PSNH PUBLIC SERVICE
Company of New Hampshire

SEABROOK STATION
Engineering Office:
1671 Worcester Road
Framingham, Massachusetts 01701
(617) - 872 - 8100

April 8, 1982

SBN-252
T.F. B 7.1.2

United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Frank J. Miraglia, Chief
Licensing Branch No. 3
Division of Licensing

References: (a) Construction Permits CPPR-135 and CPPR-136, Docket Nos. 50-443 and 50-444

Subject: Meeting Notes; Structural Engineering Branch Design Audit

Dear Sir:

We have attached notes from the March 29, 1982 through April 2, 1982 Structural Engineering Branch Design Audit conducted at the office of United Engineers (Philadelphia, PA).

These notes are provided to assist you in the preparation of the Safety Evaluation Report, as they highlight open issues, resolved issues, and commitments which have been tendered.

Very truly yours,

YANKEE ATOMIC ELECTRIC COMPANY

John DeVincentis
Project Manager

Attachment

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PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL ENGINEERING BRANCH DESIGN AUDIT

AT

UNITED ENGINEERS & CONSTRUCTORS INC.

PHILADELPHIA, PENNSYLVANIA

PURPOSE: NRC Structural Engineering Branch Design Audit per SRP 3.8.4 on RAIs 220.6 thru 220.37 and Audit Questionnaire Subject Matter

DATE: Monday, March 29, 1982 (1:00 p.m.)

ATTENDEES: See Sheet No. 1 of Attachment A.

AGENDA:

1. Discussion of the objectives and the conduct of Audit.

2. Review of Seabrook site and key structures at various stages of construction in progress through slide presentation.

3. Presentation of an overview of seismic and static analyses and design methods, as applied to containment structure (including internal structures) and other key structures, such as primary auxiliary building, control and diesel generator building, condensate storage tank, fuel storage building and polar crane support structures.

4. An overview of Tuesday's Agenda.

SEABROOK STATION UNITS 1 & 2

NRC-SEB DESIGN AUDIT
AT
UNITED ENGINEERS & CONSTRUCTORS INC.

DATE: Tuesday, March 30, 1982

ATTENDEES: See Sheet No. 2 of Attachment A.

AGENDA:

1. An overview of seismic and static analyses and design methods, as applied to various key structures (continued from Monday's meeting)

2. Audit of analysis and design calculations for the steel lined concrete containment structures.

3. Seismic analysis of polar crane.

4. Design of metal portions of equipment hatch and personnel airlock, not backed by concrete, per ASME Code Section III, Division 1.

5. Overall structural stability of key structures and incorporation of "accidental torsion" based on 5% eccentricity.

6. Design status of annular steel framing of the containment internal structures.

The action items identified at this meeting and subsequent resolution achieved are summarized on Sheet Nos. 1 and 2 of Attachment B.

SEABROOK STATION UNITS 1 & 2

NRC-SEB DESIGN AUDIT

AT

UNITED ENGINEERS & CONSTRUCTORS INC.

DATE: Wednesday, March 31, 1982

ATTENDEES: See Sheet No. 3 of Attachment A.

AGENDA:

1. Containment liner integrity with respect to turbine missile.
2. Containment ultimate capacity study.
3. Audit of analysis and design calculations for the containment internal structures and primary auxiliary building.
4. An overview of tornado missile protection.
5. State of rebar stresses and strains for the containment structure.
6. Analysis and design methods of cable tray.
7. Interaction of non-Category I structures with Category I structures.

The action items identified at this meeting and subsequent resolution achieved are summarized on Sheet Nos. 3, 4 and 5 of Attachment B.

SEABROOK STATION UNITS 1 & 2

NRC-SEB DESIGN AUDIT

AT

UNITED ENGINEERS & CONSTRUCTORS INC.

DATE: Thursday, April 1, 1982

ATTENDEES: See Sheet No. 4 of Attachment A.

AGENDA:

1. Audit of analysis and design calculations for control and diesel generator building, condensate storage tank, fuel storage buildings and polar crane support structures.
2. Dynamic lateral pressures and shear wave velocity.
3. Underground piping and underground structures.
4. Seismic instrumentation.
5. Spent fuel pool racks.
6. An overview of RAIs 220.6 thru 220.37.
7. Other technical issues as necessary.

The action items identified at this meeting and subsequent resolution achieved are summarized on Sheet Nos. 6 thru 9 of Attachment B.

SEABROOK STATION UNITS 1 & 2

NRC-SEB DESIGN AUDIT

UNITED ENGINEERS & CONSTRUCTORS INC.

