



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

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NOV 28 1978

Docket No: 50-358

APPLICANT: Cincinnati Gas & Electric Company

FACILITY: Zimmer Nuclear Power Station

SUBJECT: Summary of Meeting With Cincinnati Gas & Electric Company  
on Zimmer ABS Evaluation, November 9, 1978

Background:

The applicant (CG&E) committed to re-evaluate the Zimmer Station to assess its capability to accommodate pool dynamic loads. The re-evaluation has been in progress for about a year. The purpose of this meeting was to provide an opportunity for the applicant to present the status and result of the re-evaluation to the staff. The attendance list, agenda and presentation handouts are enclosed.

Summary:

The applicant has nearly completed the re-evaluation effort. All structures, piping, equipment and electrical instrumentation were to be re-evaluated using conservative dynamic loads combined by the absolute sum method. Where code allowable stress limits were exceeded by using the absolute method, the SRSS method was used where appropriate. If structures, piping, equipment or electrical instrumentation exceeded code allowables by the SRSS method, they were modified to meet code allowables by the absolute sum method. If they did not exceed code allowables by the SRSS method but did by the absolute sum method, the applicant is requesting relief from the staff rather than make further modifications to meet code allowables by the absolute sum method.

*I. A. Peltier*  
I. A. Peltier, Project Manager  
Light Water Reactors Branch No. 1  
Division of Project Management

Enclosures:

1. Attendance List
2. Agenda
3. Presentation Handouts

cc: See next page

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ENCLOSURE NO. 1

AGENDA

<u>NAME</u>	<u>AFFILIATION</u>
R. Bosnak*	NRC
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H. L. Brammer*	NRC
R. M. Stephens	NRC
S. Hou	NRC
P. Y. Chen	NRC
A. E. Meligi	Sargent & Lundy
R. J. Pruski	Sargent & Lundy
J. Kitz	Sargent & Lundy
A. Deguermendjian	Sargent & Lundy
J. D. Flynn	CG&E
H. C. Brinkmann	CG&E
R. B. Johnson	GE
R. Villa	GE
F. C. Cherny	NRC
K. D. Desai	NRC
D. C. Jeng	NRC
I. A. Peltier*	NRC
A. Hafiz	NRC
F. Schauer*	NRC
K. Goddard	JCP&L
J. K. Margin	GE
C. L. Child	GE
W. L. Kucharski	Sargent & Lundy
M. E. Jackson	Sargent & Lundy
L. C. S. Nieh	S&W
I. L. Gray	GE
E. O. Swain	GE

\*to get copies with enclosures.

SUGGESTED AGENDA  
NOVEMBER 9, 1978 NRC MEETING  
ZIMMER ABS EVALUATIONS

1. Opening Statement by CG&E  
Purpose of Meeting:
  - A. Fulfill Previous Commitments
  - B. Present Results of SRSS/ABS
  - C. Identify Components not Meeting ABS
  - D. Justify Components not Meeting ABS
2. NSSS Components
  - A. Piping and Pipe Mounted Equipment
  - B. Snubbers
  - C. RPV
  - D. Internals
  - E. Floor Mounted Equipment
  - F. Instrumentation
3. BOP Components
  - A. Piping and Pipe Mounted Equipment
  - B. Snubbers
  - C. Floor Mounted Equipment
  - D. Instrumentation and Electrical
  - E. Embeds and Structural Steel

AGENDA  
NOVEMBER 9, 1978 NRC MEETING  
ZIMMER ABS EVALUATIONS

1. OPENING STATEMENT BY CG&E - PURPOSE OF MEETING
2. NSSS COMPONENTS
  - A. PIPING AND PIPE MOUNTED EQUIPMENT
  - B. SNUBBERS
  - C. RPV
  - D. INTERNALS
  - E. FLOOR MOUNTED EQUIPMENT
  - F. INSTRUMENTATION
3. BOP COMPONENTS
  - A. PIPING AND PIPE MOUNTED EQUIPMENT
  - B. SNUBBERS
  - C. FLOOR MOUNTED EQUIPMENT
  - D. INSTRUMENTATION AND ELECTRICAL
  - E. EMBEDS AND STRUCTURAL STEEL

ZIMMER PIPING ANALYSIS  
SUMMARY OF RESULTS  
STEAM PIPING

	<u>DESIGN</u> <u>CASE</u>	<u>CASE A</u>	<u>CASE B</u>
PIPING STRESSES	OK	OK	OK
FATIGUE	OK	OK	OK
MSIV	OK	OK	OK
SRV	OK	OK	OK
SHUBBERS	1-OL	4-OL	6-OL

FOR STUDY ONLY

## PURPOSE OF MEETING

1. FULFILL PREVIOUS COMMITMENTS FOR EVALUATIONS
  - A. EVALUATE ALL NRC LOAD COMBINATIONS
  - B. COMBINE LOADS BOTH SRSS & ABS
    - (1) IF CALCULATED  $<$  SRSS UPGRADE TO ABS IF POSSIBLE
    - (2) IF SRSS  $<$  CALCULATED  $<$  ABS  
DISCUSS WITH NRC BEFORE CHANGING
    - (3) IF CALCULATED  $>$  ABS ACCEPTABLE - NO QUESTIONS
    - (4) DRYWELL STEEL UPGRADED TO ABS
2. PRESENT ABS/SRSS RESULTS TO NRC
  - A. IDENTIFY COMPONENTS NOT MEET ABS
  - B. JUSTIFY COMPONENTS NOT MEET ABS
3. OBTAIN NRC APPROVAL

## ZIMMER NSSS DESIGN ADEQUACY VERIFICATION

- INTRODUCTION
- LOAD COMBINATIONS CONSIDERED
- COMPONENTS ASSESSED
- SUMMARY OF RESULTS

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## INTRODUCTION

- NSSS EQUIPMENT DESIGN BASES
  - PRESSURE
  - THERMAL
  - SEISMIC
  
- DYNAMIC LOADS IDENTIFIED AFTER DESIGN
  - SRV STRUCTURAL RESPONSES
  - LOCA STRUCTURAL RESPONSES
  - ANNULUS PRESSURIZATION
  
- DESIGN ADEQUACY MUST BE VERIFIED
  - ORIGINAL LOADS
  - ADDITIONAL LOADS

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NSSS EQUIPMENT ADEQUACY VERIFIED

●	RPV	OK
●	RPV INTERNALS	OK
●	RPV EQUIPMENT	OK
●	FLOOR MOUNTED EQUIPMENT	OK
●	PIPING AND PIPE MOUNTED EQUIP.	--
	-LIMITED SNUBBER OVERLOADS	

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SUMMARY OF LOAD CASES

<u>CASE</u>	<u>OBE,OT</u>	<u>OBE+OT</u>	<u>SSE+OT</u>	<u>SSE+LOCA</u>	<u>SSE+AP</u>	<u>AP</u>
Design	B-SRSS	C-SRSS	D-SRSS	D-SRSS	-----	D-SRSS
Case A	-----	B-SRSS	D-SRSS	D-SRSS	D-SRSS	-----
Case B	-----	B-ABS	D-ABS	D-SRSS	D-SRSS	-----

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- NSSS SAFETY RELATED COMPONENTS ASSESSED -

COMPONENT	CASE A	CASE B
RPV		
- Skirt	OK	OK
- Shroud Support	OK	OK
- Stabilizer Bracket	OK	OK
- Steam Dryer Bracket	OK	OK
RPV INTERNALS		
- Core Plate	OK	OK
- Top Guide	OK	OK
- Shroud	OK	OK
- Fuel Assembly	OK	OK
- CRD Guidetubes	OK	OK
- CRD Housing	OK	OK
- Jet Pump Assemblies	OK	OK
- Core Spray Lines	OK	OK
RPV EQUIPMENT		
- Fuel Storage Racks	OK	OK
- Refueling Platform	OK	OK
- Stabilizer	OK	OK
- CRD Restraint Beams	OK	OK

