Docket File

SEP 1 8 1978

DOCKET NOS. 50-361
AND 50-362

APPLICANTS: SOUTHERN CALIFORNIA EDISON COMPANY (SCE)
SAN DIEGO GAS AND ELECTRIC COMPANY (SDG&E)

FACILITY: SAN ONOFRE UNITS 2 AND 3

SUBJECT: SUMMARY OF MEETING TO DISCUSS CEDM SNUBBERS

On August 31, 1978, members of the NRC staff met with the applicant in Bethesda, Maryland to discuss the above subject. Attendees at the meeting are given in Enclosure 1.

During the course of the NRC staff review of the San Onofre 2 & 3 FSAR, a number of questions have been raised which involve the CEDM snubbers. These questions are: 112.6, 112.20, 112.22, 112.23, 112.26, 112.30, 112.31 and 112.32. The purpose of the August 31, 1978 meeting was the presentation by the applicant of all aspects of the CEDM snubber design, analysis, and testing, and a discussion of the response to be provided by the applicant to the outstanding questions relating to the snubbers. The material presented by the applicant at the meeting is given in Enclosure 2. At the conclusion of the meeting the staff indicated that the approach being taken by the applicant appeared to be reasonable but that staff conclusions about the adequacy of the design could not be reached until all the outstanding questions are answered in an amendment to the FSAR and have been reviewed by the staff.

Original Signed by
Harry Rood

Harry Rood
Light Water Reactors
Branch No. 2
Division of Project Management

Enclosures:
1. Attendance list
2. Material Presented by the Applicant

cc w/encls:
See page 2

MC
60

OFFICE ➤	DPM:LWR #2	DPM:LWR #2				
SURNAME ➤	HRood:mt	RLBaer				
DATE ➤	9/17/78	9/18/78				

NRC FORM 318 (9-76) NRCM 0240 ☆ U. S. GOVERNMENT PRINTING OFFICE: 1976 — 626-624

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ENCLOSURE 1

ATTENDANCE LIST
CEDM SNUBBERS MEETING
AUGUST 31, 1978
SAN ONOFRE

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K. N. Haslinger
A. B. Spinell, Jr.

NRC - STAFF

H. Rood
H. L. Brammer
R. Bosnak
J. Kovacs

8-31-78

SCE CEDM SEISMIC SNUBBER PRESENTATION OUTLINE

A. INTRODUCTION

I. CEDM DESCRIPTION AND COMPONENT DISCUSSION

a). Design Criteria

b). Limiting Event

II. ASSESSMENT OF NEED FOR SNUBBERS

a). Unsupported Results VS. Supported

(1) Load & Deflection

b). Installed Normal Motion

c). Seismic Response Spectra

III. SNUBBER DESIGN

a). Design Bases

b). Detailed Description

c). Installation Arrangement and Procedure

d). Snubber Tests

IV. CEDM ANALYSIS

a). CEDM Model Representation

b). Reactor Head Lift Rig Support Simulation

c). Coupled Analysis Enveloping Approach

d). Loading Results

e). Component Stresses

V. DYNAMIC TESTING

a). Model Verification of Free Standing CEDM Frequencies - Damping

b). Model Verification of Supported CEDM (Sine Sweep)

- Test Arrangment
- Test Fixture Verification Effort
- Test Results - Frequencies - Damping

c). Ramdom Multi Frequency Testing

- Test Scope
- Results

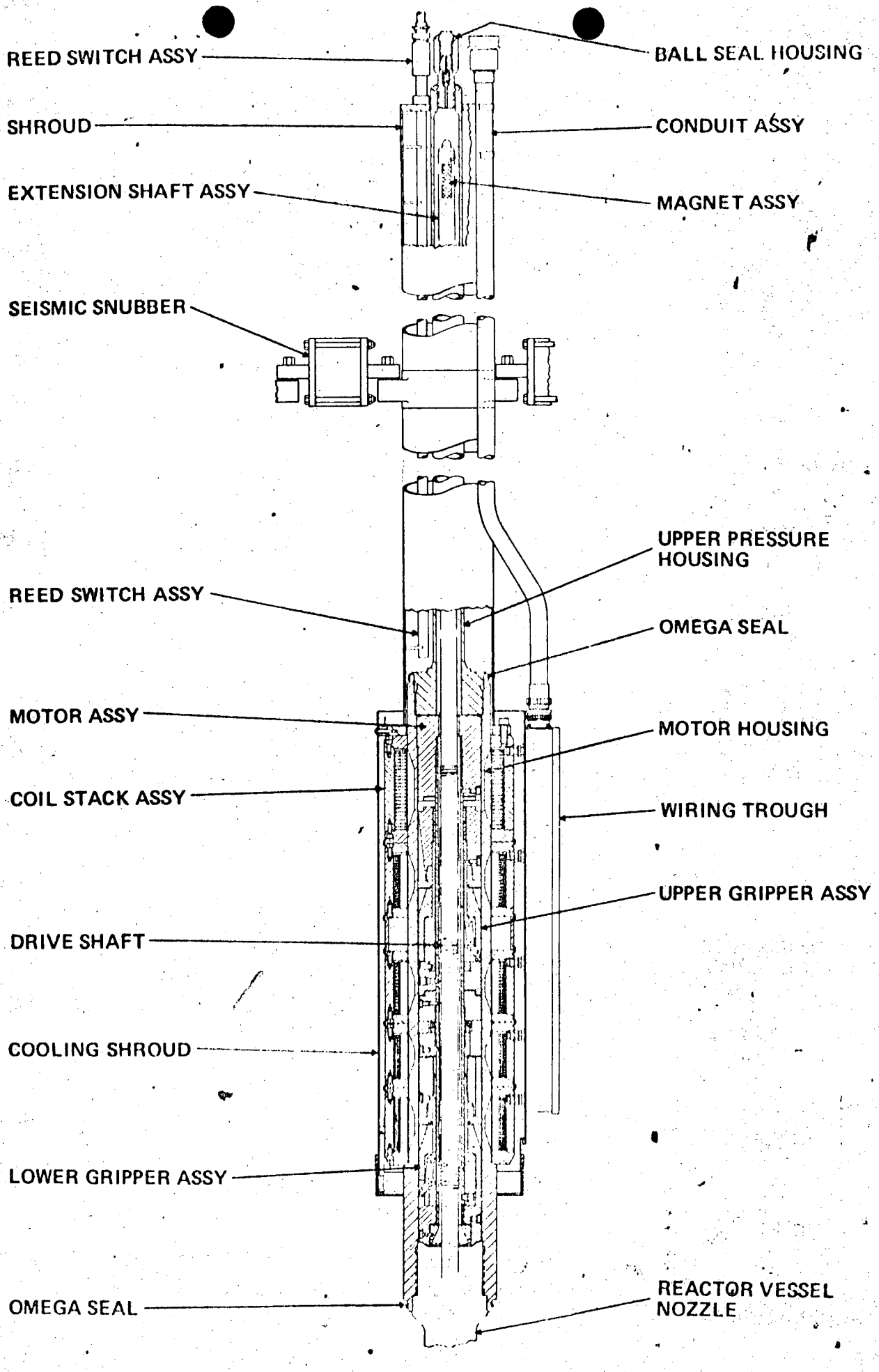
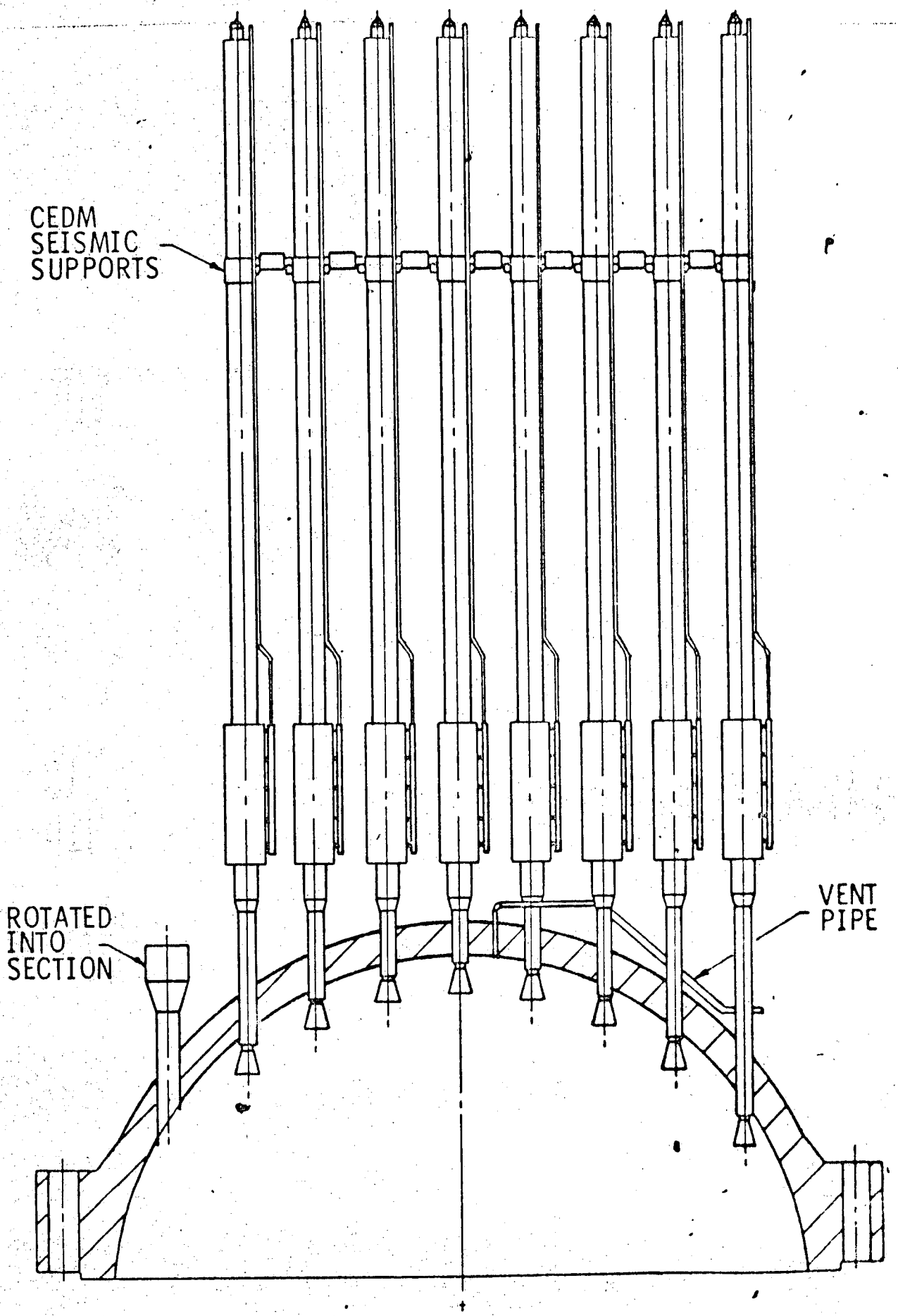
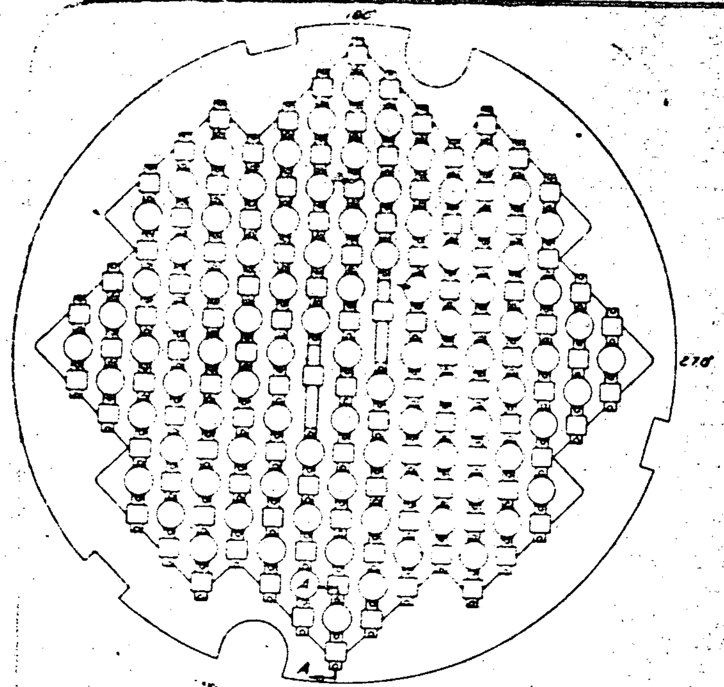
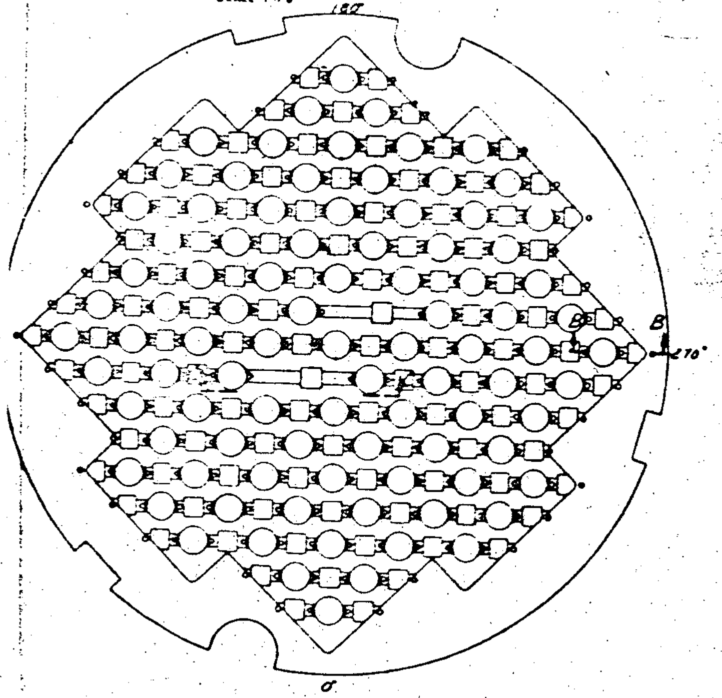


