Generator Project are consistent with current practices in the industry. As the original plant specification only referenced to DEMA standards which are performance oriented (thereby defaulting to manufacturer's standards), the current approach is believed to provide equivalent or enhanced quality components thereby maintaining the current safety levels (when utilized for safety related components).

9) Comparison of ANSI B31.1-1967 and ANSI B31.1-1989

The six chapters of B31.1 were reviewed to ascertain if any changes in the 1989 Edition of the standard from the 1967 Edition would affect the level of conservatisms utilized in the original design for the components within the scope of the Diesel Generator Addition Project and therefore potentially affect the level of safety. The following is a summary of the comparison of each chapter.

Chapter I — Not compared as it only provided the scope and definitions.

Chapter II — Both editions are considered equivalent. Equivalent equations and factors are utilized. Material allowables are equivalent for the materials addressed in 1967. Welded Stainless Steel does have higher allowables but these materials are not being utilized.

The 1989 edition is more definitive in certain areas and addresses strain analysis calculations. The These variances do not effect safety margins utilized.

Chapter III — These chapters are considered equivalent although the 1989 Edition addresses many more materials. As the piping codes utilized for final plant design are being maintained,no materials not addressed in the 1967 standard should be introduced.

Chapter IV — These chapters are equivalent.

Chapter V — The 1989 edition is more detailed and more specific providing quantitative solutions where the 1967 edition provided qualitative guidance. This is considered as an enhancement as far as allowing for better control/consistency in addressing the requirements.

Chapter VI — Concerning NDE, the 1967 Standard refers to other standards while the 1989 Standard provides acceptance standards. As the NDE requirements utilized for the project are consistent with those required for ASME B&PV Code, Section III, Class 3 components, this difference is not considered relevant with the acceptance criteria in the standards enveloped by that being utilized by the project.

Summary — There are no differences between the two editions of the standards that would reduce the safety margins incorporated into the original design. Additionally, the enhanced Quality Assurance, material and personnel certification and testing (including NDE) being invoked as part of the project is intended to enhance the safety considerations of the project (See Note 10).

10) Specific US ASI/ASME Code and Edition intended is not identified in the specification.

11) DEMA 1958 and DEMA 1972 are both performance oriented standards that default to manufacturer fabrication standards. Since many engines have been provided under the 1972 Edition and there is no way to evaluate the fabrication practice differences, it is assumed that the level of safety is equivalent to or enhanced due to the "lessons learned" and technological changes during the time interval between the publishing of the standards.

12) Deleted

13) ASA standards have become part of ANSI standards.

14) New design codes to latest edition.

15) Deleted

16) Comparison of ACI 318-63 With ACI 318-89

a) The general sections relating to standards and test, construction requirements, concreting and reinforcing details are expanded in ACI 318-89. The requirements are either the same or more stringent than the requirements of ACI 318-63 with one exception. Chapter 2 of ACI 318-63 "Load Tests of Structures" is deleted from ACI 318-89.

b) ACI 318-89 is more stringent on treatment of wind and seismic loads. The load combinations consisting of these loads are more conservative than the 63 Code. Chapter 21, "Special Provisions for Seismic Design" is added.

c) The load factors used in the dead and live load combination are less conservative in ACI 318-89 Code. The load factors have decreased from 1.5 to 1.4 for dead load and from 1.8 to 1.7 for live load. The decrease in the load factors does not necessarily reduce the level of safety of a building designed and built to 89 code versus a building designed and built in year 1963 to 63 Code. The additional detailing requirements, workmanship, etc. cited in item (a) above provide an overall safer building. In addition, the reduction of the load factors is acceptable to the Engineering Community and the NRC Staff.

d) The procedure for calculation of development length and splicing of reinforcement in ACI 318-63 is different from ACI 318-89. According to ACI 318-63, the ultimate flexural bond stress calculated for a reinforcement should be less than allowable strengths given in the Code for ASTM A305 and ASTM A408 reinforcements. ACI 318-89, requires that the development lengths and lap splices be smaller than values specified for ASTM A615, ASTM A616, A617 and A706. ACI 318-63 Procedure cannot be used for the reinforcement presently used in the U.S.A. However a brief review of the required developed length for #9 bar (as an example) regardless of the type of reinforcements shows that ACI 318-89 requirements are the same or in some cases more stringent than ACI 318-63.

e) The strength reduction factors, and minimum reinforcing requirements for walls, slabs and flexural members applicable to the D.G. Building are the same in 63 and 89 Codes.

17) Comparison of ACI-318-89 and ACI 349-90

a) ACI 349-90 requires a Quality Assurance Program covering nuclear safety related structures while ACI 318-89 does not. PBNP has a Quality Assurance Program in place according to Section 1.8 of the FSAR.

b) ACI 349-90 requires testing admixtures for concrete and has stricter requirements for material storage. No testing of admixtures is planned for the DGB. The material will be purchased from a vendor with a quality assurance program. Adequate requirements for control of the quality of concrete are provided in the Ready-Mix Concrete Specification 6704.001-SP-S-026.

c) Lightweight concrete is not permitted by ACI 349-90 and is not being used in the Diesel Generator Building.

d) Aluminum pipe is not permitted in ACI 349 to convey concrete. Also a method of temperature control in hot weather concreting is required to be specified in construction specification according to ACI 349. The Cast-In-Place Concrete Specification 6704.001-SP-S-025 for the DGB is consistent with those requirements. ACI 305R-91, "Hot Weather Concreting", provides methods for temperature control and is being referred to in the Concrete Specification.

e) ACI 349 requires that forms and form release agents be compatible with coating systems. Diesel Generator Concrete Specification complies with this requirement. ACI 349 also requires that pressure pipes embedded in concrete be tested before concreting. There are no pressure pipes embedded in concrete in the Diesel Generator Building.

f) Relocation of reinforcement requires Engineer approval according to ACI 349. The Concrete Specification for the Diesel Generator Building provides provision for control of any deviations from the drawing requirements.

g) Minimum reinforcing requirements for walls and slabs in ACI 349-90 are more stringent than ACI 318-89. The reinforcing bars provided in the Diesel Generator Building are more than the minimum reinforcing bars required by ACI 349-90.

h) The load combinations in ACI 349-90 are broadly expanded to include severe, extreme and abnormal loads. The load combinations considered for the design of the Diesel Generator Building are in conformance with the SRP 3.8.4 and thus satisfy the requirements of ACI 349-90.

i) The minimum slab thickness requirements in ACI 349-90 are higher than what is required in ACI 318-89. The 2' thick slab used in the Diesel Generator Building satisfies the ACI 349-90 criteria.

j) The walls which are subjected to transverse loads must satisfy strength and deflection requirements given in ACI 349-90. The 2' thick wall of the Diesel Generator Building is in compliance with the requirements.

k) Crack control requirements in ACI 349-90 are less conservative than ACI 318-89.

l) Membrane stresses should be considered in calculating punching shear capacity according to ACI 349-90. The membrane stresses are negligible in the Diesel Generator Building since loads that induce high membrane stresses (internal pressures, etc.) are not postulated for the building.

m) There are additional requirements for mechanical splices and splices of "tension tie members" in ACI 349-90. Mechanical splices and tension tie members are not used in the Diesel Generator Building.

n) The requirements for calculation of development of deformed bars in tension are less conservative in ACI 349-90, but the requirements for calculation of the length of lap splices of these bars are more conservative. Overall for #6 and #7 reinforcing bars used in the Diesel Generator Building, the length of lap splices calculated based on ACI 318-90 is more conservative than ACI 349-90.

o) Appendix A, "Thermal Considerations", is included in ACI 349-90. The Diesel Generator Building is not subjected to high temperature variation. The reinforcing provided is sufficient for the normal temperature changes and shrinkage of concrete.

p) Appendix B, "Steel Embedments", is included in ACI 349-90. The steel embedments in the DGB are designed in accordance with Appendix B in ACI 349-90.

q) Appendix C, "Special provision for Impulsive and Impactive Effects", is included in ACI 349 90. The requirements of this Appendix and of Position 10 of Regulatory Guide 1.142 are invoked to design the walls and slabs of the DGB for the effect of the tornado-generated missiles.

18) Comparison of AISC 6th and 9th Edition

a) Limiting width-thickness ratio for compression elements for compact section is higher in 9th Edition. Some steel profiles that were not considered to be compact in the 6th Ed. meet the requirements of compact section in 9th Ed.

b) The requirements for design of tension members are more conservative in the 9th Edition. Allowables are the same, or are more conservative in the 9th Edition (Reference Section 1.5.1.1, 6th Edition and Chapter D, 9th Edition).

c) The design procedure for slender compressive members (single angles, struts, etc.) is completely different and more conservative in 9th Edition. It requires consideration of eccentricity of loads, the flexural-torsional buckling, etc. in design of such members. (Reference Appendix B of 9th Edition).

d) The requirements for compact and non compact flexural members with unbraced length greater than L_c is changed in 9th Edition. There are more requirements to be met but Equation F1-6 of the 9th Edition, which gives the allowable compressive stress, may be less conservative than the Formula 4 of the 6th Edition for certain cases.

e) There are more requirements for compact rectangular and circular tubes in the 9th Edition (Reference Section F3 9th Edition).

f) Allowable bearing stresses on concrete are less conservative in the 9th Edition. (Reference Section 1.5.5 of 6th Edition and J9 of 9th Edition).

g) Minimum size of fillet welds are lower in 9th Edition for certain part thicknesses.

h) The allowable stress in welds are higher in 9th Edition. (Reference 1.5.3 6th Edition and Table J2.5 9th Edition). However, there are more requirements for welded connection in 9th Edition.

i) The allowable stresses in the rivets and bolts are higher in the 9th Edition. (Reference Table 1.5.2.1 6th Edition, Table J3.2 of the 9th Edition).

j) The method of combining shear and tension in rivets and bolts is different in the two codes. The allowable tension stress calculated using equations given in Table J3.3 of the 9th Edition is higher than those in the 6th Edition. (Reference Section 1.6.3 6th Edition and Table J3.3 9th Edition).

k) The section dealing with fatigue is greatly expanded in the 9th Edition. (Reference Section 1.7 of 6th Edition and Appendix K of 9th Edition).

l) The limiting slenderness ratios are more liberal in the 9th Edition. (Reference Section 1.8 6th Edition and Chapter B 9th Edition).

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 The applicable rules and basic acceptance criteria pertinent to the areas of this section of the Standard Review Plan are:				
1. 10 CFR Part 50, §50.55a, "Codes and Standards." This rule requires that structures, systems, and components shall be designed, fabricated erected, constructed, tested and inspected in accordance with the requirement of applicable codes and standards commensurate with the importance of the safety function to be performed. (Ref. 1) 2. 10 CFR part 50, Appendix A: (a) General Design Criterion 1 - "Quality Standards and Records." This criterion requires that structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. It also requires that appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit. (Ref. 2) (b) General Design Criterion 2 - "Design Bases for Protection Against Natural Phenomena." This criterion requires that safety-related portions of the system shall be designed to withstand the effects of earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. (Ref. 3) (c) General Design Criterion 44 - "Cooling Water." This criterion requires that a system shall be provided with the safety function of transferring the combined heat load from structures, systems, and components important to safety to an ultimate heat sink under normal operating and accidental conditions. (Ref. 4)	N/A		Section 2.5.1 FSAR (Ref. 1)	The Diesel Generator Building (DGB) is located more than 100' away from the top of the bank of the Lake Michigan slope. The slope of the bank is 1 to 1 1/2, where as the slope of the beach is 1 to 100. The top of this bank is approximately 20 feet higher than the beach. The bank will be protected from erosion by extending the present riprapping of the bank to 50 feet beyond the edge of the DGB. Since the DGB is located more than 100 feet from the bank, and the slope of the bank is mild, and the bank is protected from erosion by riprapping, it is concluded that the bank will not fail. In the remote possibility of a slope failure due to extreme environmental conditions, the failure surface will be far enough away from the building as to not adversely affect the safety-related Structures, Systems and Components (SSC).

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) 3. 10 CFR Part 50, Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." This appendix establishes quality assurance requirements for the design, construction, and operation of those structures, systems, and components of nuclear power plants that prevent or mitigate the consequences of postulated accidents that could cause undue risk to the health and safety of the public. (Ref. 5) 4. 10 CFR Part 100, "Reactor Site Criteria." This part describes criteria which guide the evaluation of the suitability of proposed sites for nuclear power and testing reactors. (Ref. 6) 5. 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants." These criteria describe the nature of the investigations required to obtain the geologic and seismic data necessary to determine site suitability and identifies geologic and seismic factors required to be taken into account in the siting and design of nuclear power plants. (Ref. 7) The following regulatory guides provide information, recommendations, and guidance and in general describe a basis acceptable to the staff that may be used to implement the requirements of 10 CFR Part 50, §50.55a; 10 CFR Part 50, Appendix A, General Design Criteria 1, 2, and 44; 10 CFR Part 50, Appendix B; 10 CFR Part 100; and 10 CFR Part 100, Appendix A.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) 1. Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." This guide describes a basis acceptable to the staff that may be used to implement General Design Criteria 2 and 44 with regard to the ultimate heat sink, including necessary retaining structures and the canals and conduits connecting the ultimate heat sink with the cooling water system intake structures. (Ref. 8) 2. Regulatory guide 1.28, "Quality Assurance Program Requirements (Design and Construction)." This guide describes a method acceptable to the staff for complying with the Commission's regulations with regard to 10 CFR Part, 50 Appendix B, overall quality assurance program requirements during design and construction of nuclear power plants. (Ref. 9) 3. Regulatory Guide 1.132, "Site Investigations for Foundations of Nuclear Power Plants." This guide describes programs of site investigations related to geotechnical engineering aspects that would normally meet the needs for evaluating the safety of the site from the standpoint of the performance of foundation and earthworks under anticipated loading conditions including earthquake in complying with 10 CFR Part 100 and 10 CFR Part 100, Appendix A. It provides general guidance and recommendations for developing site-specific investigation programs as well as specific guidance for conducting subsurface investigations, the spacing and depth of borings, and sampling. (Ref. 10) 4. Regulatory Guide 1.138, "Laboratory Investigations of Soils for Engineering Analysis and Design of Nuclear Power Plants." This guide describes laboratory investigations and testing practices acceptable for determining soil and rock properties and characteristics needed for engineering analysis and design for foundations and earthwork for nuclear power plants in complying with 10 CFR Part 100 and 10 CFR Part 100, Appendix A. (Ref. 11)				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) The information in the SAR must be in compliance with the criteria presented in References 1 through 7. This section of the SAR is judged acceptable if the information presented is sufficient to demonstrate the dynamic and static stability of all slopes whose failure could adversely affect, directly or indirectly safety-related structures of the nuclear plant or pose a hazard to the public. The emergency cooling water source is of particular interest with regard to slope stability (Refs. 4 and 8). The secondary source of emergency cooling water should survive the operating basis earthquake (OBE) and design basis flood. Completeness is determined by the ability to make an independent evaluation on the basis of information provided by the applicant. Specific criteria necessary to meet the relevant requirements of the Commission regulations identified above are as follows: Subsection 2.5.5.1. In meeting the requirements of References 3, 4, and 6 and the regulatory positions contained in References 8, 10 and 11, the discussion of slope characteristics is acceptable if the subsection includes: 1. Cross sections and profiles of the slope in sufficient quantity and detail to represent the slope and foundation conditions. 2. A summary and description of static and dynamic properties of the soil and rock comprising seismic Category I embankment dams and their foundations, natural and cut slopes, and all soil or rock slopes whose stability would directly or indirectly affect safety-related and Category I facilities. The text should include a complete discussion of procedures used to estimate, from the available field and laboratory data, conservative soil properties and profiles to be used in the analysis. 3. A summary and description of groundwater, seepage, and high and low groundwater conditions.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) Subsection 2.5.5.2. In meeting the requirements of References 1, 2, 3, 6 and 7 and the regulatory positions of Reference 8, the discussicn of design criteria and analyses is acceptable if the criteria for the stability and design of all seismic Category I slopes are described and valid static and dynamic analyses have been presented to demonstrate that there is an adequate margin of safety. A number of different methods of analysis are available in the literature. Computer analyses should be verified by manual methods. Analysis using both deterministic and probabilistic approaches is desirable. To be acceptable, the static analyses should include calculations with different assumptions and methods of analysis to assess the following factors: 1. The uncertainties with regard to the shape of the slope, boundaries of the several types of soil within the slope and their properties, the forces acting on the slope, and pore pressures acting within the slope. 2. Failure surfaces corresponding to the lowest factor of safety. 3. The effect of the assumptions inherent in the method of analysis used. 4. Adverse conditions such as high water levels due to the probable maximum flood (PMF), sudden drawdown, or steady seepage at various levels. In general, safety factors related to the slope hazard are needed; however, actual values depend somewhat on the method of analysis, on the assumptions concerning the soil properties, on construction techniques, and on the range of material parameters.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) To be acceptable, the dynamic analyses must account for the effect of cyclic motion of the earthquake on soil strength properties. Actual test data are needed for both the in situ soils as well as for any materials used in the construction of dams or embankments. As discussed above, the various parameters, such as geometry, soil strength, modeling method (location and number of elements (mesh) if a finite-element analysis is used), and hydrodynamic and pore pressure forces, should be varied to show that there is an adequate margin of safety (Refs. 34 and 35). Where liquefaction is possible, major dam foundation slopes and embankments should be analyzed by state-of-the-art finite-element or finite-difference methods of analysis. Where there are liquefiable soils, changes in pore pressure due cyclic loading must be considered in the analysis to assess not only the potential for liquefaction but also the effect of pore pressure increase on the stress-strain characteristic of the soil and the post-earthquake stability of the slopes. <u>Subsection 2.5.5.3</u>. In meeting the requirements of Reference 7 and the regulatory positions of References 10 and 11, the applicant should describe the borings and soil testing carried out for slope stability studies and dam and dike analyses. The test data, which must meet the criteria set forth in Sections 2.5.1 and 2.5.4, could be presented in those sections and referenced in this subsection. Because dams, dikes, and natural or cut slopes are often remote from the main plant area, results of additional exploration, tests, and analyses for these areas should be presented in this subsection.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
2.5.5 STABILITY OF SLOPES REV. 2, July 1981 (cont'd) <u>Subsection 2.5.5.4.</u> In meeting the requirements of Reference 5 and the regulatory positions of References 9, 10, and 11, the applicant should describe the excavation, backfill, and borrow material planned for any dams, dikes, and embankment slopes. Planned construction procedures and control of earthworks should be described. To be acceptable, the information must be given as discussed in subsection 2.5.4.5. Some of this information could be presented in subsection 2.5.4.5. Because dams, dikes, and other earthworks are often remote from the main seismic Category I structures, it is necessary to complete this information in this subsection. Quality control techniques and requirements during and following construction must also be discussed and referenced to quality assurance sections of the SAR.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.2.1 SEISMIC CLASSIFICATION REV. 1, July 1981 Acceptance criteria is based on meeting requirements of the following regulations:				
1. 10 CFR Part 50, Appendix A, General Design Criterion 2, as it relates to the requirements that structures, systems, and components important to safety shall be designed to withstand the effects of earthquakes without loss of capability to perform necessary safety functions.	X			The Diesel Generator Building (DGB), the Emergency Diesel Generators (EDG) and all auxiliary and support systems including that part of ventilation system required to support operation of the engine and switchgear are classified as Seismic Category I and are designed to withstand the effects of an Operating Basis Earthquake (OBE) and Safe Shutdown Earthquake (SSE) [Design and Hypothetical Earthquakes]. These classifications comply with the requirements of Regulatory Guide 1.29.
2. 10 CFR Part 100, Appendix A, as it relates to certain structures, systems, and components being designed to withstand the Safe Shutdown Earthquake (SSE) and remain functional. These plant features are those necessary to assure: a. the integrity of the reactor coolant pressure boundary, b. the capability to shut down the reactor and maintain it in a safe shutdown condition, c. the capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the guideline exposures of 10 CFR Part 100.	X			
To meet the requirements of General Design Criterion 2 and 10 CFR Part 100, Appendix A, the following regulatory guide is used: Regulatory Guide 1.29, "Seismic Design Classification". This guide describes an acceptable method of identifying and classifying those plant features that should be designed to withstand the effects of the SSE.	X			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.1 WIND LOADINGS REV. 2 - July 1981 SEB accepts the design of structures that must withstand the effects of the design wind load if the relevant requirements of the General Design Criterion 2 concerning natural phenomena are complied with. The criteria necessary to meet the relevant requirements of GDC 2 are as follows:				
1. The wind used in the design shall be the most severe wind that has been historically reported for the site and surrounding area with sufficient margin for the limited accuracy, quantity, and period of time in which historical data has been accumulated.	X		FSAR 2.6.2 (Ref. 1)	Wind velocity of 108 mph is used in the design of the structures. The recurrence interval of this wind is 100 years.
2. The acceptance criteria for the design wind velocity and its recurrence interval, the velocity variation with height, the applicable gust factors, and the bases for determining these site-related parameters, are established by the Accident Evaluation Branch (AEB) and are contained in SRP Sections 2.3.1 and 2.3.2. The approved values of these parameters should serve as basic input to the review and evaluation of the structural design procedures.	N/A			Not applicable to DG Project. The variation of wind pressure with height is obtained from ASCE 7-88 (Formerly called ANSI 58.1).

