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August 25, 1981

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U.S. NUCLEAR REGULATORY COMMISSION

Mr. A. Schwencer, Chief
Licensing Branch 2
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: LaSalle County Station Units 1 and 2
Design Assessment Report (DAR)
High Frequency Load Assessment
NRC Docket Nos. 50-373/374

Dear Mr. Schwencer:

The purpose of this letter is to document proposed changes to the LaSalle County DAR, Appendix H, which were discussed in a telephone conference with Mr. A. Bournia on July 30, 1981. The proposed changes will be incorporated into a future amendment to the DAR.

If there are any questions in this regard, please direct them to this office.

Very truly yours,

L. O. DelGeorge

L. O. DelGeorge
Director of Nuclear Licensing

cc: Mr. D. Terao (NRR-MEB)

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of responses at other locations. The spectra for the points on Figure H.4-1 are shown in Figures H.4-2 through H.4-34.

H.4.4.2 Exceedance Evaluations

To investigate the effects of a spectra input that contains high-frequency components, the subsystem being analyzed must have an appropriate mathematical model and a wide range of frequencies. The subsystems shown in Figures H.4-35 through H.4-37 were selected for evaluation. To accurately predict high-frequency response, detailed lumped mass models, including support stiffness effects, were constructed. Subsystem 1, 2, and 3, shown in Figures H.4-35 through H.4-37, were modeled with 108, 90, and 56 modal points, respectively. The modal frequencies and participation factors for the excitations in the x, y, z directions are presented in Tables H.4-8 through H.4-10 for the three subsystems. All three subsystems had their first modal frequency under 10 Hz and their final modal frequency above 99 Hz. Also, all three subsystems exhibited response contributions from a wide range of frequencies.

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Comparison of Responses

The results of the analyses using the current design basis spectra and the 4TCO load spectra are compared by computing the percent variation of the 4TCO load results with respect to the current design basis results. The responses compared are the restraint reactions and the elbow stresses. The restraint reactions were chosen because they are generally more sensitive to high-frequency response and generally have a lower design margin. The elbow stresses were chosen because pipe stresses are highest at the elbows.

Tables H.4-11 and H.4-12 compare the restraint reactions and elbow stresses respectively for Subsystem 1. The reactions

INSERT to page H-11

The input response spectra for these subsystems was the vertical and horizontal spectra giving the worst exceedances, specifically the vertical response spectrum at location 266 and the horizontal response spectrum at location 227.

and stresses are always lower for the 4TCO load response: reactions are lower by 4% to 58% and stresses are lower by 17% to 51%. Tables H.4-13 and H.4-14 compare the reactions and stresses for Subsystem 2. The reactions and stresses are always lower for the 4TCO load response: reactions are lower by 15% to 50% and stresses by 37% to 48%. Tables H.4-15 and H.4-16 compare the reactions and stresses for Subsystem 3. Again, the reactions and stresses are always lower for the 4TCO load response: reactions are lower by 36% to 48% and stresses by 33% to 42%.

From the worst-case comparisons shown, it is concluded that the 4TCO load yields a lower response than or, at best, equal to the current design basis load. In conclusion, the higher, high-frequency response is more than compensated for by the decreased responses in the lower frequency regions.

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H.4.4.3 High Frequency Subsystems in the Wetwell

The subsystems with the highest fundamental frequencies are the portions of the ECCS discharge and suction piping located in the wetwell. Their high fundamental frequencies result from the fact that these subsystems are relatively short and are rigidly supported. Two of these subsystems, RH36 and RH42, were chosen to compare the analysis effects resulting from utilizing the 4TCO load spectra versus the design basis spectra. Geometry plots of these subsystems are shown in Figures H.4-38&39. Their dynamic characteristics (modal frequencies and participation factors) are presented in Tables H.4-17 and 18. These subsystems were analyzed for 4TCO loads using the horizontal and vertical spectra for location 227.

Note that subsystems located in the wetwell may be loaded by submerged structure, and pool swell and fallback (PSF) loads in addition to response spectra loads. Subsystem RH36 is loaded by all three of the loadings and subsystem RH42 is loaded by only submerged structure and response spectra loads (the elevation of RH42 is below the elevation of the downcomer exits and therefore it is not affected by PSF).

Comparison of Responses

The results of the analyses using the current design basis spectra and the 4TCO load spectra are compared by computing the percent variation of the 4TCO load results from the current design basis

results. The parameters compared are restraint reactions and node point stresses.

