

Central Calorimeter Support Cradle
Jack Failure Analysis

D-Zero Engineering Note 3740.215-EN-84

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Approved *R. M. H. W. a. b.*

Introduction

The Central Calorimeter and its support cradle (Figure 1) are to be supported by either hydraulic or mechanical jacks. If hydraulics are used, each support will use two hydraulically coupled jacks with two out of the four supports hydraulically coupled giving the effect of a three point support system. If mechanical jacks are used, all four points are used for support. Figure 2 shows two examples of jack placement on a 3.5 inch support plate.

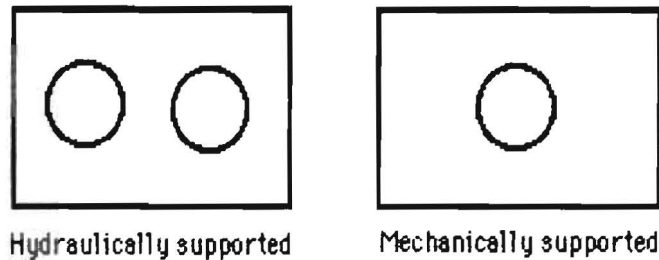
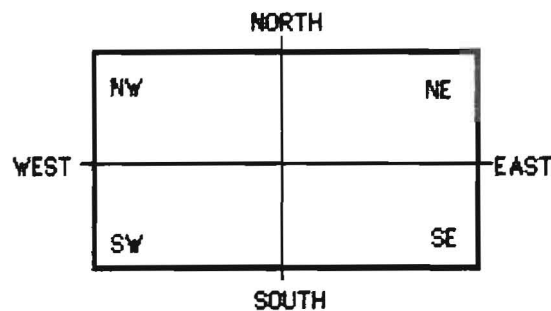


Figure 2

These two support scenarios lead to five jack failure cases to be studied. This report deals with the way in which a 0.25 inch drop (Failed jack) at one support affects the stresses in the cradle. The stresses from each failure case were analysed in two ways. First, stress factors, defined as quotients of stress intensities of the failed case with respect to the static case, were generated and then, hand calculations similar to those in Engineering Note 3740.215-EN-14 (Reference 1) were done using the reaction forces from the failed case.

The Five Failure Cases

Viewing the Central Calorimeter Support Cradle from the top.



Where **SE** equals **QUADRANT 1**, **NE** equals **QUADRANT 2**, **SW** equals **QUADRANT 3**, and **NW** equals **QUADRANT 4**. These are the four point of support. The five failure cases are as follows:

- NUMBERONE:** SW-SE Hydraulic Tie; NE Failure
- NUMBERTWO:** SW-SE Hydraulic Tie; SW-SE Failure
- NUMBERTHREE:** NW-SW Hydraulic Tie; NE Failure
- NUMBERFOUR:** NW-SW Hydraulic Tie; NW-SW Failure
- NUMBERFIVE:** ALL MECHANICAL; NE Failure

The failure cases and the quadrants noted above will be referred to by the above names for the remainder of this report.

Finite Element Model

Figure 3 shows a finite element model of the Central Calorimeter Support Cradle. For the hydraulic cases, the cradle is supported by tied beams (STIF4) and spars (STIF8) that ensure that hydraulically coupled supports will produce identical reaction forces, as do real hydraulics. The failed quadrant consists of a 'gap' element (STIF52) at each support node with a 0.25 inch initial gap. This element will allow a jack failure simulation at that quadrant. For the mechanical case, the cradle is supported by 0.00 inch initial gap spacers with 0.25 initial gap spacers at the failed quadrant. Loads and individual support arrangement are equivalent to that in Reference 1 and can be found in that note.

Factor Listing

Two FORTRAN programs (Appendix 1 and 2) were used to manipulate stress output from the finite element runs. The first, the Delete program, deletes all unnecessary headers from the stress printouts. The second, called Program, takes the stress intensity of the static case and a failed case, divides them, and prints these factors and also the coordinates of each node. This list (approximately 1740 nodes) is reduced to the nodes that lie in the points of interest noted in Reference 1 (Section A-A, Section B-B, Tie Plate, Stanchion and 3.5 inch Support Plates, and the Arm Connect). Figures 4-8 show the nodes chosen for this analysis. The program was also modified to pick out the factors that are greater than 1.2 and less than 0.75. Appendices 3 through 7 contain the factor listings for cases NUMBERONE through NUMBERFIVE.

Hand Calculations

Stress calculations for the static case were done by Leo Engstrom in Reference 1. Stresses for each of the failure cases are tabulated in Table 2 of this report (Appendix 8 has the actual calculations). All of the calculations follow the exact format of Reference 1. The reactions used for these calculations are tabulated in Table 1 of this report and are ANSYS® generated.

Conclusion

The hydraulic cases show that the reactions on the 3.5 inch support plate are well distributed throughout the four plates. (Largest factor from table 1 is 1.047) Because of this, the hand calculations for the hydraulic cases are approximately equivalent to that of the static calculations in reference 1. The largest deviation from the static case is 0.755 ksi in the bending stress of the 3.5 inch bearing plate of case NUMBERONE. The largest factor for the hydraulic cases is 1.3302 and is found in the arm of the failed quadrant of case NUMBERONE. This factor corresponds to a change in stress from 539 psi to 717 psi.

The mechanical case however shows that the reactions do not distribute themselves as evenly (Largest factor from table 1 is 1.17323). The calculations still do not vary greatly from that of the static case. The largest deviation from the static case is 2.82 ksi in the bearing stress of the 3.5 inch bearing plate of case NUMBERFIVE. The largest factor for the mechanical case is 4.1489 and appears in the arm of quadrant 1. This factor corresponds to a change in stress from 1214 psi to 5038 psi.

References

- 1.) D-Zero Engineering Note 3740.215-EN-14, Leo Engstrom.
January 5, 1987

Appendices

- 1.) Delete program *
- 2.) PROGRAM program *
- 3.) NUMBERONE Factor Listing *
- 4.) NUMBERTWO Factor Listing *
- 5.) NUMBERTHREE Factor Listing *
- 6.) NUMBERFOUR Factor Listing *
- 7.) NUMBERFIVE Factor Listing *
- 8.) Hand Calculations

* Does not appear in distributed Engineering Note. See D-Zero Engineering Note Catalog for complete appendices

TABLE 1 REACTION COMPARISON

Reactions (Tons)

	NW	NE	SW	SE
Static	89.113	89.113	89.113	89.113
Numberone	93.3229	84.877	89.1	89.1
Numbertwo	89.12	89.12	89.12	89.12
Numberthree	91.27	86.9547	91.27	86.944
Numberfour	84.877	93.323	84.877	93.323
Numberfive (hard)	104.55	73.65	73.65	104.55

(Bold is failed quadrant)

Reaction Factors

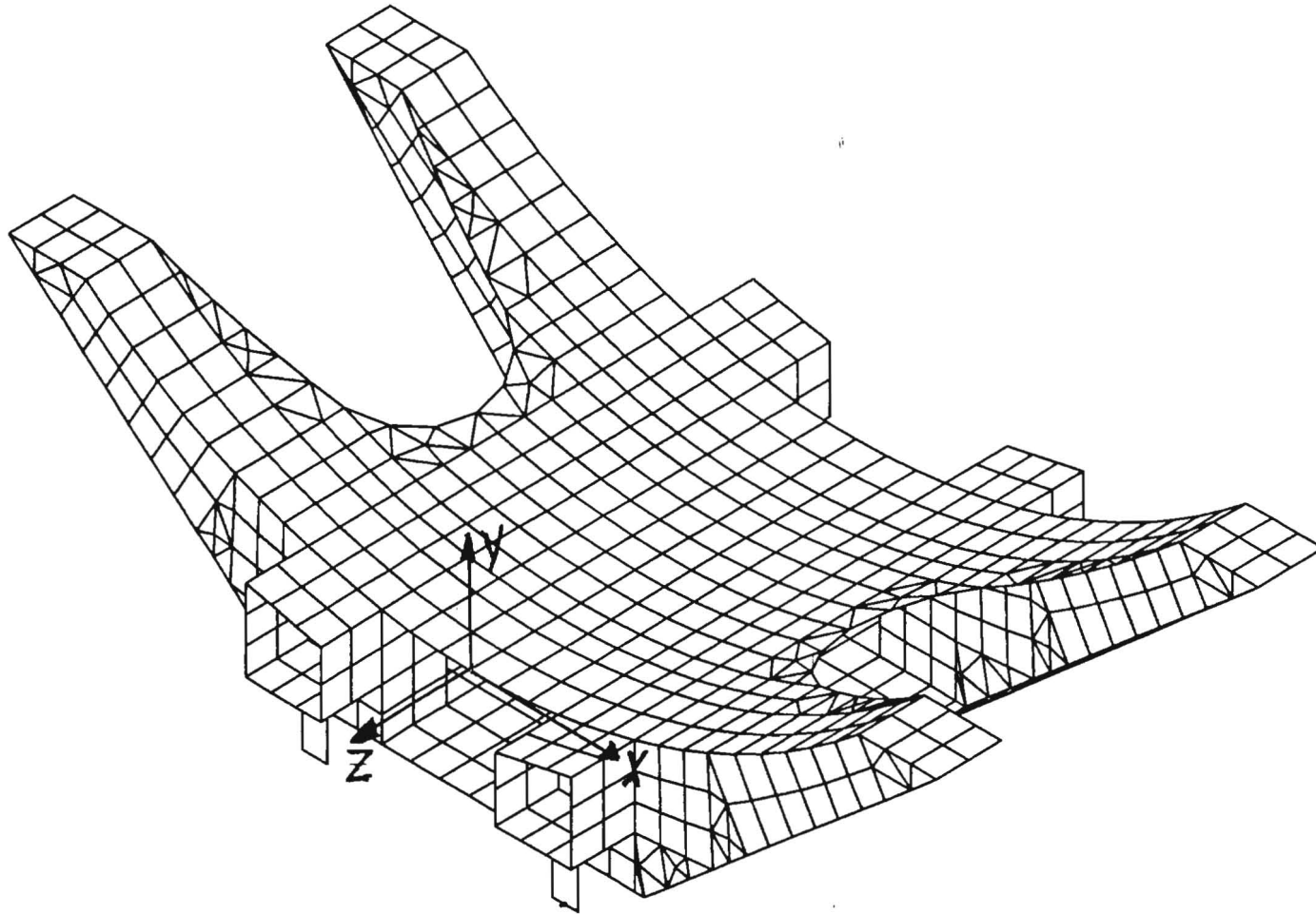
	NW	NE	SW	SE
Static	1.00	1.00	1.00	1.00
Numberone	1.0472	0.9525	0.99985	0.99985
Numbertwo	1.00007	1.00007	1.00007	1.00007
Numberthree	1.0242	0.97578	1.0242	0.97578
Numberfour	0.95246	1.04724	0.95246	1.04724
Numberfive (hard)	1.17323	0.826478	0.826478	1.17323

TABLE 2 CRADLE STRESSES (ksi)

Location	Allowable	Static	One	Two	Three	Four	Five
Center Beam							
Bending @ B-B	19.8	5.36	5.36	5.36	5.481	5.604	6.278
Bending @ A-A	19.8	7.52	7.867	7.52	7.694	7.867	8.813
Shear @ B-B	12.0	1.80	2.072	1.80	1.844	1.885	2.112
Shear @ A-A	12.0	6.79	7.11	6.79	6.954	7.110	7.965
Arms							
Bending	19.8	18.5	18.5	18.5	18.5	18.5	18.5
Shear	12.0	9.91	9.91	9.91	9.91	9.91	9.91
Stanchion							
Support Plate	22.5	22.7	22.7	22.7	22.7	22.7	22.7
3.5 in Bearing Plate							
Bending	22.5	15.7	16.455	15.7	15.877	16.45	18.188
Plate Shear	12.0	2.71	2.844	2.71	2.172	2.844	3.186
Punching Shear	12.0	3.60	3.772	3.6	3.689	3.772	4.225
Bearing	112.5	22.4	23.47	22.4	22.955	23.47	26.29
Tie Plate							
Tension	18.0	7.54	7.51	7.54	7.523	7.507	7.419

