

May 11, 1989

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Docket No. 50-416

FACILITY: Grand Gulf Nuclear Station, Unit 1  
LICENSEE: System Energy Resources, Inc. (SERI)  
SUBJECT: SUMMARY OF FEBRUARY 14, 1989 MEETING WITH SERI REGARDING PIPE SUPPORT CALCULATIONS

The meeting was held in the NRC Rockville Offices to discuss the staff's request for additional information (NRC letter to SERI dated January 25, 1989). Enclosure 1 is a list of attendees. Enclosure 2 is a handout prepared by the licensee.

The licensee provided results of its review of pipe supports for the alternate decay heat removal system to determine effects of torsional loads on the supports. The licensee concluded that, when the effects of torsional loads were considered the resulting total stresses were still within Code allowable stresses and the simplified design calculations were conservative. The licensee agreed to submit results of the calculations.

151

Lester L. Kintner, Senior Project Manager  
Project Directorate II-1  
Division of Reactor Projects I/II  
Office of Nuclear Reactor Regulation

Enclosures:  
As stated

cc w/enclosures:  
See next page

[GGNS MTG SUMMARY 2/14]

OFC	:PM:PD21:DRPR:D:PD21:DRPR	:	:	:	:	:	:
NAME	:LKintner:jw :EAdensam	:	:	:	:	:	:
DATE	:5/11/89	:	:5/11/89	:	:	:	:

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PDC

DF01 1/1

DISTRIBUTION FOR MEETING SUMMARY DATED: May 11, 1989

Facility: GRAND GULF NUCLEAR STATION, UNIT 1

Docket File

NRC PDR

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cc: Licensee/Applicant Service List

DF01  
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Grand Gulf Nuclear Station (GGNS)

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## TORSIONAL LOADS ON PIPE SUPPORTS