Tables H.4-19 & 20 compare the restraint reactions and node point stresses, respectively, for subsystem RH-36. The design basis restraint reactions are not affected by the 4TCO loads. This is because the bounding loads do not involve chugging or CO; PSF loadings result in the bounding load case. For the same reason most of the design stresses, including the largest magnitude stress, are not affected. For several locations (node points 14 through 20) chugging and CO do influence the bounding stresses. The stresses at all but one of these locations decreased, with the increase being only 0.29%.

Tables H.4-21 & 22 compare the restraint reaction and node point stresses, respectively, for subsystem RH-42. For this subsystem chugging and CO do influence the bounding loads (RH-42 is not loaded by PSF). As the tables illustrate both the restraint reactions and node point stresses decrease as a result of utilizing the 4TCO spectra.

The above subsystems were chosen, because of their high fundamental frequencies, to assess the effects of analyzing to the 4TCO chugging and CO response spectra. These subsystems were not adversely affected by the 4TCO spectra and the design basis is shown to be conservative.

H.4.4.4 High Frequency Subsystems Outside Wetwell

A survey of the fundamental frequencies was made of all subsystems penetrating the containment wall below elevation 730'. The distribution of these subsystem is shown in Fig H.4-40. The two high frequency subsystems found are part of the RHR safety relief discharge piping as shown in Fig. H.4-41. They are almost identically routed, consist of approximatley 8 feet of 2 inch schedule 80 piping, and have no supports.

The highest ratios of calculated stress to allowable stress of equation 9 are shown in Table H.4-~~22~~23. These stresses must be increased 9 times in order to exceed the Code allowables.

Considering the a low ~~steam~~ stress levels in these subsystems, that material certifications are available to increase the allowable stresses, and that using a time history analysis will reduce the impact of the high 4TCO response spectra, the current stress analyses of these subysystem are sufficient to show their adequacy to withstand the increased 4TCO loads at the 698' elevation.

TABLE H.4-17

SUBSYSTEM RH-36 - MODAL FREQUENCIES AND PARTICIPATION FACTORS

MODE NUMBER	FREQUENCY HZ	PARTICIPATION FACTORS X	Y	Z
1	26.25	-1.008	0.000	-0.732
2	27.57	0.715	-0.332	-0.984
3	69.58	0.029	1.388	-0.040
4	80.77	0.171	0.000	0.124
5	93.19	0.465	-0.000	0.338
6	103.30	0.424	0.499	-0.583
7	137.36	0.632	-0.000	0.458
8	152.43	0.508	-0.184	-0.701
9	199.20	0.574	-0.000	0.416
10	246.30	-0.517	-0.101	0.714
11	282.48	-0.663	0.000	-0.480
12	330.03	0.029	0.730	-0.040
13	335.57	0.113	-0.000	0.084
14	353.35	0.058	-0.138	-0.083
15	392.15	0.522	0.000	0.377

TABLE H.4-18

SUBSYSTEM RH-42 - MODAL FREQUENCIES AND PARTICIPATION FACTORS

MODE NUMBER	FREQUENCY HZ	PARTICIPATION FACTORS X	Y	Z
1	18.78	1.579	1.169	-2.248
2	19.35	-2.479	0.001	-1.739
3	77.40	0.480	-2.860	-0.686
4	113.76	0.769	-0.000	0.537
5	178.89	1.681	-0.291	-2.409
6	222.22	1.943	0.043	1.362
7	223.21	0.230	-2.490	-0.257
8	330.03	-0.525	-0.957	0.749
9	374.53	-0.841	-0.000	-0.589
10	456.62	0.021	0.078	-0.029
11	456.62	-0.131	0.000	-0.088
12	561.79	0.117	-0.398	-0.166
13	578.03	-0.417	-0.279	0.590
14	595.23	0.178	0.000	0.122
15	606.06	-0.009	0.632	0.004

TABLE H.4-19

COMPARISON OF RESTRAINT REACTIONS FOR SUBSYSTEM RH-36

MODE NUMBER	DIRECTION	DESIGN (lbf)	REVISED (lbf)	VARIATION (%)
5	(Resultant)	14,160	14,160	00
9	X	3,495	3,495	00
9	Y	48,286	48,286	00
25C	X	10,159	10,159	00
25C	Y	302	302	00
25C	Z	180	180	00
25R	X	10,243	10,243	00
25R	Y	302	302	00
25R	Z	178	178	00