Figure 1 CONTROL ELEMENT DRIVE MECHANISM

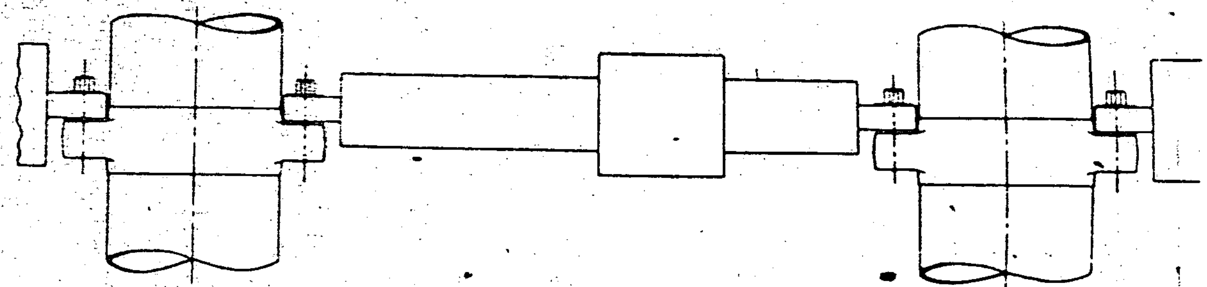

CEDM
SEISMIC
SUPPORTS
ROTATED
INTO
SECTION
VENT
PIPE



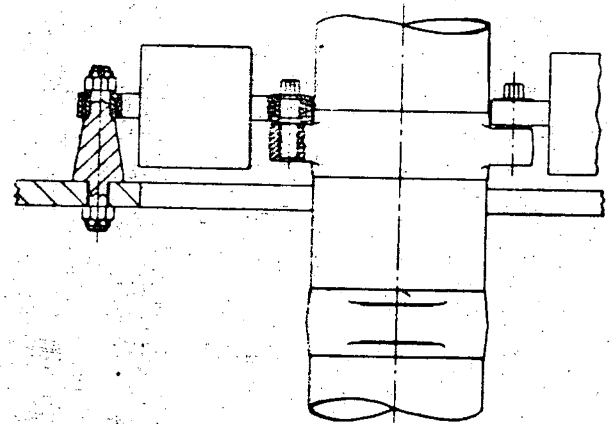
ABOVE PLATE SNUBBER LOCATIONS
SCALE 1"=1'0"



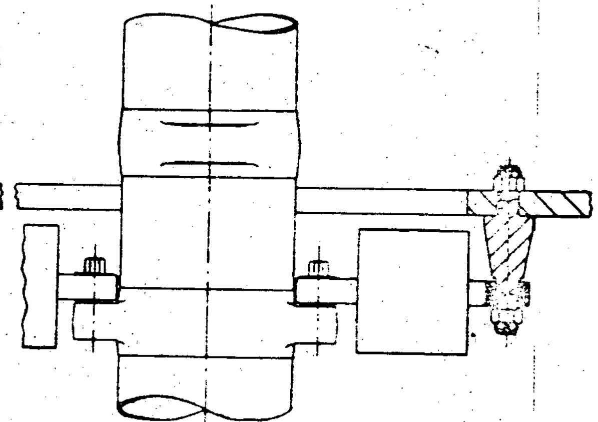
BELOW PLATE SNUBBER LOCATIONS
SCALE 1"=1'0"



