ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9004240235 DOC.DATE: 90/04/16 NOTARIZED: NO DOCKET #
FACIL:50-250 Turkey Point Plant, Unit 3, Florida Power and Light C 05000250
50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
HARRIS,K.N. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards response to 900316 request for addl info re emergency power sys enhancement project.

DISTRIBUTION CODE: A001D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 14
TITLE: OR Submittal: General Distribution

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD2-2 LA	1	1	PD2-2 PD	1	1
	EDISON,G	5	5			
INTERNAL:	NRR/DET/ECMB 9H	1	1	NRR/DOEA/OTSB11	1	1
	NRR/DST 8E2	1	1	NRR/DST/SELB 8D	1	1
	NRR/DST/SICB 7E	1	1	NRR/DST/SRXB 8E	1	1
	NUDOCS-ABSTRACT	1	1	OC/LFMB	1	0
	OGC/HDS2	1	0	REG FILE 01	1	1
	RES/DSIR/EIB	1	1			
EXTERNAL:	LPDR	1	1	NRC PDR	1	1
	NSIC	1	1			

R I D S / A D D S

R I D S / A D D S

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM P1-37 (EXT. 20079) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 21 ENCL 19

mA-4

FPL

P.O. Box 14000, Juno Beach, FL 33408-0420

APR 16 1990

L-90-140

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Request for Additional Information on
Emergency Power System Enhancement Project
NRC TAC Nos. 69023 and 69024

Attached is Florida Power & Light Company's response to your March 16, 1990 request for additional information regarding the Emergency Power System Enhancement Project.

Should there be any questions regarding this information, please contact us.

Very truly yours,

K. N. Harris
Site Vice President
Turkey Point Nuclear Plant

KNH/TCG/gp

attachment

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

A001
1/1

ATTACHMENT

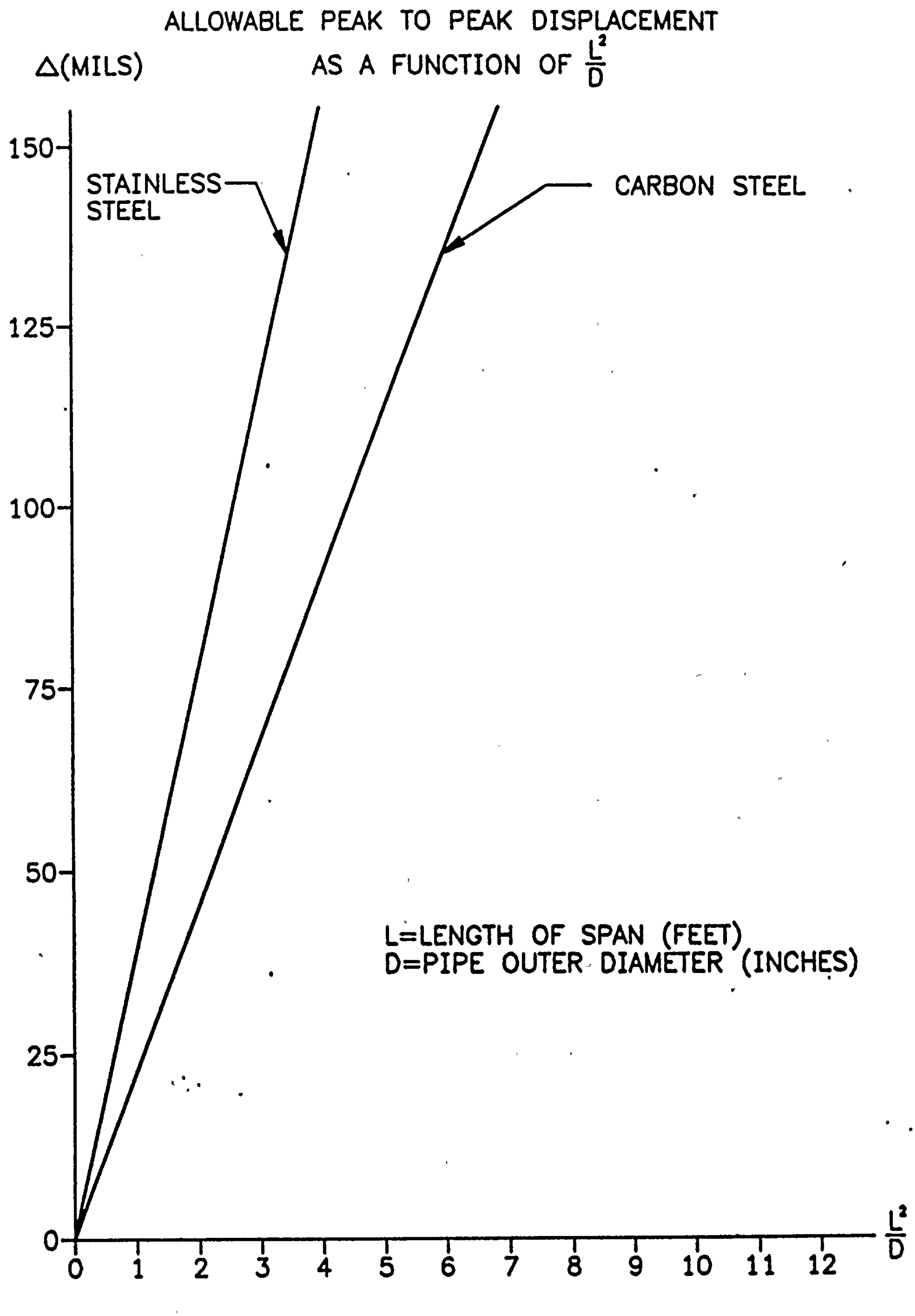
Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Request for Additional Information on
Emergency Power System Enhancement Project
NRC TAC Nos. 69023 and 69024