Figure 3 C.C. Cradle

ANSYS 4.2B
MAR 18 1987
8:46:31
PLOT NO. 1
POST1 ELEMENTS



ORIG SCALING
XV=1
YV=1
ZV=1
DIST=87.9
XF=3.16
YF=17.3
ZF=-30
HIDDEN

Figure 4

Section A-A

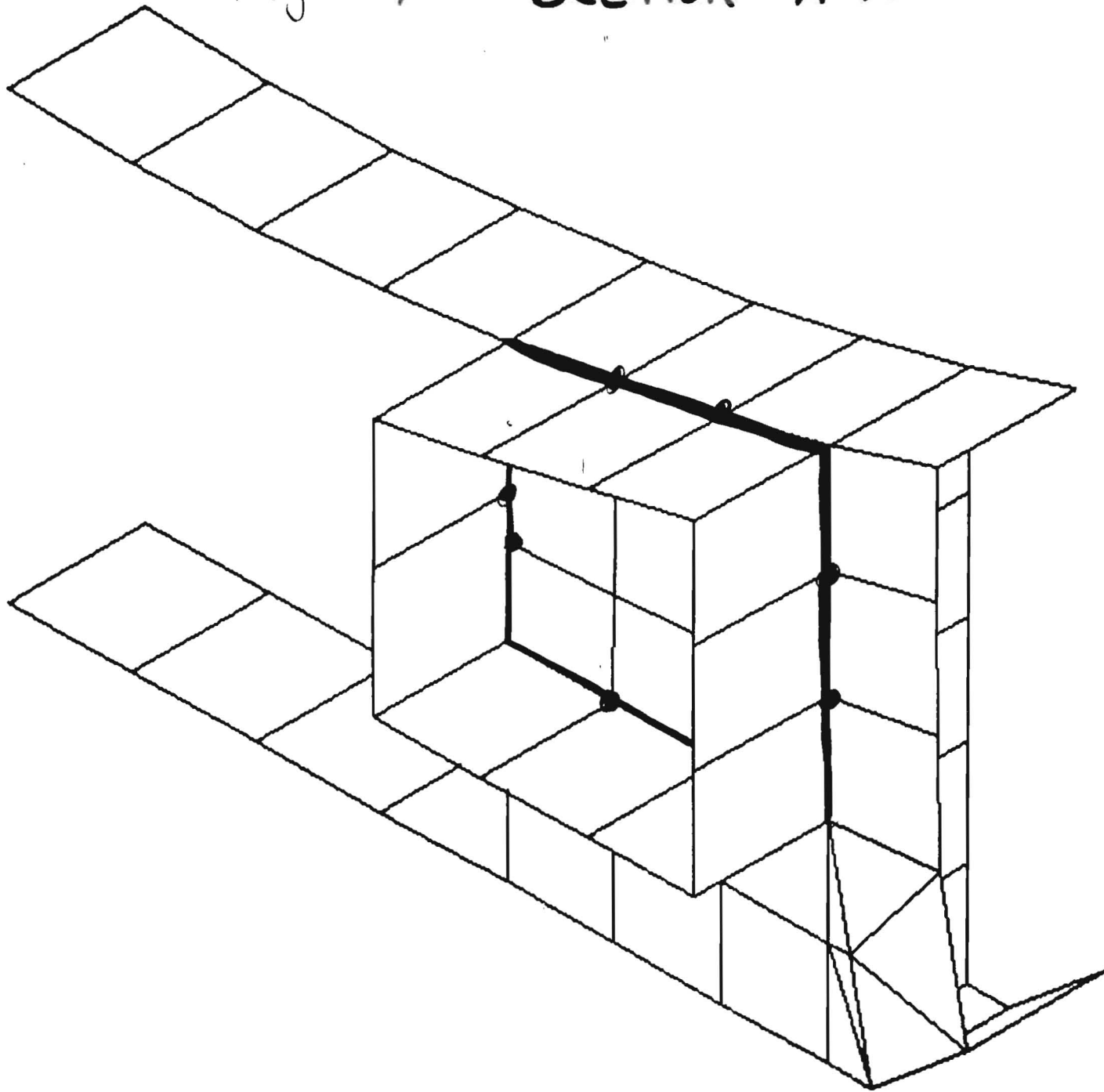


Figure 5 SECTION B-B

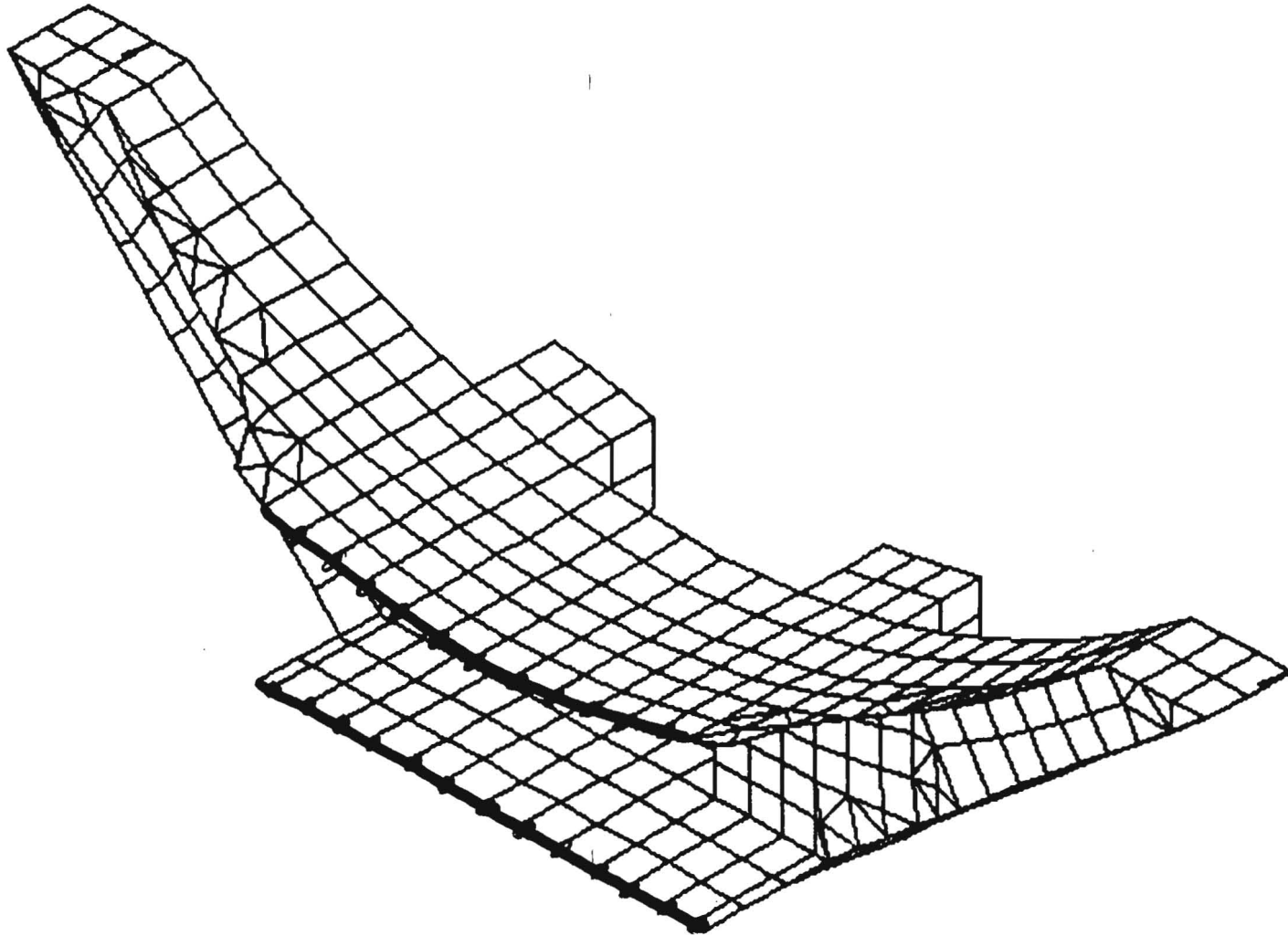


Figure 6 Tie Plate

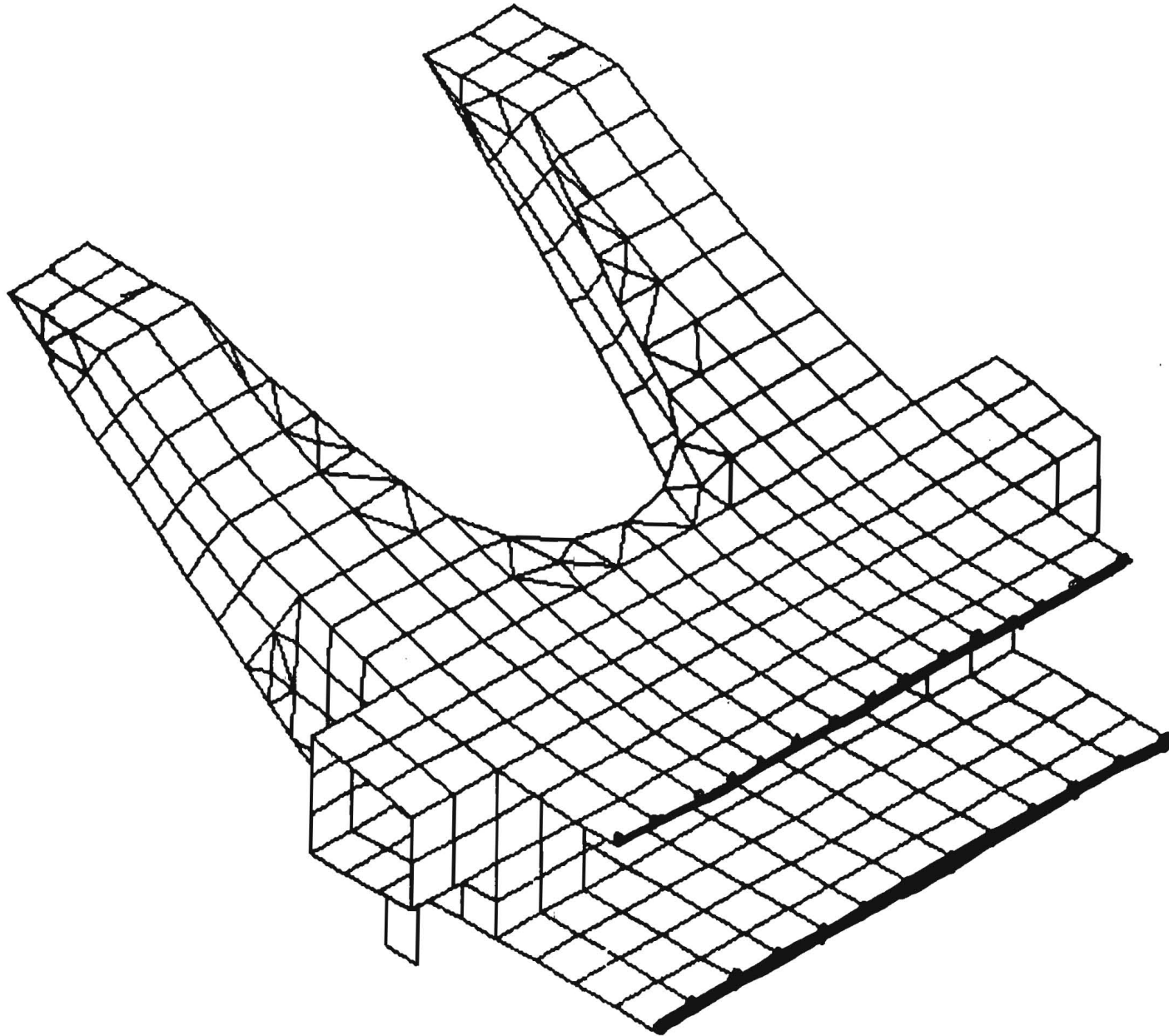
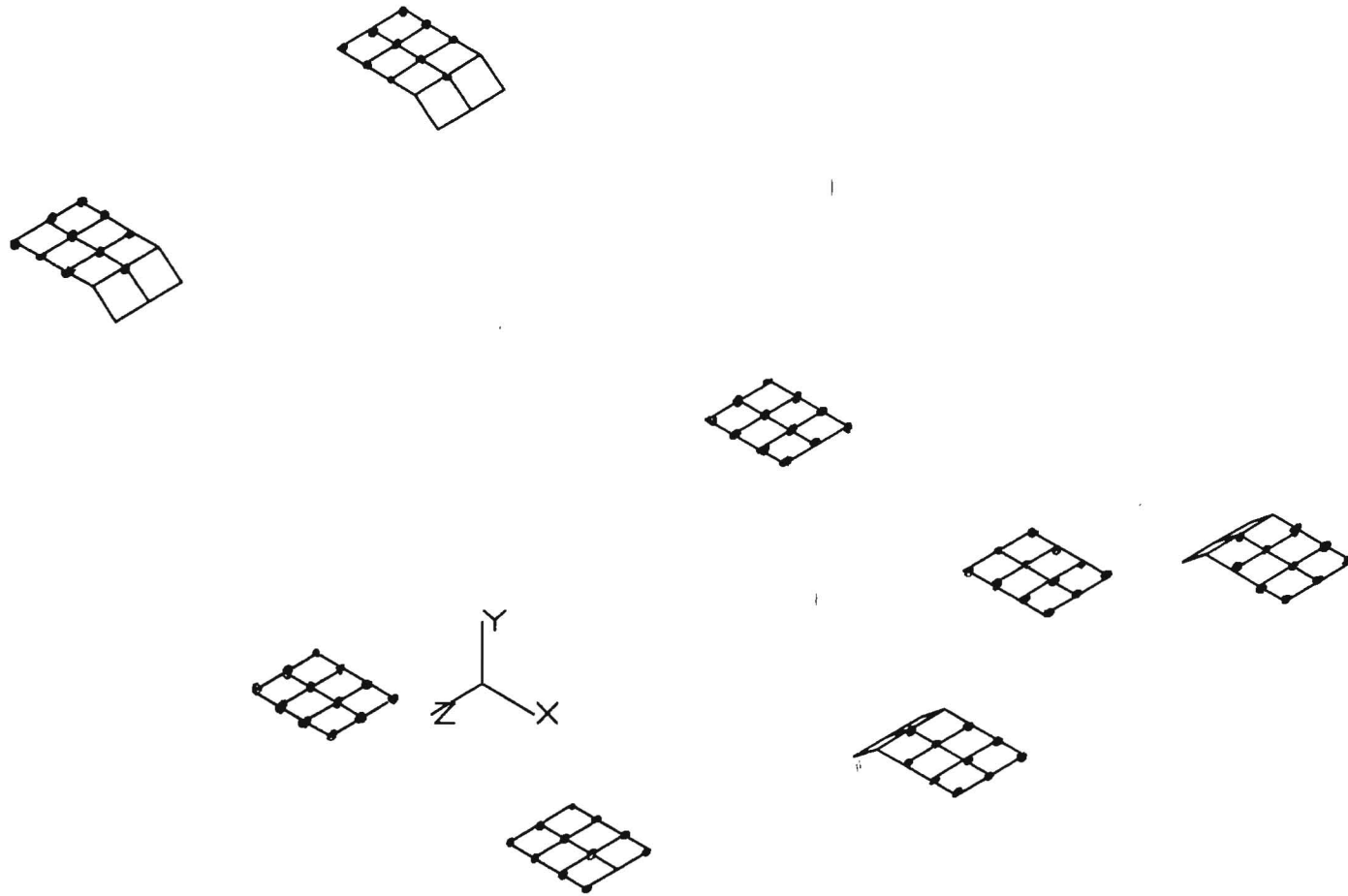


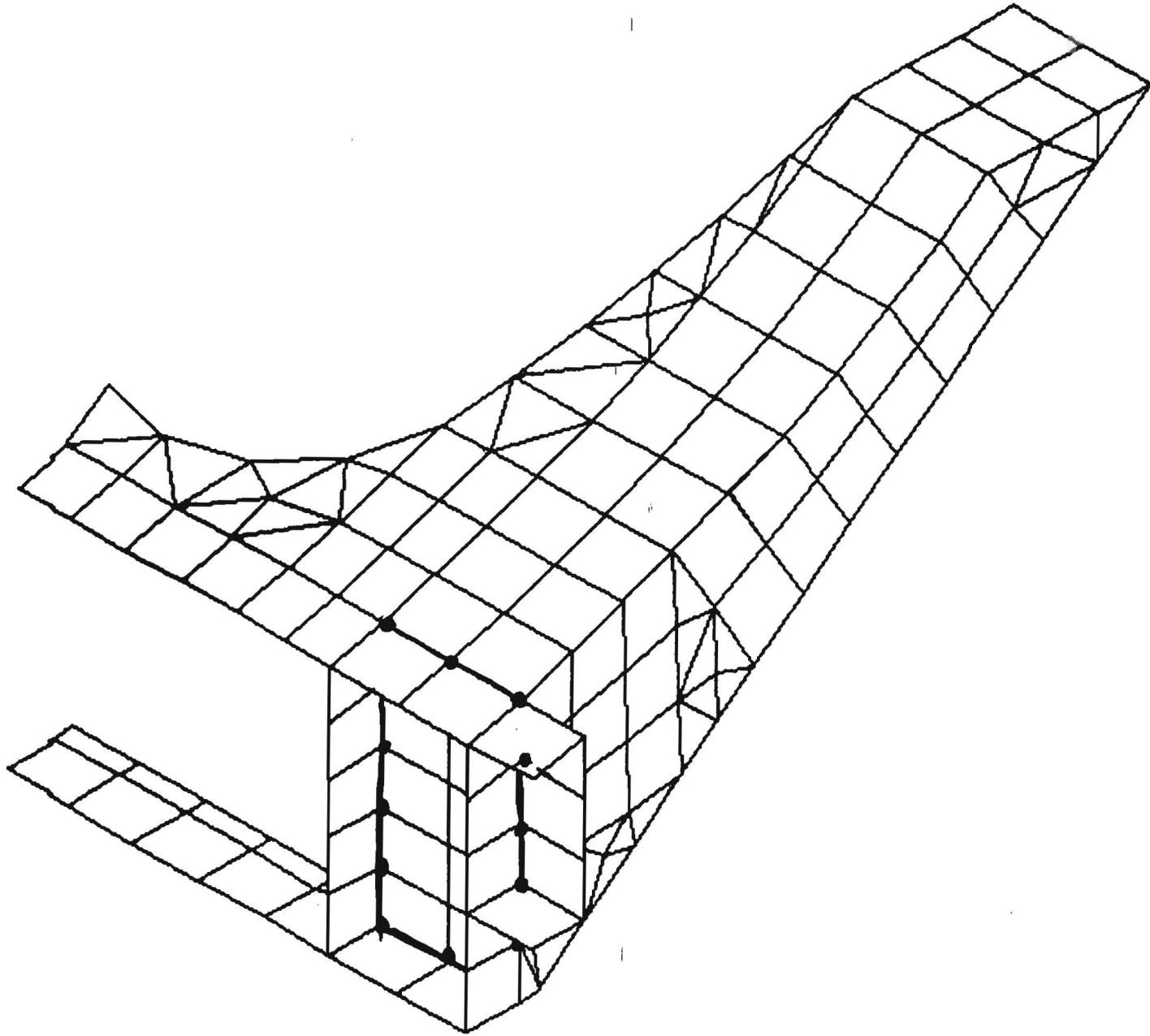
Figure 7 Stanchion: 3.5 inch Support Plate

ANSYS 4.2B
MAR 18 1987
8:53:15
PLOT NO. 2
POST1 ELEMENTS



ORIG SCALING
XV=1
YV=1
ZV=1
DIST=87.9
XF=2.14
YF=19.3
ZF=-31

Figure 8 Arm Connection



Appendix 1

DELETE Listing

Delete

```
c    delete program
character a*80
open(unit=11, status='old',file='ONE2.DAT')
open(unit=10, status='new',file='OFINAL2.DAT')
read(11,11) a
11   format(a80)
10   if(a.eq.'          ') then
      do 20 i=1,7
      read(11,11,end=90) a
20   continue
      endif
write(10,11) a
read(11,11, end=90) a
goto 10
90   end
```


APPENDIX 2

PROGRAM Listing

PROGRAM

```
C  HYDRAULIC JACK FAILURE PROGRAM
C
  OPEN (UNIT=11, STATUS='OLD',FILE='STATIC1.DAT')
  OPEN (UNIT=12, STATUS='OLD', FILE='ONE1.DAT')
  OPEN (UNIT=10, STATUS='NEW',FILE='DATA.DAT')
  open (unit=9, status='old',file='coordinate.dat')
  WRITE(10,5)
5  FORMAT(' NODE    STATIC    FAILURE    FACTOR    X-LOC
*   Y-LOC    ZLOC')
  WRITE(10,7)
7  FORMAT(' ')
  DO 12 I=1,2000
  READ(11,10,END=20) J,B
10  FORMAT(2X,I4,52X,F12.4)
  READ(12,10, END=20) K,D
  E=D/B
  IF(E.GE.1 .OR. E.LE. 1) THEN
    DO 21 L=1,2000
    READ(9,15,END=22) M,F,G,H
15  FORMAT(2X,I4,3X,F9.5,6X,F9.5,6X,F9.5)
    IF(M.EQ.J) THEN
      WRITE(10,13) J,B,D,E,F,G,H
13  FORMAT(2X,I4,2X,F12.4,2X,F12.4,2X,F10.7,2X,
      *F9.5,2X,F9.5,2X,F9.5)
      GOTO 22
    ENDIF
21  CONTINUE
22  ENDIF
12  CONTINUE
20  END
```

APPENDIX 3

NUMBER ONE

FACTOR LISTING

NUMBERONE WORST

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
511	5874.4043	4344.0947	0.7394953	15.25	-9.645	-66.25
513	6400.146	4795.0068	0.7492027	15.25	-4.27	-66.25
520	6356.3667	4602.0679	0.7240092	15.25	-13.9475	-60.625
534	539.0928	717.1074	1.3302114	19.5851	2.01868	-77.031
539	5000.1997	3506.6101	.7012940	15.25	-9.645	-71.64
541	5901.5444	3968.5972	0.6724675	15.25	-4.27	-71.64
545	4577.7803	5696.8579	1.2444586	28.2605	-9.645	-71.64
553	6224.6641	7869.0317	1.2641697	28.2605	-5.14798	-71.64
1589	2013.9762	2526.3550	1.2544116	-15.2491	-6.06167	-66.25

SECTION A-A

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
14	11704.33	11553.21	0.9870883	19.6225	1.8365	0.000
15	9258.99	9171.51	0.9905517	23.9621	2.75057	0.000
113	6400.146	6527.3105	1.019869	15.2487	-4.27	0.000
126	5711.4658	5540.5127	0.9700685	28.2605	-5.14798	0.000
127	5161.3184	5069.1475	0.982142	28.2605	-0.651	0.000
142	3779.1233	3622.7153	0.9586126	19.5868	-9.645	0.000
143	6404.4614	6103.5308	0.9530123	23.9236	-9.645	0.000
188	7970.8433	7623.667	0.956442	15.24827	-2.47834	0.000
189	2013.9762	2153.5940	1.069324	15.24913	-6.06167	0.000

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
414	11704.332	11439.495	0.977373	19.6225	1.83647	-66.25
415	9258.99	9265.211	1.000672	23.96206	2.75057	-66.25
513	6400.146	4795.0068	0.749203	15.248	-4.27	-66.25
526	5711.4658	6042.6519	1.0579861	28.261	-5.14798	-66.25
527	5161.3184	5449.0508	1.0557479	28.261	-0.651	-66.25
542	3779.1233	3054.6565	0.8082976	19.587	-9.645	-66.25
543	6404.461	5705.8169	0.8909129	23.9237	-9.645	-66.25
588	7970.843	6694.5562	0.8398805	15.2483	-2.47834	-66.25
589	2013.9762	1954.1882	0.9703135	15.2491	-6.06167	-66.25

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
1014	11704.3320	11833.8203	1.0110633	-19.623	1.8365	0.000
1015	9258.99	9332.8838	1.007981	-23.962	2.7506	0.000
1113	6400.146	6286.2134	0.9821984	-15.248	-4.27	0.000
1126	5711.4658	5871.5039	1.0280205	-28.261	-5.14798	0.000
1127	5161.3184	5244.3364	1.0160847	-28.261	-0.6509	0.000
1142	3779.1233	3927.687	1.0393116	-19.5868	-9.645	0.000
1143	6404.4614	6684.3384	1.0437003	-23.9236	-9.645	0.000
1188	7970.8433	8287.6963	1.0397515	-15.2483	-2.47834	0.000
1189	2013.972	1893.4413	0.9401508	-15.2491	-6.06167	0.000

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
1414	11704.332	11199.2344	0.9568452	-19.6225	1.83647	-66.25
1415	9258.9902	9140.8467	0.98724	-23.9621	2.75057	-66.25
1513	6400.146	6877.9766	1.0746593	-15.25	-4.27	-66.25
1526	5711.4658	5594.793	0.9795722	-28.261	-5.147	-66.25
1527	5161.3184	5121.1948	0.9922261	-28.261	-0.651	-66.25
1542	3779.1233	3420.3391	0.9050615	-19.587	-9.645	-66.25
1543	6404.461	5863.5654	0.915544	-23.9236	-9.645	-66.25
1588	7970.8433	6781.145	0.850744	-15.245	-2.4783	-66.25
1589	2013.97	2526.3550	1.254416	-15.245	-2.4783	-66.25

SECTION B-B

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
75	1145.4335	1143.5752	0.998377	15.2474	1.1049	-33.125
78	1837.4819	1829.4562	0.9956322	0.41207	0.000	-33.125
79	519.1904	555.8574	1.0706233	10.18418	0.49153	-33.125
80	1419.4530	1423.5413	1.0028802	5.09876	0.12299	-33.125
87	4898.3145	4819.0493	0.9833818	28.26045	3.84607	-33.125
90	3179.0029	3122.3203	0.9821697	23.96206	2.75057	-33.125
91	2120.7888	2088.0908	0.9845821	19.62247	1.83647	-33.125
96	6835.5942	6741.04	0.9861674	31.97561	4.9501	-33.125
216	937.4582	873.5552	0.931834	15.25	-18.25	-33.125
219	2182.5669	2169.4517	0.993991	0.000	-18.28	-33.125
220	1316.0106	1327.6467	1.008837	10.1667	-18.25	-33.125
221	1952.1735	1963.4034	1.0057525	5.08333	-18.28	-33.125
1075	1145.4335	1128.1584	0.9849184	-15.248	1.10498	-33.125
1079	519.1904	504.6033	0.9719041	-10.1842	0.49153	-33.125
1080	1419.4530	1514.3624	0.997118	-5.0987	.012299	-33.125
1087	4898.3145	4988.8467	1.0184823	-28.2604	3.84607	-33.125
1090	3179.0029	3229.2168	1.015795	-23.9621	2.75057	-33.125
1091	2120.7888	2134.6372	1.0065298	-19.62247	1.83647	-33.125
1096	6835.5942	6956.7769	1.0177282	-31.9756	4.9501	-33.125
1216	937.4582	973.9922	1.0389713	-15.25	-18.25	-33.125
1220	1316.0605	1276.7382	0.9701211	-10.1666	-18.25	-33.125
1221	1952.1735	1915.6520	0.9812919	-5.08333	-18.25	-33.125
1242	4850.7827	4883.0703	1.0066562	-23.9236	-18.28	-33.125
1243	2281.9146	2326.8164	1.0196773	-19.58683	-18.25	-33.125

TIE PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
1	18590.941	18594.3438	1.000183	0.4121	0.000	0.000
7	13989.6982	13976.5576	0.9990607	0.4121	0.000	-11.25
10	17322.6250	17312.5332	0.9994174	0.4121	0.000	-5.625
51	6976.9146	6972.2427	0.9993304	0.4121	0.000	-19.125
54	10640.6738	10630.5283	0.9990466	0.4121	0.000	-15.187
78	1837.4819	1829.4562	0.9956322	0.4121	0.000	-33.125
81	1768.3113	1760.3094	0.9954749	0.4121	0.000	-28.791
82	3195.1631	3197.1777	1.0006305	0.4121	0.000	-23.791
201	15208.0459	15216.2832	1.0005417	0.000	-18.25	0.000
206	9185.1904	9187.2959	1.0002292	0.000	-18.25	-11.25
209	12347.4111	12350.4678	1.0002476	0.000	-18.25	-5.625
212	6175.9893	6176.7090	1.0001166	0.000	-18.25	-16.625
219	2182.5669	2169.4517	0.9939909	0.000	-18.25	-33.125
222	2146.0637	2132.5413	0.9936990	0.000	-18.25	-27.625
223	3621.4751	3617.8396	0.9989961	0.000	-18.25	-22.125
401	18590.9414	18233.9648	0.9807984	0.4121	0.000	-66.25
407	13989.6982	13734.1768	0.9817351	0.4121	0.000	-55.00
410	17322.625	17000.6660	0.981414	0.4121	0.000	-60.625
451	6976.9146	6840.0576	0.980384	0.4121	0.000	-47.125
454	10640.6738	10439.8135	0.9811233	0.4121	0.000	-51.062
481	1768.3112	1769.7229	1.0008023	0.4121	0.000	-37.791
482	3195.1631	3133.3098	0.9806416	0.4121	0.000	-42.458
601	15208.0459	14918.5811	0.9809663	0.000	-18.25	-66.25
606	9185.1904	9016.8330	0.9816708	0.000	-18.25	-55.00
609	12347.4111	12120.8242	0.9816490	0.000	-18.25	-60.625
612	6175.9893	6058.0015	0.9808957	0.000	-18.25	-49.625
622	2146.0637	2123.7041	0.9895811	0.000	-18.25	-38.625
623	3621.4751	3545.2822	0.9789608	0.000	-18.25	-44.125

ARM CONNECT

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
121	14662.2695	14972.5654	1.0211629	28.2605	-9.645	-11.25
124	9262.8857	9028.5322	0.9746997	28.2605	-9.645	0.000
125	5323.7173	5250.1123	0.9861742	28.2605	-9.645	-5.625
181	10540.7070	10242.5664	0.9717153	28.2605	-18.25	0.000
182	12551.1602	12196.5088	0.9717435	28.2605	-13.6475	0.000
228	16030.9043	16094.2285	1.0039501	28.2605	-18.25	-11.25
231	8540.9580	8414.4404	0.9851869	28.2605	-18.25	-5.625
282	19003.9219	19318.3281	1.0165442	28.2605	-13.9475	-11.25
305	6782.7661	6634.0449	0.9780737	28.2605	-13.9475	-5.625