DATE: Friday, April 2, 1982

ATTENDEES: See Sheet No. 5 of Attachment A.

AGENDA:

1. An overview of ultimate capacity of concrete containment.
2. Further discussion on analysis, design and erection methods of cable trays.
3. Review of action items and establish committal dates and actionees.
4. Audit terminated at 12 noon.

The action items identified at this meeting and subsequent resolution are summarized on Sheet No. 10 of Attachment B.

SEABROOK STATION, UNITS 1 & 2
ATTENDANCE ROSTER-SEB MEETING
AT
UNITED ENGINEERS & CONSTRUCTORS

March 29, 1982

NAME	ORGANIZATION	TITLE
Howard Wong	NRC/IE	Rx Construction Engineer
Nilesh Chokshi	NRC/SEB	Structural Engineer
Khalid Shaukat	NRC/SEB	Structural Engineer
David C. Jeng	NRC/SEB	Section A Leader, SEB/DE/NRC
John Ma	NRC/SEB	Senior Structural Engineer
Richard Toland	UE&C/SAG	Mgr. Structural Analysis
Dipak Majumder	UE&C/SAG	Structural Analysis Group
Noshir Karanjia	UE&C/SAG	Structural Analysis Group
V.N.Vazirani	UE&C/SAG	Structural Analysis Group
Joe Ucciferro *	UE&C	Asst. Chief Struct. Engineer
L.S.Nascimento *	UE&C	Chief Structural Engineer
Dilip K. Ghosh	UE&C	Structural Engineer
K.M.Kalawadia	UE&C	Structural Engineer
A.J.Hulshizer	UE&C	Supervising Structural Engineer
Paul A. Nason	PSNH	Project Engineer
Henry E. Wingate	YAEC	Sr. Project Engineer
David H. Rhoads *	UE&C	Project Engineering Manager
Howard H. Katz	UE&C	Super. Licensing Engineer
Alan M. Ebner *	UE&C	Project Manager

* Part Time

SEABROOK STATION, UNITS 1 & 2
ATTENDANCE ROSTER-SEB MEETING
AT
UNITED ENGINEERS & CONSTRUCTORS

March 30, 1982

NAME	ORGANIZATION	TITLE
Howard Wong	NRC/IE	Rx Construction Engineer
Nilesh Chokshi	NRC/SEB	Structural Engineer
Khalid Shaukat	NRC/SEB	Structural Engineer
David C. Jeng	NRC/SEB	Section A Leader
John S. Ma	NRC/SEB	Senior Structural Engineer
Dipak K. Majumder	UE&C	Structural Engineer
V.N.Vazirani	UE&C	Structural Engineer
N.C.Karanjia	UE&C	Consulting Engineer
K.M.Kalawadia	UE&C	Structural Engineer
Dilip K. Ghosh	UE&C	Structural Engineer
Howard H. Katz *	UE&C	Sup. Licensing Engineer-Seabrook
John A. Mott *	UE&C	Structural Engineer
Allen J. Hulshizer	UE&C	Supv. Structural Engineer
Richard Toland	UE&C	Manager, Structural Anal. Gr.
Henry E. Wingate *	YAEC	Senior Project Engineer
Michael Ossing *	YAEC	Project Engineer

* Part Time

SEABROOK STATION, UNITS 1 & 2
ATTENDANCE ROSTER-SEB MEETING
AT
UNITED ENGINEERS & CONSTUCTORS

March 31, 1982

NAME	ORGANIZATION	TITLE
Howard Wong	NRC/IE	Rx Construction Engineer
David C. Jeng	NRC, NRR	Section A Leader, SEB/NRC
Khalid Shaukat	NRC/SEB	Structural Engineer
Nilesh Chokshi	NRC/SEB	Structural Engineer
John S. Ma	NRC/SEB	Sernior Structural Engineer
V.D.Patel *	UE&C	Structural Engineer
John A. Mott *	UE&C	Structural Engineer
V.N.Vazirani	UE&C	Structural Engineer
Richard Toland	UE&C	Manager, Struc. Anal. Gr.
Dipak Majumder	UE&C	Structural Engineer
Noshir Karanjia	UE&C	Consulting Engineer
K.M.Kalawadia *	UE&C	Structural Engineer
Dilip. K. Ghosh	UE&C	Structural Engineer
Allen J. Hulshizer	UE&C	Supverising Engineer (Structural)
R. Boritz *	UE&C	Consulting Engineer
Howard Katz *	UE&C	Superv. Licensing Engineer-Seabrook
Michael Ossing	YAEC	Project Engineer
R.K.Tucker	YAEC	SB Lead Mechanical Engineer
Joe Ucciferro *	UE&C	Asst. Chief Struct. Engineer
E. Skolnick	UE&C	Mechanical Analysis
R.J.Hammerschlag *	UE&C	Mech. Analysis
R.F.Perry *	UE&C	Mech. Analysis

