PUBLIC SERVICE COMPANY OF NEW HAMPSHIRE
SEABROOK STATION

FINAL REPORT

ON

DISCREPANCY IN DRAWINGS

WITH RESPECT TO

DESIGN CALCULATION

CONCRETE REINFORCEMENT REQUIREMENTS

FOR THE

CONTROL AND DIESEL GENERATOR BUILDINGS

1541 095

Date December 5, 1979

7912120489

CONTROL AND DIESEL GENERATOR BUILDING
CONCRETE REINFORCEMENT DISCREPANCY

INTRODUCTION

As a result of a field force inquiry regarding the re-arrangement of reinforcing bars in one of the walls of the Control and Diesel Generator Building, design calculations were reviewed and it was discovered that the calculation requirements were not fully shown on the design drawings issued for construction.

HISTORY

On Thursday, November 1, 1979, UE&C field forces contacted M. K. Sanghavi of UE&C Philadelphia Engineering Department requesting the rearrangement of certain reinforcing in the subject buildings as a convenience in placing. In reviewing the calculations to substantiate the rearrangement requested, it was discovered (and confirmed on Friday, November 2, 1979) that certain of the reinforcing shown on the drawings did not agree with the reinforcing required by the latest calculations.

Drawings and Calculations initially examined were as follows:

Drawing

101350 Rev 2 dated 3-4-79	Control Building Concrete Sections Sheet 4

Calculation Set

CD-16 Rev 1 dated 3-2-78	Common Wall Design Column Line 5

Subsequently the remainder of drawings and calculations involving the reinforcement of the Control-Diesel Generator Building were examined and again certain of the reinforcement required by the calculations was not shown on the design drawings.

Drawings and Calculations subsequently examined were as follows:

Drawings

101349 Rev 2 dated 3-1-79	Control Building Sections - Sheet 3
101352 Rev 2 dated 3-1-79	Control Building Sections - Sheet 6
101391 Rev 2 dated 7-24-79	Diesel Generator Building Sections - Sheet 4

Calculations

CD-12 Rev 1 dated 2-28-78	North Wall Design Column Line A
CD-13 Rev 1 dated 12-30-77	South Wall Design
CD-14 Rev 1 dated 12-15-77	East Wall Design Column Line 1

The results of this examination are shown in Appendix 2.

As of the time of the deficiency discovery no concrete had been placed that was affected by the lack of reinforcing indicated on the calculations.

Immediate steps were taken to notify construction forces of the need to modify reinforcement in the work then under way and appropriate Engineering Change Authorizations (ECA) were issued directing the field to install the required additional reinforcement. An interim status report was forwarded to D. H. Rhoads, Engineering Manager, per UE&C Memorandum MM#-5204A on 11/6/79 by A. J. Hulshizer. The incident was reported to the Owner per UE&C letter SBU-31428 on 11/6/79 and telephoned to the NRC on 11/6/79 by J. DeVincentis of Yankee Atomic Electric Company (See Telecon J. DeVincentis to Joseph Mattia). Copies of correspondence included in Appendix 1.

In the cases where the required reinforcement can be corrected and supplied through the normal drawing revision cycle, Design Change Notices (DCN) have been issued to identify and record the drawing revision work yet to be accomplished. A summary of the reinforcing calculation-drawing comparison and resultant action taken is tabulated in the Appendix 2.

Although no placed concrete was affected by the discovered reinforcement deficiency, additional dowels should have been provided (per the existing calculation) from the placed concrete into two of the wall areas in question. These areas are identified in the Appendix 2 tabulation as items A2 and A4. In these two cases the calculation results were found to be conservative and only minor refinements necessary to justify the acceptance of the doweling supplied.

SAFETY IMPLICATIONS

No completed concrete work has been affected by the reinforcing discrepancy between the calculations and design drawing. (Completed concrete work was below elevation 21'-6")

Positive, documented steps have been taken to insure that the required reinforcing will be installed in the concrete work yet to be done.

In summary, due to the steps taken to correct the drawings for concrete work yet to be done and the adequacy of the inplace concrete work, no design deficiency will exist in the subject structure when completed.

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If the deficiency had gone undetected, the structural integrity of the Control and Diesel Generator Building could be jeopardized under a design basis seismic event. However, due to a number of conservative areas in design of the building, it is likely that a detailed engineering reanalysis would verify the adequacy of the structure. Since in all cases the deficiency has been corrected, the design of the building is acceptable and no reanalysis of the building design for the deficient condition will be conducted.

