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WVT-TR-76050

FINITE ELEMENT STRESS ANALYSIS OF BOLT  
FOR MEDIUM CALIBER, ANTI-ARMOR AUTOMATIC CANNON,  
TEST BED NO. 2

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WATERVLIET, N.Y. 12189**

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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>This report presents the results of a finite element analysis of the Medium Caliber Anti-Armor Automatic Cannon bolt. The analysis determined the stress levels throughout the bolt cross section at peak chamber pressure. A standard axisymmetric finite element program using constant strain elements was employed. Results show the bolt design adequate. |                       |                                                                                                                                                            |

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## INTRODUCTION

This work has been performed for project 1W662603AH78, Armament Area 4: Armored Vehicle Armament Technology. The analysis presented is part of the on-going effort in the Medium Caliber Anti-Armor Automatic Cannon Program to produce several test bed automatic cannon for bench mark data generation purposes. Watervliet Arsenal is completing a 60mm unit which is a compact mechanism capable of rapid fire of high velocity KE rounds, incorporating advanced features to minimize barrel erosion and barrel vibration. This unit is designated Test Bed No. 2. Particulars of its structure and operation are available in references 1 and 2.

The bolt is a critical element in this weapon, being the item that closes the high pressure breech. The weapon will operate at chamber pressures between 70,000 and 100,000 psi. The operating pressures in the system are approximately twice those currently attained in present 60mm systems and are very close to the limits of present weapon technology. Because of the extreme operating conditions, a finite element program was used to model the weapon bolt assembly in the locked position at peak chamber pressure. Primarily the analysis is concerned with calculating and locating the maximum stress in the bolt cross section. The analysis was performed at Frankford Arsenal.

- 
1. Dynamic Analysis of Constant Reaction Systems for a Medium Caliber Anti-Armor Automatic Cannon, P. M. Vottis, J. K. Jorczak, Jul 76, Watervliet Arsenal, Watervliet, NY.
  2. (C) Dynamic Analysis of a Medium Caliber Anti-Armor Automatic Cannon (U), J. K. Jorczak, Jul 75, WVT-TR-75033, Watervliet Arsenal, Watervliet, New York

The bolt was modeled with a standard axisymmetric finite element program using constant strain elements. Modeling procedures for any axisymmetric problem are fairly simple and straightforward. The major steps in the analysis are:

1. Generate finite element mesh over the cross section.
2. Select boundary conditions appropriate to the problem.
3. Select material properties representative of material to be analyzed.

Since the actual bolt is not an axisymmetric body, some discussion of this approach is necessary.

#### Bolt Model

The bolt was modeled as an axisymmetric elastic body locked into a rigid bolt receiver. A pressure loading of 117,840 psi was applied to the bolt face, over the left edge of element numbers three to 12. The nodes on the right side of elements 36, 37, 38, 100, 101, 102, 152, 153, 154, etc., were restrained in the axial (Z) direction to simulate support given the bolt through the locking lugs by the barrel extension.

However, the actual bolt is not an axisymmetric body. Several holes are contained in the cross section modeled, thus weakening the bolt. Because of the lack of symmetry in the bolt geometry, the problem is three-dimensional and should be solved accordingly. Lack of time and money, however, necessitated a simpler approach.

The locking lugs which support the bolt during firing consist of ten sets of four segments, with each segment being slightly less than 45°. To model the bolt axisymmetrically, the locking lugs were considered solid disks. This required that the number of sets of lugs

be reduced to five so that the shear area at the root of the lugs remained approximately equal to the shear area of the actual lugs.

Next, the rearward force of the cartridge case on the bolt was calculated. Since the force is assumed to be applied uniformly, a pressure of 117,800 psi was calculated from the area of the case applying the force to the bolt face.

The best and worst cases were first analyzed. The best case is the bolt without any holes, and the worst (Run 2) is the bolt with a circular slot which is 0.93 inches wide and 0.95 inches deep in the rear face of the bolt. Figure 1 is the geometry plot for the best case, and Figure 4 is the geometry plot for Run 2.

Run 3 (Figure 7) is a variation of the Run 2, in which the circular slot was filled with a very low modulus (10 psi) material. Runs 4 and 5 are intermediate cases where the slot has the same volume as the original hole. In Run 4, Figure 10, the slot has the same width as the hole diameter (0.93 inches) but the depth is only 0.1162 inches. In Run 5, Figure 13, the slot has the same depth (0.95 inches) but is only 0.1138 inches wide and centered on the centerline of the original hole.

### Results

Computer printouts of the five models are included in Appendix A. The distorted cross section and stress field plots are in Figures 2 and 3, 5 and 6, 8 and 9, 11 and 12, 14 and 15 for Runs 1 to 5, respectively. The element with the highest stress is shaded in the geometry plot of each of the models.

A comparison of the deflection of the bolt face (nodal points 1 through 13) for the five models is given in Figure 16. Figure 17

is the bolt drawing prepared for the analysis and Figure 18 is a finish machine drawing of the bolt.

### Discussion

In Runs 1 and 4 the element with the highest stress is number 38, which is the element at the rear face of the root of the first locking lug. More important, however, is that the stress levels in that element in all runs are between 138,000 and 142,000 psi. The stress levels in this element will be lower than reported since the model assumes rigid support to the locking lugs while the barrel extension actually will elastically deform.

The element of maximum stress in Runs 2 and 3 is number 72, at 176,800 psi. These are the highest stressed elements of all the models because these models represent the weakest configuration (have the largest slot, thus minimum bolt material). Run 5 has the next highest stressed element, number 63, at 143,500 psi. This run is the most accurate of the five models and best represents the stiffness of the bolt.

### Conclusions

The yield strength value chosen for the model, 200,000 psi, is more than sufficient to withstand the forces of a 100,000 psi chamber pressure firing. If the worst case analysis of the bolt is considered, the lowest yield strength acceptable is approximately 180,000 psi. This would provide only a two per cent safety factor in the design of the bolt. However, since the most accurate model, Run 5, predicts a maximum stress of 143,500 psi, the safety factor would be 25 per cent.