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.1 WIND LOADINGS REV. 2 - July 1981 (cont'd)				
3. The procedures utilized to transform the wind velocity into an effective pressure to be applied to structures, parts and portions of structures, as delineated in ANSI A58.1, "Building Code Requirements for Minimum Design Loads in Buildings and Other Structures" (Ref. 2), are acceptable. In particular, the procedures utilized are acceptable if found in accordance with the following: For a design wind velocity of V_{30} mph specified at a height of 30 feet above the ground, the velocity pressure, q_{30}, is given by: $q_{30} = 0.00256 V^2_{30}$ psf The effective pressure for structures, q_F, and for portions thereof, q_p, at various heights above the ground should be in accordance with Table 5 and Table 6 of ANSI A58.1, respectively. Since most nuclear power plants are located in relatively open country, Exposure C, as defined in ANSI A58.1, should be selected for both tables. Depending upon the structure geometry and physical configuration, pressure coefficients may be selected in accordance with Section 6.4 of ANSI A58.1. Geometrical shapes that are not covered in this document are reviewed on a case-by-case basis. ASCE Paper No. 3269, "Wind Forces on Structures" (Ref. 3) may be used to obtain the effective wind pressures for cases which ANSI A58.1 does not cover.	X		Refs. 9, 22	The procedures of ASCE 7-88, July 1990 (formerly ANSI A58.1) is used to transform the wind velocity into wind pressure. Exposure C is assumed in accordance with this SRP.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.2 TORNADO LOADINGS REV. 2 - July 1981 SEB accepts the design of structures that must withstand the effects of the design tornado wind load and the associated missiles if the relevant requirements of General Design Criterion 2 concerning natural phenomena are complied with. The criteria necessary to meet the relevant requirements of GDC 2 are as follows:				
1. The tornado wind and associated missiles generated by the tornado winds used in the design shall be the most severe wind that has been historically reported for the site and the surrounding area with sufficient margin for the limited accuracy, quantity, and period of time in which historical data has been accumulated.	X		FSAR 5.1.2.2 (Ref. 1)	Tornado wind speed (rotational plus translational) of 360 mph is used as indicated in Subsection 5.1.2.2 of the FSAR. A pressure drop of 3 psi at a rate of 2 psi/sec is considered in developing the tornado wind loads. The pressure drop versus time used is in compliance with the requirements of Regulatory Guide 1.76 and is more conservative than the original PBNP tornado pressure drop. Two tornado generated missiles, a 4 inch x 12 inch x 12 foot plank and a 4000 pound automobile, as discussed in response to SRP 3.5.1.4 is also considered.
2. The acceptance criteria for the tornado wind velocity, the differential pressure and its associated time interval, the spectrum of tornado-generated missiles and their characteristics, and the bases for determining these parameters, are established by the Accident Evaluation Branch (AEB) as described in SRP Sections 2.3.1, 2.3.2, and 3.5.1.4. The approved values of these parameters should serve as basic input to the review and evaluation of the structural design procedures.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.2 TORNADO LOADINGS REV. 2 - July 1981 (cont'd) 3. The acceptance criteria for the procedures used to transform the tornado parameters into effective loadings on structures are as follows:				
a. For transforming the tornado wind velocity into an effective pressure applied to structures, the criteria delineated in either the American Society of Civil Engineers (ASCE) Paper No. 3269, "Wind Forces on Structures" (Ref. 2), or in ANSI A58.1, "Building Code Requirements for Minimum Design Loads in Buildings and Other Structures" (Ref. 3), are, in general, acceptable. In particular, the following shall apply: (i) The maximum velocity pressure, p, should be based upon the maximum tornado velocity, V, using the following formula: $p = 0.00256\ V^2$ psf, in which V is in mph. (ii) The velocity pressure should be assumed constant with height. (iii) The maximum velocity pressure, p, applies at the radius of the tornado funnel at which the maximum velocity occurs. The tangential velocity varies with the radial distance from the center of the tornado core. The variation may be considered in accordance with that described in the paper, "Tornado Resistant Design of Nuclear Power Plants" (Ref. 4). (iv) For calculating velocity pressures on external surfaces of structures, on external portions thereof, and on internal surfaces, where there are openings in the structure, appropriate shape coefficients shall be used in accordance with ASCE Paper No. 3269 (Ref. 2). Gust factors may be taken as unity.	X			American Society of Civil Engineers paper No. 3269, "Wind Forces on Structures" is used to transform the tornado wind speed to effective pressure applied to the Diesel Generator Building. Requirements of Section II.3 items (i), (ii), (iii) and (iv) of this SRP are considered.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.2 TORNADO LOADINGS REV. 2 - July 1981 (cont'd)				
b. If venting of a structure is adopted as a design measure to permit transforming the tornado-generated differential pressure into an effective reduced pressure, the acceptance criteria are established on a case-by-case basis, upon request, by the Auxiliary Systems Branch (ASB)	X		Ref. 21	The DGB is vented to reduce the internal pressure. the computer program TOPIC, an industry recognized program, is used to obtain the reduced maximum differential pressure between various compartments in the building. No specific acceptance criteria are established.
c. The acceptance criteria for transforming the tornado-generated missile impact into an effective or equivalent static load on structures are delineated in subsection II of SRP Section 3.5.3.	X			See response to SRP 3.5.3, subsection II.
d. Having established the effective loads for each of the above three individual tornado-generated effects, the combination thereof should then be determined in a conservative manner for each particular structure, as applicable. An acceptable method of combining these effects is as follows: (i) $W_t = W_w$ (ii) $W_t = W_p$ (iii) $W_t = W_m$ (iv) $W_t = W_w + .5 W_p$ (v) $W_t = W_w + W_m$ (vi) $W_t = W_w + .5 W_p + W_m$ where: W_t ..... total tornado load, W_w ..... tornado wind load W_p ..... tornado differential pressure load, and W_m ..... tornado missile load. For each particular structure or portion thereof, the most adverse of the above combinations should be used, as appropriate. These combined effects constitute the total tornado load which should then be combined with other loads as specified in SRP Sections 3.8.1, 3.8.4, and 3.8.5.	X			The combination of tornado wind pressure, tornado missile load and tornado differential pressure in accordance with this SRP is determined and used in design.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.3.2 TORNADO LOADINGS REV. 2 - July 1981 (cont'd)				
4. The information provided to demonstrate that failure of any structure or component not designed for tornado loads will not affect the capability of other structures or components to perform necessary safety functions is acceptable if found in accordance with either of the following: a. The postulated collapse or structural failure of structures and components not designed for tornado loads, including missiles, can be shown not to result in any structural or other damage to safety-related structures or components. b. Safety-related structures are designed to resist the effects of the postulated structural failure, collapse, or generation of missiles from structures, and components not designed for tornado loads.	N/A			There are no structures in the vicinity of the Diesel Generator Building whose failure could affect the building.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.4.1 FLOOD PROTECTION REV. 2, July 1981				
Acceptability of the flood protection measures described in the SAR is based on meeting specific general design criteria and regulatory guides. The plant design for protection of SSC from the effects of flooding is acceptable if it meets the relevant requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," and 10 CFR Part 100, Appendix A, "Seismic and Geologic Siting Criteria for Nuclear Power Plants," Section IV.C as related to protecting SSC important to safety from the effects of floods, tsunamis and seiches. Acceptance is based on the design meeting the guidelines of Regulatory Guide 1.59 with regard to the methods utilized for establishing the probable maximum flood (PMF), probable maximum precipitation (PMP), seiche and other pertinent hydrologic consideration; and the guidelines of Regulatory Guide 1.102 regarding the means utilized for protection of SSC important to safety from the effects of the PMF and PMP. If safety-related structures are protected from below-grade groundwater seepage by means of a permanent dewatering system, then the system should be designed as a safety-related system and meet the single failure criterion requirements.	X		Section 2.5 FSAR (Ref.1)	The site is protected from local flooding by the natural drainage of the site, a storm sewer system in the plant yard, and an interceptor ditch discharging to Lake Michigan. No permanent dewatering system is provided for the DGB because the water table is lower than the foundation elevation.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.1.1 INTERNALLY GENERATED MISSILES (OUTSIDE CONTAINMENT) REV. 2 - July 1981				
Acceptability of the design information on protection of essential systems and components from internally generated missiles presented in the applicant's safety analysis report (SAR) is based on meeting specific general design criteria and regulatory guides. The design of structures, systems and components is acceptable if the integrated design affords missile protection in accordance with General Design Criterion 4, with respect to protecting structures, systems and components important to safety against the effects of internally generated missiles that may result from equipment failures, in order to maintain their essential safety functions. Acceptance is based on the design meeting the guidelines of Regulatory Guide 1.115, as related to the identification and protection of SSC important to safety from the effects of turbine missiles, and the NRC staff verification that the applicant's essential SSC will be protected from internally generated missiles (outside containment) by location in individual missile-proof structures or by special localized protective shields or barriers.	X		Dwg. 6704-E-222104, 5 Rev. P2	Air intakes and exhaust stacks are not turbine missile protected. Turbine missiles cannot impact the DGB given its position relative to the turbine generator. The DGB is located outside the low trajectory turbine missile strike zone as defined by Regulatory Guide 1.115. Each EDG and its auxiliaries are protected from potential missiles generated by the second EDG located in the DGB and its auxiliaries by two 24" DGB internal walls. The G01/02 F.O. Transfer Pumps and associated piping is protected from EDG G03 by 12 inch DGB internal walls and from G04 by multiple 24" DGB internal walls. The walls are adequate to protect one EDG system from the internally generated missiles of the other system and the G01/G02 component from either of the G03 or G04 systems. Components within one system need not be protected from missiles originating from the same system in accordance with this SRP. Individual missile-proof structures or localized shields/barriers are not required. The non-safety related components of interest (e.g. the starting air compressors, the normally operating fans and the non-safety related starting air and service air valves (including the wet air receiver relief valves) are not a concern based on the following: (1) The fans are isolated from the EDG room and are not considered credible missile generators which could affect the adjacent vane axial fans as they have synchronous motors which will not overspeed. (2) The starting air compressors are not considered to generate missiles as they have synchronous motors or overspeed protection. (3) Wet air receiver relief valves and all other non-safety related air system valves are not considered viable missiles as they inherently have double retaining features.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.1.4 MISSILES GENERATED BY NATURAL PHENOMENA REV. 2 - July 1981 The acceptability of the assessment as described in the applicant's Safety Analysis Report (SAR) is based on compliance with General Design Criteria 2 and 4 as it relates to the capability of structures, systems, and components important to safety to withstand the effects of tornadoes and other natural phenomena. Acceptance is based on meeting the requirements of Regulatory Guides 1.76 and 1.117. The methodology for identification of appropriate design basis missiles generated by natural phenomena shall be consistent with the acceptance criteria defined for the evaluation of potential accidents from external sources in SRP Section 2.2.3.		X	FSAR Section 5.1.2.2 (Ref. 1) Structural Design Criteria for the PBNP. (Ref. 3) Bechtel Topical Report B-TOP-3, 1970 (Ref. 4)	Section 5.1.2.2 of FSAR and Structural Design Criteria for the PBNP postulate a 4 inch x 12 inch x 12 foot plank (108 lb), picked up and carried at a velocity of 300 mph, and a 4000 lb automobile with a velocity of 50 mph, as the tornado generated missiles which are consistent with reported missiles of previous tornadoes. The plank size and velocity are consistent with the wood plank given in SRP Section 3.5.1.4, Nov. 24, 1975, Missile Spectra A. The plank weight is less than the SRP plank. The automobile velocity is less than the velocity given in the SRP. In addition, the SRP postulates 5 more missiles (a utility pole, a steel rod and 3 steel pipes) in Spectrum A. Section V of the SRP allows acceptable alternative method for complying with specified portions of the commission's regulations. The missiles specified in Section 5.1.2.2 of the FSAR were accepted by NRC for PBNP and are used in design of the DGB for consistency and to maintain the same level of safety with the balance of the plant non-Containment Category I structures. In addition, the walls and roof slab thicknesses for the DGB satisfy the minimum acceptable barrier thickness requirements given in Table 1 of SRP 3.5.3. The exhaust stacks are protected by 24 inch thick concrete walls. The thicknesses provided are sufficient to prevent perforation, spalling, or scabbing of the walls and roof slab for the Tornado Missile Spectrum given in Table 2 of the SRP. The requirements of Regulatory Guide 1.76, Positions C-1 and C-2 and Regulatory Guide 1.117, Positions C-1 through C-3 are met. See Regulatory Guide Compliance Summary for details. For the tornado wind speed used in the design of the concrete walls and slabs see SRP 3.3.2.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.2 STRUCTURES, SYSTEMS AND COMPONENTS TO BE PROTECTED FROM EXTERNALLY GENERATED MISSILES, REV. 2 - July 1981				
Acceptability of the list of SSC to be protected against externally generated missiles, presented in the applicant's safety analysis report (SAR), is based on specific general design criteria and regulatory guides. The identification of structures, systems and components to be protected against externally generated missiles is acceptable if it is in accordance with General Design Criterion 2, with respect to the protection of SSC important to safety from the effects of natural phenomena and General Design Criterion 4, with respect to protection of SSC important to safety against the effects of externally generated missiles to maintain their essential safety functions. Acceptance is based on the design meeting the guidelines of Regulatory Guide 1.13, as related to the spent fuel pool systems and structures being capable of withstanding the effects of externally generated missiles and preventing missiles from contacting stored fuel assemblies; Regulatory Guide 1.27, as related to the ultimate heat sink and connecting conduits being capable of withstanding the effects of externally generated missiles; Regulatory Guide 1.115, as related to the protection of SSC important to safety from the effects of turbine missiles; and Regulatory Guide 1.117, as related to the protection of SSC important to safety from the effects of tornado missiles.	X			Structures, systems and components to be protected from externally generated missiles comply with Regulatory Guides 1.115 and 1.117. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guides 1.115 and 1.117. The doors to the DGB are protected from tornado generated missiles by providing concrete barriers. The large openings in the walls are all protected by steel louvers which are designed for the missiles. The small openings in the walls are protected by concrete barriers inside the building which prevents missiles from hitting any safety related components. The opening of the exhaust stack is not protected. Vertical tornado generated missiles may enter the stack openings and hit the silencer. The missiles may enter the building but do not have any adverse effect on the safety related equipment and components. All barriers are designed for the postulated missiles. The thickness of the concrete barriers conform with Table 1 of SRP 3.5.3.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.3 BARRIER DESIGN PROCEDURES REV. 1 - July 1981 SEB accepts the design of structures, shields, and barriers that must withstand the effects of environmental and natural phenomena if the relevant requirements of General Design Criteria 2 (Ref. 1) and 4 (Ref. 2) are met. The relevant requirements of General Design Criteria 2 and 4 are as follows:				
A. General Design Criterion 2 as it relates to structures, systems, and components, capability to withstand, without loss of safety functions, the effects of tornadoes and the appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena.	X		FSAR 2.5, 2.6, & 2.9 (Ref.1) Dwg. No. 6704-E-222102	The design of the DGB complies with GDC2 of 10CFR Part 50, Appendix A. All components are protected from tornado missiles.
B. General Design Criterion 4 as it relates to structures, systems and components being appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids that may result from equipment failures and from events and conditions outside the nuclear power unit.	X		See GDC Compliance & Dwg. No. 6704-E-222102	The design of the DGB complies with GDC4. The two EDGs are separated by two walls to prevent missile/pipe whip from one system affecting the other system except for the Train A Fuel Oil Pump Room which is separated by a 24 inch thick concrete wall. The missile barriers used in the DGB are 24 inch thick concrete walls and slabs. Steel louvers are used to protect large openings in the walls.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.3 BARRIER DESIGN PROCEDURES REV. 1 - July 1981 (cont'd) Specific criteria necessary to meet the relevant requirements of General Design Criteria 2 and 4 are as follows: 1. For Local Damage Prediction a. In Concrete 3.5.3.1 Sufficient thickness of concrete should be provided to prevent perforation, spalling, or scabbing of the barriers in the event of missile impact. Several empirical equations, such as the modified NDRC formula (Ref. 3) are available to estimate missile penetration into concrete. These equations should be used to determine the required barrier thicknesses. Thicknesses resulting from such calculations should in no case be less than those listed in Table 1, which thicknesses are necessary to protect against tornado missiles. The tornado missile spectrum for which Table 1 concrete requirements are adequate is shown in Table 2. Tornado missiles and other types of missiles are specified in accordance with SRP Section 3.5.1. Barrier thicknesses less than those listed in Table 1 may be used provided that sufficient justification including test data are presented to support them, in which case they will be reviewed on a case-by-case basis.	X		Structural Drawings 6704-E-121201 thru 121211	PBNP is located in the Region I of the Tornado Intensity map given in Regulatory Guide 1.76. The thicknesses of the concrete walls and roof slabs of the DGB satisfy the minimum acceptable barrier thickness requirements given in Table 1 of this SRP for the tornado generated missile. No calculation is required to estimate penetration of the wood plank in concrete or steel louvers. For internally generated missiles there are two 24 inch thick walls separating the two safety related systems. The Train A Fuel Oil Pump Room is separated by one 12 inch thick wall. The walls are considered adequate based on past experiences.
For turbine missile barriers, penetration and scabbing predictions should be based on empirical equations such as the modified NRDC formula (Ref. 3) or the results of a valid test program.	X		Drawing 6704-E-151001	The DGB is located outside the low-trajectory turbine missile zone.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.3 BARRIER DESIGN PROCEDURES Rev. 1 - July 1981 (cont'd)				
b. In Steel				
The results of test conducted by the Stanford Research Institute on the penetrations of missiles into steel plates are summarized by W. B. Cottrell and A. W. Savolainen in "U. S. Reactor Containment Technology" (Ref. 4). The equations presented in Reference 4 are acceptable. Other equations such as the Ballistic Research Laboratory formula described in Reference 5 may be used provided the results are either comparable to those referenced above, or are validated by penetration tests.	N/A			Steel plate is not used as missile barrier.
c. In Composite Sections				
For composite or multi-element barriers, procedures for prediction of local damage are acceptable if the residual velocity of the missile perforating the first element is considered as the striking velocity for the next element. For determining this residual velocity, the equations presented by Recht and Ipson (Ref. 6) are acceptable when the first barrier of a multi-element missile barrier is steel. When the first barrier is concrete, procedures are reviewed on a case-by-case basis.	N/A			No credit is taken of the multi element barriers effect to resist the tornado generated missiles. The internally generated missiles from one EDG are prevented from impacting the other EDG by two 24 inch thick concrete walls except for the Train A Fuel Oil Pump Room which is separated by one 12 inch thick concrete wall.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.5.3 BARRIER DESIGN PROCEDURES REV. 1 - July 1981 (cont'd)				
2. For Overall Damage Prediction The response of a structure or barrier to missile impact depends largely on the location of impact (e.g., midspan of a slab or near a support), on the dynamic properties of the target and missile, and on the kinetic energy of the missile. In general, the assumption of plastic collisions is acceptable, where all of the missile initial momentum is transferred to the target and only a portion of its kinetic energy is absorbed as strain energy within the target. However, where elastic impacts are expected, the additional momentum transferred to the target by missile rebound should be included.	X			The overall damage effects of the postulated missiles on the walls and slabs are considered. The procedures given in ASCE Manual 58 "Structural Analysis, and Design of Nuclear Power Plant Facilities" (Ref. 6) and Bechtel's BC-TOP-9A, "Design of Structures for Missile Impact" (Ref. 5) are used. The impact load transient (impact forcing function) for the wood plank is obtained based on the conservation of impulse and momentum. The automobile forcing function is obtained using an equation given in Design Guide No. C-2.45 (Ref. 8). An elasto-plastic analysis is performed to obtain the required ductility ratio for comparison with the allowable ductility ratio. The procedure given in ASCE Manual 58 (Ref. 6) is followed. The required ductility ratios are all less than the allowable ratios indicated below.
After it has been demonstrated that the missile will not penetrate the barrier, an equivalent static load concentrated at the impact area should then be determined, from which the structural response, in conjunction with other design loads, can be evaluated using conventional design methods. An acceptable procedure for such an analysis, where the impact is assumed to be plastic, is presented in a paper by Williamson and Alvy (Ref. 5). Other procedures may be used provided the results obtained are comparable to those referenced above.				
Maximum allowable ductility ratios for steel and reinforced concrete barriers and other structural elements if used, in the above analysis, are given in Appendix A to this SRP section.	X For Conc	X For Steel		The allowable ductility ratios used for reinforced concrete conform with the maximum allowable ratios given in Appendix A of the SRP. The allowable ductility ratios used for steel louvers conforms with the maximum allowable ratios given in BC-TOP-9A and ASCE Manual 58 (Reference 5 and 6, respectively). The allowable ductility ratios for steel given in these references are acceptable to the Nuclear Industry and the NRC.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990				
Acceptability of the plant design for protection against postulated piping breaks outside containment, as described in the applicant's safety analysis report (SAR), will be based on General Design Criterion 4, as it relates to structures, systems and components important to safety being designed to accommodate the dynamic effects of postulated pipe rupture, including the effects of pipe-whipping and discharging fluids. Acceptance is based on conformance to Branch Technical Position SPLB 3-1, attached to the SRP section.				Refer to review of BTP SPLB 3-1.
BRANCH TECHNICAL POSITION SPLB 3-1 (FORMERLY BTB ASB 3-1) PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT.				
A. BACKGROUND				
General Design Criterion 4, "Environmental and Missile Design Bases", of Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants", requires that systems and components important to safety "...shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit." Guidance on acceptable design approaches to meet General Design Criterion 4 for existing plants and for existing plants and for plants for which applications for construction permits were then under review was provided in letters to applicants and licensees from A. Giambusso, Deputy Director of Licensing for Reactor Projects, most of which were dated in December 1972. The guidance document from these letters is attached as Appendix B to this position. Similar interim guidance for new plants was provided in a letter to applicants, prospective applicants, reactor vendors, and architect-engineers from J. F. O'Leary, Director of Licensing, dated July 12, 1973. This document is attached as Appendix C to this position.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd) Reviews of nuclear power plant designs have indicated that the functional or structural integrity of systems and components required for safe shutdown of the reactor and maintenance of cold shutdown conditions could be endangered by fluid system piping failures at locations outside containment. The staff has evolved an acceptable approach for the design, including the arrangement, of fluid systems located outside of containment to assure that the plant can be safely shut down in the event of piping failures outside containment. This approach is set forth in this position and in the companion branch technical position BTP MEB 3-1 attached to SRP Section 3.6.2. It is the intent of this design approach that postulated piping failures in fluid systems should not cause a loss of function of essential safety-related systems and that nuclear plants should be able to withstand postulated failures of any fluid system piping outside containment, taking into account the direct results of such failure and the further failure of any single active component, with acceptable off-site consequences. The detailed provisions of the position below and of BTP MEB 3-1 are intended to implement this intent with due consideration of the special nature of certain dual purpose systems and the need to define and to limit to a finite number the types and locations of piping failures to be analyzed. Although various measures for the protection of safety-related systems and components are outlined in this position, the preferred method of protection is based upon separation and isolation by plant arrangement. Past applications for CP & OL licenses contained plant layouts where safety-related equipment or structures were located near the main steam and feedwater high energy lines on the basis of utilization of the "break exclusion" design basis in these lines. In consideration of the large magnitude of potential energy stored in these (main steam and feed) systems during normal plant operation, BTP SPLB 3-1 is intended to give clear guidance on acceptable methods for protecting essential equipment from the effects of postulated failures in these systems.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
B. BRANCH TECHNICAL POSITION				
1. Plant Arrangement				
Protection of essential systems and components[1]/ against postulated piping failures in high or moderate energy fluid systems that operate during normal plant conditions and that are located outside of containment, should be provided by items a., b., or c. below in order of their preference.				
a. Plant arrangements should separate fluid system piping from essential systems and components. Separation should be achieved by plant physical layouts that provide sufficient distances between essential systems and components and fluid system piping such that the full dynamic effects of any postulated piping failure therein (e.g., pipe whip, jet impingement, and the environmental conditions resulting from the escape of contained fluids as appropriate to high or moderate energy fluid system piping) cannot impair the integrity or operability of essential systems and components.		X		Due to the function of (1) Service Air (Maintenance), (2) Fire Protection and (3) the non-safety related portion of the Starting Air System, these fluid systems could not be physically separated from the essential systems.
1) Even though portions of the main steam and feedwater lines meet the break exclusion requirements of item B.1.6 of BTP EMEB 3-1, they should be separated from essential equipment. Designers are cautioned to avoid concentrating essential equipment in the break exclusion zone. Essential equipment must be protected from environmental effects of an assumed nonmechanistic longitudinal break of the main steam and feedwater lines. Each assumed nonmechanistic longitudinal break should have a cross sectional area of at least one square foot and should be postulated to occur at a location that has the greatest effect on essential equipment.				
2) The main steam and feedwater lines should not be routed around or in the vicinity of the control room.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
b. Fluid system piping or portions thereof not satisfying the provisions of item B.1.a should be enclosed within structures or compartments designed to protect nearby essential systems and components. Alternatively, essential systems and components may be enclosed within structures or compartments designed to withstand the effects of postulated piping failures in nearby fluid systems.		X		Due to the function of (1) Service Air, (2) Fire Protection, and (3) the non-safety related portion of the Starting Air System, these fluid systems could not be enclosed within structures or compartments designed to protect nearby essential systems and components.
c. Plant arrangements or system features that do not satisfy the provisions of either item B.1.a or item B.1.b. should be limited to those for which the above provisions are impractical because of the stage of design or construction of the plant; because the plant design is based upon that of an earlier plant accepted by the staff as a base plant under the Commission's standardization and replication policy; or for other substantive reasons such as particular design features of the fluid systems. Such cases may arise, for example, (1) at interconnections between fluid systems and essential systems and components, or (2) in fluid systems having dual functions (i.e., required to operate during normal plant conditions as well as to shut down the reactor). In these cases, redundant design features that are separated or otherwise protected from postulated piping failures, or additional protection, should be provided so that the effects of postulated piping failures are shown by the analyses and guidelines of Section B.3 to be acceptable. Additional protection may be provided by restraints and barriers or by designing or testing essential systems and components to withstand the effects associated with postulated piping failures.	X			Two of the fluid systems that are run in each EDG and associated auxiliaries rooms i.e., fire protection and Service Air systems are moderate energy. There are no high energy lines except the non-safety related portion of the Starting Air System which does not have a sustained energy source. Therefore pipe whip and jet impingement are not a concern. Additionally, environmental upset is not a concern for the Service Air or Starting Air Systems. The actions to mitigate the environmental consequences of running the fire protection piping is as follows: 1. The EDG systems trains are separated such that no failure of component in one room could affect any components in the second train. 2. Floor drains are provided which would prevent an accumulation of water from a fire protection line crack in any EDG room.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
If a case should arise as a result of overriding engineering considerations, where adequate separation by physical distance or adequate separation by a combination of distance and barriers cannot be reasonably attained, and so justified to the staff, restraints may be used to assist in obtaining a finding of adequate separation by distance or barriers when designed as follows: 1) The use of a restraint should not affect the responses of the piping systems when subjected to the loads resulting from normal and upset plant and system operating conditions. (a) Care should be exercised to ensure that the system stresses due to normal and upset transients, thermal growth, and inertial effects and differential anchor motions associated with seismic events are not adversely affected by the restraints. (b) A program should be developed to ensure that the system stresses due to long term changes in the system and its supports and restraints, such as due to pipe relaxation and differential settling, will not be adversely affected by the restraints. (c) Details of the methods used to obtain these assurances should be submitted to the staff for review. 2) The restraint and its supporting structures should be designed so that they will not prevent the inservice inspection of any pipe welds.	X			The Service Air, the Starting Air (non-safety related portion) and the Fire Protection systems are seismically restrained. The piping is analyzed/supported to assure maintaining structural integrity under seismic conditions. The above actions maintain the appropriate level of safety by preventing any potential failure of a non-safety related fluid system from adversely impacting a safety related system.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
2. Design Features				
a. Essential systems and components should be designed to meet the seismic design requirements of Regulatory Guide 1.29.	X			Essential systems and components are designed per Reg. Guide 1.29.
b. Protective structures or compartments, fluid system piping restraints, and other protective measures should be designed in accordance with the following:				
(1) Protective structures or compartments needed to implement Section B.1 should be designed to seismic Category I requirements. The protective structures should be designed to withstand the effects of a postulated piping failure (i.e., pipe whip, jet impingement, pressurization of compartments, water spray, and flooding, as appropriate) in combination with loadings associated with the operating basis earthquake and safe shutdown earthquake within the respective design load limits for structures. Piping restraints, if used, may be taken into account to limit effects of the postulated piping failure.	N/A			
(2) High-energy fluid system piping restraints and protective measures should be designed such that a postulated break in one pipe cannot, in turn, lead to rupture of other nearby pipes or components if the secondary rupture could result in consequences that would be considered unacceptable for the initial postulated break. An unrestrained whipping pipe should be considered capable of rendering damage as defined in Subsection III.2. of SRP Section 3.6.	N/A			
c. Fluid system piping in containment penetration areas should be designed to meet the break exclusion provisions contained in item B.1.b of BTP EMEB 3-1.	N/A			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
d. Piping classification as required by Regulatory Guide 1.26 should be maintained without change until beyond the outboard restraint. If the restraint is located at the isolation valve, a classification change at the valve interface is acceptable.	X			Piping classification per Reg. Guide 1.26 is maintained to the outboard restraint beyond an isolation valve. Adequate restraint is provided to assess integrity of the isolation valve.
3. Analyses and Effects of Postulated Piping Failures				
a. To show that the plant arrangement and design features provide the necessary protection of essential systems and components, piping failures should be postulated in accordance with BTP EMEB 3-1, attached to SRP Section 3.6.2. In applying the provisions of BTP EMEB 3-1, each longitudinal or circumferential break in high-energy fluid system piping or leakage crack in moderate-energy fluid system piping should be considered separately as a single postulated initial event occurring during normal plant conditions. An analysis should be made of the effects of each such event, taking into account the provisions of BTP EMEB 3-1 and of the system and component operability considerations of item B.3.b below. The effects of each postulated piping failure should be shown to result in offsite consequences within the guidelines of 10 CFR Part 100 and to meet the provisions of items B.3.c and d below.	X			A crack in the fire protection or Service Air piping in an EDG room or associated auxiliaries room or a break in the non-safety related Starting Air piping would not result in a loss of off-site power, there would be no effect from this event during normal plant operation.
b. In analyzing the effects of postulated piping failures, the following assumptions should be made with regard to the operability of systems and components:				
(1) Offsite power should be assumed to be unavailable if a trip of the turbine-generator system or reactor protection system is a direct consequence of the postulated piping failure.	N/A			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
(2) A single active component failure should be assumed in systems used to mitigate failure and to shut down the reactor, except as noted in item B.3.b(3) below. The single active component failure is assumed to occur in addition to the postulated piping failure and any direct consequences of the piping failure, such as unit trip and loss of offsite power.	N/A			The potential failures in the EDG or associated auxiliaries room could not result in a unit trip or a loss of off-site power.
(3) Where the postulated piping failure is assumed to occur in one of two or more redundant trains of a dual-purpose moderate energy essential system, i.e., one required to operate during normal plant conditions as well as to shut down the reactor and mitigate the consequences of the postulated piping failure, single failures of components in other train or trains of that system or other systems necessary to mitigate the consequences of piping failure and shut down the reactor, need not be assumed provided the system is designed to seismic Category I standards, are powered from both offsite and onsite sources, and are constructed, operated, and inspected to quality assurance testing, and inservice inspection standards appropriate for nuclear safety systems. Examples of systems that may, in some plant designs, qualify as dual-purpose essential systems are service water systems, component cooling systems, and residual heat removal systems.	N/A			
(4) All available systems, including those actuated by operator actions, may be employed to mitigate the consequences of a postulated piping failure. In judging the availability of systems, account should be taken of the postulated failure and its direct consequences such as unit trip and loss of offsite power, and of the assumed single active component failure and its direct consequences. The feasibility of carrying out operator actions should be judged on the basis of ample time and adequate access to equipment being available for the proposed actions.	N/A			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd)				
c. The effects of a postulated piping failure, including environmental conditions resulting from the escape of contained fluids, should not preclude habitability of the control room or access to surrounding areas important to the safe control of reactor operations needed to cope with the consequences of the piping failure.	N/A			
d. The functional capability of essential systems and components should be maintained after a failure of piping not designed to seismic Category I standards, assuming a concurrent single active failure.	X			All systems in the DGB that are not designed to Seismic Category I standards are of moderate energy and a pipe failure would not impact the functional capability of the essential systems and components.
4. Implementation				
a. Designs of plants for which construction permit applications are tendered after July 1, 1975 should conform to the provisions of this position.				
b. Designs of plants for which construction permit applications are tendered after July 1, 1973 and before July 1, 1975 should conform to the provisions of either (a) the letter of July 12, 1973 from J. F. O'Leary, Appendix C to this position, or (b) this position, at the option of the applicants.				
c. Designs of plants for which construction permit applications were tendered before July 1, 1973 and operating licenses are issued after July 1, 1975 should follow the guidance provided in the December 1972 letter from A. Giambusso, Appendix B to this position and provide analyses of moderate energy lines made in conformance with Section B.3 of this position, as part of the operating license application for these plants to demonstrate that acceptable protection against the effects of piping failures outside containment has been provided. Alternately, this position may be used in its entirety as an acceptable basis for this finding.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.1 PLANT DESIGN FOR PROTECTION AGAINST POSTULATED PIPING FAILURES IN FLUID SYSTEMS OUTSIDE CONTAINMENT REV. 2 - October 1990 (cont'd) For plants in this category for which construction permits are not issued as of February 1, 1975, a commitment by the applicant to either (a) follow the guidance of Appendix B and submit Section B.3 analyses of moderate energy lines with the plant final safety analysis report (FSAR), or (b) conform the plant design to the provisions of this position, should provide an acceptable basis for issuance of the construction permit with regard to effects of piping failures outside containment. d. Design of plants for which operating licenses are issued before July 1, 1975 are considered acceptable with regard to effects of piping failures outside containment on the basis of the analyses made and measures taken by applicants and licensees in response to the December 1972 letter from A. Giambusso, and the staff review and acceptance of these analyses and measures. For plants in this category for which the staff review and acceptance of protection against the effects of piping failures outside containment is not substantially complete as of February 1, 1975, a commitment by the applicant to carry out analyses according to Section B.3 of this position, to submit them for staff review, and to carry out any system modifications found necessary before extended operation of the plant at power levels above one-half the license power level, should provide an acceptable basis for issuance of the operating license.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.6.2 Determination of Rupture Locations and Dynamic Effects Associated with the postulated Rupture of Piping Rev. 1, July 1981				
MEB acceptance criteria are based on meeting the requirements of General Design Criterion 4, as it relates to structures, systems, and components important to safety being designed to accommodate the dynamic effects of postulated pipe rupture, including postulation of pipe rupture locations; break and crack characteristics; dynamic analysis of pipe whip, and jet impingement loads. Specific criteria necessary to meet the relevant requirements of GDC 4 are as follows: 1. <u>Postulated Pipe Rupture Locations Inside Containment</u> Acceptable criteria to define postulated pipe rupture locations and configurations inside containment are specified in Branch Technical Position (BTP) MEB 3-1 (Ref. 4). 2. <u>Postulated Pipe Rupture Locations Outside Containment</u> For protection against postulated pipe ruptures outside containment, BTP MEB 3-1 provide acceptable criteria to define postulated rupture locations and plant layout considerations. 3. <u>Methods of Analysis</u> Detailed acceptance criteria covering pipe whip dynamic analysis, including determination of the forcing functions of jet thrust and jet impingement, are included in subsection III, "Review Procedures," of this SRP section. The general bases and assumptions of the analysis are given in BTP MEB 3-1, subsection B.3.	N/A			The walls separating the two EDGs prevent pipe whip and jet impingement loads due to a possible pipe rupture in one system from affecting the second system. Therefore, no pipe rupture effects are postulated for this Diesel Generator Project.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - August 1989 The staff accepts the design of structures that are important to safety and that must withstand the effects of the earthquakes if the relevant requirements of General Design Criterion (GDC) 2 (Ref. 4) and Appendix A to 10 CFR Part 100 (Ref. 2) concerning material phenomena are complied with. The relevant requirements of GDC 2 and Appendix A to 10 CFR Part 100 are:				
1. For GDC 2 - The design basis shall reflect appropriate consideration of the most severe earthquakes that have been historically reported for the site and surrounding area with sufficient margin for the limited accuracy, quantity, and period of time in which historical data have been accumulated.	X		2.9 FSAR (Ref. 1)	The design of the DGB, which is classified as a Category I structure, complies with GDC 2 of 10 CFR Part 50 and 10 CFR Part 100, Appendix A.
2. For Appendix A to 10 CFR Part 100 - Two earthquake levels, the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE), shall be considered in the design of the safety-related structures, components, and systems.	X		2.9 FSAR (Ref. 1)	Two earthquake levels, the maximum hypothetical and the design with horizontal ground acceleration of 0.12g and 0.06g respectively are considered in the design.
Specific criteria necessary to meet the relevant requirements of GDC 2 and Appendix A to 10 CFR Part 100 are described below. The acceptance criteria for the areas of review described in subsection 1, above are as follows. 1. Design Ground Motion a. Design Response Spectra				
The proposed OBE and SSE design response spectra for use in analyses and design of structure, systems, and components should, generally, meet or exceed amplitudes of the site-specific spectra at all frequencies. The use of generic spectra, such as Regulatory Guide 1.60 (Ref. 5) spectra, as design spectra is also acceptable provided that their use is consistent with the information reviewed in SRP Section 2.5.2.		X	Appendix A FSAR (Ref. 1)	The Housner Horizontal Design Response Spectra, Fig. A-1 & A-2 in Appendix A of FSAR, which is used in design of the building, is consistent with the PBNP original design basis. The use of these spectra is done to maintain consistancy throughout all buildings of the plant. A site specific spectra has not been generated. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.60.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - Aug. 1989 (cont'd)				
To be acceptable, the design response spectra should be specified for three mutually orthogonal directions -- two horizontal and one vertical. Current practice is to assume that the maximum ground accelerations in the two horizontal directions are equal.		X	2.9 and Appendix A FSAR (Ref. 1)	Only one horizontal and one vertical design response spectra is specified and used in accordance with Section 2.9 of the FSAR. The structural responses are added using absolute sum method. This approach is conservative for symmetric structures. The design of the DGB exceeds the requirements of Reg. Guide 1.92.
b. Design Time History				
The SSE and OBE design time histories to be used in the free field of the soil media shall be consistent with those developed or specified in Section 2.5.2. For both horizontal and vertical input motions, either a single time history or multiple time histories can be used.		X	2.9 and Appendix A FSAR (Ref. 1)	In order to maintain consistant design throughout all structures at Point Beach, the recorded time history at Olympia, Washington N 80E on April 1, 1949 is used for development of floor response spectra. The Olympia time history spectra envelop the design response spectra at almost all frequency ranges.
For linear structural analyses, using site-independent response spectra (e.g., Regulatory Guide 1.60), the total duration of the artificial accelerogram should be long enough such that adequate representation of the Fourier components at low frequency is included in the time history. The total time duration between 10 seconds and 25 seconds is required to adequately match the design response spectra at 0.4 Hz. The corresponding stationary phase strong-motion duration should be between 6 seconds and 15 seconds. If site-specific information reviewed in SRP Section 2.5.2 indicates duration 1-20 estimates outside the above ranges, the site-specific values should be used. The rationale for selecting lower and upper limits on duration is presented in Reference 6. For nonlinear problems, duration estimates are reviewed on a case-by-case basis.	N/A		2.9 and Appendix A FSAR (Ref. 1)	Artificial time history is not used.
Option 1: Single Time History				
To be considered acceptable, the response spectra of the artificial time history to be used in the free field must envelop the free-field design response spectra for all damping values actually used in the response analysis.	N/A		2.9 and Appendix A FSAR (Ref. 1)	Artificial time history is not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - August 1989 (cont'd)				
When spectral values are calculated from the a ''ficial time history, the frequency intervals at which spectral values are determined are to be small enough such that any reduction in these intervals does not result in more than 10 percent change in the computed spectra.	N/A		2.9 and Appendix A FSAR (Ref. 1)	Artificial time history is not used.
Table 3.7.1-1 provides an acceptable set of frequencies at which the response spectra may be calculated. Another acceptable method is to choose a set of frequencies such that each frequency is within 10 percent of the previous one.	X		(Ref. 16)	Ground and floor response spectra using Olympia time history are obtained for the set of frequencies listed in Table 3.7.1-1.