Several of the conservative areas utilized in the design of the Control and Diesel Generator Building are:

a. The design of the Control and Diesel Generator Building employs finite element modeling of the entire structure to determine the structural behavior under various loading combinations. In performing the final design for each, the structural component stresses are combined and areas reinforced in practical manners which result in conservatisms that provide inherent structural strengths beyond that actually required. Greater refinement in calculations would result in reducing certain of the calculated reinforcing requirements.

b. In the case of the Control and Diesel Generator Building, an additional conservatism exists in that the seismic analysis of the building was done based on damping values of 2% and 5% (of critical damping) for the Operating Basis Earthquake and Safe Shut Down Earthquake respectively, whereas damping values of 4% and 7% are acceptable (per NRC Regulatory Guide 1.6.1). Utilization of higher damping values will result in lower seismic forces and consequently lower seismic related stresses which are the major contributor to the structure's concrete reinforcement requirements.

c. An analysis of the structure taking into account the actual strength of concrete (which generally runs 1000 psi above the design minimum) will result in reduced reinforcement requirements.

d. In all loading cases examined, the governing loading is associated with the Operating Basis Earthquake (the lower of the two design earthquakes).

SOURCE OF DEFICIENCY

Calculations for the Control and Diesel Generator Building were performed in two phases under Calculation Set No's CD-12, CD-13, CD-14 and CD-16. The first issue of these calculations (Rev 0) did not contain the reinforcement which was ultimately left off the drawings. Subsequent design work resulted in determining the need for additional reinforcing in certain elements of the building and calculations were revised accordingly and all completed as Revision 1. The latest of these is dated 3-2-78.

As of the time of the latest available calculations (Rev 1) the drawings had not been finished or issued for construction.

Subsequently the drawings were assigned to be made and checked in a routine manner with respect to Revision 1 of the appropriate calculations.

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Drawings were completed and signed off by the assigned checker (M. R. Sachdev) as being in conformance with the latest revision of the calculations (Rev 1) and issued for construction as Revision 0 on 7-14-78. However, an investigation of the discrepancy between the drawings and the calculations indicated that in fact the drawings only contained the reinforcement requirements of Revision 0 of the calculations.

The checker involved was interviewed with respect to the disparity between the calculations and the drawings. He indicated that he had examined the calculations in question and felt that the approach used contained conservatisms that did not require the additional reinforcing as shown in the calculations. He therefore did not instruct the draftsman to correct either the original issue or subsequent revisions of the drawings.

The action taken by the checker was a violation of UE&C Engineering & Design procedures GEDP-0005A, Section VII, Subsection as follows:

D. "If differences in results are obtained, the differences shall be resolved by the Design Supervisor or Responsible Engineer."

E. "Checking shall be considered complete when the Designer and Checker agree on changes and correction. Unsettled disagreement shall be resolved with Design Supervisor."

Also, no revisions to completed calculations are permitted without authorization, which is to be documented on the standard form "Calculation Revision Control Sheet" form SB-10.

In this case, the checker made an unauthorized, unilateral, undocumented decision which resulted in the drawings not conforming to the reinforcing requirements as shown in the pertinent calculations.

In further discussions with M. R. Sachdev, he indicated that he had reviewed his opinion on the "design conservatisms" with his immediate design supervisor, B. K. Talukdar, who had in M. R. Sachdev's mind planned to take appropriate action to have calculations re-examined. B. K.Talukdar is no longer employed by UE&C and no attempt has been made as of now to contact him concerning the situation.

M. R. Sachdev has formulated a memo and issued it to A. J. Hulshizer on 11/26/79 (MM#-5298A) describing his technical reasons for arriving at the "unnecessary reinforcing" for all but the "common wall", which he now agrees should have also contained the additional reinforcing. A copy of this memo is in Appendix 3.

Review of the memo MM#-5298A by UE&C, Seabrook Project Structural design personnel does not confirm M. R. Sachdev's position and it is concluded to reinforce the walls as required by Revision 1 of the calculations.

In summary the checker, with all good intentions, knowingly allowed the drawings to be issued against a void issue of calculations while at the same time signing the drawings off against the later (Rev 1) issues. In addition to the other violations stated, the checker certified wrong information.