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
521	14662.2695	14128.0537	0.9635653	28.2605	-9.645	-55.00
524	9262.8857	9906.2305	1.0694541	28.2605	-9.645	-66.25
525	5323.7173	5825.7344	1.0942982	28.2605	-9.945	-60.625
581	10540.7070	10491.7090	0.9953516	28.2605	-18.25	-66.25
582	12551.1602	12846.7617	1.0235517	28.26050	-13.9475	-66.25
628	16030.9043	15977.2119	0.9966507	28.26050	-18.25	-55.00
631	8540.9580	8811.1035	1.0316294	28.2605	-18.25	-60.625
682	19003.9219	18502.3125	0.973605	28.2605	-13.9475	-55.00
705	6782.7661	7508.6611	1.1070205	28.2605	-13.9475	-60.625

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
1121	16442.2695	14346.7080	0.9784780	-28.2605	-9.645	-11.25
1124	9262.8857	9485.6621	1.0240505	-28.2605	-9.645	0.000
1125	5323.7173	5390.4409	1.0125333	-28.2605	-9.645	-5.625
1181	10540.7070	10833.9590	1.0278209	-28.2605	-18.25	0.000
1182	12551.1602	12891.3643	1.0271053	-28.2605	-13.9475	0.000
1228	16030.9043	15938.1523	0.9942142	-28.2605	-18.25	-11.25
1231	8540.9580	8658.4346	1.01375454	-28.2605	-18.25	-5.625
1282	19003.9219	18671.4492	0.982505	-28.2605	-13.9475	-11.25
1305	6782.7661	6922.4951	1.0206006	-28.2605	-13.9475	-5.625

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	Z-LOC
1521	14662.2695	14678.2686	1.0010911	-28.2605	-9.6450	-55.00
1524	9262.8857	9138.5430	0.9865763	-28.2605	-9.645	-66.25
1525	5325.7173	5322.3130	0.9997362	-28.2605	-9.645	-60.625
1581	10540.7070	10303.2646	0.9774738	-28.2605	-18.25	-66.25
1582	12551.1602	12300.6240	0.9800388	-28.2605	-13.9475	-66.25
1628	16030.9043	16093.0664	1.0038776	-28.2605	-18.25	-55.00
1631	8540.9580	8451.1113	0.9894805	-28.2605	-18.25	-60.625
1682	19003.9219	19135.8457	1.0069419	-28.2605	-13.9475	-55.00
1705	6782.7661	6722.1953	0.9910699	-28.2605	-13.9475	-60.625

STANCHION AND 3.5 INCH SUPPORT PLATES

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
38	14083.2598	14086.7832	1.0002502	66.62949	23.63070	-5.62500
100	4698.7598	4686.8618	0.9974679	79.90000	23.63070	0.00000
101	8676.7129	8671.6094	0.9994118	71.05299	23.63070	0.00000
102	7697.5327	7671.7847	0.9966550	75.47649	23.63070	0.00000
103	6581.2065	6578.6240	0.9996076	79.90000	23.63070	-11.25000
104	7036.5752	7045.7700	1.0013068	79.90000	23.63070	-5.62500
105	13235.8369	13264.4111	1.0021589	75.47649	23.63070	-11.25000
106	15801.0771	15854.1289	1.0033575	71.05299	23.63070	-11.25000
107	21384.1797	21390.2676	1.0002847	71.05299	23.63070	-5.62500
108	15424.8838	15429.3447	1.0002892	75.47649	23.63070	-5.62500
111	7406.6182	7465.0781	1.0078930	15.25000	-9.64501	0.00000
124	9620.8887	9365.8760	0.9734939	28.26050	-9.64501	0.00000
138	6601.4473	6950.9175	1.0529385	15.25000	-9.64501	10.78100
139	9114.5664	9287.4629	1.0189693	15.25000	-9.64501	5.39050
142	6885.4316	6741.9795	0.9791659	19.58683	-9.64501	0.00000
143	7686.2979	7411.7759	0.9642842	23.92366	-9.64501	0.00000
144	7939.5073	7634.2236	0.9615488	28.26050	-9.64501	10.78100
145	10971.8213	10759.5469	0.9806527	28.26050	-9.64501	5.39050
146	11031.4912	11038.5010	1.0006354	23.92366	-9.64501	10.78100
147	11312.3691	11269.5176	0.9962119	19.58683	-9.64501	10.78100
148	14395.0352	14401.6133	1.0004569	19.58683	-9.64501	5.39050
149	14264.2383	14241.3594	0.9983960	23.92366	-9.64501	5.39050

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
438	14083.2598	14077.9971	0.9996263	66.62949	23.63070	-60.62500
500	4698.7598	4717.7686	1.0040455	79.90000	23.63070	-66.25000
501	8676.7129	8681.0176	1.0004961	71.05299	23.63070	-66.25000
502	7697.5327	7736.8345	1.0051057	75.47649	23.63070	-66.25000
503	6581.2065	6587.2222	1.0009141	79.90000	23.63070	-55.00000
504	7036.5752	7023.4785	0.9981388	79.90000	23.63070	-60.62500
505	13235.8369	13195.3447	0.9969407	75.47649	23.63070	-55.00000
506	15801.0771	15724.3154	0.9951420	71.05299	23.63070	-55.00000
507	21384.1797	21374.8691	0.9995646	71.05299	23.63070	-60.62500
508	15424.8838	15418.3398	0.9995757	75.47649	23.63070	-60.62500
511	7406.6182	6829.8491	0.9221279	15.25000	-9.64501	-66.25000
524	9620.8887	10108.7266	1.0507061	28.26050	-9.64501	-66.25000
538	6601.4473	7869.1362	1.1920320	15.25000	-9.64501	-77.03100
539	9114.5664	6595.8481	0.7236601	15.25000	-9.64501	-71.64000
542	6885.4316	6373.0234	0.9255808	19.58683	-9.64501	-66.25000
543	7686.2979	8013.3911	1.0425553	23.92366	-9.64501	-66.25000
544	7939.5073	6806.8804	0.8573429	28.26050	-9.64501	-77.03100
545	10971.8213	12951.3438	1.1804187	28.26050	-9.64501	-71.64000
546	11031.4912	15168.6348	1.3750303	23.92366	-9.64501	-77.03100
547	11312.3691	6459.8115	0.5710397	19.58683	-9.64501	-77.03100
548	14395.0352	9077.9609	0.6306314	19.58683	-9.64501	-71.64000
549	14264.2383	19345.8613	1.3562492	23.92366	-9.64501	-71.64000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1038	14083.2598	14080.2090	0.9997834	-66.62949	23.63070	-5.62500
1100	4698.7598	4710.0820	1.0024096	-79.90000	23.63070	0.00000
1101	8676.7129	8682.2637	1.0006397	-71.05299	23.63070	0.00000
1102	7697.5327	7721.4653	1.0031091	-75.47649	23.63070	0.00000
1103	6581.2065	6583.8311	1.0003988	-79.90000	23.63070	-11.25000
1104	7036.5752	7028.6108	0.9988682	-79.90000	23.63070	-5.62500
1105	13235.8369	13209.4824	0.9980088	-75.47649	23.63070	-11.25000
1106	15801.0771	15752.3721	0.9969176	-71.05299	23.63070	-11.25000
1107	21384.1797	21378.9414	0.9997550	-71.05299	23.63070	-5.62500
1108	15424.8838	15420.9531	0.9997452	-75.47649	23.63070	-5.62500
1111	7406.6182	7360.6636	0.9937955	-15.25000	-9.64501	0.00000
1124	9620.8887	9865.5557	1.0254308	-28.26050	-9.64501	0.00000
1138	6601.4473	6270.7925	0.9499118	-15.25000	-9.64501	10.78100
1139	9114.5664	8953.5605	0.9823353	-15.25000	-9.64501	5.39050
1142	6885.4316	7024.0957	1.0201387	-19.58683	-9.64501	0.00000
1143	7686.2979	7943.1948	1.0334227	-23.92366	-9.64501	0.00000
1144	7939.5073	8230.5752	1.0366607	-28.26050	-9.64501	10.78100
1145	10971.8213	11172.3926	1.0182806	-28.26050	-9.64501	5.39050
1146	11031.4912	11025.5322	0.9994598	-23.92366	-9.64501	10.78100
1147	11312.3691	11353.0723	1.0035981	-19.58683	-9.64501	10.78100
1148	14395.0352	14388.4805	0.9995447	-19.58683	-9.64501	5.39050
1149	14264.2383	14286.6270	1.0015695	-23.92366	-9.64501	5.39050

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1438	14083.2598	14086.7324	1.0002465	-66.62949	23.63070	-60.62500
1500	4698.7598	4686.5581	0.9974032	-79.90000	23.63070	-66.25000
1501	8676.7129	8672.0547	0.9994631	-71.05299	23.63070	-66.25000
1502	7697.5327	7671.1323	0.9965703	-75.47649	23.63070	-66.25000
1503	6581.2065	6578.4258	0.9995775	-79.90000	23.63070	-55.00000
1504	7036.5752	7046.0713	1.0013496	-79.90000	23.63070	-60.62500
1505	13235.8369	13264.9941	1.0022029	-75.47649	23.63070	-55.00000
1506	15801.0771	15855.4746	1.0034426	-71.05299	23.63070	-55.00000
1507	21384.1797	21390.4980	1.0002955	-71.05299	23.63070	-60.62500
1508	15424.8838	15429.4551	1.0002964	-75.47649	23.63070	-60.62500
1511	7406.6182	7730.1143	1.0436766	-15.25000	-9.64501	-66.25000
1524	9620.8887	9492.4131	0.9866462	-28.26050	-9.64501	-66.25000
1538	6601.4473	7348.6641	1.1131898	-15.25000	-9.64501	-77.03100
1539	9114.5664	9908.8457	1.0871439	-15.25000	-9.64501	-71.64000
1542	6885.4316	6773.4512	0.9837366	-19.58683	-9.64501	-66.25000
1543	7686.2979	7438.9023	0.9678134	-23.92366	-9.64501	-66.25000
1544	7939.5073	7928.6328	0.9986303	-28.26050	-9.64501	-77.03100
1545	10971.8213	11131.9619	1.0145956	-28.26050	-9.64501	-71.64000
1546	11031.4912	11568.7227	1.0486999	-23.92366	-9.64501	-77.03100
1547	11312.3691	11759.5215	1.0395278	-19.58683	-9.64501	-77.03100
1548	14395.0352	15046.9102	1.0452847	-19.58683	-9.64501	-71.64000
1549	14264.2383	14932.9971	1.0468836	-23.92366	-9.64501	-71.64000

APPENDIX 4

NUMBERTWO

FACTOR LISTING

NUMBERTWO WORST

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
119	6534.1294	4695.2827	0.7185782	15.25000	-13.94750	0.00000
139	5000.1997	3747.8337	0.7495368	15.25000	-9.64501	5.39050
141	5901.5444	4250.4063	0.7202193	15.24870	-4.27001	5.39050
142	3779.1233	2749.6501	0.7275894	19.58683	-9.64501	0.00000
145	4577.7803	5909.7163	1.2909567	28.26050	-9.64501	5.39050
152	4057.0024	5014.3447	1.2359728	28.26047	-0.65095	5.39050
153	6224.6641	8184.3057	1.3148189	28.26047	-5.14798	5.39050
188	7970.8433	5656.6582	0.7096688	15.24827	-2.47834	0.00000
189	2013.9762	2525.1011	1.2537889	15.24913	-6.06167	0.00000
194	6526.2607	4742.6914	0.7267088	23.93646	-5.51314	0.00000
195	4778.5171	3263.9058	0.6830374	19.59871	-5.81784	0.00000
1119	6534.1294	4695.2827	0.7185782	-15.25000	-13.94750	0.00000
1139	5000.1997	3747.8337	0.7495368	-15.25000	-9.64501	5.39050
1141	5901.5444	4250.4063	0.7202193	-15.24870	-4.27001	5.39050
1142	3779.1233	2749.6501	0.7275894	-19.58683	-9.64501	0.00000
1145	4577.7803	5909.7163	1.2909567	-28.26050	-9.64501	5.39050
1152	4057.0024	5014.3447	1.2359728	-28.26047	-0.65095	5.39050
1153	6224.6641	8184.3057	1.3148189	-28.26047	-5.14798	5.39050
1188	7970.8433	5656.6582	0.7096688	-15.24827	-2.47834	0.00000
1189	2013.9762	2525.1011	1.2537889	-15.24913	-6.06167	0.00000
1194	6526.2607	4742.6914	0.7267088	-23.93646	-5.51314	0.00000
1195	4778.5171	3263.9058	0.6830374	-19.59871	-5.81784	0.00000

SECTION A-A

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
14	11704.3320	10917.6123	0.9327839	19.62247	1.83647	0.00000
15	9258.9902	9197.2881	0.9933360	23.96206	2.75057	0.00000
113	6400.1460	5148.7349	0.8044715	15.24870	-4.27001	0.00000
126	5711.4658	5942.8662	1.0405151	28.26048	-5.14798	0.00000
127	5161.3184	5433.3174	1.0526996	28.26047	-0.65095	0.00000
142	3779.1233	2749.6501	0.7275894	19.58683	-9.64501	0.00000
143	6404.4614	5235.0938	0.8174136	23.92366	-9.64501	0.00000
188	7970.8433	5656.6582	0.7096688	15.24827	-2.47834	0.00000
189	2013.9762	2525.1011	1.2537889	15.24913	-6.06167	0.00000

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
414	11704.3320	11680.6465	0.9979764	19.62247	1.83647	-66.25000
415	9258.9902	9243.0996	0.9982837	23.96206	2.75057	-66.25000
513	6400.1460	6413.4307	1.0020757	15.24870	-4.27001	-66.25000
526	5711.4658	5699.2935	0.9978688	28.26048	-5.14798	-66.25000
527	5161.3184	5150.6313	0.9979294	28.26047	-0.65095	-66.25000
542	3779.1233	3763.7559	0.9959336	19.58683	-9.64501	-66.25000
543	6404.4609	6380.1396	0.9962025	23.92366	-9.64501	-66.25000
588	7970.8433	7936.1641	0.9956492	15.24827	-2.47834	-66.25000
589	2013.9762	2030.7102	1.0083089	15.24913	-6.06167	-66.25000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1014	11704.3320	10917.6123	0.9327839	-19.62247	1.83647	0.00000
1015	9258.9902	9197.2881	0.9933360	-23.96206	2.75057	0.00000
1113	6400.1460	5148.7349	0.8044715	-15.24870	-4.27001	0.00000
1126	5711.4658	5942.8662	1.0405151	-28.26048	-5.14798	0.00000
1127	5161.3184	5433.3174	1.0526996	-28.26047	-0.65095	0.00000
1142	3779.1233	2749.6501	0.7275894	-19.58683	-9.64501	0.00000
1143	6404.4614	5235.0938	0.8174136	-23.92366	-9.64501	0.00000
1188	7970.8433	5656.6582	0.7096688	-15.24827	-2.47834	0.00000
1189	2013.9762	2525.1011	1.2537889	-15.24913	-6.06167	0.00000

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1414	11704.332	11680.6465	0.9979764	-19.62247	1.83647	-66.25
1415	9258.9902	9243.0996	0.9982837	-23.96206	2.75057	-66.25
1513	6400.1460	6413.4307	1.0020757	-15.24870	-4.27001	-66.25000
1526	5711.4658	5699.2935	0.9978688	-28.26048	-5.14798	-66.25000
1527	5161.3184	5150.6313	0.9979294	-28.26047	-0.65095	-66.25000
1542	3779.1233	3763.7559	0.9959336	-19.58683	-9.64501	-66.25000
1543	6404.4609	6380.1396	0.9962025	-23.92366	-9.64501	-66.25000
1588	7970.8433	7936.1641	0.9956492	-15.24827	-2.47834	-66.25000
1589	2013.9762	2030.7102	1.0083089	-15.24913	-6.06167	-66.25000

SECTION B-B

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
75	1145.4335	1124.5837	0.9817975	15.24740	1.10498	-33.12500
78	1837.4819	1811.1801	0.9856859	0.41207	0.00000	-33.12500
79	519.1904	530.3132	1.0214232	10.18418	0.49153	-33.12500
80	1419.4530	1408.1710	0.9920519	5.09876	0.12299	-33.12500
87	4898.3145	4903.1714	1.0009916	28.26045	3.84607	-33.12500
90	3179.0029	3161.2742	0.9944232	23.96206	2.75057	-33.12500
91	2120.7888	2094.3047	0.9875121	19.62247	1.83647	-33.12500
96	6835.5942	6858.2622	1.0033162	31.97561	4.95008	-33.12500
216	937.4582	904.4899	0.9648323	15.25000	-18.25000	-33.12500
219	2182.5669	2153.4124	0.9866421	0.00000	-18.25000	-33.12500
220	1316.0605	1283.5681	0.9753109	10.16666	-18.25000	-33.12500
221	1952.1735	1924.6079	0.9858795	5.08333	-18.25000	-33.12500
1075	1145.4335	1124.5837	0.9817975	-15.24740	1.10498	-33.12500
1079	519.1904	530.3132	1.0214232	-10.18418	0.49153	-33.12500
1080	1419.4530	1408.1710	0.9920519	-5.09876	0.12299	-33.12500
1087	4898.3145	4903.1714	1.0009916	-28.26045	3.84607	-33.12500
1090	3179.0029	3161.2742	0.9944232	-23.96206	2.75057	-33.12500
1091	2120.7888	2094.3047	0.9875121	-19.62247	1.83647	-33.12500
1096	6835.5942	6858.2622	1.0033162	-31.97561	4.95008	-33.12500
1216	937.4582	904.4899	0.9648323	-15.25000	-18.25000	-33.12500
1220	1316.0605	1283.5681	0.9753109	-10.16666	-18.25000	-33.12500
1221	1952.1735	1924.6079	0.9858795	-5.08333	-18.25000	-33.12500
1242	4850.7827	4819.7144	0.9935952	-23.92366	-18.25000	-33.12500
1243	2281.9146	2253.0295	0.9873418	-19.58683	-18.25000	-33.12500

ARM CONNECT

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
121	14662.2695	14116.0283	0.9627451	28.26050	-9.64501	-11.25000
124	9262.8857	9824.2871	1.0606076	28.26050	-9.64501	0.00000
125	5323.7173	5858.3745	1.1004293	28.26050	-9.64501	-5.62500
181	10540.7070	10246.0508	0.9720459	28.26050	-18.25000	0.00000
182	12551.1602	12615.9092	1.0051588	28.26050	-13.94750	0.00000
228	16030.9043	16038.4531	1.0004709	28.26050	-18.25000	-11.25000
231	8540.9580	8732.8896	1.0224719	28.26050	-18.25000	-5.62500
282	19003.9219	18614.7031	0.9795190	28.26050	-13.94750	-11.25000
305	6782.7661	7491.7134	1.1045219	28.26050	-13.94750	-5.62500

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
521	14662.2695	14657.3818	0.9996666	28.26050	-9.64501	-55.00000
524	9262.8857	9249.7090	0.9985775	28.26050	-9.64501	-66.25000
525	5323.7173	5316.1890	0.9985859	28.26050	-9.64501	-60.62500
581	10540.7070	10533.6426	0.9993298	28.26050	-18.25000	-66.25000
582	12551.1602	12534.4990	0.9986725	28.26050	-13.94750	-66.25000
628	16030.9043	15998.8115	0.9979981	28.26050	-18.25000	-55.00000
631	8540.9580	8530.2480	0.9987460	28.26050	-18.25000	-60.62500
682	19003.9219	18986.0566	0.9990599	28.26050	-13.94750	-55.00000
705	6782.7661	6773.0342	0.9985652	28.26050	-13.94750	-60.62500

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1121	14662.2695	14116.0283	0.9627451	-28.26050	-9.64501	-11.25000
1124	9262.8857	9824.2871	1.0606076	-28.26050	-9.64501	0.00000
1125	5323.7173	5858.3745	1.1004293	-28.26050	-9.64501	-5.62500
1181	10540.7070	10246.0508	0.9720459	-28.26050	-18.25000	0.00000
1182	12551.1602	12615.9092	1.0051588	-28.26050	-13.94750	0.00000
1228	16030.9043	16038.4531	1.0004709	-28.26050	-18.25000	-11.25000
1231	8540.9580	8732.8896	1.0224719	-28.26050	-18.25000	-5.62500
1282	19003.9219	18614.7031	0.9795190	-28.26050	-13.94750	-11.25000
1305	6782.7661	7491.7134	1.1045219	-28.26050	-13.94750	-5.62500

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1521	14662.2695	14657.3818	0.9996666	-28.26050	-9.64501	-55.00000
1524	9262.8857	9249.7090	0.9985775	-28.26050	-9.64501	-66.25000
1525	5323.7173	5316.1890	0.9985859	-28.26050	-9.64501	-60.62500
1581	10540.7070	10533.6426	0.9993298	-28.26050	-18.25000	-66.25000
1582	12551.1602	12534.4990	0.9986725	-28.26050	-13.94750	-66.25000
1628	16030.9043	15998.8115	0.9979981	-28.26050	-18.25000	-55.00000
1631	8540.9580	8530.2480	0.9987460	-28.26050	-18.25000	-60.62500
1682	19003.9219	18986.0566	0.9990599	-28.26050	-13.94750	-55.00000
1705	6782.7661	6773.0342	0.9985652	-28.26050	-13.94750	-60.62500

