

Catawba Nuclear Station
Units 1 and 2

Nuclear Safety Related Diaphragm Valves
Item 5B-473 Frequency Report

APPROVED
DUKE POWER CO.
DATE SEP 01 1983
S. K. BLACKLEY
CHIEF ENGINEER
By MECHANICAL DIVISION

Duke Specification CHS-1205.04-00-0001

Duke Valve List CN-0150-30

MPSCo Order E66449-11

CNM 1205.04-0426

QA CONDITION 1

DOCUMENT
CONTROL DATE
AUG 23 1983
DUKE POWER COMPANY
DESIGN ENGINEERING

ITT-Grinnell Valve Company
DIA-FLO Division
33 Centerville Road
Lancaster, PA 17603

VENDOR INSTRUCTION MANUAL
 INSERTION CONTROL FORM
 (To be placed inside front of Manual)

DUKE FILE NUMBER: CNM 1205-04-0426	TRANSMITTAL NUMBER: 00037	INSERTION CONTROL FORM: SHEET 1 OF 1
DOCUMENT CONTROL DATE: <div style="border: 1px solid black; padding: 5px; display: inline-block; text-align: center;"> DOCUMENT CONTROL DATE DEC - 6 1983 DUKE POWER COMPANY DESIGN ENGINEERING CO </div>	APPROVED BY: J.R. Kiser	DATE APPROVED: 12-30-83
	PROOFED BY: N. Stuart	DATE PROOFED: 1-5-84
<p style="text-align: center;">MATERIAL REMOVED</p> <p>REMOVE Pages 1-4 that are directly after the MODE PLOTS. PAGE 1 HAS IMPELL LETTER NO. 0093-210-448, July 20, 1983.</p>	<p style="text-align: center;">MATERIAL INSERTED</p> <p>INSERT NEW PAGES 1 thru 4 DIRECTLY BEHIND PAGE ENTITLED FREQUENCY ITT GRINNELL ITEM 5B-473 ROTATED OPERATOR MODE NUMBER 3.</p>	