## APPENDIX A

### STRESS ANALYSIS COMPUTER OUTPUT

RUN 1

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | *****  |         | STRESSES (KPSI) |        | *****  |  |
|-------------|-------------|------|--------|---------|-----------------|--------|--------|--|
|             | R           | Z    | RR     | ZZ      | TT              | RZ     | MISES  |  |
| 1           | 2.52        | .69  | 3.30   | 3.44    | -4.13           | 6.33   | 13.29  |  |
| 2           | 2.31        | .70  | 4.36   | -29.13  | -14.54          | -7.70  | 31.99  |  |
| 3           | 2.10        | .70  | -11.09 | -90.84  | -40.79          | -17.00 | 75.76  |  |
| 4           | 1.89        | .70  | -31.19 | -119.37 | -60.27          | -8.66  | 79.26  |  |
| 5           | 1.67        | .70  | -45.38 | -117.01 | -67.65          | -7.47  | 64.80  |  |
| 6           | 1.46        | .70  | -45.09 | -90.19  | -63.84          | 10.49  | 43.24  |  |
| 7           | 1.25        | .70  | -30.00 | -30.05  | -44.77          | 13.15  | 27.13  |  |
| 8           | 1.04        | .70  | -31.91 | -25.20  | -44.89          | -18.50 | 36.43  |  |
| 9           | .83         | .70  | -59.69 | -85.69  | -75.54          | -23.08 | 45.98  |  |
| 10          | .62         | .70  | -81.94 | -117.47 | -100.13         | -6.37  | 32.68  |  |
| 11          | .41         | .70  | -89.34 | -117.68 | -112.78         | -6.84  | 28.79  |  |
| 12          | .20         | .70  | -72.03 | -103.35 | -139.20         | -17.08 | 65.30  |  |
| 13          | 2.52        | .87  | -1.89  | 4.30    | 3.16            | 4.25   | 9.31   |  |
| 14          | 2.30        | .87  | -1.13  | -43.98  | -11.20          | -7.57  | 40.97  |  |
| 15          | 2.09        | .87  | 2.42   | -93.55  | -27.72          | -24.43 | 94.96  |  |
| 16          | 1.88        | .87  | -6.45  | -113.84 | -41.60          | -27.23 | 105.91 |  |
| 17          | 1.66        | .87  | -19.92 | -104.44 | -47.84          | -14.01 | 78.44  |  |
| 18          | 1.45        | .87  | -27.92 | -75.54  | -46.02          | 4.73   | 42.43  |  |
| 19          | 1.24        | .87  | -42.83 | -42.81  | -42.62          | 2.50   | 4.34   |  |
| 20          | 1.02        | .87  | -51.07 | -45.39  | -43.88          | -22.40 | 39.35  |  |
| 21          | .81         | .87  | -48.82 | -79.21  | -52.14          | -31.62 | 61.92  |  |
| 22          | .60         | .88  | -53.65 | -106.39 | -65.22          | -21.29 | 60.54  |  |
| 23          | .38         | .88  | -55.15 | -113.84 | -78.00          | -22.51 | 64.39  |  |
| 24          | .18         | .84  | -65.88 | -132.74 | -114.12         | -36.25 | 86.69  |  |
| 25          | 2.52        | 1.03 | -1.18  | 4.86    | 9.61            | 2.28   | 10.17  |  |
| 26          | 2.30        | 1.04 | -.01   | -57.78  | -8.49           | -2.02  | 54.14  |  |
| 27          | 2.09        | 1.04 | 12.03  | -105.24 | -22.30          | -26.35 | 113.97 |  |
| 28          | 1.87        | 1.04 | -3.29  | -107.59 | -33.10          | -44.05 | 120.33 |  |
| 29          | 1.65        | 1.04 | -14.68 | -84.37  | -33.06          | -21.41 | 72.72  |  |
| 30          | 1.44        | 1.04 | -21.63 | -68.14  | -33.14          | -5.92  | 43.19  |  |
| 31          | 1.22        | 1.04 | -34.77 | -53.56  | -33.72          | -9.55  | 25.45  |  |
| 32          | 1.01        | 1.04 | -40.70 | -54.38  | -34.15          | -23.63 | 44.66  |  |
| 33          | .79         | 1.04 | -40.14 | -73.92  | -38.21          | -30.17 | 62.78  |  |
| 34          | .57         | 1.04 | -39.90 | -95.16  | -45.57          | -25.63 | 68.87  |  |
| 35          | .36         | 1.04 | -32.82 | -125.11 | -59.62          | -22.83 | 91.24  |  |
| 36          | 2.52        | 1.21 | -1.16  | 5.69    | 13.29           | .82    | 12.60  |  |
| 37          | 2.30        | 1.21 | -2.71  | -58.93  | -5.81           | 1.25   | 54.78  |  |
| 38          | 2.11        | 1.21 | 3.11   | -149.98 | -33.11          | -15.44 | 141.14 |  |
| 39          | 1.89        | 1.21 | -12.58 | -97.80  | -27.44          | -60.58 | 131.25 |  |
| 40          | 1.65        | 1.21 | -2.81  | -61.42  | -14.73          | -22.24 | 66.05  |  |
| 41          | 1.44        | 1.22 | -12.13 | -65.13  | -21.01          | -16.54 | 56.90  |  |
| 42          | 1.22        | 1.22 | -21.37 | -57.08  | -22.33          | -17.80 | 46.83  |  |
| 43          | 1.01        | 1.22 | -27.67 | -57.71  | -23.77          | -24.71 | 53.53  |  |
| 44          | .79         | 1.22 | -28.68 | -67.93  | -25.86          | -28.71 | 64.29  |  |
| 45          | .57         | 1.22 | -27.07 | -84.04  | -30.05          | -25.66 | 71.14  |  |
| 46          | .36         | 1.22 | -14.28 | -99.05  | -37.83          | -14.24 | 79.70  |  |
| 47          | 2.11        | 1.44 | 16.86  | 92.12   | 43.44           | .93    | 66.13  |  |
| 48          | 1.93        | 1.39 | 15.53  | 16.58   | 23.17           | -60.67 | 105.33 |  |
| 49          | 1.70        | 1.40 | 4.03   | -68.56  | -8.41           | -33.55 | 88.87  |  |
| 50          | 1.50        | 1.40 | .45    | -59.00  | -8.09           | -25.84 | 71.43  |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | *****  |        | STRESSES (KPSI) |        |       | ***** |  |
|-------------|-------------|------|--------|--------|-----------------|--------|-------|-------|--|
|             | R           | Z    | RR     | ZZ     | TT              | RZ     | MISES |       |  |
| 51          | 1.29        | 1.40 | -7.74  | -57.47 | -11.29          | -24.78 | 64.44 |       |  |
| 52          | 1.08        | 1.40 | -13.35 | -55.60 | -12.68          | -26.38 | 62.46 |       |  |
| 53          | .87         | 1.40 | -15.82 | -58.89 | -14.04          | -27.67 | 65.05 |       |  |
| 54          | .66         | 1.40 | -14.88 | -66.14 | -15.74          | -25.27 | 67.09 |       |  |
| 55          | .50         | 1.45 | -13.47 | -74.59 | -17.51          | -22.08 | 70.49 |       |  |
| 56          | .35         | 1.40 | -7.55  | -77.11 | -20.89          | -11.42 | 66.93 |       |  |
| 57          | 2.24        | 1.58 | -9.16  | 4.35   | 9.61            | .52    | 16.80 |       |  |
| 58          | 2.03        | 1.58 | -1.48  | 24.36  | 21.25           | -30.23 | 57.78 |       |  |
| 59          | 1.82        | 1.58 | 12.59  | -22.73 | 12.82           | -46.20 | 87.51 |       |  |
| 60          | 1.61        | 1.58 | 8.45   | -51.83 | 1.79            | -36.77 | 85.63 |       |  |
| 61          | 1.40        | 1.58 | 4.20   | -52.71 | -.83            | -31.86 | 77.61 |       |  |
| 62          | 1.19        | 1.58 | -1.14  | -52.06 | -3.04           | -30.47 | 72.69 |       |  |
| 63          | .98         | 1.58 | -4.57  | -51.10 | -3.93           | -29.71 | 69.60 |       |  |
| 64          | .77         | 1.58 | -5.60  | -52.79 | -4.41           | -27.38 | 67.34 |       |  |
| 65          | .56         | 1.58 | -4.37  | -56.50 | -4.95           | -21.39 | 63.72 |       |  |
| 66          | .35         | 1.59 | -2.60  | -59.51 | -6.65           | -9.57  | 57.44 |       |  |
| 67          | 2.47        | 1.81 | .06    | -.29   | 11.90           | 1.50   | 12.30 |       |  |
| 68          | 2.32        | 1.76 | -.10   | -.43   | 12.56           | -1.19  | 12.99 |       |  |
| 69          | 2.10        | 1.77 | -7.03  | -1.37  | 12.17           | -12.96 | 28.21 |       |  |
| 70          | 1.88        | 1.77 | 2.75   | -14.60 | 13.74           | -36.24 | 67.47 |       |  |
| 71          | 1.66        | 1.77 | 10.93  | -36.72 | 10.22           | -40.12 | 84.06 |       |  |
| 72          | 1.45        | 1.77 | 9.22   | -46.45 | 6.13            | -36.19 | 82.86 |       |  |
| 73          | 1.23        | 1.77 | 6.40   | -45.92 | 4.86            | -34.31 | 78.68 |       |  |
| 74          | 1.01        | 1.77 | 3.81   | -43.70 | 4.63            | -31.67 | 72.84 |       |  |
| 75          | .79         | 1.77 | 2.99   | -42.23 | 5.37            | -27.38 | 66.39 |       |  |
| 76          | .58         | 1.77 | 3.47   | -42.24 | 6.65            | -20.48 | 59.19 |       |  |
| 77          | .36         | 1.77 | 2.70   | -41.85 | 9.04            | -9.21  | 50.61 |       |  |
| 78          | 2.52        | 1.95 | -.09   | .50    | 13.68           | 1.38   | 13.70 |       |  |
| 79          | 2.30        | 1.95 | -.82   | -7.20  | 12.76           | -1.84  | 17.95 |       |  |
| 80          | 2.09        | 1.95 | -.52   | -14.52 | 12.33           | -13.18 | 32.59 |       |  |
| 81          | 1.87        | 1.95 | 2.45   | -23.43 | 12.23           | -28.65 | 59.00 |       |  |
| 82          | 1.65        | 1.95 | 7.60   | -34.40 | 11.55           | -36.10 | 76.51 |       |  |
| 83          | 1.44        | 1.95 | 10.71  | -40.22 | 10.92           | -37.22 | 82.22 |       |  |
| 84          | 1.22        | 1.95 | 10.38  | -38.72 | 11.23           | -36.02 | 79.65 |       |  |
| 85          | 1.01        | 1.95 | 9.76   | -34.25 | 12.86           | -32.16 | 72.00 |       |  |
| 86          | .79         | 1.95 | 10.39  | -30.83 | 15.36           | -26.06 | 62.97 |       |  |
| 87          | .57         | 1.95 | 11.36  | -28.83 | 18.73           | -18.43 | 54.63 |       |  |
| 88          | .36         | 1.95 | 7.44   | -26.29 | 25.04           | -8.20  | 47.36 |       |  |
| 89          | 2.52        | 2.13 | -.85   | 1.59   | 15.49           | 1.48   | 15.48 |       |  |
| 90          | 2.30        | 2.13 | -1.69  | -13.19 | 12.66           | .35    | 22.44 |       |  |
| 91          | 2.09        | 2.13 | 1.82   | -24.94 | 11.64           | -11.36 | 38.24 |       |  |
| 92          | 1.87        | 2.13 | .41    | -30.48 | 10.88           | -25.68 | 58.01 |       |  |
| 93          | 1.65        | 2.13 | 5.11   | -34.21 | 12.74           | -30.50 | 68.53 |       |  |
| 94          | 1.44        | 2.13 | 10.82  | -36.85 | 14.49           | -35.04 | 78.38 |       |  |
| 95          | 1.22        | 2.13 | 12.44  | -31.40 | 17.32           | -35.77 | 77.45 |       |  |
| 96          | 1.01        | 2.13 | 14.03  | -23.62 | 21.75           | -30.29 | 67.24 |       |  |
| 97          | .79         | 2.13 | 17.43  | -19.09 | 26.88           | -22.52 | 57.36 |       |  |
| 98          | .57         | 2.13 | 19.89  | -16.84 | 32.76           | -14.93 | 51.54 |       |  |
| 99          | .36         | 2.13 | 12.98  | -13.26 | 43.46           | -6.51  | 50.45 |       |  |
| 100         | 2.52        | 2.31 | -1.25  | 2.65   | 16.69           | .68    | 16.39 |       |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | *****  |        |       |        |       | ***** |  |
|-------------|-------------|------|--------|--------|-------|--------|-------|-------|--|
|             | R           | Z    | RR     | ZZ     | TT    | RZ     | MISES |       |  |
| 101         | 2.30        | 2.31 | -4.22  | -14.20 | 12.81 | 1.14   | 23.74 |       |  |
| 102         | 2.11        | 2.31 | -4.13  | -43.87 | 5.72  | -5.22  | 46.36 |       |  |
| 103         | 1.89        | 2.31 | -6.17  | -32.29 | 9.99  | -23.59 | 55.08 |       |  |
| 104         | 1.65        | 2.31 | 2.60   | -34.67 | 14.80 | -21.53 | 58.16 |       |  |
| 105         | 1.44        | 2.31 | 8.95   | -37.37 | 17.29 | -31.52 | 74.71 |       |  |
| 106         | 1.22        | 2.31 | 11.81  | -23.70 | 24.25 | -33.08 | 71.71 |       |  |
| 107         | 1.01        | 2.31 | 18.50  | -11.65 | 33.62 | -23.86 | 57.46 |       |  |
| 108         | .79         | 2.31 | 26.75  | -8.21  | 41.93 | -15.44 | 51.95 |       |  |
| 109         | .57         | 2.31 | 30.02  | -7.74  | 50.07 | -9.19  | 53.28 |       |  |
| 110         | .36         | 2.32 | 19.77  | -4.11  | 66.01 | -3.80  | 62.10 |       |  |
| 111         | 1.98        | 2.44 | 8.75   | 31.09  | 34.62 | -16.90 | 38.04 |       |  |
| 112         | 1.74        | 2.44 | -3.53  | -35.49 | 13.89 | -18.37 | 53.80 |       |  |
| 113         | 1.58        | 2.46 | -2.65  | -40.25 | 14.86 | -15.49 | 55.66 |       |  |
| 114         | 1.42        | 2.44 | 2.97   | -40.96 | 18.04 | -29.82 | 74.08 |       |  |
| 115         | 1.21        | 2.44 | 8.70   | -17.17 | 30.92 | -27.31 | 63.05 |       |  |
| 116         | 1.00        | 2.44 | 26.25  | -.74   | 46.85 | -13.71 | 47.67 |       |  |
| 117         | .78         | 2.44 | 36.12  | -2.33  | 55.42 | -8.44  | 52.97 |       |  |
| 118         | .57         | 2.44 | 38.84  | -1.91  | 65.59 | -4.14  | 59.31 |       |  |
| 119         | .36         | 2.45 | 24.98  | -.95   | 87.37 | -.23   | 78.63 |       |  |
| 120         | 2.10        | 2.54 | -4.16  | 19.68  | 25.22 | -6.08  | 29.02 |       |  |
| 121         | 1.89        | 2.54 | -2.13  | .02    | 24.04 | -20.57 | 43.62 |       |  |
| 122         | 1.67        | 2.54 | -10.40 | -41.24 | 12.82 | -16.69 | 55.16 |       |  |
| 123         | 1.48        | 2.54 | -12.83 | -51.92 | 12.82 | -23.70 | 69.81 |       |  |
| 124         | 1.27        | 2.54 | -3.27  | -7.75  | 35.24 | -17.90 | 51.36 |       |  |
| 125         | 1.03        | 2.54 | 35.07  | -.35   | 56.82 | -4.34  | 50.54 |       |  |
| 126         | .82         | 2.54 | 45.29  | -.86   | 66.08 | -3.34  | 59.63 |       |  |
| 127         | .61         | 2.54 | 47.39  | -1.65  | 75.94 | -1.52  | 68.02 |       |  |
| 128         | .39         | 2.55 | 30.99  | -.97   | 96.18 | 1.76   | 85.82 |       |  |
| 129         | 2.26        | 2.69 | -4.68  | 5.48   | 18.08 | -2.74  | 20.31 |       |  |
| 130         | 2.11        | 2.73 | -6.26  | 9.02   | 20.56 | -5.56  | 25.21 |       |  |
| 131         | 1.95        | 2.69 | -10.82 | -.85   | 19.61 | -16.63 | 39.39 |       |  |
| 132         | 1.75        | 2.69 | -11.06 | -21.44 | 17.73 | -22.43 | 52.39 |       |  |
| 133         | 1.56        | 2.69 | -19.67 | -71.92 | 4.34  | -25.89 | 81.06 |       |  |
| 134         | 2.44        | 2.87 | -2.55  | -1.38  | 14.09 | -2.06  | 16.48 |       |  |
| 135         | 2.29        | 2.91 | -2.80  | 2.27   | 16.27 | -3.34  | 18.07 |       |  |
| 136         | 2.15        | 2.87 | -7.71  | .77    | 16.47 | -7.62  | 25.01 |       |  |
| 137         | 1.96        | 2.87 | -9.37  | -5.01  | 17.50 | -15.01 | 36.05 |       |  |
| 138         | 1.77        | 2.87 | -9.56  | -22.49 | 15.89 | -19.71 | 48.06 |       |  |
| 139         | 1.57        | 2.87 | -1.51  | -43.35 | 15.25 | -12.41 | 56.52 |       |  |
| 140         | 2.53        | 3.05 | -.85   | -3.25  | 12.68 | -1.69  | 15.16 |       |  |
| 141         | 2.34        | 3.05 | -3.27  | -2.51  | 13.72 | -4.47  | 18.34 |       |  |
| 142         | 2.15        | 3.05 | -4.77  | -2.99  | 15.24 | -8.64  | 24.32 |       |  |
| 143         | 1.96        | 3.05 | -5.74  | -8.81  | 15.79 | -12.92 | 32.24 |       |  |
| 144         | 1.76        | 3.05 | -3.42  | -19.04 | 16.25 | -13.70 | 38.74 |       |  |
| 145         | 1.57        | 3.05 | -.90   | -29.33 | 16.63 | -6.90  | 41.91 |       |  |
| 146         | 2.53        | 3.23 | -.26   | -6.32  | 11.37 | -1.89  | 15.92 |       |  |
| 147         | 2.34        | 3.23 | -.54   | -4.91  | 13.01 | -4.83  | 18.21 |       |  |
| 148         | 2.15        | 3.23 | -1.32  | -6.01  | 14.09 | -7.80  | 22.68 |       |  |
| 149         | 1.96        | 3.23 | -.89   | -9.50  | 15.10 | -10.64 | 28.42 |       |  |
| 150         | 1.76        | 3.23 | -.68   | -15.20 | 15.65 | -9.82  | 31.68 |       |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** |        | STRESSES (KPSI) |        |       | ***** |  |
|-------------|-------------|------|-------|--------|-----------------|--------|-------|-------|--|
|             | R           | Z    | RR    | ZZ     | TT              | RZ     | MISES |       |  |
| 151         | 1.57        | 3.23 | .30   | -20.03 | 16.91           | -4.20  | 32.86 |       |  |
| 152         | 2.53        | 3.41 | .23   | -8.71  | 10.41           | -.88   | 16.64 |       |  |
| 153         | 2.34        | 3.41 | 2.33  | -7.53  | 12.48           | -2.64  | 17.92 |       |  |
| 154         | 2.15        | 3.41 | 7.57  | -8.21  | 14.82           | -6.40  | 23.21 |       |  |
| 155         | 1.96        | 3.41 | 1.89  | -10.04 | 13.64           | -10.93 | 27.91 |       |  |
| 156         | 1.76        | 3.41 | 1.55  | -10.54 | 15.24           | -7.64  | 25.97 |       |  |
| 157         | 1.57        | 3.41 | .70   | -13.76 | 16.16           | -3.10  | 26.41 |       |  |
| 158         | 2.11        | 3.64 | -3.20 | 6.17   | 12.59           | -6.58  | 17.86 |       |  |
| 159         | 1.96        | 3.59 | 2.78  | 1.27   | 15.01           | -12.37 | 25.09 |       |  |
| 160         | 1.77        | 3.59 | 1.64  | -7.05  | 13.67           | -7.23  | 21.95 |       |  |
| 161         | 1.57        | 3.59 | .82   | -8.16  | 15.05           | -2.80  | 20.85 |       |  |
| 162         | 2.30        | 3.83 | -3.74 | -5.28  | 5.43            | -4.96  | 13.21 |       |  |
| 163         | 2.15        | 3.78 | -4.74 | -1.26  | 7.55            | -3.05  | 12.18 |       |  |
| 164         | 1.96        | 3.78 | -2.07 | .99    | 10.72           | -7.03  | 16.79 |       |  |
| 165         | 1.77        | 3.78 | .76   | -2.12  | 12.25           | -6.03  | 16.81 |       |  |
| 166         | 1.57        | 3.78 | .56   | -3.40  | 13.59           | -2.36  | 15.93 |       |  |
| 167         | 2.48        | 4.01 | -1.11 | -3.87  | 4.62            | -2.77  | 8.91  |       |  |
| 168         | 2.34        | 3.96 | -2.02 | -3.67  | 5.14            | -3.09  | 9.71  |       |  |
| 169         | 2.15        | 3.96 | -1.93 | -1.49  | 6.67            | -2.79  | 9.68  |       |  |
| 170         | 1.96        | 3.96 | -1.62 | .12    | 8.42            | -3.60  | 11.19 |       |  |
| 171         | 1.76        | 3.96 | -.14  | -.02   | 10.20           | -3.45  | 11.89 |       |  |
| 172         | 1.57        | 3.96 | .36   | .25    | 12.04           | -1.52  | 12.03 |       |  |
| 173         | 2.53        | 4.15 | -.40  | -4.55  | 3.79            | -1.91  | 7.94  |       |  |
| 174         | 2.34        | 4.15 | -.29  | -3.37  | 4.62            | -2.82  | 8.52  |       |  |
| 175         | 2.15        | 4.15 | -.58  | -1.18  | 5.81            | -2.43  | 7.92  |       |  |
| 176         | 1.95        | 4.15 | -.39  | .37    | 7.21            | -2.02  | 8.05  |       |  |
| 177         | 1.76        | 4.15 | .26   | 1.02   | 8.67            | -1.58  | 8.51  |       |  |
| 178         | 1.57        | 4.15 | .34   | 2.16   | 10.39           | -.64   | 9.34  |       |  |
| 179         | 2.53        | 4.33 | .25   | -6.82  | 2.53            | -1.47  | 8.81  |       |  |
| 180         | 2.34        | 4.33 | .76   | -3.24  | 4.04            | -2.63  | 7.78  |       |  |
| 181         | 2.15        | 4.33 | .45   | -.30   | 5.28            | -2.12  | 6.40  |       |  |
| 182         | 1.95        | 4.33 | .85   | 1.12   | 6.50            | -.87   | 5.72  |       |  |
| 183         | 1.76        | 4.33 | 1.01  | 1.55   | 7.47            | -.62   | 6.30  |       |  |
| 184         | 1.57        | 4.33 | .44   | 2.91   | 8.79            | -.24   | 7.44  |       |  |
| 185         | 2.53        | 4.51 | .37   | -8.33  | 1.64            | -.59   | 9.46  |       |  |
| 186         | 2.34        | 4.51 | 2.02  | -3.91  | 3.63            | -1.39  | 7.29  |       |  |
| 187         | 2.15        | 4.51 | 4.39  | 1.27   | 6.04            | -2.31  | 5.80  |       |  |
| 188         | 1.96        | 4.51 | 2.25  | 1.73   | 5.95            | -.35   | 4.03  |       |  |
| 189         | 1.76        | 4.51 | 1.24  | 1.62   | 6.16            | -.64   | 4.87  |       |  |
| 190         | 1.57        | 4.51 | .47   | 3.36   | 7.33            | -.24   | 5.98  |       |  |
| 191         | 2.11        | 4.74 | -1.71 | -2.73  | 1.64            | -2.98  | 6.51  |       |  |
| 192         | 1.96        | 4.69 | .80   | .12    | 3.76            | -1.12  | 3.87  |       |  |
| 193         | 1.76        | 4.69 | .77   | 2.28   | 4.91            | -.78   | 3.87  |       |  |
| 194         | 1.57        | 4.69 | .32   | 3.83   | 5.96            | -.28   | 4.96  |       |  |
| 195         | 2.30        | 4.93 | -1.20 | -2.10  | .82             | -1.78  | 4.03  |       |  |
| 196         | 2.15        | 4.88 | -.88  | -1.20  | 1.49            | -.80   | 2.90  |       |  |
| 197         | 1.96        | 4.88 | -.27  | .67    | 2.54            | -.21   | 2.50  |       |  |
| 198         | 1.77        | 4.88 | .15   | 2.50   | 3.65            | -.17   | 3.10  |       |  |
| 199         | 1.57        | 4.88 | .17   | 4.21   | 4.76            | -.09   | 4.34  |       |  |
| 200         | 2.48        | 5.11 | -.33  | -1.30  | .67             | -.94   | 2.35  |       |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** |       |      |      |  | STRESSES (KPSI) |  | ***** |  |
|-------------|-------------|------|-------|-------|------|------|--|-----------------|--|-------|--|
|             | R           | Z    | RR    | ZZ    | TT   | RZ   |  |                 |  | MISES |  |
| 201         | 2.34        | 5.06 | -.51  | -1.24 | .80  | -.89 |  |                 |  | 2.36  |  |
| 202         | 2.15        | 5.06 | -.16  | -.40  | 1.30 | -.30 |  |                 |  | 1.68  |  |
| 203         | 1.96        | 5.06 | -.03  | .99   | 1.96 | .25  |  |                 |  | 1.78  |  |
| 204         | 1.76        | 5.06 | .11   | 2.49  | 2.77 | .37  |  |                 |  | 2.61  |  |
| 205         | 1.57        | 5.06 | .11   | 4.11  | 3.71 | .20  |  |                 |  | 3.83  |  |
| 206         | 2.53        | 5.25 | -.09  | -1.45 | .39  | -.60 |  |                 |  | 1.95  |  |
| 207         | 2.34        | 5.25 | .07   | -.84  | .66  | -.70 |  |                 |  | 1.78  |  |
| 208         | 2.15        | 5.25 | .07   | .23   | 1.07 | -.12 |  |                 |  | .95   |  |
| 209         | 1.95        | 5.25 | .14   | 1.34  | 1.58 | .52  |  |                 |  | 1.60  |  |
| 210         | 1.76        | 5.25 | .24   | 2.40  | 2.15 | .68  |  |                 |  | 2.36  |  |
| 211         | 1.57        | 5.25 | .14   | 3.65  | 2.82 | .36  |  |                 |  | 3.24  |  |
| 212         | 2.53        | 5.43 | .11   | -2.10 | -.04 | -.44 |  |                 |  | 2.28  |  |
| 213         | 2.34        | 5.43 | .32   | -.52  | .50  | -.66 |  |                 |  | 1.48  |  |
| 214         | 2.15        | 5.43 | .15   | .94   | .94  | -.10 |  |                 |  | .80   |  |
| 215         | 1.95        | 5.43 | .33   | 1.73  | 1.36 | .85  |  |                 |  | 1.94  |  |
| 216         | 1.76        | 5.43 | .46   | 2.16  | 1.66 | .81  |  |                 |  | 2.06  |  |
| 217         | 1.57        | 5.43 | .15   | 3.03  | 2.05 | .34  |  |                 |  | 2.60  |  |
| 218         | 2.53        | 5.61 | .14   | -2.53 | -.33 | -.17 |  |                 |  | 2.48  |  |
| 219         | 2.34        | 5.61 | .65   | -.59  | .37  | -.37 |  |                 |  | 1.29  |  |
| 220         | 2.15        | 5.61 | 1.18  | 2.02  | 1.28 | -.40 |  |                 |  | 1.05  |  |
| 221         | 1.96        | 5.61 | .83   | 2.08  | 1.29 | 1.23 |  |                 |  | 2.40  |  |
| 222         | 1.76        | 5.61 | .36   | 1.58  | 1.03 | .56  |  |                 |  | 1.44  |  |
| 223         | 1.57        | 5.61 | .12   | 2.55  | 1.40 | .23  |  |                 |  | 2.14  |  |
| 224         | 2.11        | 5.84 | -.60  | -2.55 | -.93 | -.78 |  |                 |  | 2.25  |  |
| 225         | 1.96        | 5.79 | -.07  | -.48  | -.15 | .99  |  |                 |  | 1.76  |  |
| 226         | 1.76        | 5.79 | .10   | 1.51  | .56  | .47  |  |                 |  | 1.48  |  |
| 227         | 1.57        | 5.79 | .03   | 2.15  | .81  | .19  |  |                 |  | 1.88  |  |
| 228         | 2.30        | 6.03 | -.25  | -.49  | -.41 | -.38 |  |                 |  | .69   |  |
| 229         | 2.15        | 5.98 | .05   | -.64  | -.35 | -.14 |  |                 |  | .64   |  |
| 230         | 1.96        | 5.98 | -.01  | -.15  | -.29 | .76  |  |                 |  | 1.34  |  |
| 231         | 1.77        | 5.98 | -.13  | .99   | .02  | .67  |  |                 |  | 1.57  |  |
| 232         | 1.57        | 5.98 | -.02  | 1.76  | .32  | .26  |  |                 |  | 1.69  |  |
| 233         | 2.48        | 6.21 | -.08  | -.27  | -.42 | -.23 |  |                 |  | .50   |  |
| 234         | 2.34        | 6.16 | -.11  | -.27  | -.44 | -.20 |  |                 |  | .45   |  |
| 235         | 2.15        | 6.16 | .02   | -.15  | -.41 | .08  |  |                 |  | .39   |  |
| 236         | 1.96        | 6.16 | .04   | .20   | -.35 | .55  |  |                 |  | 1.07  |  |
| 237         | 1.76        | 6.16 | -.04  | .74   | -.25 | .65  |  |                 |  | 1.45  |  |
| 238         | 1.57        | 6.16 | -.03  | 1.23  | -.12 | .33  |  |                 |  | 1.42  |  |
| 239         | 2.53        | 6.35 | -.02  | -.36  | -.53 | -.19 |  |                 |  | .55   |  |
| 240         | 2.34        | 6.35 | .01   | -.11  | -.50 | -.21 |  |                 |  | .59   |  |
| 241         | 2.15        | 6.35 | -.01  | .21   | -.46 | .09  |  |                 |  | .62   |  |
| 242         | 1.95        | 6.35 | .00   | .44   | -.44 | .49  |  |                 |  | 1.15  |  |
| 243         | 1.76        | 6.35 | .01   | .59   | -.46 | .60  |  |                 |  | 1.38  |  |
| 244         | 1.57        | 6.35 | .00   | .70   | -.50 | .31  |  |                 |  | 1.17  |  |
| 245         | 2.53        | 6.53 | .05   | -.59  | -.69 | -.17 |  |                 |  | .76   |  |
| 246         | 2.34        | 6.53 | .15   | .03   | -.55 | -.28 |  |                 |  | .80   |  |
| 247         | 2.15        | 6.53 | .04   | .60   | -.47 | -.02 |  |                 |  | .93   |  |
| 248         | 1.95        | 6.53 | .06   | .68   | -.50 | .54  |  |                 |  | 1.38  |  |
| 249         | 1.76        | 6.53 | .15   | .42   | -.64 | .51  |  |                 |  | 1.31  |  |
| 250         | 1.57        | 6.53 | .02   | .25   | -.86 | .19  |  |                 |  | 1.07  |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** STRESSES (KPSI) ***** |      |       |      |       |
|-------------|-------------|------|-----------------------------|------|-------|------|-------|
|             | R           | Z    | RR                          | ZZ   | TT    | RZ   | MISES |
| 251         | 2.53        | 6.71 | .08                         | -.77 | -.80  | -.08 | .88   |
| 252         | 2.34        | 6.71 | .37                         | -.03 | -.58  | -.18 | .88   |
| 253         | 2.15        | 6.71 | .73                         | 1.12 | -.25  | -.28 | 1.31  |
| 254         | 1.95        | 6.71 | .58                         | .95  | -.43  | .63  | 1.65  |
| 255         | 1.76        | 6.71 | .07                         | .02  | -1.02 | .18  | 1.11  |
| 256         | 1.57        | 6.71 | -.04                        | .04  | -1.21 | .03  | 1.22  |