1541 099

POOR ORIGINAL

CORRECTIVE ACTION

Drawing Deficiency

Action has been taken to have reinforcing supplied as required by th appropriate calculations. Specifics of the actions taken are given in th HISTORY section of this report.

Procedural Errors

A special QA training session was held with the entire Seabrook Stru Engineering-Design group to review the procedural errors involved, to ass proper compliancy with pertinent project procedures and to instill the se ness of certifying to only correct information. Similar training session will be held with all other Seabrook Engineering-Design personnel.

Verification of Drawing-Calculation Information

A comparison of all Seabrook concrete design drawings and calculatio issued to date has been initiated to assure that no design deficiencies e with respect to calculated requirements for any of the other structures. cedures instituted for the comparison are given in Appendix 4.

As of this report, 1336 calculation reinforcement items have been ini compared on 182 drawings which represents about 90% of the design drawings to date. The review has been completed for all concrete work now in place of the Safety Related buildings.

Subject to final verification, the extensive drawing-calculation revi the concrete work for drawings issued to date has not revealed any finding would indicate a design deficiency if the structures were constructed in a with the drawings as presently issued.

CONCLUSIONS

The reinforcement "deficiencies" resulting from discrepancies between "as calculated" requirements and that shown on the design drawings have be or are in the process of being fully corrected to agree with the calculati As a result there will be no design deficiency in the Control and Diesel G Building when constructed.

Measures have been instituted to assure that the type of incident pro the discrepancy should not be repeated.

All other Seabrook structures have been reviewed to assure that the incident was isolated to one man's action in a given situation.

Nothing has been determined to date to indicate that any design deficiencies exist in any of the Safety Related Building concrete work.

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APPENDIX 1

CONTROL AND DIESEL GENERATOR BUILDING

CORRESPONDENCE

1541 101

MEMORANDUM

united engineers & constructors inc.

JOB NO. 9763.006

OFFICE: Philadelphia

DEPT. Engineering - Power

DATE: November 6, 1979

TO: D. H. Rhoads

COPIES: GF Cole
AM Ebner
GE Sarstan

FROM: A. J. Hulshizer

File: 3.5.7 11.2
1.0.1.22 11.5.4
MM#-5204A

SUBJECT: Public Service Company of New Hampshire
Seabrook Station
Discrepancy in drawings with respect to Design of Reinforcing Bars for the Control Building

During review of our calculations, we have discovered a discrepancy between the reinforcing required by the current calculations and that shown on the drawings as now issued for the Control Building. The following information will provide the history of the situation, the resultant problem, the resolution and corrective action taken to prevent reoccurance.

HISTORY

On Thursday, November 1, 1979, UE&C field forces contacted our Engineering Department requesting the rearrangement of certain reinforcing in the subject building as a convenience. In reviewing the calculations to substantiate the rearrangment requested, it was discovered (and confirmed on Friday, November 2, 1979) that the reinforcing shown on the drawings did not agree with the reinforcing required by the latest calculations, although the drawings had been signed-off as being checked against those specific calculations. (For effected drawings, see attached list).

The checker involved was interviewed with respect to the disparity between the calculations and the drawings. He indicated that he had examined the calculations in question and felt that the approach used contained conservatism that did not require the additional reinforcing as shown in the calculations. He therefore, did not instruct the draftsman to correct either the original issue or subsequent revisions of the drawings.

PROBLEM

The action taken by the checker was a violation of UE&C Engineering & Design procedures GEDP-0005A, Section VII, Subsection as follows:

B. "If differences in results are obtained, the differences shall be resolved by the Design Supervisor or Responsible Engineer.

E. "Checking shall be considered complete when the Designer and Checker agree on changes and correction. Unsettled disagreement shall be resolved with Design Supervisor.

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Also, no revisions to completed calculations are permitted without authorization, which is to be documented on the standard form "Calculation Revision Control Sheet" form SB-10.

In this case, the checker made an unauthorized, unilateral, undocumented decision which resulted in the drawings not conforming to the reinforcing requirements as shown in the pertinent calculations.

As a result, drawings show portions of certain walls in the subject structure not containing reinforcing as required by the calculations, resulting in an overstresses.

RESOLUTION

No work completed in the field has been affected by the discrepancy between the calculation and drawings. (Completed concrete work is below elevation 21'-6).

Reinforcing currently being installed in walls between elevations 21'-6, and 49'-0 will be corrected to reflect the reinforcing as shown in the calculations by means of ECAs to be issued no later than Wednesday, November 7, 1979.