TABLE H.4-20

COMPARISON OF STRESSES FOR SUBSYSTEM RH-36

NODE NUMBER	STRESSES AT NODE POINTS DESIGN (psi)	REVISED (psi)	VARIATION (%)
5	15,902	15,902	00
6	3,000	3,000	00
7	6,767	6,767	00
8	13,656	13,656	00
9	20,309	20,309	00
10A	14,993	14,993	00
10B	12,636	12,636	00
11	9,085	9,085	00
12	9,429	9,429	00
13	9,475	9,475	00
14	8,934	8,703	-2.58
15	8,516	8,541	0.29
16	9,570	9,418	-1.59
17	10,348	10,004	-3.32
18	11,139	10,795	-3.09
19	11,201	10,910	-2.59
20	9,850	9,709	-1.43
21	7,441	7,441	00
25	5,914	5,914	00
27	4,422	4,422	00
35	984	984	00
40	984	984	00

TABLE H.4-21

COMPARISON OF RESTRAINT REACTIONS FOR SUBSYSTEM RH-42

NODE NUMBER	DIRECTION	DESIGN (Lbf)	REVISED (Lbf)	VARIATION (%)
5	(Resultant)	53,491	52,518	-1.82
9	X	35,131	31,155	-11.31
9	Y	60,584	60,461	-0.20

TABLE H.4-22

COMPARISON OF STRESSES FOR SUBSYSTEM RH-42

NODE NUMBER	STRESSES AT NODE POINTS DESIGN (psi)	REVISED (psi)	VARIATION (%)
5	10,694	9,563	-10.57
6	6,739	5,977	-11.31
7	8,532	7,853	-7.96
8	11,472	10,799	-5.86
9	13,893	13,627	-1.91
10A	19,390	18,982	-2.10
10X	13,140	12,843	-2.26
10B	6,076	5,696	-6.25
15	3,042	2,917	-4.11

TABLE H.4-23

COMPARISON OF NODE POINT STRESSES FOR SUBSYSTEMS RH-48 + 49

SUBSYSTEM	EQ.9 ALLOWABLES		EQ.9 STRESSES		STRESS RATIO (STRESS/ALLOWABLE)	
	S.L.B	S.L.C	S.L.B	S.L.C	S.L.B	S.L.C
RH-48	18,000	27,000	1,833	3,040	.102	.113
RH-49	18,000	27,000	1,918	3,160	.107	.117

