UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 2 1982

Docket Nos.: 50-329/330 OM, OL

APPLICANT: Consumers Power Company

FACILITY: Midland Plant, Units 1 and 2

SUBJECT: SUMMARY OF APRIL 20-24, 1981 AUDIT OF MIDLAND SEISMIC AND STRUCTURAL DESIGN CALCULATIONS

By its letter of July 7, 1980, the NRC Staff notified Consumers Power Company (the Applicant) of its plans to perform an audit of seismic and structural design analyses of safety-related structures, and provided guideline questions for the topics to be covered. The audit was subsequently conducted on April 20-24, 1981 in Ann Arbor, Michigan. The meeting agenda and speakers are shown on Enclosure 1. Meeting attendees are listed by Enclosure 2.

At the audit, the NRC Staff was given a ten-volume set of documents entitled "NRC Structural Technical Audit" responding to the guideline questions of July 7, 1980. Enclosure 3 is a general index for the ten volumes. Since the audit consisted primarily of a review of the information in these documents, and also of a review of the actual associated design calculations, a detailed summary by this paper is unnecessary. A copy of these volumes is retained by the NRC Central Files, Bethesda, Maryland.

Open items identified by the NRC Staff during the audit are listed by Enclosure 4 (See post-script below for disposition of these items).

Post-Script

Since this audit, the Applicant's letter of October 19, 1981 has provided updated pages for the document "NRC Structural Technical Audit" and responded to the open items (Enclosure 4) identified during the April 20-24, 1981 audit. The letter also noted that no further revisions to the document were planned, although remaining longer-term issues related to the audit would be documented by FSAR revisions or separate correspondence to the NRC.

DARL HOOD

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Enclosures:
As stated

cc: See next page

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NRC STRUCTURAL DESIGN AUDIT
MIDLAND PLANT UNITS 1 and 2

LOCATION Bechtel Professional Associates Corp
777 Eisenhower Parkway
Ann Arbor, Michigan

DATE: April 20-24, 1981

AGENDA TOPICS

Introduction and General Design Features
Containment Building
Auxiliary Building
Diesel Generator Building
Service Water Pump Structure
Buried Pipes and Tanks
Borated Water Tanks

NRC STRUCTURAL DESIGN AUDIT
BECHTEL ORAL PRESENTATIONS

Introduction.....Lynn Curtis

General Civil Design.....Ted Johnson
* Bechtel Audit Coordinator...Gordon Tuveson

Soil Settlement History Building.....Shing Lo
General Seismic Analysis.....Chuck McConnel

Containment General Design.....Bob Yuan
" Seismic Analysis.....Chuck McConnel
" Reactor Vessel Support Modifications.....Mo Elgaaly

Auxiliary Bldg. General Design.....Lakshmi Lakshminarayanan
" " Seismic Analysis.....Chuck McConnel
" " Foundation Modifications.....Shing Lo
" " New Siesmic Analysis.....Chuck McConnel

Diesel Generator Bldg. General Design.....Paul Shen
" " " Seismic Analysis.....Chuck McConnel
" " " Reanalysis Due to Surcharge Load.....Shing Lo
" " " New Seismic Analysis.....Chuck McConnel

Service Water Pump Structure General Design.....Paul Shen
" " " " Seismic Analysis.....Chuck McConnel
" " " " Foundation Modifications...Shing Lo
" " " " New Seismic Analysis.....Chuck McConnel

Buried Steel Pipes General Design.....John Legette
Buried Concrete Pipes " " .....S. Rao
Buried Tanks " " .....S. Rao
Buried Pipes and Tanks Seismic Analysis.....Chuck McConnel

Borated Water Tanks General Design.....S. Rao
" " " Seismic Analysis.....Chuck McConnel
" " " Foundation Settelment Analysis....Shing Lo
" " " New Seismic Analysis....Chuck McConnel

* No presentation being given

Attendees
4/20/81

Name	Organization
David L Hood	NRC/DOL Proj. Mgr
Gunnar Harstead	HEA NRC Consultant
FRANK RINALDI	NRC/NRR/SEB
Pao C. HUANG	NSWC /NRC consultant
JOHN P. MATRA JR.	NSWC/NRC CONSULTANT
H. N. Singh.	Corps of Engineers. NRC. consultant.
M. Elgaaly	Bechtel
Steve Sobkowski	Bechtel
T. E. JOHNSON	BECHTEL
B. R. Mozafari	Bechtel
P. SHUNMUGAVEL	"
B.C. McConnel	Bechtel
S. C. LO	Bechtel
G. A. TUVESON	Bechtel
D.M. BUDZIK	CPCO
T. R. THIRUVENGADAM	CPCO
B. F. Henley	CPCo
L. H. Curtis	Bechtel
B. Dhar	Bechtel
V. Lakshminarayan	Bechtel Engr.
R L TEUTEBERG	CPCo - LICENSING

Attendees
NRC Structural Audit
4/21-22/81

Name	Organization
Darl S. Hood	NRC/DOL
Gunnar Harstead	HEA / NRC Consult.
FRANK RINALDI	NRC/NRR/SEB
Pao Huang	NSWC / NRC consultant
JOHN P MATTE JR	NSWC / NRC consultant
H. N. SINGH	Corps of Engineers, NRC consultant
M. Elgaaly	BECHTEL
Brenda Mozafari	Bechtel
T. E. JOHNSON	BECHTEL
P SHUNMUGAVEL	"
D. YUAN	"
W Hagedorn	"
D. CHOW	"
G. TUCKSON	"
V. Lakshminarayan	"
[illegible]	"
Steve Hardy	"
[illegible]	"