FOR STUDY PURPOSES

-NSSS SAFETY RELATED COMPONENTS ASSESSED-

COMPONENT	CASE A	CASE B
NSSS INSTRUMENTATION	OK	OK
FLOOR MOUNTED EQUIPMENT		
- RCIC Pump	OK	OK
- RCIC Turbine	OK	OK
- RHR Pump & Motor	OK	OK
- RHR HX	OK	OK
- Standby Liquid Control Pump and Tank	OK	OK
- HPCS Pump and Motor	OK	OK
- LPCS Pump and Motor	OK	OK
- Flammability Control Equip.	Assessment Underway	Assessment Underway
PIPING and PIPE MOUNTED EQUIP.	Assessment Underway	Assessment Underway
- Recirc. Piping System		
- Recirc Pump and Valves		
- Main Steam Piping System		
- Main Steam Safety Relief Valves		
- Main Steam Isolation Valves		

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## SUMMARY OF RESULTS

- ANALYSIS NEAR COMPLETION
- CONSERVATIVE CRITERIA APPLIED
- CORRECTIVE ACTION TAKEN WHERE NECESSARY
- INTENT OF CRITERIA IS MET
- MINOR EXCEPTIONS ARE JUSTIFIED

## LOAD CASE DEFINITIONS

### OPERATING TRANSIENT

STRUCTURAL RESPONSE TO SRV DISCHARGE  
ACOUSTIC LOAD DUE TO SRV DISCHARGE  
ACOUSTIC LOAD DUE TO TURBINE STOP VALVE CLOSURE

### LOCA

SMALL/LARGE/INTERMEDIATE BREAKS  
SPVADS FOR SMALL/INTERMEDIATE  
CHUGGING  
CONDENSATION OSCILLATION  
VENT CLEARING

### AP

ANNULUS PRESSURIZATION  
JET LOADS

### ACCEPTANCE CRITERIA

A - NORMAL  
B - UPSET  
C - EMERGENCY  
D - FAULTED

ZIMMER PIPING ANALYSIS  
SUMMARY OF RESULTS  
RECIRCULATION PIPING

	<u>DESIGN</u> <u>CASE</u>	<u>CASE A</u>	<u>CASE B</u>
PIPING STRESSES	OK	OK	OK
FATIGUE	OK	OK	OK
SUCTION VALVE	OK	OK	OK
DISCHARGE VALVE	OK	OK	OK
FLOW CONTROL VALVE	OK	OK	OK
SNUBBERS	OK	OK	OK

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ZIMMER PIPING ANALYSIS  
SUMMARY OF RESULTS  
STEAM PIPING

	<u>DESIGN</u> <u>CASE</u>	<u>CASE A</u>	<u>CASE B</u>
PIPING STRESSES	OK	OK	OK
FATIGUE	OK	OK	OK
MSIV	OK	OK	OK
SRV	OK	OK	OK
SHUBBERS	1-OL	4-OL	6-OL

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CASE B SHUBBERS

	<u>TSVC</u>	<u>OBE</u>	<u>TOTAL</u>	<u>LEVEL B LIMIT</u>
SD4	16,176	8,704	24,880	24,400
SA4	18,745	8,870	27,615	24,400

LEVEL C LIMIT - 31,100

LEVEL D LIMIT - 32,300

QUALIFICATION TEST - 30,000  
(AT 30 CYCLES)

\* LEVEL B, C & D LIMITS FROM LOAD CAPACITY DATA SHEETS.

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ACCEPTANCE CRITERIA  
FOR SHUBBERS

- IF SHUBBERS DO NOT MEET CASE A CRITERIA - REPLACE THEM.
- IF SHUBBERS DO NOT MEET CASE B CRITERIA - DEMONSTRATE SHUBBERS WILL SATISFACTORILY PERFORM THEIR FUNCTION.

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## CONCLUSIONS

- RECIRC. SYSTEM MEETS ALL CRITERIA FOR BOTH CASE A & B
- STEAM SYSTEM MEETS ALL CRITERIA FOR BOTH CASE A & B, EXCEPT FOR SNUBBERS
- REPLACE MS SNUBBERS SA-8, SB-8, SC-8, SD-8 THEN:
  - ALL CRITERIA FOR CASE A IS MET.
  - FOR CASE B TWO SNUBBERS DO NOT MEET ACCEPTANCE CRITERIA. HOWEVER, CAPABILITY OF THE TWO SNUBBERS IS NOT EXCEEDED.

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NRC MEETING ON SRSS VS. ABS

BOP COMPONENTS

- PIPING AND SUPPORTS
- INLINE AND FLOOR MOUNTED EQUIPMENT
- INSTRUMENTATION AND ELECTRICAL
- STRUCTURAL EMBEDMENTS AND STEEL

• ASSUMPTIONS

• STATUS

• RESULTS

• JUSTIFICATION

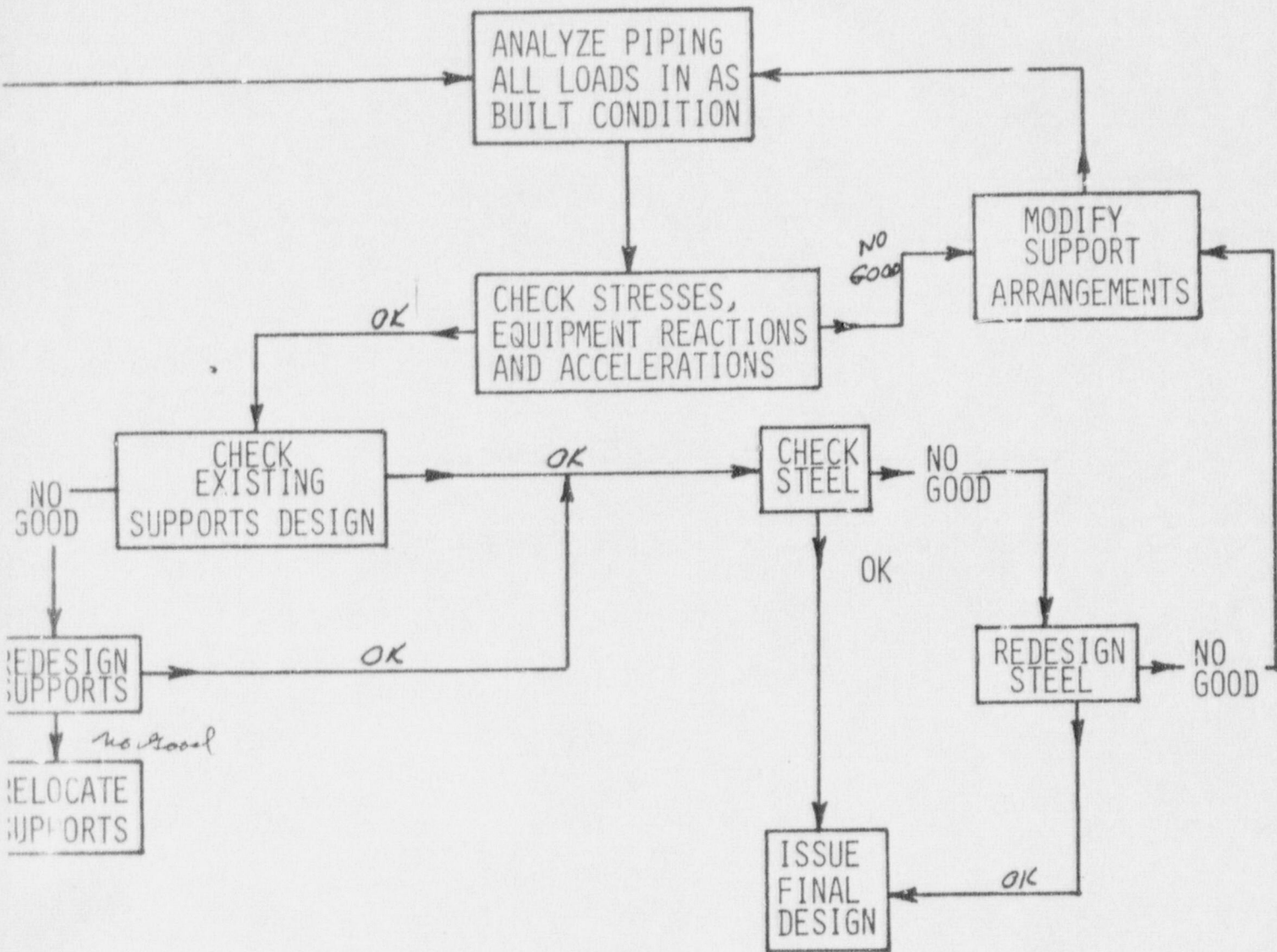
• SCHEDULE FOR COMPLETION

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DISCUSS TWO LOAD SETS

	CASE A	CASE B
OBE + OT	B-SRSS	B-ABS
SSE + OT	D-SRSS	D-ABS
SSE + LOCA	D-SRSS	D-SRSS

# EVALUATION OF PIPING





BOP PIPING AND SUPPORTS

• DRYWELL PIPING

• REACTOR BUILDING PIPING

• WETWELL PIPING

ANALYSIS PERFORMED ON PIPING  
IN  
DRYWELL

- 1) THERMAL EXPANSION - ALL OPERATING MODES
- 2) WEIGHT
- 3) SEISMIC INCLUDING DIFFERENTIAL DISPLACEMENTS
- 4) SRV BUILDING RESPONSE
- 5) HYDRAULIC TRANSIENTS (WHERE APPLICABLE)
- 6) ANNULUS PRESSURIZATION
- 7) THERMAL TRANSIENTS
- 8) COMBINED STRESS PER ASME SECTION III
- 9) NRC FUNCTIONAL CAPABILITY REQUIREMENTS (WHERE APPLICABLE)