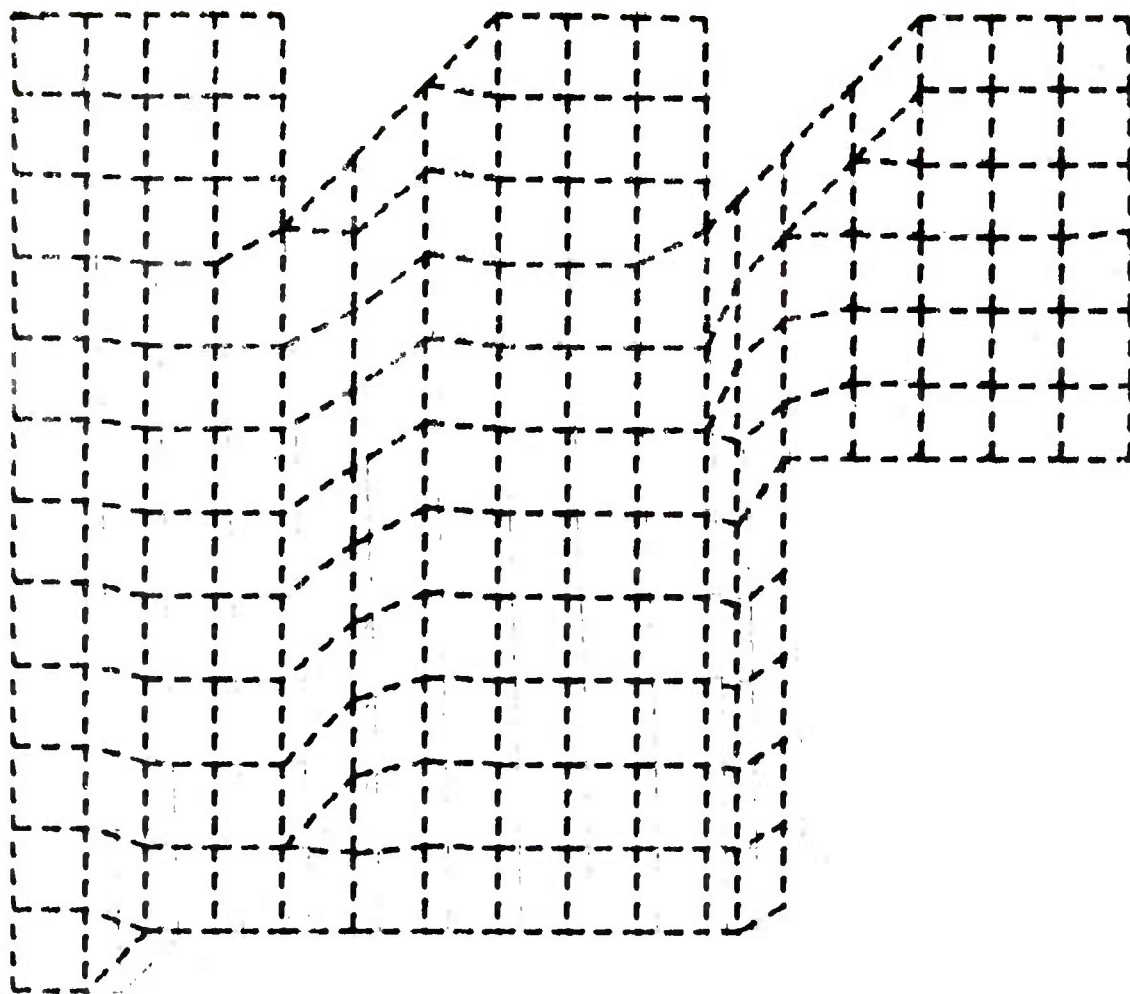


Figure 2. Distortion plot - Run 1.