Table 3.7.1-1
Suggested Frequency Intervals for Calculation of Response Spectra

Frequency Range (hertz)	Increment (hertz)
0.2 - 3.0	.10
3.0 - 3.6	.15
3.6 - 5.0	.20
5.0 - 8.0	.25
8.0 - 15.0	.50
15.0 - 18.0	1.0
18.0 - 22.0	2.0
22.0 - 34.0	3.0

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - August 1989 (cont'd)				
Each calculated spectrum of the artificial time history is considered to envelop the design response spectrum when no more than five points fall below, and no more than 10 percent below, the design response spectrum. Recent studies indicate that numerically generated artificial ground acceleration histories produce power spectral density (PSD) functions having a quite different appearance from one individual function to another, even when all these time histories are generated so as to closely envelop the same design response spectra. For example, the use of the available techniques of generating acceleration histories, that satisfy enveloping Regulatory Guide 1.60 (Ref. 5) spectra usually results in PSD functions that fluctuate significantly and randomly as a function of frequency. It is also recognized that the more closely one tries to envelop the specified design response spectra, the more significantly and randomly do the spectral density functions tend to fluctuate and these fluctuations may lead to an unconservative estimate of response of some structures, systems, and components. Therefore, when a single artificial time history is used in the design of seismic Category I structures, systems, and/or components, it must in general satisfy requirements for both enveloping design response spectra as well as adequately matching a target PSD function compatible with the design response spectra (Ref. 7). Therefore, in addition to the response spectra enveloping requirement, the use of a single time history will also be justified by demonstrating sufficient energy at the frequencies of interest through the generation of PSD function, which is greater than a target PSD function throughout the frequency range of significance.	N/A		2.9 and Appendix A of FSAR (Ref. 1)	Artificial time history is not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - August 1989 (cont'd)				
When Regulatory Guide 1.60 spectra are used as design spectra the requirements for a compatible target PSD are contained in Appendix A. Target PSD functions other than those given in Appendix A can be used if justified. For site-specific design response spectra or spectra other than Regulatory Guide 1.60 spectra, a compatible target PSD should be generated. For generation of target PSD in such cases, procedures outlined in Reference 6 can be used. For cases where a time history ensemble is used for generation of site-specific spectra, the same time histories can be used to generate mean plus one standard deviation (or 84th percentile) PSD function as a target PSD function. Procedures used to generate the target PSD will be reviewed on a case-by-case basis. The PSD requirements are included as secondary and minimum requirements to prevent potential deficiency of power over the frequency range of interest. It should be noted that the ground motion is still primarily defined by the design response spectrum. The use of PSD criteria itself can yield time histories that may not envelop the design response spectrum.	N/A		2.9 and Appendix A of FSAR (Ref. 1)	Regulatory Guide 1.60 Spectra are not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - Aug. 1989 (cont'd)				
Option 2: Multiple Time Histories				
As discussed in Section I.1.b of this SRP, the use of multiple real or artificial time histories for analyses and design of structures, systems, and components is acceptable. As a minimum, four time histories should be used for analyses. Any lesser number will be reviewed and accepted on a case-by-case basis. The parameters describing the time histories and the calculated response spectra for each time history are reviewed. The response spectra calculated for each individual time history need not envelop the design response spectra. However, the multiple time histories are acceptable if the average calculated response spectra generated from these time histories envelop the design response spectra. The design response spectra are considered to be the mean plus one standard deviation (or 84th percentile) response spectra as defined in Section 2.5.2. The review of the real time histories used in the nonlinear analysis is conducted on a case-by-case basis. Some of the specific items of interest are number of time histories, frequency content, amplitude, energy content, duration, number of strong-motion cycles, and the basis for selection of time histories. Additional information on the use of multiple time histories can be found in Reference 8. This information may be used for reference only, as it does not constitute the staff's acceptance criteria.	N/A		2.9 and Appendix A of FSAR (Ref. 1)	Single time history is used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.1 SEISMIC DESIGN PARAMETERS REV. 2 - AUGUST 1989 (cont'd)				
2. Percentage of Critical Damping Values				
The specific percentage of critical damping values used in the analyses of Category I structures, systems, and components are considered to be acceptable if they are in accordance with Regulatory Guide 1.61 (Ref. 3). Higher damping values may be used in a dynamic seismic analysis if test data are provided to support them. These values will be reviewed and accepted by the staff on a case-by-case basis.	X		Appendix A FSAR (Ref. 1)	A combined soil and structural damping of 5% and 7.5% is used for OBE and SSE respectively. Considering that the dominant modes of vibration of the soil-structure system are the rigid body motions of the DGB, and noting that the material and radiation damping of soil are high, the damping values used conforms or exceeds the requirements of this SRP. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.61.
In addition, a demonstration of the correlation between stress levels and damping values will be required and reviewed for compliance with regulatory position C.3 of Regulatory Guide 1.61. Methods for correlation of damping values with stress level are discussed in References 8 and 9. If such methods are used, they will be reviewed and accepted on a case-by-case basis.	X		(Ref. 17)	The correlation between stress levels and damping values in the structure is not required for design of safety related structures per Ref. 9 of this SRP. For generation of floor response spectra, the stress levels in the structure should be considered. The responses of the DGB are dominated by the rigid body motion of the building and are found not to be dependent on the damping values of the structure.
The damping values for foundation soils must be based upon measured values or other pertinent laboratory data, considering variation in soil properties and strains within the soil, and must include an evaluation of dissipation from pore pressure effects as well as material damping for saturated site conditions.	X		(Ref. 13)	The effective soil damping used is about 5% and 7.5% for OBE and SSE, respectively. These values are in the very low range of total damping values of soil in soil structure interaction analysis which considers soil radiation damping. The values used are conservative. The Lab Test results for PBNP Site show 20% to 30% soil material damping.
Supporting Media for Category I Structures				
To be acceptable, the description of supporting media for each Category I structure must include foundation embedment depth, depth of soil over bedrock, soil layering characteristics, design groundwater elevation, dimensions of the structural foundation, total structural height, and soil properties such as shear wave velocity, shear modulus, Poisson's ratios, and density as a function of depth.	X		(Ref. 17)	The seismic analysis is performed using soil spring lumped mass model of the DGB. A wide range of soil properties, 0.5G, 1.0G and 2.0G, is used to model the soil springs. The parameters described in this section of the SRP are considered in the model.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 The acceptance criteria for the areas of review described in subsection I of this SRP section are given below. Other approaches that can be justified to be equivalent to or more conservative than the stated acceptance criteria may be used. The staff accepts the design of structures, systems, and components that are important to safety and must withstand the effects of earthquakes if the relevant requirements of General Design Criterion (GDC) 2 contained in Appendix A to 10 CFR Part 50 (Ref. 1) and Appendix A to 10 CFR Part 100 (Ref. 2) concerning natural phenomena are complied with. The relevant requirements of GDC 2 and Appendix A to 10 CFR Part 100 are:				
1. General Design Criterion 2 - The design basis shall reflect appropriate consideration of the most severe earthquakes that have been historically reported for the site and surrounding area with sufficient margin for the limited accuracy, quality, and period of time in which historical data have been accumulated.	X		2.9 FSAR (Ref. 1)	The analysis and design of the DGB comply with GDC 2.
2. Appendix A to 10 CFR Part 100 - Two earthquake levels, the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE), shall be considered in the design of safety-related structures, components, and systems. Appendix A to 10 CFR Part 100 further states that the design used to ensure that the required safety functions are maintained during and after the vibratory ground motion associated with the safe shutdown earthquake shall involve the use of either a suitable dynamic analysis or a suitable qualification test to demonstrate that structures, systems, and components can withstand the seismic and other concurrent loads, except where it can be demonstrated that the use of an equivalent static load method provides adequate conservatism.	X		FSAR Appendix A (Ref. 1)	The analysis and design of the DGB and the safety-related components and systems, comply with 10 CFR Part 100, Appendix A. Two earthquake levels, the hypothetical earthquake (SSE) and design earthquake (OBE), are considered in the design.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
Specific criteria necessary to meet the relevant requirements of GDC 2 and Appendix A to Part 100 are as follows:				
1. Seismic Analysis Methods				
The seismic analysis of all Category I structures, systems, and components should use either a suitable dynamic analysis method or an equivalent static load method, if justified. The SRP criteria generally deal with linear elastic analysis coupled with allowable stresses near elastic limits of the structures. However, for certain special cases (e.g., evaluation of as-built structures), the staff has accepted the concept of limited inelastic/nonlinear behavior when appropriate. The actual analysis, incorporating inelastic/nonlinear considerations, is reviewed on a case-by-case basis.	X		Ref. 17	A dynamic analysis method is used for the analysis of the DGB. Dynamic analyses methods or equivalent static method are used for safety-related components and systems.
a. Dynamic Analysis Method				
A dynamic analysis (e.g., response spectrum method, time history method) should be used. The use of the equivalent static load method is also acceptable if the method can be justified. To be acceptable, dynamic analyses should consider the following items:	X		Ref. 17	Response spectrum method of analysis is used to calculate seismic acceleration at various levels of the DGB. The internal forces are obtained, conservatively, by quasi-static analysis. The floor response spectra are obtained using time history method of analysis.
(i) Use of appropriate methods of analysis (e.g., time history, response spectrum, frequency domain) accounting for effects of soil-structure interaction.	X		Ref. 17	The soil-structure interaction is considered by modeling the soil in the analyses.
(ii) Consideration of the torsional, rocking, and translational responses of the structures and their foundations.	X		Ref. 17	A two-dimensional lump-mass stick model with soil spring is used in the analysis to consider the rocking, and translational responses of the Building. There is no torsion due to symmetry.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
(iii) Use of an adequate number of masses or degrees of freedom in dynamic modeling to determine the response of all Category I and applicable non-Category I structures and plant equipment. (Caution should be exercised in reducing large static models to fewer degrees of freedom models (Ref. 3) for dynamic analysis.) The number is considered adequate when additional degrees of freedom do not result in more than 10 percent increase in responses. Alternatively, the number of degrees of freedom may be taken equal to twice the number of modes. The adequacy of the number of modes is discussed below.	X		Ref. 17	The DGB is a low reinforced concrete rigid structure. The responses of the building to seismic loads are mainly due to the rigid body motion of the soil-structure system. The high frequency modes have insignificant effect on the total responses. An adequate number of modes (20) was used in the seismic analyses of the building.
(iv) Investigation of a sufficient number of modes to ensure participation of all significant modes. The criterion for sufficiency is that the inclusion of additional modes does not result in more than a 10-percent increase in responses. Responses associated with high-frequency modes may be important in some cases (where significant modes have frequencies greater than the frequency at which spectral accelerations return to the zero period acceleration; for example, 33 cycles per second in the case of structures, equipment, and components excited directly by Regulatory Guide 1.60 design spectra). Therefore, a demonstration that adequate consideration is given to the high-frequency modes is required. (See Appendix A for acceptable methods to account for high-frequency modes.)	X			The frequency of the highest mode used was 33 cps. The first couple of modes were the significant modes contributing most to the response of the structure. The modal weights related to the high frequency were found to be negligible.
(v) Consideration of maximum relative displacement among supports of Category I structures, systems, and components.	N/A			The DGB does not have any interaction with other Category I Buildings.
(vi) Inclusion of significant effects such as piping interactions, externally applied structural restraints, hydrodynamic (both mass and stiffness effects) loads, and nonlinear responses.	N/A			There are no significant effects of these items on the DGB.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
b. Equivalent Static Load Method An equivalent static load method is acceptable if:				
(i) Justification is provided that the system can be realistically represented by a simple model and the method produces conservative results in terms of responses. Typical examples or published results for similar structures may be submitted in support of the use of the simplified method.	N/A			Equivalent static load method is not used for design of the DGB.
(ii) The design and associated simplified analysis account for the relative motion between all points of support.	N/A			Equivalent static load method is not used for design of the DGB.
(iii) To obtain an equivalent static load of a structure, equipment, or component that can be represented by a simple model, a factor of 1.5 is applied to the peak acceleration of the applicable floor response spectrum. A factor of less than 1.5 may be used if adequate justification is provided.	N/A			N/A for DGB. The method is used for components as discussed in Section 3.7.3.
2. Natural Frequencies and Response Loads To be acceptable for the operating license review, the following information should be provided:				
a. A summary of natural frequencies, mode shapes, modal and total responses for a representative number of major Category I structures, including the containment building, or a summary of the total responses if the method of direct integration is used.	X		Ref. 17	A summary of natural frequencies, mode shapes and total responses for the DGB is given in Calculation Set Number 6704.001-C-020.
b. A time history of acceleration (or other parameters of motion) or response spectrum used in design at the major plant equipment elevations and points of support.	X		Ref. 16	Response spectra at three elevations where equipment are supported in the DGB are given in Calculation Set Number 6704.001-C-019.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
c. For multiple time history option, procedures used to account for uncertainties (by variation of parameters) and to develop design responses, including justification for the statistical relationship between input design response spectra and output responses. (For example, if the average response spectra generated from the multiple design time histories are used to envelop the design response spectra, then the average responses generated from the multiple analyses are used in design.)	N/A			Multiple time history is not used.
3. Procedures Used for Analytical Modeling A nuclear power plant facility consists of very complex structural systems. To be acceptable, the stiffness, mass, and damping characteristics of the structural systems should be adequately incorporated into the analytical models. Specifically, the following items should be considered in analytical modeling:				
a. Designation of Systems Versus Subsystems				
Major Category I structures that are considered in conjunction with the foundation and its supporting media are defined as "seismic systems". Other Category I structures, systems, and components that are not designated as "seismic systems" should be considered as "seismic subsystems".	X			The DGB and its supporting media, "soil", are defined as the seismic system. The EDGs and other Seismic Category I equipment are defined as seismic subsystems.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd) b. Decoupling Criteria for Subsystems				
It can be shown, in general, that frequencies of systems and subsystems have a negligible effect on the error due to decoupling. It can be shown that the mass ratio, R_m, and the frequency ratios R_f, govern the results where R_m and R_f are defined as: $R_m = \frac{\text{Total mass of the supported subsystem}}{\text{Total mass of the supporting system}}$ $R_f = \frac{\text{Fundamental frequency of the supported subsystem}}{\text{Dominant frequency of the support motion}}$ The following criteria are acceptable: (i) If $R_m < 0.01$, decoupling can be done for any R_f. (ii) If $0.01 \le R_m \le 0.1$, decoupling can be done if $0.8 \ge Rf \ge 1.25$ (iii) If $R_m > 0.1$, a subsystem model should be included in the primary system model.	X			Each EDG weighs about 100 kips and is located on the ground floor of the building. Considering that the weight of the building is more than 18,500 kips, the system and the subsystems are considered decoupled. The weights of other seismic Category I equipment are negligible as compared to the supporting system.
If the subsystem is rigid compared to the supporting system, and also is rigidly connected to the supporting system, it is sufficient to include only the mass of the subsystem at the support point in the primary system model. On the other hand, in case of a subsystem supported by very flexible connections, e.g., pipe supported by hangers, the subsystem need not be included in the primary model. In most cases, the equipment and components, which come under the definition of subsystems, are analyzed (or tested) as a decoupled system from the primary structure and the seismic input for the former is obtained by the analysis of the latter. One important exception to this procedure is the reactor coolant system and primary structure.	X		Ref. 17	The weights of the EDGs are included in the model of the DGB.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
c. Lumped Mass Considerations				
The acceptance criteria given under subsection II.1.a(iii) of this SRP section are applicable.	X			See response to subsection II.1.a (iii) of this SRP.
d. Modeling for Three-Component Input Motion				
In general, three-dimensional models should be used for seismic analyses. However, simpler models can be used if justification can be provided that the coupling effects of those degrees of freedom that are omitted from the three-dimensional models are not significant.	X		Ref. 17	A two dimensional lump-mass model is used in the seismic analysis. There is no eccentricity between the center of mass and center of rigidity in the third direction. A 2-D model is sufficient to predict the response of the DGB accurately.
4. Soil-Structure Interaction				
A complete soil-structure interaction (SSI) analysis must properly account for all effects due to kinematic and inertial interaction for surface or embedded structures. Any analysis method based on either a direct approach or a substructure approach can be used provided the following conditions are met:	X		Ref. 17	A simplified conservative substructure approach is used in the analysis. A complete soil-structure interaction analysis considered not to be required.
a. The structure, foundation, and soil are properly modeled to ensure that the results of analyses are within the range of applicability of the particular method employed.	X		Ref. 17	An appropriate soil spring lump mass model is used in the seismic analysis.
b. The input motion at the base of a discrete soil model or soil column should produce the specified design spectra at the free surface of the soil profile in the free field (finished grade).	N/A			A complete soil-structure interaction analysis is not used.
It is noted that there is enough confidence in the current methods used to perform the SSI analysis to capture the basic phenomenon and provide adequate design information; however, the confidence in the ability to implement these methodologies is uncertain. Therefore, in order to ensure proper implementation, the following considerations should be addressed in performing SSI analysis (Ref. 4):	N/A			A complete soil-structure interaction analysis is not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
a. Perform sensitivity studies to identify important parameters (e.g., bonding and debonding of side walls, nonsymmetry of embedment, location of boundaries) and to assist in judging the adequacy of the final results. These sensitivity studies can be performed by the use of well-founded and properly substantiated simple models to give better insight;	N/A			A complete soil-structure interaction analysis is not used.
b. Through the use of some appropriate benchmark problems, the user should demonstrate its capability to properly implement any SSI methodologies; and	N/A			A complete soil-structure interaction analysis is not used.
c. Perform enough parametric studies with the proper variation of parameters (e.g., soil properties) to address the uncertainties (as applicable to the given site) discussed in subsection I.4 of this SRP section.	X		Ref. 17	The seismic analysis is performed for 0.5G, 1.0G and 2.0G to address the uncertainties of the soil properties.
For sites where SSI effects are considered insignificant and fixed base analyses of structures are performed, bases and justification for not performing SSI analyses are reviewed on a case-by-case basis. If the SSI analysis is not required, the input motion at the base of the structures will be the design motion reviewed in SRP Section 3.7.1.	X		Ref. 17	The structure is analyzed using soil spring lump mass model.
The acceptance criteria for the constituent parts of the entire SSI system are summarized as follows:				
a. Modeling of Structure				
The acceptance criteria given under subsection II.3 of this SRP section are applicable.	X			See response to subsection II.3.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
b. Modeling of Supporting Soil				
The effect of embedment of structure, ground-water effects, and the layering effect of soil should be accounted for. For the half-space modeling of the soil media, the lumped parameter (soil spring) method and the compliance function methods are acceptable. For the method of modeling soil media with finite boundaries, all boundaries should be properly simulated and the use of types of boundaries should be justified and reviewed on a case-by-case basis. Finite element and finite difference methods are acceptable methods for discretization of a continuum. The properties used in the SSI analysis should be those corresponding to the low strains that are consistent with the realistic soil strain developed during the design earthquake.	X		Ref. 17	Soil spring is used in the model. The layering effect is considered and the effect of embedment is conservatively neglected.
Use of high strain soil parameters needs to be adequately justified on a case-by-case basis.	X			High strain soil parameters are not used.
For structures supported on rock or rock-like material, a fixed base assumption is acceptable. Such materials are defined by a shear wave velocity of 3500 feet per second or greater at a shear strain of 10^{-3} percent or smaller when considering preloaded soil conditions due to the structure (Ref. 5). A comparison of fundamental natural frequencies of the fixed base and interacting structures can be used to justify the fixed base assumption (Ref. 6).	N/A			The DGB is not supported on rock.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd) c. Generation of Excitation System The control motion should be consistent with the properties of the soil profile. For profiles consisting of competent soil or rock, with relatively uniform variation of properties with depth, the control motion should be located at the soil surface at the top of the finished grade. For profiles consisting of one or more thin soil layers overlaying competent material, the control motion should be located at an outcrop (real or hypothetical) at the top of the competent material in the vicinity of the site. Variation of amplitude and frequency content with depth may be considered for partially embedded structures. The spectral amplitude of the acceleration response spectra (horizontal component of motion) in the free field at the foundation depth shall be not less than 60 percent of the corresponding design response spectra at the finished grade in the free field (Ref. 5). When variation in soil properties are considered (as required by the Specific Guidelines for SSI Analysis below), the 60 percent limitation may be satisfied using an envelope of three spectra corresponding to the three soil properties. If the accompanying rotational components of motion are ignored, no reduction is permitted in the horizontal component at the foundation level. <u>Specific Guidelines for SSI Analysis</u> The following specific guidelines are provided here to facilitate the review and draw the attention of reviewers to some important aspects of the SSI analysis. The guidelines are not necessarily requirements for the acceptance of any methodologies or an SSI analysis.	X			The time history or the response spectra is applied at the general level of the mat foundation without any reduction in the amplitude.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
o The behavior of soil, though recognized to be nonlinear, can often be approximated by linear techniques. Truly nonlinear analysis is not required unless the comparison of results from large-scale tests or actual earthquakes and analytical results indicate deficiencies that cannot be accounted for in any other manner. The nonlinear soil behavior may be accounted for by the following:	N/A			The soil is assumed to be linear. The magnitude of the ground acceleration does not warrent consideration of non-linear soil behavior. The equivalent linear soil properties are adequate for the analyses.
. Using equivalent linear soil material properties typically determined from an iterative linear analysis of the free-field soil deposit. This accounts for the primary nonlinearity, or	N/A			The soil is assumed to be linear.
. Performing an iterative linear analysis of the coupled soil-structure system. This accounts for the primary and secondary nonlinearities.	N/A			The soil is assumed to be linear.
In the event the nonlinear analysis is chosen, the results of the nonlinear analysis should be judged on the basis of the linear or equivalent linear analysis (Ref. 4).	N/A			The soil is assumed to be linear.
o Superposition of horizontal and vertical response as determined from separate analyses is acceptable (assuming nonlinear effects are not important) considering the simple material models now available.	X			The horizontal and vertical responses are obtained separately and are superimposed in subsequent analyses.
o The strain-dependent soil properties (e.g., shear modulus, damping) estimated from analysis of the seismic motion in the free field shall be consistent with the geotechnical information reviewed in SRP Section 2.5.4. Reports on recent earthquakes (e.g., Coalinga) seem to show that there may not be a decrease in shear modulus or increase in damping under high strains.	N/A			The soil is assumed to be linear.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
o Unless the site is well investigated, the variation in soil properties should be considered by performing SSI analyses using three sets of values (defined in terms of shear moduli and soil hysteretic damping ratio). These three analyses should be performed using the average (or best estimate) value, twice the average value and half the average value of the low strain shear modulus (G_{max} defined at 10^{-4} percent peak shear strain). The same shear modulus degradation (G/G_{max}) and hysteric damping (D) curves as function of peak shear strain can be used for each of these three analyses. Final values of shear modulus and damping ratio used for each of the analyses are to be compatible with the strain levels expected in the free field consistent with earthquake levels. In no case should the lower bound shear modulus be less than that value consistent with standard foundation analysis that yields foundation settlement under static loads exceeding design allowables. The upper bound shear modulus should not be less than the best estimate shear modulus defined at low strain and as determined from the geophysical testing program. In no case should the material soil damping as expressed by the hysteretic damping ratio D (defined in Ref. 5) exceed 15 percent.	X			0.5G, 1.0G and 2.0G are used in the analysis to consider the variation in soil properties.
o For dipping soil and rock strata, it is necessary to account for the coupling between the horizontal and vertical degrees of freedom in the stiffness and free-field seismic motion definitions. For such sites, modeling and analysis techniques are reviewed on a case-by-case basis.	N/A			There are no dipping soil and rock strata which affect the seismic analysis of the DGB.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
o Finite Boundary Modeling or Direct Solution Technique The direct solution method is characterized as follows: - Each analysis of the soil and structures is performed in one step. - Finite element or finite difference discrete methods of analysis are used to spatially discretize the soil-structure system. - Definition of the motion along the boundaries of the model (bottom and sides) is either known, assumed, or computed as a precondition of the analysis.	N/A			Direct Solution Technique is not used.
For the direct solution technique, spatial representation typically involves two-dimensional, plane strain mathematical models or axisymmetric models. Dynamic analysis can be performed using either frequency-domain (limited to linear analysis) or time-integration methods. The mesh size should be adequate for representing the static stress distribution under the foundation and transmitting the frequency content of interest. The two-dimensional approximation of three-dimensional problems may have to be justified in some special situations.	N/A			Direct Solution Technique is not used.
Two mathematical representations of the model side boundaries are available for use in the direct solution approach--simple or viscous boundaries and transmitting boundaries. The location of the simple or viscous boundaries is dependent on strain and damping in the soil and is typically thrice the base dimension from the structure. The side boundary nodes can be either "constrained" in which case free-field displacements are specified, or "free", in which case forces are specified. When using the transmitting boundaries, it is possible to place the boundaries immediately adjacent to the structure if secondary nonlinearities in the soil are ignored.	N/A			Direct Solution Technique is not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
The following limitations should be observed for deep soil sites: - The model depth, generally, should be at least twice the base dimension below the foundation level, which should be verified by parametric studies. - The fundamental frequency of the soil (or backfill) stratum should be well below the structural frequencies of interest. - All structural modes of significance should be included.	N/A			Direct Solution Technique is not used.
o Half Space or Substructure Solution Technique The substructure (3-step) approach comprises the following steps: (1) Determine the motion of the massless foundation, including both translational and rotational components. (2) Determine the foundation stiffness in terms of frequency-dependent impedance functions. (3) Perform soil-structure interaction analysis. Step (1) requires that assumptions be made about the mechanism of wave motion at the site. The foundation motion may be determined by a number of techniques, including: - Analytic functions - Boundary integral equations - Finite element and difference methods.	X			A simplified, conservative, half-space approach is used in the soil-structure interaction analysis. The time history is applied at the ground level of a soil spring lump mass model of the structure. The soil stiffnesses are considered to be frequency independent.
In calculating the foundation motion by one of these methods, the foundation mat is usually assumed to be rigid and bonded to the soil. However, this is not a necessary assumption because additional degrees of freedom may be specified for the foundation. Again, it must be emphasized that, in general, a translation specified on the surface of the soil produces a translation and rotation of the massless foundation.	X			The time history motion is applied at the general level of the mat foundation.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
Stiffness characteristics of the soil, required in Step (2), may also be determined by analytic functions, boundary integral equations, and finite element and difference methods. When calculating the soil stiffness, variations in soil characteristics with excitation level should be accounted for.	X		Ref. 17	The soil springs are obtained using Whitman equations as modified by Kausel & Ushigima to include the limited soil layer. Variation in soil characteristics with excitation level considered not to be required due to the wide range of soil properties used in the analysis.
Typically, the SSI analysis of Step (3) is done using frequency-domain methods. That the frequency dependence of soil impedances be accounted for is believed to be important.	N/A			Frequency domain methods are not used.
For the case where time history analyses are performed using frequency-independent soil spring parameters, the specific values of damping coefficients tend to be unrealistically large. Therefore, the spring and damping coefficients will be reviewed on a case-by-case basis.	X		FSAR Appendix A (Ref. 1)	A combined soil and structure damping of 5% is used for OBE and 7.5% for SSE according to Appendix A of the FSAR. These damping values are very conservative.
5. <u>Development of Floor Response Spectra</u>				
To be acceptable, the floor response spectra should be developed taking into consideration the three components of the earthquake motion. The individual floor response spectral values for each frequency are obtained for one vertical and two mutually perpendicular horizontal earthquake motions and are combined according to the "square root of the sum of the squares" (SRSS) method to predict the total floor response spectrum for that particular frequency (Ref. 7). If the three components of the motion are applied simultaneously (also see subsection II.6), the SRSS approach is not required.	X			The DGB has two axes of symmetry. The floor design response spectrum for a given direction is the smoothed floor response spectrum for that direction. No combination of the effects from other directions is required for symmetric structures per Reg. Guide 1.122.
When a single artificial time history is used to generate the floor response spectra, all the provisions of Reference 7, including peak broadening requirements, shall apply. The use of single artificial time history should also be justified as outlined in subsection II.1.b of SRP Section 3.7.1.	X		FSAR Appendix A Refs. 1, 16	Recorded time history at Olympia, WA is used. The requirements of Regulatory Guide 1.122 are followed in the development of the floor response spectra.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
The use of multiple time histories to generate floor response spectra is reviewed and accepted on a case-by-case basis. Particularly, the basis for procedures used to account for uncertainties (by variation of parameters) are evaluated. The same acceptance criteria are used for floor response spectra as are used for design response spectra in subsection II.1.b of SRP Section 3.7.1. For example, if the average response spectra generated from the multiple design time histories are used to envelop the design response spectra, then the average floor response spectra generated from the multiple analyses (each of which used one of the multiple design time histories) are used in design. Justification should be provided for the statistical relationship between input ground response spectra and output floor response spectra.	N/A			Multiple time histories are not used.
The methods used for direct generation of floor spectra are reviewed and accepted on a case-by-case basis.				
6. Three Components of Earthquake Motion				
Depending upon what basic methods are used in the seismic analysis, i.e., response spectra or time history method, the following two approaches are considered acceptable for the combination of three-dimensional earthquake effects (Ref. 8).				
a. Response Spectra Method				
When the response spectra method is adopted for seismic analysis, the maximum structural responses due to each of the three components of earthquake motion should be combined by taking the square root of the sum of the squares of the maximum codirectional responses caused by each of the three components of earthquake motion at a particular point of the structure or of the mathematical model.		X	FSAR Appendix A & Sect. 2.9 (Ref. 1)	Only two directional seismic, one horizontal and one vertical component acting simultaneously, is used and the effects are added by absolute sum method. Since the DGB has two axes of symmetry, with no torsional effect from seismic loads, the method used is more conservative than combining three directional seismic by the SRSS method.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
b. Time History Analysis Method When the time history analysis method is employed for seismic analysis, two types of analysis are generally performed depending on the complexity of the problem: (1) To obtain maximum responses due to each of the three components of the earthquake motion, the method for combining the three-dimensional effect is identical to that described in item 6.a except that the maximum responses are calculated using the time history method instead of the response spectrum method; (2) To obtain time history responses from each of the three components of the earthquake motion and combine them at each time step algebraically, the maximum response can be obtained from the combined time solution. When this method is used, the components of earthquake motions specified in the three different directions should be statistically independent.	N/A			Time history analysis is not used to obtain seismic forces in the DGB. The time history analysis is used only to develop the floor response spectra.
7. Combination of Modal Responses When the response spectrum method of analysis is used to determine the dynamic response of damped linear systems, in general, the most probable response is obtained as the square root of the sum of the squares of the responses from individual modes. Thus, the most probable system response, R, is given by: $R = \left(\sum_{k=1}^{N} R_k^2\right)^{1/2}$ (1) where R_k is the response for the k^{th} mode and N is the number of significant modes considered in the modal response combination.	X		Appendix A FSAR (Ref. 1)	The modal responses in the response spectrum method of analysis are combined using absolute sum method per page A-20 of FSAR. This method is more conservative than the methods given in this SRP or Regulatory Guide 1.92.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
When modes with closely spaced modal frequencies exist (two modes having frequencies within 10 percent of each other), the methods delineated in Reference 8 are acceptable. Use of other methods for considering closely spaced modes, such as those outlined in References 4 and 9 will be reviewed and accepted on a case-by-case basis. Acceptance criteria for the adequate consideration of high-frequency modes are provided in Appendix A to this SRP section.	X			See previous discussion above.
8. Interaction of Non-Category I Structures with Category I Structures				
To be acceptable, the interfaces between Category I and non-Category I structures and plant equipment must be designed for the dynamic loads and displacements produced by both the Category I and non-Category I structures and plant equipment. In addition, a statement indicating the fact that all non-Category I structures meet any one of the following requirements should be provided.				
a. The collapse of any non-Category I structure will not cause the non-Category I structure to strike a seismic Category I structure or component.	X		Drawing 6704-E-151001	The collapse of the Warehouse due to a tornado will not cause this structure to strike the DGB. Adequate distance is provided between this structure and the DGB.
b. The collapse of any non-Category I structure will not impair the integrity of seismic Category I structures or components.	X			
c. The non-Category I structures will be analyzed and designed to prevent their failure under SSE conditions in a manner such that the margin of safety of these structures is equivalent to that of Category I structures.	N/A			