Reinforcing above elevation 49'-0 will be corrected on the design drawings and placing drawings to reflect calculation requirements.

In summary, the steps taken to correct the drawings to reflect the calculation requirements will assure that no design deficiency will exist in the subject structure when completed.

CORRECTIVE ACTION

All drawings checked by the individual checker involved in the above discussion are being compared against the original calculations to assure correctness of the design drawings.

A review of all of the structures is being made to compare the calculation reinforcement requirements against that shown on the drawings.

A AQ training session has been held with the entire Structural Design Squad to assure proper compliancy with pertinent project procedures.

K. M. Kalavadia
For A. J. Hulshizer
Supv. Struct. Engineer

AJH:ls
Attachment

9763 Dist. A

GF Cole	06U0	J Casolari	06U9	WR Morrison	14U7
DH Rhoads	06U0	DD Boyle	06U9	MP Hanson	Field
AW Cole	06U0	HE Flora/JK Shaw	06U9	JF Vought	Field
WE Haug	06U0	GM Aggarwal/AS Calahan	05U7	Field DCC	Field
LS Nascimento	06U4	RA Mabry/LL Tipton	05U9	RJ Phelps	Field
AJ Hulshizer/WH Reading	06U4	DE Mc Caig	02U0	JR Whitaker	Field
S Kasturi/G Trautman	06U5	EH Case, II	02U1	P Howard-Johnson	Boston
HH Katz	06U5	JR Dmytryk	12U4	Serial File	06U1
JJ Parisano	06U6	WC Stevenson/GC Cipra	12U6	DA Fertig	06U1
NB Pauling/WJ Breslin	06U7	SVTammaro/DOPIER	14U4		

November 6, 1979
SBU-31428
File: 3.1.6
Catg: NRCD
No Response Required

Mr. John DeVincentis, Project Manager
Yankee Atomic Electric Company
Seabrook Station
20 Turnpike Road
Westborough, Massachusetts 01581

Dear Mr. DeVincentis:

Public Service Company of New Hampshire
Seabrook Station
Discrepancy in the Reinforcing Bar
for the Control Building

The purpose of this letter is to advise you of a discrepancy in the reinforcing bar design for the Control Building.

During a recent review of our calculations for the Control Building we discovered that four (4) drawings issued for construction for this building do not contain all the reinforcing bar included in the calculations.

None of the work completed in the field is affected by this discrepancy. Engineering changes are in the process of being issued to the four affected drawings to add the reinforcing bar required by calculations.

A review of all the Seabrook structures is being made to ensure that the reinforcing bar required by the calculations is shown on the drawings.

It is our belief that this design discrepancy is a reportable item in accordance with 10 CFR 50.55(e) and it is, therefore, recommended that it be reported to the Nuclear Regulatory Commission.

Very truly yours,

G. F. Cole
Project Manager

GFC:hr
cc: Messrs. John DeVincentis - YAEC - 4L
B. B. Beckley - PSNH - 3L
J. D. Haseltine - PSNH - 1L
T. M. Sherry - YAEC - 1L
J. H. Herrin - PSNH - YAEC Field Office - 1L

1541 104

FORM 540-8.3 6-54

POOR ORIGINAL GFC

MEMORANDUM

TO Distribution — COMPANY OR LOCATION — November 7, 1979

FROM J. DeVincentis — COMPANY OR LOCATION — FILE T.F. Q 2.5.3

SUBJECT Reporting 10 CFR 50.55 (e) Design Deficiencies — SBP-79-156

GF COLE	06U0	✓	RA MABRY	06U9	✓
DH RHOADS	06U0	✓	GM AGGARWAL	06U7	✓
HE FLORA	06U3	✓	CE MC CAIG	02U1	
AW COLE	06U0		JA WILMER	02U2	

On Tuesday November 6, 1979 I called Joseph Mattia, NRC Region I I&E Inspector for Seabrook Station to report two significant design deficiencies under 10 CFR 50.55 e. The telephone call was placed on the same day as notification was received from UE&C via SBU-31426 and SBU-31428.

The deficiency as identified in SBU-31426 involved use of incorrect seismic amplified response spectra in the design of components supported by the containment annular steel frame. The amplified response spectra used for the component design was that of the containment interior concrete instead of the annular steel frame. The structured members which make up the annular frame have not been fabricated and will be redesigned with braces added to stiffen the structure in order to reduce the "g" values. The design of all components located in this area will then be checked against the redesigned annular steel frame and its resulting amplified response spectra.