GOVERNING LOAD COMBINATIONS  
FOR BOP PIPING

	<u>ACCEPTANCE CRITERIA</u>	
	<u>CASE A</u>	<u>CASE B</u>
TH* + P + WT + OBE + SRV	B-SRSS	B-ABS
TH* + P + WT + SSE + SRV	D-SRSS	D-ABS
TH* + P + WT+ SSE + LOCA	D-SRSS	D-SRSS

\*TH ONLY CONSIDERED AS A WORSE EFFECT

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SRSS VS ABS EVALUATION SUMMARY - BOP  
PRELIMINARY ANALYSIS RESULTS  
DRYWELL\*

STRESS - ALL SYSTEMS GOOD FOR ABS EXCEPT FW-1 NODE 370,  
LP-1 NODE 85A AND RH-16 NODES 15, 20B, 30A, AND  
30B

SNUBBERS - ALL SYSTEMS GOOD FOR ABS *(after upgrading)*

RIGID RESTRAINTS - ALL SYSTEMS GOOD FOR ABS *(some upgraded)*

VALVE ACCELERATIONS - ALL SYSTEMS GOOD FOR ABS

EQUIPMENT REACTIONS - NOT EVALUATED

NOTE: TO MEET SRSS, APPROXIMATELY 5 SNUBBERS WERE ADDED  
AND ~~33~~ WERE UPGRADED, ANY REDESIGN OR ADDITIONS WERE  
DONE TO MEET THE ABS CRITERIA,  
*HAVE SINCE UPGRADED 15 MORE THAT ORIGINALLY MET SRSS*

\*EVALUATION FOR A.P. NOT INCLUDED.

ANALYSIS PERFORMED ON PIPING  
IN  
REACTOR BUILDING

- 1) THERMAL EXPANSION - ( ALL OPERATING MODES)
- 2) WEIGHT
- 3) SEISMIC INCLUDING DIFFERENTIAL DISPLACEMENTS
- 4) SRV (DESIGN CASE)
- 5) HYDRAULIC TRANSIENTS (WHERE APPLICABLE)
- 6) COMBINED STRESS PER ASME SECTION III
- 7) NRC FUNCTIONAL CAPABILITY CRITERIA (WHERE APPLICABLE)

SRSS VS ABS EVALUATION SUMMARY - BOP  
PRELIMINARY ANALYSIS RESULTS  
REACTOR BUILDING

STRESS - ALL SYSTEMS GOOD FOR ABS EXCEPT FW-3 NODE 370

SNUBBERS - ALL SYSTEMS GOOD FOR ABS EXCEPT 1 ON MS-10,  
2 ON WS-L0, AND 2 ON WS-L3.

RIGID RESTRAINTS - ALL SYSTEMS GOOD FOR ABS EXCEPT 1 ON  
WR-8 AND 1 ON WS-13

VALVE ACCELERATIONS - ALL SYSTEMS GOOD FOR ABS

EQUIPMENT REACTIONS - ALL SYSTEMS GOOD FOR ABS

NOTE: TO MEET SRSS, APPROXIMATELY 35 SNUBBERS WERE ADDED,  
65 RIGID RESTRAINTS WERE REDESIGNED, AND 11 SNUBBERS  
UPGRADED, ANY REDESIGN OR ADDITIONS WERE DONE TO  
MEET THE ABS CRITERIA.

SRSS VS ABS EVALUATION SUMMARY - BOP  
WETWELL

PRELIMINARY ANALYSIS  
EVALUATION NO LONGER VALID

- NEW NRC LOAD DEFINITIONS
- QUENCHER DESIGN VS. RAMSHEAD

LOGIC FOR EXCEEDING ALLOWABLES WITH ABS

- 1) CONSERVATIVE DAMPING
- 2) CONSERVATISM OF RESPONSE SPECTRA ANALYSIS VS TIME HISTORY
- 3) CODE ALLOWABLES BASED ON CONSERVATIVE YIELD STRENGTHS
- 4) USE OF QUENCHER FOR SRV EXPECTED TO REDUCE PRESENT SRV DESIGN LOAD ██████████
- 5) *LOAD DEFINITIONS SATISFY NEWMARK/KENNEDY CRITERIA FOR USING SRSS*



CONSERVATIVE CODE ALLOWABLES

STEM	NODE	MATERIAL	ALLOWABLE STRESS ASME SECTION III	MIN. YIELD* ASME SECTION III	ACTUAL YIELD	UPGRADED ALLOWABLE STRESS
-1	120A	106 GRB	20,000 PSI	35,000 PSI	55,100 PSI	31,486 PSI
-3	370	106 GRB	18,000 PSI	35,000 PSI	47,900 PSI	24,634 PSI
-1	85A	106 GRB	24,750 PSI	35,000 PSI	45,100 PSI	31,892 PSI
-16	20B	106 GRB	24,750 PSI	35,000 PSI	45,100 PSI	31,892 PSI
-16	30A	106 GRB	24,750 PSI	35,000 PSI	45,100 PSI	31,892 PSI

\*BASED ON 100°F

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BOP PIPING/SUPPORTS  
SUMMARY & CONCLUSIONS

- 1) EXTENSIVE MODIFICATIONS HAVE BEEN MADE
- 2) CONSERVATIVE LOAD DEFINITIONS HAVE BEEN USED
- 3) CONSERVATIVE ANALYSIS TECHNIQUES ARE USED
- 4) JUSTIFICATION HAS BEEN GIVEN
- 5) NRC APPROVAL OF SRSS REQUESTED

RE-EVALUATION OF BOP COMPONENTS:

PROCEDURES

RE-QUALIFICATION STATUS

OUTSTANDING ITEMS

MODIFICATIONS & NEW TESTING

CONCLUSIONS

## REQUALIFICATION PROCEDURES

ALL BOP COMPONENTS WERE QUALIFIED FOR THE ORIGINAL SEISMIC DESIGN BASIS.

REGARDLESS OF QUALIFICATION METHODS USED, THEY WERE RE-EVALUATED FOR THE FOLLOWING BOUNDING COMBINATIONS:

<u>CASE</u>	<u>OBE + OT*</u>	<u>SSE + OT*</u>	<u>SSE + LOCA**</u>	<u>SSE + AP</u>	<u>AP</u>
A	B-SRSS	C-SRSS	-	-	-
B	B-ALS	C-ABS	-	-	-

\*OT =  $SRV_{ALL}$  IS USED SINCE IT IS BOUNDING ALL OTHER TRANSIENTS (RV-1, RV-2, ...)

\*\*LOCA = CHUGGING, CONDENSATION OSCILLATION AND VLC.

## STATUS OF MECHANICAL EQUIPMENT

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ABS</u>	<u>REMARKS</u>
RBCCW PUMPS	OK	OK	RE-ANALYZED BY S&L
NITROGEN CYLINDER RACKS	OK	OK	"
MSRV ACC. TANKS (3)	OK	OK	"
" (6)	OK	OK	"
" (13)	OK	OK	"
RBCCW EXP. TANKS	OK	OK	"
CSCS WATERLEG PUMPS	OK	OK	ANALYSIS
RBCCW HEAT EXCHANGERS	NO	NO	*ANALYSIS
VALVES (ALL)	**	**	**

\* STRUCTURAL SUPPORT AND BASE HARDWARE MODIFICATION REQUIRED.