DESIGN VERIFICATION

CLIENT DUKE: AFWB+

JOB NO. 0093-210-1362

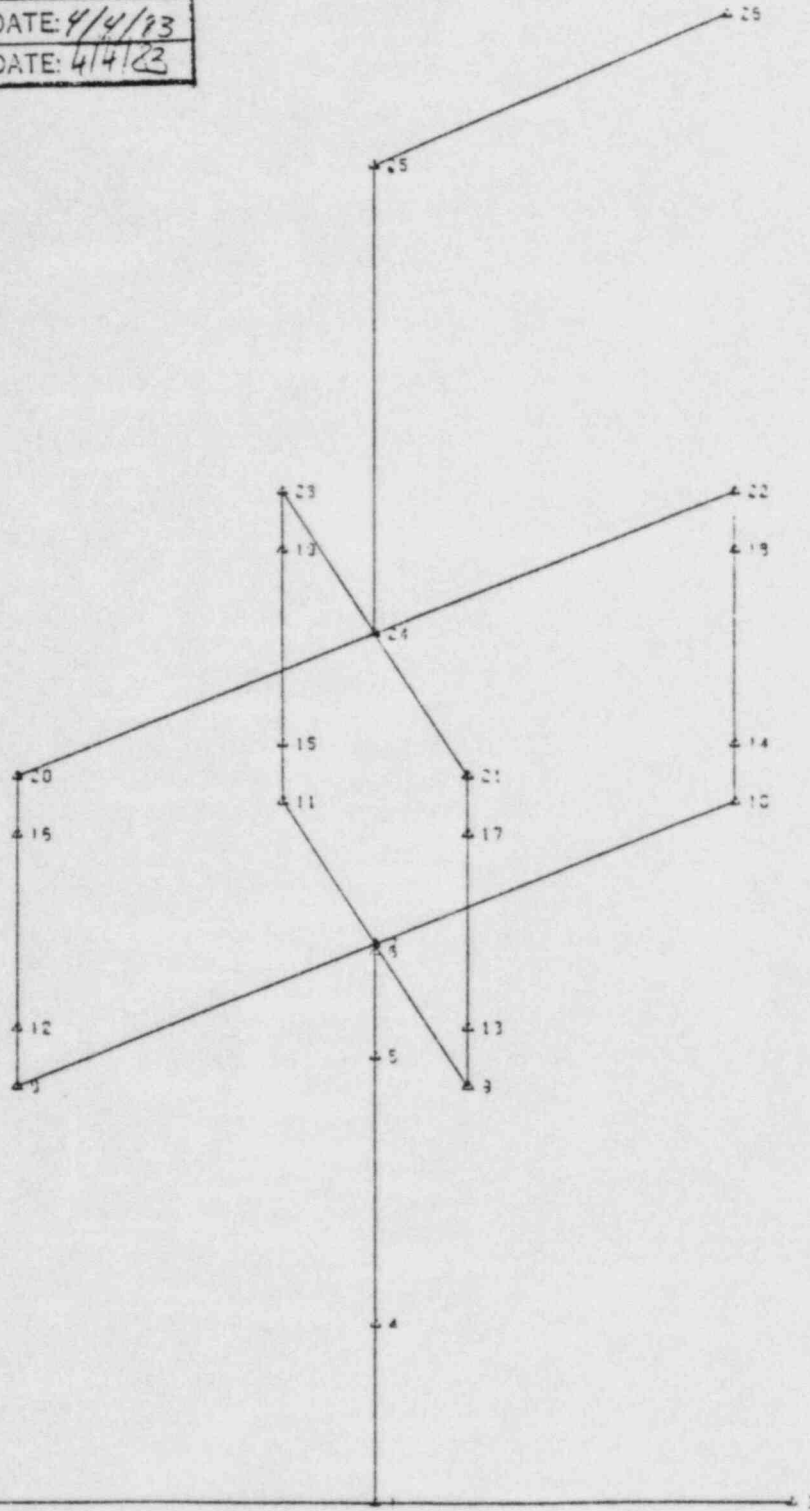
CALC/PROB NO. 136-1

BY: DN

DATE: 4/4/83

CHKD: 132

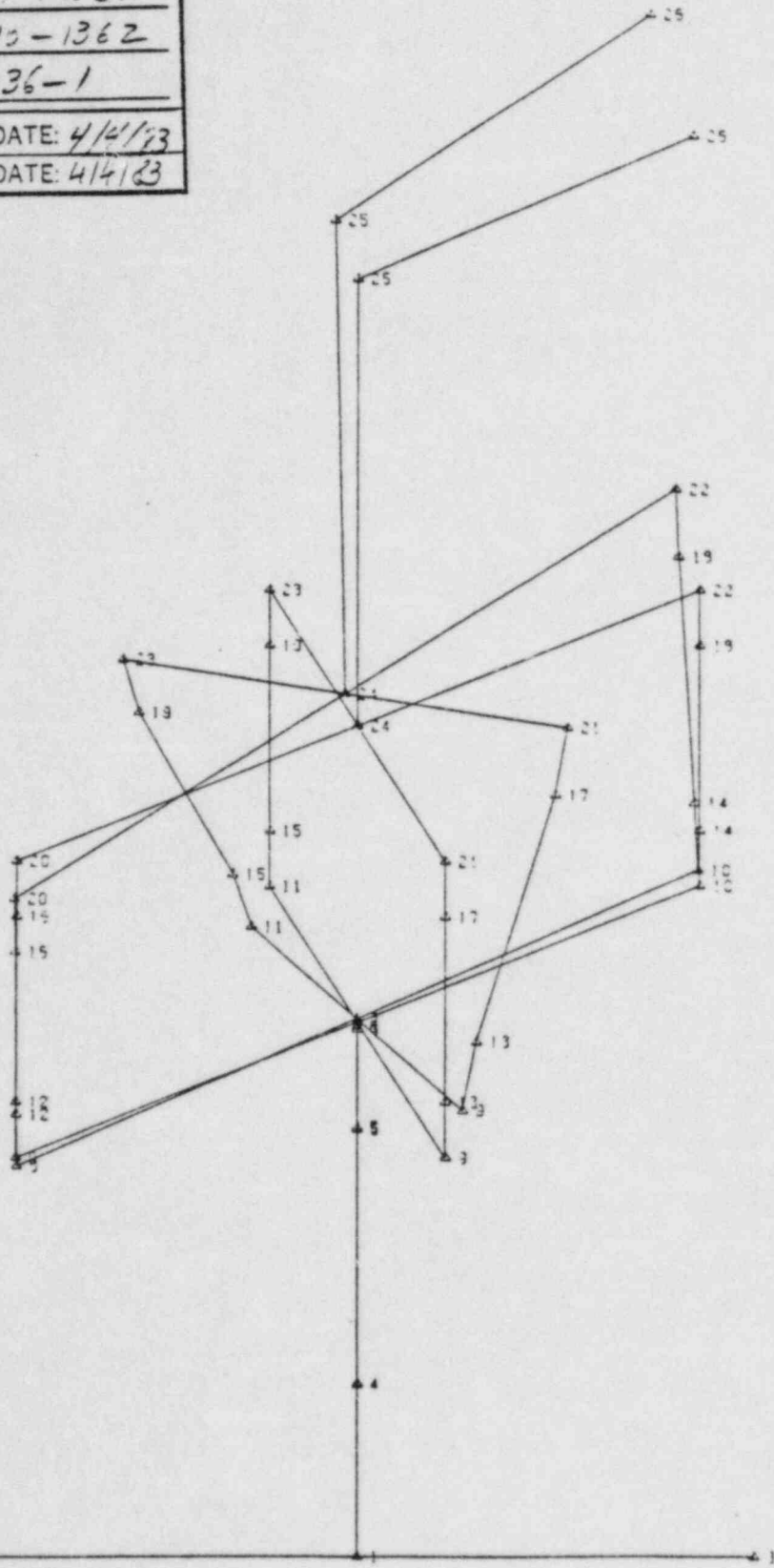
DATE: 4/4/83



DESIGN VERIFICATION

CLIENT DUKE: --WBA
 JOB NO. 2093-210-1362
 CALC, PROB NO. 136-1

BY: <u>DM</u>	DATE: <u>4/4/83</u>
CHKD: <u>MJ2</u>	DATE: <u>4/4/83</u>



FREQUENCY ITT CRINNELL ITEM 5B-473 CNM-1205.04-190
 MODE NUMBER 1

FREQUENCY = 20.393 CFS



DESIGN VERIFICATION

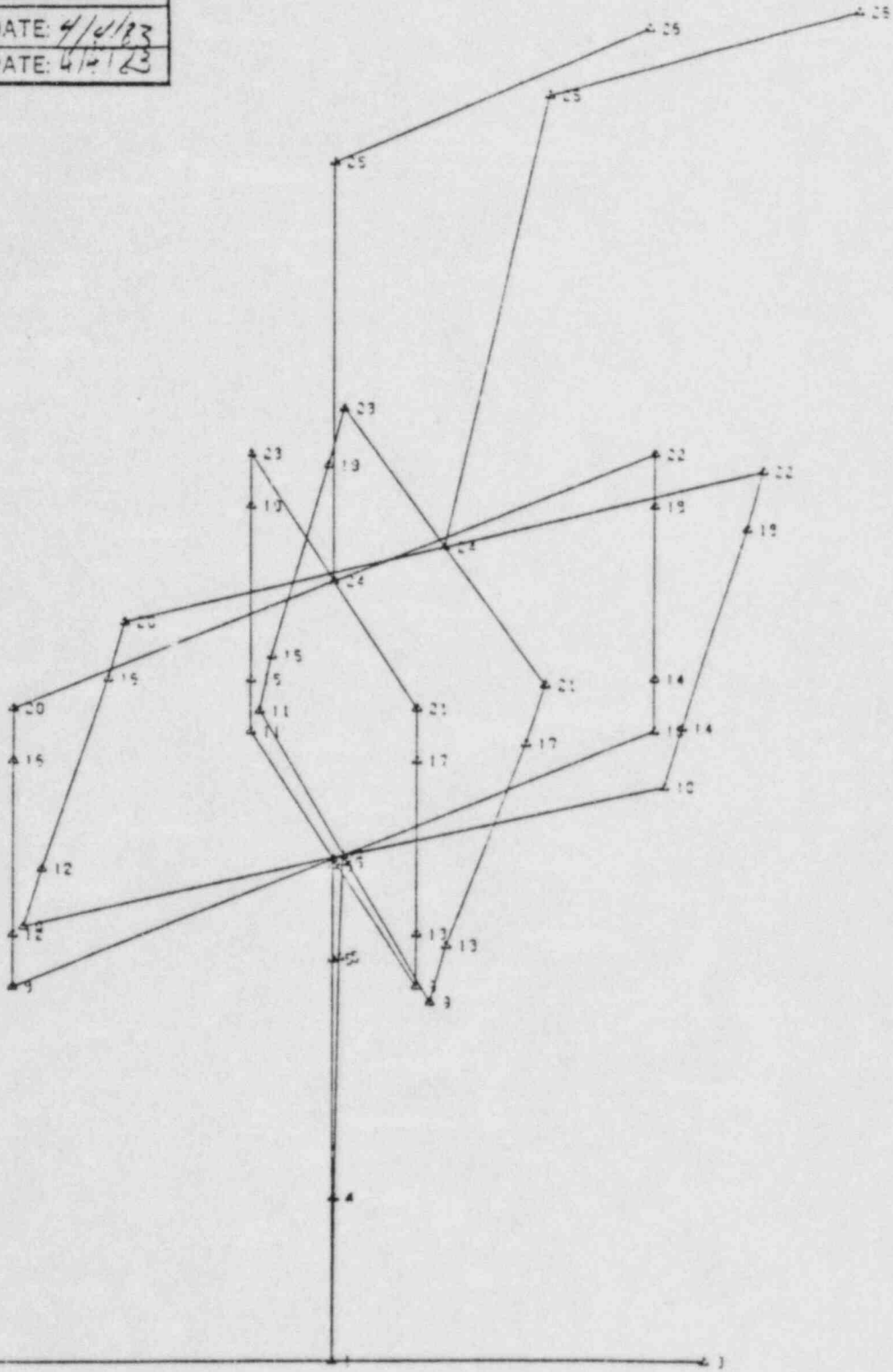
CLIENT DUKE: C-1132

JOB NO. 0093-210-1362

CALC/PROS NO. 136-1

BY: DN DATE: 4/4/83

CHKD: MDE DATE: 4/4/83



FREQUENCY ITT CRINNELL ITEM 5B-473 CNM-1205.04-130
MODE NUMBER 2

FREQUENCY = 25.733 CFS



DESIGN VERIFICATION

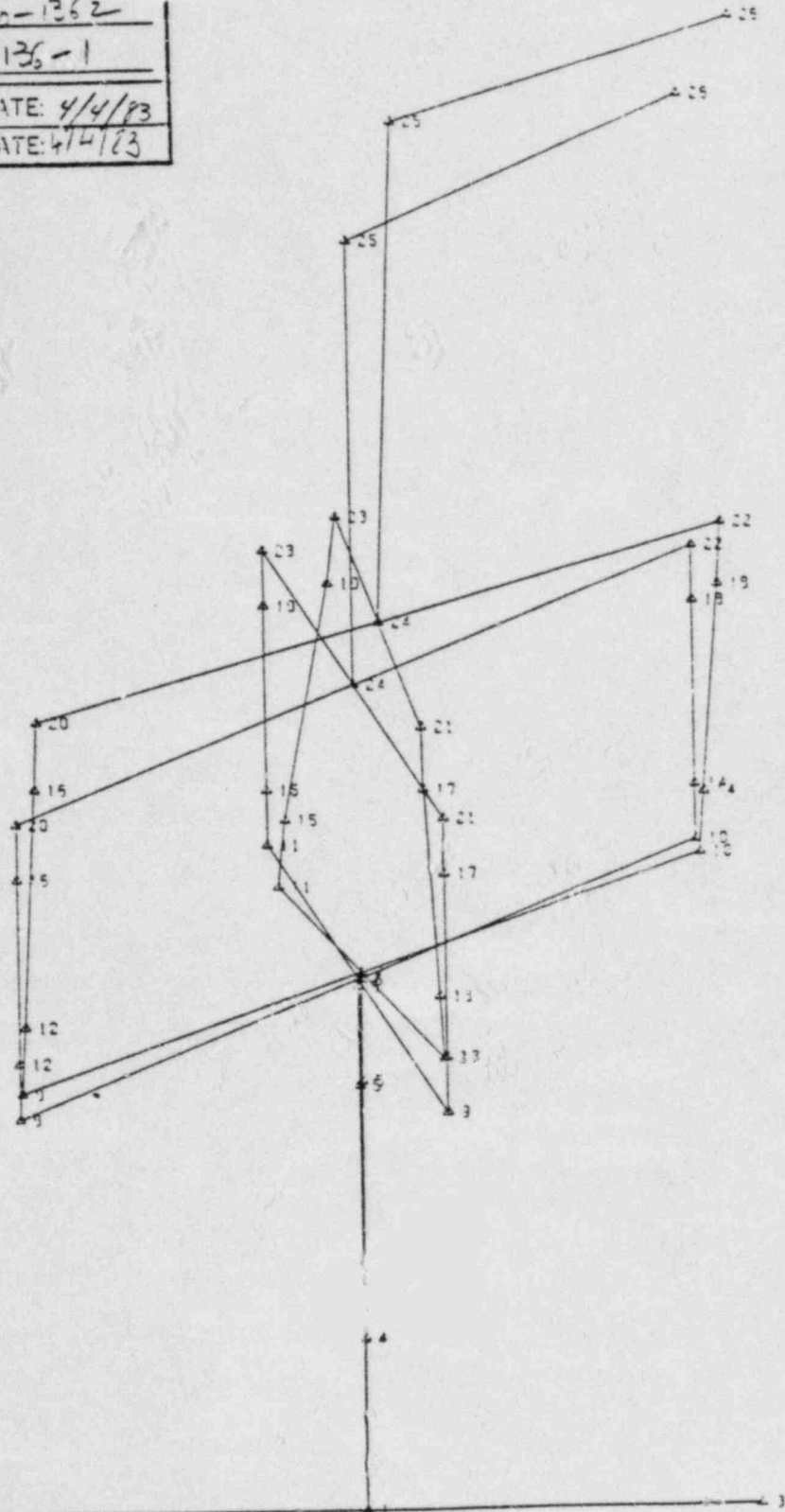
CLIENT DUKE: (ATA)WB4

JOB NO. 6093-310-1362

CALC/PROB NO. 136-1

TY: DN | DATE: 4/4/83

CHKD: YDZ | DATE: 4/4/83



FREQUENCY ITT GRINNELL ITEM 56-473 CNM-1205.04-190
MODE NUMBER 3

FREQUENCY= 30.567 **IMPELL**
CORPORATION

DESIGN VERIFICATION

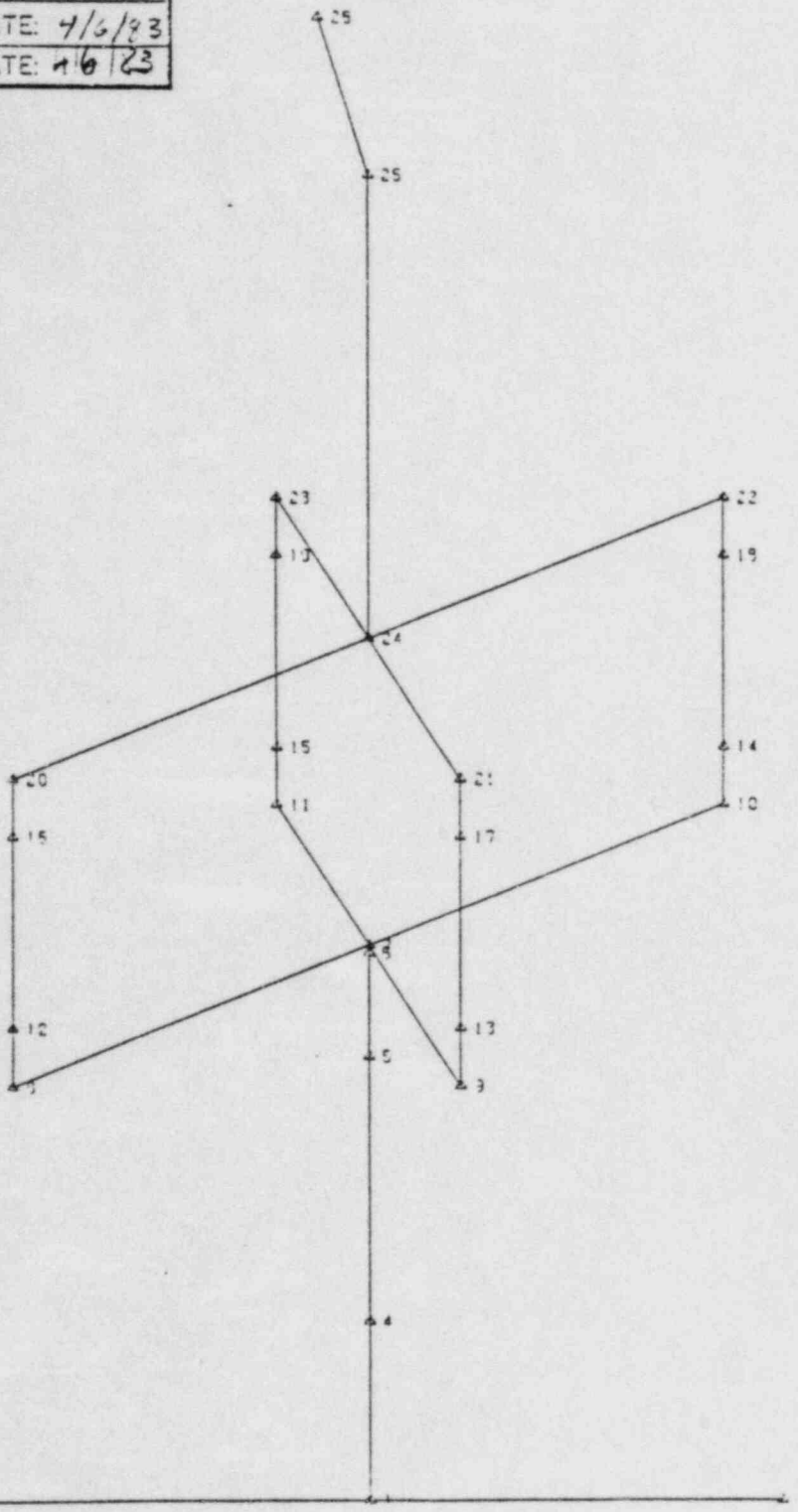
CLIENT DKE: 34-AWBA

JOB NO. 0002-210-1362