WISCONSIN ELECTRIC POWER COMPANY

DIESEL GENERATOR ADDITION PROJECT
STANDARD REVIEW PLANS COMPLIANCE SUMMARY

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
9. Effects of Parameter Variations on Floor Response Spectra Consideration should be given in the analysis to the effects on floor response spectra (e.g., peak width and period coordinates) of expected variations of structural properties, dampings, soil properties, and soil-structure interactions. The acceptance criteria for the consideration of the effects of parameter variations are provided in subsection II.5 of this SRP section.	X		Ref. 16	Floor response spectra are obtained using the requirements of Regulatory Guide 1.122. Variation of soil properties are considered and the peak widths are also broadened.
10. Use of Equivalent Vertical Static Factors The use of equivalent static load factors as vertical response loads for the seismic design of all Category I structures, systems, and components in lieu of the use of a vertical seismic system dynamic analysis is acceptable only if it can be justified that the structure is rigid in the vertical direction. The criterion for rigidity is that the lowest frequency in the vertical direction is more than 33 cps.	N/A			Vertical seismic system dynamic analysis is used to obtain the vertical responses of the DGB.
11. Methods Used to Account for Torsional Effects An acceptable method of treating the torsional effects in the seismic analysis of Category I structures is to carry out a dynamic analysis that incorporates the torsional degrees of freedom. An acceptable alternative, if properly justified, is the use of static factors to account for torsional accelerations in the seismic design of Category I structures in lieu of the use of a combined vertical, horizontal, and torsional system dynamic analysis. To account for accidental torsion, an additional eccentricity of ± 5 percent of the maximum building dimension at the level under consideration shall be assumed for both directions.	X		Ref. 17	The seismic acceleration obtained at each level from the response spectrum analysis is applied to a 3-D model of the building to obtain the internal forces. The accidental torsion as defined in this SRP is also considered.
12. Comparison of Responses The responses obtained from both response spectrum and time history modal analyses at selected points in typical Category I structures should be compared to demonstrate approximate equivalency between the two methods.	X		Ref. 16, 17	The spectra of the recorded Olympia, WA time history is different from the Housner design response spectra. The maximum floor accelerations obtained from the two methods need not be compared.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd)				
13. Analysis Procedure for Damping				
Either the composite modal damping approach or the modal synthesis technique can be used to account for element-associated damping. Use of composite modal damping for computing the response of systems with nonclassical modes may lead to unconservative results (Ref. 10). Therefore, the composite modal damping approach is acceptable provided the composite modal damping is limited to 20 percent. One of the other methods mentioned below is generally applicable if the composite modal damping exceeds 20 percent. a. Time domain analysis using complex modes/frequencies. b. Frequency domain analysis, or c. Direct integration of uncoupled equation of motion.	N/A			A combined soil and structure damping of 7.5% and 5% is used for all modes for SSE and OBE respectively.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
For the composite modal damping approach, two techniques of determining an equivalent modal damping matrix or composite damping matrix are commonly used. They are based on the use of the mass or stiffness as a weighing function in generating the composite modal damping. The formulations lead to: $\bar{B}_j = \{\phi\}^T[\bar{M}]\{\phi\}$ (2) $B_j = \{\phi\}^T[K]\{\bar{\phi}\}/[K^*]$ (3) where $[K^*] = \{\phi\}^T[K]\{\phi\}$ $[K]$ = assembled stiffness matrix, $\bar{B}_j$ = equivalent modal damping ratio of the j^{th} mode, $[\bar{K}], [\bar{M}]$ = the modified stiffness or mass matrix constructed from element matrices formed by the product of the damping ratio for the element and its stiffness or mass matrix, and $\{\phi\}$ = j^{th} normalized modal vector.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.2 SEISMIC SYSTEM ANALYSIS REV. 2 - August 1989 (cont'd) For models that take the soil-structure interaction into account by the lumped soil spring approach, the method defined by equation (3) is acceptable. For fixed base models, either equation (2) or (3) may be used. Other techniques based on modal synthesis have been developed and are particularly useful when more detailed data on the damping characteristics of structural subsystems are available. The modal synthesis analysis procedure consists of (1) extraction of sufficient modes from the structure model, (2) extraction of sufficient modes from the finite element soil model, (3) performance of a coupled analysis using the modal synthesis technique, which uses the data obtained in steps (1) and (2) with appropriate damping ratios for structure and soil subsystems. This method is based upon satisfaction of displacement compatibility and force equilibrium at the system interfaces and uses subsystem eigenvectors as internal generalized coordinates. This method results in a nonproportional damping matrix for the composite structure, and equations of motion have to be solved by direct integration or by uncoupling them by use of complex eigenvectors. Other techniques for estimating the equivalent modal damping of a soil-structure interaction model are reviewed on a case-by-case basis.				
14. Determination of Category I Structure Overturning Moments To be acceptable, the determination of the design overturning moment should incorporate the following items: a. Three components of input motion. b. Conservative consideration of vertical and lateral seismic forces.	X		Ref. 6	Three directional seismic loads are used to calculate the factors of safety against overturning and sliding and to obtain the soil pressure. The three components of seismic loads are combined by linear superposition of the components using 1.0, 0.4 and 0.4 factors per ASCE Manual 58.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989				
The acceptance criteria for the areas of review described in subsection I of this SRP section are given below. Other criteria which can be justified to be equivalent to or more conservative than the stated acceptance criteria may be used. The staff accepts the design of subsystems that are important to safety and must withstand the effects of earthquakes if the relevant requirements of General Design Criterion (GDC) 2 (Ref. 1) and Appendix A to 10 CFR Part 100 (Ref. 2) concerning material phenomena are complied with. The relevant requirements of GDC 2 and Appendix A to 10 CFR Part 100 are:				
o General Design Criterion 2 - The design basis shall reflect appropriate consideration of the most severe earthquakes reported to have affected the site and surrounding area with sufficient margin for the limited accuracy, quantity, and period of time in which historical data have been accumulated.	X		FSAR 2.9 (Ref. 1)	The analysis and design of subsystems comply with GDC 2.
o Appendix A to 10 CFR Part 100 - Two earthquake levels, the safe shutdown earthquake (SSE) and the operating basis earthquake (OBE), shall be considered in the design o safety-related structures, components, and systems. Appendix A to 10 CFR Part 100 further states that the design used to ensure that the required safety functions are maintained during and after the vibratory ground motion associated with the safe shutdown earthquake shall involve the use of either a suitable dynamic analysis or a suitable qualification test to demonstrate that structures, systems, and components can withstand the seismic and other concurrent loads, except where it can be demonstrated that the use of an equivalent static load method provides adequate conservatism.	X		FSAR Appendix A (Ref. 1)	The analysis and design of sa'-ty-related components and systems comply with 10 CFR Part 100, Appendix A. Two earthquake levels, the hypothetical and design earthquake, are considered.
Specific criteria necessary to meet the relevant requirements of GDC 2 and Appendix A to Part 100 are as follows:				
1. <u>Seismic Analysis Methods</u>				
The acceptance criteria provided in SRP Section 3.7.2, subsection II.1, are applicable.	X			The EDGs and the other safety related equipment and components are qualified using the floor response spectra obtained from time history seismic analysis.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
2. Determination of Number of Earthquake Cycles				
During the plant life at least one safe shutdown earthquake (SSE) and five operating basis earthquakes (OBEs) should be assumed. The number of cycles per earthquake should be obtained from the synthetic time history (with a minimum duration of 10 seconds) used for the system analysis, or a minimum of 10 maximum stress cycles per earthquake may be assumed.	X		Equipment Specs.	The seismic qualification of safety related electric and mechanical equipment are per IEEE Std. 344-1975 or 1987. Alternatively, some of the equipment are seismically qualified using the USI A-46 (GIP) methodology (Ref. 26). For low-cycle fatigue-sensitive equipment five OBEs are assumed.
3. Procedures used for Analytical Modeling				
The acceptance criteria provided in SRP Section 3.7.2 Subsection II.3, are applicable.	X			See response to SRP 3.7.2 subsection II.3.
4. Basis for Selection of Frequencies				
To avoid resonance, the fundamental frequencies of components and equipment should preferably be selected to be less than 1/2 or more than twice the dominant frequencies of the support structure. Use of equipment frequencies within this range is acceptable if the equipment is adequately designed for the applicable loads.	X		Equipment Specs.	The safety related miscellaneous equipment and components are adequately designed for the seismic loads. No comparisons of supporting structure frequencies and the equipment frequencies is necessary. The frequency of the diesel generator is 15 cps which is more than two times of the governing frequencies of the DGB.
5. Analysis Procedure for Damping				
The acceptance criteria provided in SRP Section 3.7.2, subsection II.13, are applicable.	X		FSAR Appendix A (Ref. 1)	The damping values used for subsystems are consistent with Table A.1-1 in Appendix A of FSAR.
6. Three Components of Earthquake Motion				
The acceptance criteria provided in SRP Section 3.7.2, subsection II.6, are applicable.	X			The qualification of safety related equipment are per IEEE Std. 344-1975 or 1987. The requirements of IEEE Std. 344 are consistent with this section of SRP. Alternatively some of the equipment are seismically qualified using the USI A-46 (GIP) methodology.
7. Combination of Modal Responses				
The acceptance criteria provided in SRP Section 3.7.2, Subsection II.7, are applicable.	X			See response to item 6, above.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
8. <u>Interaction of Other Systems With Category I Systems</u> To be acceptable, each non-Category I system should be designed to be isolated from [illegible] I system by either a constraint or barrier, or should be remotely located with regard to the seismic Category I system. If it is not feasible or practical to isolate the Category I system, adjacent non-Category I systems should be analyzed according to the same seismic criteria as applicable to the Category I system. For non-Category I systems attached to Category I systems, the dynamic effects of the non-Category I systems should be simulated in the modeling of the Category I system. The attached non-Category I systems, up to the first anchor beyond the interface, should also be designed in such a manner that during an earthquake of SSE intensity it will not cause a failure of the Category I system.	X			All Category I to non-Category I process piping boundries are isolated by anchors. The analysis considered the dynamic effects of the non-Category I piping. The one exception is the engine drain/fill line which is segregated from the associated non-Category I piping by a flexible hose.
9. <u>Multiply-Supported Equipment and Components With Distinct Inputs</u> Equipment and components in some cases are supported at several points by either a single structure or two separate structures. The motions of the primary structure or structures at each of the support points may be quite different.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
A conservative and acceptable approach for equipment items supported at two or more locations is to use an upper bound envelope of all the individual response spectra for these locations to calculate maximum inertial responses of multiple-supported items. In addition, the relative displacements at the support points should be considered. Conventional static analysis procedures are acceptable for this purpose. The maximum relative support displacements can be obtained from the structural response calculations or, as a conservative approximation, by using the floor response spectra. For the latter option the maximum displacement of each support is predicted by $s_d = S_a g/w^2$, where S_a is the spectral acceleration in "g's" at the high frequency end of the spectrum curve (which, in turn, is equal to the maximum floor acceleration), g is the gravity constant, and w is the fundamental frequency of the primary support structure in radians per second. The support displacement can then be imposed on the supported item in the most unfavorable combination. The responses due to the inertia effect and relative displacements should be combined by the absolute sum method. In the case of multiple supports located in a single structure, an alternative acceptable method using the floor response spectra involves determination of dynamic responses due to the worst single floor response spectrum selected from a set of floor response spectra obtained at various floors and applied identically to all the floors, provided there is no significant shift in frequencies of the spectra peaks. In addition, the support displacements should be imposed on the supported item in the most unfavorable combination using static analysis procedures.	X			The upper bound envelope of all the individual response spectra of the support locations of the multiple supported items is used and applied to the center of gravity of the item. The DGB is a short rigid structure. The relative displacement of points along the structure height is negligible. Therefore the relative displacements of the components support points are not included in the analysis and design of the components.
In lieu of the response spectrum approach, time histories of support motions may be used as excitations to the subsystems. Because of the increased analytical effort compared to the response spectrum techniques, usually only a major equipment system would warrant a time history approach. The time history approach does, however, provide more realistic results in some cases as compared to the response spectrum envelope method for multiply-supported systems.	N/A			Time history approach is not used.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
10. Use of Equivalent Vertical Static Factors				
The acceptance criteria provided in SRP Section 3.7.2, subsection II.10, are appl:cable.	X			Vertical floor response spectra is used to obtain the vertical responses of the subsystems.
11. Torsional Effects of Eccentric Masses				
For seismic Category I subsystems, when the torsional effect of an eccentric mass is judged to be significant, the eccentric mass and its eccentricity should be included in the mathematical model. The criteria for judging the significance will be reviewed on a case-by-case basis.	X			The qualification of safety related equipment are per IEEE Std. 344-1975 or 1987. The requirement of this section of SRP if applicable is met.
12. Category I Buried Piping, Conduits, and Tunnels				
For Category I buried piping, conduits, tunnels, and auxiliary systems, the following items should be considered in the analysis:				
a. Two types of groundshaking-induced loadings must be considered for design. (i) Relative deformations imposed by seismic waves traveling through the surrounding soil or by differential deformations between the soil and anchor points. (ii) Lateral earth pressures and ground-water effects acting on structures.	X		Calculation Set Number 6704.001-C-029 (Ref. 25)	The building settlement and the seismic movement are considered in the evaluation of the Category I buried piping and the two 2 inch fuel oil lines. Lateral earth pressure and ground water effects acting on underground electric manholes and duct banks are considered.
b. The effects of static resistance of the surrounding soil on piping deformations or displacements, differential movements of piping anchors, bent geometry and curvature changes, etc., should be adequately considered. Procedures using the principles of the theory of structures on elastic foundations are acceptable.	X			The procedure given in Reference 18 is used to consider the effects of surrounding soil on the piping responses.
c. When applicable, the effects due to local soil settlements, soil arching, etc., should also be considered in the analysis.	N/A			No local settlements or soil arching is predicted.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
d. Actual methods used for determining the design parameters associated with seismically induced transient relative deformations are reviewed and accepted on a case-by-case basis. Additional information, for guidance purposes only, can be found on page 26 of Reference 3 and in Section 3.5.2 of Reference 4.	N/A			No seismically induced transient relative deformations are used.
13. Methods for Seismic Analysis of Category I Concrete Dams				
For the analysis of all Category I concrete dams, an appropriate approach that takes into consideration the dynamic nature of forces (due to both horizontal and vertical earthquake loadings, soil-structure interaction (SSI) effects, and nonlinear stress-strain relations for the soil, should be used. Analysis of earthen dams is reviewed under Section 2.5.6.	N/A			There is no concrete dam in this project.
14. Methods for Seismic Analysis of Above-Ground Tanks				
Most above-ground fluid-containing vertical tanks do not warrant sophisticated, finite element, fluid-structure interaction analyses for seismic loading. However, the commonly used alternative of analyzing such tanks by the "Housner-method" (Ref. 5) may be inadequate in some cases. The major problem is that direct application of this method is consistent with the assumption that the combined fluid-tank system in the horizontal impulsive mode is sufficiently rigid to justify the assumption for a rigid tank. For flat-bottomed tanks mounted directly on their bases, or tanks with very stiff skirt supports, the assumption leads to the usage of a spectral acceleration equal to the zero-period base acceleration. Recent studies (Refs. 6, 7, 8, 9, and 10) have shown that for typical tank designs the frequency for this fundamental horizontal impulsive mode of the tank shell and contained fluid is such that the spectral acceleration may be significantly far greater than the zero-period acceleration. Thus, the assumption of a rigid tank could lead to inadequate design loadings. The SSI effects may also be very important for tank responses, and they may be considered for both horizontal and vertical motions.	N/A			There is no independently supported large above-ground tank in the DG Project. The 54" diameter, 7' high day tanks are seismically qualified and are anchored to platforms inside the Diesel Generator Building. The requirements of this subsection are not applicable to these tanks.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
The acceptance criteria below are based upon the information contained in References 1 through 3 and Reference 5. These references also contain acceptable calculational techniques for the implementation of these criteria. The use of other approaches meeting the intent of these criteria can also be considered if adequate justification is provided. a. A minimum acceptable analysis must incorporate at least two horizontal modes of combined fluid-tank vibration and at least one vertical mode of fluid vibration. The horizontal response analysis must include at least one impulsive mode in which the response of the tank shell and roof are coupled together with the portion of the fluid contents that moves in unison with the shell. Furthermore, at least the fundamental sloshing (convective) mode of the fluid must be included in the horizontal analysis. b. The fundamental natural horizontal impulsive mode of vibration of the fluid-tank system must be estimated giving due consideration to the flexibility of the supporting medium and to any uplifting tendencies for the tank. It is unacceptable to assume a rigid tank unless the assumption can be justified. The horizontal impulsive-mode spectral acceleration, S_{a1}, is then determined using this frequency and the appropriate damping for the fluid-tank system. Alternatively, the maximum spectral acceleration corresponding to the relevant damping may be used. c. Damping values used to determine the spectral acceleration in the impulsive mode shall be based upon the system damping associated with the tank shell material as well as with the SSI, as specified in References 3 and 10. d. In determining the spectral acceleration in the horizontal convective mode, S_{a2}, the fluid damping ratio shall be 0.5 percent of critical damping unless a higher value can be substantiated by experimental results.	N/A			See previous discussion above.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.7.3 SEISMIC SUBSYSTEM ANALYSIS REV. 2 - 1989 (cont'd)				
e. The maximum overturning moment, M_o, at the base of the tank should be obtained by the modal and spatial combination methods discussed in subsection II of SRP Section 3.7.2. The uplift tension resulting from M_o must be resisted either by tying the tank to the foundation with anchor bolts, etc., or by mobilizing enough fluid weight on a thickened base skirt plate. The latter method of resisting M_o must be shown to be conservative.	N/A			See previous discussion above.
f. The seismically induced hydrodynamic pressures on the tank shell at any level can be determined by the modal and spatial combination methods in SRP Section 3.7.2. The maximum hoop forces in the tank wall must be evaluated with due regard for the contribution of the vertical component of ground shaking. The beneficial effects of soil-structure interaction may be considered in this evaluation (Refs. 4, 11, 12, and 13). The hydrodynamic pressure at any level must be added to the hydrostatic pressure at that level to determine the hoop tension in the tank shell.				
g. Either the tank top head must be located at elevation higher than the slosh height above the top of the fluid or else must be designed for pressures resulting from fluid sloshing against this head.				
h. At the point of attachment, the tank shell must be designed to withstand the seismic forces imposed by the attached piping. An appropriate analysis must be performed to verify this design.				
i. The tank foundation (see also SRP Section 3.8.5) must be designed to accommodate the seismic forces imposed on it. These forces include the hydrodynamic pressures imposed on the base of the tank as well as the tank shell longitudinal compressive and tensile forces resulting from M_o.				
j. In addition to the above, a consideration must be given to prevent buckling of tank walls and roof, failure of connecting piping, and sliding of the tank.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981				
SEB acceptance criteria for the design of structures other than containment are based on meeting the relevant requirements of the following regulations:				
A. 10 CFR Part 50, 50.55a and General Design Criterion 1 as they relate to safety-related structures being designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 1.
B. General Design Criterion 2 as it relates to the design of the safety-related structures being capable to withstand the most severe natural phenomena such as wind, tornadoes, floods, and earthquakes and the appropriate combination of all loads.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 2.
C. General Design Criterion 4 as it relates to safety-related structure being capable of withstanding the dynamic effects of equipment failures including missiles and blowdown loads associated with the loss of coolant accidents.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 4.
D. General Design Criterion 5 as it relates to sharing of structures important to safety unless it can be shown that such sharing will not significantly impair their validity to perform their safety functions.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 5.
E. Appendix B to 10 CFR Part 50 as it relates to the quality assurance criteria for nuclear power plants.	X		Section 1.8 FSAR (Ref. 1)	PBNP has a Quality Assurance Program that is consistent with the Appendix B to 10 CFR Part 50.
The Regulatory Guides and industry standards identified in item 2 of this subsection provides information, recommendations and guidance and in general describes a basis acceptable to the staff that may be used to implement the requirements of 10 CFR Part 50, & 50.55a and GDC 1, 2, 4, 5 and Appendix B to 10 CFR Part 50. Also, specific acceptance criteria necessary to meet the relevant requirements of these regulations for the areas of review, described in subsection I of this SRP section are as follows:				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
1. Description of the Structures The descriptive information in the SAR is considered acceptable if it meets the minimum requirements set forth in Section 3.8.4.1 of the "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants" (Ref. 4). Deficient areas of descriptive information are identified by the reviewer and a request for additional information is initiated at the application acceptance review. New or unique design features that are not specifically covered in the "Standard Format..." may require a more detailed review. The reviewer determines the additional information that may be required to accomplish a meaningful review of the structural aspects of such new or unique features.	X		Structural Drawings 6704-E-121201 thru 121211 and 6704-E-121501	The DGB is a two story, above ground, reinforced concrete structure. The approximate building dimensions are 110 feet long by 71 feet wide by 42 feet high. A portion of the structure is only one story with a height of 22 feet. Two EDG Fuel Oil Storage Tanks are buried in concrete in the north and south sides of the building below the grade elevation. The tanks are structurally supported on concrete mat foundations. The building walls and slabs are 2 feet thick. There are several air intake and exhaust openings in the building. Steel louvers are used to prevent tornado generated missiles from entering the building while maintaining more than 50% of the openings. The building is vented. The seismic and tornado wind loadings are taken by the shear capabilities of the walls. The walls are also designed to withstand tornado wind pressure and tornado generated missiles.
2. Applicable Codes, Standards, and Specifications The design, materials, fabrication, erection, inspection, testing, and surveillance, if any, of Category I structures are covered by codes, standards, and guides that are either applicable in their entirety or in portions thereof. A list of such documents is as follows:				
Specification — Title				
ACI 349 — "Code Requirements for Nuclear Safety-Related Concrete Structures"		X		ACI 318-89 is used for the design of the DGB. See Appendix D, Regulatory Guide Compliance Summary, Regulatory Guide 1.142 for a discussion of ACI 318-89 versus ACI 349.
AISC — "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings"	X			AISC 9th Edition is used for the design of the steel structures.
Regulatory Guides				
1.10 — Mechanical (Caldweld) Splices in Reinforcing Bars of Category I Concrete Structures	N/A			Caldweld is not used to splice the reinforcing bars.

SRP ACCEPTANCE CRITERIA		ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)					
1.15	Testing of Reinforcing Bars for Category I Concrete Structures	N/A		Section 1.8 FSAR (Ref. 1)	Regulatory Guides 1.15 and 1.55 have been withdrawn by NRC. The requirements of these guides are covered in ANSI N45.2.5 which is included in the PBNP QA Program.
1.55	Concrete Placement in Category I Structures	N/A			See previous discussion.
1.69	Concrete Radiation Shields for Nuclear Power Plants	N/A			Not applicable for the DGB.
1.91	Evaluations of Explosions Postulated to Occur on Transportation Routes Near Nuclear Power Plants	N/A			There are no transportation routes within 2 miles of the vital structures in PBNP, therefore blast loads are not postulated.
1.94	Quality Assurance Requirements for Installation, Inspection, and Testing of Structural Concrete	X		FSAR Table 1.8-1 (Ref. 1)	The PBNP Quality Assurance Program commits to follow Regulatory Guide 1.94
1.115	Protection Against Low Trajectory Turbine Missiles	X			The DGB is located outside the low trajectory turbine missiles strike zone.
1.142	Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containments)	X			See Regulatory Guide Compliance Matrix, Reg. Guide 1.142
1.143	Design Guidance for Radioactive Waste Management Systems, Structures, and Components Installed in LWR Plants	N/A			Not applicable to this Diesel Generator Project.
3. Loads and Load Combinations The specified loads and load combinations are acceptable if found to be in accordance with the following: a. Loads, Definitions, and Nomenclature All the major loads to be encountered or to be postulated are listed below. All the loads listed, however, are not necessarily applicable to all the structures and their elements. Loads and the applicable load combinations for which each structure has to be designed will depend on the conditions to which that particular structure may be subjected.					

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
Normal loads, which are those loads to be encountered during normal plant operation and shutdown, include:				
D - Dead loads or their related internal moments and forces, including any permanent equipment loads.	X			
L - Live loads or their related internal moments and forces, including any movable equipment loads and other loads which vary with intensity and occurrence, such as soil pressure.	X			
T_o- Thermal effects and loads during normal operating or shutdown conditions, based on the most critical transient or steady state condition.	N/A			There are no significant thermal loads during normal operating or shutdown conditions in the Diesel Generator Building.
R_o- Pipe reactions during normal operating or shutdown conditions, based on the most critical transient or steady state condition.	N/A			The effect of the pipe reactions on the Diesel Generator Building is insignificant.
Severe environmental loads include:				
E - Loads generated by the operating basis earthquake.	X			
W - Loads generated by the design wind specified for the plant.	X			
Extreme environmental loads include:				
E'- Loads generated by the safe shutdown earthquake.	X			
W_t- Loads generated by the design tornado specified for the plant. Tornado loads include loads due to the tornado wind pressure, the tornado-created differential pressure, and to tornado-generated missiles.	X			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
Abnormal loads, which are those loads generated by a postulated high-energy pipe break accident, include:	N/A			The two 24 inch walls separating the EDG systems prevent the loads generated by a high-energy pipe break from affecting the second system. The Train A Fuel Oil Pump Room is separated by one 24 inch thick concrete wall. Therefore a pipe rupture has not been postulated for the Diesel Generator Project. The two 24 inch walls are considered adequate based on past experiences.
P_a- Pressure equivalent static load within or across a compartment generated by the postulated break, and including an appropriate dynamic load factor to account for the dynamic nature of the load.	N/A			
T_a- Thermal loads under thermal conditions generated by the postulated break and including T_o.	N/A			
R_a- Pipe reactions under thermal conditions generated by the postulated break and including R_o.	N/A			
Y_r- Equivalent static load on the structure generated by the reaction on the broken high-energy pipe during the postulated break, and including an appropriate dynamic load factor to account for the dynamic nature of the load.	N/A			
Y_j- Jet impingement equivalent static load on a structure generated by the postulated break, and including an appropriate dynamic load factor to account for the dynamic nature of the load.	N/A			
Y_m- Missile impact equivalent static load on a structure generated by or during the postulated break, as from pipe whipping, and including an appropriate dynamic load factor to account for the dynamic nature of the load.	N/A			
In determining an appropriate equivalent static load for Y_r, Y_j, and Y_m, elasto-plastic behavior may be assumed with appropriate ductility ratios, provided excessive deflections will not result in loss of function of any safety-related system.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
b. Load Combinations for Concrete Structures				
For concrete structures, the load combinations are acceptable if found in accordance with the following:	X			
(i) For service load conditions, either the working stress design (WSD) method as outlined in ACI 318 Code or the strength design method may be used.	N/A			Working stress design is not used. Strength design method is used.
(a) If the WSD method is used, the following load combinations should be considered: (1) D + L (2) D + L + E (3) D + L + W If thermal stresses due to T_o and R_o are present, the following combinations should be also considered: (4) $D + L + T_o + R_o$ (5) $D + L + T_o + R_o + E$ (6) $D + L + T_o + R_o + W$ Both cases of L having its full value or being completely absent should be checked.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
(b) If the strength design method is used, the following load combinations should be considered: (1) 1.4 D + 1.7 L (2) 1.4 D + 1.7 L + 1.9 E (3) 1.4 D + 1.7 L + 1.7 W If thermal stresses due to T_o and R_o are present, the following combinations should also be considered: (4) (0.75) (1.4D + 1.7L + 1.7 T_o + 1.7R_o) (5) (0.75) (1.4D + 1.7L + 1.9E + 1.7 T_o + 1.7 R_o) (6) (0.75) (1.4D + 1.7L + 1.7W + 1.7T_o + 1.7R_o) In addition, the following combinations should be considered: (7) 1.2 D + 1.9 E (8) 1.2 D + 1.7 W	X			The following load combinations are considered: 1.4D + 1.7L 1.4D + 1.7L + 1.7H 1.4D + 1.7L + 1.7W + 1.7H 1.4D + 1.7L + 1.87E + 1.7H 1.4D + 1.7W 1.4D + 1.87E 1.2D + 1.7W 1.2D + 1.87E Where, H is load due to pressure of soil and water in soil. T_o and R_o are insignificant for the design of the Diesel Generator Building.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
(ii) For factored load conditions which represent extreme environmental, abnormal, abnormal/severe environmental, and abnormal/extreme environmental conditions, the strength design method should be used and the following load combinations should be considered: (a) $D + L + T_o + R_o + E'$ (b) $D + L + T_o + R_o + W_t$ (c) $D + L + T_a + R_a + 1.5\ P_a$ (d) $D + L + T_a + R_a + 1.25\ P_a + 1.0\ (Y_r + Y_j + Y_m) + 1.25\ E$ (e) $D + L + T_a + R_a + 1.0\ P_a + 1.0\ (Y_r + Y_j + Y_m) + 1.0\ E'$ In combinations (c), (d), and (e), the maximum values of P_a, T_a, R_a, Y_j, and Y_m, including an appropriate dynamic load factor, should be used unless a time-history analysis is performed to justify otherwise. Combinations (b) and (d) and (e) and the corresponding structural acceptance criteria of subsection II.5 of this SRP section should be satisfied first without the tornado missile load in (b) and without Y_r, Y_j, and Y_m in (d) and (e). When considering these concentrated loads, local section strength capacities may be exceeded provided there will be no loss of function of any safety-related system.	X		Refs. 7, 17	The following load combinations are considered: $D + L + H + E'$ $D + L + H + W_t$ Other load combinations are not applicable and/or do not govern. T_o and R_o are insignificant for the design of the Diesel Generator Building. The effect of tornado-generated missile impact on the Diesel Generator Building walls and slabs is also considered.
Where any load reduces the effects of other loads, the corresponding coefficient for that load should be taken as 0.9 if it can be demonstrated that the load is always present or occurs simultaneously with other loads. Otherwise the coefficient for that load should be taken as zero.	X			The following load combinations, as noted before, are considered to comply with this requirement. $1.2D + 1.7W = 1.33\ (0.9D + 1.3W)$ $1.2D + 1.87E = 1.33\ (0.9D + 1.4E)$

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
Where the structural effects of differential settlement, creep, or shrinkage may be significant, they should be included with the dead load, D, as applicable.	X			The effects of differential settlement, creep, and shrinkage are considered insignificant for the DGB.
c. Load Combinations for Steel Structures				
For steel interior structures, the load combinations are acceptable if found in accordance with the following:	X			The elastic working stress design method of Part 1 of the AISC specifications is used for steel work inside the DGB.
(i) For service load conditions, either the elastic working stress design methods of Part 1 of the AISC specifications, or the plastic design methods of Part 2 of the AISC specifications, may be used.				
(a) If the elastic working stress design methods are used, the following load combinations should be considered: (1) D + L (2) D + L + E (3) D + L + W	X		Section 1.8.2.9 DBD (Ref. 7)	These load combinations are used for design of steel structures.
If thermal stresses due to T_o and R_o are present, the following combinations should be also considered: (4) $D + L + T_o + R_o$ (5) $D + L + T_o + R_o + E$ (6) $D + L + T_o + R_o + W$	X			T_o and R_o are included in the design of the steel structures where applicable (such as support of the exhaust piping, etc.)