TIE PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1	18590.9414	17829.1992	0.9590262	0.41207	0.00000	0.00000
7	13989.6982	13451.2559	0.9615115	0.41207	0.00000	-11.25000
10	17322.6250	16646.3047	0.9609574	0.41207	0.00000	-5.62500
51	6976.9146	6680.1025	0.9574580	0.41207	0.00000	-19.12500
54	10640.6738	10213.9355	0.9598956	0.41207	0.00000	-15.18700
78	1837.4819	1811.1801	0.9856859	0.41207	0.00000	-33.12500
81	1768.3112	1742.7345	0.9855361	0.41207	0.00000	-28.45800
82	3195.1631	3039.5500	0.9512973	0.41207	0.00000	-23.79100
201	15208.0459	14601.5918	0.9601228	0.00000	-18.25000	0.00000
206	9185.1904	8828.4854	0.9611652	0.00000	-18.25000	-11.25000
209	12347.4111	11871.4229	0.9614503	0.00000	-18.25000	-5.62500
212	6175.9893	5922.8037	0.9590049	0.00000	-18.25000	-16.62500
219	2182.5669	2153.4124	0.9866421	0.00000	-18.25000	-33.12500
222	2146.0637	2098.5657	0.9778674	0.00000	-18.25000	-27.62500
223	3621.4751	3454.3167	0.9538425	0.00000	-18.25000	-22.12500
401	18590.9414	18601.1816	1.0005509	0.41207	0.00000	-66.25000
407	13989.6982	13961.0098	0.9979493	0.41207	0.00000	-55.00000
410	17322.6250	17302.0273	0.9988109	0.41207	0.00000	-60.62500
451	6976.9146	6965.3960	0.9983491	0.41207	0.00000	-47.12500
454	10640.6738	10617.7900	0.9978494	0.41207	0.00000	-51.06200
481	1768.3112	1742.7638	0.9855527	0.41207	0.00000	-37.79100
482	3195.1631	3196.3496	1.0003713	0.41207	0.00000	-42.45800
601	15208.0459	15224.8135	1.0011026	0.00000	-18.25000	-66.25000
606	9185.1904	9187.8320	1.0002877	0.000	-18.25	-55.00
609	12347.4111	12352.6768	1.0004264	0.000	-18.25	-60.625
612	6175.9893	6175.7432	0.9999601	0.00000	-18.25000	-49.62500

622 2146.0637 2116.6511 0.9862946 0.0000 -18.25 -38.625

623 3621.4751 3612.3113 0.9974696 0.0000 -18.25 -44.125

APPENDIX 5
NUMBER THREE
FACTOR LISTING

STANCHION AND 3.5 IN SUPPORT PLATES

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
38	19647.1953	19647.3184	1.0000063	66.62949	23.63070	-5.62500
100	8247.0107	8236.5928	0.9987367	79.90000	23.63070	0.00000
101	10987.7227	11005.5771	1.0016249	71.05299	23.63070	0.00000
102	9593.8721	9604.1758	1.0010740	75.47649	23.63070	0.00000
103	5315.9082	5311.6963	0.9992077	79.90000	23.63070	-11.25000
104	13225.1895	13221.5645	0.9997259	79.90000	23.63070	-5.62500
105	6819.0015	6804.6973	0.9979023	75.47649	23.63070	-11.25000
106	8967.4063	8973.6807	1.0006996	71.05299	23.63070	-11.25000
107	19577.0469	19578.4238	1.0000703	71.05299	23.63070	-5.62500
108	14296.0996	14296.4180	1.0000223	75.47649	23.63070	-5.62500
111	8474.1807	7096.0234	0.8373699	15.25000	-9.64501	0.00000
124	11943.5117	12422.1914	1.0400786	28.26050	-9.64501	0.00000
138	2833.5259	3569.9216	1.2598867	15.25000	-9.64501	10.78100
139	6096.6338	5121.8384	0.8401092	15.25000	-9.64501	5.39050
142	9376.6250	8290.0439	0.8841181	19.58683	-9.64501	0.00000
143	10627.6641	11998.2119	1.1289604	23.92366	-9.64501	0.00000
144	2313.8179	2638.8293	1.1404655	28.26050	-9.64501	10.78100
145	6125.6860	7169.2417	1.1703573	28.26050	-9.64501	5.39050
146	12254.0566	17151.2793	1.3996409	23.92366	-9.64501	10.78100
147	12552.8975	7952.0659	0.6334845	19.58683	-9.64501	10.78100
148	14107.5088	9657.8145	0.6845868	19.58683	-9.64501	5.39050
149	13893.0703	19624.5352	1.4125413	23.92366	-9.64501	5.39050

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
438	19647.1953	19647.1289	0.9999966	66.62949	23.63070	-60.62500
500	8247.0107	8248.8594	1.0002241	79.90000	23.63070	-66.25000
501	10987.7227	10984.3555	0.9996936	71.05299	23.63070	-66.25000
502	9593.8721	9591.9902	0.9998038	75.47649	23.63070	-66.25000
503	5315.9082	5316.7061	1.0001501	79.90000	23.63070	-55.00000
504	13225.1895	13225.8604	1.0000508	79.90000	23.63070	-60.62500
505	6819.0015	6821.5044	1.0003670	75.47649	23.63070	-55.00000
506	8967.4063	8966.5879	0.9999087	71.05299	23.63070	-55.00000
507	19577.0469	19576.7637	0.9999855	71.05299	23.63070	-60.62500
508	14296.0996	14296.0195	0.9999944	75.47649	23.63070	-60.62500
511	8474.1807	8484.9297	1.0012684	15.25000	-9.64501	-66.25000
524	11943.5117	11923.8584	0.9983545	28.26050	-9.64501	-66.25000
538	2833.5259	2833.8892	1.0001281	15.25000	-9.64501	-77.03100
539	6096.6338	6092.6724	0.9993502	15.25000	-9.64501	-71.64000
542	9376.6250	9374.9619	0.9998226	19.58683	-9.64501	-66.25000
543	10627.6641	10618.3945	0.9991278	23.92366	-9.64501	-66.25000
544	2313.8179	2305.5981	0.9964476	28.26050	-9.64501	-77.03100
545	6125.6860	6114.8623	0.9982331	28.26050	-9.64501	-71.64000
546	12254.0566	12254.7988	1.0000606	23.92366	-9.64501	-77.03100
547	12552.8975	12551.1973	0.9998646	19.58683	-9.64501	-77.03100
548	14107.5088	14107.9824	1.0000336	19.58683	-9.64501	-71.64000
549	13893.0703	13891.7881	0.9999077	23.92366	-9.64501	-71.64000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1038	19647.1953	19647.3184	1.0000063	-66.62949	23.63070	-5.62500
1100	8247.0107	8236.5928	0.9987367	-79.90000	23.63070	0.00000
1101	10987.7227	11005.5771	1.0016249	-71.05299	23.63070	0.00000
1102	9593.8721	9604.1758	1.0010740	-75.47649	23.63070	0.00000
1103	5315.9082	5311.6963	0.9992077	-79.90000	23.63070	-11.25000
1104	13225.1895	13221.5645	0.9997259	-79.90000	23.63070	-5.62500
1105	6819.0015	6804.6973	0.9979023	-75.47649	23.63070	-11.25000
1106	8967.4063	8973.6807	1.0006996	-71.05299	23.63070	-11.25000
1107	19577.0469	19578.4238	1.0000703	-71.05299	23.63070	-5.62500
1108	14296.0996	14296.4180	1.0000223	-75.47649	23.63070	-5.62500
1111	8474.1807	7096.0234	0.8373699	-15.25000	-9.64501	0.00000
1124	11943.5117	12422.1914	1.0400786	-28.26050	-9.64501	0.00000
1138	2833.5259	3569.9216	1.2598867	-15.25000	-9.64501	10.78100
1139	6096.6338	5121.8384	0.8401092	-15.25000	-9.64501	5.39050
1142	9376.6250	8290.0439	0.8841181	-19.58683	-9.64501	0.00000
1143	10627.6641	11998.2119	1.1289604	-23.92366	-9.64501	0.00000
1144	2313.8179	2638.8293	1.1404655	-28.26050	-9.64501	10.78100
1145	6125.6860	7169.2417	1.1703573	-28.26050	-9.64501	5.39050
1146	12254.0566	17151.2793	1.3996409	-23.92366	-9.64501	10.78100
1147	12552.8975	7952.0659	0.6334845	-19.58683	-9.64501	10.78100
1148	14107.5088	9657.8145	0.6845868	-19.58683	-9.64501	5.39050
1149	13893.0703	19624.5352	1.4125413	-23.92366	-9.64501	5.39050

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1438	19647.1953	19647.1289	0.9999966	-66.62949	23.63070	-60.62500
1500	8247.0107	8248.8594	1.0002241	-79.90000	23.63070	-66.25000
1501	10987.7227	10984.3555	0.9996936	-71.05299	23.63070	-66.25000
1502	9593.8721	9591.9902	0.9998038	-75.47649	23.63070	-66.25000
1503	5315.9082	5316.7061	1.0001501	-79.90000	23.63070	-55.00000
1504	13225.1895	13225.8604	1.0000508	-79.90000	23.63070	-60.62500
1505	6819.0015	6821.5044	1.0003670	-75.47649	23.63070	-55.00000
1506	8967.4063	8966.5879	0.9999087	-71.05299	23.63070	-55.00000
1507	19577.0469	19576.7637	0.9999855	-71.05299	23.63070	-60.62500
1508	14296.0996	14296.0195	0.9999944	-75.47649	23.63070	-60.62500
1511	8474.1807	8484.9297	1.0012684	-15.25000	-9.64501	-66.25000
1524	11943.5117	11923.8584	0.9983545	-28.26050	-9.64501	-66.25000
1538	2833.5259	2833.8892	1.0001281	-15.25000	-9.64501	-77.03100
1539	6096.6338	6092.6724	0.9993502	-15.25000	-9.64501	-71.64000
1542	9376.6250	9374.9619	0.9998226	-19.58683	-9.64501	-66.25000
1543	10627.6641	10618.3945	0.9991278	-23.92366	-9.64501	-66.25000
1544	2313.8179	2305.5981	0.9964476	-28.26050	-9.64501	-77.03100
1545	6125.6860	6114.8623	0.9982331	-28.26050	-9.64501	-71.64000
1546	12254.0566	12254.7988	1.0000606	-23.92366	-9.64501	-77.03100
1547	12552.8975	12551.1973	0.9998646	-19.58683	-9.64501	-77.03100
1548	14107.5088	14107.9824	1.0000336	-19.58683	-9.64501	-71.64000
1549	13893.0703	13891.7881	0.9999077	-23.92366	-9.64501	-71.64000

NUMBERTHREE WORST

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
519	6534.1294	4821.9385	0.7379619	15.25000	-13.94750	-66.25000
534	539.0928	690.3599	1.2805957	19.58510	2.01868	-77.03100
539	5000.1997	3611.5278	0.7222767	15.25000	-9.64501	-71.64000
541	5901.5444	4095.4136	0.6939563	15.24870	-4.27001	-71.64000
545	4577.7803	5808.2876	1.2688000	28.26050	-9.64501	-71.64000
552	4057.0024	4921.1367	1.2129983	28.26047	-0.65095	-71.64000
553	6224.6641	8029.9155	1.2900159	28.26047	-5.14798	-71.64000
595	4778.5171	3528.1873	0.7383435	19.59871	-5.81784	-66.25000

SECTION A-A

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
14	11704.3320	11568.3838	0.9883848	19.62247	1.83647	0.00000
15	9258.9902	9091.1211	0.9818696	23.96206	2.75057	0.00000
113	6400.1460	6316.8682	0.9869881	15.24870	-4.27001	0.00000
126	5711.4658	5545.5776	0.9709553	28.26048	-5.14798	0.00000
127	5161.3184	5028.5488	0.9742761	28.26047	-0.65095	0.00000
142	3779.1233	3754.7361	0.9935468	19.58683	-9.64501	0.00000
143	6404.4614	6262.7324	0.9778703	23.92366	-9.64501	0.00000
188	7970.8433	7991.4873	1.0025899	15.24827	-2.47834	0.00000
189	2013.9762	1965.2789	0.9758204	15.24913	-6.06167	0.00000

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
414	11704.3320	11422.1670	0.9758922	19.62247	1.83647	-66.25000
415	9258.9902	9364.8896	1.0114374	23.96206	2.75057	-66.25000
513	6400.1460	4936.4824	0.7713078	15.24870	-4.27001	-66.25000
526	5711.4658	6046.2788	1.0586212	28.26048	-5.14798	-66.25000
527	5161.3184	5497.0283	1.0650434	28.26047	-0.65095	-66.25000
542	3779.1233	2947.3413	0.7799008	19.58683	-9.64501	-66.25000
543	6404.4609	5563.5586	0.8687005	23.92366	-9.64501	-66.25000
588	7970.8433	6378.8081	0.8002676	15.24827	-2.47834	-66.25000
589	2013.9762	2151.2693	1.0681702	15.24913	-6.06167	-66.25000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1014	11704.3320	11816.8047	1.0096095	-19.62247	1.83647	0.00000
1015	9258.9902	9410.9697	1.0164143	-23.96206	2.75057	0.00000
1113	6400.1460	6496.3145	1.0150260	-15.24870	-4.27001	0.00000
1126	5711.4658	5867.0444	1.0272397	-28.26048	-5.14798	0.00000
1127	5161.3184	5283.7036	1.0237120	-28.26047	-0.65095	0.00000
1142	3779.1233	3789.9307	1.0028597	-19.58683	-9.64501	0.00000
1143	6404.4614	6523.7998	1.0186336	-23.92366	-9.64501	0.00000
1188	7970.8433	7917.8696	0.9933541	-15.24827	-2.47834	0.00000
1189	2013.9762	2078.9578	1.0322653	-15.24913	-6.06167	0.00000

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1414	11704.3320	11204.7324	0.9573150	-19.62247	1.83647	-66.25000
1415	9258.9902	9058.2051	0.9783146	-23.96206	2.75057	-66.25000
1513	6400.1460	6668.8052	1.0419770	-15.24870	-4.27001	-66.25000
1526	5711.4658	5600.6108	0.9805908	-28.26048	-5.14798	-66.25000
1527	5161.3184	5081.4795	0.9845313	-28.26047	-0.65095	-66.25000
1542	3779.1233	3498.1377	0.9256479	-19.58683	-9.64501	-66.25000
1543	6404.4609	6014.4795	0.9391078	-23.92366	-9.64501	-66.25000
1588	7970.8433	7070.3589	0.8870277	-15.24827	-2.47834	-66.25000
1589	2013.9762	2340.8745	1.1623149	-15.24913	-6.06167	-66.25000

SECTION B-B

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
75	1145.4335	1153.4146	1.0069678	15.24740	1.10498	-33.12500
78	1837.4819	1832.1707	0.9971095	0.41207	0.00000	-33.12500
79	519.1904	586.0334	1.1287447	10.18418	0.49153	-33.12500
80	1419.4530	1431.5040	1.0084900	5.09876	0.12299	-33.12500
87	4898.3145	4814.0254	0.9827923	28.26045	3.84607	-33.12500
90	3179.0029	3116.7607	0.9804208	23.96206	2.75057	-33.12500
91	2120.7888	2089.0730	0.9850453	19.62247	1.83647	-33.12500
96	6835.5942	6736.6455	0.9855245	31.97561	4.95008	-33.12500
216	937.4582	879.0109	0.9376535	15.25000	-18.25000	-33.12500
219	2182.5669	2171.9287	0.9951258	0.00000	-18.25000	-33.12500
220	1316.0605	1330.4725	1.0109508	10.16666	-18.25000	-33.12500
221	1952.1735	1967.6696	1.0079379	5.08333	-18.25000	-33.12500
1075	1145.4335	1135.5790	0.9913967	-15.24740	1.10498	-33.12500
1079	519.1904	531.7764	1.0242416	-10.18418	0.49153	-33.12500
1080	1419.4530	1422.5068	1.0021514	-5.09876	0.12299	-33.12500
1087	4898.3145	4988.3691	1.0183848	-28.26045	3.84607	-33.12500
1090	3179.0029	3227.0767	1.0151223	-23.96206	2.75057	-33.12500
1091	2120.7888	2136.2200	1.0072762	-19.62247	1.83647	-33.12500
1096	6835.5942	6957.7676	1.0178732	-31.97561	4.95008	-33.12500
1216	937.4582	980.7935	1.0462264	-15.25000	-18.25000	-33.12500
1220	1316.0605	1276.7444	0.9701259	-10.16666	-18.25000	-33.12500
1221	1952.1735	1918.6146	0.9828095	-5.08333	-18.25000	-33.12500
1242	4850.7827	4884.4058	1.0069314	-23.92366	-18.25000	-33.12500
1243	2281.9146	2330.6497	1.0213571	-19.58683	-18.25000	-33.12500

§

STANCHION AND 3.5 in SUPPORT PLATES

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
38	19647.1953	19646.3477	0.9999568	66.62949	23.63070	-5.62500
100	8247.0107	8260.5742	1.0016446	79.90000	23.63070	0.00000
101	10987.7227	10962.1270	0.9976705	71.05299	23.63070	0.00000
102	9593.8721	9579.7275	0.9985257	75.47649	23.63070	0.00000
103	5315.9082	5322.0034	1.0011466	79.90000	23.63070	-11.25000
104	13225.1895	13230.2607	1.0003835	79.90000	23.63070	-5.62500
105	6819.0015	6837.2109	1.0026704	75.47649	23.63070	-11.25000
106	8967.4063	8962.4541	0.9994478	71.05299	23.63070	-11.25000
107	19577.0469	19575.2188	0.9999066	71.05299	23.63070	-5.62500
108	14296.0996	14295.6719	0.9999701	75.47649	23.63070	-5.62500
111	8474.1807	8498.2451	1.0028397	15.25000	-9.64501	0.00000
124	11943.5117	11635.7227	0.9742296	28.26050	-9.64501	0.00000
138	2833.5259	2814.6316	0.9933319	15.25000	-9.64501	10.78100
139	6096.6338	5993.0161	0.9830041	15.25000	-9.64501	5.39050
142	9376.6250	9238.4893	0.9852681	19.58683	-9.64501	0.00000
143	10627.6641	10376.8594	0.9764008	23.92366	-9.64501	0.00000
144	2313.8179	2186.9985	0.9451904	28.26050	-9.64501	10.78100
145	6125.6860	5905.7476	0.9640957	28.26050	-9.64501	5.39050
146	12254.0566	11960.7012	0.9760606	23.92366	-9.64501	10.78100
147	12552.8975	12247.3721	0.9756610	19.58683	-9.64501	10.78100
148	14107.5088	13791.8730	0.9776264	19.58683	-9.64501	5.39050
149	13893.0703	13524.7920	0.9734920	23.92366	-9.64501	5.39050

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
438	19647.1953	19648.1934	1.0000508	66.62949	23.63070	-60.62500
500	8247.0107	8222.6953	0.9970516	79.90000	23.63070	-66.25000
501	10987.7227	11031.6240	1.0039955	71.05299	23.63070	-66.25000
502	9593.8721	9618.6914	1.0025870	75.47649	23.63070	-66.25000
503	5315.9082	5306.2256	0.9981785	79.90000	23.63070	-55.00000
504	13225.1895	13216.6895	0.9993573	79.90000	23.63070	-60.62500
505	6819.0015	6786.2065	0.9951907	75.47649	23.63070	-55.00000
506	8967.4063	8979.3896	1.0013363	71.05299	23.63070	-55.00000
507	19577.0469	19580.5547	1.0001792	71.05299	23.63070	-60.62500
508	14296.0996	14297.0342	1.0000653	75.47649	23.63070	-60.62500
511	8474.1807	6799.0254	0.8023224	15.25000	-9.64501	-66.25000
524	11943.5117	12552.6133	1.0509986	28.26050	-9.64501	-66.25000
538	2833.5259	3287.7349	1.1602981	15.25000	-9.64501	-77.03100
539	6096.6338	4892.1211	0.8024299	15.25000	-9.64501	-71.64000
542	9376.6250	8161.4751	0.8704064	19.58683	-9.64501	-66.25000
543	10627.6641	11910.8281	1.1207381	23.92366	-9.64501	-66.25000
544	2313.8179	2488.1580	1.0753474	28.26050	-9.64501	-77.03100
545	6125.6860	7005.7715	1.1436713	28.26050	-9.64501	-71.64000
546	12254.0566	16725.5313	1.3648975	23.92366	-9.64501	-77.03100
547	12552.8975	7792.6753	0.6207870	19.58683	-9.64501	-77.03100
548	14107.5088	9425.7988	0.6681406	19.58683	-9.64501	-71.64000
549	13893.0703	19137.4336	1.3774805	23.92366	-9.64501	-71.64000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1038	19647.1953	19648.0586	1.0000440	-66.62949	23.63070	-5.62500
1100	8247.0107	8235.2109	0.9985692	-79.90000	23.63070	0.00000
1101	10987.7227	11010.2012	1.0020458	-71.05299	23.63070	0.00000
1102	9593.8721	9606.2852	1.0012939	-75.47649	23.63070	0.00000
1103	5315.9082	5310.9199	0.9990616	-79.90000	23.63070	-11.25000
1104	13225.1895	13220.9014	0.9996758	-79.90000	23.63070	-5.62500
1105	6819.0015	6803.3247	0.9977010	-75.47649	23.63070	-11.25000
1106	8967.4063	8971.6631	1.0004747	-71.05299	23.63070	-11.25000
1107	19577.0469	19578.6660	1.0000827	-71.05299	23.63070	-5.62500
1108	14296.0996	14296.4980	1.0000279	-75.47649	23.63070	-5.62500
1111	8474.1807	8460.9297	0.9984363	-15.25000	-9.64501	0.00000
1124	11943.5117	12233.1592	1.0242515	-28.26050	-9.64501	0.00000
1138	2833.5259	2855.0281	1.0075885	-15.25000	-9.64501	10.78100
1139	6096.6338	6198.3765	1.0166883	-15.25000	-9.64501	5.39050
1142	9376.6250	9513.9150	1.0146418	-19.58683	-9.64501	0.00000
1143	10627.6641	10869.9805	1.0228006	-23.92366	-9.64501	0.00000
1144	2313.8179	2433.6897	1.0518069	-28.26050	-9.64501	10.78100
1145	6125.6860	6336.8384	1.0344700	-28.26050	-9.64501	5.39050
1146	12254.0566	12547.9053	1.0239797	-23.92366	-9.64501	10.78100
1147	12552.8975	12856.7500	1.0242058	-19.58683	-9.64501	10.78100
1148	14107.5088	14423.3311	1.0223868	-19.58683	-9.64501	5.39050
1149	13893.0703	14260.0693	1.0264159	-23.92366	-9.64501	5.39050