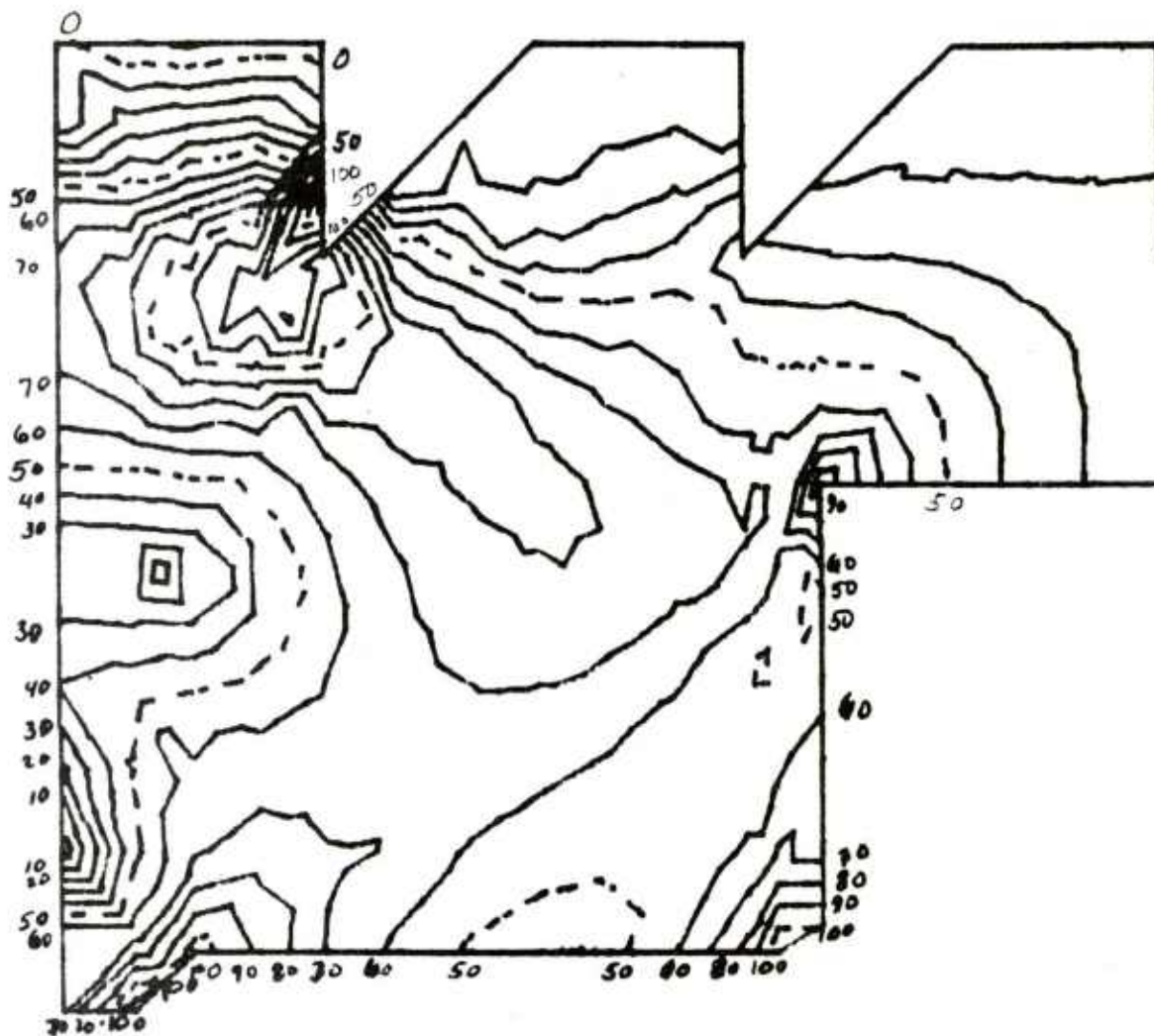


Figure 3. Stress plot - Run 1.