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE YES	ACCEPTANCE CRITERIA COMPLIANCE NO	REFERENCE	DISCUSSION/RESOLUTION
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
(b) If plastic design methods are used, the following load combinations should be considered: (1) $1.7\ D + 1.7\ L$ (2) $1.7\ D + 1.7\ L + 1.7\ E$ (3) $1.4\ D + 1.7\ L + 1.7\ W$	N/A			Plastic design methods are not used.
If thermal stresses due to T_o and R_o are present, the following combinations should also be considered: (4) $1.3\ (D + L + T_o + R_o)$ (5) $1.3\ (D + L + E + T_o + R_o)$ (6) $1.3\ (D + L + W + T_o + R_o)$	N/A			T_o and R_o are not postulated.
(ii) For factored load conditions the following load combinations should be considered: (a) If elastic working stress design methods are used: (1) $D + L + T_o + R_o + E'$ (2) $D + L + T_o + R_o + W_t$ (3) $D + L + T_a + R_a + P_a$ (4) $D + L + T_a + R_a + P_a + 1.0\ (Y_r + Y_j + Y_m) + E$ (5) $D + L + T_a + R_a + P_a + 1.0\ (Y_r + Y_j + Y_m) + E'$	X		Section 1.8.2.9 DBD (Ref. 7)	The following load combinations are used: $(D + L + E')(0.67)$ $(D + L + W_t)(0.67)$ T_o and R_o are included in the design of the steel structures where applicable. The allowable stresses are not increased for these load combinations. The approach is more conservative than the requirements of this SRP. Other load combinations are not applicable. The load combinations are consistent with the load combinations given in Section 5.3.4.5.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
(b) If plastic design methods are used:	N/A			Plastic design methods are not used.
(1) $D + L + T_o + R_o + E'$				
(2) $D + L + T_o + R_o + W_t$				
(3) $D + L + T_a + R_a + P_a$				
(4) $D + L + T_a + R_a + 1.25\ P_a + 1.0\ (Y_r + Y_j + Y_m) + 1.25\ E$				
(5) $D + L + T_a + R_a + 1.0\ P_a + 1.0\ (Y_r + Y_j + Y_m) + E'$				
In the above factored load combinations, thermal loads can be neglected when it can be shown that they are secondary and self-limiting in nature and where the material is ductile.				
In combinations (3), (4), and (5), the maximum values of P_a, T_a, R_a, Y_j, Y_r, and Y_m, including an appropriate dynamic load factor, should be used unless a time-history analysis is performed to justify otherwise. Combinations (2), (4) and (5) and the corresponding structural acceptance criteria of subsection II.5 of this SRP section should first be satisfied without the tornado missile load in (2) and without Y_r, Y_j, and Y_m in (4) and (5). When considering these concentrated loads, local section strength may be exceeded provided there will be no loss of function of any safety-related system.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
Where any load reduces the effects of other loads, the corresponding coefficient for that load should be taken as 0.9, if it can be demonstrated that the load is always present or occurs simultaneously with other loads. Otherwise, the coefficient for that load should be taken as zero.	N/A			See above.
Where the structural effect of differential settlement may be significant it should be included with the dead load, D.				
4. Design and Analysis Procedures				
The design and analysis procedures utilized for Category I structures, including assumptions on boundary conditions and expected behavior under loads, are acceptable if found in accordance with the following:				
a. For concrete structures, the procedures are in accordance with ACI-349, "Code Requirements for Nuclear Safety Related Structures" (Ref. 1).		X		ACI-318-89 is used. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.142.
b. For steel structures, the procedures are in accordance with the AISC "Specification..." (Ref. 3).	X			AISC 9th Edition is used.
c. Computer programs are acceptable if the validation provided is found in accordance with procedures delineated in subsection II.4.e of SRP Section 3.8.1.	X		Refs. 16, 17	Verified computer programs are used in the analysis.
d. Design report is considered acceptable if it contains the information specified in Appendix C to this SRP section.		X		No design report is prepared for the DGB.
e. Structural audit is conducted in accordance with the provisions of Appendix B to this SRP section.	X			Structural drawings, calculations, etc. will be available for NRC audit.
f. Design of spent fuel pool and rods is considered acceptable when the requirements of Appendix D to this SRP section are met.	N/A			There is no spent fuel pool and rods in the Diesel Generator Project.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd)				
5. Structural Acceptance Criteria				
For each of the loading combinations delineated in subsection II.3 of this SRP section, the following defines the allowable limits which constitute the structural acceptance criteria:				
a. In Combinations for Concrete ... Limit				
Paragraphs 3.b.(i)(a)(1),(2), and (3)............S[1]				
Paragraphs 3.b.(i)(a)(4),(5), and (6)............1.3 S				
Paragraphs 3.b.(i)(b)(1),(2), and (3)............U[2]	X			The section strength U, as defined in ACI-318-89 is used for all applicable load combinations.
Paragraphs 3.b.(i)(b)(4),(5), and (6)............U				
Paragraphs 3.b.(i)(6),(7), and (8)...............U				
Paragraphs 3.b.(ii)(a),(b),(c),(d), and (e)......U				
b. In Combinations for Steel ... Limit				
Paragraphs 3.c.(i)(a)(1),(2), and (3)............S	X			The sections strengths as defined in this SRP are used.
Paragraphs 3.c.(i)(a)(4),(5), and (6)............1.5 S	N/A			
Paragraphs 3.c.(i)(b)(1),(2), and (3)............Y[3]	N/A			
Paragraphs 3.c.(i)(b)(4),(5), and (6)............Y	N/A			
Paragraphs 3.c.(ii)(a)(1),(2),(3),and (4)[4].....1.6 S	X			The applicable load combinations are multiplied by a factor of 0.67 as shown in paragraph 3.c.(ii). The allowable stresses are not increased. This is equivalent to the load combinations without any factor and an increase of allowables by a factor of 1.5 which is more conservative than 1.6 permitted in this SRP.
Paragraphs 3.c.(ii)(a)(4), and (5)[4]............1.7 S	N/A			
Paragraphs 3.c.(ii)(b)(1),(2),(3),(4), and (5)...Y	N/A			
Notes:				
(1) S- For concrete structures, S is the required section strength based on the working stress design method and the allowable stresses defined in ACI 318 Code.				
For structural steel, S is the required section strength based on elastic design methods and the allowable stresses defined in Part 1 of the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" (Ref. 3).				
The one-third increase in allowable stresses for concrete and steel due to seismic or wind loadings is not permitted.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.4 OTHER SEISMIC CATEGORY I STRUCTURES REV. 1 - July 1981 (cont'd) Notes (continued) (2) U- For concrete structures, U is the section strength required to resist design loads based on the strength design methods described in ACI 349 Code (Ref. 1). (3) Y- For structural steel, Y is the section strength required tc resist design loads and based on plastic design methods described in Part 2 of the AISC "Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings" (Ref. 3). (4) For these two combinations, in computing the required section strength, S, the plastic section modulus of steel shapes, except for those which do not meet the AISC criteria for compact sections, may be used.				
6. Materials, Quality Control, and Construction Techniques For Category I structures outside the containment, the acceptance criteria for materials, quality control, and any special construction techniques are in accordance with the codes and standards indicated in subsection I.6 of SRP Section 3.8.3, as applicable.	X			No special construction technique is used. The materials conform with ACI-318-89 and AISC 9[th] Edition. The quality control, in general, complies with ANSI N45.2.5.
7. Testing and Inservice Surveillance Requirements At present there are no special testing or inservice surveillance requirements for Category I structures outside the containment. However, where some requirements become necessary for special structures, such requirements are reviewed on a case-by-case basis.	N/A			The DGB is not a special structure.
8. Masonry Walls Acceptance criteria for masonry walls are contained in Appendix A to this SRP section.	N/A			No masonry walls are used inside the DGB. The exterior side of the building's reinforced concrete walls are brick. The failure of this facade does not affect the strength of the building and has no effect on the safety-related SSC.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.5 FOUNDATIONS REV. 1 - July 1981				
SEB acceptance criteria for the design of seismic Category I foundations are based on meeting the relevant requirements of the following regulations:				
A. 10 CFR Part 50, 50.55a and General Design Criterion 1 as they relate to safety-related structures being designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety function to be performed.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 1.
B. General Design Criterion 2 (Ref. 3) as it relates to appropriate considerations being given to the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, and to the combinations of the effects of normal and accident conditions with the effects of the natural phenomena.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 2.
C. General Design Criterion 4 (Ref. 4) as it relates to structures, systems, and components important to safety being appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 4.
D. General Design Criterion 5 (Ref. 5) as it relates to structures, systems, and components important to safety not being shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 5.
The Regulatory Guides and industry standards identified in item 2 of this subsection provides information, recommendations and guidance and in general describes a basis acceptable to the staff that may be used to implement the requirement of 10 CFR Part 50, K50.55a, and GDC 1, 2, 4, and 5. Also, specific acceptance criteria necessary to meet these relevant requirements of these regulations for the areas of review, described in subsection I of this SRP Section are as follows:				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.5 FOUNDATIONS REV. 1 - July 1981 (cont'd)				
1. Description of the Foundation				
The descriptive information in the SAR is considered acceptable if it meets the minimum requirements set forth in Section 3.8.5.1 of Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants". Deficient areas of descriptive information are identified by the reviewer and a request for additional information is initiated. New or unique design features that are not specifically covered in the "Standard Format...", require a more detailed review. The reviewer determines the additional information required for a meaningful review of such new or unique design features.	X		Structural Drawings 6704-E-121201 thru 121202 and 6704-E-121205 thru 121211	The foundation of the DGB is a 2 foot thick mat at an elevation of 26 feet. At the north and south sides of the building two EDG Fuel Oil Storage Tanks are buried in concrete. Each tank is structurally supported on a 2 foot thick mat at an elevation of 10 feet - 9 inches. The mat at elevation 26 feet is structurally connected to the two mats at elevation 10 feet - 9 inches by concrete ribs. Most of the building loads at the north and south sides are transferred to the foundation at elevation 10 feet - 9 inches through the ribs. The horizontal shears are resisted by the friction and the passive soil pressure on the buried portion of the structure. No shear keys or waterproofing membranes are used. The general foundation level is above the water table.
2. Applicable Codes, Standards, and Specifications				
The design, materials, fabrication, erection, inspection, testing, and surveillance, if any, of seismic Category I foundations are covered by codes, standards, and guides that are either applicable in their entirety or in portions thereof. A list of such documents is contained in subsection I.2 of the SRP Section 3.8.3. In addition, the documents listed in subsection II.2 of SRP Section 3.8.1 are acceptable for the containment foundation.		X		ACI-318-89 is used for the design of the DGB foundation. See Appendix D, Regulatory Guide Compliance Summary, for a discussion of Regulatory Guide 1.142.
3. Loads and Load Combinations				
The specified loads and load combinations used in the design of seismic Category I foundations are acceptable if found to be in accordance with those combinations referenced in subsection II.3 of SRP Section 3.8.1 for the containment foundation, and with those combinations listed in subsection II.3 of SRP Section 3.8.4 for all other seismic Category I foundations.	X			Load combinations are given in the Discussion/Resolution column to the SRP 3.8.4 Compliance Matrix.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.5 FOUNDATIONS REV. 1 - July 1981 (cont'd)				
In addition to the load combinations referenced above, the combinations used to check against sliding and overturning due to earthquakes, winds, and tornadoes, and against floatation due to floods, are found acceptable if in accordance with the following: a. D + H + E b. D + H + W c. D + H + E' d. D + H + W_t e. D + F' where D, E, W, E', W_t are as defined in SRP Section 3.8.4, H is the lateral earth pressure, and F' is the buoyant force of the design basis flood. Justification should be provided for including live loads or portions thereof in these combinations.	X			The following load combinations are considered to check sliding and overturning: D + E D + W D + E' D + W_t There is no danger of flooding and no adverse effect from lateral soil pressure.
4. Design and Analysis Procedures The design and analysis procedures used for seismic Category I foundations are acceptable if found in accordance with the following:				
a. The design should consider the soil-structure interaction, hydrodynamic effect, and dynamic soil pressure.	X			Seismic analysis is performed considering soil-structure interaction. There are no hydrodynamic or lateral dynamic soil pressure effects on the foundation.
b. For seismic Category I concrete foundations other than the containment foundations, the procedures are in accordance with the ACI-349 Code, as augmented by Regulatory Guide 1.142.		X		ACI-318-89 is used. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.142.
c. For Category I steel foundations, the procedures are in accordance with the AISC "Specifications...".	N/A			There is no Category I steel or containment foundation design in this project.
d. For the containment foundation, the design and analysis procedures referenced in subsection II.4 of SRP Section 3.8.1 are acceptable.	N/A			See above.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.5 FOUNDATIONS REV. 1 - July 1981 (cont'd)				
e. The design report is found acceptable if it satisfies the guidelines contained in Appendix C to SRP Section 3.8.4.	N/A			No design report is prepared for the DGB.
f. The structural audit is conducted as described in Appendix B to SRP Section 3.8.4.	X			Structural drawings, calculations, etc. will be available for NRC audit.
For determining the overturning moment due to an earthquake, the three components of the earthquake should be combined in accordance with methods described in SRP Section 3.7.2. Computer programs are acceptable if the validation provided is found in accordance with procedures delineated in subsection II.4.e of SRP Section 3.8.1.	X			See response to item 14 of SRP 3.7.2. A computer program was not used to obtain the overturning moments. The moments are obtained by applying the quasi-static seismic forces obtained from seismic analysis of the DGB.
5. Structural Acceptance Criteria				
For each of the loading combinations referenced in subsection II.3 of this SRP Section, the allowable limits which constitute the acceptance criteria are referenced in subsection II.5 of SRP Section 3.8.1 for the containment foundation and are listed in subsection II.5 of SRP Section 3.8.4 for all other foundations. In addition, for the five additional load combinations delineated in subsection II.3 of this SRP section, the factors of safety against overturning, sliding and floatation are acceptable if found in accordance with the following: Minimum Factors of Safety For Combination / Overturning / Sliding / Floatation a. 1.5 1.5 -- b. 1.5 1.5 -- c. 1.1 1.1 -- d. 1.1 1.1 -- e. -- -- 1.1	X			The section strength U, as defined in ACI-318-89 is used for all applicable load combination. Factors of safety against sliding and overturning are greater than 1.5 for service load combinations and 1.1 for extreme environmental load combinations.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.8.5 FOUNDATIONS REV. 1 - July 1981 (cont'd)				
6. Materials, Quality Control, and Special Construction Techniques				
For the containment foundation, the acceptance criteria for materials, quality control, and any special construction techniques are referenced in subsection II.6 of SRP Section 3.8.1. For all other seismic Category I foundations, the acceptance criteria are similar to those referenced in subsection II.6 of SRP Section 3.8.4.	X			The materials conform with ACI-318-89. The quality control, in general, complies with ANSI N45.2.5.
7. Testing and Inservice Surveillance Requirements				
At present there are no special testing or in-service surveillance requirements for seismic Category I foundations other than those required for the containment foundation, which are covered in subsection II.7 of SRP Section 3.8.1. However, should some requirements become necessary for special foundations, they will be reviewed on a case-by-case basis.	N/A			No special foundation is used in the DGB.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981				
The acceptance criteria for the areas of review designated in subsection I are based on meeting the relevant requirements of the following regulations:				
A. General Design Criteria 1 and 30 as they relate to qualifying equipment to appropriate quality standards commensurate with the importance of the safety functions to be performed.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 1. GDC 30 (Quality of Reactor Coolant System) is not applicable to the DG Modification.
B. General Design Criterion 2 and Appendix A to 10 CFR Part 100 as they relate to qualifying equipment to withstand the effects of natural phenomena such as earthquakes.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 2.
C. General Design Criterion 4 as it relates to qualifying equipment being capable of withstanding the dynamic effects associated with external missiles and internally generated missiles, pipe whip, and jet impingement forces.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 4.
D. General Design Criterion 14 as it relates to qualifying equipment associated with the reactor coolant boundary so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure and of gross rupture.	N/A			Not Applicable to DG modification.
E. Appendix B to 10 CFR Part 50 as it relates to qualifying equipment using the quality assurance criteria provided.	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 1.
Specific criteria, regulatory guides, and industry standards that provide information, recommendations and guidance, and in general describe a basis acceptable to the staff that may be used to implement the requirements of the regulations identified above are as follows:				
Acceptable load combinations and methods for combining dynamic responses for mechanical equipment are defined in SRP Section 3.9.3. The same criteria is acceptable for electrical equipment.		X		The load combinations utilized are consistent with the current design practice at PBNP.
Acceptable testing and analysis procedures for confirming the operability of equipment for the defined load condition are presented in paragraphs XI of Appendix B to 10 CFR 50 and VI (a)(1) and (2) of Appendix A to 10 CFR Part 100 as they relate to the qualification of equipment.	X			The qualification of electrical and mechanical equipment, conforms to the requirements of IEEE Std. 344-1975 or 1987. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.100. As an alternative to qualification by testing, some of the Class 1E electric or Class 1 mechanical equipment are seismically qualified using USI A-46 (GIP) methodology.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
1. For plants for which the CP application was docketed after October 27, 1972, the qualification of electrical equipment and their supports should meet the requirements and recommendations of IEEE Std. 344-1975 and the Regulatory Position of Regulatory Guide 1.100, which endorses IEEE Std. 344-1975. These documents are generally applicable to all types of equipment and should be used to the extent practicable for the qualification of mechanical equipment as well. Specifically, conformance to the following criteria should be demonstrated.	X			The CP application for the Point Beach Nuclear Plant was docketed before October 27, 1972. However, the equipment in the DGB are all qualified per IEEE 344-1975 or 1987.
a. Qualification for Equipment Operability				
(1) Tests and analysis are required to confirm the operability of all mechanical and electrical equipment during and after an earthquake of magnitude up to and including the OBE and SSE, and for all static and dynamic loads from normal, transient and accident conditions. Prior to SSE qualification, it should be demonstrated that the equipment can withstand the OBE excitation without loss of structural integrity. Analyses alone, without testing, are acceptabl^ as a basis for qualification only if the necessary functional operability of the equipment is assured by its structural integrity alone. When complete testing is impractical, a combination of tests and analyses is acceptable.	X			The Class 1 Equipment are qualified by tests and/or qualified using USI A-46 methodology for the design (OBE) and the maximum hypothetical earthquake (SSE).
Equipment that has been previously qualified by means of tests and analyses equivalent to those described here are acceptable provided that proper documentation of such tests and analyses is submitted.	X		Vendor Seismic Qualifying Reports	The EDGs are previously qualified by test to the requirements of IEEE Std. 344-1975 using a required response spectra (RRS) which envelopes the design required response spectra.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
(2) Equipment should be tested in the operational condition. Operability should be verified during and/or after the testing, as applicable to the equipment being tested. Loadings simulating those of plant normal operation, such as thermal and flow-induced loading, if any, should be concurrently superimposed upon the seismic and other pertinent dynamic loading to the extent practicable. Particular attention should be paid, in operability qualification of mechanical equipment subjected to flow-induced loading to incorporate degraded flow conditions such as those that might be encountered by the presence of debris, impurities, and contaminants in the fluid system. An example of this may be the operability of the containment sump pump recirculating water full of debris.	X			Any components tested will be tested in the operational condition.
(3) The characteristics of the required seismic and dynamic input motions should be specified by response spectrum or time history methods. These characteristics, derived from the structures or systems seismic and dynamic analyses, should be representative of the input motions at the equipment mounting locations.	X			The seismic input motion is specified by response spectra at the equipment mounting locations.
(4) For seismic and dynamic loads, the actual test input motion should be characterized in the same manner as the required input motion, and the conservatism in amplitude and frequency content should be demonstrated (i.e., the test response spectrum(TRS) should closely resemble and envelope the required response spectrum (RRS) over the critical frequency range).	X			The tests are performed per IEEE Std. 344 which requires that TRS closely resembles and envelopes RRS.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
(5) Since seismic and the dynamic load excitation generally have a broad frequency content, multi-frequency vibration input motion should be used. However, single frequency input motion, such as sine beats, is acceptable provided the characteristics of the required input motion indicate that the motion is dominated by one frequency (e.g., by structural filtering effects), or the anticipated response of the equipment is adequately represented by one mode, or in the case of structural integrity assurance, the input has sufficient intensity and duration to produce sufficiently high levels of stress for such assurance. Components that have been previously tested to IEEE Std. 344-1971 should be reevaluated to justify the appropriateness of the input motion used, and requalified if necessary.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.
(6) For the seismic and dynamic portion of the loads the test input motion should be applied to one vertical axis and one principal horizontal axis (or two orthogonal horizontal axes) simultaneously unless it can be demonstrated that the equipment response in the vertical direction is not sensitive to the vibratory motion in the horizontal direction, and vice versa. The time phasing of the inputs in the vertical and horizontal directions must be such that a purely rectilinear resultant input is avoided. An acceptable alternative is to test with vertical and horizontal inputs in-phase, and then repeat the test with inputs 180 degrees out-of-phase. In addition, the test must be repeated with the equipment rotated 90 degrees horizontally.	X		Vendor Seismic Qualifying Reports	Other Class 1 equipment which are not qualified by analysis will be tested according to the requirements of this section.
Components that have been previously tested to IEEE Std. 344-1971 should be requalified using biaxial test input motions unless justification for using a single axis test input motion is provided.	N/A			No components have been qualified per IEEE Std. 344-1971.
(7) Dynamic coupling between the equipment and related systems, if any, such as connected piping and other mechanical components should be considered.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
(8) The fixture design should simulate the actual service mounting and should not cause any extraneous dynamic coupling to the test item.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.
(9) For pumps and valves, the loads imposed by the attached piping should be properly taken into account. In order to assure operability under combined loadings, the stresses resulting from the applied test loads should envelope the specified service stress limit for which the component's operability is intended.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.
(10) If the dynamic testing of a pump or valve assembly proves to be impracticable, static testing of the assembly is acceptable provided that the end loadings are conservatively applied and are equal to or greater than postulated events loads, all dynamic amplification effects are accounted for, the component is in the operating mode during and after the application of loads, and an adequate analysis is made to show the validity of static application of loads.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.
(11) The in situ application of vibratory devices to simulate the seismic and dynamic vibratory motions on a complex active device is acceptable to confirm the operability of the device when it is shown that a meaningful test can be made in this way.	X			Qualification per IEEE 344-1987 or 1975 has been invoked.
(12) The test program may be based upon selectively testing a representative number of components according to type, load level, size, etc., on a prototype basis.	X			For multiple components, such as valves, a minimum of one of each identical type/size/rating will be tested.
(13) Selection of damping values for equipment to be qualified should be made in accordance with Regulatory Guide 1.61 and IEEE Std. 344-1975. Higher damping values may be used if justified by documented test data with proper identification of the source and mechanism.	X			The damping values used are either in conformance with R.G. 1.61 or are lower.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
(14) When complete testing is not practicable, the features listed below should be incorporated into a test and analysis operability assurance program for pumps and valves. Similar programs can be developed for other types of equipment.	X			When testing is not practical, analysis techniques as outlined in SRP 3.10 (14) are specified.
(a) Simple and passive elements, such as valve and pump bodies and their related piping and supports may be analyzed to confirm structural integrity under postulated event loadings. However, complex active devices such as pump motors, valve operator and gate or disk assemblies, and other electrical, mechanical, pneumatic, or hydraulic appurtenances which are vital to the pump or valve operation should be tested for operability.	X			See response to (14) above.
(b) The following analyses are acceptable provided they are correlated to classical problems, elementary laboratory tests, or in situ tests:	X			See response to (14) above.
i. An analysis is performed to determine the vibratory input to the valve or pump.	X			See response to (14) above.
ii. An analysis is performed to determine the system natural frequencies and the movement of the pump or valve during the dynamic events.	X			See response to (14) above.
iii. An analysis is performed to determine the pressure differential and the impact energy on a valve disc during a LOCA, and to verify the design adequacy of the disc.	N/A			Not applicable to the Diesel Generator Project.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
iv. An analysis is performed to determine the forcing functions of the axial and radial loads imposed on a pump rotor due to a LOCA, such that combined LOCA and vibratory effects on the shaft and rotor assembly can be evaluated.	N/A			Not applicable to the Diesel Generator Project.
v. An analysis is performed to determine the speed of the pump shaft as a result of postulated events and to compare it with the design critical speed.	X			See response to (14) above.
vi. An analysis is performed to verify the design adequacy of the wall thickness of valve and pump pressure-retaining bodies.	X			See response to (14) above.
vii. An analysis is performed to determine the natural frequencies of a pump shaft and rotor assembly to ascertain whether they are within the frequency range of the vibratory excitations. If the minimum natural frequency of the assembly is beyond the excitation frequencies, a static deflection analysis of the shaft is acceptable to account for dynamic effects. If the assembly natural frequencies are close to the excitation frequencies, an acceptable dynamic analysis must be performed to determine the structural response of the assembly to the excitation frequencies.	X			See response to (14) above.
viii. When analyses are used for qualification, the combination of multimodal and multidirectional responses should be made in accordance with Regulatory Guide 1.92.	X			

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
b. Design Adequacy of Supports				
(1) Analyses or tests should be performed for all supports of mechanical and electrical equipment to assure their structural capability.	X			All supports of the mechanical and electrical equipment are qualified by analysis.
(2) The analytical results should include the required input motions to the mounted equipment as obtained and characterized in the manner stated in subsection II.1.a.(3) above, and the combined stresses of the support structures should be in accordance with the criteria specified in SRP Section 3.9.3.	X			The response spectra generated for the elevation of the equipment supports location are used to design the supports. Response spectra of higher elevation are used for locations where no response spectra are generated. All applicable loads are considered in the loading combination for the design of the supports.
(3) Support should be tested with equipment installed or with a dummy simulating the equivalent equipment inertial mass effects and dynamic coupling to the support. If the equipment is installed in a nonoperational mode for the support test, the response in the test at the equipment mounting location should be monitored and characterized in the manner as stated in subsection II.1.a(3) above. In such a case, equipment should be tested separately for operability and the actual input motion to the equipment in this test should be more conservative in amplitude and frequency content that the monitored response from the support test.	N/A			Supports are qualified by analysis.
(4) The criteria of subsections II.1.a(3), (4), (5), (6), (7), (8), and (13) above, are applicable when tests are conducted on the equipment supports.	N/A			Supports are qualified by analysis.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
c. Verification That Seismic and Dynamic Qualification Is Performed in the Proper Sequences of the Overall Qualification Program As defined in Part B of Regulatory Guide 1.100, IEEE Std. 344-1975 is an ancillary standard of IEEE Std. 323-1974 (endorsed with exceptions by Regulatory Guide 1.89. In accordance with this standard, for plants whose construction permit SER is dated July 1, 1974, or later, the seismic and dynamic testing portion of the overall qualification should be performed in its proper sequence as indicated in Section 6 of IEEE Std. 323-1974.	N/A			The equipment inside the DGB are not subjected to other environmental accident condition other than seismic.
2. For plants for which the CP application was docketed before October 27, 1972, applicants should describe the extent to which the seismic and dynamic qualification of mechanical and electrical equipment and their supports meet the criteria of subsection II.1 above. For equipment that does not meet these requirements, justification should be provided for the use of other criteria. As a minimum, the electrical equipment and their supports should meet the requirements of IEEE Std. 344-1971. It should be demonstrated that all equipment has adequate margin to perform their intended design functions during seismic and dynamic events when considering the effects of possible multi-mode response and simultaneous vertical and horizontal excitations on equipment operability. Specifically, in addition to the criteria of subsection II.1.a(1), (2), (7), (8), (9), (10), (11), (12), (13), and (14) above, the following criteria are applicable.	N/A			The CP application for the Point Beach Nuclear Plant was docketed before October 27, 1972. However, the equipment in the DGB is qualified per IEEE 344-1975 or 1987. The equipment and their supports meet the criteria of Subsection II.1 of this SRP. Therefore, the requirements of Subsection II.2 are not applicable to the Diesel Generator Project.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
a. Qualification for Equipment Operability				
(1) Single frequency input excitations, such as continuous single frequency sinusoidal motions or sine beat motions may be used; however, multifrequency input excitations as delineated in IEEE Std. 344-1975 are preferable and should be utilized whenever possible. In either case, the maximum input motion acceleration should equal or exceed the maximum seismic and dynamic acceleration expected at the equipment mounting location. See subsection II.2.b(3) below for a discussion of the participation of the equipment supports.	N/A			Not applicable to the Diesel Generator Project. See above.
(2) For single frequency input excitation, the discrete frequencies at which the test input motion is applied should cover 1-33 Hz for seismic loads. For other dynamic loads, such as in the case of hydrodynamic loads for Mark II and III containments, larger frequency ranges may be required. If resonant frequencies of the equipment and equipment supports are identified by prior analysis or "sweep" testing or both, tests conducted only at the resonant frequencies are acceptable. However, if multifrequency input excitations are used, the level of response spectrum derived from the test input should envelope the corresponding response spectrum level required for seismic and dynamic qualification at the component mounting location.	N/A			Not applicable to the Diesel Generator Project. See above.
(3) The test motion may be applied to one vertical and two orthogonal horizontal axes separately. However, biaxial input with simultaneous vertical and horizontal excitations as delineated in IEEE Std. 344-1975 is preferable and should be utilized whenever possible.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
b. Design Adequacy of Supports	N/A			Not applicable to the Diesel Generator Project. See above.
(1) Analyses or tests should be performed for all supports of mechanical and electrical equipment to assure their structural capability.				
(2) The analytical results should include the maximum accelerations and associated frequencies at the equipment mounting location, and the combined stresses of the support structures should be in accordance with the criteria specified in SRP Section 3.9.3.				
(3) Supports should be tested with equipment installed or with a dummy simulating the equivalent inertial mass effects and dynamic coupling to the support. If the equipment is installed in a nonoperational mode for the support test, the response at the equipment mounting location should be monitored such that the maximum accelerations and associated frequencies can be defined. In such a case, equipment should be tested separately for operability and the actual input motion to the equipment should be more conservative in amplitude and frequency content than the monitored response.				
(4) The criteria of subsections II.1.a(7), (8), and (13) II.2.a(1), (2), and (3), above, are applicable when tests are conducted on the equipment supports.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
3. GDC 1 of Appendix A and paragraph XVII of Appendix B to 10 CFR 50 establish requirements for records concerning the qualification of equipment. In order to satisfy these requirements, complete and auditable records must be available and maintained by the applicant, for the life of the plant, at a central location. Their files should describe the qualification method used for all equipment in sufficient detail to document the degree of compliance with the criteria of this SRP section. These records should be updated and maintained current as equipment is replaced, further tested, or otherwise further qualified. The equipment qualification file should contain a list of all systems equipment and the equipment support structures, as defined in paragraph 2 of subsection I. The equipment list should identify which equipment is NSSS supplied and which equipment is BOP supplied. The equipment qualification file should also include qualification summary data sheets for each piece of equipment, i.e., each mechanical and electrical component of each system, which summarize the component's qualification. These data sheets should include the following information: a. Identification of equipment, including vendor, model number and location within each building. Valves that are part of the reactor coolant pressure boundary should be so identified. b. Physical description, including dimensions, weight and field mounting condition. Identification of whether the equipment is pipe, floor, or wall supported. c. A description of the equipment's function within the system.	X			Auditable qualification records will be maintained by WE in accordance with GDC 1 of Appendix A and paragraph XVII of Appendix B to 10 CFR 50. (To be verified by WE)