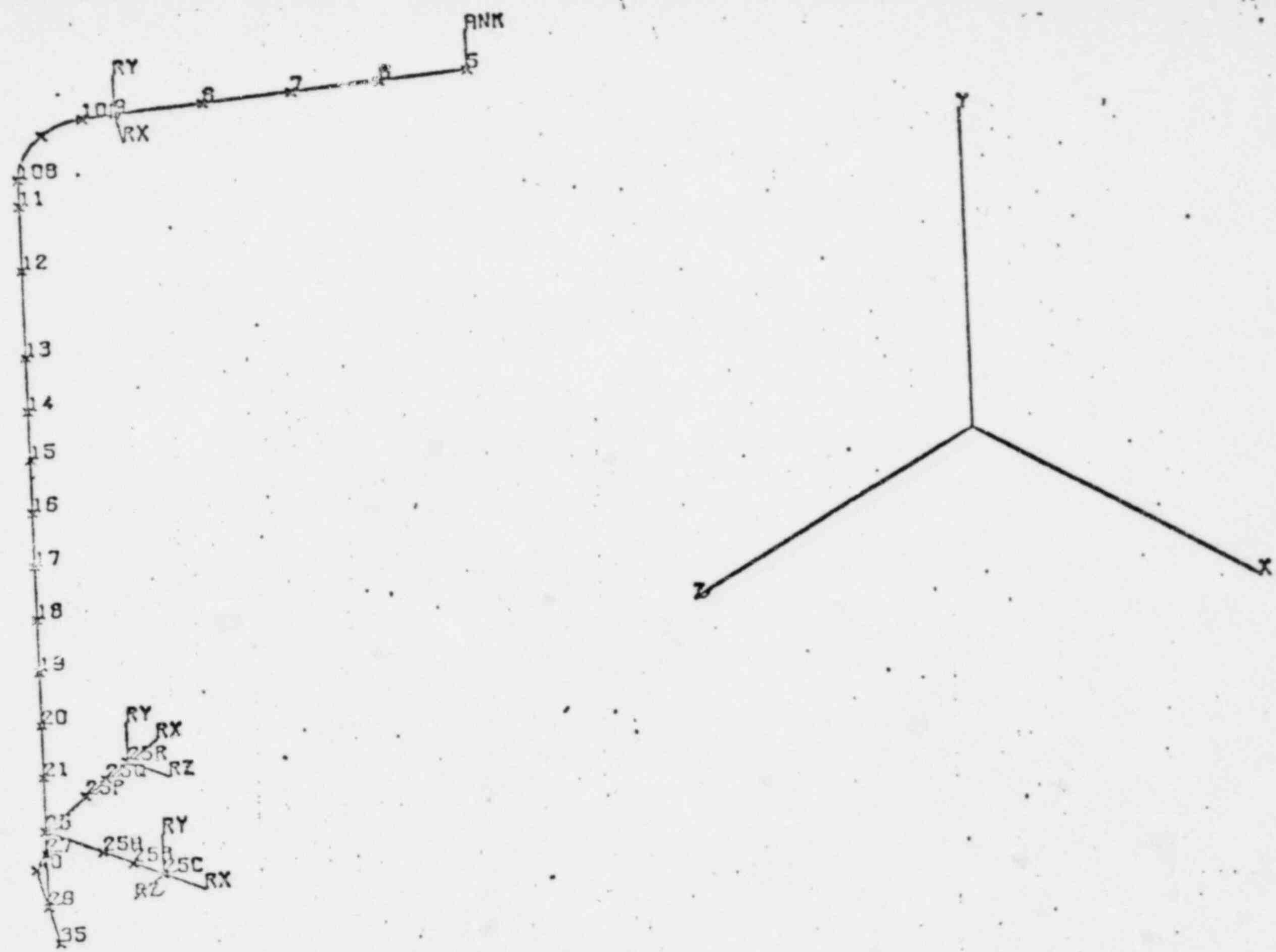

FIGURE H.4-38

RH-36 GEOMETRY

LASALLE-1

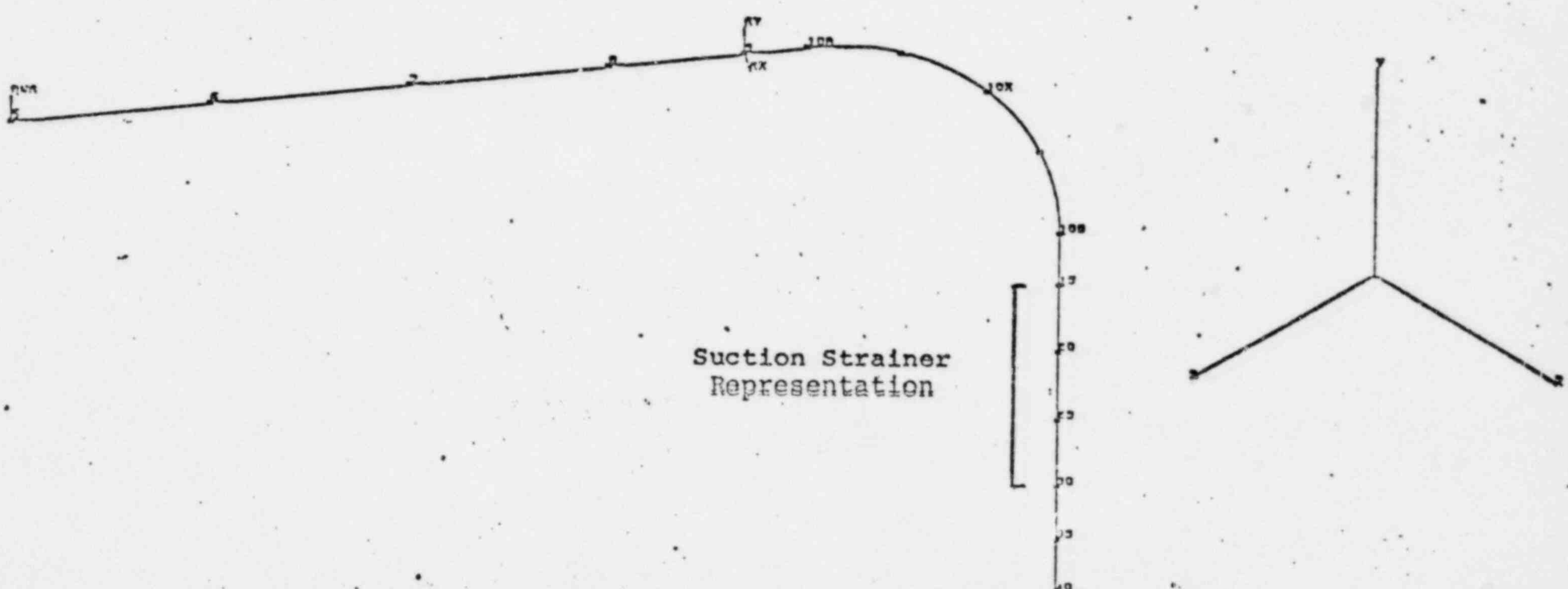

FIGURE 4.4-39

LASALLE-1 24-IN STRAINER RH-42 GEOMETRY