RUN 2

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | *****   |         | STRESSES (KPSI) |        |        | ***** |
|-------------|-------------|------|---------|---------|-----------------|--------|--------|-------|
|             | R           | Z    | RR      | ZZ      | TT              | RZ     | MISES  |       |
| 1           | 2.52        | .69  | 5.28    | 4.61    | -7.30           | 8.41   | 19.04  |       |
| 2           | 2.31        | .70  | 13.51   | -29.03  | -16.78          | -3.23  | 38.34  |       |
| 3           | 2.10        | .70  | 6.94    | -91.69  | -42.60          | -13.75 | 88.68  |       |
| 4           | 1.89        | .70  | -7.11   | -120.50 | -63.61          | -8.44  | 99.28  |       |
| 5           | 1.67        | .70  | -20.25  | -118.15 | -75.33          | -10.99 | 87.11  |       |
| 6           | 1.46        | .70  | -25.46  | -91.21  | -79.10          | 2.62   | 60.77  |       |
| 7           | 1.25        | .70  | -23.45  | -30.25  | -70.54          | 1.52   | 44.17  |       |
| 8           | 1.04        | .70  | -44.44  | -23.84  | -82.89          | -31.69 | 75.55  |       |
| 9           | .83         | .71  | -92.18  | -83.29  | -125.56         | -35.03 | 71.91  |       |
| 10          | .62         | .71  | -130.70 | -114.85 | -160.43         | -15.06 | 47.81  |       |
| 11          | .41         | .71  | -147.72 | -114.70 | -181.50         | -11.49 | 61.17  |       |
| 12          | .20         | .71  | -119.04 | -99.07  | -219.11         | -18.00 | 115.68 |       |
| 13          | 2.52        | .87  | -.75    | 9.98    | 3.43            | 9.48   | 18.91  |       |
| 14          | 2.30        | .87  | 3.89    | -43.85  | -11.77          | 1.49   | 42.23  |       |
| 15          | 2.09        | .87  | 11.03   | -97.64  | -29.55          | -18.19 | 100.20 |       |
| 16          | 1.88        | .87  | 5.08    | -119.13 | -44.70          | -26.92 | 117.88 |       |
| 17          | 1.66        | .87  | -7.20   | -110.26 | -53.35          | -21.50 | 96.85  |       |
| 18          | 1.45        | .87  | -16.94  | -80.69  | -55.36          | -12.51 | 59.67  |       |
| 19          | 1.24        | .88  | -38.84  | -44.20  | -57.02          | -23.27 | 43.42  |       |
| 20          | 1.02        | .88  | -57.81  | -40.61  | -63.49          | -51.19 | 91.04  |       |
| 21          | .81         | .88  | -65.92  | -69.47  | -76.31          | -56.88 | 98.95  |       |
| 22          | .60         | .88  | -77.28  | -94.94  | -92.82          | -38.94 | 69.48  |       |
| 23          | .38         | .88  | -79.66  | -102.69 | -108.42         | -32.64 | 62.39  |       |
| 24          | .18         | .84  | -90.03  | -121.00 | -157.56         | -37.92 | 88.00  |       |
| 25          | 2.52        | 1.03 | -1.96   | 17.50   | 13.67           | 8.12   | 22.73  |       |
| 26          | 2.30        | 1.04 | -2.27   | -58.79  | -8.52           | 9.31   | 56.04  |       |
| 27          | 2.09        | 1.04 | 13.09   | -113.80 | -23.72          | -19.11 | 117.82 |       |
| 28          | 1.87        | 1.04 | -1.97   | -118.84 | -35.74          | -43.26 | 128.33 |       |
| 29          | 1.65        | 1.04 | -8.29   | -97.30  | -35.67          | -28.67 | 93.28  |       |
| 30          | 1.44        | 1.04 | -12.63  | -80.12  | -36.86          | -27.37 | 75.87  |       |
| 31          | 1.22        | 1.04 | -28.92  | -55.59  | -38.09          | -43.39 | 78.74  |       |
| 32          | 1.01        | 1.04 | -40.88  | -42.04  | -37.89          | -60.40 | 104.68 |       |
| 33          | .79         | 1.05 | -45.23  | -51.14  | -40.35          | -59.94 | 104.24 |       |
| 34          | .57         | 1.05 | -43.32  | -70.91  | -45.30          | -42.46 | 77.88  |       |
| 35          | .36         | 1.05 | -34.96  | -100.36 | -55.18          | -26.91 | 74.40  |       |
| 36          | 2.52        | 1.21 | -3.72   | 24.35   | 20.19           | 3.54   | 26.94  |       |
| 37          | 2.30        | 1.21 | -15.47  | -55.93  | -5.43           | 8.97   | 48.84  |       |
| 38          | 2.11        | 1.21 | -21.59  | -168.91 | -41.09          | -3.19  | 138.71 |       |
| 39          | 1.89        | 1.21 | -20.99  | -111.30 | -27.55          | -54.80 | 128.90 |       |
| 40          | 1.65        | 1.22 | -1.91   | -84.51  | -14.06          | -23.04 | 86.95  |       |
| 41          | 1.44        | 1.22 | -2.70   | -88.69  | -19.04          | -37.81 | 102.68 |       |
| 42          | 1.22        | 1.22 | -13.33  | -61.27  | -16.50          | -56.41 | 108.19 |       |
| 43          | 1.01        | 1.22 | -21.41  | -36.00  | -10.01          | -63.28 | 111.90 |       |
| 44          | .79         | 1.22 | -17.54  | -27.75  | -1.80           | -57.27 | 101.74 |       |
| 45          | .57         | 1.22 | -15.35  | -43.22  | 1.62            | -36.39 | 74.23  |       |
| 46          | .36         | 1.23 | -5.27   | -68.80  | 5.29            | -11.63 | 72.28  |       |
| 47          | 2.11        | 1.44 | 23.68   | 106.37  | 61.63           | 22.11  | 81.28  |       |
| 48          | 1.94        | 1.39 | 7.10    | 9.80    | 31.51           | -50.00 | 89.66  |       |
| 49          | 1.70        | 1.40 | -5.73   | -99.12  | -5.04           | -26.33 | 104.24 |       |
| 50          | 1.50        | 1.40 | -3.92   | -106.06 | -6.20           | -33.76 | 116.72 |       |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | *****  |         | STRESSES (KPSI) |        |        | ***** |  |
|-------------|-------------|------|--------|---------|-----------------|--------|--------|-------|--|
|             | R           | Z    | RR     | ZZ      | TT              | RZ     | MISES  |       |  |
| 51          | 1.29        | 1.40 | -2.93  | -77.12  | 2.12            | -58.30 | 126.88 |       |  |
| 52          | 1.08        | 1.40 | -6.66  | -26.37  | 19.18           | -60.70 | 112.33 |       |  |
| 53          | .87         | 1.40 | 10.15  | -9.75   | 36.49           | -47.12 | 90.96  |       |  |
| 54          | .66         | 1.40 | 26.96  | -5.06   | 51.17           | -35.58 | 78.65  |       |  |
| 55          | .51         | 1.45 | 26.66  | -24.59  | 60.90           | -20.46 | 82.52  |       |  |
| 56          | .35         | 1.41 | 17.83  | -52.61  | 65.69           | 2.22   | 103.14 |       |  |
| 57          | 2.24        | 1.58 | -5.44  | 15.72   | 28.12           | 7.23   | 31.95  |       |  |
| 58          | 2.03        | 1.58 | -9.42  | 24.75   | 35.33           | -25.85 | 60.38  |       |  |
| 59          | 1.82        | 1.58 | -5.68  | -41.35  | 21.62           | -40.73 | 89.27  |       |  |
| 60          | 1.61        | 1.58 | -20.53 | -99.99  | 3.56            | -31.23 | 108.32 |       |  |
| 61          | 1.42        | 1.58 | -35.03 | -126.91 | -4.36           | -44.71 | 134.90 |       |  |
| 62          | 1.21        | 1.57 | -34.33 | -32.12  | 32.08           | -51.54 | 110.62 |       |  |
| 63          | .99         | 1.58 | 42.59  | .83     | 79.74           | -16.94 | 74.40  |       |  |
| 64          | .78         | 1.58 | 77.22  | -1.80   | 98.12           | -20.38 | 97.87  |       |  |
| 65          | .58         | 1.58 | 113.63 | 28.89   | 121.96          | -32.03 | 105.04 |       |  |
| 66          | .37         | 1.59 | 49.20  | -50.35  | 102.11          | -3.79  | 134.24 |       |  |
| 67          | 2.47        | 1.81 | -.20   | 5.67    | 26.20           | 3.46   | 24.75  |       |  |
| 68          | 2.32        | 1.76 | -3.53  | 7.21    | 27.97           | .07    | 27.74  |       |  |
| 69          | 2.10        | 1.77 | -18.73 | 1.47    | 26.69           | -15.07 | 47.27  |       |  |
| 70          | 1.88        | 1.77 | -19.36 | -26.94  | 24.90           | -39.24 | 83.49  |       |  |
| 71          | 1.67        | 1.77 | -24.17 | -76.59  | 15.27           | -45.47 | 112.13 |       |  |
| 72          | 1.47        | 1.76 | -38.51 | -176.16 | -12.43          | -51.83 | 176.86 |       |  |
| 73          | .38         | 1.77 | 33.99  | -3.53   | 86.69           | -34.65 | 98.81  |       |  |
| 74          | 2.52        | 1.95 | -1.46  | 3.88    | 26.35           | 1.03   | 25.63  |       |  |
| 75          | 2.30        | 1.95 | -7.42  | -2.08   | 26.40           | -5.09  | 32.71  |       |  |
| 76          | 2.09        | 1.95 | -13.17 | -13.88  | 25.88           | -19.68 | 52.10  |       |  |
| 77          | 1.87        | 1.95 | -17.12 | -36.64  | 23.71           | -36.95 | 83.31  |       |  |
| 78          | 1.66        | 1.95 | -16.98 | -78.89  | 17.43           | -42.88 | 112.54 |       |  |
| 79          | 1.47        | 1.95 | -.54   | -118.14 | 14.34           | -21.10 | 130.91 |       |  |
| 80          | .38         | 1.96 | -3.75  | -.45    | 24.36           | -6.26  | 28.73  |       |  |
| 81          | 2.52        | 2.13 | -1.66  | 2.52    | 27.12           | -.49   | 26.95  |       |  |
| 82          | 2.30        | 2.13 | -4.56  | -10.37  | 25.91           | -5.61  | 35.12  |       |  |
| 83          | 2.09        | 2.13 | -5.15  | -25.77  | 24.98           | -19.99 | 56.16  |       |  |
| 84          | 1.87        | 2.13 | -9.60  | -42.69  | 23.00           | -35.40 | 83.64  |       |  |
| 85          | 1.66        | 2.13 | -6.40  | -64.75  | 22.48           | -31.95 | 94.80  |       |  |
| 86          | 1.47        | 2.13 | -1.15  | -85.77  | 21.60           | -12.75 | 100.45 |       |  |
| 87          | .38         | 2.14 | -.24   | .77     | 4.57            | 2.15   | 5.76   |       |  |
| 88          | 2.52        | 2.31 | -.85   | .71     | 27.43           | -.54   | 27.55  |       |  |
| 89          | 2.30        | 2.31 | -.25   | -15.15  | 26.12           | -3.34  | 36.66  |       |  |
| 90          | 2.11        | 2.31 | 6.14   | -43.16  | 22.32           | -15.24 | 64.71  |       |  |
| 91          | 1.89        | 2.31 | -4.80  | -41.63  | 22.25           | -34.72 | 81.87  |       |  |
| 92          | 1.66        | 2.31 | -.58   | -49.85  | 26.20           | -23.16 | 77.94  |       |  |
| 93          | 1.47        | 2.31 | 1.23   | -63.32  | 26.52           | -9.39  | 81.87  |       |  |
| 94          | .38         | 2.32 | -.42   | .59     | -2.56           | 3.16   | 6.14   |       |  |
| 95          | 1.98        | 2.44 | 12.40  | 32.05   | 47.07           | -32.89 | 64.43  |       |  |
| 96          | 1.74        | 2.44 | .61    | -41.78  | 25.14           | -25.71 | 73.63  |       |  |
| 97          | 1.58        | 2.46 | -.16   | -53.28  | 24.10           | -18.51 | 75.68  |       |  |
| 98          | 1.46        | 2.44 | 2.79   | -47.26  | 30.12           | -8.99  | 69.73  |       |  |
| 99          | .38         | 2.45 | -.13   | .39     | -4.26           | 2.11   | 5.72   |       |  |
| 100         | 2.10        | 2.54 | -9.06  | 14.99   | 29.94           | -15.04 | 42.89  |       |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** STRESSES (KPSI) ***** |        |       |        |       |
|-------------|-------------|------|-----------------------------|--------|-------|--------|-------|
|             | R           | Z    | RR                          | ZZ     | TT    | RZ     | MISES |
| 101         | 1.89        | 2.54 | 3.68                        | .16    | 34.59 | -30.46 | 62.13 |
| 102         | 1.68        | 2.54 | 1.58                        | -39.88 | 25.57 | -20.56 | 67.50 |
| 103         | 1.48        | 2.54 | 1.30                        | -42.80 | 28.68 | -10.01 | 64.83 |
| 104         | .40         | 2.55 | -.23                        | .16    | -5.68 | .86    | 5.85  |
| 105         | 2.26        | 2.69 | -8.40                       | -.37   | 19.94 | -7.85  | 28.72 |
| 106         | 2.11        | 2.73 | -6.62                       | 5.53   | 24.18 | -10.52 | 32.47 |
| 107         | 1.95        | 2.69 | -8.31                       | -2.12  | 25.56 | -19.83 | 46.43 |
| 108         | 1.75        | 2.69 | .60                         | -17.64 | 28.10 | -21.19 | 54.20 |
| 109         | 1.54        | 2.69 | -1.03                       | -38.65 | 25.50 | -12.39 | 59.82 |
| 110         | 2.44        | 2.87 | -4.38                       | -5.91  | 14.95 | -4.89  | 21.84 |
| 111         | 2.29        | 2.91 | -2.89                       | -2.49  | 17.55 | -6.66  | 23.30 |
| 112         | 2.15        | 2.87 | -7.33                       | -1.97  | 18.86 | -8.95  | 28.54 |
| 113         | 1.96        | 2.87 | -6.05                       | -3.60  | 22.23 | -14.23 | 36.65 |
| 114         | 1.77        | 2.87 | -4.55                       | -13.34 | 23.61 | -15.49 | 42.87 |
| 115         | 1.57        | 2.87 | -2.09                       | -29.20 | 23.79 | -11.06 | 49.72 |
| 116         | 2.53        | 3.05 | -.95                        | -8.04  | 12.93 | -3.46  | 19.42 |
| 117         | 2.34        | 3.05 | -2.80                       | -6.11  | 14.51 | -6.40  | 22.15 |
| 118         | 2.15        | 3.05 | -3.32                       | -3.41  | 17.31 | -8.79  | 25.67 |
| 119         | 1.96        | 3.05 | -3.76                       | -5.13  | 19.38 | -10.73 | 30.24 |
| 120         | 1.76        | 3.05 | -2.13                       | -10.88 | 21.32 | -10.94 | 34.52 |
| 121         | 1.57        | 3.05 | -.21                        | -17.32 | 23.44 | -5.84  | 36.87 |
| 122         | 2.53        | 3.23 | .12                         | -12.87 | 10.47 | -3.06  | 20.95 |
| 123         | 2.34        | 3.23 | .66                         | -7.43  | 13.45 | -6.35  | 21.29 |
| 124         | 2.15        | 3.23 | -.28                        | -4.36  | 15.72 | -7.67  | 22.69 |
| 125         | 1.96        | 3.23 | .44                         | -4.70  | 17.93 | -8.11  | 24.89 |
| 126         | 1.76        | 3.23 | .63                         | -7.97  | 19.44 | -7.43  | 27.48 |
| 127         | 1.57        | 3.23 | .63                         | -9.97  | 21.77 | -3.31  | 28.57 |
| 128         | 2.53        | 3.41 | .62                         | -16.29 | 8.76  | -1.29  | 22.24 |
| 129         | 2.34        | 3.41 | 4.00                        | -9.95  | 12.58 | -3.42  | 20.57 |
| 130         | 2.15        | 3.41 | 10.32                       | -3.96  | 17.09 | -7.02  | 22.23 |
| 131         | 1.96        | 3.41 | 3.89                        | -4.44  | 16.23 | -7.77  | 22.48 |
| 132         | 1.76        | 3.41 | 2.43                        | -4.86  | 17.57 | -6.00  | 22.38 |
| 133         | 1.57        | 3.41 | 1.00                        | -5.00  | 19.57 | -2.47  | 22.60 |
| 134         | 2.11        | 3.64 | -4.19                       | 1.03   | 10.37 | -7.98  | 18.83 |
| 135         | 1.96        | 3.59 | 2.78                        | 1.19   | 14.53 | -9.69  | 20.99 |
| 136         | 1.77        | 3.59 | 1.98                        | -1.76  | 15.02 | -5.87  | 18.33 |
| 137         | 1.57        | 3.59 | .92                         | -.62   | 17.22 | -2.27  | 17.57 |
| 138         | 2.30        | 3.83 | -3.94                       | -6.08  | 4.54  | -5.49  | 13.60 |
| 139         | 2.15        | 3.78 | -4.25                       | -2.22  | 6.77  | -3.01  | 11.43 |
| 140         | 1.96        | 3.78 | -1.71                       | 1.64   | 10.19 | -5.03  | 13.74 |
| 141         | 1.77        | 3.78 | .68                         | 1.82   | 12.56 | -4.33  | 13.61 |
| 142         | 1.57        | 3.78 | .58                         | 3.09   | 14.83 | -1.73  | 13.51 |
| 143         | 2.48        | 4.01 | -1.13                       | -4.17  | 3.84  | -2.98  | 8.70  |
| 144         | 2.34        | 3.96 | -1.94                       | -3.96  | 4.34  | -3.14  | 9.26  |
| 145         | 2.15        | 3.96 | -1.44                       | -1.44  | 5.98  | -2.26  | 8.39  |
| 146         | 1.96        | 3.96 | -1.10                       | 1.40   | 7.96  | -2.19  | 8.94  |
| 147         | 1.76        | 3.96 | .05                         | 3.24   | 10.15 | -1.96  | 9.56  |
| 148         | 1.57        | 3.96 | .38                         | 5.50   | 12.56 | -.82   | 10.69 |
| 149         | 2.53        | 4.15 | -.37                        | -4.78  | 2.97  | -1.98  | 7.56  |
| 150         | 2.34        | 4.15 | -.06                        | -3.30  | 3.85  | -2.71  | 7.77  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** |       |       |       |       | ***** |  |
|-------------|-------------|------|-------|-------|-------|-------|-------|-------|--|
|             | R           | Z    | RR    | ZZ    | TT    | RZ    | MISES |       |  |
| 151         | 2.15        | 4.15 | -.24  | -.53  | 5.14  | -1.79 | 6.34  |       |  |
| 152         | 1.95        | 4.15 | -.04  | 1.97  | 6.70  | -.84  | 6.16  |       |  |
| 153         | 1.76        | 4.15 | .49   | 3.85  | 8.40  | -.36  | 6.91  |       |  |
| 154         | 1.57        | 4.15 | .40   | 6.31  | 10.43 | -.05  | 8.73  |       |  |
| 155         | 2.53        | 4.33 | .30   | -7.05 | 1.64  | -1.49 | 8.50  |       |  |
| 156         | 2.34        | 4.33 | .91   | -2.85 | 3.26  | -2.50 | 6.88  |       |  |
| 157         | 2.15        | 4.33 | .55   | .84   | 4.62  | -1.55 | 4.76  |       |  |
| 158         | 1.95        | 4.33 | 1.00  | 2.90  | 5.96  | .28   | 4.36  |       |  |
| 159         | 1.76        | 4.33 | 1.22  | 3.98  | 7.05  | .42   | 5.11  |       |  |
| 160         | 1.57        | 4.33 | .48   | 6.16  | 8.49  | .20   | 7.15  |       |  |
| 161         | 2.53        | 4.51 | .41   | -8.54 | .71   | -.58  | 9.16  |       |  |
| 162         | 2.34        | 4.51 | 2.08  | -3.36 | 2.84  | -1.33 | 6.29  |       |  |
| 163         | 2.15        | 4.51 | 4.25  | 3.01  | 5.47  | -1.97 | 4.03  |       |  |
| 164         | 1.96        | 4.51 | 2.43  | 3.67  | 5.50  | 1.01  | 3.19  |       |  |
| 165         | 1.76        | 4.51 | 1.27  | 3.45  | 5.51  | .16   | 3.69  |       |  |
| 166         | 1.57        | 4.51 | .47   | 5.95  | 6.81  | .09   | 5.96  |       |  |
| 167         | 2.11        | 4.74 | -1.68 | -4.15 | .32   | -2.77 | 6.17  |       |  |
| 168         | 1.96        | 4.69 | .56   | .03   | 2.59  | .29   | 2.39  |       |  |
| 169         | 1.76        | 4.69 | .70   | 3.80  | 4.19  | -.03  | 3.31  |       |  |
| 170         | 1.57        | 4.69 | .28   | 5.83  | 5.29  | .01   | 5.30  |       |  |
| 171         | 2.30        | 4.93 | -.97  | -1.87 | .25   | -1.53 | 3.23  |       |  |
| 172         | 2.15        | 4.88 | -.45  | -1.29 | .80   | -.58  | 2.08  |       |  |
| 173         | 1.96        | 4.88 | -.06  | .72   | 1.67  | .67   | 1.90  |       |  |
| 174         | 1.77        | 4.88 | .07   | 3.41  | 2.83  | .57   | 3.24  |       |  |
| 175         | 1.57        | 4.88 | .14   | 5.69  | 4.02  | .20   | 4.94  |       |  |
| 176         | 2.48        | 5.11 | -.26  | -1.08 | .18   | -.78  | 1.75  |       |  |
| 177         | 2.34        | 5.06 | -.35  | -1.04 | .27   | -.68  | 1.64  |       |  |
| 178         | 2.15        | 5.06 | .07   | -.28  | .69   | -.01  | .85   |       |  |
| 179         | 1.96        | 5.06 | .18   | 1.22  | 1.26  | .77   | 1.71  |       |  |
| 180         | 1.76        | 5.06 | .16   | 3.11  | 2.02  | .89   | 3.02  |       |  |
| 181         | 1.57        | 5.06 | .09   | 5.10  | 2.94  | .44   | 4.42  |       |  |
| 182         | 2.53        | 5.25 | -.06  | -1.18 | -.05  | -.48  | 1.40  |       |  |
| 183         | 2.34        | 5.25 | .13   | -.59  | .18   | -.48  | 1.12  |       |  |
| 184         | 2.15        | 5.25 | .18   | .44   | .52   | .17   | .43   |       |  |
| 185         | 1.95        | 5.25 | .24   | 1.62  | .96   | .88   | 1.94  |       |  |
| 186         | 1.76        | 5.25 | .27   | 2.87  | 1.47  | 1.02  | 2.87  |       |  |
| 187         | 1.57        | 5.25 | .12   | 4.29  | 2.08  | .52   | 3.72  |       |  |
| 188         | 2.53        | 5.43 | .11   | -1.67 | -.40  | -.34  | 1.69  |       |  |
| 189         | 2.34        | 5.43 | .30   | -.22  | .05   | -.45  | .90   |       |  |
| 190         | 2.15        | 5.43 | .15   | 1.18  | .43   | .16   | .96   |       |  |
| 191         | 1.95        | 5.43 | .30   | 1.99  | .78   | 1.12  | 2.46  |       |  |
| 192         | 1.76        | 5.43 | .43   | 2.52  | 1.04  | 1.04  | 2.59  |       |  |
| 193         | 1.57        | 5.43 | .12   | 3.46  | 1.36  | .44   | 3.02  |       |  |
| 194         | 2.53        | 5.61 | .12   | -1.98 | -.63  | -.13  | 1.86  |       |  |
| 195         | 2.34        | 5.61 | .53   | -.21  | -.05  | -.26  | .80   |       |  |
| 196         | 2.15        | 5.61 | .86   | 2.25  | .73   | -.18  | 1.50  |       |  |
| 197         | 1.96        | 5.61 | .71   | 2.33  | .77   | 1.50  | 3.05  |       |  |
| 198         | 1.76        | 5.61 | .28   | 1.83  | .46   | .75   | 1.96  |       |  |
| 199         | 1.57        | 5.61 | .09   | 2.83  | .78   | .31   | 2.52  |       |  |
| 200         | 2.11        | 5.84 | -.47  | -2.60 | -1.31 | -.53  | 2.08  |       |  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | ***** STRESSES (KPSI) ***** |      |       |      |       |
|-------------|-------------|------|-----------------------------|------|-------|------|-------|
|             | R           | Z    | RR                          | ZZ   | TT    | RZ   | MISES |
| 201         | 1.96        | 5.79 | -.17                        | -.48 | -.65  | 1.32 | 2.33  |
| 202         | 1.76        | 5.79 | .04                         | 1.65 | .06   | .65  | 1.96  |
| 203         | 1.57        | 5.79 | .00                         | 2.28 | .25   | .26  | 2.21  |
| 204         | 2.30        | 6.03 | -.12                        | -.30 | -.59  | -.21 | .55   |
| 205         | 2.15        | 5.98 | .19                         | -.57 | -.61  | -.05 | .78   |
| 206         | 1.96        | 5.98 | .05                         | -.17 | -.65  | .92  | 1.72  |
| 207         | 1.77        | 5.98 | -.15                        | 1.01 | -.41  | .81  | 1.92  |
| 208         | 1.57        | 5.98 | -.03                        | 1.78 | -.17  | .31  | 1.96  |
| 209         | 2.48        | 6.21 | -.04                        | -.14 | -.58  | -.14 | .55   |
| 210         | 2.34        | 6.16 | -.05                        | -.15 | -.61  | -.10 | .55   |
| 211         | 2.15        | 6.16 | .08                         | -.11 | -.63  | .15  | .69   |
| 212         | 1.96        | 6.16 | .09                         | .19  | -.63  | .61  | 1.32  |
| 213         | 1.76        | 6.16 | -.03                        | .71  | -.60  | .71  | 1.67  |
| 214         | 1.57        | 6.16 | -.04                        | 1.18 | -.54  | .35  | 1.65  |
| 215         | 2.53        | 6.35 | -.00                        | -.20 | -.65  | -.12 | .61   |
| 216         | 2.34        | 6.35 | .02                         | -.01 | -.65  | -.12 | .69   |
| 217         | 2.15        | 6.35 | .02                         | .23  | -.66  | .15  | .84   |
| 218         | 1.95        | 6.35 | .02                         | .41  | -.69  | .51  | 1.30  |
| 219         | 1.76        | 6.35 | .01                         | .55  | -.75  | .59  | 1.52  |
| 220         | 1.57        | 6.35 | -.01                        | .64  | -.84  | .30  | 1.38  |
| 221         | 2.53        | 6.53 | .04                         | -.36 | -.76  | -.12 | .73   |
| 222         | 2.34        | 6.53 | .12                         | .12  | -.68  | -.19 | .86   |
| 223         | 2.15        | 6.53 | .03                         | .56  | -.66  | .03  | 1.06  |
| 224         | 1.95        | 6.53 | .04                         | .60  | -.72  | .50  | 1.44  |
| 225         | 1.76        | 6.53 | .11                         | .37  | -.89  | .47  | 1.41  |
| 226         | 1.57        | 6.53 | -.00                        | .22  | -1.12 | .17  | 1.28  |
| 227         | 2.53        | 6.71 | .07                         | -.49 | -.84  | -.06 | .80   |
| 228         | 2.34        | 6.71 | .30                         | .07  | -.70  | -.13 | .94   |
| 229         | 2.15        | 6.71 | .58                         | .99  | -.46  | -.21 | 1.35  |
| 230         | 1.95        | 6.71 | .44                         | .81  | -.66  | .55  | 1.63  |
| 231         | 1.76        | 6.71 | .01                         | .02  | -1.20 | .15  | 1.24  |
| 232         | 1.57        | 6.71 | -.05                        | .03  | -1.40 | .02  | 1.39  |