SECTION C-C
SCALE-HALF SIZE



SECTION A-A (ROTATED)
SCALE-HALF SIZE

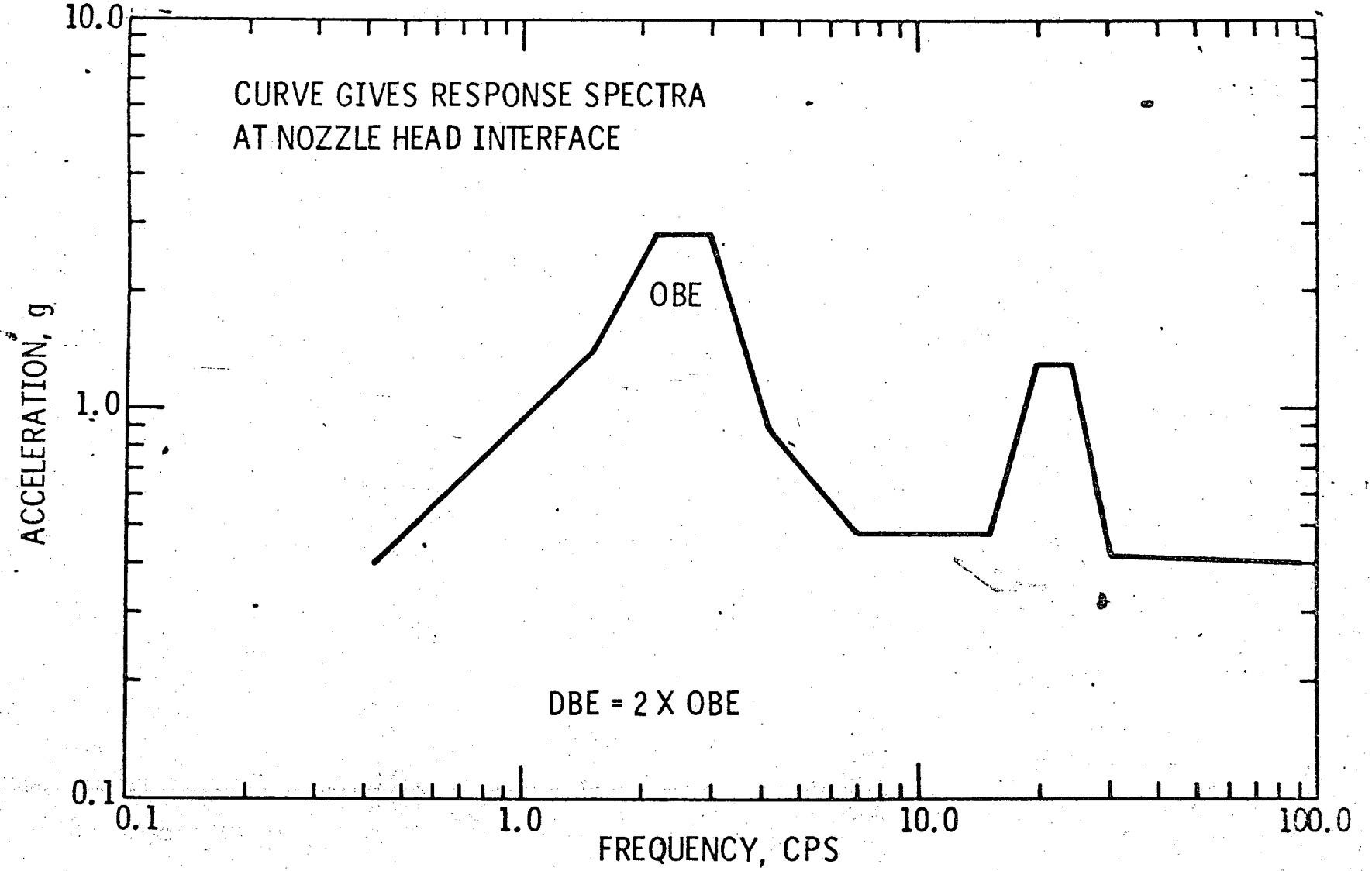


SECTION B-B
SCALE-HALF SIZE

Figure 2

2% DAMPING

VERTICAL RESPONSE SPECTRUM



STUB SNUBBER

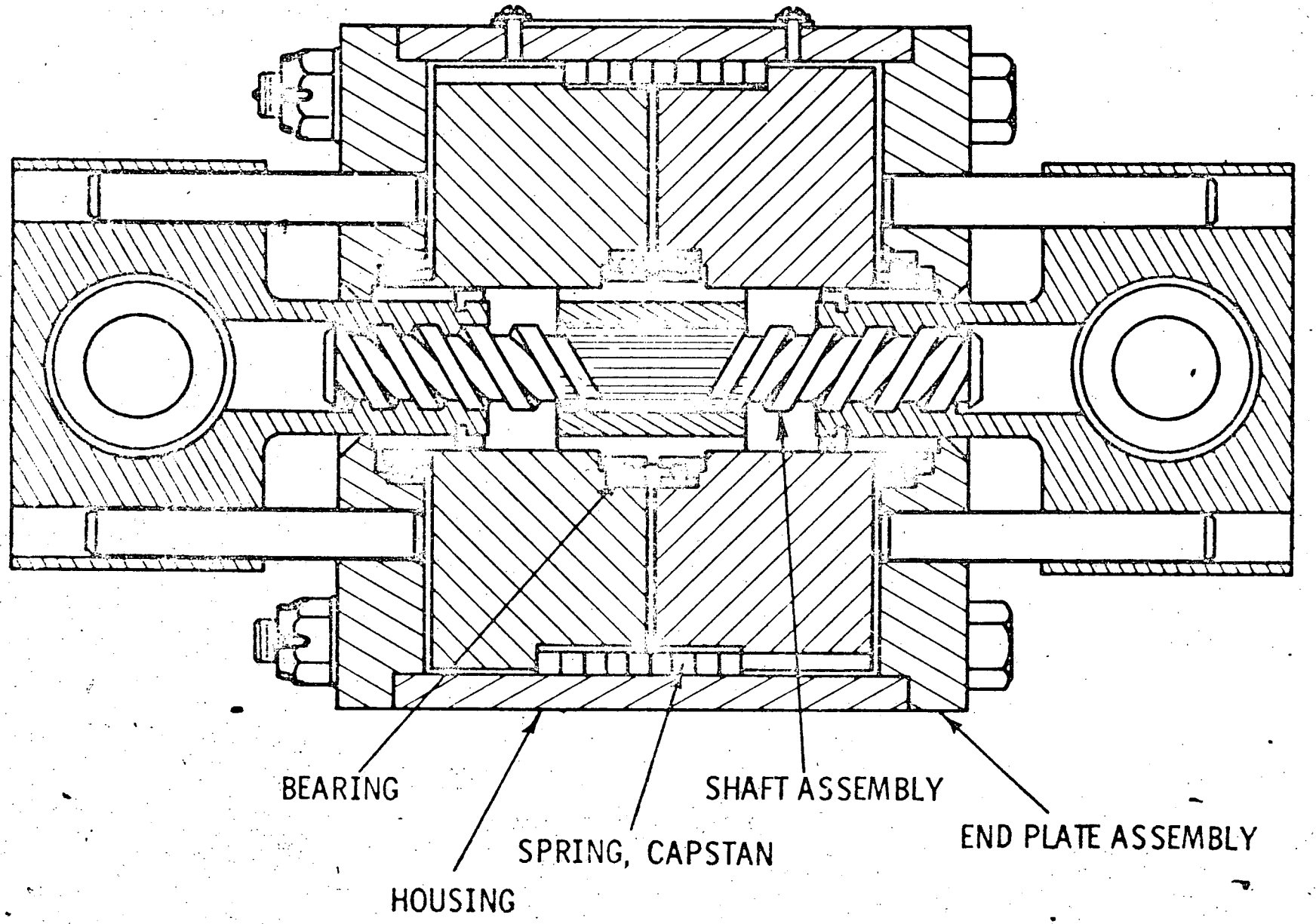
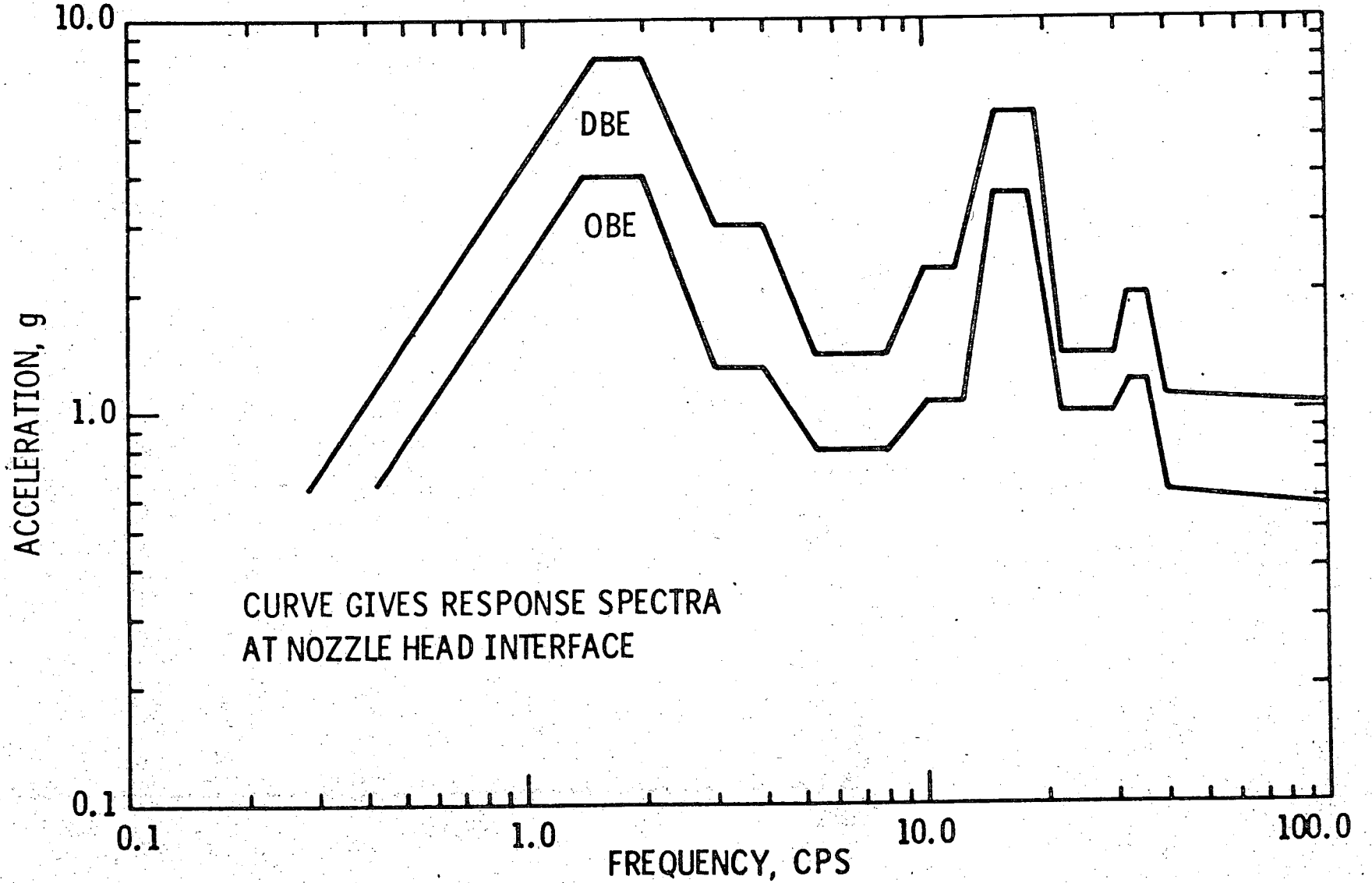