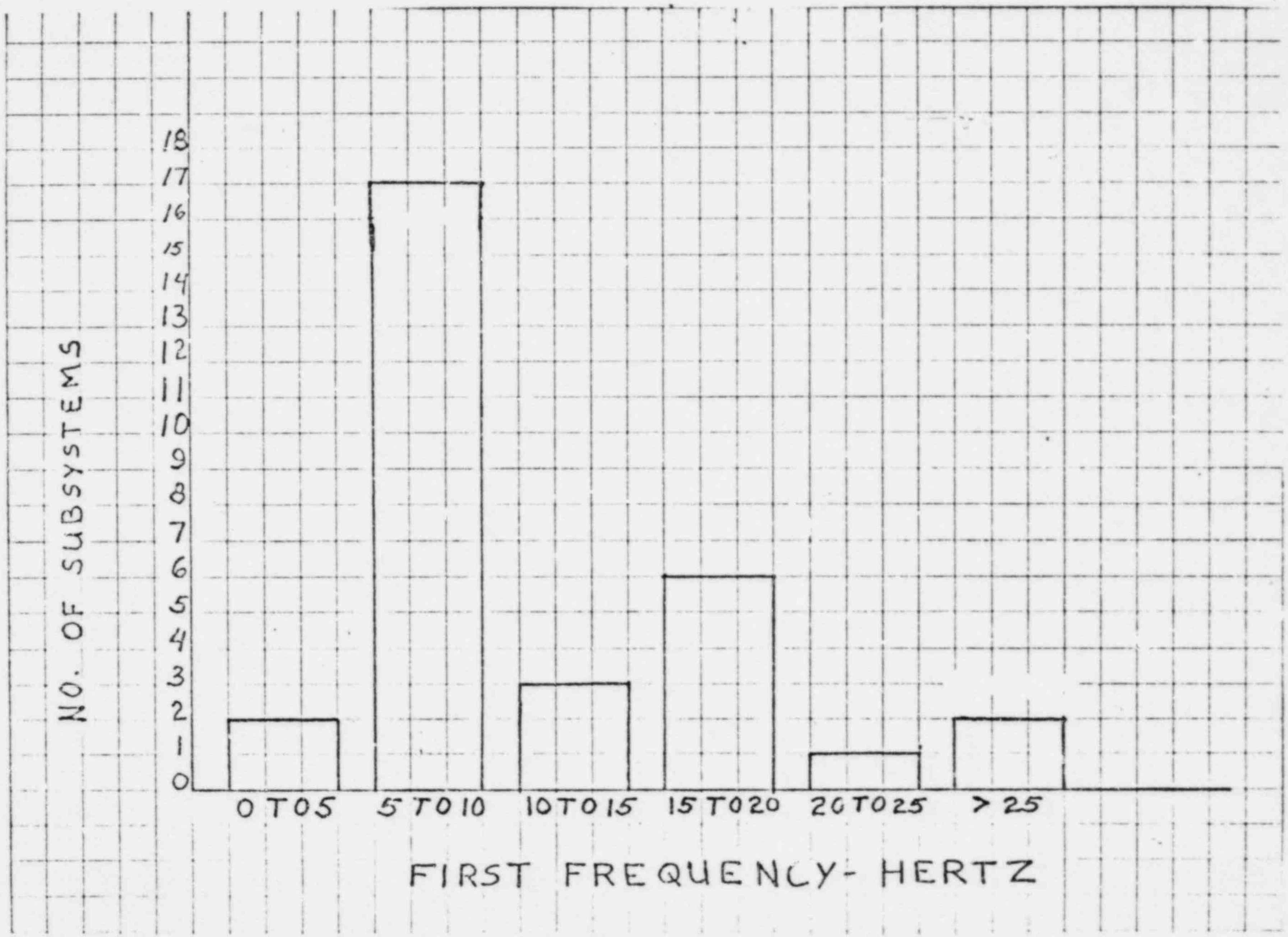
NO. OF SUBSYSTEMS
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
0 TO 5
5 TO 10
10 TO 15
15 TO 20
20 TO 25
> 25
FIRST FREQUENCY- HERTZ