\*\* PIPE SYSTEM LOADS AND ACCELERATIONS WILL BE LIMITED TO THE VALUES THE VALVES WERE ORIGINALLY QUALIFIED.

# RBCCM PUMPS

METHOD OF REQUALIFICATION: ANALYSIS BY ABSOLUTE SUM

<u>LOCATION</u>	<u>STRESSES</u>	
	MAX. STRESS KSI	ALLOWABLE STRESS KSI
PUMP SUPPORT PEDESTAL	28.25	32.40
SUCTION FLANGE	21.10	31.50
DISCHARGE FLANGE	20.47	31.50
MOTOR SHAFT	4.48	36.00

	<u>DEFLECTIONS</u>	
	MAXIMUM DEFLECTION IN	ALLOWABLE DEFLECTION IN
PUMP SHAFT	0.00865	0.010
MOTOR SHAFT	0.00244	0.010

# NITROGEN CYLINDER RACKS

METHOD OF QUALIFICATION: ANALYSIS BY ABSOLUTE SUM

<u>LOCATION</u>	<u>STRESSES</u>	
	MAX. STRESS KSI	ALLOWABLE STRESS KSI
WELD	5.15	12.00
CHANNELS	3.20	21.60
TOP BRACKET	15.45	21.60
ANCHOR BOLTS	19.29	25.50

	<u>DEFLECTIONS</u>	
	MAX. DEFLECTION IN	ALLOWABLE DEFLECTION IN
TOP BRACKET	0.007	NO LIMIT
TOP CHANNEL	0.040	NO LIMIT
BOTTOM CHANNEL	0.013	NO LIMIT

# MSRV ACCUMULATOR TANKS

METHOD OF REQUALIFICATION: ANALYSIS BY ABSOLUTE SUM

## 27" x 12-3/4" CYLINDRICAL TANKS

<u>LOCATION</u>	<u>STRESSES</u>	
	MAX. STRESS KSI	ALLOWABLE STRESS KSI
BOTTOM OF SHELL AT SADDLE	3.00	16.44
NOZZLE	14.90	16.44

## 44" x 20" CYLINDRICAL TANKS

BOTTOM OF SHELL AT SADDLE	3.403	16.44
NOZZLE	8.94	16.44

## 39" x 20" CYLINDRICAL TANKS

BOTTOM OF SHELL AT SADDLE	3.89	16.44
NOZZLE	8.94	16.44



# RBCCW EXPANSION TANKS

METHOD OF REDUALIFICATION: ANALYSIS BY ABSOLUTE SUM

## LOCATION

## STRESSES

MAX. STRESS

ALLOWABLE STRESS

KSI

KSI

BOTTOM OF SHELL AT SADDLE

21.8

24.7

NOZZLE

13.49

13.7

MAXIMUM  
DEFLECTION  
IN

ALLOWABLE  
DEFLECTION  
IN

SUPPORT AT TANK

0.0021

NO LIMIT

ZIMMER-1 MECHANICAL BOP EQUIPMENT

COMPONENT NAME: RBCCW HEAT EXCHANGERS 1WRO2AA

QUALIFICATION METHOD: ANALYSIS	ORIGINAL QUALIFICATION (SEISMIC ONLY)		REVISED QUALIFICATION (SEISMIC + SRV LOADS)	
	OBE	DBE	OBE	DBE
1. CALCULATED NATURAL FREQUENCY	$F_{H_1} > 33 \text{ Hz}, F_{H_2} = 29.1 \text{ Hz}$ $F_V = 29.1 \text{ Hz}$		$F_{H_1} > 33 \text{ Hz}, F_{H_2} = 29.1 \text{ Hz}$ $F_V = 29.1 \text{ Hz}$	
2. REQUIRED G-LEVEL:				
OBE	$H_1 = 0.33, H_2 = 0.32, H_V = 0.9$		$H_1 = 0.6, H_2 = 0.58, H_V = 1.8$	
DBE	$H_1 = 0.56, H_2 = 0.46, H_V = 1.7$		$H_1 = 0.7, H_2 = 0.63, H_V = 1.6$	
3. TYPE OF ANALYSIS:				
A. STATIC	---		---	
B. EQUIVALENT STATIC	YES		YES	
C. DYNAMIC	YES		YES	
D. RESPONSE SPECTRUM	---		---	
E. TIME-HISTORY	---		---	
4. SUMMARY OF STRESSES:	OBE	DBE	OBE	DBE
A. LOCATION	ANCHOR BOLTS		ANCHOR BOLTS	
B. SEISMIC STRESS	---	---	---	---
C. TOTAL STRESS			127 KSI	133 KSI
D. ALLOWABLE STRESS	57 KSI	76 KSI	57 KSI	76 KSI
5. DEFLECTIONS:				
A. MAXIMUM	NO CRITICAL DEFLECTIONS		NO CRITICAL DEFLECTION	
B. ALLOWABLE	$\pm 3/8''$		$\pm 3/8''$	

ZIMMER-1 MECHANICAL BOP EQUIPMENT (CONT'D)

6. REMARKS:

- A. SUPPORT PEDESTAL SYSTEM AND ARRANGEMENT ARE BEING REVIEWED AND REDESIGNED TO TAKE THE OVERSTRESSED LOADS ON THE ANCHOR BOLTS AND FOUNDATION COMPONENTS;
- B. STRESS ANALYSIS OF HEAT EXCHANGER SHELL RINGS AND NOZZLES INDICATE STRESSE LEVELS MUCH LOWER THAN ALLOWABLES AS PER ASME CODE.