Figure 1
2% DAMPING
HORIZONTAL RESPONSE SPECTRUM



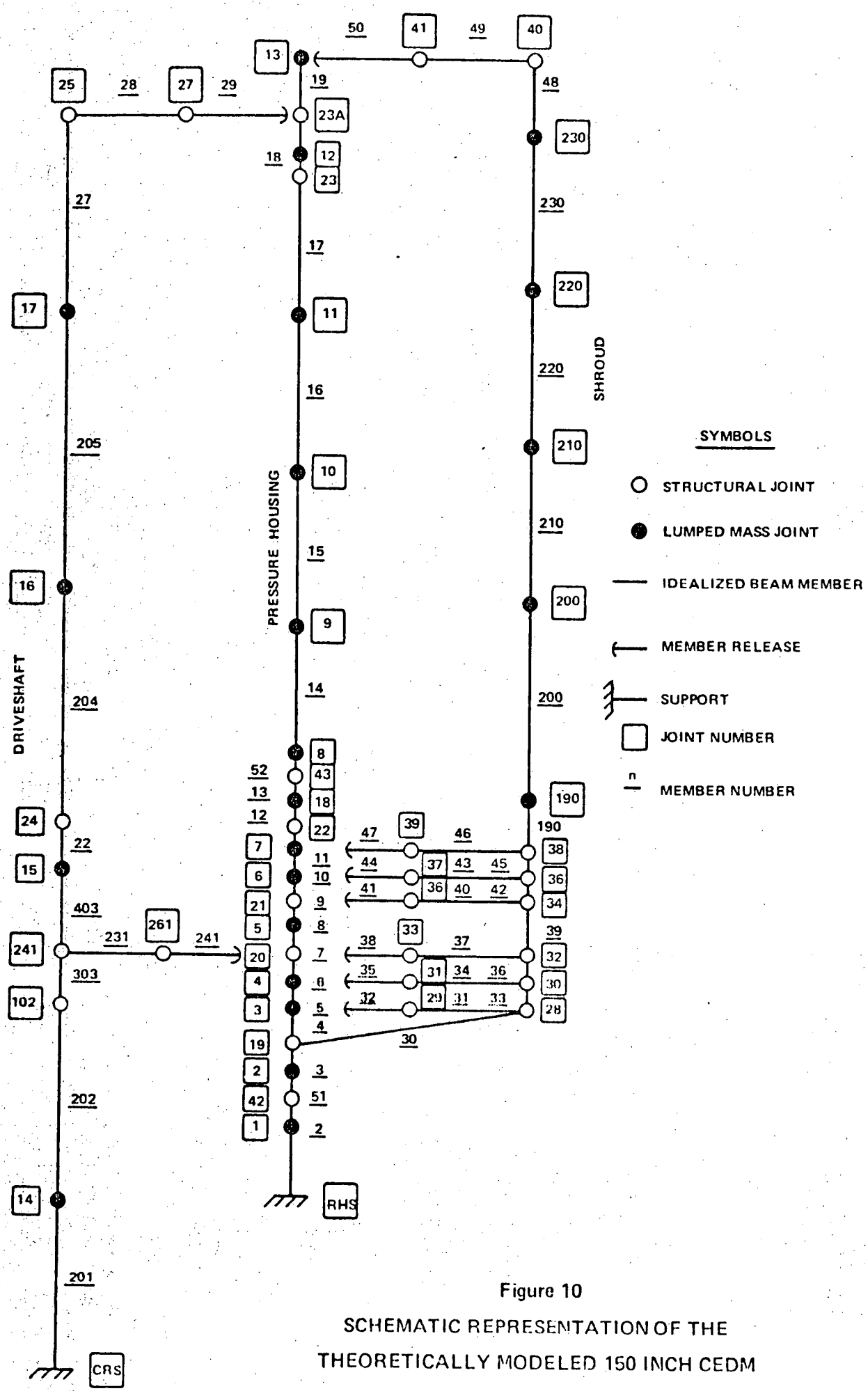


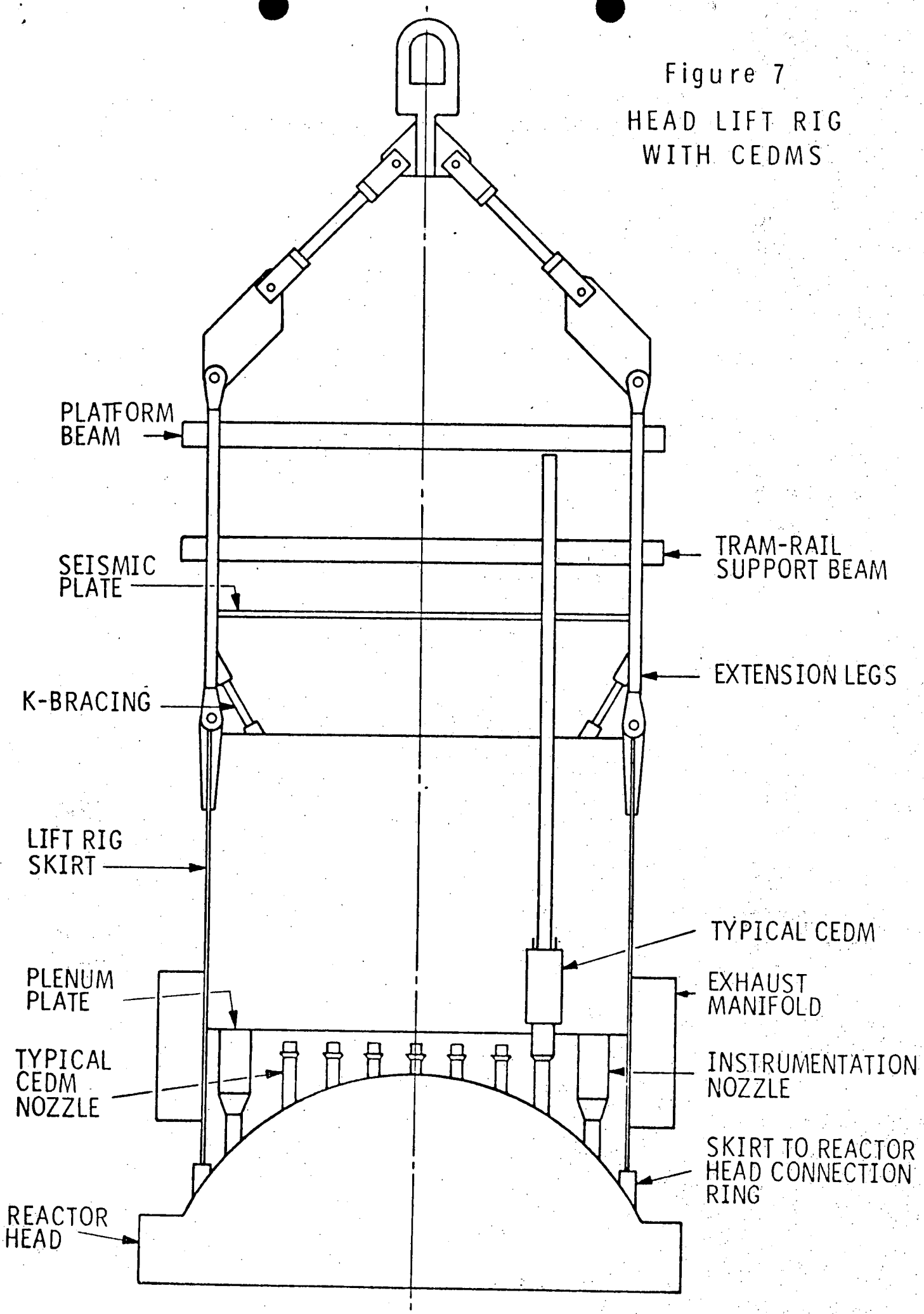
Figure 10

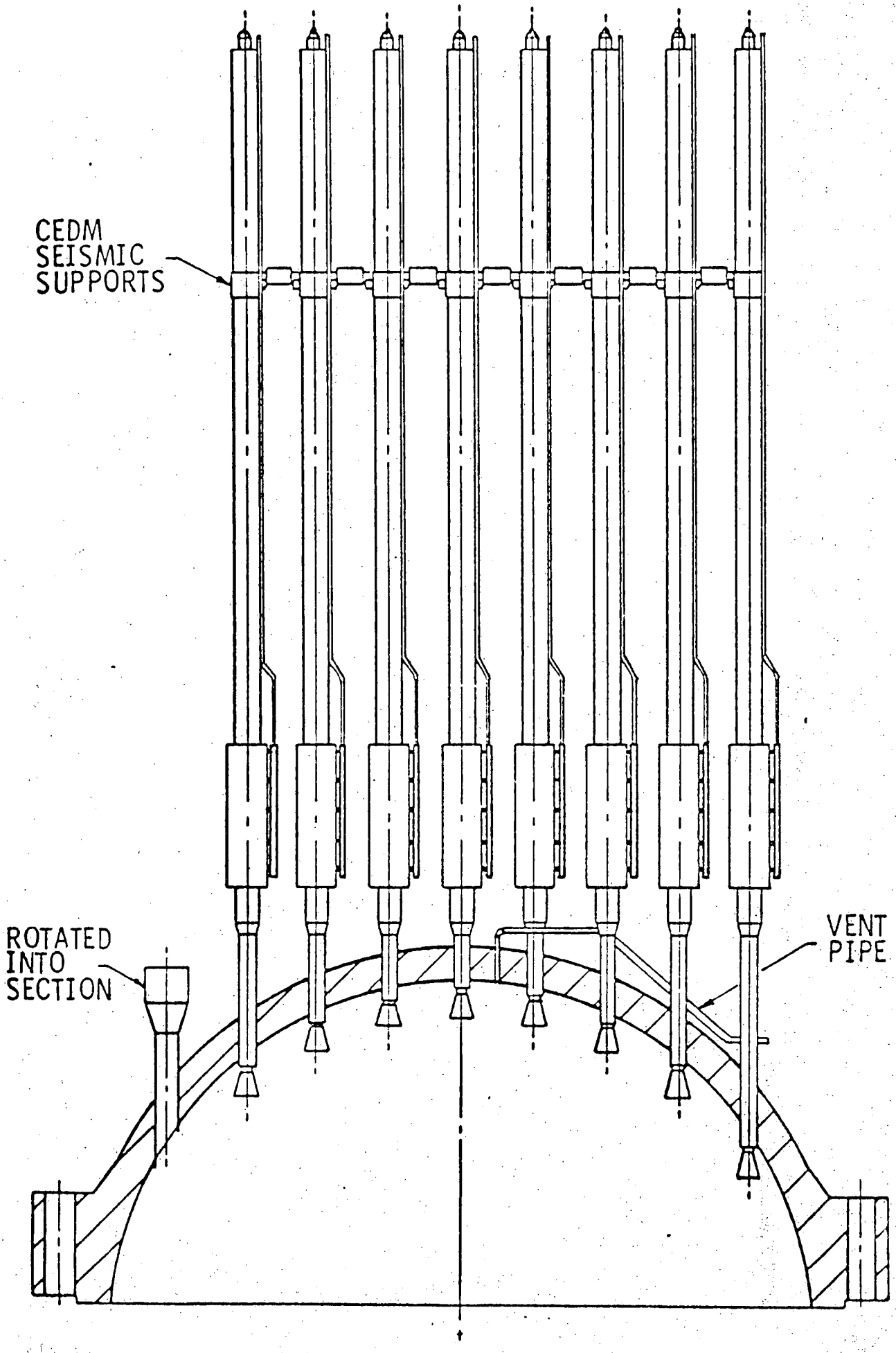
SCHEMATIC REPRESENTATION OF THE

THEORETICALLY MODELED 150 INCH CEDM

Figure 7

HEAD LIFT RIG
WITH CEDMS




CEDM
SEISMIC
SUPPORTS
ROTATED