Attendees
4/23/81

Name	Organization
Darl S Hood	NRC/DOL
Gunnar Harstead	HEA/NRC Consultant
FRANK RINALDI	USNRC/NRR/SEB
Pao Huang	NSWC/NRC Consultant
JOHN P MATTEO JR	NSWC/NRC CONSULTANT
H. N. SINGH	Corps of Engineers/NRC consultant
J V Rotz	Bechtel Civil/Struct Staff
Steve Sobkowski	Bechtel
Brenda Mozafari	Bechtel
T.E. JOHNSON	BECHTEL
B.C. Mc Connel	BECHTEL
Paul P. Shea	Bechtel
D. A. ZONECK	Bechtel
G. A. TUVESON	BECHTEL
M. LITKE	BECHTEL
S C LO	BECHTEL
TR Thiruvengadam	CPCo
BF Henley	CPCo

NRC Structural Audit
4/24/81

Name	Organization
Paul D Hood	NRC/DOL
Gunnar Harstead	HEA/NRC Consultant
FRANK RINALDI	USNRC/NRR/SEB
P. HUANG	NSWC/NRC Consultant
J. P. MATTA JR	NSWC/NRC CONSULTANT
H.N. SINGH	U.S. Corps of Engineer/NRC Consultant.
B.P. Moza-fari	Bechtel
Steve Sobrowski	"
T.E. JOHNSON	"
P. SHUNMUGAVEL	"
BOB YUAN	"
G. TUVESON	"

ENCLOSURE 3
"NRC STRUCTURAL TECHNICAL AUDIT"

GENERAL INDEX

NRC STRUCTURAL AUDIT

PRELIMINARY LIST OF OPEN ITEMS

Containment

a. Review Numbers on Page 21, Table 3.8-1

b. Verify that torsion was used on components and internal structures.

c. Membrane shear allowable in equipment hatch area shear allowable (400 psi) needs verification

d. Bijlaard: Show that this technique is applicable for containment shell

e. Check adequacy of baseslab shear reinforcement #9's on vertical wide flanges.

f. Impact effect of 1/32 inch gap steam generator needs to be assessed

g. Allowable membrane tension, $3\sqrt{f'_c}$ and $6\sqrt{f'_c}$ - which load combination in tension and bending and where does it apply

h. Want to know the actual yield stress for reinforcement in the primary shield.

i. Explain Mu and Vu along with safety factor; Page 57

j. Reactor pressure vessel upper lateral support is this considered in analysis

k. To tabulate shear values in all tables

Auxiliary Building

a. Check for possible additional loading on control tower due to the effects of caissons

b. Bending on foundation of wing due to revised outer caissons must be assessed

c. Stiffness of caissons should consider concrete and soil together

d. Is friction between the caissons required to develop full load

e. Subgrade modulus should be calculated from tests for use in the foundation design

f. Fuel rack calcs-unchecked (vendor calc) impact factor used between fuel racks, and pool walls from tipping needs to be studied

(Resolved) g. Calcs for shear wall should be explained showing approach used

h. How does thru cracks affect load capability

i. Effect of long-term settlement on control tower versus main section of auxiliary building

j. Use an acceptable method to analyze the thru cracks, to verify capacity of isolated typical section.

Diesel Generator Building

a. Verify spring constants

b. Cracks: estimate stress; also consider widening of cracks

c. Cracks should include reversal effects of seismic loads

d. Co-ordinate with vendor on pedestal design and seismic qualification for diesel generators

e. Want commitment to evaluate cracks influence on structural capacity

f. Present evaluation of tornado missile effects on a wall with thru-cracks

Service Water Pump Structure

a. Monitor cracks

b. Hydrodynamic loads on interior walls

c. Foundation bearing capacity of new wall needs identified factor of safety

d. Commit to monitor service water pipes for settlement effects.

Borated Water Storage Tanks

a. Provide details of final design, especially connection between the two foundation walls

b. Provide Vendor acceptance of tank foundation modifications

c. Pipes should also be monitored in the valve pit

d. Commit to monitor high stress points after implementation of fix for cracks

Buried Pipe and Tanks

a. Earthquake should be considered in tank piping connection design

b. Control room tanks should be monitored for displacements

c. Describe air supply lines to control room from tanks

General

a. Want schedule for design of remedial fixes

b. Want copy of calculation index for fixes

4/24/81
SS:5

MEETING SUMMARY DISTRIBUTION

Docket File
NRC/PDR
Local PDR
TIC/NSIC/TERA
LB #4 r/f
H. Denton
E. Case
D. Eisenhut
R. Purple
B. J. Youngblood
A. Schwencer
F. Miraglia
J. Miller
G. Lainas
R. Vollmer
J. P. Knight
R. Bosnak
F. Schauer
R. E. Jackson
Attorney, OELD
OIE (3)
ACRS (16)
R. Tedesco
R. Hernan

NRC Participants:
D. Hood
F. Rinaldi

bcc: Applicant & Service List

G. Lear
S. Pawlicki
V. Benaroya
Z. Rosztoczy
W. Haass
D. Muller
R. Ballard
W. Regan
R. Mattson
P. Check
O. Parr
F. Rosa
W. Butler
W. Kreger
R. Houston
W. Gammill
L. Rubenstein
T. Speis
W. Johnston
S. Hanauer
C. Berlinger
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D. Skovholt
M. Ernst
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G. Knighton
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P. Collins
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