ZIMMER-1 MECHANICAL BOP EQUIPMENT

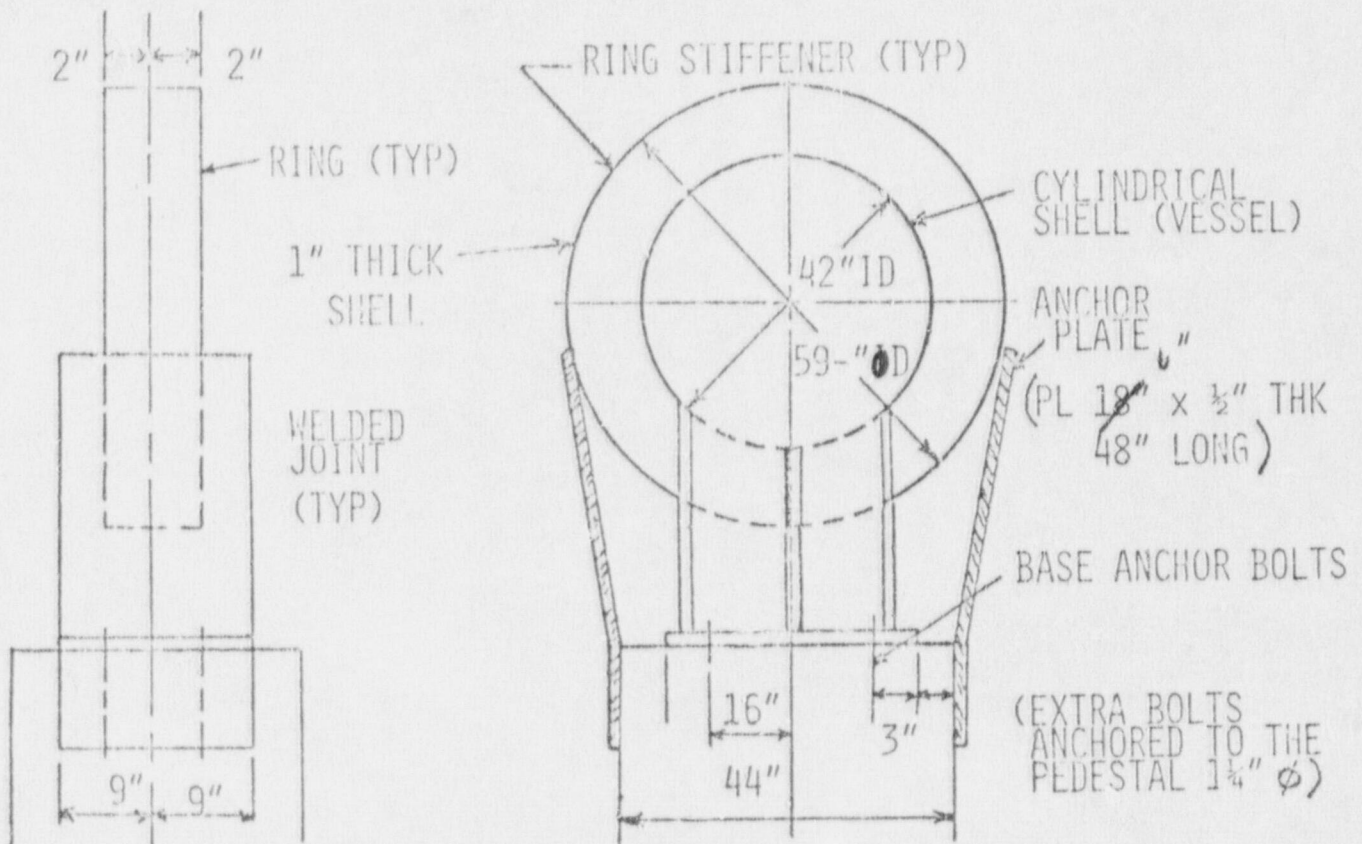
COMPONENT NAME RBCCW HEAT EXCHANGERS - 1WRO2AB/AC

QUALIFICATION METHOD: ANALYSIS	ORIGINAL QUALIFICATION (SEISMIC ONLY)		REVISED QUALIFICATION (SEISMIC + SRV LOADS)	
	CALCULATED NATURAL FREQUENCY	$F_{H1} > 33 \text{ Hz}, F_{H2} = 32.6 \text{ Hz}$ $F_V = 32.6 \text{ Hz}$		$F_{H1} > 33 \text{ Hz}, F_{H2} = 32.6 \text{ Hz}$ $F_V = 32.6 \text{ Hz}$
REQUIRED G-LEVEL:				
	OBE	$H_1=0.33, H_2=0.32, H_V=0.75$	$H_1=0.33, H_2=0.32, H_V=0.75$	$H_1=0.33, H_2=0.32, H_V=0.75$
DBE	$H_1=0.56, H_2=0.46, H_V=1.46$	$H_1=0.56, H_2=0.46, H_V=1.46$	$H_1=0.56, H_2=0.46, H_V=1.46$	$H_1=0.56, H_2=0.46, H_V=1.46$
TYPE OF ANALYSIS:				
A. STATIC	---		---	
B. EQUIVALENT STATIC	YES		YES	
C. DYNAMIC	YES		YES	
D. RESPONSE SPECTRUM	---		---	
E. TIME-HISTORY	---		---	
SUMMARY OF STRESSES:				
	OBE	DBE	OBE	DBE
A. LOCATION	ANCHOR BOLTS		ANCHOR BOLTS	
B. SEISMIC STRESS	---	---	---	---
C. TOTAL STRESS			108 ksi	136 ksi
D. ALLOWABLE STRESS	57 ksi	76 ksi	57 ksi	76 ksi
DEFLECTIONS:				
A. MAXIMUM	NO CRITICAL DEFLECTIONS		NO CRITICAL DEFLECTIONS	
B. ALLOWABLE	$\pm 3/8"$		$\pm 3/8"$	

REMARKS:

- A. SUPPORT PEDESTAL SYSTEM AND ARRANGEMENTS ARE BEING REVIEWED AND REDESIGNED TO TAKE THE OVERSTRESSED LOADS ON THE ANCHOR BOLTS AND FOUNDATION COMPONENTS.
- B. STRESS ANALYSIS OF HEAT EXCHANGER SHELL, RINGS AND NOZZLES INDICATE STRESS LEVELS MUCH LOWER THAN ALLOWABLES AS PER ASME CODE.

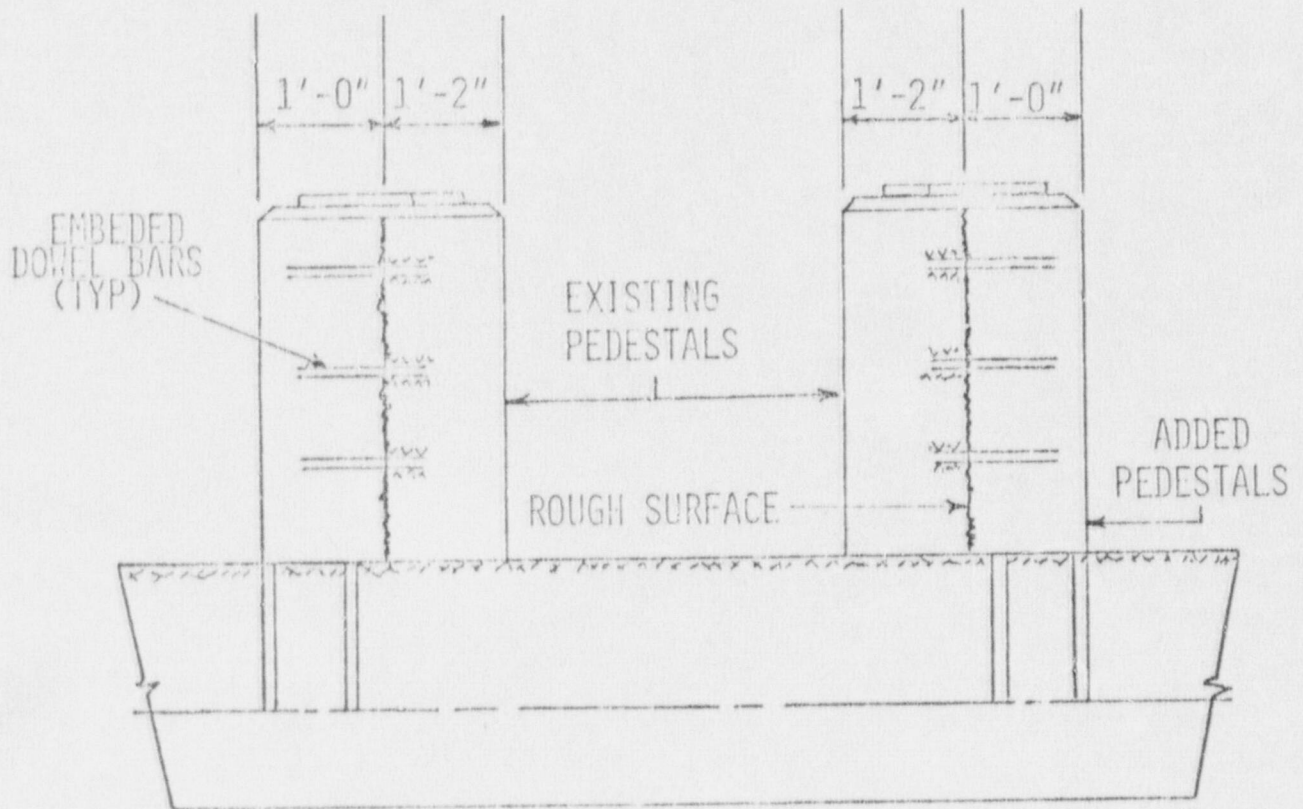
~~PROPOSED~~ MODIFICATION TO  
HEAT EXCHANGER FOUNDATION SYSTEM  
PRELIMINARY DESIGN



(NOTE: SLOTTED HOLES ARE AT THE FAR END)

REMARKS: THE ANCHOR PLATE (PL 6" x 1/2" THK X 48" LONG) WILL BE WELDED TO THE OUTER RING AT THE UPPER END AND THEN BOLTED IN PLACE TO THE CONCRETE PEDESTAL. THE PLATE WILL CARRY SLOTTED HOLES AT THE FAR-END TO PERMIT THERMAL EXPANSION OF THE VESSEL FREELY ALONG AXIAL DIRECTION.

TYPICAL MODIFIED FOUNDATION PLAN FOR HEAT EXCHANGER SUPPORT SYSTEM



## STATUS OF ELECTRICAL EQUIPMENT

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ABS</u>	<u>REMARKS</u>
480v. MOTOR CONTROL CENTERS	OK	OK	TEST
ELEC. PENET. ASSYS.	OK	OK	ANALYSIS
250v. DC. DIST. EQUIP.	OK	OK	TEST
VALVE OPERATORS:			
SMB-000	*	*	*TEST
SMB-1	*	*	*TEST
SMB-3	*	*	*TEST

\* PIPE SYSTEM ACCELERATION WILL BE LIMITED TO THE VALUES THE OPERATORS WERE ORIGINALLY QUALIFIED.