The deficiency reported in SBU-31428 involved four drawings, issued for construction of the control building, which did not contain all the reinforcing bar included in the calculations. None of the work completed in the field is affected by this discrepancy. A review of all Seabrook structures is being conducted to insure that the reinforcing bar required by the calculations is shown on the drawings.

The inspector cautioned me that the regulation require, within 30 days, a report to be filed with substantial detail describing these deficiencies including an analysis of safety implications, corrective action taken and sufficient information to permit analysis and evaluation of the deficiency and of the corrective action. Mr. Mattia asked me when I first had knowledge of the deficiencies. I stated that I was informed by mail today that both of the items described above were considered reportable significant deficiencies as defined in 10 CFR 50.55 e. I stated that about two weeks ago we had been informed by UE&C that a discrepancy existed in the response spectra that was used for piping and supports of equipment in the containment annular area and that UE&C was conducting an evaluation to determine the extent of the discrepancy.

1541 105

I have instructed UE&C to initiate preparation of these reports. If more than 30 days are required to prepare such a report, we can submit an interim report within 30 days and state the date for the final report.

RECEIVED BY
U E & C INC.
NOV 14 1979
RESPONSE NO

PSNH
CONTROLLED
CORRESPONDENCE

RESPONSE REQ'D	NO
SUBJ FILE	3.1.6
RESPONSE BY	—
LS NASCIMENTO	06U4 ✓
HH KATZ	06U3 ✓

SERIAL FILE	06U1	✓	HN PARKER	02U5	
FP DOC	06U1		RF PERRY	07U7	
AJ HULSHIZER	06U4	✓	JJ UCCIFERRO	07U8	
S KASTURI	06U5	✓	CQ MILLER	07U7	
WE HAUG	06U0	✓	JR DMYTRYK	12U4	✓
DD BOYLE	06U4	✓	JF VOUGHT	FIELD	✓
JJ PARISANO	06U6	✓	MP HANSON	FIELD	✓
NB PAULING	06U7	✓	GC CIPRA	12U5	
JL CASOLARI	06U9		S TIMMARAJU	14U4	✓
* WITH ENCLOSURE			FH JOHNSON	BOSTON	✓

I have also instructed Yankee's QAD to audit UE&C records rega discovery and extent of the deficiency and the corrective actions t or to be taken.

John DeVincentis
Project Manager

JDV:tla

cc: LHH
WJM
JWSi
JHH.
BBB
DEV
WPJ
TMS
RPP
JRH
FDB
AMS
PROJECTS
FEGreenman
SCDoret
G.F. Cole SB-8551

POOR ORIGINAL

APPENDIX 2

CONTROL AND DIESEL GENERATOR BUILDING

SUMMARY OF DISCREPANCIES
AND
SPECIFIC ACTION TAKEN

1541 107

APPENDIX 2

to

FINAL REPORT

on

CONCRETE REINFORCEMENT DISCREPANCY

CONTROL & DIESEL GENERATOR BLDG.

MAJOR WALLS

"A" - 1st Wall lifts between El. 21'-6" & 49'-0" & below

	Wall Location	Calculation Requirements	Provided on Design Drawing	ACTION Taken and/or Required
A1	Common Wall Between Control & D.G. Bldg. Line 5	#11@12 + #6@12 Ea. Face Horiz. (CD-16)	#11@12" Ea. Face Horiz. (F-101350)	Field Addition #9@24' Ea. Face Horiz. ECA 01/1101A
A2	North Wall along Col. A aprox. 18'-0" horiz. length at Col. Line 1	#10@6 Ea. Face Vert. in 18'-0 length (CD-12)	#10@12 Ea. Face Vert. (F-101350)	Field Addition #10@12" Ea. Face Vert. splicing with #11@6" DWLS. (in. 14'-0" width) ECA 01/1101A revise calc. to reflect reinf. requ'd in 14'-0" width only
A3	North wall along Col. 'A' Between El. 34'-0" & 51'-6 @ Col. Line 5 & 5.5	#8@12 + #4@12 Horiz. Ea. Face (CD-12)	#8@12 Ea. Face Horiz. (F101391)	Field Addition #6@24 Ea. Face Horiz. in this area ECA 01/1101A
A4	Near South Wall 3 Walls of Stair 'A'	#10@12" Ea. Face Vert. (CD-13)	#9@12" Vert. (F-101349)	#9@12" Ea. Face Vert. acceptable. Revise Calc. Set CD-13 DCN--01/1184A
A5	South Wall 1 to 5 @ Col. Line E	#11@12 Ea. Face Vert. (CD-20)	#11@6 Ea. Face Vert.. (F-111343)	Provided more reinf. than Req'd.