### BACKGROUND

- o Alternate Decay Heat Removal Scope
- o NRC Audit
- o NRC Letter

### SERI Response

- o Original Analysis
- o Refined Analysis Results

### CONCLUSIONS

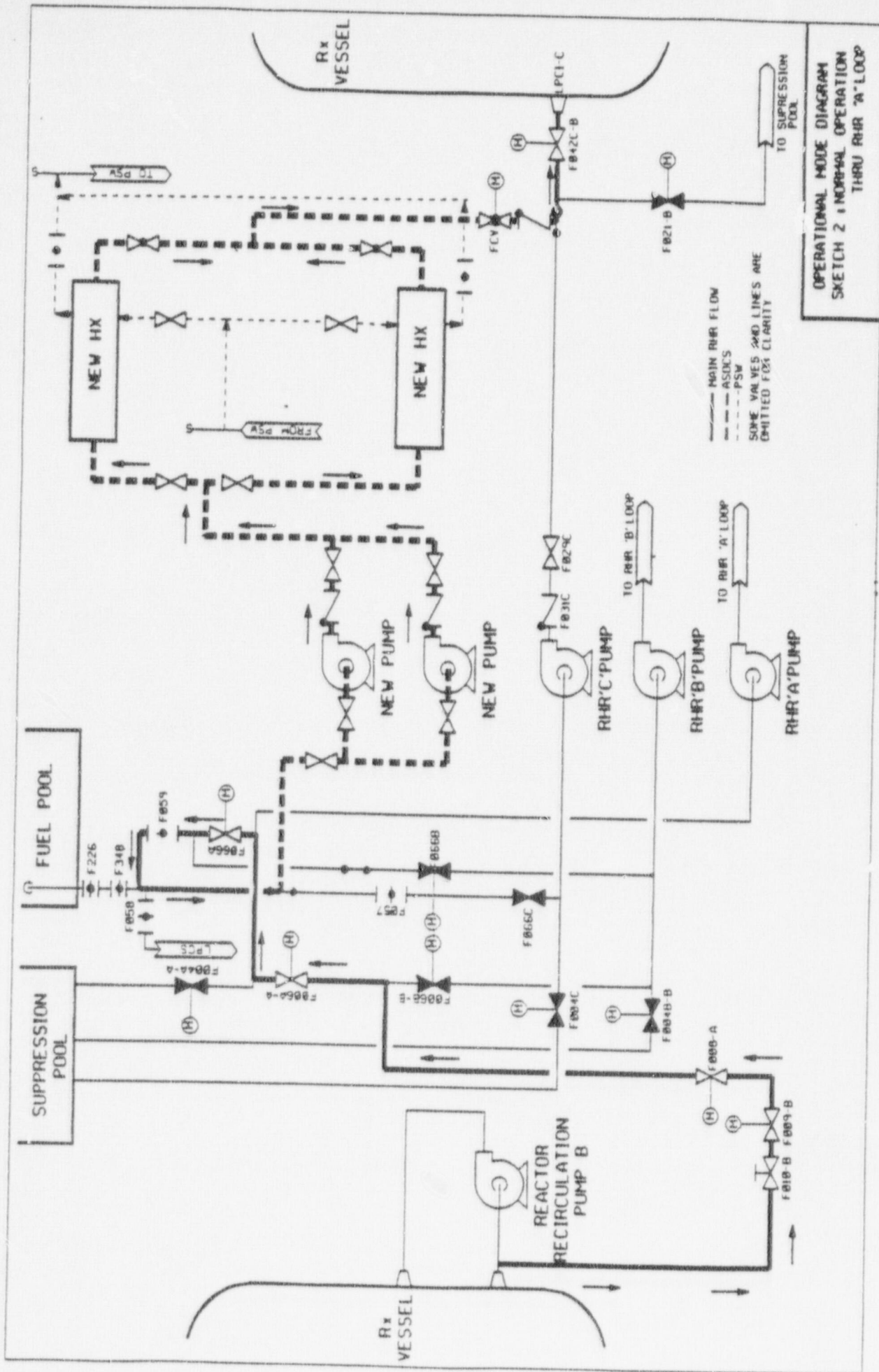
## BACKGROUND

### Alternate Decay Heat Removal Scope

o	System Scope (Figure 1)	
o	Pipe Support Scope:	
o	New Q supports	33
o	New Non-Q supports	4
o	Q Supports (load increase)	29
o	Q-supports (No load increase)	70
o	Non-Q supports (load increase)	18
o	Non-Q supports (no load increase)	10
		<hr/>
	TOTAL	164

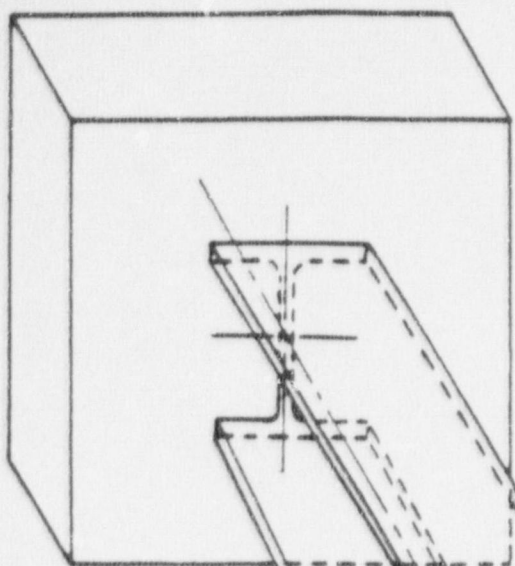
### NRC Audit Torsional Load Concern

- o Torsional Loads on Open Sections (Figure 2)
- o Consideration of Warping Shear Term

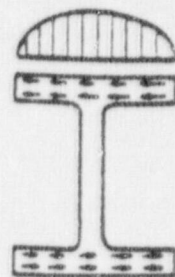


OPERATIONAL MODE DIAGRAM  
 SKETCH 2 - NORMAL OPERATION  
 THRU RHR 'A' LOOP

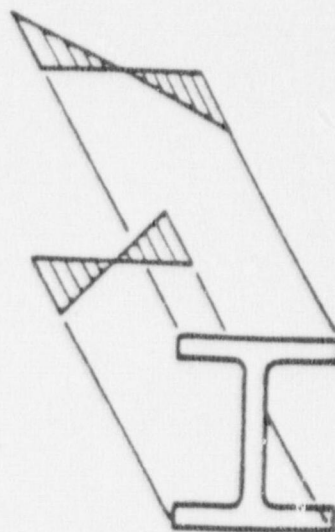
— MAIN RHR FLOW  
 - - - - - ASDCS  
 ····· PSW  
 SOME VALVES AND LINES ARE  
 OMITTED FOR CLARITY



TORSION

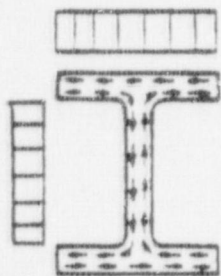


WARPING SHEAR STRESSES



WARPING NORMAL STRESSES  
(BENDING)