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
d. Identification of all design (functional) specifications and qualification reports, and their locations. Functional specifications for active valve assemblies should confirm to the Regulatory Position of Regulatory Guide 1.148.				
e. Description of the required loads and their intensities for which the equipment must be qualified.				
f. If qualification by test, identification of the test methods and procedures, important test parameters and a summary of the test results.				
g. If qualification by analysis, identification of the analysis methods and assumptions and comparisons between the calculated and allowable stresses and deflections for critical elements.				
h. The natural frequency (or frequencies) of the equipment.				
i. Identification of whether the equipment may be affected by vibration fatigue cycle effects and a description of the methods and criteria used to qualify the equipment for such loading conditions.				
j. Indicate whether the equipment has met the qualification requirements.				
k. Availability for inspection, i.e., identify whether the equipment is already installed.				
l. A compilation of the required response spectra (or time history) and corresponding damping for each seismic and dynamic load specified for the equipment together with all other loads considered in the qualification and the method of combining all loads.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
4. General Design Criterion 14 of Appendix A to 10 CFR 50 requires, in part, that the reactor coolant pressure boundary shall be designed, fabricated, erected and tested so as to have an extremely low probability of abnormal leakage. General Design Criterion 30 further requires, in part, that components which are part of the reactor coolant pressure boundary shall be designed, fabricated, erected, and tested to the highest quality standards practical. In order to satisfy these requirements, the qualification program for valves that are part of the reactor coolant pressure boundary should include testing or testing and analyses that demonstrate these valves will not experience any leakage, or increase in leakage, as a result of any loading or combination of loadings that the valves must be qualified for.	N/A			Not applicable to the Diesel Generator Project. There is no reactor coolant in the Diesel Generator Project.
5. In documenting the implementation of the qualification program described above, the following information should be included in the indicated documents.				
a. The PSAR should contain:	N/A			Not applicable to the Diesel Generator Project. See above.
(1) A detailed description of NSSS and A/E practice followed in qualification, including criteria, methods, and procedures used in conducting testing and analysis, which demonstrate the extent of compliance with the criteria set forth in subsections II.1, 2, 3, and 4 above.				
(2) Information regarding administrative control of component qualification, especially a description of the equipment qualification file, the handling of documentation, internal acceptance review procedures, identification of the scope of NSSS and A/E suppliers, and the procedures of the interchange of information between NSSS, A/E, equipment vendors and testing laboratories.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.10 SEISMIC AND DYNAMIC QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT, REV. 2, July 1981 (cont'd)				
b. In addition to the information contained in the PSAR, as revised, the FSAR should contain:	N/A			Not Applicable to the Diesel Generator Project. See above.
(1) A list of all systems required to perform the functions defined in paragraph 2 of subsection I.				
(2) A description of the results of any in-plant tests, such as in situ impedance tests, and any plans for operational tests which will be used to confirm the qualification of any item of equipment.				
c. The Seismic Qualification Report (SQR) should contain:	N/A			Not applicable to the Diesel Generator Project. See above.
(1) The list of systems required to perform the functions defined in paragraph 2 of subsection I.				
(2) The list of equipment, and their supports, associated with each system, and any other equipment required in accordance with paragraph 2 of subsection I.				
(3) The summary data sheets for each piece of equipment, i.e., each component, listed.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.11 ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT Rev. 2 - July 1981				
The general requirements for environmental design and qualification of all equipment are embodied in General Design Criterion 4 of Appendix A to 10 CFR Part 50.				Wisconsin Electric's EQ program meets the requirements of 10CFR 50.49. The equipment for this program will fall within the bounds of the WE EQ progam. All the electrical equipment and mechanical equipment is located in a mild environment except for a portion of the 5KV power cable feed to the Safety Injection Pumps. See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.29.
Specific criteria, task action plan items, regulatory guide, and industry standards that provide information, recommendations and guidance and, in general, describes a basis acceptable to the staff that may be used to implement the requirements of General Design Criterion 4 are as follows:				
Simply stated, the general requirements for environmental design and qualification are as follows: (1) The equipment shall be designed to have the capability of performing its design safety functions under all normal, abnormal, accident, and postaccident environments and for the length of time for which its function is required. (2) The equipment environmental capability shall be demonstrated by appropriate testing and analyses. (3) A quality assurance program meeting the requirements of 10 CFR 50 Appendix B shall be established and implemented to provide assurance that all requirements have been satisfactorily accomplished. The environmental design of mechanical and electrical equipment is acceptable when it can be ascertained that all three requirements are met.				
At the time of the CP and OL application, complete and auditable records must be available and maintained at a central location which describe the environmental qualification method used for all mechanical and electrical equipment in sufficient detail to document the degree of compliance with the requirements discussed herein. Thereafter, such records should be updated and maintained current as equipment is replaced, tested, or otherwise qualified.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.11 ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT Rev. 2 - July 1981 (cont'd) Harsh Environment The specific criteria for assessing the acceptability of the environmental qualification program of OL applicants are provided in NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," issued in December 1979. NUREG-0588 includes two sets of qualification requirements, Category I and Category II, which relate to IEEE 323-1974 and 1971 respectively. Category II is for plants whose construction permit SERs were dated before July 1, 1974 unless the licensee made a commitment in the construction permit record to use the 1974 standard, or unless the operating license application indicates the 1974 standard is to be used in which case, Category I will be the applicable criteria to be used. Category I is for plants whose construction permit SERs were dated after July 1, 1974. Subsection VI lists the documents which provide both acceptance criteria and evaluation guidance used in the review. The most important of these documents is IEEE Std 323 (augmented by Regulatory Guide 1.89), "General Guide for Qualifying Class I Electric Equipment for Nuclear Power Generating Stations." This document, although specifically written for Class I electric equipment, contains a clear presentation of the principles and criteria that are generic to the environmental qualification process itself; therefore, IEEE Std 323 is considered applicable to the environmental qualification of other types of equipment. This document contains detailed criteria applicable to whatever method of qualification is used, i.e., type testing, analyses, operating experience, on-going qualification, or combined qualification. NUREG-0588 (endorsed by the Commission Memorandum and Order CLI-80-21 dated May 23, 1980), "Interim Staff Position on Electrical Equipment," discusses the staff position and acceptance criteria on the environmental qualification of electrical equipment. These criteria are general in nature and could also be applied to the mechanical equipment. The environmental design and qualification of equipment is acceptable when it is ascertained that the criteria of NUREG-0588 have been met.	X		FSAR 8.2.2 (Ref. 1)	See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.131 and the 5KV cables.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.11 ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT Rev. 2 - July 1981 (cont'd) IEEE Std. 334, "Guide for Type Tests of Continuous-Duty Class I Motors Installed Inside the Containment of Nuclear Power Generating Stations" (augmented by Regulatory Guide 1.40); IEEE Std 382, "Guide for Type Test of Class I Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations" (augmented by Regulatory Guide 1.131), are specific with regard to type test qualification of the equipment identified in their titles. The detailed criteria contained in these documents as they relate to environmental qualification should be used in conjunction with the more comprehensive criteria of NUREG-0588 for evaluating the respective equipment environmental qualifications. IEEE Std. 317, "Electric Penetration Assemblies in Containment Structures for Nuclear Power Generating Stations "(augmented by Regulatory Guide 1.63), contains general guidance for qualification of penetration assemblies. Therefore, this document as it relates to environmental qualification should be used in conjunction with NUREG-0588 for evaluating the environmental qualification of this equipment. In addition, IEEE Standards 381, 535, 627, 649, and 650 can be used for guidance purposes even though NRC has not formerly endorsed these standards through the issuance of a Regulatory Guide. The effects of the chemicals should be addressed for the equipment qualification. The concentration of chemicals used for qualification should be equivalent to or more severe than that resulting from the most limiting mode of plant operation (e.g., containment spray, ECCS initiation, or recirculation phase). If the chemical composition of the chemical spray can be affected by equipment malfunctions, the most severe chemical environment that results from a single failure in the spray system should be assumed. If only demineralized water spray is used then the effect of the demineralized water spray should be included in the equipment qualification.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
3.11 ENVIRONMENTAL QUALIFICATION OF MECHANICAL AND ELECTRICAL EQUIPMENT Rev. 2 - July 1981 (cont'd)				
Radiation dose and dose rate used to determine the radiation environment for qualification of electrical and mechanical equipment shall be based on NRC staff approved source term and methodology as discussed in NUREG-0588 and supplemented by Section II.B.2 of NUREG-0737 and NUREG-0718. The radiation environment shall be based on the integrated effects of the normally expected radiation environment over the equipment's installed life plus that associated with the most severe design basis event during or following which the equipment is required to remain functional. Effects of the beta radiation shall also be considered in the qualification program. Effect of recirculatory fluid shall be considered for the equipment located outside the containment.				
MILD ENVIRONMENT				
The environmental qualification of all electrical and mechanical equipment located in the mild environment is acceptable if the following procedure is followed:	X			All safety related equipment which is located in a mild environment is specified to the normal and abnormal environmental conditions for that area.
The documentation required to demonstrate qualification of equipment in a mild environment are the "Design/Purchase" specifications. The specifications shall contain a description of the functional requirements for its specific environmental zone during normal and abnormal environmental conditions. A well supported maintenance/surveillance program in conjunction with a good preventive maintenance program will suffice to assure that equipment that meets the design/purchase specifications is qualified for the designed life.				
Furthermore the maintenance/surveillance program data and records shall be reviewed periodically (not more than 18 months) to ensure that the design qualified life has not suffered thermal and cyclic degradation resulting from the accumulated stresses triggered by the abnormal environmental conditions and the normal wear due to its service condition. Engineering judgment shall be used to modify the replacement program and/or replace the equipment as deemed necessary.		X		The WE EQ maintenance program verifies replacement of items that have exceeded their qualified life. The program does not formally address a surveillance review period.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
7.3 ENGINEERED SAFETY FEATURES SYSTEMS Rev. 2 - July 1981				
Acceptance criteria and guidelines applicable to the ESFAS and ESF control systems are identified in SRP Section 7.1. The review of Section 7.1 of the SAR confirms that the appropriate acceptance criteria and guidelines have been identified as applicable for these systems. The review of the ESFAS and ESF control systems in this section of the SAR confirms that these systems conform to the requirements of the acceptance criteria and guidelines. The branch technical positions are used when a particular design problem and an acceptable solution have been identified.			FSAR 7.5 (Ref. 1)	The diesel generator is an essential auxiliary supporting (EAS) system which receives a start signal from the ESFAS Safety Injection signal. The ESFAS is not within the scope of this modification.
Acceptance criteria for the review of ESFAS and ESF control systems are:				
1. General Design Criterion 2, "Design Basis for Protection Against Natural Phenomena."	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 2.
2. General Design Criterion 4, "Environmental and Missile Design Basis."	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 4.
The following acceptance criteria for applicable to the review of the ESFAS.				
1. 10 CFR Part 50, 50.55a(h), "Protection Systems": IEEE Std 279, "Criteria for Protection Systems for Nuclear Power Generating Stations."				
2. General Design Criterion 20, "Protection System Function".				Not applicable to the Diesel Generator Project.
3. General Design Criterion 21, "Protection System Reliability and Testability."				Not applicable to the Diesel Generator Project.
4. General Design Criterion 22, "Protection System Independence."				Not applicable to the Diesel Generator Project.
5. General Design Criterion 23, "Protection System Failure Modes."				Not applicable to the Diesel Generator Project.
6. General Design Criterion 24, "Separation of Protection and Control Systems".	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 24.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
7.3 ENGINEERED SAFETY FEATURES SYSTEMS Rev. 2 - July 1981 In addition, the ESF control systems are reviewed for conformance to the following acceptance criteria*, applicable to ESF system with regards to conformance to the single failure criterion on a system basis, and to operability from onsite and offsite electrical power:				
1. General Design Criterion 34, "Residual Heat Removal."	N/A			Not applicable to the Diesel Generator Project.
2. General Design Criterion 35, "Emergency Core Cooling."	N/A			Not applicable to the Diesel Generator Project.
3. General Design Criterion 38, "Containment Heat Removal."	N/A			Not applicable to the Diesel Generator Project.
4. General Design Criterion 41, "Containment Atmosphere Cleanup."	N/A			Not applicable to the Diesel Generator Project.
Regulatory Guides, Branch Technical Positions, and industry standards that provide information, recommendations and guidance, and in general describe a basis acceptable to the staff that may be used to implement the requirements of the Commission regulations identified above are given in SRP Section 7.1, Table 7-1 (Ref. 1) and Appendix 7-A (Ref. 2). In addition, Task Action Plan items are also implemented to meet these regulations as identified in SRP Section 7.1, Table 7-2 (Ref. 3).				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
7.4 SAFE SHUTDOWN SYSTEMS Rev. 2 - July 1981				
The acceptance criteria and guidelines applicable to the systems required for safe shutdown are identified in SRP Section 7.1. The review of Section 7.1 of the SAR confirms that the appropriate acceptance criteria and guidelines have been identified as applicable for these systems. The review of the systems required for safe shutdown in this section of the SAR confirms that these systems conform to the requirements of the acceptance criteria and guidelines. The branch technical positions are used when a particular design problem and an acceptable solution have been identified.				The modified a-c electrical system is an essential auxiliary supporting (EAS) system which is utilized to provide power to the equipment required to safely shut down the plant. Compliance with the Acceptance Criteria is discussed below. See the System Design Description for a discussion of the design details addressed in the Review Procedures. Also see Regulatory Guide Compliance Summaries for additional information.
Acceptance criteria for the review areas of this SRP section are:				
1. General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 2.
2. General Design Criterion 4, "Environmental and Missile Design Bases."				See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 4.
3. General Design Criterion 13, "Instrumentation and Control."				Not applicable to the Diesel Generator Project.
4. General Design Criterion 19, "Control Room."				See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 19.
In addition to the acceptance criteria indicated above, the instrumentation and control systems are reviewed for conformance to the following acceptance criteria, applicable to systems required for safe shutdown, with regards to operability from onsite and offsite electrical power and with regards to single failure assumptions.				
1. General Design Criterion 34, "Residual Heat Removal."				Not applicable to the Diesel Generator Project.
2. General Design Criterion 35, "Emergency Core Cooling."				Not applicable to the Diesel Generator Project.
3. General Design Criterion 38, "Containment Heat Removal."				Not applicable to the Diesel Generator Project.
Regulatory Guides, Branch Technical Position and industry standards that provide information, recommendations and guidance and in general describe a basis acceptable to the staff that may be used to implement the requirements of the Commission regulations identified above are given in SRP Section 7.1, Table 7-1 (Ref. 1) and SRP Appendix 7-A (Ref. 2).				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
8.3.1 A-C POWER SYSTEMS (ON-SITE) REV. 2 - July 1981				
In general, the onsite a-c power system is acceptable when it can be concluded that this system has the required redundancy, meets the single failure criterion, is protected from the effects of postulated accidents, is testable, and has the capacity , and capability to supply power to all safety loads and other required equipment in accordance with GDC 2, 4, 5, 17, 18, and 50. Table 8-1 lists General Design Criteria (GDC), regulatory guides, and branch technical positions used as the bases for arriving at this conclusion.				Compliance with the Acceptance Criteria is discussed below. See the System Design Description for a discussion of the design details addressed in the Review Procedures.
The design of the a-c power system is acceptable if the integrated design is in accordance with the following criteria and guidelines:				
1. General Design Criterion 2, as related to structures, systems, and components of the a-c onsite power system being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapter 3 of the SAR, and reviewed by the ASB and the Structural Engineering Branch (SEB) as part of their primary review responsibility.	X		FSAR Section 8.1.1 (Ref. 1)	See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 2.
2. General Design Criterion 4, as related to structures, systems, and components of the a-c power system being capable of withstanding the effects of missiles and environmental conditions associated with normal operations and postulated accidents, as established in Chapter 3 of the SAR and reviewed by ASB, RSB and EQB as part of their primary review responsibility.	X		FSAR Section 8.1.1 (Ref. 1) Design Basis Doc. Drawings	See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 4.
3. General Design Criterion 5, as related to the sharing of structures, systems, and components of the a-c power system, and the following guidelines:	X			See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 5.
a. Regulatory Guide 1.32 (see also IEEE 308), as related to the sharing of structures, systems and components of the a-c power system,	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.32.
b. Regulatory Guide 1.81, as related to the sharing of structures, systems and components of the a-c power system, positions C.2 and C.3.	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.81.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
8.3.1 A-C POWER SYSTEMS (ON-SITE) REV. 2 - July 1981 (cont'd)				
4. General Design Criterion 17, as related to the onsite a-c power system's (a) capacity and capability to permit functioning of structures, systems and components important to safety, (b) the independence, redundancy and testability to perform it's safety function assuming a single failure, and (c) provisions to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power from the transmission network. Acceptance is based on meeting the following specific guidelines:	X		FSAR Section 8.2.3 (Ref. 1)	See Appendix C, General Design Criteria Compliance Matrix, for a discussion of Criterion 17.
a. Regulatory Guide 1.6, as related to the independence of the onsite a-c power system, positions D.1, D.2, D.4 & D.5	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.6.
b. Regulatory Guide 1.9 (see also IEEE 387).	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.9.
c. Regulatory Guide 1.32 (see also IEEE 308) as related to design criteria for onsite a-c power systems.	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.32.
d. Regulatory Guide 1.75 (see also IEEE 384) as related to the onsite a-c power system.	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.75.
e. Regulatory Guide 1.108 as related to the testability of the onsite a-c power system.	X			See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.108.
f. NUREG/CR 0660, as related to the following:				
(1) The diesel generator sets shall be capable of operation at less than full load for extended periods of time without degradation of performance or reliability. With offsite power available, no load operation of the diesel generators will occur following a safety injection signal. Extended no load operation of this equipment shall be minimized. Operating procedures shall be provided that limit extended no load operation of the diesel generators. The procedures shall require loading of the diesel engine to a minimum of 25% of full load for one hour after eight hours of continuous no load operation or to a load as recommended by the engine manufacturer.				The EMD diesel Generators are capable of operation at less than full load for extended periods of time. Operating procedures require operation of the engines above 25% of full load for a minimum of one hour every eight hours of reduced load.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
8.3.1 A-C POWER SYSTEM (ON-SITE) REV. 2 - July 1981 (cont'd)				
(2) A complete formal training program shall be provided for all personnel who will be responsible for the maintenance and availability of the diesel generators. The depth and quality of training shall be at least equivalent to that provided by major diesel engine manufacturers training programs.	X			The existing diesel generator program meets this requirement. The new diesel generators will become part of the existing program.
(3) A preventive maintenance program shall be provided which encompasses investigative testing of components which have a history of repeated malfunctioning and a plan for the replacement of those components which require constant attention and repair with other products of proven reliability.	X			The existing diesel generator program meets this requirement. The new diesel generators will become part of the existing program.
(4) Repair and maintenance procedures shall provide for a final equipment check prior to an actual start-run-load test to assure that all electrical circuits are functional (i.e., fuses in place, no loose wires, test leads removed, etc.) and all valves are in the proper position. The test procedure(s) shall explicitly state that upon satisfactory test completion the diesel generator unit shall be returned to a ready automatic standby service under the control of the control room operator.	X			The existing diesel generator program meets this requirement. The new diesel generators will become part of the existing program.
(5) Except for sensors and other equipment that must be directly mounted on the engine or associated piping, the controls and monitoring instruments shall be installed on a free standing floor mounted panel located on a vibration free floor area. NOTE: If the floor is not vibration free the panel shall be equipped with vibration mounts.	X			All controls and monitory instruments that are not required to be mounted on the engine or associated piping are mounted to a vibration free floor or wall.
5. General Design Criterion 18, as related to the testability of the onsite a-c power system, and the guidelines of Regulatory Guide 1.118 (see also IEEE 338), as related to the capability for testing the onsite a-c power system.	X			See Appendix C, General Design Criteria Compliance Matrix, for discussion of Criterion 18.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
8.3.1 A-C POWER SYSTEMS (ON-SITE) REV. 2 - July 1981 (cont'd)				
6. The design requirements for an onsite a-c power supply for systems covered by General Design Criteria 33, 34, 38, 41 and 44 are encompassed in General Design Criterion 17.	X			See Appendix C, General Design Criteria Compliance Summary for discussion.
7. General Design Criterion 50, as related to the design of containment electrical penetrations containing circuits of the a-c power system and the guidelines of Regulatory Guide 1.63 (see also IEEE 317) as related to the capability of the electric penetration assemblies to withstand, without loss of mechanical integrity, the maximum possible fault current versus time condition that could occur given single random failure of circuit overload protective devices located in circuits of the onsite a-c power systems.	N/A			Not within the scope of the Diesel Generator Project
Branch Technical Positions and industry standards that provide information, recommendations and guidance and in general describe a basis acceptable to the staff that may be used to implement the requirements of General Design Criteria 2, 4, 5, 17, 18, and 50 are identified in SRP Section 8.1, Table 8.1 and Appendix 8-A. In addition, TMI Action Plan items II.E.3.1 and II.G.1 of NUREGs 0737 and 0718 are also implemented to meet these regulations.				
ICSB 4 Requirements on Motor-Operated Valves in the ECCS Accumulator Lines	N/A			System does not design/install motor operated injection valves.
ICSB 8 Use of Diesel-Generator Sets for Peaking	X			The new EDGs will not be used as peaking units.
ICSB 11 Stability of Offsite Power Systems	N/A			Offsite grid is not within the scope of the project.
ICSB 18 Application of the Single Failure Criterion to Manually-Controlled Electrically-Operated Valves	X			The system is designed such that failure of single component (including electrically operated valves) will not result in the loss of a safety function.
ICSB 21 Guidance for Application of RG 1.47	X			Bypass indication in accordance with this branch technical position will be provided.
PSB 1 Adequacy of Station Electric Distribution System Voltages	X			Undervoltage relays in accordance with this branch technical position will be provided.
PSB 2 Criteria for Alarms and Indications Associated with Diesel-Generator Unit Bypassed and Inoperable Status	X			Bypass indication in accordance with this branch technical position will be provided.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
8.3.1 A-C POWER SYSTEMS (ON-SITE) REV. 2 - July 1981 (cont'd)				
NUREG/CR 0660 Enhancement of Onsite Diesel Generator Reliability	X			All contacts and relays required for the EDG operation which are to be located in the EDG room will be enclosed in dust-tight steel cabinets having fully gasketed doors and openings. The fuel supply to the engine driven fuel oil pump is assured by a Class 1E powered DC booster pump. The electrical insulation and generator construction is in compliance with the recommended environment conditions. EDG cooling water temperature control is in accordance with the recommendations. Instruments, control, monitoring or indicating elements will be supported in or on a free standing, directly floor mounted panel where possible.
NUREG 0718 Licensing Requirements for Pending Applications for Construction Permits and Manufacturing License	N/A			This is Not Applicable to the diesel generator project.
NUREG 0737 Clarifications of TMI Action Plan Requirements				See Appendix D, Regulatory Guide Compliance Summary, for discussion of Regulatory Guide 1.97.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.1 FIRE PROTECTION PROGRAM REV. 3 - July 1981 The applicant's fire protection program is acceptable if it is in accordance with the following criteria:				
1. 10 CFR Part 50 § 50.48, and General Design Criterion 3, as related to fire prevention, the design and operation of fire detection and protection systems, and administrative controls provided to protect safety-related structures, systems, and components of the reactor facility.	X			The fire protection program relative to the DGB is in accordance with 10CFR50 § 50.48 which addresses Criteria 3 of Appendix 'A' and also Appendix 'R'. The redundant trains are separated by distance and/or 2-3 hour fire rated walls (no access) Fire protection in the form of automatic wet sprinklers are provided in the G01/G02 Fuel Oil Transfer Pump Room, G03/G04 fuel Oil Transfer Pump Room and Day Tank Room, each engine room, the Mechanical Room, and in the G03 Day Tank Room. Fire detection and fire extinguishers are provided in each area of the building. Hose stations are located throughout the structure such that hose coverage is provided to each area from at least one hose station. The exhaust fans in the Engine Room, Day Tank Room, and the F.O. Transfer Pump Rooms are configured such that they could assist in smoke removal. The HVAC unit common to the two switchgear rooms has fire dampers that would isolate each fire zone. Each switchgear room also has an exhaust fan which could be used for smoke removal. Additionally, on fan failure, the stationary (non-closing) air intakes could serve as a smoke/heat vent. The supply to the sprinkler systems and hose station is such that a single active failure or crack in the piping in the DGB will not impair both fire suppression systems capabilities. This does not extend to the underground header. All combustible storage greater than 20 gallon are isolated within 3 hour fire walls. Leakage in the day tanks are controlled by providing drainage to a separate/isolated sump outside the structure. Diking is provided to prevent migration of the spilled fuel oil to other areas of the structure.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.1 FIRE PROTECTION PROGRAM REV. 3 - July 1981 (cont'd)				
2. General Design Criterion 5, as related to fire protection for shared safety-related structures, systems, and components to assure the ability to perform their intended safety function.	N/A			The Fuel Oil Storage Tank configuration meets the NFPA 30 criteria for storage under a structure. The EDG rooms as well as their supporting rooms are provided with drains. The drains from each EDG area discharge to separate sumps. The systems is designed so that a fire can not spread from the G03 EDG area to the G04 EDG area or from the G03 EDG area to the G01/G02 Fuel Transfer Pump Room.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.2 COMMUNICATIONS SYSTEMS Rev. 2 - July 1981				
Acceptability of the design of the communication system, as described in the applicant's safety analysis report (SAR), is based in part on the degree of similarity of the design with that for previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that directly apply to the safety-related performance requirements for the design and use of the communication system during normal plant operations and transient conditions. The PSB will use the following criterion to assess the system design capability: the communication system is acceptable if the integrated design of the system will provide effective communication between plant personnel in all vital areas during normal plant operatior and during the full spectrum of accident or incident conditions (including fire) under maximum potential noise levels.	X		FSAR 7.7.5 (Ref. 1)	The Communication Systems within the DGB is an extension of and consistent with the existing plant communication system as described in referenced FSAR Section. See the System Design Description for a discussion of the design details. A system functional test will be performed.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.3 LIGHTING SYSTEMS Rev. 2 - July 1981				
Acceptability of the design of the normal and emergency lighting system, as described in the applicant's safety analysis report (SAR), is based in part on the degree of similarity of the systems design with those for previously reviewed plants with satisfactory operating experience. There are no general design criteria or regulatory guides that directly apply to the safety-related performance requirements for the lighting system. The PSB will use the following criteria to assess the systems design capability: (1) the normal lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate station lighting in all areas, from offsite power sources, required for normal plant operation, control and maintenance of equipment and plant access routes; (2) the emergency lighting system(s) is acceptable if the integrated design of the system(s) will provide adequate emergency station lighting in all areas, from onsite power sources, required for fire fighting, control and maintenance of safety-related equipment, and the access routes to and from these areas; and (3) the lighting systems designs will be acceptable if they conform to the Illuminating Engineering Society (IES) Lighting Handbook as related to systems design and illumination levels recommended for industrial facilities.	X		FSAR 7.7.5 (Ref. 1)	Normal and emergency lighting is provided in normal plant areas, vital areas and essential passageways to and from these areas. See the Design Descriptions for a discussion of the design details.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 Acceptability of the diesel engine fuel oil storage and transfer system as described in the applicant's safety analysis report (SAR), is based on specific general design criteria, regulatory guides and industry standards, military specifications, available technical literature, and operational performance data obtained from similarly designed systems at other plants having satisfactory operational experience. The design of the diesel engine fuel oil storage and transfer system is acceptable if the integrated design of the system is in accordance with the following criteria:				
1. General Design Criterion 2, as related to the ability of structures housing the system and the system itself to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapter 2 and 3 of the SAR, and the position of Regulatory Guide 1.117, as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles, Appendix Position 13.	X			All components and piping in the system are designed to Seismic Category I requirements in compliance with R.G. 1.29. The system is completely housed within a Seismic Category I structure. This structure is designed to withstand the effects of tornado, and flood, as required by GDC 2 and R.G. 1.102. The non-seismic Category I components in the vicinity of the system are designed to maintain their structural integrity given a seismic event. The system meets the requirements of R.G. 1.117.
2. General Design Criterion 4, with respect to structures housing the system and the system itself being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks, and the position of Regulatory Guide 1.1115, as related to the protection of structures, systems and components import to safety from the effects of turbine missiles, Postilion C.1.	X			The system and the structure housing the system is designed to withstand the effects of externally generated missiles. Pipe rupture and jet impingement forces as per GDC 4 are not applicable. No high energy piping is present in the EDG Area. A crack in moderate energy piping will not damage or degrade the system. The system meets the requirements of R.G. 1.115.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 (cont'd)				
3. General Design Criterion 5, as related to the capability of shared systems and components important to safety to perform required safety functions.	X			One storage tank feeds the day/integral tanks for G01 and G02 (Train A, Units 1 and 2) automatically. Similarly the second storage tank supplies the day tanks for G03 and G04 (Train B, Units 1 and 2). There is sufficient fuel to provide approximately a five day supply with either all four EDGs at the reduced loads they would experience, 3 EDGs on line (two at reduced load) or 2 EDGs of the same train on line (at reduced loads). With 2 fully loaded EDGs (one per train) there is sufficient fuel for 7 days. Note that in an emergency, a manual cross tie has been provided between the storage tanks to assure a minimum of 7 days under the scenarios when only 5 days is otherwise available.
4. General Design Criterion 17, as related to the capability of the fuel oil system to meet independence and redundancy criteria, and the guidance and positions of the following:				
a. Regulatory Guide 1.9 as related to the design of the diesel engine fuel oil systems.	X			The system complies with GDC 17, with full redundancy of supply for each EDG and with interconnection capability as shown on Drawings 6704-E-222001/222002. The drawings also include the instrumentation and controls provided for the system.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 (cont'd)				
	X			The auxiliary module piping subassemblies are designed and fabricated to ANSI B31.1 criteria with enhanced material, inspection and NDE requirements. The overflow lines, vent lines, drain lines, portions downstream of the block valves and fill tank and its fill lines up to the block valves (as shown on Drawing 6704-E-222002) are coded Non-Nuclear Safety (NNS). The storage tanks, transfer pumps, valves, and other essential components in the transfer lines to and from the day tanks are coded ANS Safety Class 3. Auxiliary module components are coded NNS; the on-engine piping and components are considered part of the EDG and qualified for nuclear plant operation. The isolation valves separating essential from non-essential components are Quality Group C and Seismic Category I. The essential portions of the system which are not part of the EDG are designated ANS Safety Class 3.
	X			Sufficient space has been provided to permit inspection, cleaning, maintenance, and repair of the system.
	X			The day tanks for G03 and G04 and the G01, G02, G03 and G04 transfer pumps are physically separated from the EDGs and are located within separate concrete enclosures. The storage tanks are encased in concrete in underground bunkers (no air space for fume accumulation). The day tank enclosures are provided with exhaust ventilation to prevent combustibility of vapors. The storage tank enclosures have no air space as they are completely encased, therefore, there are no ventilation requirements. All tank vents are equipped with flame arrestor devices. The outside fill and vent lines are located and protected so as to avoid effects from tornado, missiles and floods.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 (cont'd)				
	X			The level of fuel is indicated and alarmed locally and alarmed remotely.
				Each Fuel Oil Storage Tank has a total capacity of 35,800 gallons, of which approximately 34,000 gallons are usable. One storage tank is interconnected with both new EDGs (G03 and G04) to provide a sufficient supply of oil for one or both EDGs for approximately five days (an emergency cross tie will assure a minimum of seven days to either train on the failure of the opposite train). Each day tank (G03 and G04) has a 550 gallon capacity. The EDG fuel consumption at 100% generator rating of 2850 kW is less than 205 gallons per hour.
	X			The minimum site storage of approximately five days is dedicated to the EDGs. Fuel can be brought to the site within (by WE) from local sources or from more remote terminals within (by WE) hours.
	X			A single failure may result in loss of fuel to one EDG, the other units can provide sufficient capacity for emergency conditions, including safe shutdown of both reactors coincident with LOOP.
	X			The EDGs will be qualified in accordance with IEEE 387 and R.G. 1.9.
	X			The basis for the selection of the EDGs as related to the storage and transfer system meets the requirements of R. G. 1.9.
b. Regulatory Guide 1.137 are related to the diesel engine fuel oil system design, fuel oil quality and tests.	X			To assure quality and reliability of the fuel oil supplied to the EDGs, certification will be required that the delivered oil conforms to the standards specified in ANSI N195. Samples of delivered fuel will be tested to measure viscosity and percent of moisture and sediment. Inspection of stored fuel is scheduled at 92 day intervals. Over limit indications require corrective action. Residual fuel in the fill tank will be sample tested prior to fill with new fuel.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 (cont'd)				R.G. 1.137 (CI) considers compliance to the requirements of ANSI N195-1976 as an acceptable method for the system design. The EDG Fuel Oil system meets ANSI N195-1976. At a level near where the F.O. Transfer Pump is automatically switched on there is approximately 60 minutes of fuel available for operation. System desig. exceeds the redundancy requirements needed to satisfy the single failure criterion. The system has the capability to have two day tanks cross connected to allow one F.O. Transfer Pump to supply two EDGs given a F.O. Transfer Pump failure as compared to the single pump required by the ANSI Standard. The Fuel Oil Fill Tank (non-safety related) discharge nozzle is located above the floor of the tank and the transfer pump takes suction above the floor of the safety-related storage tanks, thus minimizing entrapment of sediment. A fuel oil filter and strainer system prevents passage of particles 5μ or larger to the EDG fuel injectors. Additionally, tank fill nozzles are configured to discharge within 6 inches of the tank bottom (Day Tanks and Fill Tank) or have baffle plates (Fuel Oil Storage Tanks) to minimize the creation of turbulence of sediment.
c. Branch Technical Position ICSB-17 (PSB) as related to diesel engine fuel oil systems protective interlocks during accident conditions.				See Item II.4.e BTP ICSB-17 (PSB) is incorporated in IEEE 387.
d. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability."	X			(NUREG/CR-0660) Instrumentation has been provided to detect water and drain lines have been provided to remove water accumulated in the tank, with the fuel outlet pipe above the tank floor. The engine driven pump is supplemented by an electric motor driven pump.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.4 EMERGENCY DIESEL ENGINE FUEL OIL STORAGE AND TRANSFER SYSTEM REV. 2 - July 1981 (cont'd)				The motor driven auxiliary fuel oil pump starts automatically. Either the motor driven or engine driven pump is adequate to supply the required oil to the EDG. The Fuel Oil Day Tank outlets are located above the engine pump intake to maintain a positive pressure on the pumps at all tank levels. The overflow lines from the G03 and G04 day tanks are diverted back to the safety related storage tank.
e. IEEE Standard 387 as related to the design of the diesel engine fuel oil system.	X			R.G. 1.137 (CI) considers compliance to the requirements of ANSI N195-1976 as an acceptable method for the system design. The EDG Fuel Oil system meets ANSI N195-1976. At a level near where the transfer pump is switched on there is approximately 60 minutes of fuel available for operation. System design exceeds the redundancy requirements needed to satisfy the single failure criterion. The system has the capability to be switched to a redundant transfer pump as compared to the single pump required by the ANSI Standard. The electrical features of the EDGs Standby Power Supplies are presented in this section. The EDGs will be qualified in accordance with IEEE 387 and R.G. 1.9. Data will be collected in accordance with quality procedures outlined in IEEE 323 and IEEE 387. There are no protective monitors in this system that would prevent an EDG from starting in an emergency.
f. ANSI Standard N195, "Fuel Oil Systems for Standby Diesel Generators."	X			ANSI Standard N195-1976 is addressed in Item II.4.b as part of R.G. 1.137.
g. Diesel Engine Manufacturers' Association (DEMA) Standard as related to the design of the diesel fuel oil system.	X			The system meets diesel engine manufacturer's recommendations.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.5 EMERGENCY DIESEL ENGINE COOLING WATER SYSTEM REV. 2 - July 1981 Acceptability of the emergency diesel engine cooling system design, as described in the applicant's safety analysis report (SAR), is based on specific General Design Criteria, regulatory guides, and industry standards. Information obtained from other Federal agencies and reports, military specifications, available technical literature, and operational performance data obtained from similarly designed systems at other plants having satisfactory operational experience will also be utilized in determining EDECWS acceptability. The EDECWS is acceptable if the integrated system design is in accordance with the following criteria:				
1. General Design Criterion 2, as related to structures housing the system and the system itself being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapters 2 and 3 of the SAR. Acceptance is based on meeting Appendix Position 13 of Regulatory Guide 1.117 as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles.	X			The system and the structure housing the system are capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes and floods, and meets the requirements of GDC 2 and R.G. 1.117. The Glycol Cooling System auxiliary skid piping subassemblies are designed and fabricated to B31.1 with augmented quality criteria, except for overflow, vent and drain lines, as shown on Drawing 6704-E-222007/008. The radiator is coded and stamped ASME VIII. On-engine piping and components are considered part of the EDG assembly, qualified for nuclear plant applications. The essential portions of the System which are not part of the EDG are designated ANS Safety Class 3; the system is designed to Seismic Category I requirements, in compliance with Reg. Guide 1.29. All subsystems are housed separately in a Seismic Category I structure and are not affected by failures of Non-Seismic Category I structures or components. The DGB which houses the EDG Cooling Water System is approximately 19 feet above the Design Basis Flood Elevation.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.5 EMERGENCY DIESEL ENGINE COOLING WATER SYSTEM REV. 2 - July 1981 (cont'd)				
2. General Design Criterion 4, with respect to structures housing the system and the system itself being cable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. Acceptance is based on meeting Position C.1 of Regulatory Guide 1.115 as related to the protection of structures, systems, and components important to safety from the effects of turbine missiles.	X			The system and the structure housing the system are capable of withstanding the effects of externally generated missiles. An internally generated missile from one of the EDGs will only cause the loss of that EDG as the redundant train is physically separated via structural components designed to protect the redundant components from internally generated missiles. The EDG area does not contain any high energy piping. A crack in a moderate energy piping will not damage or degrade the system. The physical arrangement meet the requirements of R.G. 1.115.
3. General Design Criterion 5, as related to the capability of shared systems and components important to safety being capable of performing required safety functions.	X			The EDG Glycol Cooling System is not shared.
4. General Design Criterion 17, as related to the capability of the cooling water system to meet independence and redundancy criteria, and General Design Criterion 44, to assure:				
a. The capability to transfer heat from systems and components to a heat sink under transient or accident conditions.	X			The EDG Glycol Cooling System is designed to provide full load cooling for the EDGs while they are operating and to maintain each engine at an acceptable starting temperature during standby conditions. The system uses a 15 kW heater to maintain a minimum standby temperature of 120°F. The Glycol Cooling System piping and radiator are provided with 1 inch vent lines to assure that all spaces are filled with water.
	X			The design of the system meets the requirements of the diesel engine manufacturer, Regulatory Guide 1.9 and IEEE 387 as outlined below.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.5 EMERGENCY DIESEL ENGINE COOLING WATER SYSTEM REV. 2 - July 1981 (cont'd)				
	X			Instrumentation is provided to monitor Glycol Cooling System temperature and pressure, and head tank level plus alarm high and low jacket water temperature and surge tank level. These instruments rec ive periodic calibration and inspection to verify their accu acy. Temperature control is by a thermostatically controlled three-way valve which provides a bypass around the radiator. Protective interlocks will not prevent starting the engine under emergency conditions. Instrumentation is designed to monitor the system during periodic testing.
	X			The Glycol Cooling System contains corrosion and organic growth inhibitors which are compatible with system materials and as recommended by the engine manufacturer. The water is periodically analyzed and treated, as necessary, to maintain required water quality. The cooling capacity of the system is 11,000,000 Btu/hr and meets recommended manufacturer's temperature differentials under adverse conditions.
	X			In the event of LOOP, the radiator is loaded onto the bus when the diesel is up to rated speed. The functional performance characteristics of the system are met under adverse environmental occurrences, abnormal operational requirements and accident conditions, including LOOP.
b. Redundancy of components so that under accident conditions the safety function can be performed assuming a single active component failure.	X			The System meets the requirements of GDC 17 and the single failure criterion of GDC 44, a detailed failure analysis is not required on the basis of redundancy. The cooling water pumps are redundant.
c. The capability to isolate components of the system or piping, if required to maintain the system safety function.	X			Leakage is detectable visually and through level sensors in the Glycol Cooling System expansion tank. Portions of a sub-system cannot be isolated, but the subsystem for each engine is separate.
To meet the requirements of these regulations the following guidance and positions are used:				
a. Regulatory Guide 1.9, as related to the design of the diesel cooling water system.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.5 EMERGENCY DIESEL ENGINE COOLING WATER SYSTEM REV. 2 - July 1981 (cont'd)				
b. Branch Technical Position ICSB-17 (PSB), as related to engine cooling water protective interlocks accident conditions.				
c. NUREG/CR-0660, Enhancement of Onsite Emergency Diesel Generator Reliability.				
d. IEEE Standard 387, as related to the design of the diesel engine cooling water system.				
e. Diesel Engine Manufacturers Association (DEMA) Standard, as related to the design of the engine cooling water systems.				
5. General Design Criterion 45, as related to design provisions to permit periodic inspection of safety-related components and equipment of the system.	X			Ample space has been provided to permit inspection, cleaning, maintenance and repair of the system.
	X			The system is designed to permit periodic inspection and testing.
6. General Design Criterion 46, as related to design provisions to permit appropriate functional testing of safety-related systems or components to assure structural integrity and leak tightness, operability and performance of active components, and the capability of the system to function as intended under accident conditions.	X			Scheduled inspection and testing is performed as part of the overall engine performance tests, including loading at full and reduced loads.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.6 EMERGENCY DIESEL ENGINE STARTING SYSTEM REV. 2 - July 1981 Acceptability of the diesel engine starting system, as described in the applicant's safety analysis report (SAR), is based on specific general design criteria, regulatory guides, and industry standards. Information obtained from other Federal agencies and reports, military specifications, available technical literature, and operational performance data obtained from similarly designed systems at other plants having satisfactory operational experience will also be utilized to determine EDESS acceptability. The design of the EDESS is acceptable if the integrated design of the system is in accordance with the following criteria:				
1. General Design Criterion 2, as related to the ability of structures housing the system to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapters 2 and 3 of the SAR. Acceptance is based on meeting Position 13 to the appendix to Regulatory Guide 1.117, as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles.	X			The Starting Air System is a complete system, consisting of the Start Air Compressors, the Air Dryer Assembly and the Starting Air Receivers. The Starting Air System is located in a single area of each EDG room.
	X			The starting air piping subassemblies upstream of the Starting Air Receivers are designed and fabricated to ANSI B31.1 criteria. Piping and valves from the receivers to the EDG interface are coded ANS Safety Class 3 and are designed and fabricated to enhanced ANSI B31.1 criteria except the Starting Air Receivers which are coded and stamped ASME VIII, enhanced. All other components and on-engine piping and components are considered part of the EDG and are qualified for nuclear plant application. The system is designed to Seismic Category I requirements. All of the components in the EDG room that are downstream of the double check valves are Seismic Category I. The structure which houses the system is capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes and floods and meets the requirements of R.G. 1.117.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.6 EMERGENCY DIESEL ENGINE STARTING SYSTEM REV. 2 - July 1981				
2. General Design Criterion 4, with respect to structures housing the systems and the system itself being capable of withstanding the effects of externally and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. Acceptance is based on meeting Position C.1 of Regulatory Guide 1.115 as related to the protection of structures, systems, and components important to safety from the effects of turbine missiles.	X			There is no high energy piping present in the EDG room. Cracks in moderate energy piping will not damage or degrade the system. The structure housing the system is capable of withstanding the effects of externally generated missiles. An internally generated missile from one of the EDGs will only cause the loss of that EDG as components of the redundant train are physically separated via structural design to protect the redundant components from internally generated missiles and meets the requirements of R.G. 1.115.
3. General Design Criterion 5, as related to the capability of shared systems and components import to safety to perform required safety functions.				
4. General Design Criterion 17, as related to the capability of the diesel engine air starting system to meet independence and redundancy criteria. Specific criteria and guidance necessary to meet the relevant requirements of GDC 17 are as follows:				
a. Regulatory Guide 1.0 as related to the design of the diesel air starting systems.	X			Each air compressor is pressure activated to maintain pressure at its connected air receivers at all times. Each receiver has been provided with a pressure gage, relief valve, drain valve, and automatic means for maintaining pressure within an allowable range and suitable low pressure alarm.
	X			The single failure criterion is satisfied and significantly enhanced by having a separate air starting system for each EDG and have a system that will start on either one or two sets of starting air motors.
	X			Ample space has been provided to permit inspection, cleaning, maintenance and repair of the system.
				The design of the system meets the recommendations of the engine manufacturer, and meets the requirements of R.G. 1.9
	X			Actuation of the start air system is by ESFAS, LOOP, or manual signals which open the air admission valves which are integral to the EDG.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.6 EMERGENCY DIESEL ENGINE STARTING SYSTEM REV. 2 - July 1981 (cont'd)				
b. Branch Technical Position ICSB-17 (PSB) as related to diesel engine air starting systems' protective interlocks during accident conditions.				BTP ICSB-17 (PSB) has been replaced by IEEE 387 Amendments. See Item II.4.d.
c. NUREG/CR-0660 "Enhancement of Onsite Emergency Diesel Generator Reliability."	X			This Starting Air System has an air dryer of the desiccant type, 35 SCFM capacity which will minimize moisture and the resultant rust buildup in the recesses. Additionally a condensation trap type drain is affixed to the moist air receiver and prefilter to allow removal of any moisture accumulation. Periodic blowdown is specified to prevent moisture accumulation which could deter system functions.
d. IEEE Standard 387 as related to the design of the diesel engine air starting system.	X			The EDGs and their auxiliaries meet the requirements of IEEE 387.
	X			The EDG Starting Air System surveillance instrumentation is listed in Table 8.3-5. There are no protective interlocks for this system which could prevent the engine from starting under emergency conditions.
e. Diesel Engine Manufacturers Association (DEMA) Standard as related to the design of the diesel air starting system.	X			The design of the system meets the recommendations of the engine manufacturer.
f. Each diesel engine should be provided with a dedicated air starting system consisting of an air compressor, an air dryer, one ore more air receiver(s), piping, injection lines and valves, and devices to crank the engine as recommended by the engine manufacturer.	X			Each EDG is provided with a separate, independent Starting Air System, consisting of two (2) compressors (1 electric and 1 diesel), drier, filters, receivers and interconnecting piping.
g. As a minimum, the air starting system should be capable of cranking a cold diesel engine five times without recharging the receiver(s). The air starting system capacity should be determined as follows: (1) each cranking cycle duration should be approximately 3 seconds; (2) consist of two to three engine revolutions; or (3) air start requirements per engine start provided by the engine manufacturer; whichever air start requirement is larger.	X			The system can start the engine within ten (10) seconds, with a minimum pressure of 230 psig in the receivers. Each pair of air receivers (two pairs per engine) has sufficient volume to provide a minimum of five (5) starts. Each starting cycle consists of a continuous supply of starting air for a maximum of 5 seconds.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.6 EMERGENCY DIESEL ENGINE STARTING SYSTEM REV. 2 - July 1981 (cont'd)				
h. Alarms should be provided which alert operating personnel if the air receiver pressure falls below the minimum allowable value.	X			Lo-lo pressure in either pair of Starting Air Receivers is alarmed in the EDG Control Panel and in the Control Room on "Diesel Generator Trouble".
i. Provisions should be made for the periodic or automatic blowdown of accumulated moisture and foreign material in the air receiver(s), and other critical points of the system.	X			A condensation trap-type drain is provided for each drier/receiver to prevent moisture and contaminant accumulation over long standby periods, periodic blowdown of the system is specified. Preventing the accumulation of moisture and contaminants serves to prevent carryover to the engine. Additionally, filters are provided upstream and downstream of the driers which should assist in the control of contaminants prior to entering the safety related portion of the system.
j. Starting air should be dried to a dew point of not more than 50 F when installed in a normally control 70 F environment, otherwise the starting air dew point should be controlled to at least 10 F less than the lowest expected ambient temperature.	X			Dew point at 250 psig after the drier is -40° F. Minimum room temperature is 50°F.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.7 EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM REV. 2 - July 1981				
Acceptability of the emergency diesel engine lubrication system, as described in the applicant's safety analysis report (SAR), is based on specific general design criteria and regulatory guides. The reviewer will also utilize information obtained from other sources such as other Federal agencies, published reports, industry standards, military specifications, and technical literature on commercially available products. An additional basis for the acceptability of the system will be the degree of similarity with systems in previously reviewed plants with satisfactory operating experience.	X			The EDG Lube Oil System is wholly contained by the engine and the auxiliary skid module.
The design of the EDELS is acceptable if the integrated design of the system is in accordance with the following criteria:	X			The EDG Lube Oil System is wholly contained by the engine and the auxiliary skid module.
1. General Design Criterion 2, as related to structures housing the system and the system itself being capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in chapters 2 and 3 of the SAR. Acceptance is based on meeting Position 13 of the appendix to Regulatory Guide 1.117, as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles.	X			Refer to discussion for Reg. Guide 1.117 in Appendx D.
2. General Design Criterion 4, with respect to structures housing the system and the system itself being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. Acceptance is based on meeting Position C.1 of Regulatory Guide 1.115 as related to the protection of structures, system, and components important to safety from the effects of turbine missiles.	X			There is no high energy piping present in the EDG room. A crack in a moderate energy piping will not damage or degrade the system. The structure which houses the system is capable of withstanding the effects of externally generated missiles, and internally generated missile from one of the EDGs will only cause the loss of that EDG as the redundant train and the G01/G02 F.O. Transfer Pumps are physically separated via structural components designed to protect the redundant components from internally generated missiles. The piping meets the requirements of R.G. 1.115.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.7 EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM REV. 2 - July 1981 (cont'd)				
3. General Design Criterion 5, as related to shared system and components important to safety being capable of performing required safety functions.	X			DLO System meets the requirements of GDC 5.
4. General Design Criterion 17, as related to the capability of the diesel engine lubrication system to meet independence and redundancy criteria. Acceptance is based on meeting the following specific criteria.				
a. Regulatory Guide 1.9, as related to the design of the diesel engine systems.	X			The provision for a physically separate, full capacity lubrication system for each EDG satisfies the requirements of the single failure criteria for complete independence and redundancy of on-site power systems (GDC 17). Lube oil cooling systems are also separate and independent. The system has a low level alarm in the sump, to warn against excessive leakage. Other leaking can be observed, visually, during engine starting or in the standby mode. Excessive leakage is controlled by tightening or repairing system components. No isolation provisions are made, but redundancy and separation would allow the removal from service for repair.
	X			The system has no piping interconnections.
	X			Ample space has been provided to permit inspection, cleaning, maintenance, and repair of the system. The system design meets the engine manufacturer's recommendations, and meets the requirements of R.C. 1.9 and IEEE-387.
b. Branch Technical Position ICSB-17 (PSB), as related to diesel engine lubrication systems' protective interlocks during accident conditions.				See Item II.4.d
c. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability."	X			(NUREG/CR-0660) A lube oil keep warm feature is provided for the system by maintaining a minimum Glycol Cooling System temperature and circulating it through the lube oil cooler. This satisfies NUREG/CR-0660 requirements.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.7 EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM REV. 2 - July 1981 (cont'd)				
d. IEEE Standard 387, as related to the design of the diesel engine lubrication system.	X			The standby power supplies meet the requirements of IEEE 387 and R.G. 1.9. Lube oil pressure and sump level alarms warn the operator of system malfunction. The system is tested with the EDG and no special features are necessary for operational testing. During an emergency running condition, the low-low lube oil pressure trip signal is maintained because such a potential failure can cause destruction of the engines within a period shorter than the time in which the operator is able to respond and take corrective action.
e. Diesel Engine Manufacturers Association (DEMA) Standard, as related to the design of the diesel lubrication system.	X			The system design meets the engine manufacturer's recommendation.
f. The operating pressure, temperature differentials, flow rate, and heat removal rate of the system external to the engine are in accordance with recommendations of the engine manufacturer.	X			The system has been designed and tested for the engine requirements. Monitoring of pressure, level and temperature is provided.
g. The system has been provided with sufficient protective measures to maintain the required quality of the oil during engine operation.	X			A full flow duplex filter and strainer have been provided with the engine.
h. Protective measures (such as relief ports) have been taken to prevent unacceptable crankcase explosions and to mitigate the consequences of such an event.	X			The lube oil sump tank is properly vented to preclude accumulation of vapors and eliminate the potential for explosions.
i. The temperature of the lubricating oil is automatically maintained above a minimum value by means of an independent recirculation loop including its own pump and heater, to enhance the "first-try" starting reliability of the engine in the standby condition.	X			The system is provided with a keep-warm feature, which applies heat to maintain a minimum operating temperature of 120° F during standby periods. When the EDG is operated for test purposes, or receives an ESFAS signal, the normal lube oil cycle cools the engine and rejects heat to the Glycol Cooling System.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.7 EMERGENCY DIESEL ENGINE LUBRICATION SYSTEM REV. 2 - July 1981 (cont'd)				
j. The diesel engine is provided with a dedicated lube oi' system design which includes measures to provide lubrication to the diesel engine wearing parts during standby conditions and/or normal and emergency starts.	X			The EDG Lube Oil System is designed to provide sufficient lubrication to permit proper operation under all loading conditions, including standby mode. Redundancy is provided as per R.G. 1.6. The lube oil system for each engine is dedicated to that engine.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.8 EMERGENCY DIESEL ENGINE COMBUSTION AIR INTAKE AND EXHAUST SYSTEM, REV. 2 - July 1981 Acceptability of the design of the emergency diesel generator combustion air intake and exhaust system, as described in the applicant's safety analysis report (SAR), is based on specific general design criteria and regulatory guides and industry standards. Information obtained from other Federal agencies and reports, military specifications, available technical literature, and operational performance data obtained from similarly designed systems at other plants having satisfactory operational experience will also be utilized to determine EDECAIES acceptability. The design of the EDECAIES is acceptable if the integrated design of the system is in accordance with the following criteria:				
1. General Design Criterion 2, as related to the ability of structures housing the system and system components to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, and floods, as established in Chapters 2 and 3 of the SAR. Acceptance is based on meeting Appendix Position 13 of Regulatory Guide 1.117 as related to the protection of structures, systems, and components important to safety from the effects of tornado missiles.	X			The components of the EDG Intake and Exhaust Air System are classified Seismic Category I. Quality Group, and design codes are provided in Section 3.2.
	X			The system is required to withstand the effects of tornadoes, missiles, hurricanes, dust, rain, snow, ice, and flooding as defined in FSAR Sections 1.8, 2.3, 3.3, 3.4, and 3.5. The structure housing the system is capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes and floods and meets the requirements of R.G. 1.117.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.8 EMERGENCY DIESEL ENGINE COMBUSTION AIR INTAKE AND EXHAUST SYSTEM, REV. 2 - July 1981 (cont'd)				
2. General Design Criterion 4, with respect to structures housing the systems and the system components being capable of withstanding the effects of external missiles and internally generated missiles, pipe whip, and jet impingement forces associated with pipe breaks. Acceptance is based on meeting Position C.1 of Regulatory Guide 1.115 as related to the protection of structures, systems, and components important to safety from the effects of turbine missiles.	X			There is no high energy piping present in the EDG Area. A crack in moderate energy piping will not damage or degrade the system. The structure housing the system is capable of withstanding the effects of externally generated missiles. An internally generated missile from one of the EDGs will only cause the loss of that EDG as the redundant train and G01/G02 F.O. Transfer Pumps are physically separated via structural components designed to protect the redundant components from internally generated missiles. The piping meets the requirements of R.G. 1.115.
	X			The cubicles at all levels are constructed to prevent entrance of high velocity missiles from exterior moderate and high energy pipe breaks or outside environmental effects.
3. General Design Criterion 5, as related to shared systems and components important to safety being capable of performing required safety functions.	X			The EDG Intake and Exhaust Systems components/piping are not shared between the two diesels.
4. General Design Criterion 17 as related to the capability of the diesel engine air starting system to meet independence and redundancy criteria. Acceptance is based on meeting the following specific criteria:				
a. Regulatory Guide 1.9 as related to the design of the diesel engine combustion air intake and exhaust systems.	X			The system is designed to meet the requirements of R.G. 1.9 and IEEE 387. The intake and exhaust components and piping are so arranged that a malfunction in any component in a system associated with one EDG will, in no way, impair or affect the operation of the other unit or the G01/G02 F.O. Transfer Pumps, and thus meets the single failure criterion. Ample space has been provided to allow inspection and dismantling of equipment when required.
b. Branch Technical Position (ICSB-17 (PSB) as related to diesel engine combustion air intake and exhaust systems protective interlocks during accident conditions.				See Item II.4.d.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
9.5.8 EMERGENCY DIESEL ENGINE COMBUSTION AIR INTAKE AND EXHAUST SYSTEM, REV. 2 - July 1981 (cont'd)				
c. NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability	X			There is one (1) air intake filter for each EDG. The lower edge of the intake louvers on the DGB wall are approximately 23 feet above grade (NUREG/CR-0660).
d. IEEE Standard 387 as related to the design of the diesel engine combustion air intake and exhaust system.	X			The system meets the requirements of IEEE 387. There are no protective interlocks for this system.
e. Diesel Engine Manufacturers Association (DEMA) Standard as related to the design of the diesel combustion air intake and exhaust system.	X			The system meets the requirements of the engine manufacturer.
f. Each emergency diesel engine should be provided with an independent and reliable combustion air intake and exhaust system. The system should be sized and physically arranged such that no degradation of engine function will be experienced when the diesel generator set is required to operate continuously at the maximum rated power output.	X			The Air Intake and Exhaust System of one EDG is totally independent of that of the other EDG.
g. The combustion air intake system shall be provided with a means of reducing airborne particulate material over the entire time period that emergency power is required assuming the maximum airborne particulate concentration at the combustion air intake.	X			Dust ingestion is prevented by use of an oversized, six-element, 5 micron filter assembly for each intake. The intake louver height (approximately 23 feet above ground level) coupled with the chevron configuration of the building intake, minimizes the amount of dust ingestion during periods of abnormal dust generation.
h. Suitable design precautions have been taken to preclude degradation of the diesel engine power output due to exhaust gases and other dilutents that could reduce the oxygen content below acceptable levels.	X			The ingestion of exhaust fumes into the EDG is minimized by placing the exhaust pipe exit approximately 20 feet higher than the top of the intake filters and 30 feet away from the EDG. No gases whose accidental release could jeopardize the operation of the equipment are stored in the vicinity of the intakes. The EDGs can run at full power with air at tornado vacuum conditions.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
13.6 PHYSICAL SECURITY Rev. 2 - July 1981				
At the FSAR stage, the applicant's security plan is considered acceptable if it conforms to the requirements of 10 CFR Part 50, 50.34(c), 10 CFR Part 73, 73.55 and 10 CFR Part 73, Appendix B and Appendix C. If applicable, 10 CFR Parts 25, 75 and 95 must be addressed. In addition, the requirements and recommendations of ANSI N18.17 establish the basis for an adequate security plan for the protection of nuclear power plants against radiological sabotage.				Compliance with the Acceptance Criteria is discussed blow. See the System Description for additional design details.
Specific acceptance criteria, including staff positions, regarding some of the more general requirements of 10 CFR Part 73, 73.55 and Part 73, Appendices B and C are as follows:				
a. Section b of 73.55 - Physical security organization. The licensee shall establish a security organization, including guards, to protect his facility against radiological sabotage.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
b. Section c of 73.55 - Physical Barriers. The licensee shall locate vital equipment only within a vital area, which, in turn, shall be located within a protected area such that access to vital equipment requires passage through at least two physical barriers.	X			Vital equipment added by the Diesel Generator Project will be located within a vital area (either an existing plant vital area or the new DGB) which is located within a protected area.
c. Section d of 73.55 - Access Requirements. The licensee shall control all points of personnel and vehicle access into a protected area. Identification and search of all individuals shall be made and authorization shall be checked at such points.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
d. Section e of 73.55 - Detection Aids. All alarms required pursuant to this part shall annunciate in a continuously manned central alarm station located within the protected area and in at least one other continuously manned station, not necessarily onsite, such that a single act cannot remove the capabilities of calling for assistance or otherwise responding to an alarm.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
e. Section f of 73.55 - Communication Requirements. Each guard, watchman or armed response individual, or any other individual performing an active security function on duty shall be capable of maintaining continuous communications with an individual in each continuously manned alarm stations.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
13.6 PHYSICAL SECURITY Rev. 2 - July 1981 (cont'd)				
f. Section g of 73.55 - Testing and Maintenance. Each licensee shall test and maintain intrusion alarms, emergency alarms, communications equipment, access control equipment, physical barriers, and other security-related devices or equipment.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
g. Section h of 73.55 - Response Requirements. The licensee shall maintain liaison with local law enforcement authorities. Each licensee shall maintain an adequate number of guards for response and assessment of possible security threats. Each licensee shall require that those guards take steps to neutralize the threat when detected with sufficient force to protect the health and safety of the public.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
h. Part 73, Appendix B - General Criteria for Security Personnel. These general criteria establish requirements for the selection, training, equipping, testing, and qualification of individuals who will be responsible for the protecting of special nuclear materials, nuclear facilities, and nuclear shipments.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
i. Part 73, Appendix C - Licensee Safeguards Contingency Plans. A licensee safeguards contingency plan is a documented plan to give guidance to licensee personnel in order to accomplish specific defined objectives in the event of threats, thefts, or radiological sabotage relating to special nuclear material or nuclear facilities licensed under the Atomic Energy Act of 1954, as amended.	X			The existing plant security plan meets this requirement. The expanded Security System for the DGB is an extension of and consistent with the existing plant Security System.
Implementation of the physical security program should be accomplished 1 to 2 months before fuel loading. Security features required for new fuel in storage prior to loading of the first unit should be implemented as of the time fuel is onsite.	X			The security program for the extended area will be in place prior to connecting the diesels to the plant.