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APPENDIX 2

"B" - 2nd Wall lifts between El. 50'-6" & 76'-6"

	Wall Location	Calculation Requirements	Provided on Design Drawing	ACTION Taken and/or Required
B1	Common Wall Between Control & D.G Bldg. Line 5	#11@6" Horiz. Ea. Face (CD-16)	#9@6 Horiz. Ea. Face (F-101350)	Revise Design DWG. to revise #9 to #11 bars DCN 01/1184A
B2	South Wall Between Col. Line 5 & 9	#9@6 Vert. Ea. Face (CD-13)	#11@12 Vert. Ea. Face (F-101391)	Revise Design DWG. to add additional reinf. as dowels and vert. bars ECA 01/1109A & ECA 01/1181A
B3	North Wall Between Col. Line 5 & 9	#9@6 Vert. Ea. Face (CD-12)	#11@12" Vert. Ea. Face (F-101391)	Revise Design DWG. to add additional reinf. as dowels and vert. bars ECA 01/1109A & ECA 01/1181A
B4	Near South Wall - Stair 'A' (i) 22'-0" Long South Wall	#9@12 + #6@12 Vert. Ea. Face (CD-13)	#9@12 Vert. Ea. Face (F-101349)	Revise Design DWG. to add additional reinf. as dowels & vert. bars. ECA 01/1109A & DCN 01/1184A
	(ii) East & West Wall	#8@12 + #4@12 Horiz. Ea. Face (CD-13)	#8@12 Horiz. Ea. Face (F-101349)	Revise Design DWG. to add additional reinf. DCN 01/1184A

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APPENDIX 2

"C" - 3rd. Wall lifts above El. 76'-0"

	Wall Location	Calculation Requirements	Provided on Design Drawing	ACTION Taken/and/or Required
C1	Common Wall Between Control & D.G. Bldg. Line 5	#11@12 Horiz. Ea. Face (CD-16)	#8@12" Horiz. Ea. Face (F-101350)	Revise Design DWG. to add additional reinf. DCN 01/1184A
C2	East Wall along Col. Line 1	#9@12 Horiz. Ea. Face (CD-14)	#8@12 Horiz. Ea. Face (F-101350)	Revise Design DWG. to add additional reinf. DCN 01/1184A
C3	South Wall @ Col. Line E Between 1 & 5 above El. 86'-0	#8@12 + #4@12 Horiz. Ea. Face (CD-13)	#8@12 Horiz. Ea. Face (F-101352)	Revise Design DWG. to add additional reinf. DCN 01/1184A
C4	South Wall @ Col. E Between 5 & 9	#9@6" Vert. Ea. Face (CD-13)	#11@12 Vert. Ea. Face (F-101391)	Revise Design DWG. to add additional reinf. DCN 01/1184A
C5	Stair A - 3 Walls	#8@12 Horiz. (CD-13)	#7@12 Horiz. Ea. Face (F-101349)	Revise Design DWG. to add additional reinf. DCN 01/1184A

1541 110

APPENDIX 3

CONTROL AND DIESEL GENERATOR BUILDING

M. R. SACHDEV MEMO #5298A

1541 111

FORM 3305

MEMORANDUM

united engineers & constructors inc

JOB NO.	9763.006	OFFICE:	Philadelphia
DEPT.	Engineering - Power Division	DATE:	November 26 , 1979 MM: 5298A
TO:	A. J. Hulshizer	COPIES:	M. R. Sachdev File 3.5.2 3.5.7 DCC
FROM:	M. R. Sachdev		

SUBJECT: Public Service Company of New Hampshire
Seabrook Station
Control & Diesel Generator Bldg.
Discrepancies between drawings and design calculations

I have reviewed the drawings showing walls of the building and the corresponding calculations to find the reasons for the discrepancies between them. Since these drawings were first issued in May 1978, it is difficult to establish with full certainty the causes of discrepancies.