CALC/PROB NO. 136-1

BY: DW | DATE: 4/6/83

CHKD: P-12 | DATE: 4/6/83



FREQUENCY ITT ORINNELL ITEM 56-473 ROTATED OPERATOR



DESIGN VERIFICATION

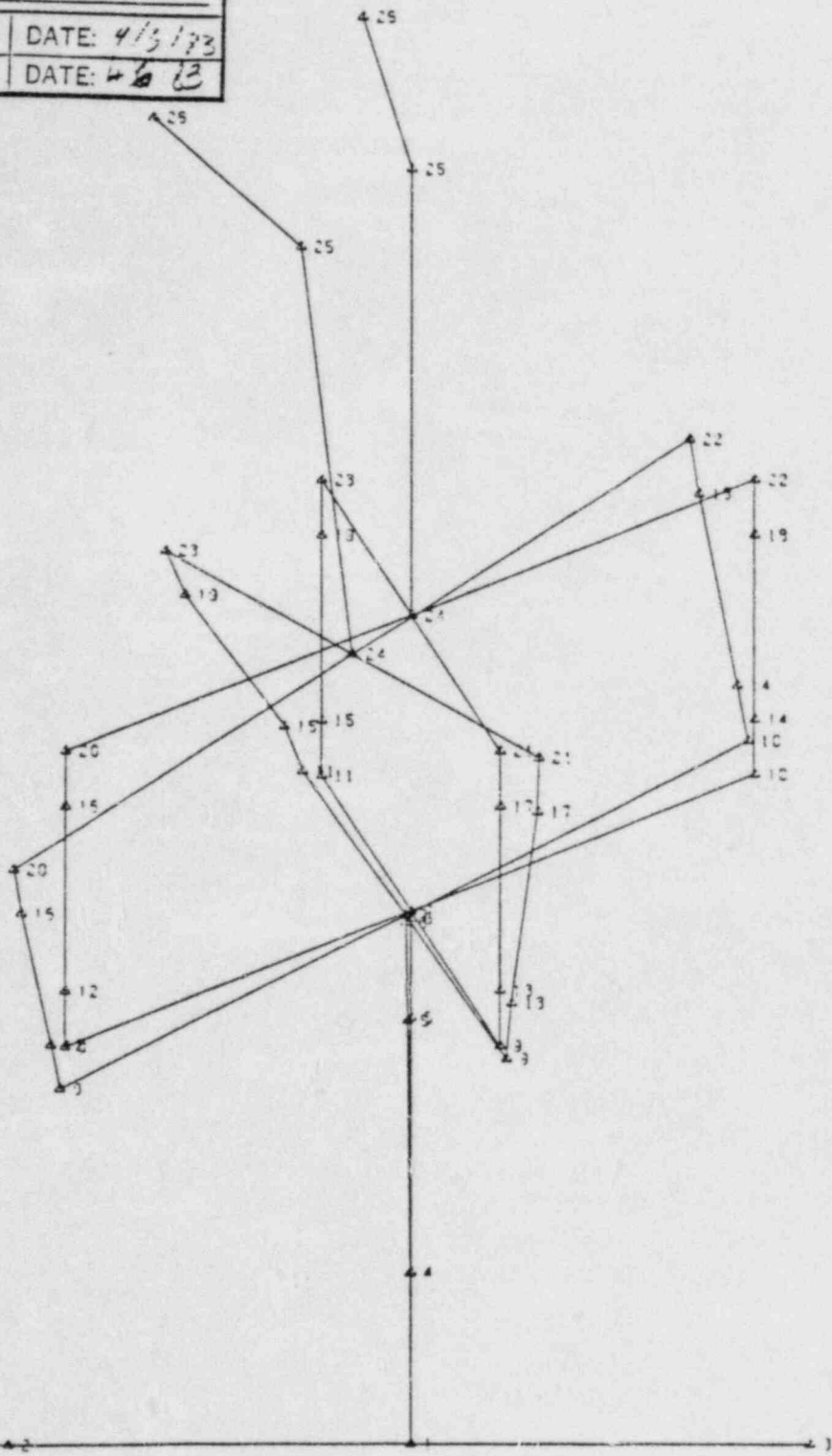
CLIENT DUKE: CA-10124

JOB NO. 0093-210-1362

CALC/PROB NO. 136-1

BY: DAI | DATE: 4/3/73

CHKD: MSE | DATE: 4/6/73



FREQUENCY ITT CRINNELL ITEM 56-173 ROTATED OPERATOR
MODE NUMBER 1

FREQUENCY= 20.122 CPS



DESIGN VERIFICATION

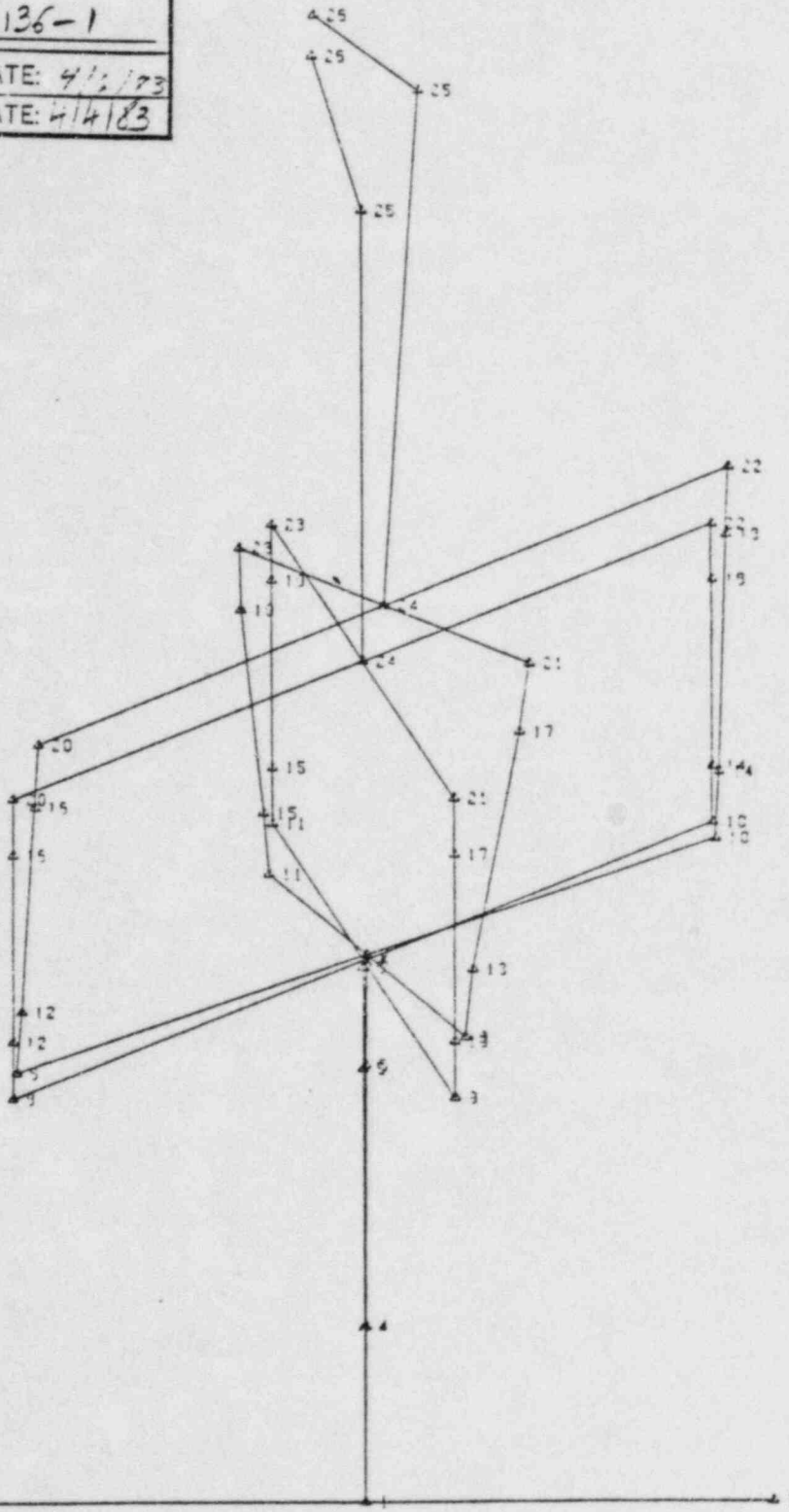
CLIENT DUKE: CATWBA

JOB NO. 0093-210-1362

CALC/PROB NO. 136-1

BY: DN | DATE: 4/2/83

CHKD: MDR | DATE: 4/4/83



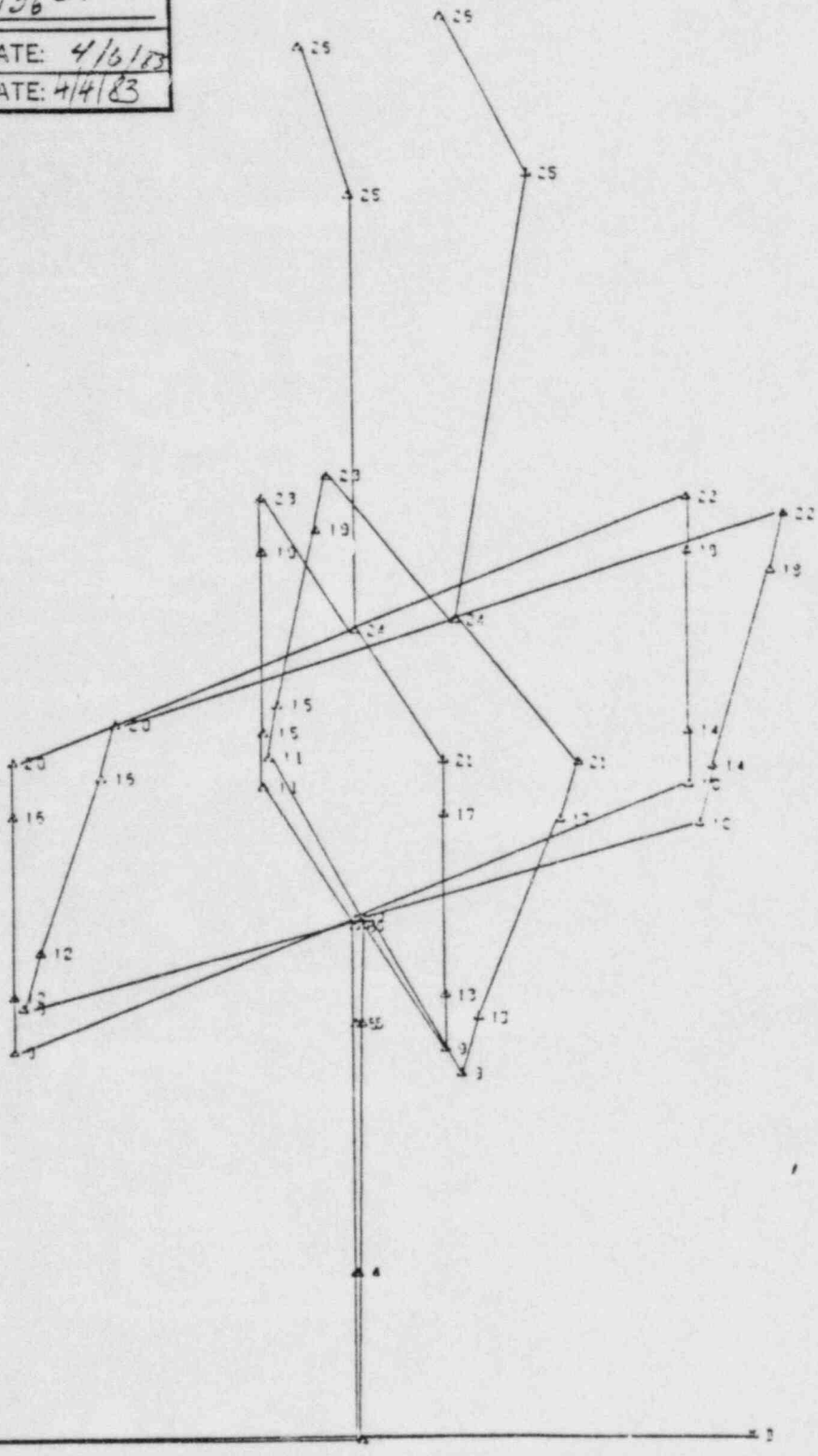
FREQUENCY ITT CRINNELL ITEM SB-473 ROTATED OPERATOR
MODE NUMBER 2

FREQUENCY = 23.353 CPS



DESIGN VERIFICATION

CLIENT DUKE: CAT+WBA
JOB NO. 0093-210-1362
CALC/PROB NO. 136-1
BY: DN | DATE: 4/6/83
CHKD: MDP | DATE: 4/4/83



FREQUENCY ITT GRINNELL ITEM 56-473 ROTATED OPERATOR
MODE NUMBER 3

FREQUENCY = 32.574 CFS **IMPELL**
CORPORATION

ITT GRINHELL 4"-150# VALVE - ITEM 5B-473, ROTORK 14N41 MOUNTED PERPENDICULAR* TO PIPE RUN AXIS - REVISION 1
 0-FREE, 1-FIXED GLOBAL DEGREE OF FREEDOM.

Pillar Steel: SA 193, Grade B7