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1438	19647.1953	19646.4590	0.9999625	-66.62949	23.63070	-60.62500
1500	8247.0107	8261.2793	1.0017302	-79.90000	23.63070	-66.25000
1501	10987.7227	10961.1621	0.9975827	-71.05299	23.63070	-66.25000
1502	9593.8721	9579.0615	0.9984562	-75.47649	23.63070	-66.25000
1503	5315.9082	5322.2690	1.0011966	-79.90000	23.63070	-55.00000
1504	13225.1895	13230.5107	1.0004023	-79.90000	23.63070	-60.62500
1505	6819.0015	6838.2900	1.0028286	-75.47649	23.63070	-55.00000
1506	8967.4063	8961.8096	0.9993759	-71.05299	23.63070	-55.00000
1507	19577.0469	19575.0195	0.9998965	-71.05299	23.63070	-60.62500
1508	14296.0996	14295.5840	0.9999639	-75.47649	23.63070	-60.62500
1511	8474.1807	8598.4824	1.0146683	-15.25000	-9.64501	-66.25000
1524	11943.5117	11789.3838	0.9870952	-28.26050	-9.64501	-66.25000
1538	2833.5259	2868.1726	1.0122274	-15.25000	-9.64501	-77.03100
1539	6096.6338	6081.4976	0.9975173	-15.25000	-9.64501	-71.64000
1542	9376.6250	9459.0508	1.0087906	-19.58683	-9.64501	-66.25000
1543	10627.6641	10630.3506	1.0002528	-23.92366	-9.64501	-66.25000
1544	2313.8179	2248.8025	0.9719012	-28.26050	-9.64501	-77.03100
1545	6125.6860	6076.3843	0.9919516	-28.26050	-9.64501	-71.64000
1546	12254.0566	12564.6689	1.0253477	-23.92366	-9.64501	-77.03100
1547	12552.8975	12815.1484	1.0208917	-19.58683	-9.64501	-77.03100
1548	14107.5088	14444.8857	1.0239147	-19.58683	-9.64501	-71.64000
1549	13893.0703	14216.0986	1.0232511	-23.92366	-9.64501	-71.64000

ARM CONNECT

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
121	14662.2695	14924.6592	1.0178956	28.26050	-9.64501	-11.25000
124	9262.8857	9040.2852	0.9759685	28.26050	-9.64501	0.00000
125	5323.7173	5207.7720	0.9782210	28.26050	-9.64501	-5.62500
181	10540.7070	10354.2490	0.9823107	28.26050	-18.25000	0.00000
182	12551.1602	12267.7109	0.9774165	28.26050	-13.94750	0.00000
228	16030.9043	15950.9551	0.9950128	28.26050	-18.25000	-11.25000
231	8540.9580	8408.0000	0.9844329	28.26050	-18.25000	-5.62500
282	19003.9219	19166.9551	1.0085789	28.26050	-13.94750	-11.25000
305	6782.7661	6598.5850	0.9728457	28.26050	-13.94750	-5.62500

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
521	14662.2695	14173.5430	0.9666677	28.26050	-9.64501	-55.00000
524	9262.8857	9908.8857	1.0697407	28.26050	-9.64501	-66.25000
525	5323.7173	5888.1465	1.1060216	28.26050	-9.64501	-60.62500
581	10540.7070	10372.5850	0.9840502	28.26050	-18.25000	-66.25000
582	12551.1602	12778.7686	1.0181345	28.26050	-13.94750	-66.25000
628	16030.9043	16120.8691	1.0056120	28.26050	-18.25000	-55.00000
631	8540.9580	8822.0215	1.0329077	28.26050	-18.25000	-60.62500
682	19003.9219	18655.8008	0.9816816	28.26050	-13.94750	-55.00000
705	6782.7661	7571.4819	1.1162823	28.26050	-13.94750	-60.62500

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1121	14662.2695	14395.7334	0.9818217	-28.26050	-9.64501	-11.25000
1124	9262.8857	9473.3262	1.0227187	-28.26050	-9.64501	0.00000
1125	5323.7173	5436.1372	1.0211169	-28.26050	-9.64501	-5.62500
1181	10540.7070	10721.9199	1.0171918	-28.26050	-18.25000	0.00000
1182	12551.1602	12819.9844	1.0214183	-28.26050	-13.94750	0.00000
1228	16030.9043	16080.5762	1.0030985	-28.26050	-18.25000	-11.25000
1231	8540.9580	8664.6016	1.0144765	-28.26050	-18.25000	-5.62500
1282	19003.9219	18823.5508	0.9905087	-28.26050	-13.94750	-11.25000
1305	6782.7661	6962.0176	1.0264275	-28.26050	-13.94750	-5.62500

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1521	14662.2695	14622.6006	0.9972945	-28.26050	-9.64501	-55.00000
1524	9262.8857	9152.4102	0.9880733	-28.26050	-9.64501	-66.25000
1525	5323.7173	5279.7324	0.9917380	-28.26050	-9.64501	-60.62500
1581	10540.7070	10416.3477	0.9882020	-28.26050	-18.25000	-66.25000
1582	12551.1602	12374.0615	0.9858899	-28.26050	-13.94750	-66.25000
1628	16030.9043	15949.8291	0.9949425	-28.26050	-18.25000	-55.00000
1631	8540.9580	8445.2852	0.9887983	-28.26050	-18.25000	-60.62500
1682	19003.9219	18979.3730	0.9987082	-28.26050	-13.94750	-55.00000
1705	6782.7661	6685.4932	0.9856588	-28.26050	-13.94750	-60.62500

TIE PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1	18590.9414	18594.4863	1.0001907	0.41207	0.00000	0.00000
7	13989.6982	13976.1563	0.9990320	0.41207	0.00000	-11.25000
10	17322.6250	17312.3027	0.9994041	0.41207	0.00000	-5.62500
51	6976.9146	6973.7173	0.9995418	0.41207	0.00000	-19.12500
54	10640.6738	10630.4678	0.9990408	0.41207	0.00000	-15.18700
78	1837.4819	1832.1707	0.9971095	0.41207	0.00000	-33.12500
81	1768.3112	1773.2323	1.0027829	0.41207	0.00000	-28.45800
82	3195.1631	3205.2837	1.0031675	0.41207	0.00000	-23.79100
201	15208.0459	15216.3975	1.0005492	0.00000	-18.25000	0.00000
206	9185.1904	9186.6279	1.0001565	0.00000	-18.25000	-11.25000
209	12347.4111	12350.2119	1.0002269	0.00000	-18.25000	-5.62500
212	6175.9893	6176.1074	1.0000191	0.00000	-18.25000	-16.62500
222	2146.0637	2137.6670	0.9960874	0.00000	-18.25000	-27.62500
223	3621.4751	3618.2639	0.9991133	0.00000	-18.25000	-22.12500
401	18590.9414	18225.3848	0.9803368	0.41207	0.00000	-66.25000
407	13989.6982	13727.1631	0.9812337	0.41207	0.00000	-55.00000
410	17322.6250	16992.8535	0.9809629	0.41207	0.00000	-60.62500
451	6976.9146	6831.5249	0.9791613	0.41207	0.00000	-47.12500
454	10640.6738	10432.2891	0.9804162	0.41207	0.00000	-51.06200
481	1768.3112	1762.5574	0.9967462	0.41207	0.00000	-37.79100
482	3195.1631	3119.2341	0.9762363	0.41207	0.00000	-42.45800
601	15208.0459	14911.4434	0.9804970	0.00000	-18.25000	-66.25000
606	9185.1904	9011.2051	0.9810581	0.00000	-18.25000	-55.00000
609	12347.4111	12114.7822	0.9811597	0.00000	-18.25000	-60.62500
612	6175.9893	6052.6807	0.9800342	0.00000	-18.25000	-49.62500
622	2146.0637	2126.1782	0.9907340	0.00000	-18.25000	-38.62500
623	3621.4751	3540.1851	0.9775533	0.00000	-18.25000	-44.12500

APPENDIX 6

NUMBERFOUR

Factor Listing

NUMBERFOUR WORST

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1119	6534.1294	4865.1260	0.7445714	-15.25000	-13.94750	0.00000
1134	539.0928	693.4313	1.2862930	-19.58510	2.01868	10.78100
1139	5000.1997	3570.0325	0.7139780	-15.25000	-9.64501	5.39050
1141	5901.5444	4034.0669	0.6835612	-15.24870	-4.27001	5.39050
1145	4577.7803	5648.5156	1.2338984	-28.26050	-9.64501	5.39050
1153	6224.6641	7817.8853	1.2559530	-28.26047	-5.14798	5.39050
1195	4778.5171	3501.4636	0.7327511	-19.59871	-5.81784	0.00000
1519	6534.1294	4863.5645	0.7443324	-15.25000	-13.94750	-66.25000
1534	539.0928	693.7038	1.2867984	-19.58510	2.01868	-77.03100
1539	5000.1997	3569.3191	0.7138353	-15.25000	-9.64501	-71.64000
1541	5901.5444	4034.0757	0.6835627	-15.24870	-4.27001	-71.64000
1545	4577.7803	5647.3994	1.2336545	-28.26050	-9.64501	-71.64000
1553	6224.6641	7818.0493	1.2559793	-28.26047	-5.14798	-71.64000
1595	4778.5171	3502.5527	0.7329790	-19.59871	-5.81784	-66.25000

SECTION A-A

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
14	11704.3320	11326.7246	0.9677378	19.62247	1.83647	0.00000
15	9258.9902	9211.0342	0.9948206	23.96206	2.75057	0.00000
113	6400.1460	6757.6450	1.0558579	15.24870	-4.27001	0.00000
126	5711.4658	5754.7256	1.0075742	28.26048	-5.14798	0.00000
127	5161.3184	5203.0288	1.0080813	28.26047	-0.65095	0.00000
142	3779.1233	3523.8606	0.9324545	19.58683	-9.64501	0.00000
143	6404.4614	6141.8330	0.9589929	23.92366	-9.64501	0.00000
188	7970.8433	7045.6704	0.8839304	15.24827	-2.47834	0.00000
189	2013.9762	2397.6921	1.1905266	15.24913	-6.06167	0.00000

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
414	11704.3320	-11325.3486	0.9676203	19.62247	1.83647	-66.25000
415	9258.9902	9210.4512	0.9947577	23.96206	2.75057	-66.25000
513	6400.1460	6759.2915	1.0561152	15.24870	-4.27001	-66.25000
526	5711.4658	5753.4727	1.0073549	28.26048	-5.14798	-66.25000
527	5161.3184	5202.4111	1.0079616	28.26047	-0.65095	-66.25000
542	3779.1233	3522.7603	0.9321634	19.58683	-9.64501	-66.25000
543	6404.4609	6139.2422	0.9585884	23.92366	-9.64501	-66.25000
588	7970.8433	7042.1489	0.8834886	15.24827	-2.47834	-66.25000
589	2013.9762	2399.3064	1.1913280	15.24913	-6.06167	-66.25000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1014	11704.3320	11297.2842	0.9652225	-19.62247	1.83647	0.00000
1015	9258.9902	9198.8076	0.9935001	-23.96206	2.75057	0.00000
1113	6400.1460	4905.0737	0.7664003	-15.24870	-4.27001	0.00000
1126	5711.4658	5872.4146	1.0281799	-28.26048	-5.14798	0.00000
1127	5161.3184	5359.8398	1.0384634	-28.26047	-0.65095	0.00000
1142	3779.1233	2941.4873	0.7783518	-19.58683	-9.64501	0.00000
1143	6404.4614	5448.1128	0.8506746	-23.92366	-9.64501	0.00000
1188	7970.8433	6427.2773	0.8063485	-15.24827	-2.47834	0.00000
1189	2013.9762	2095.5859	1.0405217	-15.24913	-6.06167	0.00000

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1414	11704.3320	11299.7031	0.9654291	-19.62247	1.83647	-66.25000
1415	9258.9902	9200.3994	0.9936720	-23.96206	2.75057	-66.25000
1513	6400.1460	4905.1621	0.7664141	-15.24870	-4.27001	-66.25000
1526	5711.4658	5872.8311	1.0282528	-28.26048	-5.14798	-66.25000
1527	5161.3184	5360.8711	1.0386631	-28.26047	-0.65095	-66.25000
1542	3779.1233	2941.4290	0.7783363	-19.58683	-9.64501	-66.25000
1543	6404.4609	5447.4785	0.8505756	-23.92366	-9.64501	-66.25000
1588	7970.8433	6427.5815	0.8063866	-15.24827	-2.47834	-66.25000
1589	2013.9762	2096.0745	1.0407642	-15.24913	-6.06167	-66.25000

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SECTION B-B

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
75	1145.4335	1110.6465	0.9696298	15.24740	1.10498	-33.12500
78	1837.4819	1813.6466	0.9870282	0.41207	0.00000	-33.12500
79	519.1904	477.3048	0.9193251	10.18418	0.49153	-33.12500
80	1419.4530	1401.3214	0.9872264	5.09876	0.12299	-33.12500
87	4898.3145	5073.9873	1.0358640	28.26045	3.84607	-33.12500
90	3179.0029	3270.9680	1.0289289	23.96206	2.75057	-33.12500
91	2120.7888	2143.7686	1.0108354	19.62247	1.83647	-33.12500
96	6835.5942	7074.0869	1.0348898	31.97561	4.95008	-33.12500
216	937.4582	1009.5634	1.0769156	15.25000	-18.25000	-33.12500
219	2182.5669	2154.9978	0.9873685	0.00000	-18.25000	-33.12500
220	1316.0605	1238.4325	0.9410148	10.16666	-18.25000	-33.12500
221	1952.1735	1878.2201	0.9621174	5.08333	-18.25000	-33.12500
1075	1145.4335	1141.9307	0.9969419	-15.24740	1.10498	-33.12500
1079	519.1904	583.6582	1.1241698	-10.18418	0.49153	-33.12500
1080	1419.4530	1418.5295	0.9993494	-5.09876	0.12299	-33.12500
1087	4898.3145	4732.7095	0.9661914	-28.26045	3.84607	-33.12500
1090	3179.0029	3053.4658	0.9605106	-23.96206	2.75057	-33.12500
1091	2120.7888	2046.8429	0.9651328	-19.62247	1.83647	-33.12500
1096	6835.5942	6641.4946	0.9716046	-31.97561	4.95008	-33.12500
1216	937.4582	808.6712	0.8626211	-15.25000	-18.25000	-33.12500
1220	1316.0605	1342.1357	1.0198131	-10.16666	-18.25000	-33.12500
1221	1952.1735	1973.8665	1.0111122	-5.08333	-18.25000	-33.12500
1242	4850.7827	4727.5112	0.9745873	-23.92366	-18.25000	-33.12500
1243	2281.9146	2139.8457	0.9377414	-19.58683	-18.25000	-33.12500

STANCHION AND 3.5 in PLATE

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
38	19647.1953	19647.2617	1.0000033	66.62949	23.63070	-5.62500
100	8247.0107	8249.3184	1.0002798	79.90000	23.63070	0.00000
101	10987.7227	10983.8721	0.9996496	71.05299	23.63070	0.00000
102	9593.8721	9591.5986	0.9997630	75.47649	23.63070	0.00000
103	5315.9082	5316.8491	1.0001770	79.90000	23.63070	-11.25000
104	13225.1895	13226.0088	1.0000620	79.90000	23.63070	-5.62500
105	6819.0015	6822.2559	1.0004772	75.47649	23.63070	-11.25000
106	8967.4063	8965.9883	0.9998419	71.05299	23.63070	-11.25000
107	19577.0469	19576.5957	0.9999769	71.05299	23.63070	-5.62500
108	14296.0996	14295.9385	0.9999887	75.47649	23.63070	-5.62500
111	8474.1807	8651.0000	1.0208657	15.25000	-9.64501	0.00000
124	11943.5117	12076.8330	1.0111626	28.26050	-9.64501	0.00000
138	2833.5259	2880.5356	1.0165906	15.25000	-9.64501	10.78100
139	6096.6338	6178.8779	1.0134901	15.25000	-9.64501	5.39050
142	9376.6250	9594.2002	1.0232040	19.58683	-9.64501	0.00000
143	10627.6641	10867.0879	1.0225284	23.92366	-9.64501	0.00000
144	2313.8179	2365.2698	1.0222368	28.26050	-9.64501	10.78100
145	6125.6860	6281.1919	1.0253859	28.26050	-9.64501	5.39050
146	12254.0566	12843.2969	1.0480853	23.92366	-9.64501	10.78100
147	12552.8975	13104.9707	1.0439798	19.58683	-9.64501	10.78100
148	14107.5088	14744.4043	1.0451459	19.58683	-9.64501	5.39050

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
438	19647.1953	19647.2422	1.0000024	66.62949	23.63070	-60.62500
500	8247.0107	8249.4619	1.0002972	79.90000	23.63070	-66.25000
501	10987.7227	10983.5674	0.9996218	71.05299	23.63070	-66.25000
502	9593.8721	9591.4375	0.9997463	75.47649	23.63070	-66.25000
503	5315.9082	5316.9160	1.0001895	79.90000	23.63070	-55.00000
504	13225.1895	13226.0664	1.0000663	79.90000	23.63070	-60.62500
505	6819.0015	6822.4419	1.0005045	75.47649	23.63070	-55.00000
506	8967.4063	8965.9746	0.9998404	71.05299	23.63070	-55.00000
507	19577.0469	19576.5762	0.9999760	71.05299	23.63070	-60.62500
508	14296.0996	14295.9336	0.9999884	75.47649	23.63070	-60.62500
511	8474.1807	8652.5342	1.0210466	15.25000	-9.64501	-66.25000
524	11943.5117	12074.7305	1.0109866	28.26050	-9.64501	-66.25000
538	2833.5259	2880.9033	1.0167203	15.25000	-9.64501	-77.03100
539	6096.6338	6178.7417	1.0134678	15.25000	-9.64501	-71.64000
542	9376.6250	9594.5439	1.0232407	19.58683	-9.64501	-66.25000
543	10627.6641	10866.2500	1.0224495	23.92366	-9.64501	-66.25000
544	2313.8179	2364.3181	1.0218256	28.26050	-9.64501	-77.03100
545	6125.6860	6279.9922	1.0251900	28.26050	-9.64501	-71.64000
546	12254.0566	12844.1846	1.0481578	23.92366	-9.64501	-77.03100
547	12552.8975	13105.5488	1.0440258	19.58683	-9.64501	-77.03100
548	14107.5088	14745.4531	1.0452203	19.58683	-9.64501	-71.64000
549	13893.0703	14566.6504	1.0484831	23.92366	-9.64501	-71.64000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1038	19647.1953	19647.2012	1.0000004	-66.62949	23.63070	-5.62500
1100	8247.0107	8236.4814	0.9987233	-79.90000	23.63070	0.00000
1101	10987.7227	11005.5166	1.0016195	-71.05299	23.63070	0.00000
1102	9593.8721	9604.2412	1.0010808	-75.47649	23.63070	0.00000
1103	5315.9082	5311.6968	0.9992078	-79.90000	23.63070	-11.25000
1104	13225.1895	13221.5352	0.9997237	-79.90000	23.63070	-5.62500
1105	6819.0015	6804.4390	0.9978644	-75.47649	23.63070	-11.25000
1106	8967.4063	8974.0117	1.0007366	-71.05299	23.63070	-11.25000
1107	19577.0469	19578.5508	1.0000768	-71.05299	23.63070	-5.62500
1108	14296.0996	14296.4922	1.0000274	-75.47649	23.63070	-5.62500
1111	8474.1807	6850.4917	0.8083957	-15.25000	-9.64501	0.00000
1124	11943.5117	12238.7881	1.0247227	-28.26050	-9.64501	0.00000
1138	2833.5259	3346.2517	1.1809498	-15.25000	-9.64501	10.78100
1139	6096.6338	4868.6694	0.7985832	-15.25000	-9.64501	5.39050
1142	9376.6250	8080.1689	0.8617353	-19.58683	-9.64501	0.00000
1143	10627.6641	11649.0137	1.0961030	-23.92366	-9.64501	0.00000
1144	2313.8179	2450.9060	1.0592476	-28.26050	-9.64501	10.78100
1145	6125.6860	6851.5029	1.1184875	-28.26050	-9.64501	5.39050
1146	12254.0566	16329.2227	1.3325565	-23.92366	-9.64501	10.78100
1147	12552.8975	7606.4595	0.6059525	-19.58683	-9.64501	10.78100
1148	14107.5088	9233.9512	0.6545416	-19.58683	-9.64501	5.39050
1149	13893.0703	18675.4629	1.3442286	-23.92366	-9.64501	5.39050
1438	19647.1953	19647.1953	1.0000000	-66.62949	23.63070	-60.62500