* Part Time

SEABROOK STATION, UNITS 1 & 2
ATTENDANCE ROSTER-SEB MEETING
AT
UNITED ENGINEERS & CONSTRUCTORS

April 1, 1982

NAME	ORGANIZATION	TITLE
Howard Wong	NRC/IE	Rx Construction Engineer
David C. Jeng	NRC/NRR	Section A Leader, SEB/NRR
Nilesh Chokshi	NRC/NRR/SEB	Structural Engineer
Khalid Shaukat	NRC/SEB	Structural Engineer
John S. Ma	NRC/SEB	Senior Structural Engineer
R.K.Tucker	YAEC	SB Lead Mech. Engineer
V.N.Vazirani	UE&C	Engineer
Dipak K. Majumder	UE&C	Structural Engineer, SAG
Noshir Karanjia	UE&C	Consulting Engineer, SAG
D. Patel *	UE&C	Geotechnical Engineer
Allen J. Hulshizer	UE&C	Supervising Struct. Engineer
V.D.Patel *	UE&C	Structural Engineer
K.M.Kalawadia	UE&C	Structural Engineer
Dilip K. Ghosh	UE&C	Structural Engineer
Joe Ucciferro *	UE&C	Asst. Chief Struct. Engr.
W.H.Reading *	UE&C	Struct. Design Supervisor
R.F.Perry *	UE&C	Mechanical Analysis
E.Skolnick *	UE&C	Mechanical Analysis
L.S.Nascimento *	UE&C	Chief Struct. Engr.
H.H.Katz *	UE&C	Superv. Licensing Engineer
G. Gupta *	UE&C	I&C Engineer
T.C.Yu *	UE&C	Mechanical Analysis

* Part Time

SEABROOK STATION, UNITS 1 & 2
ATTENDANCE ROSTER-SEB MEETING
AT
UNITED ENGINEERS & CONSTRUCTORS

April 2, 1982

NAME	ORGANIZATION	TITLE
K.M.Kalawadia	UE&C	Structural Engineer
Dilip K. Ghosh	UE&C	Structural Engineer
N.C.Karanjia	UE&C	Consulting Engineer
D.K.Majumder	UE&C	Structural Engineer
R.Toland	UE&C	Mgr. Structual Analysis
V.N.Vazirani	UE&C	Structural Engineer
J.S.Ma	NRC/SEB	Senior Structual Engineer
Nilesh Chokshi	NRC/SEB	Structural Engineer
Khalid Shaukat	NRC/SEB	Structural Engineer
David C. Jeng	NRC/SEB	Section A Leader, SEB/NRC
D.H.Rhoads	UE&C	P.E.M.
H.Wingate	YAEC	Proj. Eng.
R.F.Perry *	UE&C	MAG
E.Skolnick *	UE&C	MAG
Allen J. Hulshizer	UE&C	Superv. Struct. Eng.
B.B.Scott *	UE&C	Asst. Mgr. R&QA
E.P.Rothong *	UE&C	Chief Elec. Engr.
A.M.Ebner *	UE&C	Project Manager
L.S.Nascimento *	UE&C	Chief Struct. Eng.
J.J.Ucciferro	UE&C	Asst. Chief Struct. Eng.