## STATUS OF HVAC EQUIPMENT

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ABS</u>	<u>REMARKS</u>
MISTURE SEPARATOR (SGTS)	OK	OK	RE-ANALYZED BY S&L
PRESSURE TRANSMITTER (SGTS) MODEL ITT BARTON #384	OK	OK	TEST
TEMP. TRANSMITTER (SGTS) ALLISON MODEL #1052	OK	OK	TEST
TEMP. SWITCHES (SGTS) MERCROID #DAW-7038-80452	OK	OK	TEST
BLAST COIL HEATERS (SGTS) INDEECO	OK	OK	ANALYSIS
BACK PRESSURE DAMPERS (SGTS)	OK	OK	ANALYSIS
LIQUID LEVEL CONTROLS (SGTS) MERCROID #201G-7710	OK	OK	TEST
SOLENOID VALVE (SGTS) ATKOMATIC	OK	OK	TEST
DELUGE PIPING (SGTS)	OK	OK	ANALYSIS
BACK DRAFT DAMPERS (SGTS)	OK	OK	ANALYSIS
SECONDARY FANS (SGTS)	OK	OK	ANALYSIS
PRIMARY FANS (SGTS)	OK	OK	ANALYSIS
PRE-FILTERS (SGTS)	OK	OK	ANALYSIS



## STATUS OF HVAC EQUIPMENT (CONT'D)

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ABS</u>	<u>REMARKS</u>
HEPA FILTERS	OK	OK	TEST
SGTS MAIN HOUSING UNIT	OK	OK	ANALYSIS
CSCS EQUIP. COOLING FANS	OK	OK	ANALYSIS
AIR SENSORS - AIR MONITOR CORP. #SMD-116	OK	OK	ANALYSIS
SPECIAL COIL CABINETS	OK	OK	RE-ANALYZED BY S&L
REFRIGERATION SPECIALTIES	OK	OK	TEST
HVAC DAMPERS	OK	OK	ANALYSIS
DAMPER-OPERATOR ASSY.	-	-	TO BE TESTED TO ABS.

## SGT SYSTEM MOISTURE SEPARATORS

METHOD OF REQUALIFICATION: ANALYSIS BY ABSOLUTE SUM

	<u>STRESSES</u>	
LOCATION	MAX. STRESS KSI	ALLOWABLE STRESS KSI
STEEL FRAME	10.56	22.00

## SPECIAL COIL CABINETS

METHOD OF REQUALIFICATION: ANALYSIS BY ABSOLUTE SUM

	<u>STRESSES</u>	
LOCATION	MAX. STRESS KSI	ALLOWABLE STRESS KSI
BEAM	8.00	21.60
PLATE	1.75	21.60
TUBE	0.69	9.00
NOZZLE	13.15	35.00

	<u>DEFLECTION</u>	
LOCATION	MAXIMUM DEFLECTION (IN)	ALLOWABLE DEFLECTION (IN)
TUBE	0.0025	NO LIMIT

# STATUS OF CONTROL & INSTRUMENTATION

EQUIPMENT NAME	SRSS	ABS	REMARKS
W & T CHLORINE DETECTOR #50-125A	OK	OK	RE-TESTED WITNESSED/ REPORT PENDING
" #50-125D	OK	OK	"
DELAVAL LEVEL SWITCH #30497	OK	OK	"
PYROTRONICS SMOKE DETECTOR #DIS-3/5A	OK	OK	"
PYROTRONICS CONTROL UNIT #CTZ-2	OK	OK	"
PYROTRONICS INDICATING UNIT #FIU-6	OK	OK	"
PYROTRONICS ZONE UNIT #ZIU-6	OK	OK	"
UNITED ELECTRIC TEMPERATURE SWITCH #303	OK	OK	"
HAYS DIFF. TRANSMITTER #252A	OK	OK	"
" #252 $\sqrt{x}$	OK	OK	"
UNITED ELECTRIC TEMPERATURE SWITCH #800	OK	OK	"
SOLON D.P. SWITCH #7PS	OK	OK	"
Dwyer D.P. SWITCH #1638	OK	OK	"

# STATUS OF CONTROL & INSTRUMENTATION (CONT'D)

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ABS</u>	<u>REMARKS</u>
GL TRANSFER SWITCH #SB-1	OK	OK	RE-TESTED WITNESSED/ REPORT PENDING
GE CONTROL SWITCH #SBM	OK	OK	"
AGASTAT TIME DELAY RELAY #7012AD	OK	OK	"
ASCO SOLENOID VALVE #8320	OK	OK	"
LOVE TEMPERATURE CONTROLLER #54	OK	OK	"
LOVE CURRENT RELAY #48	OK	OK	"
LOVE CURPENT RELAY #56	OK	OK	"
GE CONTROL RELAY #IIM A	OK	OK	"
GE CONTROL RELAY #HFA	OK	OK	"
BACHARACH AMMONIA DETECTOR (CONTROLLER ONLY) #38-H	OK	OK	"
WELD RID	OK	OK	"
NAMCO LIMIT SWITCH #EA700	OK	OK	"
ITT DAMPER MOTOR #AH91	OK	OK	"
" #NH91	OK	OK	"
" #AH95	OK	OK	"
" #NH95	OK	OK	"

STATUS OF CONTROL & INSTRUMENTATION (CONT'D)

<u>EQUIPMENT NAME</u>	<u>SRSS</u>	<u>ADS</u>	<u>REMARKS</u>
PYROTROINICS SMOKE DETECTOR #CDA-2	OK	OK	TESTED WITNESSED/ REPORT PENDING
" #DIA-11	OK	OK	"
BACHARACH NH <sub>3</sub> DETECTOR HEAD #350-H	OK	OK	"
ROSEMONT PRESSURE TRANSMITTER #1152DP4A22	OK	OK	TEST
ROSEMONT TEMPERATURE SENSOR #88-14-1	OK	OK	"
DRESSER TEMPERATURE INDICATORS #E160E-060 & #A160E-060	OK	OK	"
DRESSER PRESSURE GAUGES #1009S & #1009SL	OK	OK	"
ITT BARTON DIFF. PRESSURE SWITCH #288A	OK	OK	"
HVAC CONTROLS PANEL	OK	OK	ANALYSIS
PRIMARY CONTAINMENT ATMOSPHERIC SAMPLING SYSTEM			REPORT NOT IN
MISC. CONTROL PANEL & INSTRUMENTS			REPORTS PENDING

## QUALIFICATION STATUS SUMMARY

PERCENTAGE OF COMPLETION - 90%

### A. EQUIPMENT REQUIRING HARDWARE MODIFICATION:

#### 1. RBCCW HEAT EXCHANGERS -

STRUCTURAL SUPPORT MODIFICATION

SADDLE SUPPORT BASE MODIFICATION TO INCREASE  
NUMBER OF ANCHOR BOLTS.

### B. EQUIPMENT REQUIRING RETEST:

1. SEVERAL HVAC INSTRUMENTATION - TEST COMPLETED,  
WAITING FOR FINAL REPORTS.

2. DAMPER/OPERATOR ASSEMBLY - TEST SCHEDULE 11-10-78.

### C. EQUIPMENT NOT YET QUALIFIED:

1. PRIMARY CONTAINMENT ATMOSPHERIC SAMPLING SYSTEM

2. MISCELLANEOUS CONTROL PANEL & INSTRUMENTS

## CONCLUSIONS

- I. ALL DOP EQUIPMENT WILL MEET THE NEW LOADS.
  - A) EQUIPMENT QUALIFIED BY TEST - NOT MEETING NEW LOADS, WERE/WILL BE TESTED TO NEW LOAD (ABS)
  - B) EQUIPMENT QUALIFIED BY ANALYSIS - NOT MEETING NEW LOADS WERE/WILL BE QUALIFIED BY DESIGN/HARDWARE MODIFICATIONS FOR ABS.
- II. ALL VALVES AND OPERATORS WILL BE SHOWN TO MEET SRSS AS MINIMUM\*. IF THIS DOES NOT HAPPEN, MODIFICATIONS WILL BE MADE TO MEET ABS.