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
15.2.6 LOSS OF NONEMERGENCY AC POWER TO THE STATION AUXILIARIES Rev. 1 - July 1981				
The RSB acceptance criteria are based on meeting the relevant requirements of the following regulations:			FSAR 14.1.11 (Ref. 1)	A loss of all AC power to the station auxiliaries analysis was performed in referenced FSAR section. The Diesel Generator Project is outside the scope of this analysis.
A. General Design Criterion 10 as it relates to the reactor coolant system being designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during normal operations including anticipated operational occurrences.				
B. General Design Criterion 15 as it relates to the reactor coolant system and its associated auxiliaries being designed with appropriate margin to assure that the pressure boundary will not be breeched during normal operations including anticipated operational occurrences.				
C. General Design Criterion 26 as it relates to the reliable control of reactivity changes to assure that specified acceptable fuel design limits are not exceeded, including anticipated operational occurrences. This is accomplished by assuring that appropriate margin for malfunctions, such as stuck rods, are accounted for.				
D. TMI Action Plan items II.E.1.1, II.E.1.2, and II.K.2(1) of NUREGs-0718 and -0737 as they relate to the performance requirements of the auxiliary feedwater system for the loss of nonemergency ac power event.				
Specific criteria necessary to meet the relevant requirements of GDC 10, 15, and 16 for events of moderate frequency* are as follows:				
1. Pressure in the reactor coolant and main steam systems should be maintained below 110% of the design values (Ref. 1).				
2. Fuel cladding integrity shall be maintained by ensuring that the minimum DNBR remains above the 95/95 DNBR limit for PWRs and the CPR remains above the MCPR safety limit for BWRs based on acceptable correlations (see SRP Section 4.4).				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
15.2.6 LOSS OF NONEMERGENCY AC POWER TO THE STATION AUXILIARIES Rev. 1 - July 1981 (cont'd)				
3. An incident of moderate frequency should not generate a more serious plant condition without other faults occurring independently.				
4. An incident of moderate frequency in combination with any single active component failure, or single operator error, shall be considered and is an event for which an estimate of the number of potential fuel failures shall be provided for radiological dose calculations. For such accidents, fuel failures must be assumed for all rods for which the DNBR or CPR falls below those values cited above for cladding integrity unles it can be shown, based on an acceptable fuel damage model (see SRP Section 4.2), that fewer failures occur. There shall be no loss of function of any fission product barrier other than the fuel cladding.				
5. To meet the requirements of General Design Criteria 10 and 15, the positions of Regulatory Guide 1.105, "Instrument Spans and Setpoints," are used with regard to their impact on the plant response to the type of transient addressed in this SRP section.				
6. The most limiting plant systems single failure, as defined in the "Definitions and Explanations" of Appendix A to 10 CFR Part 50, shall be identified and assumed in the analysis and shall satisfy the positions of Regulatory Guide 1.53 (Ref.14).				
The applicant's analysis of the loss of ac power transient should be based on an acceptable model. Models which have been approved by the NRC are identified in References 2 through 8. If the applicant proposes analytical methods which have not been approved, these are evaluated by the staff for acceptability. For new generic methods, the reviewer requests an evaluation by the appropriate branch.				

SRP ACCEPTANCE CRITERIA	ACCEPTANCE CRITERIA COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
	YES	NO		
15.2.6 LOSS OF NONEMERGENCY AC POWER TO THE STATION AUXILIARIES Rev. 1 - July 1981 (cont'd) The value of parameters used in the analytical model should be suitably conservative. The following values are considered acceptable for use in the model. a. The initial power level is taken as the licensed core thermal power for the number of loops initially assumed to be operating plus an allowance of 2% to account for power measurement uncertainties, unless a lower power level can be justified by the applicant. The number of loops operating at the initiation of the event should correspond to the operating condition which maximizes the consequences of the event. b. Conservative scram characteristics are assumed, i.e., for a PWR - maximum time delay with the most reactive rod held out of the core, and for a BWR - a design conservatism factor of 0.8 times the calculated negative reactivity insertion rate. c. The core burnup is selected to yield the most limiting combination of moderator temperature coefficient, void coefficient, Doppler coefficient, power profile and radial power distribution. d. Mitigating systems should be assumed to be actuated in the analyses at setpoints with allowance for instrument inaccuracy in accordance with Regulatory Guide 1.105. Compliance with Regulatory Guide 1.105 is determined by ICSB. * The term "moderate frequency" is used in this SRP section in the sam sense as in the definitions of design and plant process conditions in References 9 and 10.				

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GENERAL DESIGN CRITERIA CORRELATION

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 1. Quality Standards and Records. Structures, systems and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.	X		1	4.1.2, 5.1.1.1	The Diesel Generator (DG) modification design, fabrication, erection and testing is consistent with the position on QA issues presented in the FSAR.

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GENERAL DESIGN CRITERIA CORRELATION

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE YES	COMPLIANCE NO	PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
Criterion 2. Design bases for protection against natural phenomena. Structures, systems and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy quantity , and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.	X		2	4.1.2, 5.1.1.1, 8.1.1	The Diesel Generator Building, the Emergency Diesel Generators (EDG) and all auxiliary components required for the start and operation of the engines and delivery of power, including electrical distribution and piping components, are designed to withstand the most severe of the natural phenomena without loss of capability to perform their intended safety functions. The natural phenomena such as floods, tornadoes, and earthquakes, considered for design are discussed in Sections 2.5, 2.6 & 2.9 of the FSAR, respectively. Design magnitudes are based upon the most severe of the natural phenomena recorded for the site and are given in structural design criteria for the Point Beach Nuclear Plant. The criteria for determining the effects of these natural phenomena on the structure, systems and components are discussed in Appendix A of the FSAR. For further information see FSAR Sections 1.3.1 and 8.1.1. The EDG's and all auxiliary components, including electrical and piping, are protected from all natural phenomena by (1) the Diesel Generator Building or (2) installation underground below the frost line (minimum 6 feet) for piping and the bottom of the Electrical Duct Bank or (3) installation within the existing plant. The EDG's and all components required to support the start and operation of the engines and to distribute the generators output power are seismically analyzed or tested consistent with the original site design basis or more conservative basis. For the design natural phenomena see Sections 2.5, 2.6, 2.9 and Appendix A of FSAR. Also see response to SRP 3.3.1, 3.3.2, 3.5.1.4 and 3.7.1 in the Standard Review Plans Compliance Summary.

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE YES	COMPLIANCE NO	PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
Criterion 3. Fire Protection. Structures, systems and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used whenever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety. Firefighting systems shall be design to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components.	X		3	5.1.1.1, 9.6	The following features were incorporated into the EDGs and their auxiliary systems to (1) minimize the probability and effects of a fire and (2) to detect and fight a fire: • The redundant DG sets and auxiliary systems are separated by three hour fire walls. • Each fuel oil day tank is segregated from its associated diesel generator by 3 hour fire walls. • The diesel and tank rooms are provided with automatic sprinklers and fire detection. • The switchgear rooms are provided with fire detection. • Fire extinguishers are provided in each area. • Installation within the existing plant is in compliance with the Appendix R Analysis. • Cable runs (FSAR Sec. 8.2.2) are routed and installed to protect them from physical damage. • The use of combustible material is limited as much as possible. • Noncombustibles and fire resistant materials are used wherever possible. • The pressurized Fire Protection Piping is analyzed and supported to assure its structural integrity during a Seismic event (not function). See FSAR Section 1.3.1. It is the express policy of the licensee to ensure that fire prevention in all areas be provided by structure and component design which maximizes the use of fire-resistant materials, optimizes the containment of combustible materials, and maintains exposed combustible materials below ignition temperatures. The fire protection system has the capability to extinguish any probable combination of simultaneous fires. Refer to Discussion/Resolution under SRP 9.5.1 for further information.

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 4. Environmental and missile design bases. Structures, systems and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operations, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit. However, the dynamic effects associated with postulated pipe ruptures of primary coolant loop piping in pressurized water reactors may be excluded from the design basis when analyses demonstrate the probability of such rupturing is extremely low under design basis conditions.	X		40	4.1.2, 5.1.1.1, 6.1.1	Per FSAR Section 1.3.7 Standby and emergency power supplies are protected from dynamic effects or missiles by proper layout of plant equipment and provision of missile barriers. The environment for the DG sets and Safety Related cable and wiring to and from the existing plant will not be affected by the post-accident environment for any DBA. Cabling within the existing plant RCA will be qualified for its environment. See FSAR Section 8.1.1. The design of the new DG sets is consistent with this regulatory position. (1) The diesel generator building Heating, Ventilation and Air Conditioning System is designed to maintain the environment in each area of the structure within the qualification parameters (temperature) required by the components to assure their operability under all site conditions including normal operation, maintenance testing and postulated accidents including a loss-of-coolant accident. Note that due to the location of the diesel building, the environment would not be affected by a loss-of-coolant accident. (2) The components in the Diesel Generator Building are protected against missiles generated by components external to the Diesel Generator Building, by the structure itself. For the description of the missiles used in the design, see Standard Review Plans Compliance Summary, SRP 3.3.2 and 3.5.1.4. (3) The walls separating the two EDG systems prevent missiles/pipe whip and discharging fluid from one system affecting the second system. For internally generated missiles from non-safety related components, see Standard Review Plans Compliance Summary, SRP 3.5.1.1. (4) The Diesel Generator Building is designed to withstand the effect of tornado generated missiles. Turbine generated missiles are not considered to strike the building because the building is located outside the low trajectory missile strike zone.