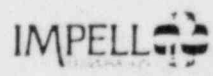
COMMON 1

NODE NUMBER	C	V	Z	KK	YY	ZZ	NOIAL POINT COORDINATES	Z
1	3	3	0	3	0	0	0.000	0.000
2	1	1	1	1	1	1	-5.750	0.000
3	1	1	1	1	1	1	5.750	0.000
4	3	3	0	0	0	0	0.000	0.000
5	3	3	0	3	0	0	0.000	0.000
6	3	3	0	3	3	3	3.000	0.000
7	3	3	0	3	3	3	0.000	0.000
8	3	3	0	3	0	0	-3.120	2.595
9	3	3	0	0	0	0	3.120	2.595
10	3	3	0	3	3	3	3.120	-2.595
11	3	3	0	3	3	3	-3.120	-2.595
12	0	0	0	0	0	0	-3.120	2.595
13	3	3	0	3	0	0	3.120	2.595
14	3	3	0	3	0	3	3.120	-2.595
15	3	3	0	3	3	3	-3.120	-2.595
16	0	0	0	3	0	0	-3.120	2.595
17	0	0	0	3	0	3	3.120	2.595
18	0	3	0	3	0	0	3.120	-2.595
19	3	3	0	3	3	3	-3.120	-2.595
20	3	3	0	3	0	0	-3.120	2.595
21	0	0	0	3	0	0	3.120	2.595
22	3	3	0	3	0	0	3.120	-2.595
23	3	3	0	3	3	3	3.120	-2.595
24	3	3	0	3	0	0	-3.120	2.595
25	0	0	0	3	0	0	0.000	0.000
26	3	3	0	3	0	0	0.000	0.000
27	1	1	1	1	1	1	-2.750	-2.306
							200.000	0.000

DOCUMENT CONTROL DATE
DEC 6 1983
DUKE POWER COMPANY DESIGN ENGINEERING

DESIGN VERIFICATION
 CLIENT: W.K.C. Control
 JOB NO.: 0-23-210
 CALC/PROB NO.: 136-13
 BY: [Signature] DATE: 10/1/83
 CHKD. BY: [Signature] DATE: 10/1/83
 HIT: 0.006 10/1/83
 P.C.E. E.N.G.