\* ALL VALVES SHALL BE CHECKED FOR ABS ALSO.  
THESE VALVES WHICH MEET SRSS AND DONOT MEET  
ABS SHALL BE IDENTIFIED

SUMMATION OF STRUCTURAL ELEMENTS  
TO MEET ABSOLUTE SUM CRITERIA

	<u>PER CENT</u>
<u>CONCRETE</u>	
SLABS, BEAMS, SHEAR WALLS, AND POOL WALLS	100
<u>STEEL</u>	
STANDARD CABLE TRAY HANGERS	90
SPECIAL CABLE TRAY HANGERS	100
CONDUIT HANGERS	100
HVAC HANGERS	100
STABILIZER TRUSS	100
SUPPRESSION POOL FRAMING	100
FRAMING OUTSIDE CONTAINMENT	100
DRYWELL FRAMING	75
EMBEDMENTS	REASSESSMENT IS STILL IN PROGRESS



## DRYWELL FRAMING

SEVENTY-FIVE PERCENT OF THE STRUCTURAL STEEL IN THE DRYWELL AREA OF THE REACTOR CONTAINMENT MEETS THE ABSOLUTE SUMMATION CRITERION. THE REMAINING 25% OF THE FRAMING HAD TO BE MODIFIED AS SHOWN ON THE ATTACHED TABLES TO MEET THE CRITERION. (A TOTAL OF 87 EXISTING MEMBERS REQUIRED MODIFICATIONS AND 15 STRUCTURAL MEMBERS WERE ADDED TO MEET THE ABSOLUTE SUM CRITERION.)

TABLE 1

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-398, ELEVATION 535'-11 1/2" & 532'-9"		
1	W27x160 (50)	Side Plate (Det. E)
7	W10x21	Cover Plates (Det. B)
10	W24x68	Cover Plates (Det. F)
14	W14x30 W/ Cover Plate	Side Plate (Det. E)
15	W14x30	Cover Plates (Det. B)
17	W14x43	Side Plates (Det. D)
20	W14x314 & W24x68 I-	Cover Plates (Det. B)
29	W14x314 & W24x68 & Cover Plate I-	Cover Plates (Det. B)
39A	-	Add MC8x22.8
39B	-	Add W8x17
69	W24x68	Side Plates (Det. H)
74	W24x68	Side Plate (Det. G)
80	W14x38	Cover Plates (Det. B)
83	W10x21	Side Plates (Det. D)
85	W8x17	Side Plates & Cover Plates (Det. B&E)
86	W14x34	Side Plate (Det. E)
93	W18x55	Cover Plate (Det. B)

TABLE 1 (continued)

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-398, ELEVATION 535'-11 1/2" & 532'-9"		
151	-	Add 2 Angles 6x4x7/16
152	-	Add W8x67
153	-	Add 2 Angles 6x4x7/16
154	-	Add 2 Angles 6x4x7/16
RECIRC POST	W12x65	Replace with* built up section
RECIRC POST	W12x65	Replace with* built up section

\*SEE FIGURE 1

MODIFICATIONS FOR RECIRC. POSTS

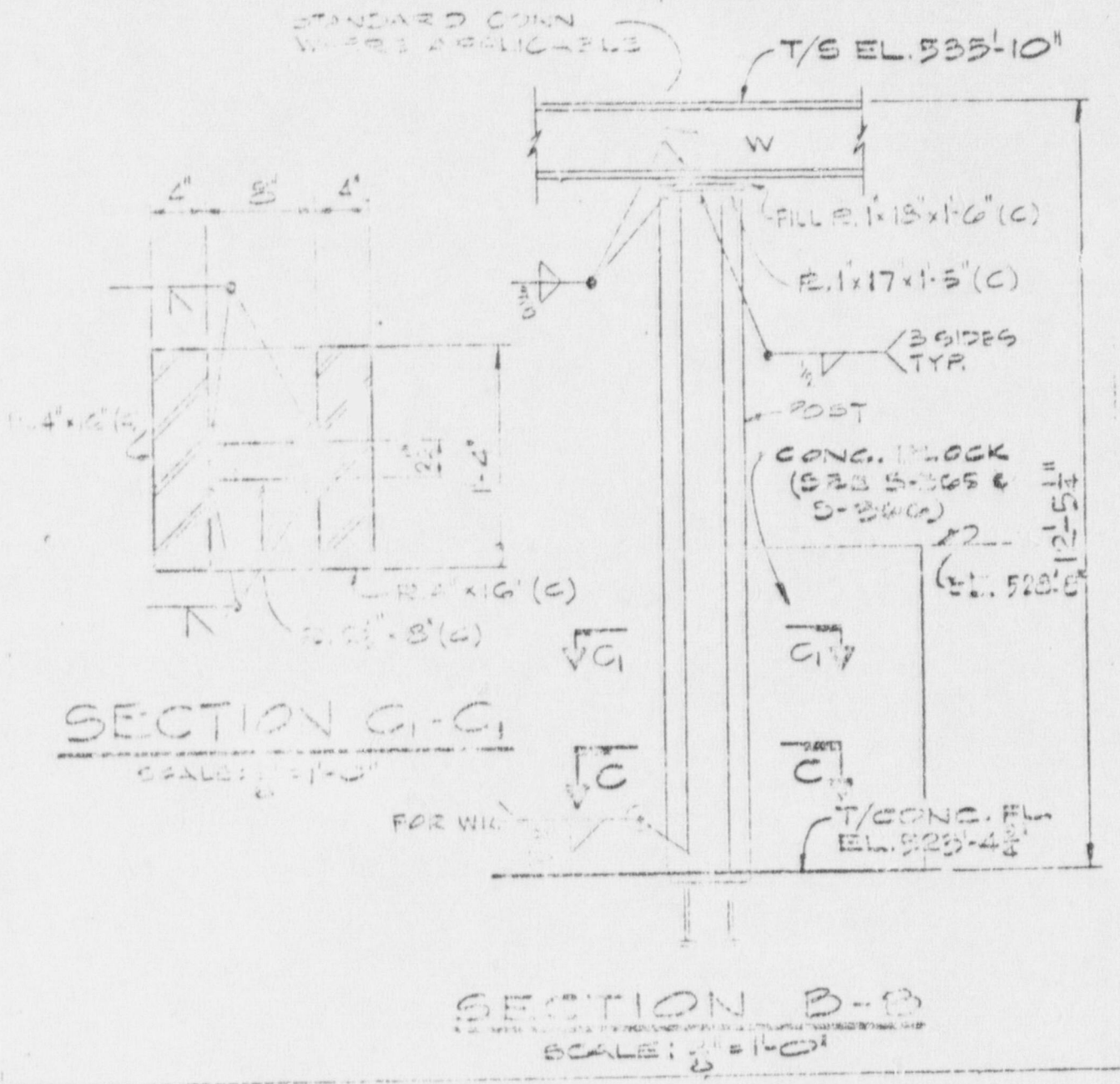
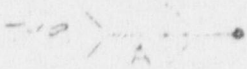
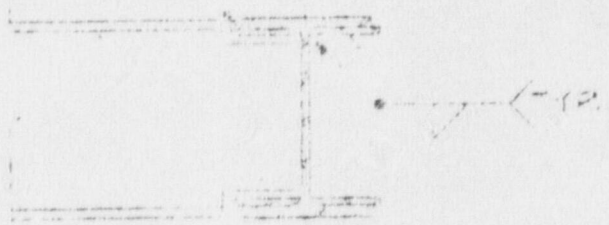


FIGURE 1

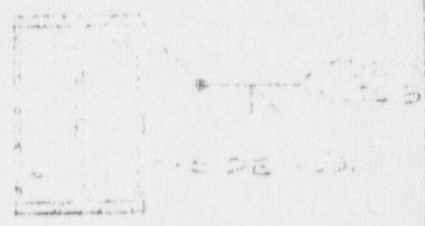
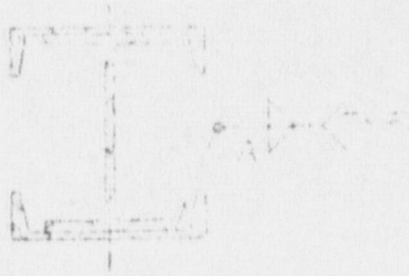
TYPICAL MODIFICATION DETAILS