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1500	8247.0107	8236.4561	0.9987202	-79.90000	23.63070	-66.25000
1501	10987.7227	11005.5381	1.0016214	-71.05299	23.63070	-66.25000
1502	9593.8721	9604.2588	1.0010827	-75.47649	23.63070	-66.25000
1503	5315.9082	5311.6895	0.9992064	-79.90000	23.63070	-55.00000
1504	13225.1895	13221.5283	0.9997232	-79.90000	23.63070	-60.62500
1505	6819.0015	6804.4019	0.9978590	-75.47649	23.63070	-55.00000
1506	8967.4063	8974.0498	1.0007409	-71.05299	23.63070	-55.00000
1507	19577.0469	19578.5547	1.0000770	-71.05299	23.63070	-60.62500
1508	14296.0996	14296.4941	1.0000277	-75.47649	23.63070	-60.62500
1511	8474.1807	6849.3560	0.8082618	-15.25000	-9.64501	-66.25000
1524	11943.5117	12236.6436	1.0245432	-28.26050	-9.645538	-66.25000
1538	2833.5259	3345.6338	1.1807317	-15.25000	-9.64501	-77.03100
1539	6096.6338	4867.5815	0.7984048	-15.25000	-9.64501	-71.64000
1542	9376.6250	8078.8242	0.8615919	-19.5868	-9.64501	-66.25000
1543	10627.6641	11647.6816	1.095977	-23.9236	-9.64501	-66.25000
1544	2312.8179	2450.3433	1.059	-28.2605	-9.64501	-77.031
1545	6125.6860	6851.7090	1.1185211	-28.26050	-9.64501	-71.64000
1546	12254.0566	16331.8252	1.33276	-23.9236	-9.64501	-77.031
1547	12552.8975	7607.6499	0.6060473	-19.58683	-9.64501	-77.031
1548	14107.5088	9234.04	0.654547	-19.58683	-9.64501	-71.64000
1549	13893.0703	18676.9160	1.3443332	-23.92366	-9.64501	-71.64000

ARM CONNECT

QUADRANT 1

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
121	14662.2695	14361.5508	0.9794903	28.26050	-9.64501	-11.25000
124	9262.8857	9361.3965	1.0106350	28.26050	-9.64501	0.00000
125	5323.7173	5389.6025	1.0123758	28.26050	-9.64501	-5.62500
181	10540.7070	10597.0186	1.0053422	28.26050	-18.25000	0.00000
182	12551.1602	12641.7402	1.0072168	28.26050	-13.94750	0.00000
228	16030.9043	15999.1719	0.9980205	28.26050	-18.25000	-11.25000
231	8540.9580	8568.4609	1.0032201	28.26050	-18.25000	-5.62500
282	19003.9219	18802.1660	0.9893835	28.26050	-13.94750	-11.25000
305	6782.7661	6862.4082	1.0117419	28.26050	-13.94750	-5.62500

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
521	14662.2695	14363.4014	0.9796165	28.26050	-9.64501	-55.00000
524	9262.8857	9359.7129	1.0104532	28.26050	-9.64501	-66.25000
525	5323.7173	5389.1201	1.0122852	28.26050	-9.64501	-60.62500
581	10540.7070	10594.7178	1.0051240	28.26050	-18.25000	-66.25000
582	12551.1602	12639.0977	1.0070063	28.26050	-13.94750	-66.25000
628	16030.9043	15999.7861	0.9980589	28.26050	-18.25000	-55.00000
631	8540.9580	8567.5049	1.0031081	28.26050	-18.25000	-60.62500
682	19003.9219	18804.3223	0.9894969	28.26050	-13.94750	-55.00000
705	6782.7661	6861.3423	1.0115846	28.26050	-13.94750	-60.62500

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1121	14662.2695	14435.0400	0.9845024	-28.26050	-9.64501	-11.25000
1124	9262.8857	9678.4131	1.0448594	-28.26050	-9.64501	0.00000
1125	5323.7173	5751.7881	1.0804082	-28.26050	-9.64501	-5.62500
1181	10540.7070	10196.4961	0.9673446	-28.26050	-18.25000	0.00000
1182	12551.1602	12499.0732	0.9958500	-28.26050	-13.94750	0.00000
1228	16030.9043	16036.4141	1.0003437	-28.26050	-18.25000	-11.25000
1231	8540.9580	8686.1484	1.0169994	-28.26050	-18.25000	-5.62500
1282	19003.9219	18808.8516	0.9897352	-28.26050	-13.94750	-11.25000
1305	6782.7661	7361.3481	1.0853018	-28.26050	-13.94750	-5.62500

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1521	14662.2695	14436.3906	0.9845945	-28.26050	-9.64501	-55.00000
1524	9262.8857	9676.4414	1.0446465	-28.26050	-9.64501	-66.25000
1525	5323.7173	5749.9414	1.0800613	-28.26050	-9.64501	-60.62500
1581	10540.7070	10195.9131	0.9672893	-28.26050	-18.25000	-66.25000
1582	12551.1602	12497.3945	0.9957163	-28.26050	-13.94750	-66.25000
1628	16030.9043	16036.5898	1.0003546	-28.26050	-18.25000	-55.00000
1631	8540.9580	8685.2510	1.0168942	-28.26050	-18.25000	-60.62500
1682	19003.9219	18810.0449	0.9897981	-28.26050	-13.94750	-55.00000
1705	6782.7661	7359.1597	1.0849792	-28.26050	-13.94750	-60.62500

TIE PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1	18590.9414	18231.5313	0.9806675	0.41207	0.00000	0.00000
7	13989.6982	13720.7881	0.9807780	0.41207	0.00000	-11.25000
10	17322.6250	16990.4883	0.9808264	0.41207	0.00000	-5.62500
51	6976.9146	6834.0474	0.9795229	0.41207	0.00000	-19.12500
54	10640.6738	10429.1543	0.9801216	0.41207	0.00000	-15.18700
78	1837.4819	1813.6466	0.9870282	0.41207	0.00000	-33.12500
81	1768.3112	1748.2881	0.9886767	0.41207	0.00000	-28.45800
201	15208.0459	14927.3467	0.9815427	0.00000	-18.25000	0.00000
206	9185.1904	9016.8994	0.9816780	0.00000	-18.25000	-11.25000
209	12347.4111	12123.4717	0.9818634	0.00000	-18.25000	-5.62500
212	6175.9893	6055.8711	0.9805508	0.00000	-18.25000	-16.62500
219	2182.5669	2154.9978	0.9873685	0.00000	-18.25000	-33.12500
222	2146.0637	2108.7981	0.9826354	0.00000	-18.25000	-27.62500
223	3621.4751	3538.4832	0.9770834	0.00000	-18.25000	-22.12500
401	18590.9414	18238.8047	0.9810587	0.41207	0.00000	-66.25000
407	13989.6982	13719.6523	0.9806968	0.41207	0.00000	-55.00000
410	17322.6250	16990.5781	0.9808316	0.41207	0.00000	-60.62500
451	6976.9146	6832.4688	0.9792966	0.41207	0.00000	-47.12500
454	10640.6738	10427.5078	0.9799669	0.41207	0.00000	-51.06200
481	1768.3112	1748.5225	0.9888093	0.41207	0.00000	-37.79100
482	3195.1631	3127.6179	0.9788602	0.41207	0.00000	-42.45800
601	15208.0459	14926.4502	0.9814838	0.00000	-18.25000	-66.25000
606	9185.1904	9016.5889	0.9816442	0.00000	-18.25000	-55.00000
609	12347.4111	12122.7559	0.9818055	0.00000	-18.25000	-60.62500
612	6175.9893	6055.8369	0.9805452	0.00000	-18.25000	-49.62500
622	2146.0637	2108.7649	0.9826199	0.00000	-18.25000	-38.62500
623	3621.4751	3538.5681	0.9771069	0.00000	-18.25000	-44.12500

APPENDIX 7

NUMBERFIVE

Factor Listing

NUMBERFIVE WORST

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
63	5058.0073	6255.3447	1.2367212	40.91170	8.23438	-19.12500
75	1214.2780	5037.9116	4.1488948	15.24740	1.10498	-33.12500
77	1121.9081	4337.3657	3.8660617	15.24740	1.10498	-28.45800
83	4028.0276	8129.6084	2.0182602	5.09876	0.12299	-23.79100
84	3228.4978	6326.5479	1.9595950	10.18418	0.49153	-23.79100
86	1924.1449	6990.4146	3.6329980	10.18418	0.49153	-28.45800
88	5962.2173	7184.9082	1.2050732	28.26045	3.84607	-23.79100
90	3170.8860	4314.3813	1.3606232	23.96206	2.75057	-33.12500
91	2845.5210	5009.4805	1.7604792	19.62247	1.83647	-33.12500
92	4733.1221	5811.0273	1.2277366	19.62247	1.83647	-23.79100
93	5175.9380	6746.4570	1.3034270	23.96206	2.75057	-23.79100
94	2421.5706	3969.0112	1.6390235	19.62247	1.83647	-28.45800
95	3137.9849	4572.3472	1.4570966	23.96206	2.75057	-28.45800
111	6053.9985	7963.8711	1.3154730	15.25000	-9.64501	0.00000
112	5787.0298	7733.1177	1.3362844	15.25000	-9.64501	-5.62500
113	6672.7446	8348.7227	1.2511678	15.24870	-4.27001	0.00000
114	2493.1843	4040.9524	1.6207997	15.24870	-4.27001	-5.62500
120	6524.2920	9393.4014	1.4397579	15.25000	-13.94750	-5.62500
133	618.8265	460.7569	0.7445656	23.92280	2.93238	10.78100
139	5438.0469	6527.6367	1.2003642	15.25000	-9.64501	5.39050
141	6579.0015	7958.2290	1.2096409	15.24870	-4.27001	5.39050
142	3789.2974	2753.1521	0.7265601	19.58683	-9.64501	0.00000
146	720.4385	884.5084	1.2277361	23.92366	-9.64501	10.78100
147	895.4142	1125.6899	1.2571723	19.58683	-9.64501	10.78100
148	526.9106	669.5283	1.2706676	19.58683	-9.64501	5.39050
188	9572.9775	6707.5996	0.7006806	15.24827	-2.47834	0.00000

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
189	1850.8263	2622.8689	1.4171340	15.24913	-6.06167	0.00000
194	6172.1460	4312.0439	0.6986296	23.93646	-5.51314	0.00000
195	4537.6011	3193.2126	0.7037227	19.59871	-5.81784	0.00000
199	9574.3340	6191.4819	0.6466749	19.58683	-13.94750	0.00000
476	4482.5850	7391.4624	1.6489285	15.24740	1.10498	-42.45800
477	4067.4087	6586.9727	1.6194519	15.24740	1.10498	-37.79100
492	2937.9636	4075.9580	1.3873413	19.62247	1.83647	-42.45800
494	3148.3630	5277.8384	1.6763754	19.62247	1.83647	-37.79100
495	3038.2180	3981.0769	1.3103329	23.96206	2.75057	-37.79100
497	5092.8276	6298.2798	1.2366960	33.11902	5.27150	-38.99900
512	5603.2339	4056.3938	0.7239380	15.25000	-9.64501	-60.62500
520	6347.5664	4345.3447	0.6845686	15.25000	-13.94750	-60.62500
533	738.6489	1172.9719	1.5879966	23.92280	2.93238	-77.03100
534	770.9153	1334.7360	1.7313652	19.58510	2.01868	-77.03100
542	4080.1113	5856.6660	1.4354182	19.58683	-9.64501	-66.25000
588	10556.6924	13547.4023	1.2832999	15.24827	-2.47834	-66.25000
589	2271.6011	4967.1338	2.1866224	15.24913	-6.06167	-66.25000
593	10118.9873	12564.6240	1.2416879	19.61059	-1.99068	-66.25000
594	6707.6372	8549.3389	1.2745678	23.93646	-5.51314	-66.25000
595	4904.3843	6732.2134	1.3726928	19.59871	-5.81784	-66.25000
599	10249.5762	14247.6973	1.3900768	19.58683	-13.94750	-66.25000
626	2175.5720	2734.0874	1.2567211	5.08333	-18.25000	-38.62500
627	1817.0812	2281.1533	1.2553943	10.16666	-18.25000	-38.62500
1075	1214.2780	4503.7134	3.7089641	-15.24740	1.10498	-33.12500
1077	1121.9081	3326.1904	2.9647620	-15.24740	1.10498	-28.45800
1086	1924.1449	4209.1440	2.1875401	-10.18418	0.49153	-28.45800
1093	5175.9380	3619.0352	0.6992037	-23.96206	2.75057	-23.79100

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1095	3137.9849	2262.1355	0.7208880	-23.96206	2.75057	-28.45800
1112	5787.0298	4103.7036	0.7091209	-15.25000	-9.64501	-5.62500
1114	2493.1843	1827.6001	0.7330385	-15.24870	-4.27001	-5.62500
1120	6524.2920	4288.3623	0.6572916	-15.25000	-13.94750	-5.62500
1133	618.8265	1020.4310	1.6489776	-23.92280	2.93238	10.78100
1134	603.2517	1070.6567	1.7748092	-19.58510	2.01868	10.78100
1142	3789.2974	5674.7534	1.4975741	-19.58683	-9.64501	0.00000
1143	6419.9321	7842.2515	1.2215474	-23.92366	-9.64501	0.00000
1147	895.4142	665.9202	0.7437007	-19.58683	-9.64501	10.78100
1148	526.9106	392.8171	0.7455099	-19.58683	-9.64501	5.39050
1188	9572.9775	12650.5313	1.3214835	-15.24827	-2.47834	0.00000
1189	1850.8263	4745.8682	2.5641890	-15.24913	-6.06167	0.00000
1192	7223.4541	8672.1611	1.2005560	-23.94926	-1.38128	0.00000
1193	9302.0889	11862.1553	1.2752142	-19.61059	-1.99068	0.00000
1194	6172.1460	8205.7822	1.3294861	-23.93646	-5.51314	0.00000
1195	4537.6011	6496.9121	1.4317945	-19.59871	-5.81784	0.00000
1199	9574.3340	13796.6572	1.4410044	-19.58683	-13.94750	0.00000
1216	913.7531	1119.7089	1.2253954	-15.25000	-18.25000	-33.12500
1226	2185.2837	2761.0942	1.2634946	-5.08333	-18.25000	-27.62500
1227	1874.0566	2355.3962	1.2568437	-10.16666	-18.25000	-27.62500
1452	7318.2026	9372.7119	1.2807395	-10.18418	0.49153	-47.12500
1459	7887.6396	9713.1953	1.2314451	-23.96206	2.75057	-47.12500
1460	7685.8706	9693.2275	1.2611749	-19.62247	1.83647	-47.12500
1463	4804.3564	6091.1470	1.2678382	-40.91170	8.23438	-47.125000
1512	5603.2339	7410.7129	1.3225778	-15.25000	-9.64501	-60.62500
1513	6620.7393	8125.8618	1.2273345	-15.24870	-4.27001	-66.25000
1514	2737.3845	4113.3452	1.5026553	-15.24870	-4.27001	-60.62500

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1520	6347.5664	8905.8174	1.4030286	-15.25000	-13.94750	-60.62500
1528	3458.7295	4215.4878	1.2187966	-28.26048	-0.65095	-60.62500
1533	738.6489	495.6037	0.6709598	-23.92280	2.93238	-77.03100
1534	770.9153	547.1519	0.7097431	-19.58510	2.01868	-77.03100
1541	6479.7485	7837.4990	1.2095375	-15.24870	-4.27001	-71.64000
1542	4080.1113	2943.3879	0.7213989	-19.58683	-9.64501	-66.25000
1546	729.3591	892.3582	1.2234826	-23.92366	-9.64501	-77.03100
1547	888.4908	1106.3942	1.2452511	-19.58683	-9.64501	-77.03100
1548	512.0069	643.9552	1.2577081	-19.58683	-9.64501	-71.64000
1588	10556.6924	7633.0361	0.7230518	-15.24827	-2.47834	-66.25000
1594	6707.6372	4977.5317	0.7420693	-23.93646	-5.51314	-66.25000
1595	4904.3843	3568.8181	0.7276791	-19.59871	-5.81784	-66.25000
1599	10249.5762	6960.7695	0.6791276	-19.58683	-13.94750	-66.25000

SECTION A-A

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
14	12598.3779	11791.8184	0.9359791	19.62247	1.83647	0.00000
15	9870.0508	10115.6328	1.0248815	23.96206	2.75057	0.00000
113	6672.7446	8348.7227	1.2511678	15.24870	-4.27001	0.00000
126	5887.9609	5804.4741	0.9858208	28.26048	-5.14798	0.00000
127	5448.1396	5680.3828	1.0426279	28.26047	-0.65095	0.00000
142	3789.2974	2753.1521	0.7265601	19.58683	-9.64501	0.00000
143	6419.9321	5027.4707	0.7831034	23.92366	-9.64501	0.00000
188	9572.9775	6707.5996	0.7006806	15.24827	-2.47834	0.00000
189	1850.8263	2622.8689	1.4171340	15.24913	-6.06167	0.00000

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
414	13735.7178	14714.0322	1.0712241	19.62247	1.83647	-66.25000
415	10490.8438	10334.7891	0.9851246	23.96206	2.75057	-66.25000
513	6620.7393	5340.4595	0.8066258	15.24870	-4.27001	-66.25000
526	6102.7935	6120.2676	1.0028633	28.26048	-5.14798	-66.25000
527	5643.4819	5403.8066	0.9575306	28.26047	-0.65095	-66.25000
542	4080.1113	5856.6660	1.4354182	19.58683	-9.64501	-66.25000
543	6830.1108	8072.9741	1.1819682	23.92366	-9.64501	-66.25000
588	10556.6924	13547.4023	1.2832999	15.24827	-2.47834	-66.25000
589	2271.6011	4967.1338	2.1866224	15.24913	-6.06167	-66.25000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1014	12598.3779	13433.9111	1.0663207	-19.62247	1.83647	0.00000
1015	9870.0508	9751.8311	0.9880224	-23.96206	2.75057	0.00000
1113	6672.7446	5287.7793	0.7924444	-15.24870	-4.27001	0.00000
1126	5887.9609	6017.7896	1.0220498	-28.26048	-5.14798	0.00000
1127	5448.1396	5254.7271	0.9644994	-28.26047	-0.65095	0.00000
1142	3789.2974	5674.7534	1.4975741	-19.58683	-9.64501	0.00000
1143	6419.9321	7842.2515	1.2215474	-23.92366	-9.64501	0.00000
1188	9572.9775	12650.5313	1.3214835	-15.24827	-2.47834	0.00000
1189	1850.8263	4745.8682	2.5641890	-15.24913	-6.06167	0.00000

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1414	13735.7178	12782.0352	0.9305692	-19.62247	1.83647	-66.25000
1415	10490.8438	10738.1572	1.0235742	-23.96206	2.75057	-66.25000
1513	6620.7393	8125.8618	1.2273345	-15.24870	-4.27001	-66.25000
1526	6102.7935	6107.2676	1.0007331	-28.26048	-5.14798	-66.25000
1527	5643.4819	5909.6851	1.0471700	-28.26047	-0.65095	-66.25000
1542	4080.1113	2943.3879	0.7213989	-19.58683	-9.64501	-66.25000
1543	6830.1108	5611.2314	0.8215433	-23.92366	-9.64501	-66.25000
1588	10556.6924	7633.0361	0.7230518	-15.24827	-2.47834	-66.25000
1589	2271.6011	2420.1196	1.0653806	-15.24913	-6.06167	-66.25000

SECTION B-B

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
75	1214.2780	5037.9116	4.1488948	15.24740	1.10498	-33.12500
87	4162.9565	4641.5479	1.1149642	28.26045	3.84607	-33.12500
90	3170.8860	4314.3813	1.3606232	23.96206	2.75057	-33.12500
91	2845.5210	5009.4805	1.7604792	19.62247	1.83647	-33.12500
96	5683.3965	6317.6992	1.1116062	31.97561	4.95008	-33.12500
216	913.7531	1047.6416	1.1465260	15.25000	-18.25000	-33.12500
219	2392.3420	2645.5015	1.1058208	0.00000	-18.25000	-33.12500
220	1392.2172	1575.4454	1.1316090	10.16666	-18.25000	-33.12500
221	2134.5977	2366.6130	1.1086928	5.08333	-18.25000	-33.12500
1075	1214.2780	4503.7134	3.7089641	-15.24740	1.10498	-33.12500
1087	4162.9565	3727.1646	0.8953167	-28.26045	3.84607	-33.12500
1090	3170.8860	2759.7566	0.8703424	-23.96206	2.75057	-33.12500
1091	2845.5210	2910.4431	1.0228156	-19.62247	1.83647	-33.12500
1096	5683.3965	5119.5161	0.9007846	-31.97561	4.95008	-33.12500
1216	913.7531	1119.7089	1.2253954	-15.25000	-18.25000	-33.12500
1220	1392.2172	1616.6379	1.1611967	-10.16666	-18.25000	-33.12500
1221	2134.5977	2389.9517	1.1196263	-5.08333	-18.25000	-33.12500
1242	5220.9829	5264.5967	1.0083536	-23.92366	-18.25000	-33.12500
1243	2415.5967	2485.2119	1.0288191	-19.58683	-18.25000	-33.12500