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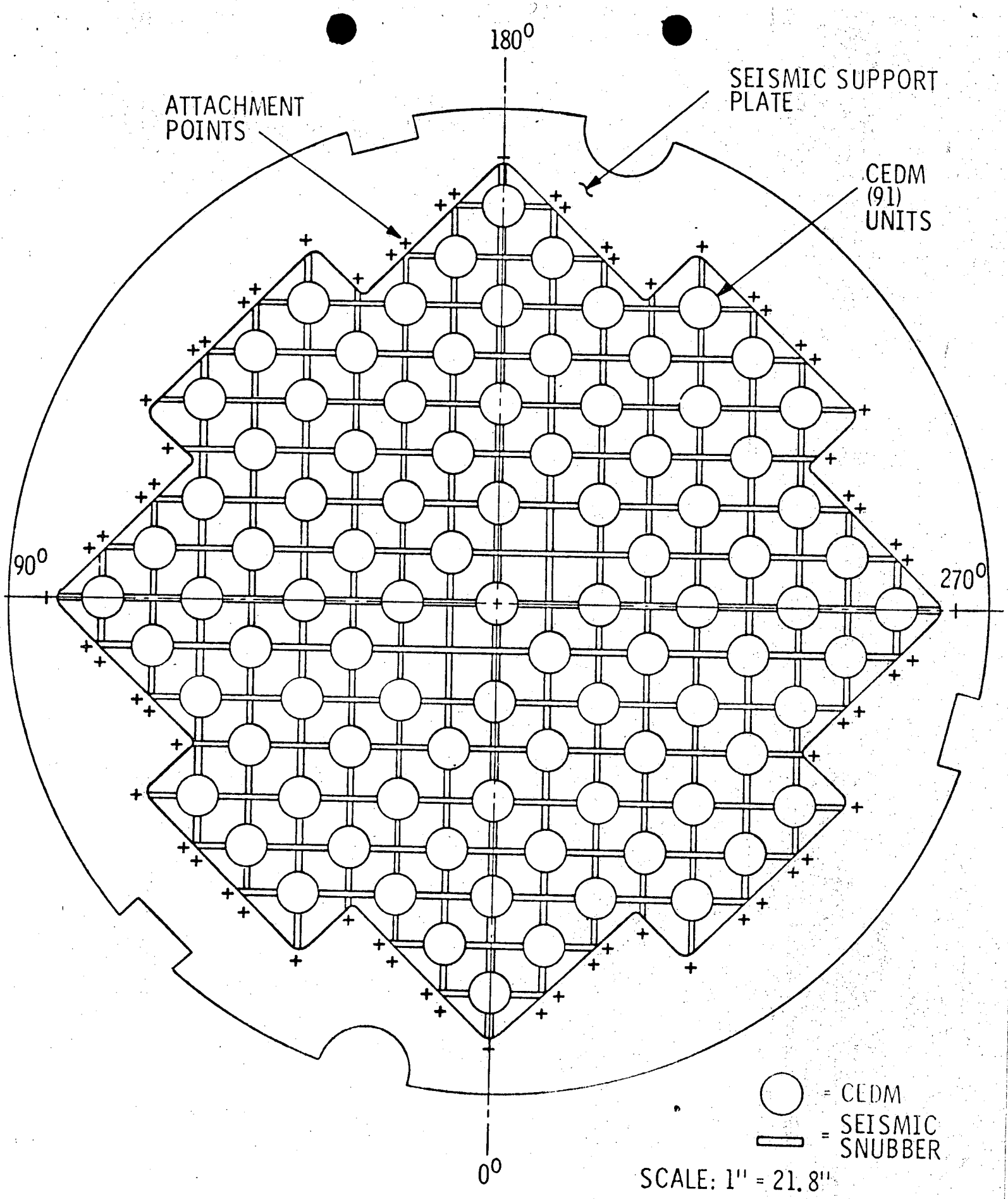


Figure 8
CEDM SEISMIC SUPPORT ATTACHMENT POINTS

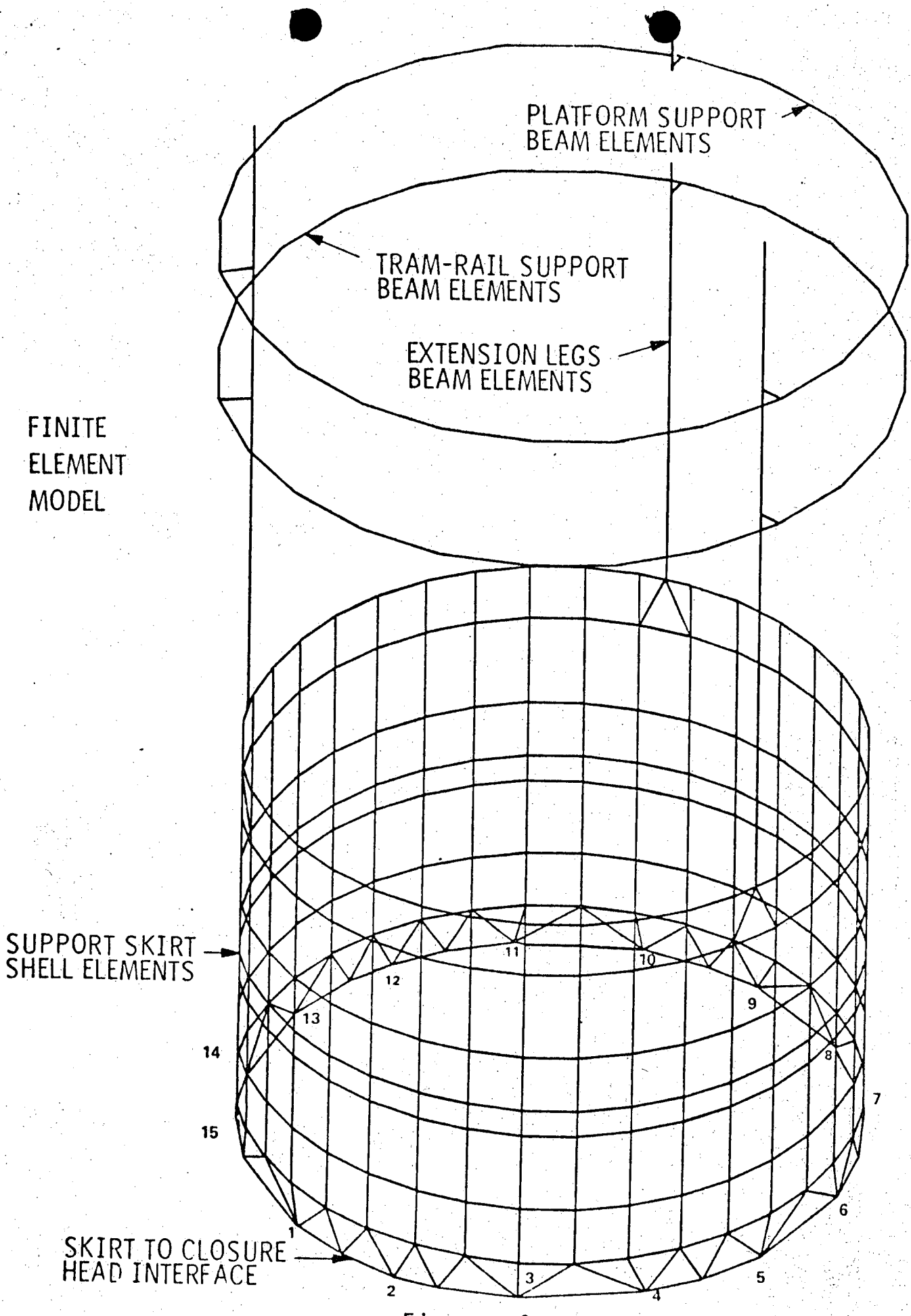


Figure 9

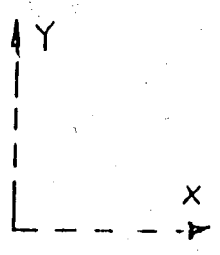
REACTOR HEAD LIFT RIG STRUCTURE STRESS MODEL

COMBUSTION ENGINEERING, INC.
WINDSOR, CONN.