WARPING TORSION

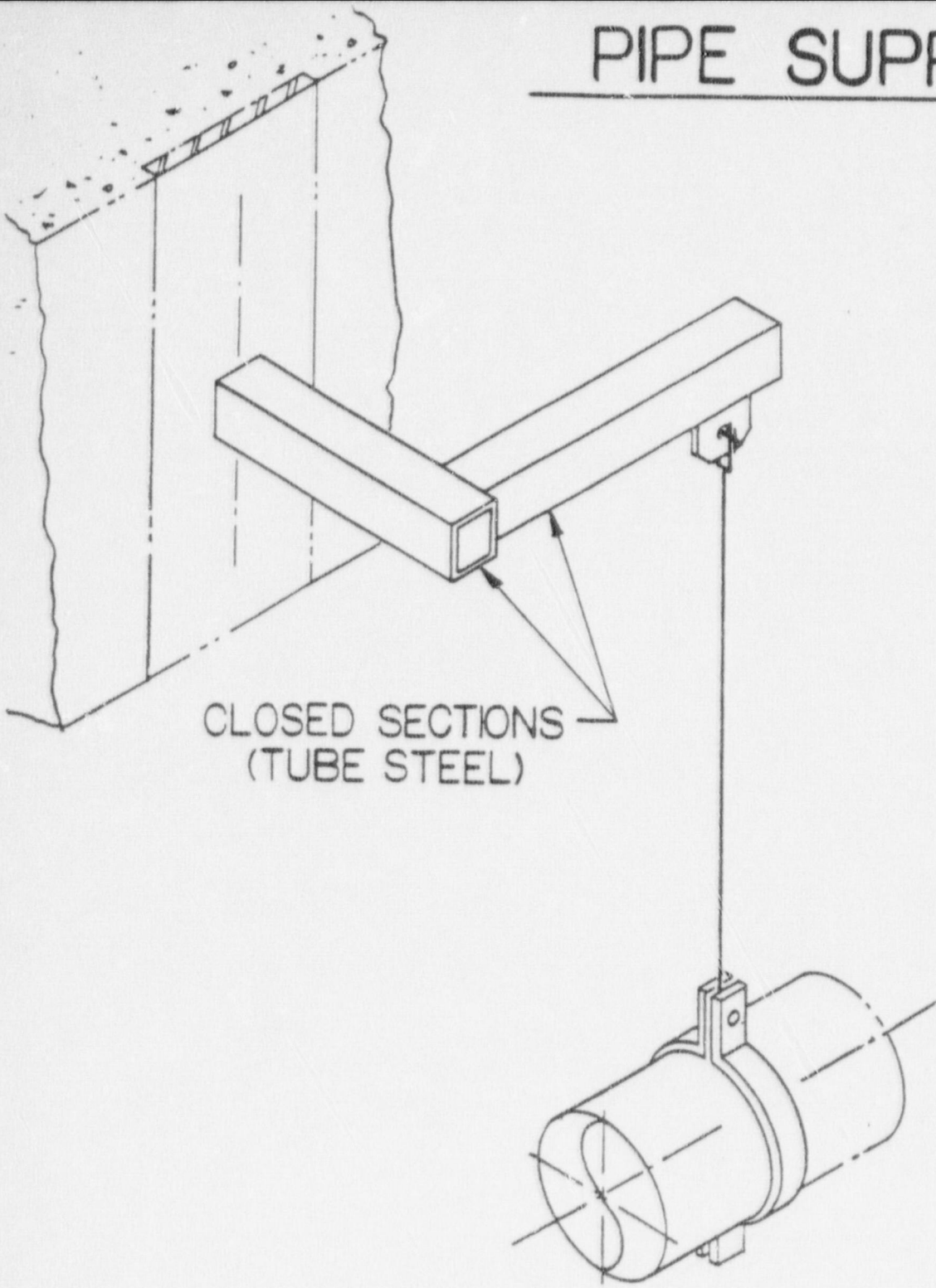


PURE TORSIONAL  
SHEAR STRESSES

ST. VENANT TORSION

(FIGURE 2)