Question 1 — Your response dated March 20, 1989 (letter L-89-107) repeatedly referenced the ANSI B31.1 code as the design basis for diesel generator piping. Please specify the edition of this code on which you rely.

Response — The 1986 Edition of the ANSI B31.1 Code is the design basis code for the diesel generator piping.

<u>Question 2</u> Please specify the criteria for acceptability of the piping vibration (during testing) for piping attached to the diesel generators.

<u>Response</u> All off skid piping systems connected to the diesel generators utilize flexible connections in order to isolate the piping from vibration generated by the diesel. The next page provides the acceptance criteria developed by the AE for piping vibration to be measured during start-up testing. Testing at the manufacturer's facility indicated that all skid mounted piping also met this criteria. Additionally, all instrument tubing was replaced with 3/8" diameter 0.065" wall 316 stainless steel tubing with 60" support spacing in response to IE Notice 89-07.


ALLOWABLE PEAK TO PEAK DISPLACEMENT
AS A FUNCTION OF $\frac{L^2}{D}$
Δ(MILS)
150
125
100
75
50
25
0
STAINLESS STEEL
CARBON STEEL
L=LENGTH OF SPAN (FEET)
D=PIPE OUTER DIAMETER (INCHES)
0 1 2 3 4 5 6 7 8 9 10 11 12
$\frac{L^2}{D}$

Question 3 — In the structural area, please address the seismic input used in the analysis.

Response — The new EDG Building is a seismic Category 1 reinforced concrete structure with the following seismic input as per the Turkey Point Updated Final Safety Analysis Report (UFSAR) Appendix 5A:

a. Maximum horizontal ground acceleration for maximum earthquake E' = 0.15g
b. Maximum horizontal ground acceleration for OBE = 0.05g
c. Maximum vertical ground acceleration is two-thirds of the maximum horizontal ground acceleration values. (0.1g for E' and 0.033g for OBE)

The ground acceleration time-history used for the New Diesel Generator Building seismic design application is based on the St. Lucie Unit No. 2 ground acceleration time-history. A scale factor has been used to adjust the St. Lucie time-history to values corresponding to ground accelerations of 0.15g for E' and 0.05g for OBE, which are the maximum ground acceleration specified in the UFSAR for Turkey Point Units 3 & 4 seismic design application. The ground response spectra values derived from the St. Lucie Unit No. 2 ground acceleration time-history were used instead of the original Turkey Point Units 3 & 4 ground spectra values for the following reasons:

a. The ground spectra values derived from St. Lucie Unit No. 2 ground acceleration time-history envelope both the original Turkey Point ground spectra values and the RG 1.60, Rev 1, " Ground Spectra Values".