The review indicates that, in the case of common wall, drawings were developed using a copy of calculations having older revision. However, the control sheets for the drawings were prepared by referring to the original sheets of calculations having latest revision. This resulted in proper control sheets but drawings with superseded information.

For the remaining walls, latest revisions of calculations were reviewed and discussed with then Design Supervisor Mr. B. Talukdar and it was decided that rebar shown in the calculations could be simplified if somewhat less conservative approach is used. Thus, the modified rebar arrangement was shown on the drawings and it was decided to revise the calculations at the same time. Somehow, the calculations were not revised to date, resulting in the discrepancies between the drawing and the calculations.

In "Attachment A", explanations regarding the discrepancies and the reasons for somewhat less conservative approach are outlined. If these reasons are acceptable, the presently shown rebar in North, South, East and West walls will be OK.

M.R. Sachdev

M. R. Sachdev

MRS:mbs

Attachment

1541 112

ATTACHMENT A

1. NORTH WALL

A. Lower East Corner, Elements 462 & 446.
Refer to page 28 of calculation set CD-12.

In the design of lower east corner, the loads from adjacent element from east wall have been added to the loads from element 462. The reason for this was a large opening in the floor @ north east corner. This opening has since been replaced by slab on the beams. Thus element 545 in east wall is supported by the slab @ El. 21'-6" and loads from this element need not be added to element 462. Thus existing rebar #10@12" vertical is adequate.

B. Vertical rebar above elevation 50'-0", Elements 424,440.
Refer to page 37 of calculation set CD-12.

In the design for compression, cm = 1.0 is used in the formulae $\delta = \frac{cm}{1-\frac{Pu}{\phi Pc}}$

However cm = 0.6 is acceptable since under seismic loads M1/M2 will be negative. Using cm = 0.6, Mu = 134 K' Pu = 25.08 Kips and plotting the values on the interaction diagram on page 38 of set CD-12, #11@12" vertical rebar will be acceptable.

C. Horizontal rebar, Element 454
Refer to page 53 of calculation set CD-12

Method of combining shear, moment and tension (in some elements of wall) to obtain the horizontal rebar is conservative, considering the fact that the potential shear failure plane must extend through all horizontal rebar. Also effect of moment in addition to tension is to reduce tension on one face and to increase on the other face. It seems that small moments could be neglected in obtaining the ultimate shear capacity. Using this approach, maximum rebar for element 454 will be 0.73 in^2 & #8@12" will be adequate.

2. SOUTH WALL

A. Vertical rebar above El. 51'-6", D.G. Bldg. Elements 360 & 344
Refer to page No. 41 of calculation set CD-13

In the design of wall, cm = 1.0 has been used. As discussed earlier, cm = 0.6 may be used. Using this, δ = 1.0, Mu = 129.85 K-Ft, Pu = 58.86 Kips. Plotting these values on the interaction diagram on page 44.CD-13, #11 @ 12" rebar is acceptable.

B. Horizontal rebar above elevation 78'-6", Control Bldg. Element 320
Refer to page 57 of CD-13

As discussed earlier, effect of small moments may not be combined to find the total rebar. Thus combining shear and tension, required rebar is 0.73 $in^2/ft < 0.78\ in^2$. Thus #8@12" will be adequate.

C. Stair Tower Design. Refer to page 65, Calculation Set CD-13

Stair tower has not been included in the computer model. However, adding this tower will reduce seismic accelerations due to increased stiffness. Also tower would provide added shear area in both directions.

Referring to page 65, calculation set CD-13,

Shear for 10'-0" long wall, (2'0" thick) is 1740 Kips. This compares with total shear of 12822 Kips for 4'0" thick wall, 88'-0" long (see page 9 of calculation set CD-16). So shear used is high considering the relative stiffness of the wall, and design approach used is very conservative. Because of small relative stiffness, nominal rebar for the stair tower is adequate.

3. EAST WALL

Horizontal rebar above elevation 75'0", element 491
Refer to Page no. 40, calculation set CD-14

As discussed earlier, since the direct tension is localized in the center of wall (near the intersection with floors), method of combining moment, shear and tension is conservative. If only shear and tension are combined, area of steel required would be 0.56 in^2/Ft. Thus #8@12" rebar is adequate.

4. WEST WALL

No discrepancies are found between the calculations and the drawings.

5. COMMON WALL

Even though design of wall is based on larger assumed openings (as compared to actual openings) and generally conservative approach, additional rebar indicated by the calculations are recommended.