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 5. Sharing of structures, systems, and components. Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.	X		4	6.1.1	The EDG's are not shared among the two units except for the capability which will allow one diesel to feed two buses (one Unit 1 bus and one Unit 2 bus) when one engine is out of service. Each engine is sized and designed with the capability to supply the LOCA loads on one unit while supplying the shutdown loads on the other unit. Therefore the overall EDG design provides an increase in the capability to perform their safety function relative to the original design. The two new EDG's are installed within a common building with internal rooms provided to separate one diesel generator and its auxiliaries from the other, except that a common duct bank and shared manholes are utilized for the interface cabling and a shared room is used for the fuel oil transfer pumps (the two Train A pumps are in one room and the two Train B pumps are in another room). Two new independent 125 Volt DC panels are provided to supply power for the EDGs and switchgear which are located in the separate rooms. These panels are fed from existing 125 Volt DC panels which have the capability to tie redundant loads but are significantly restricted by either administrative control or physical interlocking devices or both. These existing panel capability to tie redundant load groups are not effected by the scope of this modification. The separate duct banks and manholes for A and B trains are seismically designed and protected from external hazards. Since there are no internal hazards which can affect more than one Train, there is no significant affect on the ability of the cable within the duct banks and manholes to perform their safety functions. The design provides two separate rooms for the Fuel Oil Transfer Pumps. One room is common for G03/G04 and a second room is common for G01/G02. Since the Fuel Oil Transfer Pump Rooms are seismically designed and protected from external hazards and there is no internal hazard which can affect more than one Train, there is no significant affect on the abilities of the Fuel Oil Pumps within the shared room from performing their functions. The existing EDG's have adequate capacity to control a LOCA in one unit and a concurrent shutdown of the second unit. The two new EDG's will have the same adequate capacity, as

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 17. Electric power systems. An onsite electric power system and an offsite electric power system shall be provided to permit functioning of structures, systems and components important to safety. The safety function for each system (assuming the other system is not functioning) shall be to provide sufficient capacity and capability to assure that (1) specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded as a result of anticipated operational occurrences and (2) the core is cooled and containment integrity and other vital functions are maintained in the event of postulated accidents. The onsite electric power supplies, including the batteries, and the onsite electric distribution system shall have sufficient independence, redundancy, and testability to perform their safety function assuming a single failure. Electric power from the transmission network to the onsite electric distribution system shall be supplied by two physically independent circuits (not necessarily on separate rights of way) designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident conditions. A switchyard common to both circuits is acceptable. Each of these circuits shall be designed to be available in sufficient time following a loss of all onsite alternating current power supplies and the other offsite electric power circuit, to assure that specified acceptable fuel design limits and design conditions of the reactor coolant pressure boundary are not exceeded. One of these circuits shall be designed to b available within a few seconds following a loss-of-coolant accident to assure that core cooling, containment integrity, and other vital safety functions are maintained. Provisions shall be included to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power from the transmission network, or the loss of power from the onsite electric power supplies.	X		39	8.1.1	Emergency and Standby Power Supplies are presently provided with sufficient independence, redundancy and testability to satisfy the requirements of this GDC. The new EDG sets are intended to enhance this capability. The present onsite electrical power system consists of two independent and redundant electric power distribution systems for each unit and two independent and redundant shared diesel generators each capable of providing sufficient power for all postulated accidents. The new system will enhance this capability by adding two additional diesel generators which are independent and redundant from the existing diesel generators. The new system has sufficient independence, redundancy and testability (see RG 1.9 and GDC 18 Compliance Discussions) to perform their safety function assuming a single failure. There is no change to the offsite electric power system. The offsite and onsite electric power sources are separate except when paralleled during testing thus minimizing the probability of losing one source as a result of a loss of the other source. See GDC 18 and Regulatory Guides 1.6, 1.9, 1.32, and 1.75 Compliance Discussions for further detail.

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GENERAL DESIGN CRITERIA CORRELATION

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 18. Inspection and testing of electric power systems. Electric power systems important to safety shall be designed to permit appropriate periodic inspection and testing of important areas and features, such as wiring, insulation,connections, and switchboards, to assess the continuity of the systems and the conditions of their components. The systems shall be designed with the capability to test periodically (1) the operability and functional performance of the components of the systems, such as onsite power sources, relays, switches, and buses, and (2) the operability of the systems as a whole and, under conditions as close to design as practical, the full operation sequence that brings the system into operation, including operation of applicable portions of the protection system, and the transfer of power among the nuclear power unit, the offsite power system, and the onsite power system.	X		39	8.1.1	Capability is provided to test the operational startup sequence for the EDG power source in its normal and alternate line up. See Regulatory Guides 1.32 and 1.108 Compliance Discussions for further detail.

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 19. Control room. A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without the personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.	X		11	7.7.1	Adequate control and instrumentation is provided in the Control Room and outside the Control Room to support the operation of the new DG sets. The Control Room has provisions for controlling and monitoring the status of the new EDG's and for controlling and monitoring the position of the electrical systems 4160V switchgear breakers. Provisions locally are available for controlling and monitoring the status of the new EDG's, controlling and monitoring the position of those electrical breakers necessary to safely shutdown the plant, and indication necessary to shutdown the plant.

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GENERAL DESIGN CRITERIA CORRELATION

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 23. Protection system failure modes. The protection system shall be designed to fail into a safe state or into a state demonstrated to be acceptable on some other defined basis if conditions such as disconnection of the system, loss of energy (e.g., electric power, instrument air), or postulated adverse environments (e.g., extreme heat or cold, fire, pressure steam, water, and radiation) are experienced.	X		26	7.2.1	See response to Criterion 24.

10 CFR 50 APPENDIX-A CRITERION	COMPLIANCE		PBNP AIF GDC No.	PBNP FSAR SECTION	COMPLIANCE POSITION
	YES	NO			
Criterion 24. Separation of protection and control systems. The protection system shall be separated from the control system to the extent that failure of any single control system component or channel, or failure or removal from service of any single protection system component or channel which is common to the control and protection systems leaves intact a system satisfying all the reliability, redundancy, and independence requirements of the protection system. Interconnection of the protection and control systems shall be limited so as to assure safety is not significantly impaired.	X		20	7.2.1	The protection system is not within the scope of this project and by design, the DG control systems do not directly interact with the protection system. Failure of any single control system or channel associated with the new diesel generators will not affect the protection system.

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DIESEL GENERATOR ADDITION PROJECT
REGULATORY GUIDES COMPLIANCE SUMMARY

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.6	Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems (3/10/71)	X		FSAR 8.1, 8.2, 1.3.7 (Ref. 1)	The safety related loads added are assigned to their respective redundant load group in such a manner that a loss of one group will not prevent the minimum safety functions from being performed. Each a-c load group bus has a connection to the preferred (offsite) source. Additionally, each bus has a connection to a standby (onsite) source. There is no automatic connection between the load group of one unit with the load group of the other unit. However, the electrical distribution system may be configured in such a manner that one EDG may power the same train load groups on both units. Redundant load groups and their standby source are independent from each other since: The redundant load groups are not automatically paralleled with a redundant load group standby source under any condition, There are no provisions for automatically connecting one load group with its redundant load group, There are no provisions for automatically transferring loads between redundant power sources, There are no means for manually connecting 5KV redundant load groups together. The existing 480 Volt and 125 Volt DC levels do have the capability to tie redundent load groups together,but it is significantly restricted either by administrative controls or physical interlocking devices or both. The existance of these means are not affected by the scope of this modification. Standby power is provided by a single EDG for each redundant load group. The onsite electrical system may be configured such that the standby power for the same train load group from both units is provided by a single EDG.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.9	Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants (Revision 2, 12/79)		X	FSAR 8.2, 8.3, 13.2.2.1, 15.4.6 (Ref. 1)	The new installation shall be in compliance with regulatory guide 1.9 unless noted otherwise below. In addition to supplying sufficient power for shutting down the other unit, each EDG has enough capacity to start and run a fully loaded set of engineered safeguards equipment to adequately cool the core and maintain the containment pressure within the design value for any loss of coolant accident. EDG loads are known and are within the EDG's 200 hour rating for the first approximately 1/2 hour and within the EDG's 2000 hour rating thereafter. The EDG applications design incorporates all applicable service, environmental, testing and design basis requirements. The EDG is provided with automatic and manual control both locally and in the Control Room. Surveillance instrumentation is provided. The EDG is tripped on overspeed or differential overcurrent or 2 out of 3 low lube oil pressure after time delay. All other trips are bypassed under accident conditions.
Regulatory Guide 1.12	Instrumentation for Earthquake(Revision 1,4/74)		X	Ref. 2	Seismic instruments were provided on the Unit 1 containment base slab, in the switch yard and in the Energy Information Center Building of the PBNP. The instruments were installed in 1970 to satisfy a commitment in the Point Beach FFDSAR in response to AEC Question 5.12. Two of the instruments were later relocated to the foundation of the control Auxiliary Building at El. 8'-0" and on the side of the Spent Fuel Pool. The instruments do not satisfy the Regulatory Guide 1.12 requirements. However, Wisconsin Electric is not required to meet these requirements since it was licensed prior to the issuance of this Regulatory Guide. No seismic instrumentation is required in the Diesel Generator Building.

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REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.26	Quality Group Classifications and Standards for Water, Steam and Radioactive Waste Containing Components of Nuclear Power Plants (Revision 3, 2/76)		X		The water containing components including piping are designed to ANSI B31.1 (Enhanced) and ASME VIII (Enhanced) consistent with the original PBNP design basis. The enhancements invoke the primary material certification, testing and NDE required by ASME Section III. This enhances the safety inherent in the original Design Codes to a level more consistent with todays standards.
Regulatory Guide 1.28	Quality Assurance Program Requirements (Design and Construction) (Revision 3, 8/85)	X		FSAR 1.8 (Ref. 1)	PBNP is committed to ANSI N18.7-1976 which includes commitment to ANSI/ASME N45.2 and the appropriate ANSI N45.2 series as stated in Section 1.8 of FSAR. Section D of Regulatory Guide 1.28 permits the use of ANSI N45.2 instead of ANSI/ASME NQA-1-1983.
Regulatory Guide 1.29	Seismic Design Classification (Revision 3, 9/78)	X		Ref. 7	The Diesel Generator Building, the EDGs and all auxiliary and support systems including that part of the heating and ventilation required to support operation of the engine and switchgear are classified as Seismic Category I and are designed to withstand the effects of an OBE and a SSE (Design and Hypothetical Earthquakes). The portions of the systems or components that form interfaces between Seismic Category I and non-Seismic Category I are designed to the Seismic Category I requirements.
Regulatory Guide 1.30	Quality Assurance Requirements for the Installation, Inspection and Testing of Instrumentation and Electric Equipment (8/11/72)	X		FSAR 1.8 (Ref. 1)	Installation, Inspection and Testing of Instrumentation and Electric Equipment will be in accordance with the quality assurance requirements of ANSI-N42.2.4-1972 as supplemented by the Regulatory Guide positions.

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REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.32	Criteria for Safety-Related Electric Power Systems for Nuclear Power Plants (Revision 2, 2/77)	X		FSAR 8.1, 8.2 (Ref. 1)	The new safety related power system design is in compliance with IEEE-308 principal and supplementary design criteria. The offsite power is outside the scope of this project. The DC system is outside the scope of this project except for DC feeder circuits which are used for EDG and switchgear breaker control. See R.G. 1.75 discussion for "Independence of Redundant Standby Sources" and Connection of Non-Class 1E Equipment to 1E Systems." See R.G. 1.9 discussion for "Diesel Generator Set Capacity." See R.G. 1.81 discussion for "Shared Electric Systems for Multiple-Unit Nuclear Power Plants." See R.G. 1.93 discussion for "Availabi'ity of Electric Power Systems."
Regulatory Guide 1.41	Preoperational Testing of Redundant On-Site Electric Power Systems to Verify Proper Load Group Assignments (3/73)	X		FSAR 8.3 13.2.2.1 15.4.6 (Ref. 1)	The modified on-site electrical power system will be subjected to a pre-operational test to verify the existence of independence among redundant on-site power sources and their load groups. The test will be initiated by direct action of the safety related bus undervoltage sensing relays Various possible combinations of power sources and load groups will be tested with redundant power sources disconnected Disconnected power sources will be monitored to verify absence of voltage.
Regulatory Guide 1.47	Bypassed and Inoperable Status Indication for Nuclear Power Plant Safety Systems (5/73)	X		FSAR 8.2.3 (Ref. 1)	System level annunciators are provided for each of the new EDGs (G03 and G04). To assure compliance with IEEE 279-1971, the annunciators located in the control room will automatically actuate if the EDGs, its mechanical or electrical auxiliaries are bypassed or rendered inoperative.

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REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.53	Application of the Single-Failure Criteria to Nuclear Power Plant Protection Systems (6/73)	X		FSAR 7.0, 8.0 (Ref. 1)	The protection system is not within the scope of the project. Failure of any single control system or channel associated with the new EDGs will not affect the protection system.
Regulatory Guide 1.54	Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants (6/73)	X			ANSI N101.4-1972 will be evoked to address all coatings associated with safety related structures or components.
Regulatory Guide 1.59	Design Basis Floods for Nuclear Power Plants, Rev. 2, August 1977	X		FSAR 2.5 (Ref. 1)	The Site is 20 or more feet above normal lake level and there is no record of any flooding by the lake at any time. There are no rivers or large streams at or near the site. The most plausible flooding hazard at the site is the probability of a simultaneous melting of a large amount of snow in the spring combined with sustained heavy rains. For protection against this possible flooding see response to SRP 3.4.1.
Regulatory Guide 1.60	Design Response Spectra for Seismic Design of Nuclear Power Plants (Revision 1, 12/73)		X	FSAR Appendix A (Ref. 1)	The Housner Horizontal Design Response Spectra, given in Figures A-1 and A-2 in Appendix A of FSAR, has been used in the design. This Design Response Spectra is consistent with the original PBNP Design Basis. The vertical Design Response Spectra was obtained by multiplying the horizontal Design Response Spectra by two-thirds. The Diesel Generator Building is designed using the Housner Design Response Spectra so that a consistent level of safety can be maintained with the structures, systems and components throughout the balance of the plant.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.61	Damping Values for Seismic Design of Nuclear Power Plants (10/73)	X		FSAR Appendix A (Ref. 1)	The damping values used in seismic analysis of PBNP structures and components are given in Table A.1-1 of FSAR. The values, except for reinforced concrete structures on soil, are all smaller than or equal to the values given in Regulatory Guide 1.61. For reinforced concrete structures, Regulatory Guide 1.61 requires 4% and 7% damping for OBE and SSE respectively. Table A.1-1 of FSAR suggests using higher damping values (5% for OBE and 7.5% for SSE) for reinforced concrete structures on soil. The FSAR also limits the soil damping to 5% for both OBE and SSE. The actual soil damping at the PBNP Site, as indicated from the lab test results, is 20% to 30% which is much higher than 5%. The Diesel Generator Building is a low reinforced concrete rigid structure. The responses of the building to seismic loads are mainly due to the rigid body motion of the soil-structure system. The damping values given in Table A.1-1 of the FSAR for a reinforced concrete building on soil are lower than the composite model damping, when calculated based on the requirements of SRP 3.7.2, using actual soil damping and the damping values given in Regulatory Guide 1.61. The response of the building, using lower soil-structure system damping (5% and 7.5%) will be more conservative. Thus, the design of the Diesel Generator Building conforms or exceeds the requirements of Regulatory Guide 1.61. Position 3 of this Regulatory Guide is not clear. However, the correlation between stress levels and damping values in the building is not required for design of safety related structures per Ref. 9 of SRP 3.7.1. The responses of the Diesel Generator Building for generation of the floor response spectra is found not to be dependent on the damping values of the structure due to dominant rigid body motions of the structure.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.62	Manual Initiation of Protection Actions (10/73)	X		FSAR 7.0 (Ref. 1)	This modification does not provide any new system level manual initiation signals. The existing SI initiation signal is provided to the new EDGs. The SI initiation signal to the EDGs is activated automatically or manually. The EDGs response to the manually actuated SI signal is identical to its response to the automatically actuated SI signal.
Regulatory Guide 1.64	Quality Assurance Program Requirements for the Design of Nuclear Power Plants (Revision 2, 6/76)	X		FSAR 1.8.3 (Ref. 1)	The design activities associated with modifications of safety-related structures, systems and components are in accordance with the provisions of Section 8 of ANSI N45.2.11-1974 per section 1.8.3 of the FSAR. The Diesel Generator Project QA program complies with the requirements of Regulatory Guide 1.64.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.75	Physical Independence of Electric Systems (Revision 2, 9/78)		X	FSAR 1.3, 7.2.1, 8.2.2 (Ref. 1)	Existing Building Existing plant interface is in compliance with IEEE-384-1992 general and specific separation criteria except as noted for the existing plant interface: Cable and raceway separations are per FSAR sections Internal switchboard separation is per FSAR sections. Diesel Generating Building The new safety related electric power system design consisting of the new EDGs, the associated auxiliaries and switchgear is in compliance with IEEE-384-1992 general and specific separation criteria except for the requirements of physical seperation distances between Class 1E and non-Class 1E circuits within control switchboards (Reference Section 6.6 and 6.7 of IEEE 384-1992). Isolation of non-Class 1E above 120v that are loads energized from a Class 1E AC source is by a breaker that is properly coordinated and tripped by an SI signal. Isolation of non-class 1E loads 120v and below that are energized from a class 1E source isby a breaker that is properly coordinated. Isolation of non-Class 1E loads energized from a Class 1E DC source is by a fused disconnect that is properly coordinated. All safety related cable is routed in trays or conduit. All safety related cables are routed within safety class structures. There are no associated circuits since all the non-safety related circuits are powered from isolated power supplies and routed in separate raceways. Separation will be based on the recommended distances in IEEE-384-1992, therefore a separation analysis will not be performed. The design does not utilize cable tunnels. The design does not permit cable splices in raceways. The safety related cables shall be installed using an adequate QC program for proper route. Maintenance of such separations is maintained by use of CARDS database plus control on future design and construction efforts. Raceways are color coded to visually verify the physical separation.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.75	**Physical Independence of Electric Systems (Revision 2, 9/78) - Continued**	X			(Note: The design basis for the existing EDG and switchgear is not within the scope of this project except to reconfigure the safety related switchgear and/or train on one of the existing EDGs from B train to A train. The design basis for the existing system is described in referenced FSAR sections and will not be upgraded.)
Regulatory Guide 1.76	**Design Basis Tornado for Nuclear Power Plants (4/74)**	X		FSAR 5.1.2.2 (Ref. 1)	The PBNP is located in Region I of the Tornado Intensity Regions map of Regulatory Guide 1.76. The maximum wind speed, rotational plus translational, of the Design Basis Tornado (DBT) used in the design of the Diesel Generator Building is 360 mph with a pressure drop of 3 psi and a rate of pressure drop of 2 psi/sec. The DBT conforms with this Regulatory Guide.

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		YES	NO		
Regulatory Guide 1.81	Shared Emergency and Shutdown Electric Systems for Multi Unit Nuclear Power Plants (Revision 1, 1/75)	X		FSAR 8.2, 1.3 (Ref. 1)	The existing system has two shared EDGs (G01 and G02). The new system adds two EDGs (G03 and G04). The new system will normally not be configured as a shared system but will have the capability to be configured as a shared system when one EDG is out of service. The DC feeds for the switchgear control are not shared. The DC feeds for the EDG control are not shared except when the EDGs are configured as shared units. The system is designed such that a single failure (including a spurious accident signal in the non-accident unit, when all four diesels are lined up in the normal configuration) with the most severe design basis event and loss of offsite power will not preclude the capability to automatically supply minimum ESF loads on one unit and safely shutdown the remaining unit. Any one EDG has sufficient capacity to attain a safe and orderly shut down of both units to cold shutdown assuming a loss of offsite power and the most severe postulated loading. With one EDG unavailable due to maintenance and/or testing, the same train EDG from the other unit has the capability to be configured as a shared EDG. No coordination will be required between the unit operators for the shared EDG to meet the above design criteria. The status of the electrical system configuration is indicated in the Control Room on Panel C02 for both unit operators. Also, see discussion for Reg. Guides 1.6, 1.9, and 1.47.
Regulatory Guide 1.89	Qualification of Class 1E Equipment For Nuclear Power Plants	X		Ref. 29	All the equipment is located in a mild environment and required for safety related functions will be qualified to IEEE 344 except for a portion of the 5kv power feeders to the Safety Injection Pumps. These cables will be qualified in accordance with IEEE-323-1984 and IEEE-383-1974. See Regulatory Guide 1.131 Compliance Summary.

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REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.92	**Combining Modal Responses and Spatial Components in Seismic Response Analysis (Revision 1, 2/76)**	X		FSAR 2.9, & FSAR Appendix A (Ref. 1)	The Diesel Generator Building responses to seismic loads are obtained using the response spectrum method of analysis. The number of the modes considered adequately represent the structure. The modal responses are combined using the absolute sum method per page A-20 of the FSAR. This method is more conservative than the methods given in Regulatory Guide 1.92 and thus exceeds the requirements of the guide. Only two directional seismic, one horizontal and one vertical component acting simultaneously, is used in the analysis and the effects are added by the absolute sum method per page A-18 and Section 2.9 of the FSAR. In addition, the out of plane seismic effect on the walls is considered in the analysis. Since the building has two axes of symmetry, with no torsional effect from seismic loads, the method used is more conservative than combining three directional seismic by SRSS method.
Regulatory Guide 1.93	**Availability of Electric Power Sources (12/74)**		X	FSAR 15.3.7 (Ref. 1)	Compliance to this Reg. Guide will be determined based on current and proposed Technical Specifications.
Regulatory Guide 1.94	**Quality Assurance Requirements for Installation, Inspection and Testing of Structural Concrete and Structural Steel During the Construction Phase of Nuclear Power Plants (Revision 1, 4/76)**	X		FSAR 1.8 (Ref. 1)	The PBNP Quality Assurance Program commits to the guideline provided in ANSI N18.7-1976 which includes ANSI N45.2.5-1974 per Section 1.8 of FSAR. The PBNP Quality Assurance Program also commits to follow Regulatory Guide 1.94 per Table 1.8-1 of FSAR.
Regulatory Guide 1.97	**Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident (Rev. 3, 5/83), Errata (7/81)**	X		Ref. 28	Status indication of each EDG and the safety related bus variables are provided to the control room operators during accident conditions. Local status indication is provided for the new EDG auxiliaries motor control center and DC distribution panel.

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REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.100	Seismic Qualification of Electric and Mechanical Equipment for Nuclear Power Plants (Revision 2, 6/88)	X		TVA DCN No. E6-90-D707 (Ref. 23)	The seismic qualification of Electric and Mechanical Equipment of the Diesel Generator Project either conforms to the requirements of IEEE Std. 344-1975 or IEEE Std. 344-1987 as follows: Switchgear — IEEE Std. 344-1987 All other Class 1E Electric — IEEE Std. 344-1987 Diesel Generator Control Panel — IEEE Std. 344-1987 Diesel Generators and Mechanical Equipment (already procured by WE) — IEEE Std. 344-1975 All other Class 1 Mechanical Equipment including Tanks — IEEE Std. 344-1987 As an alternative, some of the Class 1E electric or Class 1 Mechanical Equipment is seismically qualified using the USI A-46 (GIP) methodology. IEEE Std. 344-1987 accepts the use of experience data for equipment qualification. NRC has accepted the GIP methodology for PBNP equipment and components. This methodology is part of the design basis for the Diesel Generator Project.
Regulatory Guide 1.102	Flood Protection for Nuclear Power Plants (Revision 1, 9/76)	Ind.		FSAR 2.5 (Ref. 1)	Section 2.5 of FSAR provides information on the most plausible flooding hazard at the site. The site is 20 or more feet above normal lake level and there is no record that it was flooded by the lake at any time. Natural drainage of the site, a storm sewer system in the plant yard, and an interceptor ditch discharging to Lake Michigan provide protection against local flooding.
Regulatory Guide 1.105	Instrument Setpoints for Safety-Related Systems (Rev. 2. 2/86)			FSAR 15.2 (Ref. 1)	Not applicable to this modification.
Regulatory Guide 1.106	Thermal Overload Protection for Electric Motors on Motor Operated Valves (Revision 1, 3/77)				Not applicable to this modification since no new MOVs or MOV controllers with thermal overload protection will be installed. The modification to the existing MOV circuits is limited to relocating the power supply for one valve.

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		YES	NO		
Regulatory Guide 1.108	Periodic testing of Diesel Generator Units used as Onsite Electric Power Systems at Nuclear Power Plants (Revision 1, 8/77 (Errata 9/77)	X		FSAR 8.2, 8.3, 13.2.2.1, 15.4.6 (Ref. 1)	The new EDGs are designed to be tested during normal plant operation and during plant shut down. Each EDG can be tested independently of the other EDGs Testability has been considered in the selection and location of instrumentation sensors and critical components Periodic testing will not impair the capability of the tested unit to supply emergency power within the required time EDG status indication is provided in the Control Room. Communications are available between the EDG local control room and the main control room via the PA system and a telephone. All protective trips are in force during testing.
Regulatory Guide 1.115	Protection Against Low Trajectory Missiles (Revision 1, 7/77)	X			The Diesel Generator Building is located outside the low trajectory turbine missile strike zone as defined in Regulatory Guide 1.115.
Regulatory Guide 1.117	Tornado Design Classification (Revision 1, 4/78)	X		FSAR 5.1.2.2 (Ref. 1)	The EDGs and all mechanical, auxiliary, and electrical components, including piping and other safety-related electrical and mechanical devices and circuitry, are protected from tornado and tornado-generated missiles by the Diesel Generator Building or underground installation. The Diesel Generator Building, including the exhaust stacks, is designed to withstand the effects of tornado wind and tornado-generated missiles, as defined in Section 5.1.2.2 of the FSAR.
Regulatory Guide 1.118	Periodic Testing of Electric Power and Protection Systems (Revision 2, 6/2/78)	X		FSAR 8.3 (Ref. 1)	The design is in compliance with IEEE-338-1977.
Regulatory Guide 1.120	Fire Protection Guidelines for Nuclear Power Plants (Revision 1, 11/77)	X			Each EDG set is separated from the second set to the extent that a fire cannot disable both engines. Separation and fire barriers are provided to maintain physical independence. See discussion for SRP 9.5.1.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.122	Development of Floor Design Response spectra for Seismic Design of Floor-Supported Equipment or Components (Revision 1, 2/78)	X		Ref. 1, Ref. 16	The floor design response spectrum for the Diesel Generator Building is obtained by time history technique. The sample earthquake utilized is that recorded at Olympia, Washington N 80E on April 13, 1949 as specified in Appendix A of FSAR. The same time history adjusted for peak ground acceleration of 0.12g in both horizontal directions and 2/3 of 0.12g in the vertical direction is applied separately to the Diesel Generator Building mathematical model. A two-dimensional lump mass soil spring model is used in the analysis. Variation of soil properties are considered per SRP 3.7.2 Rev. 2. The time histories are obtained at various locations and the corresponding floor response spectra are calculated. Then, the floor design response spectra are obtained in conformance with the requirements of Regulatory Guide 1.122.
Regulatory Guide 1.123	Quality Assurance Requirements for Control of Procurement of Items and Services for Nuclear Power Plants (Revision 1, 7/77)	X		Ref. 1 Sections 1.8 & 1.8.7	The PBNP Quality Assurance Program commits to the guidelines provided in ANSI N18.7-1976 which includes ANSI N45.2.13-1976 as specified in Section 1.8 of FSAR. The requirements of ANSI N45.2.13-1976 are met for the procurement of components within the scope of Section 5.2.13 of ANSI N18.7-1976.
Regulatory Guide 1.131	Qualification Test of Electric Cables, Field Splices, and Connections for Light-Water-Cooled Nuclear Power Plants	X		FSAR 8.2.2 (Ref. 1)	All safety related cable, field splices and connections will be qualified in accordance with IEEE-323-1974, and IEEE-383-1974 as supplemented by the Regulatory Guide Position.
Regulatory Guide 1.137	Fuel Oil Systems for Standby Diesel Generators (Revision 1, 10/79)	X			The fuel oil system complies with ANSI/ANS-59.51-1989 (Revision of N195-1976) except that only approximately six days of fuel oil is provided without cross tying the two Fuel Oil Storage Tanks. The volume of fuel oil available has been calculated based on continuous operation by two engines fed from each tank utilizing a worst case calculated load profile. Day tanks are located per manufacturers instructions, while assuring a positive head on the engine fuel oil pumps. System arrangement allows for ASME Section XI In-service Inspection including pressure testing. Fuel oil stored within the safety related storage tanks and the day tanks will see a minimum temperature of approximately 40°F which is well above the cloud point. The Fuel Oil Storage Tanks are coated and buried in concrete. Underground piping is coated and placed in a lined trench. Refer to SRP 9.5.4 for further detail.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.138	Laboratory Investigation of Soils for Engineering Analysis and Design of Nuclear Power Plants (April 1978)	X		Ref. 12 Ref. 13	The original soil data for the Point Beach Nuclear Plant (Ref. 13) is used for the design of the Diesel Generator Building. Confirmatory soil exploration work will be performed for the proposed location of the DGB. The soil exploration work will be in accordance with Specification No. 6704-5-1 Section 02010 which invokes applicable requirements of Regulatory Guide 1.138 for laboratory investigations and tests.

REGULATORY GUIDE		REGULATORY POSITION COMPLIANCE		REFERENCE	DISCUSSION/RESOLUTION
		YES	NO		
Regulatory Guide 1.142	Safety-Related Concrete Structures for Nuclear Power Plants (Other Than Reactor Vessels and Containment) (Revision 1, 9/81)	X		Ref. 1 Ref. 7 Ref. 19 Ref. 20	Section C of this Regulatory Guide accepts the ACI 349-76 Code and its 1979 supplement (except Appendix B) for design of safety-related concrete structures other than reactor vessels and containments, subject to 12 modification/clarifications. The Diesel Generator Building is designed and will be constructed using ACI-318-89 (the updated version of the code used for the other non-containment Category I structures at PBNP) with the following exceptions to the codes: 1) The load combinations for normal loading which includes seismic and wind are not reduced by 0.75 factor; 2) Two additional load combinations with load factors of 1 are added for Extreme Environmental Condition; i.e., SSE and Tornado loading; 3) Requirements of Appendix C of ACI-349-90 in conjunction with position 10 of Regulatory Guide 1.142 are invoked to design the building for the effect of the tornado-generated missiles; 4) Requirements of Appendix B of ACI-349-90 are used to design steel embedments in concrete; 5) ACI-349-90 requires a quality assurance program covering nuclear safety related structures while ACI 318-89 does not. PBNP has a quality assurance program in place according to Section 1.8 of FSAR; 6) The frequency of concrete compressive strength testing and other activities related to the installation, inspection, and testing of structural concrete during the construction phase are specified in Specifications 6704-1-1 Section 03300, "Cast-In-Place Concrete" and 6704-1-1 Section 03302, "Ready-Mixed Concrete." These specifications meet the intent of the requirements of ACI 349-90. See Note 18 of the Codes and Standards Matrix for comparison between ACI 349 and ACI 318 codes as well as for resolutions to the exceptions taken. Considering that a) there is no requirement for radiation-shielding of the Diesel Generator Building; b) there is no pressure and/or high pressure loading and; c) the building is a shear wall type structure, it is concluded that the design of the building meets the requirements and intent of

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		YES	NO		
Regulatory Guide 1.148	Functional Specification for Active Valve Assemblies in Systems Important to Safety in Nuclear Power Plants (4/81)	X			The requirements of this Regulatory Guide will be incorporated into the specification of Active Valves procured in off-engine systems.
Regulatory Guide 1.151	Instrument Sensing Lines (8/83)		X	FSAR 7.0 (Ref. 1)	The instrumentation sensing lines are in accordance with ISA-S67.02 as supplemented by the regulatory guide positions except they will conform to ASME/ANSI B31.1 consistent with the piping design. See Regulatory Guide 1.26 Compliance discussion for detail.
Regulatory Guide 1.153	Criteria for Power, Instrumentation, and Control Portions of Safety Systems.		X	FSAR 7.0, P 0 (Ref. 1)	The documented design basis consists of documenting the following: Assumptions Applicable Codes, Standards and Regulatory Requirements Existing Documentation Unique Client Requirements Client Input Required Functional Performance Requirements Design Parameters Operational Considerations Environmental Conditions Redundancy/Separation Requirements Accessibility Requirements Unique Construction Requirements The new safety related power system design is in compliance with IEEE-603 Safety System Criteria, Source and Command Feature and Design Requirements, Execute Features Functional and Design Requirements and Power Source Requirements as supplemented by the regulatory positions.