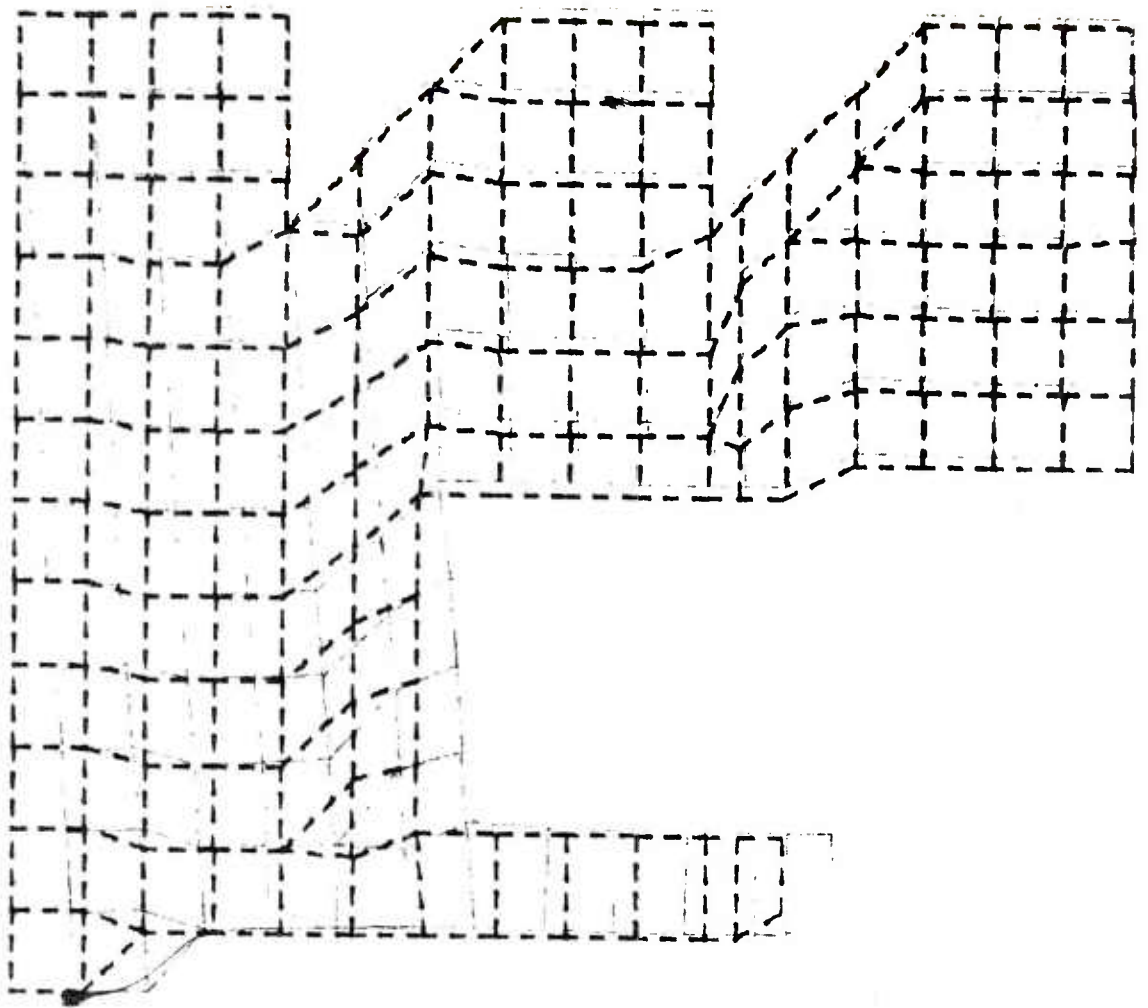


Figure 5. Distortion plot - Run 2.

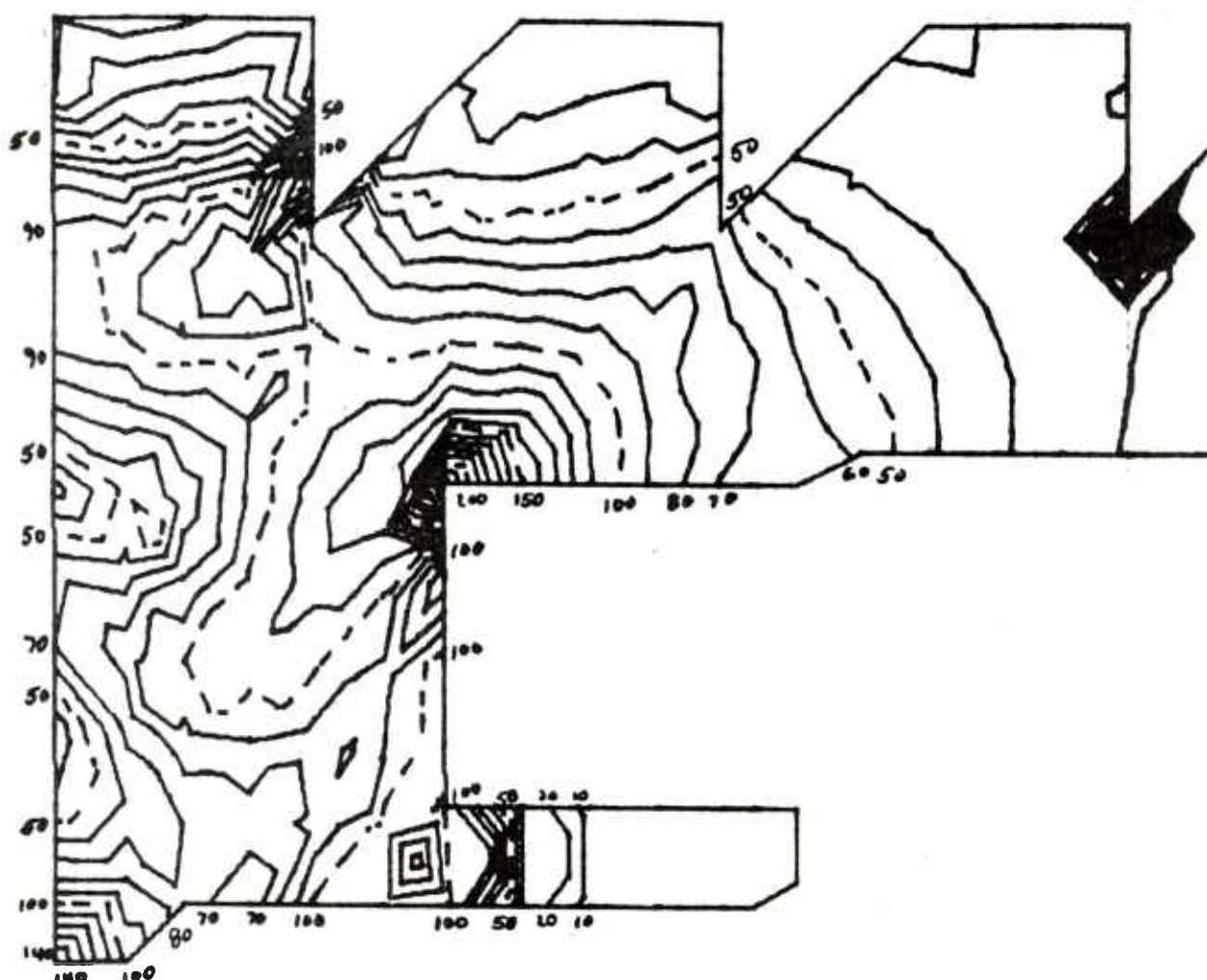


Figure 6. Stress plot - Run 2.