b. Since the ground spectra values for the New Diesel Generator Building envelope the RG 1.60, Rev 1, " Ground Spectra Values", the damping values recommended in RG 1.61 Rev 0 are applicable in the seismic design of the New Diesel Generator Building and for equipment seismic qualification application.

Damping values used in the design and analysis are those presented in RG 1.61 "Damping Values for Seismic Design of Nuclear Power Plants" Rev 0. The

Response (Cont'd)

combination of modes in maximum response analysis was performed using the "square-root-of-the-sum-of-the-squares" (SRSS) method in accordance with RG 1.92, Rev 1, "Combining Modal Response and Spatial Components in Seismic Response Analysis". Orthogonal earthquake components were combined using the SRSS method to determine maximum response as presented in RG 1.92 Rev 1. Building floor response spectra curves were developed from synthetic time-histories using the methods described in RG 1.122, "Development of Floor Design Response Spectra for Seismic Design of Floor Supported Equipment or Components" Rev 0. The building mathematical model used in the dynamic analysis consists of a lumped mass cantilever coupled to the acceleration time-history input by soil springs.

Modifications and additions to existing structures have utilized seismic input in accordance with the criteria specified in the Turkey Point 3 & 4 UFSAR.

Question 4 Please discuss how the Soil-Structure Interaction (SSI) effects were considered.

Response Soil under the Emergency Diesel Generator Building and the Diesel Oil Storage Tank foundation consists of compacted crushed limerock fill underlaid by limestone formation. Variation in structural properties of the two layers indicated that the layering effect of the foundation had to be considered in soil-structure interaction.

The Soil-Structure Interaction (SSI) analysis was performed by using the half-space lumped parameter method. Three separate models representing North-South, East-West, and vertical directions were considered. Simplified lumped mass models which represent the mass and stiffness effects of the structure were used. The building mat was considered as a rigid body. There are a total of 5 mass points (in addition to the mat) for the horizontal N-S, E-W models, and a total of 8 mass points for the vertical model. In the vertical model, two mass points were used to represent the floor structural flexibility.

For half-spacing modeling of the soil media, the lumped parameter (soil springs and damping) method was used. The lumped parameters included those for both translation and rocking. The soil layered effects were considered based on the paper "Impedance Functions for a Rigid Foundation on a Layered Medium", by J. E. Luco. The soil damping was limited to a maximum of 20 percent, as required by NUREG 0800, Section 3.7.2, Rev 2.

The design free field motion was conservatively input into the massless rigid foundation (base of soil model). Three models (E-W, N-S and vertical) subjected to respective orthogonal earthquake directions were analyzed separately. The Ebasco in-house computer program DYNAMIC 2037 (used earlier on other nuclear plants) was used in the analysis. The modal superposition analysis method was employed. The composite modal dampings were calculated based on the stiffness-weighted method.

Response Cont'd

Dynamic analysis (for maximum responses and floor response spectra) was performed using the following inputs:

a. Horizontal soil bearing spring based on upper layer of compacted limerock fill properties (E_s = 127ksi μ = .256)

b. Soil material damping SSE = 10% and OBE = 5% (Reference Turkey Point UFSAR Appendix 5A)

c. Composite soil stiffness and soil damping as derived from the above analysis were used.

Static analysis was performed for the finite element model with the following inputs:

a. Vertical soil springs based on subgrade modulus of 185 pci.

b. Static horizontal soil springs in two directions were calculated based on dynamic horizontal shear springs for upper layer of compacted limerock fill properties (E_s = 127 ksi and μ = 0.256).

c. Maximum response obtained from dynamic analysis were used as input for seismic loading.

Question 5 — Please address how structural load combinations were considered.