APPENDIX 4

STRUCTURAL PROCEDURES
FOR
DRAWING-CALCULATION COMPLIANCE REVIEW

1.0 PURPOSE

1.1 The purpose of the Drawing-Compliance Review is to check issued design drawings against the latest calculation sets to determine if the design requirements set forth in the calculations have in fact been fully displayed on the issued design drawings.

2.0 GENERAL PROCEDURE

2.1 All initiated reviews shall be fully documented in the manner described herein.

2.2 Review shall be made with respect to a given set of calculations. Once review has been initiated, checking shall continue until the calculation has been reviewed in its entirely with respect to pertinent drawings.

2.3 Only pertinent drawings are to be reviewed.

2.4 The purpose of the review is only to be sure that the drawings contain the proper design information. The method or character of displaying information is not part of this review. Do not enter findings with irrelevent opinions or methods of display or drawing techniques unless they convey wrong information.

2.5 Once a set of calculations have been throughly reviewed and the findings and corrective recommendations duly noted the forms and calculations shall be completly turned over to the responsible design supervisor.

2.6 The design supervisor shall initiate an independent check of the findings and corrective recommendations which shall be duly recorded. Disagreement on findings and/or corrective recommendations shall be satisfactorily settled. No initial findings are to be erased from the forms.

2.7 Discrepancies shall be noted and course of action officially resolved. Disposition shall be recorded for action by either an ECA or a DCN. All dispositions shall be approved by the Supervising Discipline Engineer prior to taking final action.

2.8 Upon completion of forms (fully signed thru) the record forms shall be filed as follows:

2.8.1 A copy filed in subject file No. 11.5.4.1 by Building and Calculation set No.

2.8.2 Original copies of review forms not requiring further action or action completed filed in a loose leaf note book by Building and Calculation Set No.

2.8.3 Original copies of review forms pending action filed in a seperate (from 2.8.2) loose leaf note book by Building and Calculation Set No.

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PSNH SEABROOK STATION

DRAWING - CALCULATION
COMPLIANCE REVIEW
SUMMARY

REVIEWED CALCULATION

SET NO _____

REV _____

REVIEW SHEET
ONE OF _____

BUILDING / AREA _____

PART COVERED _____

REVIEW AUTHORIZED BY _____ DATE _____

REVIEW STARTED BY _____ DATE _____

REVIEW COMPLETED BY _____ DATE _____

ITEM	DRAWING		REF CALC PAGE	REVIEW CONCLUSIONS		REVIEW OF RECOMMENDATIONS	
	NO	REV		DWG OK AS IS	CORRECTIVE RECOMMENDATIONS	BY / DATE	REMARKS
A							
B							
C							
D							
E							
F							
G							
H							
J							
K							

ADDITIONAL REMARKS & CONCLUSIONS: (IDENTIFY BY ITEM)

RESOLUTION OF CORRECTIVE RECOMMENDATIONS

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FINAL DISPOSITION APPROVED	BY	DESIGN SUPER	COGNISANT ENG'R	SDE	CHECK BELOW IF ITEMS CONT'D ON NEXT PAGE
	DATE				ITEMS CONTINUED

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DRAWING - CALCULATION

COMPLIANCE REVIEW

SUMMARY SHEET CONTINUED

REVIEWED CALCULATION

SET NO _____

REV _____

REVIEW SHEET TWO OF _____

ITEM	DRAWING		REF CALC PAGE	REVIEW CONCLUSIONS		REVIEW OF RECOMMENDATIONS	
	NO	REV		DWG OK AS IS	CORRECTIVE RECOMMENDATIONS	BY / DATE	REMARKS
L							
M							
N							
P							
Q							
R							
S							
T							
U							
V							
W							
X							
Y							
Z							

ADDITIONAL REMARKS & CONCLUSIONS (IDENTIFY BY ITEM)

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DRAWING - CALCULATION
COMPLIANCE REVIEW
REVIEW DETAILS

REVIEWED CALCULATION

SET NO _____

REV NO _____

REVIEW SHEET _____ OF _____

ITEM NO	REVIEWED DRAWING NO	ITEM DESCRIPTION	CALC PG REF	COMPARISON		REVIEW CONCLUSIONS		REVIEWED BY
				CALCULATION REQUIREMENTS	SUPPLIED ON DRAWING	DWG OK AS IS	CORRECTIVE RECOMMENDATIONS	

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