CUSTOMER SCE HLR CONT. No CD-CEM-026 MADE BY KHH DATE 3/23/77

LOCATION DWG. No. CHK'D BY GER DATE 3/25/77

Joint No.	Member No.	Joint Coordinates [in]	Inertia [lb sec²/in]	HLR Components
1025		246.25	18.07	Platform Support Beam, Platform, Dead Weight, 3 Legs
	1006			
1019		201.25	32.34	Tramrail Support Beam, Hoist + Lifting Beam, Track + Trolleys
	1005			
1107		175.00	3.06	Seismic Plate
1007	1004	165.75	3.24	Lower Extension Legs
	1003			
1003		130.25	0.7746	6 K-Braces
	1002			
1002		28.25	109.1	Mass of Shroud
	1001			
1001		-216.00		(Fictitious elevation to provide desired displacement and natural frequency characteristics)



Schematic of Simplified Head Lift Rig Model

SH 5 OF

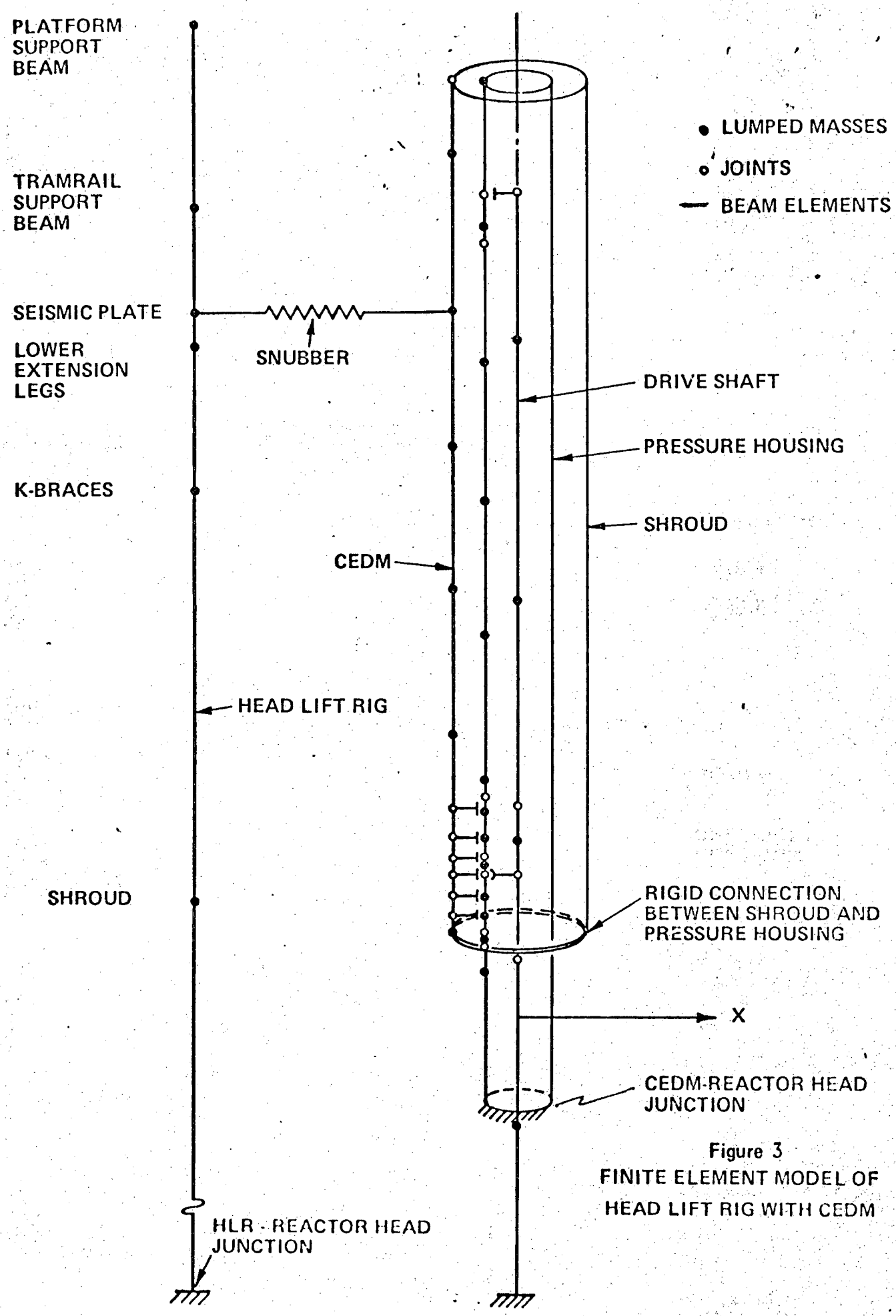


Figure 3
FINITE ELEMENT MODEL OF HEAD LIFT RIG WITH CEDM

TABLE

SCE CEDM LOADS - COIL STACK AND SHROUD

Height Along CEDM (In)	Axial Force Mech. (lb.)	Shear Force (lbs)			Bending Moment (in-lbs)		
		Mech.	OBE	DBE	Mech.	OBE	DBE
25.3	1252	37	16	28	.407	571	945
30.5	1252	58	103	171	.423	626	1011
35.5	1252	72	159	295	113	121	198
39.5	1252	233	579	983	233	626	1121
44.7	1252	757	1807	2860	975	2429	4033
52.7	1252	757	1807	2860	4454	10374	16220
70.7	1278	126	182	290	3487	12923	18890
106.7	1257	111	120	197	4720	15615	23044
141.9	1193	120	112	215	4864	15550	23286
175.3	1050	162	287	472	5811	13813	22451
214.7	252	116	287	472	1305	2615	4066
232.8	0	74	145	226	0	0	0

TABLE

CEDM Nozzle Loads

	Nozzle Loads in Kips			
			Load Category	
	OBE	DBE	OBE	DBE
Allowable Load			23.30	55.93
Calculated Load			16.25	20.50

TABLE

SCE CEDM LOADS - PRESSURE HOUSING AND NOZZLE

Height Along CEDM (in)	Axial Force Mech. (lbs)	Shear Force (lbs)			Bending Moment (in-lbs)		
		Mech.	OBE	DBE	Mech.	OBE	DBE
-22.7	4173	561	1353	1974	15150	52055	76286
11.5	4173	561	1353	1974	13990	32022	48978
17.7	3881	446	1301	1897	12874	24462	38110
19.7	3881	446	1301	1897	12530	22132	34560
20.3	4131	416	1250	1823	12391	21550	33681
30.5	3605	460	1152	1678	9303	11770	19462
35.5	3154	437	980	1424	7798	9385	16231
37.5	2803	431	742	1104	7116	8626	14990
39.5	2265	582	1246	1818	6431	8022	14000
44.7	2265	819	1391	2667	5671	11330	17363
51.8	1674	638	1391	2667	2684	4660	8791
54.8	1258	193	216	329	2261	4450	8330
59.1	1258	193	216	327	1993	4143	7791
95.0	1017	53	93	172	764	2418	3604
128.7	920	59	74	136	1093	2275	3582
162.4	768	50	59	80	1496	2790	5406
192.5	560	43	58	89	1093	2430	4780
196.2	560	52	79	127	1193	2407	4769
204.5	297	36	79	147	974	2066	4165
232.8	297	35	73	147	0	0	0

TABLE 2

DEFLECTIONS OF SCE CEDMS UNDER

SEISMIC LOADING-COIL STACK AND SHROUD

Height Along CEDM, Inches	R.S.S. Deflections Under OBE Loading Inches	R.S.S. Deflections Under DBE Loading Inches
25.3	.045	.088
30.5	.052	.101
35.5	.064	.113
39.5	.072	.123
44.7	.082	.136
52.7	.095	.153
70.7	.117	.180
106.7	.135	.216
141.9	.142	.253
175.3	.179	.318
214.7	.258	.443
232.8	.322	.540

TABLE 2

DEFLECTIONS OF SCE CEDMS UNDER

SEISMIC LOADING-PRESSURE HOUSING

Height Along CEDM, Inches	R.S.S. Deflection Under OBE Loading Inches	R.S.S. Deflection Under DBE Loading Inches
-22.7	.000	.000
11.5	.027	.053
17.7	.035	.069
19.7	.038	.074
20.3	.039	.075
25.3	.045	.088
30.5	.054	.101
35.5	.064	.113
37.5	.068	.118
39.5	.072	.123
44.7	.082	.136
51.8	.095	.153
54.8	.100	.160
59.1	.108	.170
95.0	.173	.327
128.7	.286	.533
162.4	.352	.650
192.5	.342	.626
196.2	.338	.616
204.5	.325	.590
232.8	.322	.540