Response — The new EDG Building, all internal structures and all new exterior structures (i.e., ductbanks and manholes) as shown on Figure 1-1 (page 12 of 13) were designed in accordance with the following criteria. Modifications and additions to existing structures have been designed in accordance with the criteria specified in the Turkey Point Updated Final Safety Analysis Report (UFSAR).

STRUCTURAL ANALYSIS

The load combinations and structural acceptance criteria used in the design are in accordance with NUREG 0800 (Standard Review Plan - SRP) Section 3.8.4 as follows:

A. Load Combinations for Concrete Structures

The following load combinations have been used to determine the required limiting capacity of any concrete structural element in the Diesel Generator Building, where U is the section strength required to resist design loads based on the strength design methods described in ACI 349-85.

- Normal Operating Loads

  $U = 1.4D + 1.7L$
  $U = (0.75)\ (1.4D + 1.7L + 1.7To)$

- Operating Basis Earthquake

  $U = 1.4D + 1.7L + 1.9E$
  $U = (0.75)\ (1.4D + 1.7L + 1.9E + 1.7To)$
  $U = 1.2D + 1.9E$

- Safe Shutdown Earthquake

  $U = D + L + To + E'$

Response Cont'd

- o Hurricane

  U = 1.4D + 1.7L + 1.7Hu
  U = (0.75)(1.4D + 1.7L + 1.7Hu + 1.7To)
  U = 1.2D + 1.7Hu

- o Tornado

  U = D + To + L + W

- o Non-Tornado generated Missile

  U = D + To + L + M

Note for Concrete Structures:

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

Where the structural effects of differential settlements, creep, or shrinkage may be significant, they have been included with the dead load, D, as applicable.

B. Load Combination for Steel Structures

The following load combinations have been considered in the design of structural steel members, 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" (1978), published in the Manual of Steel Construction (1980):

- o Normal Operating Loads

  D + L = S

  D + L + To = 1.5 S

Response Cont'd

- Operating Basis Earthquake

  D + L + E = S

  D + L + To + E = 1.5 S

- Safe Shutdown Earthquake

  D + L + To + E' = 1.6 S

- Hurricane Load

  D + L + Hu = S

  D + L + To + Hu = 1.5 S

- Tornado Load

  D + L + To + W = 1.6 S

- Non-Tornado Generated Missile

  D + L + To + M = 1.6 S

Where

D = Dead Load

L = Live Load

Hu = Wind Load

W = Tornado Wind Load

E = Operating Basis Earthquake Loads

E' = Maximum Earthquake Loads

To = Thermal Load

M = Non-Tornado Generated Missiles

Notes for Steel Structures

1. For all loading cases, the live load was considered to vary from zero to its maximum potential value, except for earth load, which was present at all times.

Response Cont'd

2. For structural steel members, thermal loads in the factored load combinations were neglected since the material is ductile and the thermal loads are secondary and self-limiting in nature.

GENERAL NOTES

For the design of the foundation mat and walls affected by the diesel oil storage tanks, each of the tanks was considered full or empty, depending on the situations that constitute critical loadings for design loads. The oil tanks were assumed full or empty whichever condition was governing for design or stability, except for seismic load combination. For seismic load combinations, the minimum oil volume of each tank was considered to be 34,000 gallons and the maximum oil volume in each tank was considered to be 42,000 gallons. The proposed Technical Specification (Section 3.8.1.1.C) for Turkey Point Unit 4 specifies the minimum oil volume as 34,700 gallons. Continuous operation of Diesel Generator for 7 days during a LOOP requires 34,000 gallons of oil.