FIGURE H.4-40

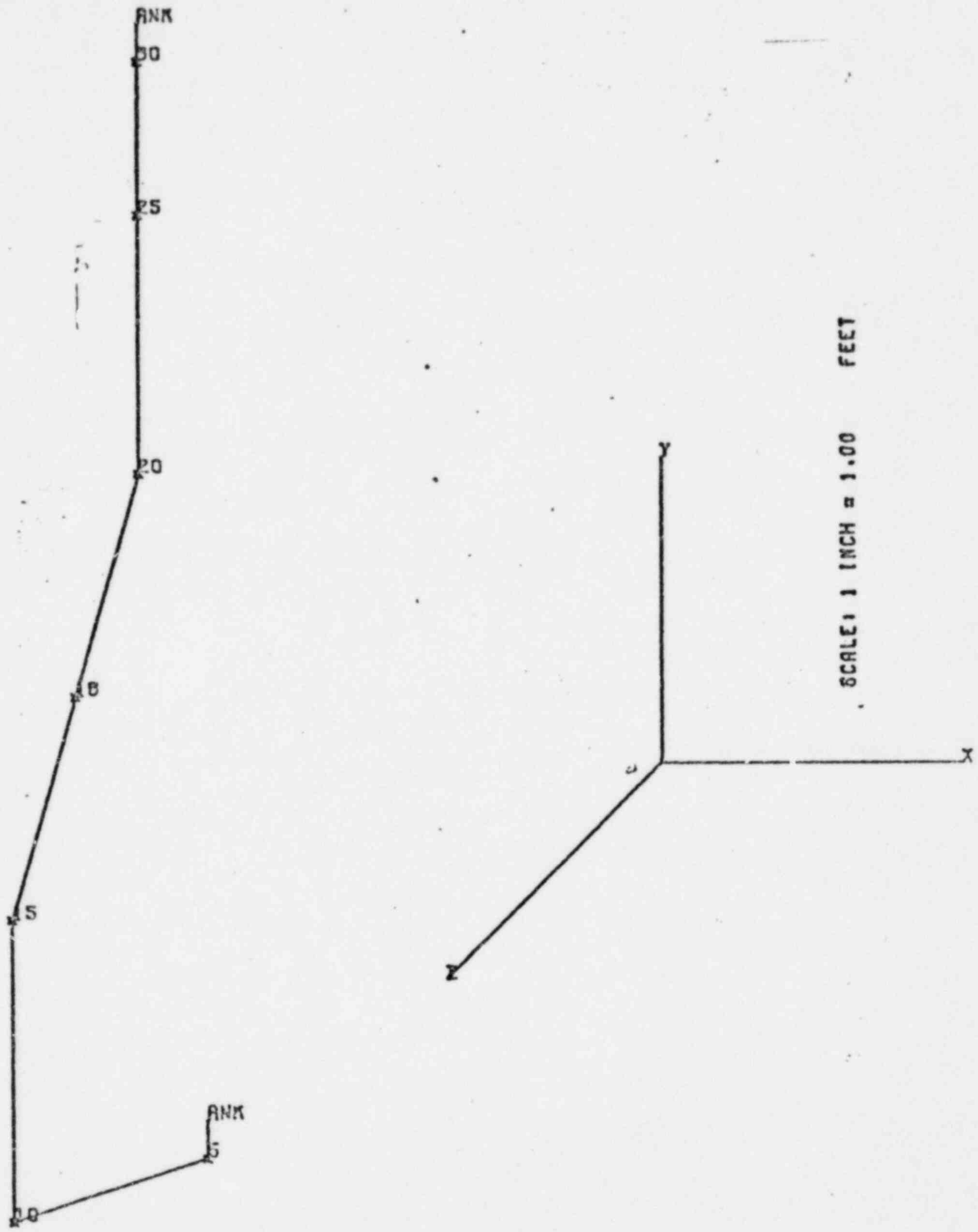

FIGURE H.4-41

4266-10 LAS-1 RH-48 & RH-49 *FRONT VIEW OBLQ* DCJ 03-20-80