DETAIL A



DETAIL B



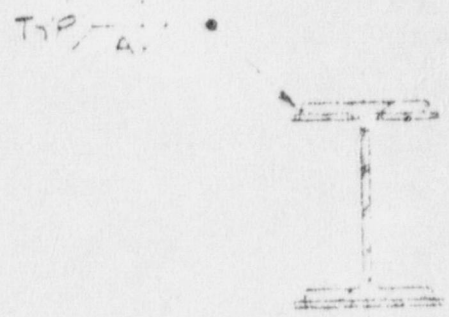
DETAIL C

DETAIL D

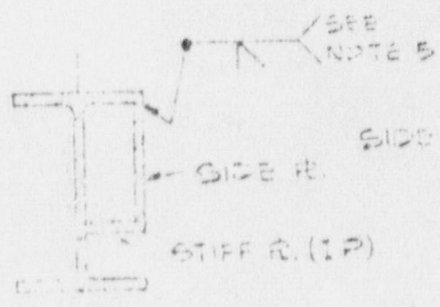
TYPICAL MODIFICATION DETAILS



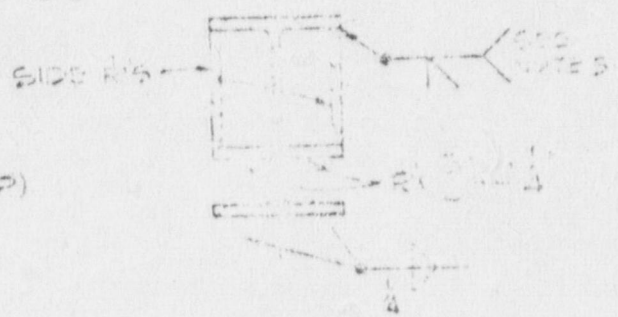
DETAIL E



DETAIL F



DETAIL G



DETAIL H

## CABLE TRAY HANGERS

1. 100% OF SPECIAL CABLE TRAY HANGERS MEET THE ABSOLUTE SUMMATION CRITERIA. NO MODIFICATIONS ARE REQUIRED.
  
2. STANDARD CABLE TRAY HANGERS
  - A. 90% OK FOR AES
  - B. REMAINING 10% OK FOR SRES
  - C. NEED ACCEPTANCE OF 10% FOR SRES (10 HANGERS).

ASIS FOR EXCEEDING ALLOWABLE  
- WITH ABS

---

CONSERVATIVE DAMPING

CONSERVATIONISM OF RESPONSE SPECTRA  
ANALYSIS VS TIME HISTORY

ALLOWABLES BASED ON

CONSERVATIVE YIELD STRENGTHS

4) USE OF CURRENT A. S. S. EXPECTED  
TO BE PRESENT IN DESIGN  
LOAD.

5) LOAD DEFINITION MEETS  
DR. NEWMARK'S CRITERIA FOR SLS

1) LOCAL YIELDING / BUCKLING BUT  
NO HANGER FAILURE



SUMMARY  
EPS / AYS  
EVALUATION.

EVALUATIONS PRESENTED

SUBSTANTIAL CHANGES MADE

SPECIAL LIMITED EXCEPTIONS IDENTIFIED

JUSTIFICATIONS PROVIDED

MR. [unclear]

TABLE 1 (continued)

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-398, ELEVATION 535'-11 1/2" & 532"-9"		
96	W8x31	Side Plates (Det. D)
98	W8x17	Cover Plate (Det. B)
103	W10x21	Side Plates (Det. D)
104	W10x54 W/ Cover Plate	Side Plate (Det. E)
106	W24x68	Side Plate (Det. E)
113	W10x21	Side Plate (Det. E)
116	W8x10	W12x27
122	W10x21	Cover Plates & Side Plate (Det. B&E)
75A	-	Add 2 Angles 6x4x7/16
75C	-	Add 2 Angles 6x4x7/16
75D	-	Add 2 Angles 6x4x7/16
145	-	Add 2 Angles 6x4x7/16
146	-	Add W8x67
147	-	Add 2 Angles 6x4x7/16
148	-	Add W8x67
149	-	Add 2 Angles 6x4x7/16
150	-	Add W8x67

TABLE 2

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-399, ELEVATION 561'-8 1/2"		
4	W12x190	W18x 70 W/ Side Plate (Det. D)
6	W10x33	Cover Plate (Det. B)
7	W10x21	W18x70 Side Plate (Det. D)
8	W10x21	Side Plate (Det. D)
9	W10x21	Cover Plate (Det. B)
10	W10x21	Side Plate (Det. D)
14	W36x230	Cover Plate (Det. B)
17	W3x17	W10x49 Side Plate (Det. D)
18	W27x177	Side Plate (Det. D)
19	W10x21	W10x49 Side Plate (Det. D)
20	W12x50	W16x88 W/ Side Plate (Det. D)
21	W24x68 & MC18x48.8	W24x94 W/ Side Plate (Det. D)
29	W24x68 & C15x40	Add C15x40 Top (Det. C)
33	W8x10	Cover Plate (Det. B)
34	W10x21	Side Plate (Det. E)

TABLE 2 (continued)

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-399, ELEVATION 561'-8 1/2"		
73	W12x79	Cover Plate (Det. B)
76	W8x17	W10x89
78	W10x21	W10x54 W/ Side Plates (Det. D)
81	W27x177	Side Plates (Det. D)
82	W8x17	Side Plates (Det. D)
86	W36x230 (50)	Cover Plates (Det. B)
87	W10x21	W18x70 W/ Side Plate (Det. E)
88	W10x33	Cover Plates (Det. B)
89	W8x17	Side Plates (Det. D)
91	W8x17	Side Plates (Det. D)
92	W10x21	W18x70 W/ Side Plates (Det. D)

DRAWING S-399, ELEVATION 546'-5 1/2"

1	W10x39/ C12x20.7	Add C12x20.7 & Side Plates (Det. C&D)
2	W10x39/ C12x20.7	Add C12x20.7 & Side Plates (Det. C&D)
3	W12x27	Side Plates (Det. D)

TABLE 2 (continued)

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
DRAWING S-399, ELEVATION 546'-5 1/2"		
4	W12x27	Side Plates (Det. D)
9	W12x27 & Cover Plate	Side Plates (Det. D)
10	W12x27 & Cover Plate	Side Plates (Det. D)
13	W21x68	Side Plates (Det. D)
14	W21x68	Side Plates (Det. D)

TABLE 3

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
----------------	-----------------------	---

DRAWING S-400, ELEVATION 572'-6"

1	W8x28	Side Plates (Det. D)
2	W8x28 & Cover Plate	Cover Plates & Side Plates (Det. B & D)
3	W8x28	Cover Plates (Det. F)
20	W8x28	Cover Plates (Det. B)
21	W8x10	Cover Plate (Det. B)
23	W10x21	Cover Plate (Det. A)

Dwgs. S-400, Elevation 583'-7 7/8"

No Changes Required

Dwg. S-400, Elevation 590'-10"

No Changes Required

TABLE 4

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
	DRAWING S-402, ELEVATIONS 524'-10 3/4" & 525'-7"	
1	W8x17 & Cover	Side Plates (Det. D)
2	W8x17	W8x40
3	W8x20	Cover Plates (Det. F)
4	W8x17	Cover Plates (Det. F)
5	W8x17	W8x40
7	W8x17	W8x67
8	W8x17	Side Plate (Det. E)
9	W10x21	W10x112
10	W10x21	W10x112
11	W8x17	Side Plates (Det. D)
12	W8x17	Side Plate (Det. E)
13	W8x17	Cover Plates (Det. B)
14	W8x10	Cover Plates (Det. F)
20	W8x17	Cover Plates (Det. F)
42	W8x17	Side Plates (Det. D)

TABLE 5

BEAM NUMBER	EXISTING B.M. SIZE	MODIFICATION REPLACEMENT/ REINFORCEMENT
----------------	-----------------------	---

DRAWING S-403, ELEVATION 551'-4", 553'-10" & 554'-0 1/2"

3	W8x17	Cover Plate (Det. A)
7	W14x84	Side Plates (Det. D)
19	W14x111	Cover Plates (Det. B)
25	C8x11.5	W8x17
28	W10x21	W10x39
32	W12x27	Cover Plates (Det. F)
33	W12x27	Cover Plates (Det. F)
37	W8x17	Side Plates (Det. D)