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |         |         |        |        |
|-------------|-------------|------|----------------|---------|---------|--------|--------|
|             | R           | Z    | RR             | ZZ      | TT      | RZ     | MISES  |
| 1           | 2.62        | 0.60 | 5.28           | 4.61    | -7.30   | 8.41   | 19.04  |
| 2           | 2.41        | 0.60 | 13.51          | -29.03  | -16.78  | -3.23  | 38.34  |
| 3           | 2.20        | 0.60 | 6.94           | -91.69  | -42.60  | -13.75 | 88.68  |
| 4           | 1.99        | 0.60 | -7.11          | -120.50 | -63.61  | -8.44  | 99.28  |
| 5           | 1.78        | 0.60 | -20.25         | -118.15 | -75.33  | -10.99 | 87.11  |
| 6           | 1.57        | 0.61 | -25.46         | -91.21  | -79.10  | 2.62   | 60.77  |
| 7           | 1.36        | 0.61 | -23.45         | -30.25  | -70.54  | 1.52   | 44.16  |
| 8           | 1.15        | 0.61 | -44.44         | -23.84  | -82.88  | -31.69 | 75.55  |
| 9           | 0.93        | 0.61 | -92.18         | -83.29  | -125.56 | -35.03 | 71.91  |
| 10          | 0.72        | 0.61 | -130.70        | -114.85 | -160.43 | -15.06 | 47.81  |
| 11          | 0.51        | 0.61 | -147.71        | -114.70 | -181.50 | -11.49 | 61.17  |
| 12          | 0.30        | 0.62 | -119.04        | -99.07  | -219.11 | -18.00 | 115.68 |
| 13          | 0.09        | 0.62 | -0.75          | 9.98    | 3.43    | 9.48   | 18.91  |
| 14          | 2.62        | 0.79 | 3.89           | -43.85  | -11.77  | 1.49   | 42.23  |
| 15          | 2.41        | 0.79 | 11.03          | -97.64  | -29.55  | -18.19 | 100.20 |
| 16          | 2.20        | 0.79 | 5.08           | -119.13 | -44.70  | -26.92 | 117.88 |
| 17          | 1.99        | 0.79 | -7.20          | -110.26 | -53.35  | -21.50 | 96.85  |
| 18          | 1.78        | 0.79 | -16.94         | -80.69  | -55.36  | -12.51 | 59.67  |
| 19          | 1.57        | 0.80 | -38.84         | -44.20  | -57.02  | -23.26 | 43.42  |
| 20          | 1.36        | 0.80 | -57.81         | -40.61  | -63.49  | -51.19 | 91.03  |
| 21          | 1.15        | 0.80 | -65.92         | -69.47  | -76.31  | -56.88 | 98.95  |
| 22          | 0.94        | 0.80 | -77.28         | -94.94  | -92.82  | -38.94 | 69.48  |
| 23          | 0.73        | 0.80 | -79.66         | -102.69 | -108.42 | -32.64 | 62.39  |
| 24          | 0.53        | 0.80 | -90.03         | -121.00 | -157.56 | -37.92 | 88.00  |
| 25          | 0.30        | 0.81 | -1.96          | 17.50   | 13.67   | 8.12   | 22.73  |
| 26          | 0.09        | 0.81 | -2.27          | -58.75  | -8.52   | 9.31   | 56.04  |
| 27          | 2.63        | 0.95 | 13.09          | -113.80 | -23.72  | -19.11 | 117.82 |
| 28          | 2.41        | 0.95 | -1.97          | -118.84 | -35.74  | -43.26 | 128.33 |
| 29          | 2.19        | 0.95 | -8.29          | -97.30  | -35.67  | -28.67 | 93.28  |
| 30          | 1.98        | 0.95 | -12.63         | -80.12  | -36.86  | -27.37 | 75.87  |
| 31          | 1.76        | 0.95 | -28.92         | -55.59  | -38.09  | -43.39 | 78.74  |
| 32          | 1.54        | 0.95 | -40.88         | -42.04  | -37.89  | -60.40 | 104.68 |
| 33          | 1.33        | 0.95 | -45.23         | -51.14  | -40.35  | -59.94 | 104.24 |
| 34          | 1.11        | 0.96 | -45.32         | -70.91  | -45.30  | -42.46 | 77.87  |
| 35          | 0.90        | 0.96 | -34.96         | -100.36 | -55.18  | -26.91 | 74.40  |
| 36          | 0.68        | 0.96 | -3.72          | 24.34   | 20.19   | 3.54   | 26.94  |
| 37          | 0.47        | 0.96 | -15.47         | -55.93  | -5.43   | 8.97   | 48.84  |
| 38          | 0.25        | 0.96 | -21.59         | -168.91 | -41.09  | -3.19  | 138.71 |
| 39          | 2.63        | 1.12 | -20.99         | -111.30 | -27.55  | -54.80 | 128.90 |
| 40          | 2.41        | 1.12 | -1.91          | -84.51  | -14.06  | -23.04 | 86.95  |
| 41          | 2.19        | 1.12 | -2.70          | -88.69  | -19.04  | -37.81 | 102.68 |
| 42          | 1.98        | 1.12 | -13.33         | -61.27  | -16.50  | -56.41 | 108.19 |
| 43          | 1.76        | 1.13 | -21.41         | -36.00  | -10.01  | -63.28 | 111.90 |
| 44          | 1.55        | 1.13 | -17.54         | -27.75  | -1.80   | -57.27 | 101.74 |
| 45          | 1.33        | 1.13 | -15.35         | -43.22  | 1.62    | -36.39 | 74.23  |
| 46          | 1.11        | 1.13 | -5.27          | -68.80  | 5.29    | -11.63 | 72.28  |
| 47          | 0.90        | 1.13 | 23.68          | 106.37  | 61.63   | 22.11  | 81.28  |
| 48          | 0.68        | 1.14 | 7.10           | 9.80    | 31.51   | -50.00 | 89.66  |
| 49          | 0.47        | 1.14 | -5.73          | -99.12  | -5.04   | -26.33 | 104.24 |
| 50          | 0.25        | 1.14 | -3.92          | -106.06 | -6.20   | -33.76 | 116.72 |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |         |        |        |        |
|-------------|-------------|------|----------------|---------|--------|--------|--------|
|             | R           | Z    | RR             | ZZ      | TT     | RZ     | MISES  |
| 51          | 2.63        | 1.30 | -2.93          | -77.12  | 2.12   | -58.30 | 126.88 |
| 52          | 2.41        | 1.30 | -6.66          | -26.37  | 19.18  | -60.70 | 112.33 |
| 53          | 2.19        | 1.30 | 10.15          | -9.75   | 36.49  | -47.12 | 90.96  |
| 54          | 2.07        | 1.30 | 26.96          | -5.06   | 51.17  | -35.58 | 78.65  |
| 55          | 1.76        | 1.30 | 26.66          | -24.59  | 60.90  | -20.46 | 82.52  |
| 56          | 1.55        | 1.30 | 17.83          | -52.61  | 65.69  | 2.22   | 103.14 |
| 57          | 1.33        | 1.31 | -5.44          | 15.72   | 28.12  | 7.23   | 31.95  |
| 58          | 1.11        | 1.31 | -9.42          | 24.75   | 35.33  | -25.85 | 60.38  |
| 59          | 0.90        | 1.31 | -5.68          | -41.35  | 21.62  | -40.73 | 89.27  |
| 60          | 0.68        | 1.31 | -20.53         | -99.99  | 3.56   | -31.23 | 108.32 |
| 61          | 0.47        | 1.31 | -35.03         | -126.91 | -4.36  | -44.71 | 134.90 |
| 62          | 0.25        | 1.31 | -34.33         | -32.12  | 32.08  | -51.54 | 110.62 |
| 63          | 2.26        | 1.49 | 42.59          | 0.83    | 79.74  | -16.94 | 74.40  |
| 64          | 2.05        | 1.49 | 77.22          | -1.80   | 98.12  | -20.38 | 97.87  |
| 65          | 1.85        | 1.49 | 113.63         | 28.89   | 121.96 | -32.03 | 105.04 |
| 66          | 1.65        | 1.49 | 49.20          | -50.35  | 102.11 | -3.79  | 134.24 |
| 67          | 1.45        | 1.49 | -0.20          | 5.67    | 26.20  | 3.46   | 24.75  |
| 68          | 1.25        | 1.49 | -3.53          | 7.21    | 27.97  | 0.07   | 27.74  |
| 69          | 1.05        | 1.49 | -18.73         | 1.47    | 26.69  | -15.07 | 47.27  |
| 70          | 0.85        | 1.50 | -19.36         | -26.94  | 24.90  | -39.24 | 83.49  |
| 71          | 0.65        | 1.50 | -24.17         | -76.59  | 15.27  | -45.47 | 112.13 |
| 72          | 0.45        | 1.50 | -38.51         | -176.18 | -12.43 | -51.83 | 176.85 |
| 73          | 0.25        | 1.50 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 74          | 2.44        | 1.67 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 75          | 2.22        | 1.67 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 76          | 2.00        | 1.67 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 77          | 1.78        | 1.67 | 33.99          | -3.53   | 86.68  | -34.65 | 98.81  |
| 78          | 1.57        | 1.67 | -1.46          | 3.88    | 26.35  | 1.03   | 25.63  |
| 79          | 1.39        | 1.65 | -7.42          | -2.08   | 26.40  | -5.09  | 32.71  |
| 80          | 1.13        | 1.66 | -13.17         | -13.88  | 25.88  | -19.68 | 52.10  |
| 81          | 0.91        | 1.66 | -17.12         | -36.64  | 23.71  | -36.95 | 83.31  |
| 82          | 0.69        | 1.66 | -16.98         | -78.89  | 17.43  | -42.88 | 112.54 |
| 83          | 0.52        | 1.66 | -0.54          | -118.14 | 14.34  | -21.10 | 130.91 |
| 84          | 0.25        | 1.68 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 85          | 2.63        | 1.86 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 86          | 2.41        | 1.86 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 87          | 2.20        | 1.86 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 88          | 1.98        | 1.86 | -3.75          | -0.45   | 24.36  | -6.26  | 28.73  |
| 89          | 1.76        | 1.86 | -1.66          | 2.52    | 27.12  | -0.49  | 26.95  |
| 90          | 1.55        | 1.86 | -4.56          | -10.37  | 25.91  | -5.61  | 35.12  |
| 91          | 1.39        | 1.86 | -5.15          | -25.77  | 24.98  | -19.99 | 56.16  |
| 92          | 1.11        | 1.86 | -9.60          | -42.69  | 23.00  | -35.40 | 83.64  |
| 93          | 0.90        | 1.86 | -6.40          | -64.75  | 22.48  | -31.95 | 94.80  |
| 94          | 0.68        | 1.86 | -1.15          | -85.77  | 21.60  | -12.75 | 100.45 |
| 95          | 0.52        | 1.87 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 96          | 0.25        | 1.87 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 97          | 2.63        | 2.04 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 98          | 2.41        | 2.04 | 0.00           | 0.00    | 0.00   | 0.00   | 0.00   |
| 99          | 2.20        | 2.04 | -0.24          | 0.77    | 4.57   | 2.15   | 5.76   |
| 100         | 1.98        | 2.04 | -0.85          | 0.71    | 27.43  | -0.54  | 27.55  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |        |       |
|-------------|-------------|------|----------------|--------|-------|--------|-------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ     | MISES |
| 101         | 1.76        | 2.04 | -0.25          | -15.15 | 26.12 | -3.34  | 36.66 |
| 102         | 1.55        | 2.04 | 6.14           | -43.16 | 22.32 | -15.24 | 64.71 |
| 103         | 1.39        | 2.04 | -4.80          | -41.63 | 22.25 | -34.72 | 81.86 |
| 104         | 1.11        | 2.04 | -0.58          | -49.85 | 26.20 | -23.16 | 77.94 |
| 105         | 0.90        | 2.04 | 1.23           | -63.32 | 26.52 | -9.39  | 81.87 |
| 106         | 0.68        | 2.04 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 107         | 0.52        | 2.05 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 108         | 0.25        | 2.05 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 109         | 2.63        | 2.22 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 110         | 2.41        | 2.22 | -0.42          | 0.59   | -2.56 | 3.16   | 6.14  |
| 111         | 2.20        | 2.22 | 12.40          | 32.05  | 47.07 | -32.89 | 64.43 |
| 112         | 1.98        | 2.22 | 0.61           | -41.78 | 25.13 | -25.71 | 73.63 |
| 113         | 1.76        | 2.22 | -0.16          | -53.28 | 24.10 | -18.51 | 75.68 |
| 114         | 1.55        | 2.22 | 2.79           | -47.26 | 30.12 | -8.99  | 69.73 |
| 115         | 1.39        | 2.22 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 116         | 1.11        | 2.22 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 117         | 0.90        | 2.22 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 118         | 0.68        | 2.22 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 119         | 0.52        | 2.23 | -0.13          | 0.39   | -4.26 | 2.11   | 5.72  |
| 120         | 0.25        | 2.23 | -9.06          | 14.99  | 29.94 | -15.04 | 42.89 |
| 121         | 2.63        | 2.40 | 3.68           | 0.16   | 34.59 | -30.46 | 62.13 |
| 122         | 2.41        | 2.40 | 1.58           | -39.88 | 25.57 | -20.56 | 67.50 |
| 123         | 2.20        | 2.40 | 1.30           | -42.80 | 28.68 | -10.01 | 64.83 |
| 124         | 2.07        | 2.40 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 125         | 1.76        | 2.40 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 126         | 1.55        | 2.40 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 127         | 1.39        | 2.40 | 0.0            | 0.0    | 0.0   | 0.0    | 0.0   |
| 128         | 1.11        | 2.40 | -0.23          | 0.15   | -5.68 | 0.86   | 5.85  |
| 129         | 0.90        | 2.40 | -8.40          | -0.37  | 19.94 | -7.85  | 28.72 |
| 130         | 0.68        | 2.40 | -6.62          | 5.53   | 24.18 | -10.52 | 32.47 |
| 131         | 0.51        | 2.41 | -8.31          | -2.12  | 25.56 | -19.83 | 46.43 |
| 132         | 0.25        | 2.41 | 0.60           | -17.64 | 28.10 | -21.19 | 54.20 |
| 133         | 2.15        | 2.48 | -1.03          | -38.65 | 25.50 | -12.39 | 59.81 |
| 134         | 1.94        | 2.48 | -4.38          | -5.91  | 14.95 | -4.89  | 21.84 |
| 135         | 1.73        | 2.48 | -2.89          | -2.49  | 17.55 | -6.66  | 23.29 |
| 136         | 1.52        | 2.48 | -7.33          | -1.97  | 18.86 | -8.95  | 28.54 |
| 137         | 1.39        | 2.48 | -6.05          | -3.60  | 22.22 | -14.23 | 36.65 |
| 138         | 1.09        | 2.48 | -4.55          | -13.34 | 23.61 | -15.49 | 42.87 |
| 139         | 0.88        | 2.48 | -2.09          | -29.20 | 23.78 | -11.06 | 49.72 |
| 140         | 0.67        | 2.48 | -0.95          | -8.04  | 12.93 | -3.46  | 19.42 |
| 141         | 0.51        | 2.49 | -2.80          | -6.11  | 14.51 | -6.40  | 22.15 |
| 142         | 0.25        | 2.49 | -3.32          | -3.41  | 17.31 | -8.79  | 25.67 |
| 143         | 2.27        | 2.60 | -3.76          | -5.13  | 19.38 | -10.73 | 30.24 |
| 144         | 2.05        | 2.60 | -2.13          | -10.88 | 21.32 | -10.94 | 34.52 |
| 145         | 1.84        | 2.60 | -0.21          | -17.32 | 23.44 | -5.84  | 36.87 |
| 146         | 1.62        | 2.60 | 0.12           | -12.87 | 10.47 | -3.06  | 20.95 |
| 147         | 1.39        | 2.60 | 0.66           | -7.43  | 13.45 | -6.35  | 21.29 |
| 148         | 1.19        | 2.60 | -0.28          | -4.36  | 15.72 | -7.67  | 22.69 |
| 149         | 0.87        | 2.60 | 0.44           | -4.70  | 17.93 | -8.11  | 24.89 |
| 150         | 0.75        | 2.60 | 0.63           | -7.97  | 19.44 | -7.43  | 27.48 |