ARM CONNECT

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
121	15304.7686	15814.9473	1.0333346	28.26050	-9.64501	-11.25000
124	9821.5498	9683.4590	0.9859400	28.26050	-9.64501	0.00000
125	5693.9976	6040.4214	1.0608401	28.26050	-9.64501	-5.62500
181	10963.5166	10026.1689	0.9145030	28.26050	-18.25000	0.00000
182	13214.3350	12588.0078	0.9526024	28.26050	-13.94750	0.00000
228	16970.1816	18126.7520	1.0681531	28.26050	-18.25000	-11.25000
231	9056.7744	9069.7773	1.0014358	28.26050	-18.25000	-5.62500
282	19962.4219	21282.7754	1.0661420	28.26050	-13.94750	-11.25000
305	7261.1777	7576.2388	1.0433898	28.26050	-13.94750	-5.62500

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
521	14896.8818	14559.9443	0.9773820	28.26050	-9.64501	-55.00000
524	10119.7666	10144.3369	1.0024279	28.26050	-9.64501	-66.25000
525	5833.1396	5524.3052	0.9470552	28.26050	-9.64501	-60.62500
581	11380.4199	12200.0381	1.0720201	28.26050	-18.25000	-66.25000
582	13696.2100	14132.6904	1.0318687	28.26050	-13.94750	-66.25000
628	16811.6035	15628.7354	0.9296398	28.26050	-18.25000	-55.00000
631	9250.3848	9182.5303	0.9926647	28.26050	-18.25000	-60.62500
682	19503.0332	18310.3184	0.9388446	28.26050	-13.94750	-55.00000
705	7568.0835	7375.0459	0.9744932	28.26050	-13.94750	-60.62500

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1121	15304.7686	14825.1855	0.9686645	-28.26050	-9.64501	-11.25000
1124	9821.5498	9985.7168	1.0167149	-28.26050	-9.64501	0.00000
1125	5693.9976	5445.6196	0.9563790	-28.26050	-9.64501	-5.62500
1181	10963.5166	11917.9160	1.0870523	-28.26050	-18.25000	0.00000
1182	13214.3350	13858.9023	1.0487779	-28.26050	-13.94750	0.00000
1228	16970.1816	15819.4238	0.9321894	-28.26050	-18.25000	-11.25000
1231	9056.7744	9068.8096	1.0013288	-28.26050	-18.25000	-5.62500
1282	19962.4219	18662.9531	0.9349043	-28.26050	-13.94750	-11.25000
1305	7261.1777	7176.5845	0.9883499	-28.26050	-13.94750	-5.62500

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1521	14896.8818	15276.3467	1.0254728	-28.26050	-9.64501	-55.00000
1524	10119.7666	10117.9736	0.9998228	-28.26050	-9.64501	-66.25000
1525	5833.1396	6255.3540	1.0723820	-28.26050	-9.64501	-60.62500
1581	11380.4199	10590.0791	0.9305526	-28.26050	-18.25000	-66.25000
1582	13696.2100	13278.0430	0.9694684	-28.26050	-13.94750	-66.25000
1628	16811.6035	17999.1348	1.0706376	-28.26050	-18.25000	-55.00000
1631	9250.3848	9355.4053	1.0113531	-28.26050	-18.25000	-60.62500
1682	19503.0332	20744.4395	1.0636519	-28.26050	-13.94750	-55.00000
1705	7568.0835	8038.0371	1.0620968	-28.26050	-13.94750	-60.62500

TIE PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1	19640.0820	19644.3984	1.0002198	0.41207	0.00000	0.00000
7	15607.1484	15718.1660	1.0071132	0.41207	0.00000	-11.25000
10	18799.2285	18825.8184	1.0014144	0.41207	0.00000	-5.62500
51	8697.8447	9168.4990	1.0541116	0.41207	0.00000	-19.12500
54	12335.9551	12610.5342	1.0222584	0.41207	0.00000	-15.18700
201	16130.5986	16133.0586	1.0001525	0.00000	-18.25000	0.00000
206	9685.4326	9724.5205	1.0040357	0.00000	-18.25000	-11.25000
209	13084.1748	13096.5195	1.0009435	0.00000	-18.25000	-5.62500
212	6461.3804	6542.1323	1.0124977	0.00000	-18.25000	-16.62500
219	2392.3420	2645.5015	1.1058208	0.00000	-18.25000	-33.12500
222	2305.1980	2715.9443	1.1781827	0.00000	-18.25000	-27.62500
223	3737.9561	3923.7046	1.0496925	0.00000	-18.25000	-22.12500
401	18701.4219	18726.4688	1.0013393	0.41207	0.00000	-66.25000
407	19952.5508	20054.6563	1.0051174	0.41207	0.00000	-55.00000
410	20354.2109	20427.5723	1.0036043	0.41207	0.00000	-60.62500
454	26097.8770	26143.9609	1.0017658	0.41207	0.00000	-51.06200
601	16349.8105	16351.6484	1.0001124	0.00000	-18.25000	-66.25000
606	9756.7295	9788.5986	1.0032663	0.00000	-18.25000	-55.00000
609	13253.6445	13263.2666	1.0007260	0.00000	-18.25000	-60.62500
612	6468.4209	6538.3867	1.0108166	0.00000	-18.25000	-49.62500
622	2322.6453	2715.5752	1.1691735	0.00000	-18.25000	-38.62500
623	3720.1455	3894.8093	1.0469508	0.00000	-18.25000	-44.12500

STANCHION AND 3.5 in SUPPORT PLATE

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
38	20611.9492	20601.4395	0.9994901	66.62949	23.63070	-5.62500
100	8643.2266	8670.5479	1.0031610	79.90000	23.63070	0.00000
101	11539.8076	11460.6406	0.9931397	71.05299	23.63070	0.00000
102	10073.4092	10036.0547	0.9962918	75.47649	23.63070	0.00000
103	5573.9229	5589.1187	1.0027262	79.90000	23.63070	-11.25000
104	13872.4805	13885.1934	1.0009164	79.90000	23.63070	-5.62500
105	7140.9375	7172.3394	1.0043974	75.47649	23.63070	-11.25000
106	9418.0049	9440.0400	1.0023397	71.05299	23.63070	-11.25000
107	20541.1270	20538.4902	0.9998716	71.05299	23.63070	-5.62500
108	14999.4717	14999.2900	0.9999879	75.47649	23.63070	-5.62500
111	9475.7090	10692.2480	1.1283851	15.25000	-9.64501	0.00000
124	12426.9697	12405.5225	0.9982741	28.26050	-9.64501	0.00000
138	3173.0437	3529.7180	1.1124077	15.25000	-9.64501	10.78100
139	8330.6182	8975.0898	1.0773618	15.25000	-9.64501	5.39050
142	8351.6768	8982.9365	1.0755848	19.58683	-9.64501	0.00000
143	9834.9131	10144.9697	1.0315261	23.92366	-9.64501	0.00000
144	2550.2729	2502.7712	0.9813738	28.26050	-9.64501	10.78100
145	6295.2349	7411.9106	1.1773843	28.26050	-9.64501	5.39050
146	11103.1084	12900.5859	1.1618896	23.92366	-9.64501	10.78100
147	11455.2148	13455.4805	1.1746162	19.58683	-9.64501	10.78100
148	11864.2979	13876.7324	1.1696210	19.58683	-9.64501	5.39050

QUADRANT 2

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
438	20613.4004	20623.7344	1.0005013	66.62949	23.63070	-60.62500
500	8634.4326	8617.4297	0.9980308	79.90000	23.63070	-66.25000
501	11559.0742	11621.0313	1.0053600	71.05299	23.63070	-66.25000
502	10083.4600	10110.8447	1.0027158	75.47649	23.63070	-66.25000
503	5570.0698	5560.5732	0.9982951	79.90000	23.63070	-55.00000
504	13869.1133	13860.7451	0.9993966	79.90000	23.63070	-60.62500
505	7129.6475	7112.3633	0.9975758	75.47649	23.63070	-55.00000
506	9418.7100	9391.2734	0.9970870	71.05299	23.63070	-55.00000
507	20541.9375	20542.8926	1.0000465	71.05299	23.63070	-60.62500
508	14999.5244	14999.2148	0.9999794	75.47649	23.63070	-60.62500
511	9637.7139	9562.7676	0.9922236	15.25000	-9.64501	-66.25000
524	12829.6514	12708.9414	0.9905913	28.26050	-9.64501	-66.25000
538	3232.4375	3300.4346	1.0210358	15.25000	-9.64501	-77.03100
539	8546.4316	8086.9478	0.9462367	15.25000	-9.64501	-71.64000
542	8571.9434	8737.6299	1.0193290	19.58683	-9.64501	-66.25000
543	10170.0645	10651.5283	1.0473412	23.92366	-9.64501	-66.25000
544	2739.4868	2949.8948	1.0768056	28.26050	-9.64501	-77.03100
545	6406.6108	5852.2310	0.9134675	28.26050	-9.64501	-71.64000
546	11204.1172	9378.0381	0.8370171	23.92366	-9.64501	-77.03100
547	11401.9746	9438.3428	0.8277814	19.58683	-9.64501	-77.03100
548	11870.9609	9863.2178	0.8308694	19.58683	-9.64501	-71.64000
549	11699.2109	9691.1621	0.8283603	23.92366	-9.64501	-71.64000

QUADRANT 3

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1038	20611.9492	20622.5098	1.0005124	-66.62949	23.63070	-5.62500
1100	8643.2266	8616.0234	0.9968526	-79.90000	23.63070	0.00000
1101	11539.8076	11619.3447	1.0068924	-71.05299	23.63070	0.00000
1102	10073.4092	10110.9346	1.0037252	-75.47649	23.63070	0.00000
1103	5573.9229	5560.5020	0.9975922	-79.90000	23.63070	-11.25000
1104	13872.4805	13860.6553	0.9991476	-79.90000	23.63070	-5.62500
1105	7140.9375	7109.9888	0.9956660	-75.47649	23.63070	-11.25000
1106	9418.0049	9396.2188	0.9976867	-71.05299	23.63070	-11.25000
1107	20541.1270	20543.7930	1.0001298	-71.05299	23.63070	-5.62500
1108	14999.4717	14999.7148	1.0000162	-75.47649	23.63070	-5.62500
1111	9475.7090	9222.7266	0.9733020	-15.25000	-9.64501	0.00000
1124	12426.9697	12482.3721	1.0044582	-28.26050	-9.64501	0.00000
1138	3173.0437	3155.4670	0.9944606	-15.25000	-9.64501	10.78100
1139	8330.6182	7861.4546	0.9436820	-15.25000	-9.64501	5.39050
1142	8351.6768	8528.2871	1.0211467	-19.58683	-9.64501	0.00000
1143	9834.9131	10431.3623	1.0606461	-23.92366	-9.64501	0.00000
1144	2550.2729	2782.8181	1.0911844	-28.26050	-9.64501	10.78100
1145	6295.2349	5734.3325	0.9109005	-28.26050	-9.64501	5.39050
1146	11103.1084	9311.4326	0.8386329	-23.92366	-9.64501	10.78100
1147	11455.2148	9456.7842	0.8255440	-19.58683	-9.64501	10.78100
1148	11864.2979	9854.3691	0.8305902	-19.58683	-9.64501	5.39050
1149	11676.6074	9671.9199	0.8283159	-23.92366	-9.64501	5.39050

QUADRANT 4

NODE	STATIC	FAILURE	FACTOR	X-LOC	Y-LOC	ZLOC
1438	20613.4004	20603.0781	0.9994993	-66.62949	23.63070	-60.62500
1500	8634.4326	8651.5156	1.0019785	-79.90000	23.63070	-66.25000
1501	11559.0742	11497.3867	0.9946633	-71.05299	23.63070	-66.25000
1502	10083.4600	10056.1709	0.9972937	-75.47649	23.63070	-66.25000
1503	5570.0698	5580.3613	1.0018476	-79.90000	23.63070	-55.00000
1504	13869.1133	13877.9121	1.0006344	-79.90000	23.63070	-60.62500
1505	7129.6475	7147.0601	1.0024422	-75.47649	23.63070	-55.00000
1506	9418.7100	9446.2285	1.0029217	-71.05299	23.63070	-55.00000
1507	20541.9375	20540.9922	0.9999540	-71.05299	23.63070	-60.62500
1508	14999.5244	14999.8369	1.0000209	-75.47649	23.63070	-60.62500
1511	9637.7139	10489.1299	1.0883421	-15.25000	-9.64501	-66.25000
1524	12829.6514	12983.3398	1.0119791	-28.26050	-9.64501	-66.25000
1538	3232.4375	3446.4961	1.0662221	-15.25000	-9.64501	-77.03100
1539	8546.4316	9206.3154	1.0772116	-15.25000	-9.64501	-71.64000
1542	8571.9434	9083.2158	1.0596448	-19.58683	-9.64501	-66.25000
1543	10170.0645	10356.4727	1.0183291	-23.92366	-9.64501	-66.25000
1544	2739.4868	2696.3022	0.9842362	-28.26050	-9.64501	-77.03100
1545	6406.6108	7287.0957	1.1374338	-28.26050	-9.64501	-71.64000
1546	11204.1172	13034.5352	1.1633701	-23.92366	-9.64501	-77.03100
1547	11401.9746	13366.8760	1.1723299	-19.58683	-9.64501	-77.03100
1548	11870.9609	13880.4238	1.1692755	-19.58683	-9.64501	-71.64000
1549	11699.2109	13713.2676	1.1721532	-23.92366	-9.64501	-71.64000

APPENDIX 8
HAND CALCULATIONS

Failure Stress Calculations

For all stress hand calculations for the Jack Failure Analysis of the Central Calorimeter Cradle, the most severe reaction force will be used along with Leo Engstrom's stress calculations from Engineering Note 3740.251-EN-14, which also contains all moment of inertia and static case calculations.

These diagrams will be referred to in all five cases and are defined in the above mentioned Engineering Note.

Central Beam

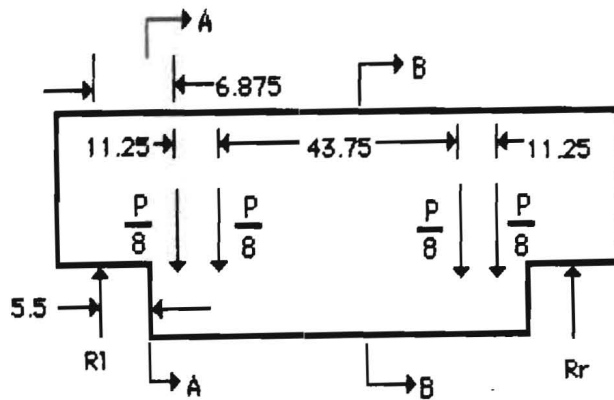


Figure 9

Section A-A

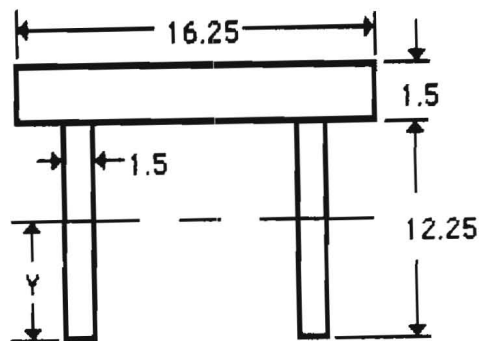


Figure 10

Section B-B

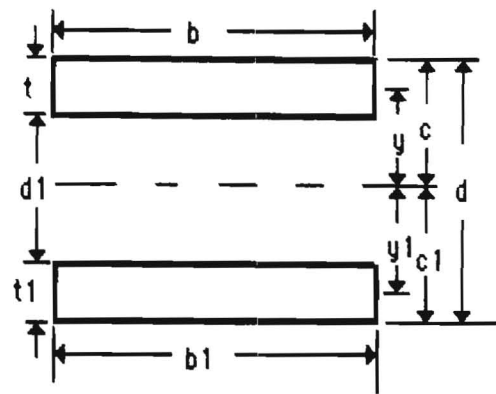


Figure 11

Section A-A B-B Shear

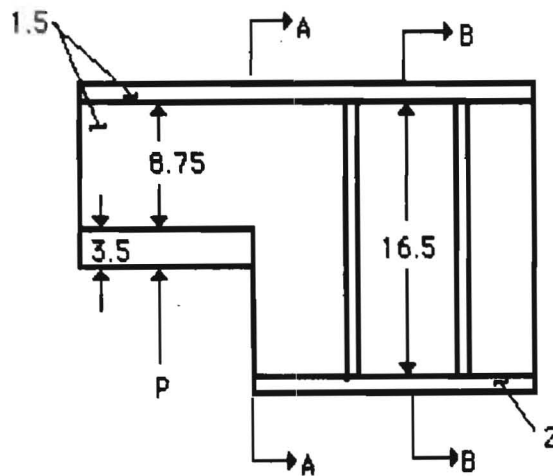


Figure 12

Arm

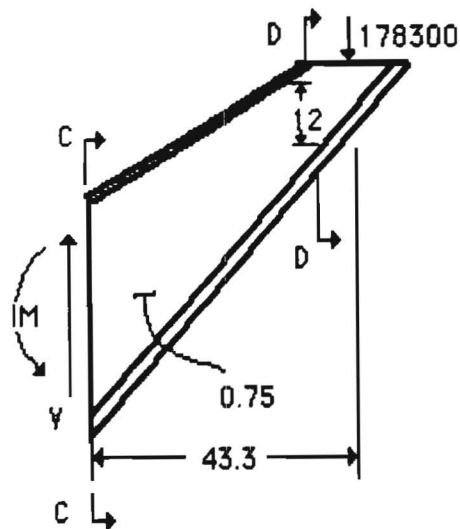


Figure 13

Tie Plate

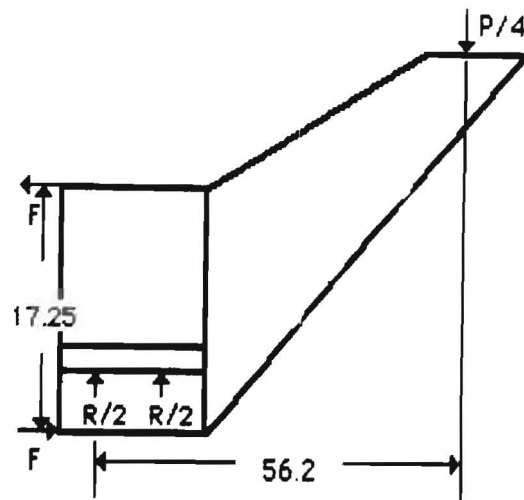


Figure 14

Stanchion Plate

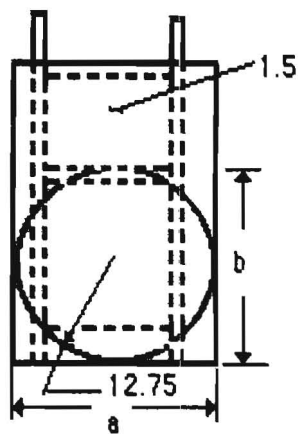


Figure 15

3.5 in Bearing Plate

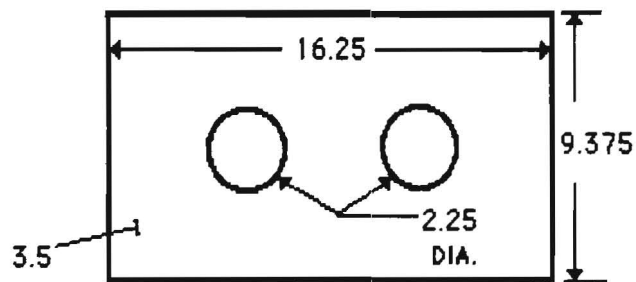
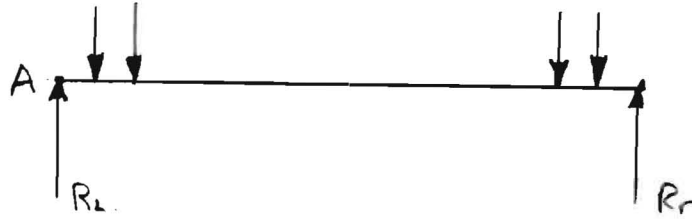