*Rotated 90° from that shown in assembly dwg. CNM 1205.04-0190



ITT GRINNELL 4"-150# VALVE - ITEM 5B-473, ROTORK 14#M1 MOUNTED PERPENDICULAR TO PIPE RUN AXIS - REVISION 1

Pillar Steel: SA 193, Grade B7

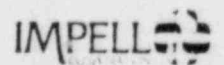
MATERIAL NO.	YOUNG S MODJLUS (PSI)	POISSON S RATIO	MASS DENSITY (#-S2/IN4)
1	2.930E+07	3.00000E-01	7.34000E-90
2	2.930E+07	3.00000E-01	1.00000E-90

ALL PROPERTIES IN INCH UNITS (AXIAL-AXIS ORIENTED FROM I TO J-NODE OF MEMBER, 1-AXIS LOCATED IN PLANE OF K-NODE ORTHOGONALLY POSITIONED TO AXIAL-AXIS, LOCAL 2-AXIS DEFINED BY RIGHT HAND RULE).

DOCUMENT CONTROL DATE
DEC 6 1983
DUKE POWER COMPANY DESIGN ENGINEERING

DESIGN VERIFICATION
CLIENT *Duke - Carolina*
JOB NO. *CC73-210*
CALC/PROB *RO/36-1A*
BY: *JS* DATE: *10/83*
CHECKED: *J* DATE: *11/83*

PROPERTY	AXIAL AREA	SHEAR AREA-1	SHEAR AREA-2	TORSION-1	INERTIA-1	INERTIA-2
1	5.353E+00	2.581E+00	2.581E+00	2.404E+01	1.212E+01	1.202E+01
2	4.422E+00	2.211E+00	2.211E+00	3.511E+01	1.433E+01	1.755E+01
3	2.333E+00	1.417E+00	1.417E+00	3.156E+00	1.373E+00	1.575E+00
4	2.037E+00	1.358E+00	1.358E+00	3.820E-01	1.232E+00	9.500E-02
5	1.227E+00	9.270E-01	9.200E-01	2.470E-01	1.213E-01	1.200E-01
6	9.553E-01	4.830E-01	4.830E-01	3.950E-01	1.373E-01	1.970E-01
7	3.341E-01	2.370E-01	2.300E-01	5.300E-03	3.113E-03	3.400E-03
8	1.000E+02	1.000E+02	1.000E+02	1.000E+03	1.000E+03	1.000E+03



Pillar Steel: SA 193, Grade B7

BEAM NO	NODES		MATL K	PROP NO
	I	J		
1	1	2	27	1
2	1	3	27	1
3	1	4	27	2
4	4	5	27	2
5	5	6	27	3
6	6	7	27	6
7	7	8	1	4
8	7	9	1	4
9	7	10	1	4
10	7	11	1	4
11	8	12	1	7
12	9	13	1	7
13	10	14	1	7
14	11	15	1	7
15	12	16	1	5
16	13	17	1	5
17	14	18	1	5
18	15	19	1	5
19	16	20	1	7
20	17	21	1	7
21	18	22	1	7
22	19	23	1	7
23	24	21	27	8
24	24	21	27	8
25	24	22	27	8
26	24	23	27	8
27	24	25	27	8
28	25	26	27	8

DOCUMENT CONTROL DATE
 DEC 6 1983
DUKE POWER COMPANY DESIGN ENGINEERING

DESIGN VERIFICATION
 CLIENT *Duke Construction*
 JOB NO. *0013 210*
 CALC. NO. *14-TA*
 BY *SAC* DATE *11/10/83*
 CHECKED *MLP* DATE *11/11/83*

ALL UNITS REPRESENTED AS LB, INCHES, SECONDS IN GLOBAL SYSTEM

MODE NO	APPLIED LOADS OR MASSES					
	RK	RY	RZ	MX	MY	MZ
25	5.993E-01	5.993E-01	5.993E-01	5.233E+01	5.319E+01	1.156E+01

IMPELLER

ITT GRINNELL 4"-150# VALVE - ITEM 5B-473, ROTORK 14NA1 MOUNTED PERPENDICULAR TO PIPE RUN AXIS - REVISION 1

Pillar Steel: SA 193, Grade B7

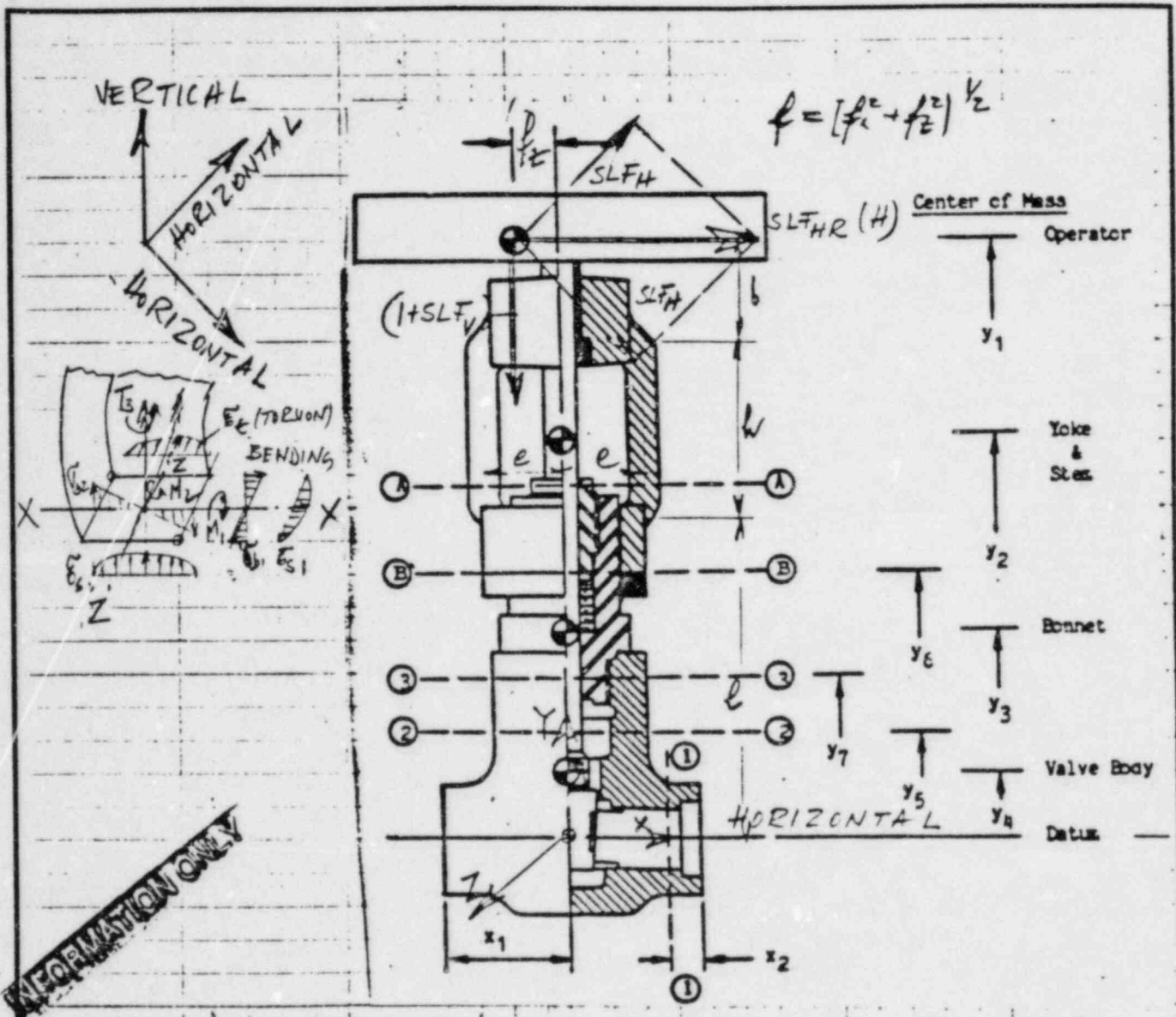
ANALYSIS SUMMARY:

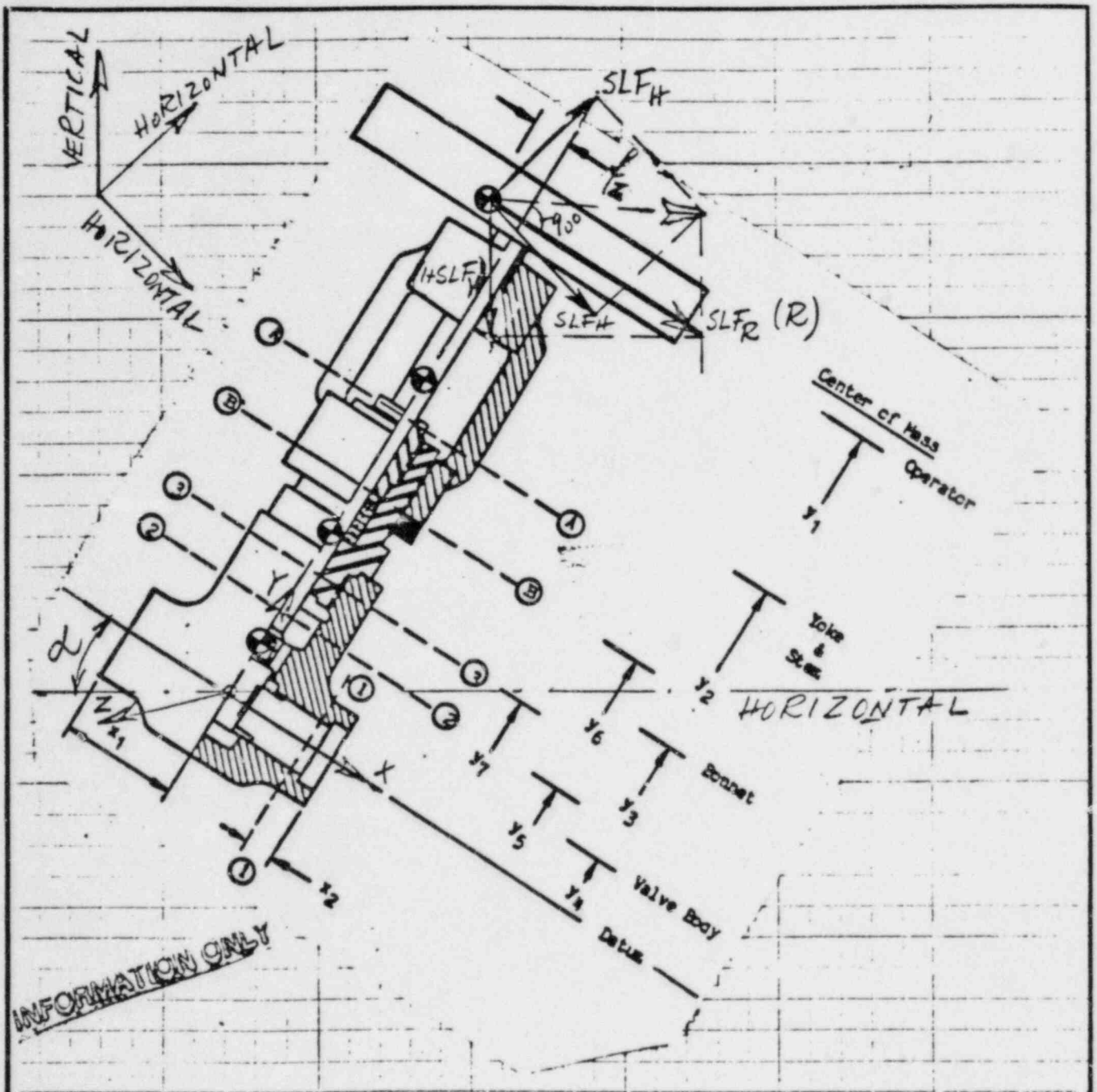
MODAL FREQ. (CPS)	MODAL TYPE	Max. Allow. Seismic Load (G) CALCULATED FOR INCLINED OPERATOR STEM (1)		Allow. Restraint Load (lbs)	
		RESULTANT OBE	RESULTANT SSE	RESULTANT OBE	RESULTANT SSE
20.12	B	9.95	11.98	2436.76	2933.90
23.95	T			QUALIFIED BY STATIC DEFLECTION TEST	
32.57	B	-	5.2	-	1225.0

DOCUMENT CONTROL DATE
 DEC 6 1983
 DUKE POWER COMPANY
 DESIGN ENGINEERING

NOTE (1) Resultant applied perpendicular to operator stem axis.

DESIGN VERIFICATION
 CLIENT WVE:YAT
 JOB NO. 6672-210
 CALC/PROB NO. 126-1A
 BY: [Signature] DATE: 11/8
 CHKD: MJE DATE: 11/8





VALVE SEISMIC ORIENTATION
 INCLINED STEM AXIS - PERPENDICULAR TO SLFR
 SLFR APPLIED ON THE YOKE WEAKEST DIRECTION
 FOR $SLF_H = (SLF_V + 1) = 3 \times \alpha = \tan\left(\frac{1}{\sqrt{2}}\right) \approx 35.26$

					SEISMIC LOAD FACTORS CORRELATION ANALYSIS			
					eds nuclear		JOB NO	PAGE
							CALC NO	3
REV	BY	DATE	CHECKED	DATE				
	MJR	7/11/83	SW	7/11/83				

FREQUENCY ITT GRINNELL ITEM 5B-473 CVM-1205.04-190

NUMBER OF NODAL POINTS = 27
NUMBER OF ELEMENT TYPES = 1
NUMBER OF LOAD CASES = 1
NUMBER OF FREQUENCIES = 3
ANALYSIS TYPE CODE = 2
BLANK COMMON STORAGE SPECIFIED = 7476
RESTART CODE = 2
NUMBER OF FREQUENCIES/BLOCK = 0
MODES (EIGEN VALUE) ANALYSIS CODE = 2

Log. # AATQURA

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO.	0012-710
CALCIPROB NO.	136-1
BY: A. W. J.	DATE: 8/1/83
CHKD BY: A. W. J.	DATE: 4/2/83

NODE NUMBER	BOUNDARY CONDITION CODES						NODAL POINT COORDINATES			
	X	Y	Z	XX	YY	ZZ	X	Y	Z	
1	1		0	0	0	0	0.000	0.000	0.000	0
2	1	1	1	1	1	1	-5.750	0.000	0.000	0
3	1	1	1	1	1	1	5.750	0.000	0.000	0
4	0	0	0	0	0	0	0.000	2.310	0.000	0
5	0	0	0	0	0	0	0.000	5.750	0.000	0
6	0	0	0	0	0	0	0.000	7.100	0.000	0
7	0	0	0	0	0	0	0.000	7.200	0.000	0
8	0	0	0	0	0	0	-3.120	7.200	2.595	0
9	0	0	0	0	0	0	3.120	7.200	2.595	0
10	0	0	0	0	0	0	3.120	7.200	-2.595	0
11	0	0	0	0	0	0	-3.120	7.200	-2.595	0
12	0	0	0	0	0	0	-3.120	7.950	2.595	0
13	0	0	0	0	0	0	3.120	7.950	2.595	0
14	0	0	0	0	0	0	3.120	7.950	-2.595	0
15	0	0	0	0	0	0	-3.120	7.950	-2.595	0
16	0	0	0	0	0	0	-3.120	10.450	2.595	0
17	0	0	0	0	0	0	3.120	10.450	2.595	0
18	0	0	0	0	0	0	3.120	10.450	-2.595	0
19	0	0	0	0	0	0	-3.120	10.450	-2.595	0
20	0	0	0	0	0	0	-3.120	11.200	2.595	0
21	0	0	0	0	0	0	3.120	11.200	2.595	0
22	0	0	0	0	0	0	3.120	11.200	-2.595	0
23	0	0	0	0	0	0	-3.120	11.200	-2.595	0
24	0	0	0	0	0	0	0.000	11.200	0.000	0
25	1	0	0	0	0	0	0.000	17.230	0.000	0
26	0	0	0	0	0	0	2.905	17.230	-2.750	0
27	1	1	1	1	1	1	200.000	200.000	0.000	0

NUMBER OF NODE CARDS READ = 27

Fig. # AATQURA

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO.	2093-210
CALC/PROB NO.	136-1
BY: <i>W</i>	DATE: <i>1/11/83</i>
CHKD: <i>MJR</i>	DATE: <i>1/27/83</i>

BEAM GEOMETRIC PROPERTIES

ELEMENT TYPE	AREA X	AREA Y	AREA Z	INERTIA X	INERTIA Y	INERTIA Z
1	5.363E+00	2.681E+00	2.681E+00	2.404E+01	1.202E+01	1.202E+01
2	4.422E+00	2.211E+00	2.211E+00	3.511E+01	1.755E+01	1.755E+01
3	2.835E+00	1.417E+00	1.417E+00	3.150E+00	1.575E+00	1.575E+00
4	2.037E+00	1.358E+00	1.358E+00	3.820E-01	1.252E+00	9.500E-02
5	1.227E+00	9.200E-01	9.200E-01	2.400E-01	1.200E-01	1.200E-01
6	9.660E-01	4.830E-01	4.830E-01	3.950E-01	1.970E-01	1.970E-01
7	3.340E-01	2.500E-01	2.500E-01	6.800E-03	3.400E-03	3.400E-03
8	1.000E+02	1.000E+02	1.000E+02	1.000E+03	1.000E+03	1.000E+03

ELEMENT LOAD MULTIPLIERS

	A	B	C	D
X-DIR	0.	0.	0.	0.
Y-DIR	0.	0.	0.	0.
Z-DIR	0.	0.	0.	0.

Fig. # AATQURA

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO.	0072-79
CALC PROP. NO.	12671
BY:	DATE:
CHKD:	DATE: 7/2/83

MATERIAL	YOUNG S MODJLUS	POISSON S RATIO	MASS DENSITY	DAMPING RATIO
1	2.930E+07	3.0000E-01	7.34000E-04	0.
2	2.930E+07	3.0000E-01	1.00000E-09	0.