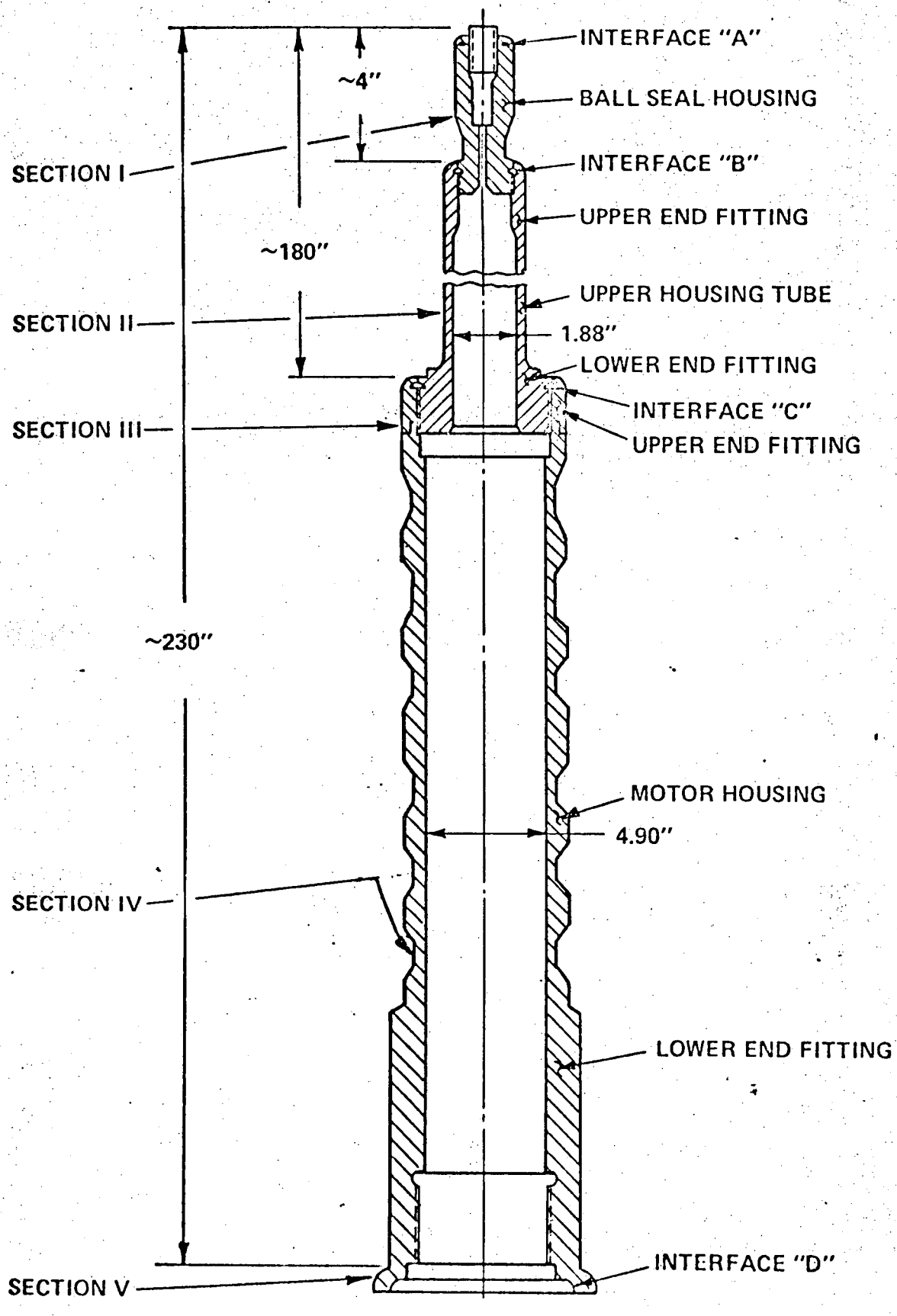


Figure 4
SCHEMATIC SHOWING CRITICAL SECTION OF CEDM HOUSING

TABLE I

COMPARISON OF COMPUTED CEDM STRESS INTENSITIES WITH STRESS ALLOWABLES

PART III

CRITICAL WALL SECTION STRESSES IN PSI

Location	Conditions	Design	Emergency	Test
SECTION I	Stress intensity	9957	4148	12407
	Pm Allowable	Sm = 16000	1.25m = 20256	.9Sy = 14742
SECTION II	Stress intensity	13977	12658	13820
	Pm Allowable	Sm = 16600	1.25m = 20256	.9Sy = 19200
SECTION III	Stress intensity	14091	12674	17633
	Pm Allowable	Sm = 18900	1.25m = 23016	.9Sy = 21510
SECTION IV	Stress intensity	24462	22578	30444
	Pm Allowable	Sm = 29900	1.2Sm = 36468	.9Sy = 64215
SECTION V	Stress intensity	11352	10245	14177
	Pm Allowable	Sm = 23300	1.25m = 27960	.9Sv = 26820

NOTE: 1) Stress intensity also applies to the faulted condition, however, faulted allowables exceed emergency allowables and thus are not shown.

Table 1

Comparison of Computed and Measured
Natural Frequencies for SCE Type, Free Standing CEDM

Significant Natural Frequencies (Hertz)

Analytical*	Experimental
2.95	2.85
11.80	10.0
14.50	14.2
17.30	--

* Modeling technique for drive shaft resulted in additional, non-significant natural frequencies within seismic range.