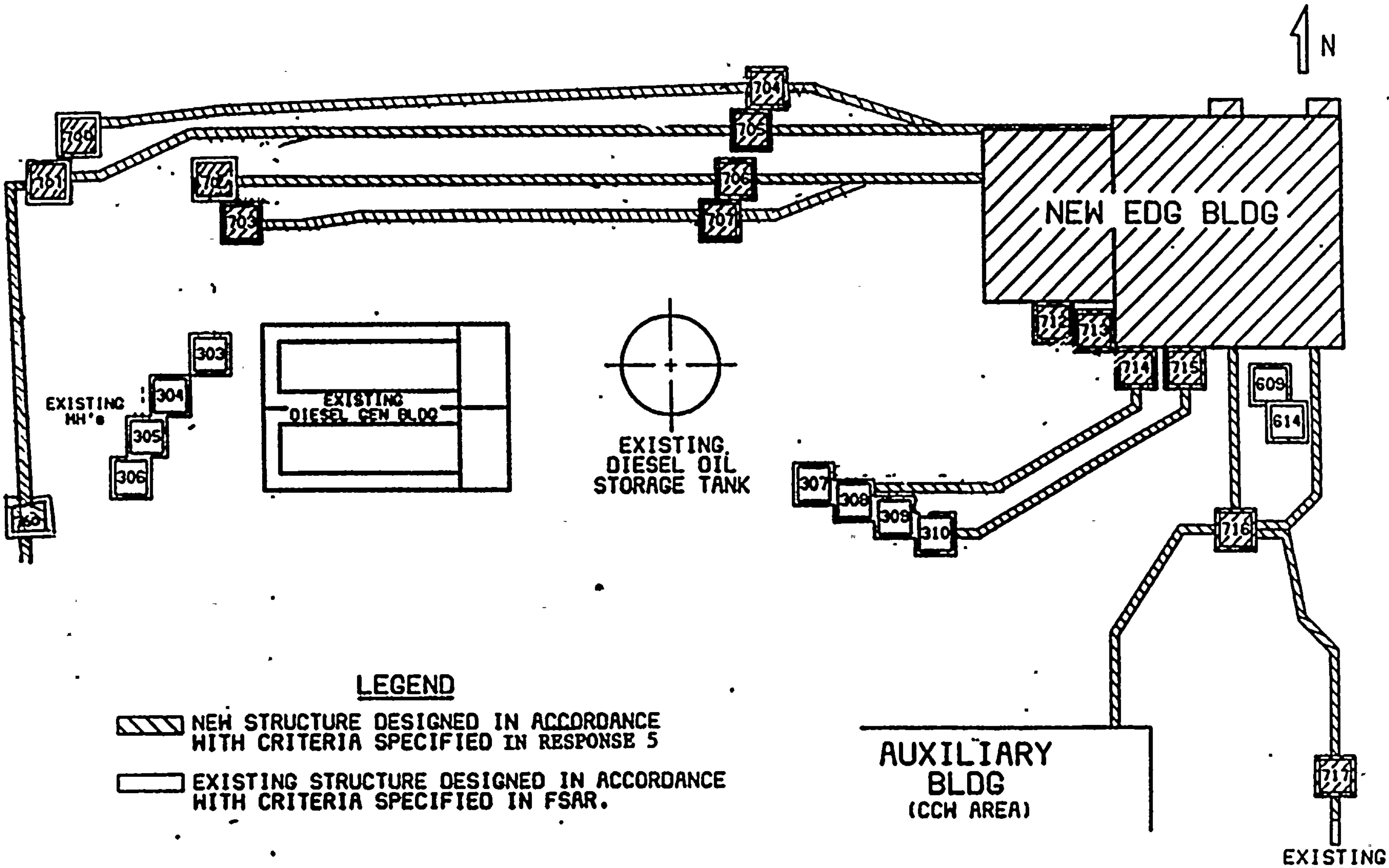


FIGURE 1-1
EPS ENHANCEMENT PROJECT
CIVIL/STRUCTURAL CRITERIA
(NOT TO SCALE)

Question 6 Please address how the common foundation was analyzed.

Response The Diesel Generator Building and Diesel Oil Storage Tank Building have one common foundation which has been designed for the various loading combinations as stated in the response to Question 5.

The superstructure houses the diesel generators and diesel oil storage tanks in one common building separated by partition walls.

The foundation and the superstructure are combined into a single three dimensional finite element model and analyzed considering all possible load combinations using the STARDYNE computer program. (See the response to Question 4 for discussions of dynamic and static analysis).