Sg. # AATRURA

DESIGN VERIFICATION	
CLIENT	AUKE
JOB NO.	693-270
CALC/PHC NO.	136-1
BY	AN
DATE	4/18
CHECKED	MOA
DATE	4/18

..... NODAL POINT LOADS OR MASSES

NODE	LOAD	----- APPLIED LOADS OR MASSES -----					
NO	CASE	RX	RY	RZ	MX	MY	MZ
26	0	5.980E-01	5.980E-01	5.980E-01	1.156E+01	5.819E+01	6.283E+01

Sig. # KATAURA

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO	0073-210
CALC/PROB NO	136-1
BY	JN
DATE	4/7/83
CHKD	MJR
DATE	4/8/83

SUMMARY OF MODES

MODE	FREQ. (RAD/SEC)	FREQ. (CPS)	PERIOD
1	.123073E+03	.203834E+02	.049053
2	.161683E+03	.257327E+02	.038861
3	.192185E+03	.305873E+02	.032693

Seq. # AATQURA
 DESIGN VERIFICATION
 CLIENT DUKE
 JOB NO. 2293-210
 CALC/PROB NO. 126-1
 BY: DW DATE: 11/85
 CHKD M 2 DATE: 12/83

DESIGN VERIFICATION

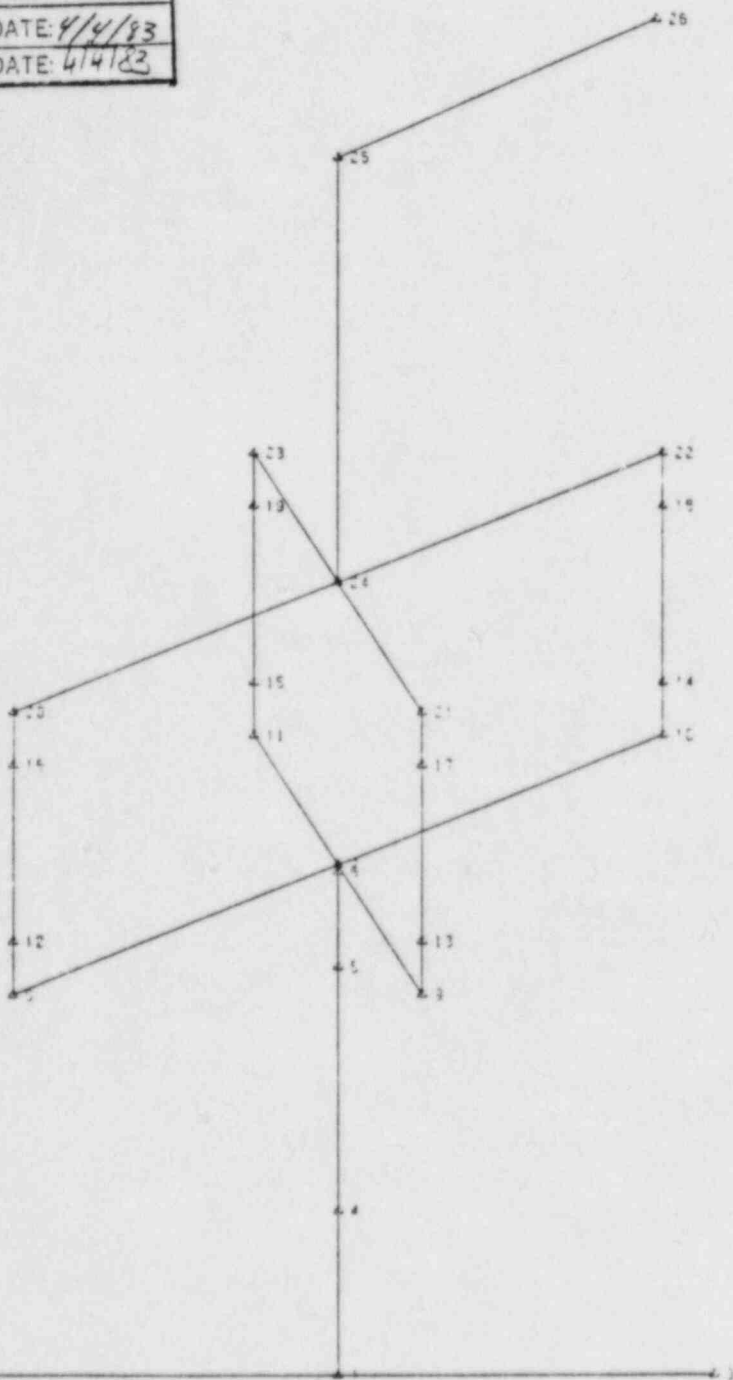
CLIENT DUKE: CATWBA

JOB NO. 0093-210-1362

CALC. PROB NO. 136-1

BY: DN DATE: 4/4/83

CHKD: YBZ DATE: 4/4/83



FREQUENCY ITT CRINNEL ITLM SB-473 CNM-1205.04-190

SEAN NO	I	J	K	VAL-SE04	VAL-SE03	ELIM-0403	C	D	I	EXI CODES	J	BAND
1	1	2	27	1	3	3	3	3	3		5	5
2	1	3	27	1	3	3	0	0	3		5	5
3	1	4	27	1	3	0	0	0	0		0	12
4	6	5	27	1	0	0	0	0	0		0	12
5	3	5	27	1	0	0	3	3	3		3	12
6	5	7	27	1	3	3	3	3	3		3	12
7	7	8	1	1	3	0	0	0	0		0	12
8	7	9	1	1	3	0	0	0	0		0	18
9	7	13	1	1	3	3	3	3	3		3	24
10	7	11	1	1	3	0	3	3	3		3	33
11	9	12	1	1	0	0	0	0	0		0	30
12	9	13	1	1	0	0	0	0	0		0	30
13	11	14	1	1	3	3	3	3	3		3	33
14	11	13	1	1	0	0	0	0	0		0	30
15	12	15	1	1	0	0	0	0	0		0	30
16	13	17	1	1	3	0	0	0	0		0	30
17	14	18	1	1	3	3	3	3	3		3	33
18	15	13	1	1	0	3	0	0	0		0	30
19	16	20	1	1	0	0	0	0	0		0	30
20	17	21	1	1	0	0	0	0	0		0	30
21	18	22	1	1	3	3	3	3	3		3	33
22	19	23	1	1	0	3	0	0	0		0	30
23	24	23	27	2	3	0	0	0	0		0	33
24	24	21	27	2	0	0	0	0	0		0	24
25	24	22	27	2	3	3	3	3	3		3	13
26	24	23	27	2	0	0	0	0	0		0	12
27	24	25	27	2	3	0	0	0	0		0	12
28	25	25	27	2	3	0	3	0	3		3	12

ELEMENT BAWOIJGH IS 33

Seq. # HAIRQUEA

DESIGN VERIFICATION	
CLIENT	J VCE
JOB NO.	0092-210
CALC/PROB NO.	135-1
BY: M	DATE: 4/48
CHKD: M	DATE: 4/48

USER NUMBER = 10MRYM
JOB CARD NAME = JOB

AAAAAAAAA	AAAAAAAAA	TTTTTTTTT	330000000	FFFFFFFFF	LL	VV	VV			
LLLLLLLLL	LLLLLLLLL	TTTTTTTTT	333300000	FF'FF'FF'F	LL	VV	VV			
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AAAAAA	AAAAAA	AAAAAA	AAAAAA	TT	33	QQ	FF	LL	VV	VV
LLLLLLLL	LLLLLLLL	TTTTTT	33	QQ	FF	LL	VV	VV		
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV
AA	AA	AA	AA	TT	33	QQ	FF	LL	VV	VV

83/74/04. 33.45.13.4

FREQUENCY ANALYSIS
 4" 150 ITT G. RINNELL VALVE, ITEM 58-473
 ROTORK 14N11 - mounted perpendicular
 to pipe run axis.

$$f_1 = 20.01 \text{ Hertz}$$

DESIGN VERIFICATION	
CLIENT	DUKE: CATAWBA
JOB NO.	0093-210-1362
CALC/PROB NO.	136-1
BY:	DN
DATE:	4/2/83
CHKD:	YDR
DATE:	4/4/83

NUMBER OF NODAL POINTS = 27
 NUMBER OF ELEMENT TYPES = 1
 NUMBER OF -JAD CASES = 1
 NUMBER OF FREQUENCIES = 3
 ANALYSIS TYPE CODE = 2
 BLANK COMMON STORAGE SPECIFIED = 7475
 RESTART CODE = 2
 NUMBER OF FREQUENCIES/BLOCK = 3
 MODES (EIGEN VALUES) ANALYSIS CODE = 2

Sig # AA7QZLN
 DESIGN REVIEW TICKET
 CLIENT DUKE
 JOB NO 2093-270
 CALC PROP NO 126-1
 BY GW DATE 4/3/83
 CHKD MDR DATE 4/13/83

STORAGE REQUIRED IN ROUTINE.. GAP1

REQUIRED BLANK COMMON = 403
AVAILABLE BLANK COMMON = 7476

LOCAL POINT DATA AS INPUT

NODE NUMBER	C	Y	Z	KX	KY	KZ	LOCAL POINT COORDINATES	Z
1	0	0	0	0	0	0	0.000	0.000
2	1	1	1	1	1	1	0.001	0.001
3	1	1	1	1	1	1	0.001	0.000
4	0	0	0	0	0	0	2.311	0.000
5	0	0	0	0	0	0	5.751	0.000
6	0	0	0	0	0	0	7.111	0.000
7	0	0	0	0	0	0	7.201	0.000
8	0	0	0	0	0	0	7.201	2.595
9	0	0	0	0	0	0	7.201	2.595
10	0	0	0	0	0	0	7.201	-2.595
11	0	0	0	0	0	0	7.201	-2.595
12	0	0	0	0	0	0	7.951	2.595
13	0	0	0	0	0	0	7.951	2.595
14	0	0	0	0	0	0	7.951	-2.595
15	0	0	0	0	0	0	7.951	-2.595
16	0	0	0	0	0	0	10.451	2.595
17	0	0	0	0	0	0	10.451	2.595
18	0	0	0	0	0	0	10.451	-2.595
19	0	0	0	0	0	0	10.451	-2.595
20	0	0	0	0	0	0	11.201	2.595
21	0	0	0	0	0	0	11.201	2.595
22	0	0	0	0	0	0	11.201	-2.595
23	0	0	0	0	0	0	11.201	-2.595
24	0	0	0	0	0	0	11.201	0.000
25	0	0	0	0	0	0	17.231	0.000
26	0	0	0	0	0	0	17.231	-2.595
27	1	1	1	1	1	1	200.001	0.000

sq. # ATR FLX

DESIGN VERIFICATION
CLIENT DUKE
JOB NO. 0073-210
CALC/PROB NO. 1361
BY DW DATE 4/2/83
CARD NO. 4483

NUMBER OF NODE CARDS READ = 27

MATERIAL	YOUNG S MODJLUS	POISSON S RATIO	MASS DENSITY	DAMPING RATIO
1	2.930E+07	3.00000E-01	7.34000E-40	0.
2	2.930E+07	3.00000E-01	1.00000E-90	0.