* Part Time

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 3/30/82

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
1	Response to RAI 220.13. Damping values used in seismic analysis.	In describing the applicability of damping values of R.G. 1.61 to the Seabrook design, UE&C will provide a discussion of the design philosophy wherein a design without excessive conservatism results in stress levels compatable with the given damping values. Action by R.H. Toland and N.C. Karanjia.	Resolved based on discussion. Revised response to be submitted by April 19, 1982.
2	Response to RAI 220.21. The current technical position of the NRC staff requires the consideration of 'accidental torsion' in the design of structures.	UE&C will show for the containment structure and a typical building that structural stresses are still acceptable for this condition. Action by Structural discipline, K.M. Kalawadia and D.K. Ghosh, with input from Structural Analysis Group.	Open. UE&C will provide an assessment of the impact for 'accidental torsion' based on 5% eccentricity in the design of the containment structure and a typical Category I structure. Due to NRC by May 3, 1982.
3	Response to RAI 220.20. Justification of $\pm$10% peak spreading.	The response should note that soil variability is not a parameter here since Seabrook is a rock site. Since soil is the principal source of variability in seismic response, the $\pm$10% peak spreading is justified. Action by N.C. Karanjia.	Resolved based on discussion. Revised response to be submitted by April 19, 1982.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 - 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 3/30/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
4	Response to RAI 220.18. Meeting the intent of R.G. 1.122 frequency increments in calculating floor response spectra.	The UE&C response should note the compatibility of its method to the intent of the Reg. Guide. Action by N.C. Karanjia.	Resolved. Revised response will show the comparison of results obtained using frequencies from two different documented tables. Due to NRC by April 19, 1982.
5	Response to RAI 220.29. Load combinations for equipment hatch and personnel locks.	Clarification of load combination which controls the design. Action by Mechanical Analysis Group.	Resolved. Revised response to be submitted by April 19, 1982.
6	Response to RAI 220.30. Stress limits for equipment hatch and personnel locks.	Clarification of load combination which controls the design. Action by Mechanical Analysis Group.	Resolved. Revised response to be submitted by April 19, 1982.
7	Response to RAI 220.26. Effect of temperature gradient across the wall on containment structural design.	UE&C will clarify its response especially with regards to the ASME provisions for rebar strain. Action by R.H. Toland.	Resolved. Revised response to be submitted by April 19, 1982.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 - 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 3/31/82

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
1	Response of RAI 220.11. Clarification of terminology, Disagreement on basic physical phenomenon.	UE&C will clarify the issue and terminology as required. Action by Bob Boritz, Al Hulshizer and R.H. Toland	Open. Revised response consistent with the present industry design practice to be submitted by May 3, 1982.
2	Response to RAI 220.37. Ultimate Containment Capacity Study.	UE&C will give an overview of ultimate capacity of concrete containment on 4/2/82 and a date when study could be completed. Action by R.H. Toland and D.K. Ghosh.	Open. UE&C to submit the ultimate containment capacity study for the membrane region by July 1, 1982.
3	a) Overturning analysis of the primary auxiliary bldg. giving the summary of the final calculation	UE&C will provide this information.	Resolved. Supporting documents to be submitted by April 19, 1982.
	b) A generic statement that the approach taken by UE&C in Seabrook is conservative.	Action taken by Structural discipline with input from Structural Analysis Group.	
	c) A supporting study for this approach.		
4	Tornado missile protection.	UE&C will provide a copy of calculation pages showing 12"ϕ steel pipe, 13½"ϕ utility pole & automobile missiles including the forcing function. Action by R.H. Toland.	Calculation to be submitted by April 19, 1982.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 - 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 3/31/82 (Cont't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
5	NRC requires responses to the following questions with respect to cable tray analysis: a) Why is static load/ deflection test suitable for the dynamic case? b) Show that cable integrity is maintained when tray is deformed to proportional load limit +1/3 (ultimate load limit - proportional load limit). c) What is load criteria for for connection of horizontal strut to vertical strut, with cable tray placed on horizontal strut. d) How is differential displacement between consecutive supports accounted for?	UE&C will provide responses by Friday, 4/2/82. Action by R.F. Perry and E. Skolnick.	Open. UE&C's response to question Nos. a), b) and c) was provided for NRC's review on 4/2/82. Total response to all questions a) through d) due to NRC by May 19, 1982.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 - 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 3/31/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
6	Calculation of Anchor Plates.	UE&C will provide this Anchor Plate calculation. Action by Structural Discipline, A. Hulshizer	Item closed based on presented calculation.
7	Rebar details, forces and moments due to pressure, temperature and earthquake for two sections of the containment-one in membrane area, and one at wall base junction.	UE&C will provide such information. Action by D.K. Ghosh.	Typical design data for mechanical loads and the resulting stresses/ strains in rebars and concrete (as discussed on 4/2/82) to be submitted by April 19, 1982.
8	Effect of Switch Gear Building (Non-Category I) on the Control Building (Catetory I). Show how seismic/wind loads were calculated including consideration of the dynamic nature of the load.	UE&C will provide the calculation. Action by Structural Discipline.	Item closed based on presented documents.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 4/1/82