Figure 16

Number One Stress Calculations

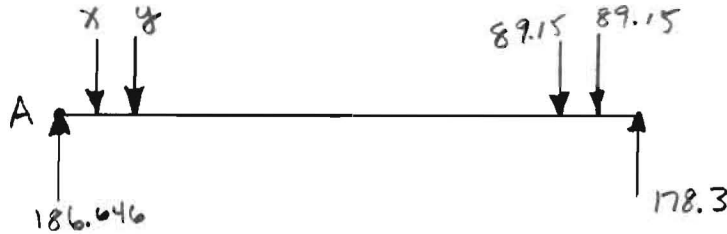
Center Beam

Using Figure 9 and drawing a Free body drawing



where $R_L = 186.646$ kips \rightarrow From table 1 - number one
 $R_r = 178.3$ kips NW-SW arrangement

if we assume 178.3 kips is equally carried by its webs



$$\sum M_A = 0$$

$$-178.3(80) + 89.15(73.125) + 89.15(61.875) + y(18.125) + x(6.875) = 0$$

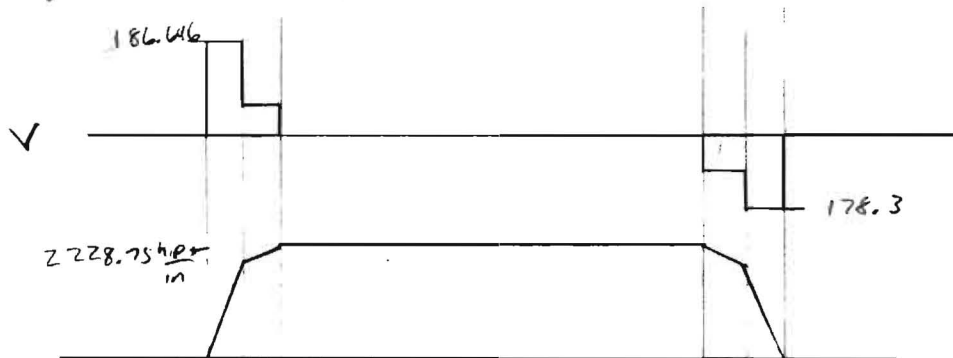
$$\sum F = 0 \quad x + y = 186.646$$

Solving for x & y

$$x = 102.596 \text{ kips}$$

$$y = 84.046 \text{ kips}$$

Looking @ Shear & Moment Diagrams



$$M_{\max} = 2228.75 \text{ kips in}$$

$$V_{\max} = 186.646 \text{ kips}$$

Bending Stress

In Section B-B - Figure 11 -

$$c = 11.179 \text{ in}; \quad c_1 = 8.821; \quad d = 20''$$

$$I = 4654 \text{ in}^4 \quad - \quad \text{from Engineering Note 3740.215-EN-14}$$

$$\sigma = \frac{M_{\max} c}{I} = \frac{2228.75 \times 10^3 (11.179)}{4654} = \underline{5,354 \text{ psi}}$$

In section A-A - Figure 10.

$$y = 8.867 \quad - \quad I = 1157 \text{ in}^4$$

$$M_{\max} = R(d) = 186,646 (5.5)$$

$$= 10.2655 \times 10^6 \text{ in lb}$$

$$\sigma_{\max} = \frac{M_{\max} c}{I} = \frac{10.2655 \times 10^6 (8.867)}{1157}$$

$$= \underline{7867.28 \text{ psi}}$$

Shear Stress

Shear between webs - Section B-B of Figure 12

$$V = 102,596 \text{ lbs}$$

$$\tau = V/A = \frac{102596}{2(1.5)(16.5)} = \underline{2072.646 \text{ psi}}$$

Shear at section A-A of Figure 12

$$P = 186,646 \text{ lbs}$$

$$\tau = P/A = \frac{186646}{2(1.5)(8.75)} = \underline{7110.32 \text{ psi}}$$

Arms

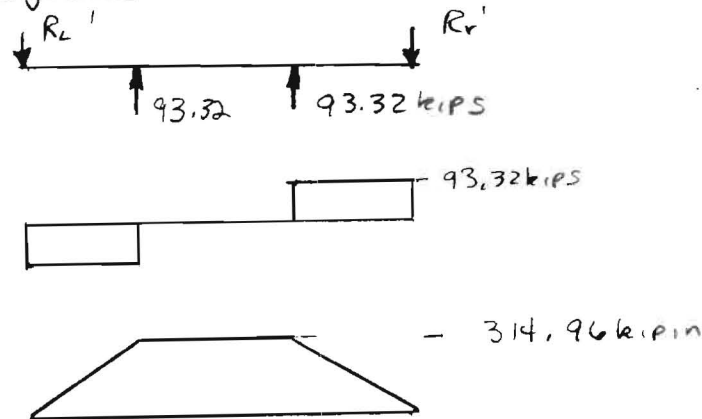
Since the load on the Arms do not vary, the stresses will be exactly the same as the static case

Stanchion Plate

Since no variation in Arm load, Stanchion plate stresses will not change from the static case.

3 1/2" Bearing Plate

Using Figure 16 and drawing Freebody, shear and moment diagrams -

Bending

$$M_{max} = 314.96 \text{ kip-in}$$

$$S = 19.14 \text{ in}^3$$

$$\sigma = \frac{m \cdot c}{I} = \frac{314,960}{19.14} = \underline{16,455 \text{ ksi}}$$

Shear stress

Plate Shear

$$\tau = V/A = \frac{93,322}{9.375(3.5)} = \underline{2844.1 \text{ psi}}$$

Punching Shear

$$\tau = V/A_{jack} = \frac{93322}{\pi(2.25)(3.5)} = \underline{3772.1 \text{ psi}}$$

Bearing Stress

$$F = P/A = \frac{93322 \times 10^3 (4)}{\pi(2.25)^2} = \underline{23,47 \text{ ksi}}$$

Tie Plate Figure 14

$$\Sigma m_+ = 0$$

$$R/2(9.5) - P/4(56.2) + F(17.25) = 0$$

$$F = 529260.74 \text{ lbs}$$

$$\sigma = P/A = \frac{529260.74}{(69-22)(1.5)} = \underline{\underline{7507 \text{ psi}}}$$

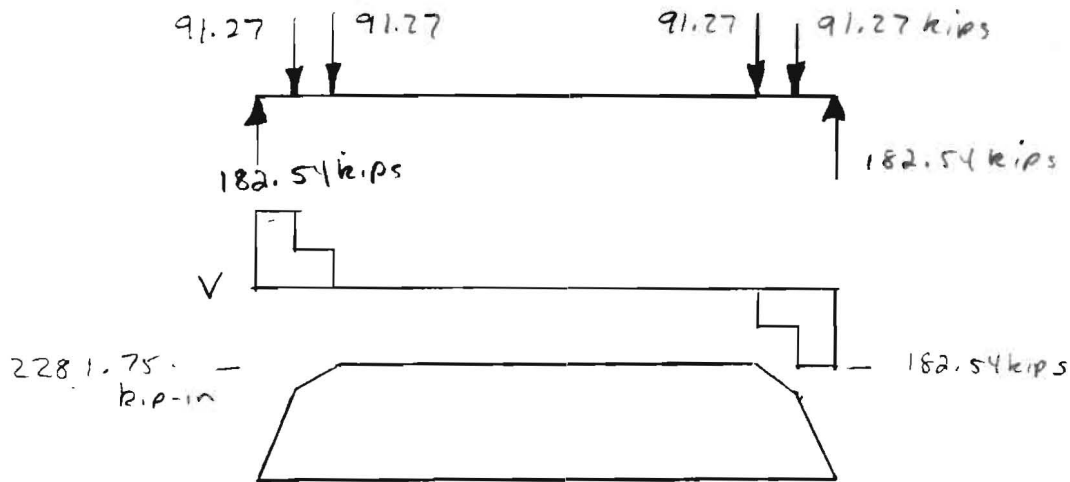
Number Two Stress Calculations

From Table 1, the reaction forces are distributed exactly the same as the static case so no changes in stress occur.

Number Three Stress Calculations

Center Beam

Using Figure 9 and the NW-SW configuration from table 1, a free body diagram with shear and moment diagrams can be drawn.



$$M_{\max} = 2281.75 \text{ kip-in} \quad V_{\max} = 182.54 \text{ kips}$$

Bending

Section B-B - Figure 11

$$I = 4654 \text{ in}^4 ; C = 11.179 \text{ in}$$

$$\sigma = \frac{m c}{I} = \frac{2281.75 \times 10^3 (11.179)}{4654} = \underline{5450.8 \text{ psi}}$$

Section A-A - Figure 10

$$M = 182540 (5.5") = 1003970 \text{ lb-in}$$

$$C = 8.867 ; I = 1157$$

$$\sigma = \frac{m c}{I} = \frac{1003970 (8.867)}{1157} = \underline{7694.2 \text{ psi}}$$

Shear Stress - Figure 12

Shear between Webs - Section B-B

$$V = 91270 \text{ lbs}$$

$$\tau = \frac{V}{A} = \frac{91270}{2(1.5)(16.5)} = \underline{1843.84 \text{ psi}}$$

Shear at A-A

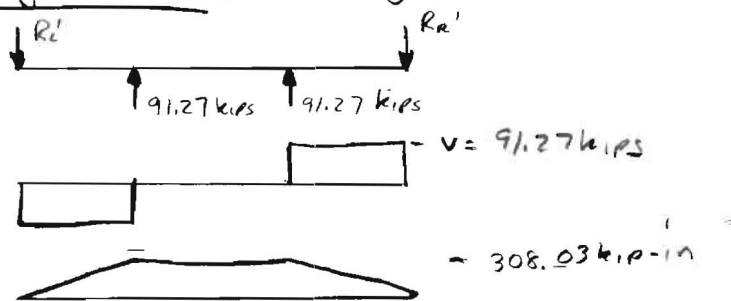
$$P = 182,540 \text{ lbs} \quad \tau = P/A = \frac{182540}{2(1.5)(8.75)} = \underline{6953.9 \text{ psi}}$$

Arms - Figure 13.

Since there is no change of the load on the arms, the stresses will be exactly the same as the static case.

Stanchion Plate - Figure 15.

Since there is no change of load on stanchion plate, there will be no change in stresses

3 1/2" Bearing Plate - Figure 16

$$M_{\max} = 308.03 \text{ kip-in} \quad V_{\max} = 91.27 \text{ kips}$$

$$Z = 19.4 \text{ in}^3$$

Bending Stress

$$\sigma = \frac{Mc}{I} = \frac{M}{Z} = \frac{308030}{19.4} = \underline{15877.8 \text{ psi}}$$

Shear Stress

Plate Shear

$$\tau = v/A = \frac{91270}{9.375(3.5)} = \underline{2172 \text{ psi}}$$

Punching Shear

$$\tau = v/A = \frac{91270}{\pi(2.25)(3.5)} = \underline{3689.16 \text{ psi}}$$

Bearing Stress

$$F = P/A_{\text{bearing}} = \frac{91270(4)}{\pi(2.25)^2} = \underline{22,954.8 \text{ psi}}$$

Tie Plate - Figure 14

$$\sum M_A = 0$$

$$R = 182540 \text{ lbs} \quad P = 712905 \text{ lbs}$$

$$R/2(9.5) - P/4(56.2) + F(17.25) = 0$$

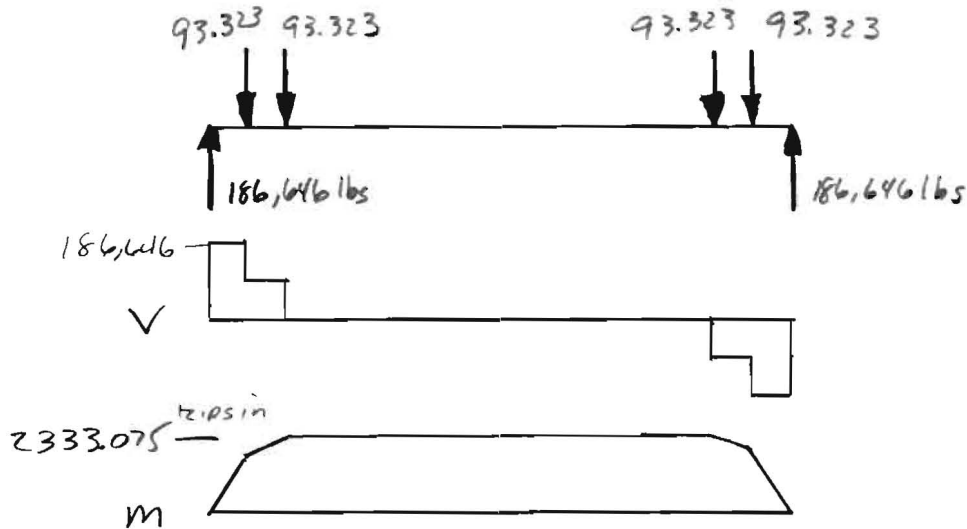
$$F = 530391.32$$

$$\sigma = F/A = \frac{530391.32}{(69.22)(1.5)} = \underline{\underline{7523.28 \text{ psi}}}$$

Number Four Stress Calculations

Center Beam

Using Figure 9 and the NE-SE configuration of Table 1, a free body, shear and moment diagram can be drawn



$$M_{max} = 2333.075 \text{ kips-in} \quad V_{max} = 186,646 \text{ kips}$$

Bending

Section B-B - Figure 11

$$I = 4654 \text{ in}^4 \quad C = 11.179 \text{ in}$$

$$\sigma = \frac{mC}{I} = \frac{2333.075 \times 10^3 (11.179)}{4654} = \underline{5604.09 \text{ psi}}$$

Section A-A - Figure 10

$$m = 186.646 \times 10^3 (5.5) = 1026553 \text{ lb-in}$$

$$I = 1157 \text{ in}^4 \quad C = 8.867$$

$$\sigma = \frac{mC}{I} = \frac{1026553 (8.867)}{1157} = \underline{7867.28 \text{ psi}}$$

Shear Stress - Figure 12

Shear between webs - Section B-B

$$V = 93,323 \text{ lbs}$$

$$\tau = V/A = \frac{93323}{2(1.5)(16.5)} = \underline{1885.3 \text{ psi}}$$

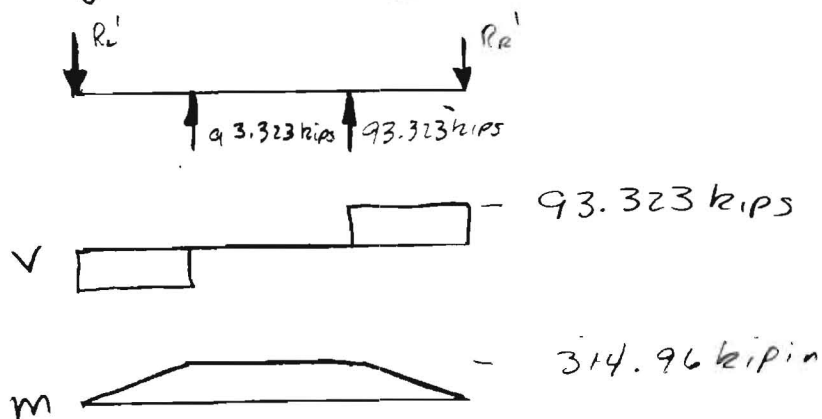
Shear at A-A

 $P = 186646 \text{ lbs}$ of shear

$$\sigma = P/A = \frac{186646}{2(1.5)(8.75)} = \underline{7110.324 \text{ psi}}$$

Arm: Stanchion plate - Figure 13 & 15

Since there is no change in the loads on the Cradle the stresses in the Arms and Stanchion plate does not change

3 1/2" Bearing Plate - Figure 16

$$M_{\max} = 314.96 \text{ kip-in} \quad U_{\max} = 93.323 \text{ kips}$$

Bending

$$Z = 19.14 \text{ in}^3$$

$$\sigma = \frac{M}{Z} = \frac{314.96 \times 10^3}{19.14} = \underline{16,455.6 \text{ psi}}$$

Shear Stress

Plate Shear

$$V = 93,323 \text{ lbs} \quad \tau = V/A = \frac{93,323}{9.375(3.5)} = \underline{2844.13 \text{ psi}}$$

Punching Shear

$$\tau = V/A = \frac{93,323}{\pi(2.25)(3.5)} = \underline{3772.14 \text{ psi}}$$

Bearing Stress

$$F = 93,323 \text{ lbs}$$

$$F_b = F/A = \frac{93,323}{\pi(2.25)^2} = \underline{23.471 \text{ ksi}}$$

Tie Plate - Figure 14

$$\sum M_A = 0$$

$$R = 186646.0 \text{ lbs} \quad P = 712905 \text{ lbs}$$

$$R/2 (9.5) - P/4 (56.2) + F (17.25) = 0$$

$$F = 529260.68$$

$$\sigma = F/A = \frac{529260.68}{(69-22)(1.5)} = \underline{\underline{7507.24 \text{ psi}}}$$

Number Five Stress Calculations

Center Beam

Using Figure 9 and the NE-SE configuration of Table 1, a free body, Shear, and Moment diagram can be drawn.



$$\sum M_A = 0$$

$$209.1 \text{ kip}(80) - 104.55(73.125) - 104.55(61.875) - x(18.125) - y(6.875) = 0$$

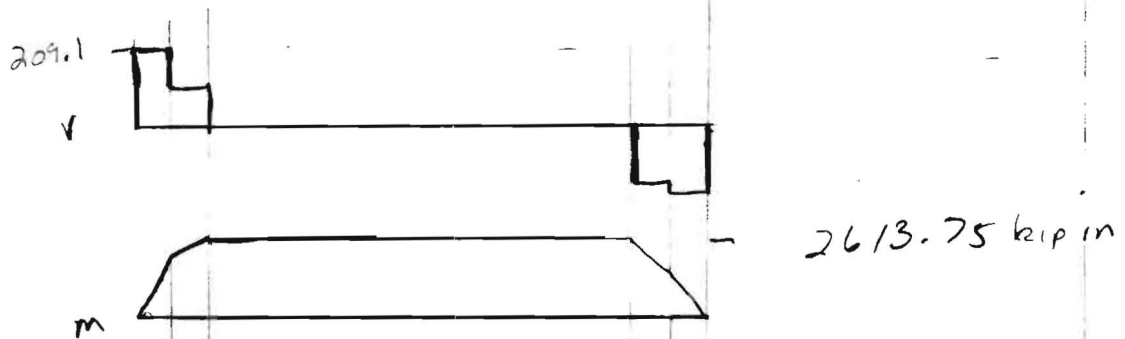
$$\sum F = 0$$

$$x + y = 147.3 \text{ kips}$$

solving for x, y --

$$x = 142.3 \text{ kips}$$

$$y = 4.983 \text{ kips}$$



Bending

Section B-B - Figure 11
 $I = 4654 \text{ in}^4$, $C = 11.179 \text{ in}$

$$\sigma = \frac{mC}{I} = \frac{2613750(11.179)}{4654} = \underline{5604.09 \text{ psi}}$$

Section A-A - Figure 10 - $I = 1157 \text{ in}^4$, $C = 8.867 \text{ in}$

$$M = 209100(5.5) = 1150050 \text{ lbs-in}$$

$$\sigma = \frac{mC}{I} = \frac{1150050(8.867)}{1157} = \underline{8813.7 \text{ psi}}$$

Shear Stress - Figure 12

Shear between webs - Section B-B

$V = 104550 \text{ lbs}$

$$\tau = V/A = \frac{104550}{2(1.5)(16.5)} = \underline{2112.12 \text{ psi}}$$

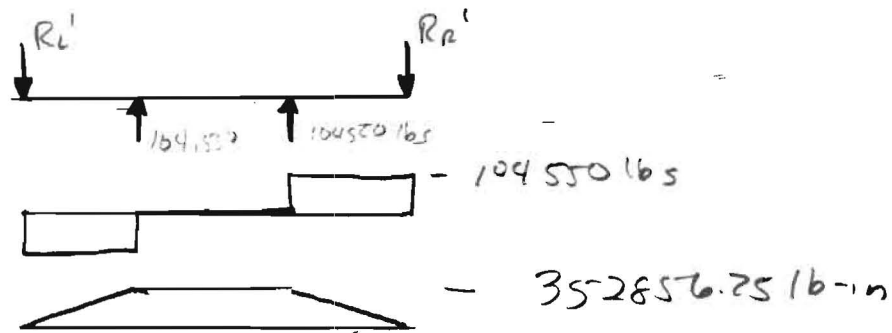
Shear at Section A-A

$V = 209100$

$$\tau = V/A = \frac{209100}{2(1.5)(8.75)} = \underline{7965.7 \text{ psi}}$$

Arms & Stanchion Plate - Figures 13 & 15

Since there is no change in the loads on the Arms or Stanchion Plates, the stresses in these will not change

3 1/2" Bearing Plate - Figure 16

$M_{\max} = 352856.25 \text{ lb-in} \quad V_{\max} = 104550 \text{ lbs}$

Bending

$z = 19.4$

$$\sigma = M/z = \frac{352856.25}{19.4} = \underline{18,188.46 \text{ psi}}$$

ShearPlate Shear
 $V = 104550$

$$\tau = V/A = \frac{104550}{9.375(3.5)} = \underline{3186.286 \text{ psi}}$$

Punching Shear

$$\tau = V/A = \frac{104550}{\pi(2.25)(3.5)} = \underline{4225.943 \text{ psi}}$$

Bearing Stress

$$\sigma = F/A_{\text{Bear}} = \frac{104550 (4)}{\pi(2.25)^2} = \underline{26294.75 \text{ psi}}$$

Tie Plate - Figure 14

$$\Sigma M_a = 0$$

$$R = 209.100 \text{ kips} \quad P = 712905$$

$$R/2(9.5) - P/4(56.2) + F(17.25) = 0$$

$$F = 523077.7 \text{ lbs}$$

$$\sigma = F/A = \frac{523077.7}{(69-22)(1.5)} = \underline{7419.54 \text{ lbs}}$$