Seq. # AATR FLV

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO.	0043-210
CALC/PROB NO.	136-1
BY: DN	DATE: 4/2/83
CHKD: MA	DATE: 4/9/83

ELEM GEOMETRIC PROPERTIES

ELEMENT TYPE	AREA X	AREA Y	AREA Z	INERTIA X	INERTIA Y	INERTIA Z
1	5.353E+00	2.581E+00	2.581E+00	2.404E+01	1.202E+01	1.202E+01
2	4.422E+00	2.211E+00	2.211E+00	3.511E+01	1.755E+01	1.755E+01
3	2.335E+00	1.417E+00	1.417E+00	3.150E+00	1.575E+00	1.575E+00
4	2.037E+00	1.358E+00	1.358E+00	3.820E-01	1.252E+00	9.500E-02
5	1.227E+00	9.200E-01	9.200E-01	2.400E-01	1.200E-01	1.200E-01
6	9.550E-01	4.830E-01	4.830E-01	3.950E-01	1.970E-01	1.970E-01
7	3.341E-01	2.500E-01	2.500E-01	5.300E-03	3.400E-03	3.400E-03
8	1.000E+02	1.000E+02	1.000E+02	1.000E+03	1.000E+03	1.000E+03

ELEMENT LOAD MULTIPLIERS

	A	B	C	D
X-DIR	0.	0.	0.	0.
Y-DIR	0.	0.	0.	0.
Z-DIR	0.	0.	0.	0.

Log. #AATQFLV

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO	0013-210
CALC/PROB NO	136-1
BY	DM
DATE	7/3/83
TIME	4/4/83

NODE L0A1
 NO CASE
 25 1. 5.881E-11 5.931E-11 5.931E-11 5.233E+01 5.317E+01 1.155E+01
 RK RZ MX MY MZ
 ----- APPLIED LOADS OR MASSES -----

fig. # AA7QFLV

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO	0233-210
CALC/PROB. NO.	136-1
BY:	DATE: 4/7/83
CHECKED:	DATE: 4/18/83

SUMMARY OF MODES

MODE	FREQ. (RAD/SEC)	FREQ. (CPS)	PERIOD
1	.125133E+13	.201224E+02	.0495311
2	.150199E+13	.233525E+02	.041741
3	.204570E+13	.325743E+02	.030531

SQ. #AA TQFLV

DESIGN VERIFICATION	
CLIENT	DUKE
JOB NO.	1073-210
CALCJOB NO.	136-1
BY	DATE: 1/17/83
CHKD.	MJA DATE: 4/18/83

DESIGN VERIFICATION

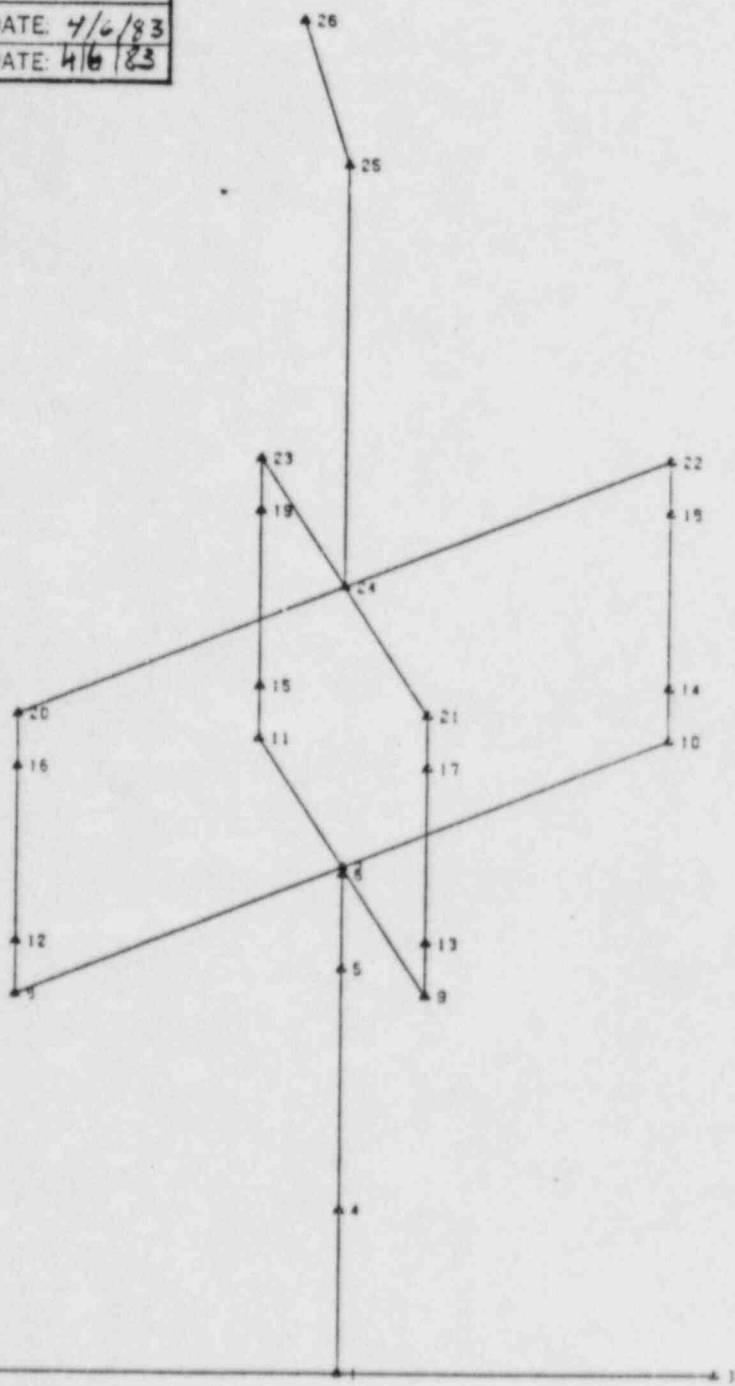
CLIENT DUKE: CATAWBA

JOB NO. 0093-210-1362

CALC/PROB NO. 136-1

BY: DN DATE: 4/6/83

CHKD: MSR DATE: 4/6/83



FREQUENCY ITT GRINNELL ITEM SB-473 ROTATED OPERATOR

Fig. # ATR FLW

DESIGN VERIFICATION	
CLIENT	D. J. KE
JOB NO.	0043-210
CALC. PROB. NO.	13-1
BY	J. N.
DATE	1/1/12
CHKD.	M. S.
DATE	1/1/12

BEAM NO	MODES I	MODES J	K	MATL GEO. NO	A	B	C	D	I	EMJ CODES J	BAND
1	1	2	27	1	0	0	0	0	0	0	6
2	1	3	27	1	0	0	0	0	0	0	6
3	1	4	27	1	0	0	0	0	0	0	12
4	4	5	27	1	0	0	0	0	0	0	12
5	5	6	27	1	0	0	0	0	0	0	12
6	6	7	27	1	0	0	0	0	0	0	12
7	7	8	27	1	0	0	0	0	0	0	12
8	7	9	27	1	0	0	0	0	0	0	12
9	7	10	27	1	0	0	0	0	0	0	18
10	7	11	27	1	0	0	0	0	0	0	24
11	8	12	27	1	0	0	0	0	0	0	30
12	9	13	27	1	0	0	0	0	0	0	30
13	10	14	27	1	0	0	0	0	0	0	30
14	11	15	27	1	0	0	0	0	0	0	30
15	12	16	27	1	0	0	0	0	0	0	30
16	13	17	27	1	0	0	0	0	0	0	30
17	14	18	27	1	0	0	0	0	0	0	30
18	15	19	27	1	0	0	0	0	0	0	30
19	16	21	27	1	0	0	0	0	0	0	30
20	17	21	27	1	0	0	0	0	0	0	30
21	18	22	27	1	0	0	0	0	0	0	30
22	19	23	27	1	0	0	0	0	0	0	30
23	24	23	27	2	0	0	0	0	0	0	30
24	24	21	27	2	0	0	0	0	0	0	30
25	24	22	27	2	0	0	0	0	0	0	24
26	24	23	27	2	0	0	0	0	0	0	18
27	24	25	27	2	0	0	0	0	0	0	12
28	25	26	27	2	0	0	0	0	0	0	12

ELEMENT BANDWIDTH IS 30

Attachment 4

Static Deflection Test
for
Valves VQ2A and VQ16A