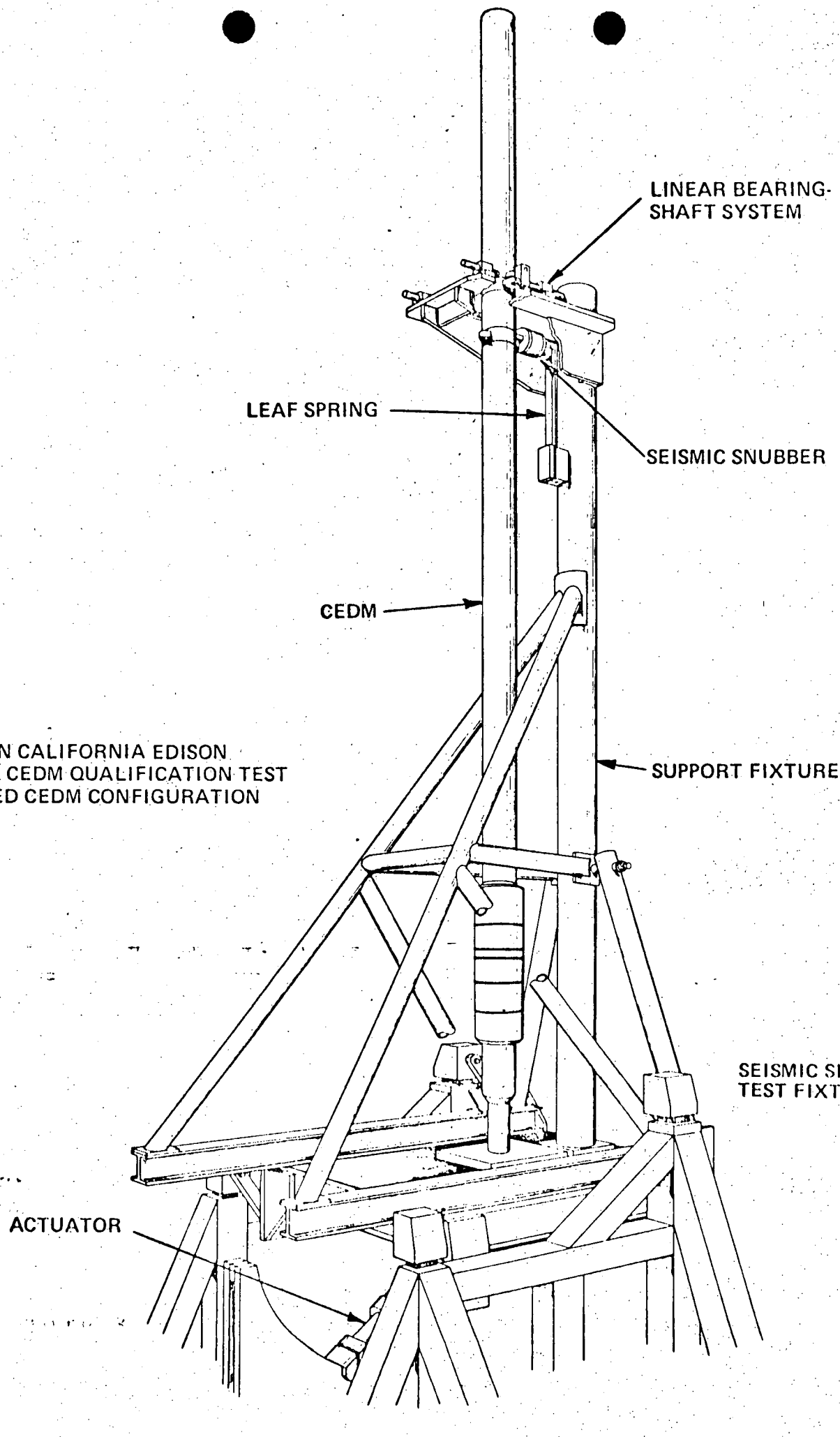


Figure 1

SOUTHERN CALIFORNIA EDISON
RSPT AND CEDM QUALIFICATION TEST
SUPPORTED CEDM CONFIGURATION

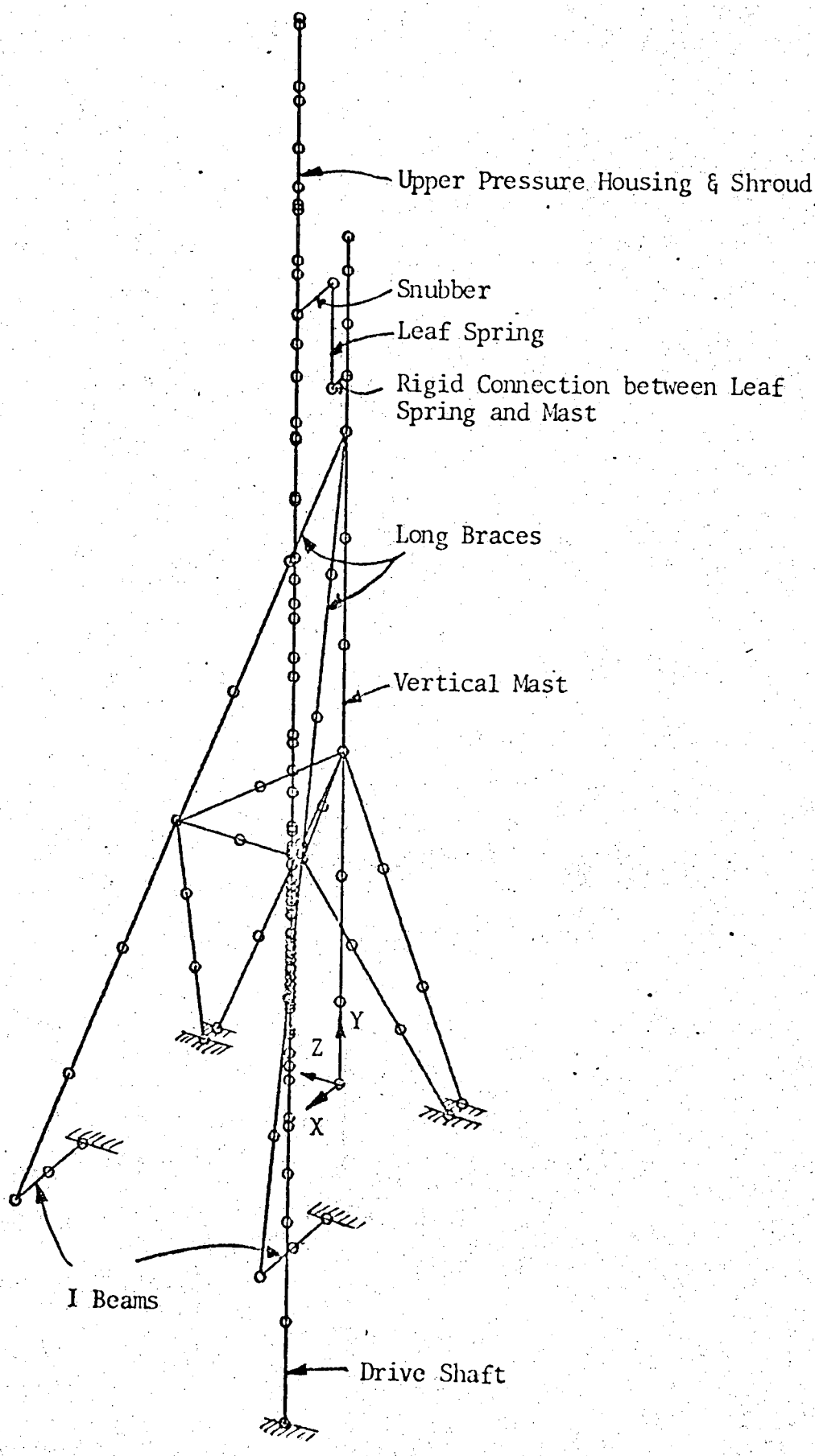


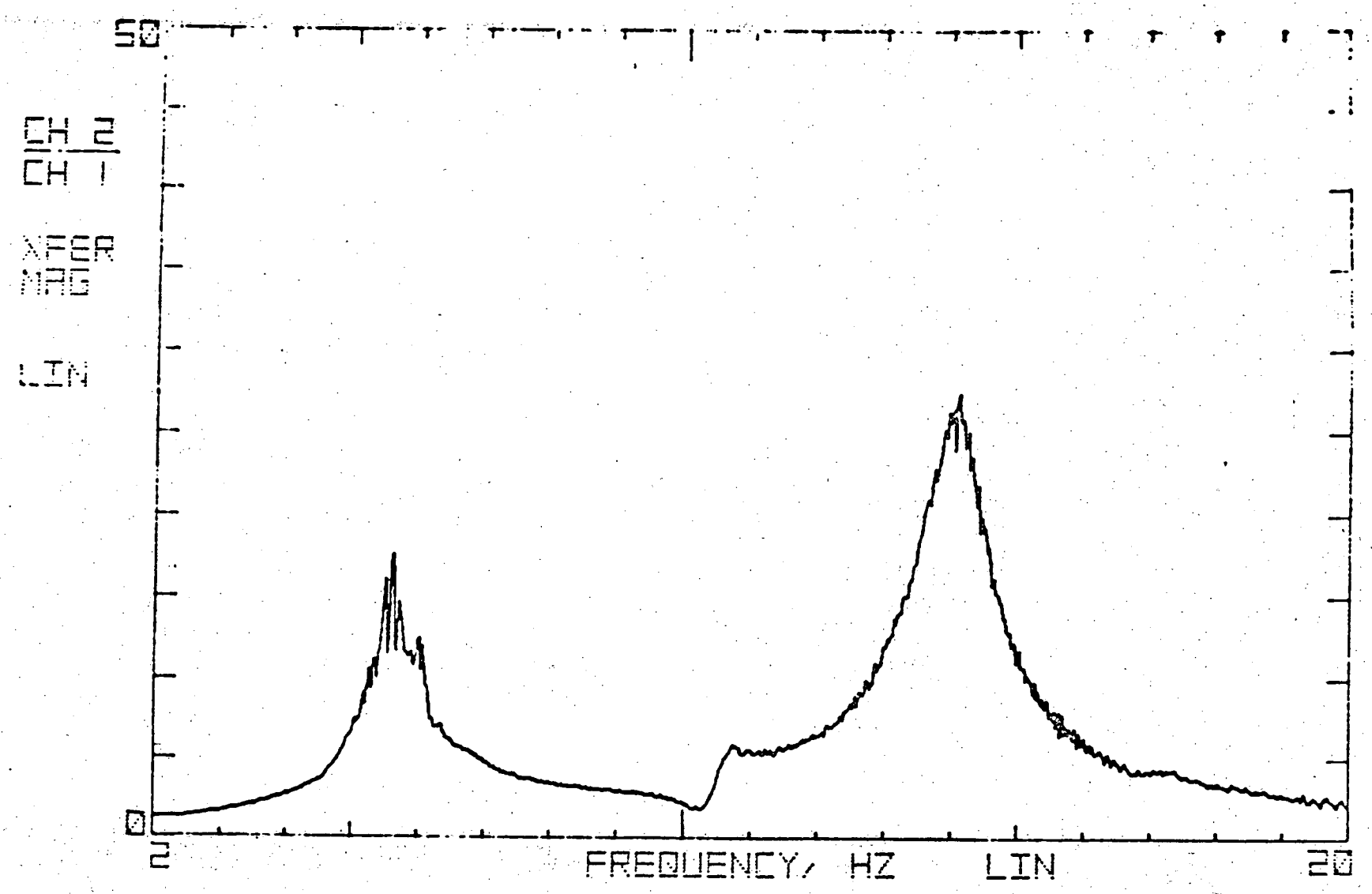
Figure 1: (a) Layout of SCE CEIM Test Fixture

Table 2

Comparison of Natural Frequencies For the Supported SCE Type CEDM (Analytical vs. Experimental)

Frequencies as Computed for SCE Plant	Frequencies as Computed for Test Configuration	Frequencies as Determined by Test
4.78*	4.73*	5.6*
7.33*	7.23*	
11.18	12.15	10.8
13.14	13.14	--
14.36*	14.51*	13.8*
17.05*	17.2 *	--
20.22	--	20.7
32.35	31.1	--

* Indicates high modal participation. Frequencies are listed in Hertz



RUN 6 SCER05
SCE CEDM SUPPORTED 3/21/78

Acc 20/K.C.

Table 3

Comparison of Significant Analytical and Experimental Results for SCE CEDM under DBE Loading Conditions

Parameter	CEDM Supported By Head Lift Rig (RSS)	CEDM Supported By Test Fixture (RSS)	** Test Results * (Peak Amplitudes)
Nozzle Load	75.7 inch kips	78.9 inch kips	~89.6 inch kips
Displacement at snubber level at bottom of shroud at top of shroud	.273 inch .136 inch .538 inch	.255 inch .145 inch .472 inch	.354 inch ----- -----
Max. Deflection on Shroud on pressure Housing	.538 inch .548 inch	.472 inch .525 inch	----- -----

* Test Run No. 26

** Note that Test Spectrum was considerably above R.R.S. and that nozzle stresses include impact stresses caused by lateral shifting of CEDM components. (High Frequency)

Meeting Summary

Docket File
NRC PDR
Local PDR
TIC
NRR Reading
LWR #2 File
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J. Stolz
R. Baer
O. Parr
S. Varga
C. Heltemes
R. Houston
L. Crocker
D. Crutchfield
F. J. Williams
R. Mattson
D. Muller
Project Manager - H. Rood
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J. Knight
D. Ross
L. Rubenstein
W. Haass

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S. Pawlicki
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K. Kniel
T. Novak
Z. Rosztoczy
W. Bulter

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L. Dreher
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A. T. Cardone
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J. Greeves
T. Cheng
R. Gilman
H. McGurren
G. Quittschreiber - ACRS
R. E. Jackson