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
1	Clarify the criteria for rigid and non-rigid walls subjected to static and dynamic lateral earth pressures.	UE&C will provide such criteria. Action by Structural Discipline.	Open. Response (being consistent with actual work performed and identifying all the non-rigid walls) to be submitted by May 3, 1982.
2	Justify why wave other than shear wave is not considered in calculating soil strain.	UE&C will provide this information. Action by N.C. Karanjia.	Open. Response to be submitted by May 3, 1982.
3	Discuss the seismic instrumentation and basis for its location; also identify operator's notification.	UE&C to discuss. Action by G. Gupta of I & C Discipline.	Item closed based on discussion and presented documents.
4	Confirm the value of dynamic soil pressure used in conformance with the parameters given in RAI 220.16. Acceptance of this parameter will be done by Geotechnical Branch of NRC.	UE&C to provide such information. Action by D. Patel.	Item resolved based on presented documents. For the purpose of confirmation, calculation to be submitted by April 19, 1982.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 4/1/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
5	Response to RAI 220.36 will be submitted as discussed (add effects of filtering of time-history motion through structures).	UE&C to submit. Action by N.C. Karanjia.	Item resolved based on discussion. Response to be submitted by April 19, 1982.
6	Revise response to RAI 220.18 as discussed. Show comparison of results obtained using frequencies from two different documented tables.	UE&C to revise. Action by N.C. Karanjia.	Resolved. Refer to Item #4, dated 3/30/82.
7	Revise response to RAI 220.9 as discussed.	Structural Discipline to revise. Action by D.K. Ghosh.	Resolved. Revised response to be submitted by April 19, 1982.
8	Response to RAI 220.14 and 220.15 to be submitted.	UE&C to submit.	Open. Response as discussed to be submitted by April 19, 1982.
9	Revise response to RAI 220.17 as discussed, (give reference to Whitman's paper).	UE&C to revise. Action by N.C. Karanjia.	Resolved. Revised response to be submitted by May 3, 1982

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 4/1/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
10	Response to RAI 220.24 not adequate. Re-submit.	UE&C to re-submit. Action by Mechanical Analysis Group.	Item resolved. Response will include an additional sentence, "Conservatism in combining modal responses is equal to or greater than that recommended in Regulatory Guide 1.92." Due to NCR by April 19, 1982.
11	Needs the discussion of amplification of input motion with respect to RAI 220.25.	UE&C to revise. Action by N.C. Karanjia.	Resolved. Discussion will be provided in the revised response. Due to NRC by May 3, 1982.
12	NRC will send revised position on RAI 220.35.	Action by NRC.	Open. NRC to provide YAEC with the revised position. Due to YAEC by April 19, 1982.
13	Discussed the status of response to the following RAI's:		
	220.6	N/A	Resolved based on submitted response.
	220.7	N/A	Resolved based on submitted response.
	220.8	Correct typographical error from "radio" to "radial"	Resolved. Corrected response to be submitted by April 19, 1982.
	220.10	N/A	Resolved based on submitted response.
	220.12	N/A	Resolved based on submitted response.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 4/1/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
13	(Continued)		
	220.22	Refer to Item #3, dated 3/31/82.	
	220.23	N/A	Resolved based on submitted response.
	220.28	N/A	Resolved based on submitted response.
	220.31	N/A	Resolved based on submitted response.
	220.32	UE&C to submit the results of a detailed review of ACI-318 versus ACI-349.	Open. Due to NRC by July 30, 1982.
	220.33	N/A	Resolved based on submitted response.
14	Clarify response to RAI 220.27.	UE&C to explain. Action by B.B. Scott.	Open. Clarified the ASME Code position regarding the use of prepackaged grout and epoxies. Revised response to be submitted by April 19, 1982. NRC will be advised of the progress of the issue.

SEABROOK STATION, UNITS 1 & 2

NRC STRUCTURAL DESIGN AUDIT, 3/29/82 to 4/2/82

ACTION ITEMS AND RESOLUTION

DATE: 4/2/82 (Con't.)

ITEM	ISSUE	REQUIRED ACTION	RESOLUTION
1	Provide the NRC with the following information regarding the design of cable tray:	UE&C to submit required information. Action by E.P. Rothong, R.F. Perry and E. Skolnick.	Item 1(b) closed based on presented response. Response to all other questions to be submitted by April 19, 1982 See also Item #5, dated 3/31/82.
	a) Technical basis for treating the trays as non-safety related structural elements.		Open.
	b) Confirm that these trays were erected to the QA requirements of Appendix B to Part 50.		Closed.
	c) Provide any available test data which would further assure the structural integrity and functionality of the trays when subjected to SSE and other applicable loads.		Open.
	d) Check IEEE 344 applicable provision which may require additional bases for establishing non-safety related structural elements.		Open.