# PIPE SUPPORT



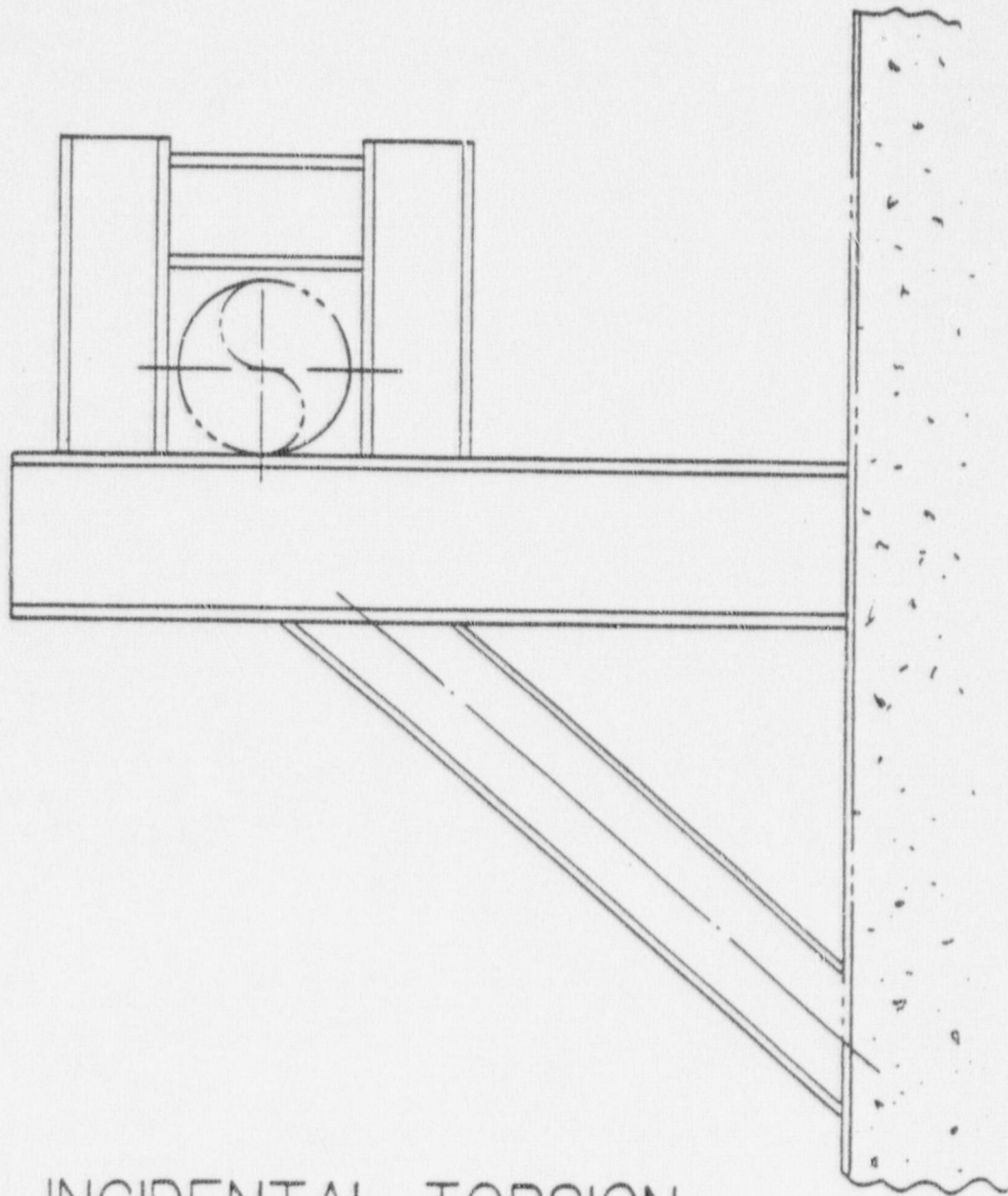
CLOSED SECTIONS  
(TUBE STEEL)

PRIMARY TORSION



# PIPE SUPPORT

NOTE: ALL MEMBERS ARE WIDE FLANGE SECTIONS (I-BEAM).



INCIDENTAL TORSION  
(DUE TO FRICTION)

## SERI RESPONSE

### Original ADHRS Calculations

- o Agree that warping shear term not explicitly considered
- o However, calculations were considered acceptable:
  - o Simplified St. Venant pure torsion approach very conservative
  - o Warping shear term is a small effect
  - o Simplified St. Venant approach envelopes warping shear component
  - o Resulting calculations are conservative

Refined Analysis:

- o SERI agreed to revise calculations:
  - o Consider warping shear
  - o Refined St. Venant pure torsion shear
  
- o Scope:
  - o Supports reevaluated: 164
  - o Open Section with Torsional Loads: 12
  
- o Results:
  - o Code Allowable met in all cases
  - o Resultant open section shear loads reduced by a factor of 45% or more
  - o Conservatism of the original calculations confirmed

## CONCLUSIONS

- o Original ADHRS pipe support calculations were conservative
- o No safety significance
- o No further evaluation warranted