RUN 3

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |       |       |
|-------------|-------------|------|----------------|--------|-------|-------|-------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ    | MISES |
| 151         | 0.51        | 2.61 | 0.63           | -9.97  | 21.77 | -3.31 | 28.57 |
| 152         | 0.32        | 2.61 | 0.62           | -16.29 | 8.76  | -1.29 | 22.24 |
| 153         | 2.45        | 2.78 | 4.00           | -9.95  | 12.58 | -3.42 | 20.57 |
| 154         | 2.25        | 2.78 | 1.32           | -3.96  | 17.09 | -7.02 | 22.23 |
| 155         | 2.06        | 2.78 | 3.89           | -4.44  | 16.23 | -7.77 | 22.48 |
| 156         | 1.87        | 2.78 | 2.43           | -4.86  | 17.57 | -6.00 | 22.38 |
| 157         | 1.67        | 2.78 | 1.00           | -5.00  | 19.57 | -2.47 | 22.60 |
| 158         | 1.48        | 2.78 | -4.19          | 1.03   | 10.37 | -7.98 | 18.83 |
| 159         | 2.63        | 2.96 | 2.78           | 1.19   | 14.53 | -9.69 | 20.99 |
| 160         | 2.43        | 2.96 | 1.98           | -1.76  | 15.02 | -5.87 | 18.33 |
| 161         | 2.24        | 2.96 | 0.92           | -0.62  | 17.22 | -2.27 | 17.57 |
| 162         | 2.05        | 2.96 | -3.94          | -6.08  | 4.54  | -5.49 | 13.60 |
| 163         | 1.86        | 2.96 | -4.25          | -2.22  | 6.77  | -3.01 | 11.43 |
| 164         | 1.67        | 2.96 | -1.71          | 1.64   | 10.19 | -5.03 | 13.74 |
| 165         | 1.48        | 2.96 | 0.68           | 1.82   | 12.56 | -4.33 | 13.61 |
| 166         | 2.63        | 3.14 | 0.58           | 3.09   | 14.83 | -1.73 | 13.51 |
| 167         | 2.43        | 3.14 | -1.13          | -4.17  | 3.84  | -2.98 | 8.70  |
| 168         | 2.24        | 3.14 | -1.94          | -3.96  | 4.34  | -3.14 | 9.26  |
| 169         | 2.05        | 3.14 | -1.44          | -1.44  | 5.98  | -2.26 | 8.39  |
| 170         | 1.86        | 3.14 | -1.10          | 1.40   | 7.96  | -2.19 | 8.94  |
| 171         | 1.67        | 3.14 | 0.05           | 3.24   | 10.15 | -1.96 | 9.56  |
| 172         | 1.48        | 3.14 | 0.38           | 5.50   | 12.56 | -0.82 | 10.69 |
| 173         | 2.63        | 3.32 | -0.37          | -4.78  | 2.97  | -1.98 | 7.56  |
| 174         | 2.43        | 3.32 | -0.08          | -3.30  | 3.85  | -2.71 | 7.77  |
| 175         | 2.24        | 3.32 | -0.24          | -0.53  | 5.14  | -1.79 | 6.34  |
| 176         | 2.05        | 3.32 | -0.04          | 1.97   | 6.70  | -0.84 | 6.16  |
| 177         | 1.86        | 3.32 | 0.49           | 3.85   | 8.40  | -0.36 | 6.91  |
| 178         | 1.67        | 3.32 | 0.40           | 6.31   | 10.43 | -0.05 | 8.73  |
| 179         | 1.48        | 3.32 | 0.30           | -7.05  | 1.64  | -1.49 | 8.50  |
| 180         | 2.63        | 3.50 | 0.91           | -2.85  | 3.26  | -2.50 | 6.87  |
| 181         | 2.43        | 3.50 | 0.55           | 0.84   | 4.62  | -1.55 | 4.76  |
| 182         | 2.24        | 3.50 | 1.00           | -2.90  | 5.96  | 0.28  | 4.36  |
| 183         | 2.07        | 3.50 | 1.22           | 3.98   | 7.05  | 0.42  | 5.11  |
| 184         | 1.86        | 3.50 | 0.48           | 6.16   | 8.49  | 0.20  | 7.15  |
| 185         | 1.67        | 3.50 | 0.41           | -8.54  | 0.71  | -0.58 | 9.16  |
| 186         | 1.48        | 3.50 | 2.08           | -3.36  | 2.84  | -1.33 | 6.29  |
| 187         | 2.25        | 3.69 | 4.25           | 3.01   | 5.47  | -1.97 | 4.03  |
| 188         | 2.06        | 3.69 | 2.43           | 3.67   | 5.50  | 1.01  | 3.19  |
| 189         | 1.86        | 3.69 | 1.27           | 3.45   | 5.51  | 0.16  | 3.69  |
| 190         | 1.67        | 3.69 | 0.47           | 5.95   | 6.81  | 0.09  | 5.96  |
| 191         | 1.48        | 3.69 | -1.68          | -4.15  | 0.32  | -2.77 | 6.17  |
| 192         | 2.44        | 3.87 | 0.56           | 0.03   | 2.59  | 0.29  | 2.39  |
| 193         | 2.25        | 3.87 | 0.70           | 3.80   | 4.19  | -0.03 | 3.31  |
| 194         | 2.05        | 3.87 | 0.28           | 5.83   | 5.29  | 0.01  | 5.30  |
| 195         | 1.86        | 3.87 | -0.97          | -1.87  | 0.25  | -1.53 | 3.23  |
| 196         | 1.67        | 3.87 | -0.45          | -1.29  | 0.80  | -0.58 | 2.08  |
| 197         | 1.48        | 3.87 | -0.06          | 0.72   | 1.67  | 0.67  | 1.90  |
| 198         | 2.63        | 4.06 | 0.07           | 3.41   | 2.83  | 0.57  | 3.24  |
| 199         | 2.43        | 4.06 | 0.14           | 5.69   | 4.02  | 0.20  | 4.94  |
| 200         | 2.24        | 4.06 | -0.26          | -1.08  | 0.18  | -0.78 | 1.75  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |       |       |       |       |
|-------------|-------------|------|----------------|-------|-------|-------|-------|
|             | R           | Z    | RR             | ZZ    | TT    | RZ    | MISES |
| 201         | 2.05        | 4.06 | -0.35          | -1.04 | 0.27  | -0.68 | 1.64  |
| 202         | 1.86        | 4.06 | 0.07           | -0.28 | 0.69  | -0.01 | 0.85  |
| 203         | 1.67        | 4.06 | 0.18           | 1.22  | 1.26  | 0.77  | 1.71  |
| 204         | 1.48        | 4.06 | 0.16           | 3.11  | 2.02  | 0.89  | 3.02  |
| 205         | 2.63        | 4.24 | 0.09           | 5.10  | 2.94  | 0.44  | 4.42  |
| 206         | 2.43        | 4.24 | -0.06          | -1.18 | -0.05 | -0.48 | 1.40  |
| 207         | 2.24        | 4.24 | 0.13           | -0.59 | 0.18  | -0.48 | 1.12  |
| 208         | 2.05        | 4.24 | 0.18           | 0.44  | 0.52  | 0.17  | 0.43  |
| 209         | 1.86        | 4.24 | 0.24           | 1.62  | 0.96  | 0.88  | 1.94  |
| 210         | 1.67        | 4.24 | 0.27           | 2.87  | 1.47  | 1.02  | 2.87  |
| 211         | 1.48        | 4.24 | 0.12           | 4.29  | 2.08  | 0.52  | 3.72  |
| 212         | 2.63        | 4.42 | 0.11           | -1.67 | -0.40 | -0.34 | 1.69  |
| 213         | 2.43        | 4.42 | 0.30           | -0.22 | 0.05  | -0.45 | 0.90  |
| 214         | 2.24        | 4.42 | 0.15           | 1.18  | 0.43  | 0.16  | 0.96  |
| 215         | 2.05        | 4.42 | 0.30           | 1.99  | 0.78  | 1.12  | 2.46  |
| 216         | 1.86        | 4.42 | 0.43           | 2.52  | 1.04  | 1.04  | 2.59  |
| 217         | 1.67        | 4.42 | 0.12           | 3.46  | 1.36  | 0.44  | 3.02  |
| 218         | 1.48        | 4.42 | 0.12           | -1.93 | -0.63 | -0.13 | 1.86  |
| 219         | 2.63        | 4.60 | 0.53           | -0.21 | -0.05 | -0.26 | 0.80  |
| 220         | 2.43        | 4.60 | 0.86           | 2.25  | 0.73  | -0.18 | 1.50  |
| 221         | 2.24        | 4.60 | 0.71           | 2.33  | 0.77  | 1.50  | 3.05  |
| 222         | 2.47        | 4.60 | 0.28           | 1.83  | 0.46  | 0.75  | 1.96  |
| 223         | 1.86        | 4.60 | 0.09           | 2.83  | 0.78  | 0.31  | 2.52  |
| 224         | 1.67        | 4.60 | -0.47          | -2.60 | -1.31 | -0.53 | 2.08  |
| 225         | 1.48        | 4.60 | -0.17          | -0.48 | -0.65 | 1.32  | 2.33  |
| 226         | 2.25        | 4.79 | 0.04           | 1.65  | 0.06  | 0.65  | 1.96  |
| 227         | 2.06        | 4.79 | 0.00           | 2.28  | 0.25  | 0.26  | 2.21  |
| 228         | 1.86        | 4.79 | -0.12          | -0.30 | -0.59 | -0.21 | 0.55  |
| 229         | 1.67        | 4.79 | 0.19           | -0.57 | -0.61 | -0.05 | 0.78  |
| 230         | 1.48        | 4.79 | 0.05           | -0.17 | -0.65 | 0.92  | 1.72  |
| 231         | 2.44        | 4.97 | -0.15          | 1.01  | -0.41 | 0.81  | 1.92  |
| 232         | 2.25        | 4.97 | -0.03          | 1.78  | -0.17 | 0.31  | 1.96  |
| 233         | 2.05        | 4.97 | -0.04          | -0.14 | -0.58 | -0.14 | 0.55  |
| 234         | 1.86        | 4.97 | -0.05          | -0.15 | -0.61 | -0.10 | 0.55  |
| 235         | 1.67        | 4.97 | 0.08           | -0.11 | -0.63 | 0.15  | 0.69  |
| 236         | 1.48        | 4.97 | 0.09           | 0.19  | -0.63 | 0.61  | 1.32  |
| 237         | 2.63        | 5.16 | -0.03          | 0.71  | -0.60 | 0.71  | 1.67  |
| 238         | 2.43        | 5.16 | -0.04          | 1.18  | -0.54 | 0.35  | 1.65  |
| 239         | 2.24        | 5.16 | 0.00           | -0.20 | -0.65 | -0.12 | 0.61  |
| 240         | 2.05        | 5.16 | 0.02           | -0.01 | -0.65 | -0.12 | 0.69  |
| 241         | 1.86        | 5.16 | 0.02           | 0.23  | -0.66 | 0.15  | 0.84  |
| 242         | 1.67        | 5.16 | 0.02           | 0.41  | -0.69 | 0.51  | 1.30  |
| 243         | 1.48        | 5.16 | 0.01           | 0.55  | -0.75 | 0.59  | 1.52  |
| 244         | 2.63        | 5.34 | -0.01          | 0.64  | -0.84 | 0.30  | 1.38  |
| 245         | 2.43        | 5.34 | 0.04           | -0.36 | -0.76 | -0.12 | 0.73  |
| 246         | 2.24        | 5.34 | 0.12           | 0.12  | -0.68 | -0.19 | 0.86  |
| 247         | 2.05        | 5.34 | 0.03           | 0.56  | -0.66 | 0.03  | 1.06  |
| 248         | 1.86        | 5.34 | 0.04           | 0.60  | -0.72 | 0.50  | 1.44  |
| 249         | 1.67        | 5.34 | 0.11           | 0.37  | -0.89 | 0.47  | 1.41  |
| 250         | 1.48        | 5.34 | 0.00           | 0.22  | -1.12 | 0.17  | 1.28  |

RUN 3

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |       |       |       |       |
|-------------|-------------|------|----------------|-------|-------|-------|-------|
|             | R           | Z    | RR             | ZZ    | TT    | RZ    | MISES |
| 251         | 2.63        | 5.52 | 0.07           | -0.49 | -0.84 | -0.06 | 0.80  |
| 252         | 2.43        | 5.52 | 0.30           | 0.07  | -0.70 | -0.13 | 0.94  |
| 253         | 2.24        | 5.52 | 0.58           | 0.99  | -0.46 | -0.21 | 1.35  |
| 254         | 2.05        | 5.52 | 0.44           | 0.81  | -0.66 | 0.55  | 1.63  |
| 255         | 1.86        | 5.52 | 0.01           | 0.02  | -1.20 | 0.15  | 1.24  |
| 256         | 1.67        | 5.52 | -0.05          | 0.03  | -1.40 | 0.02  | 1.39  |

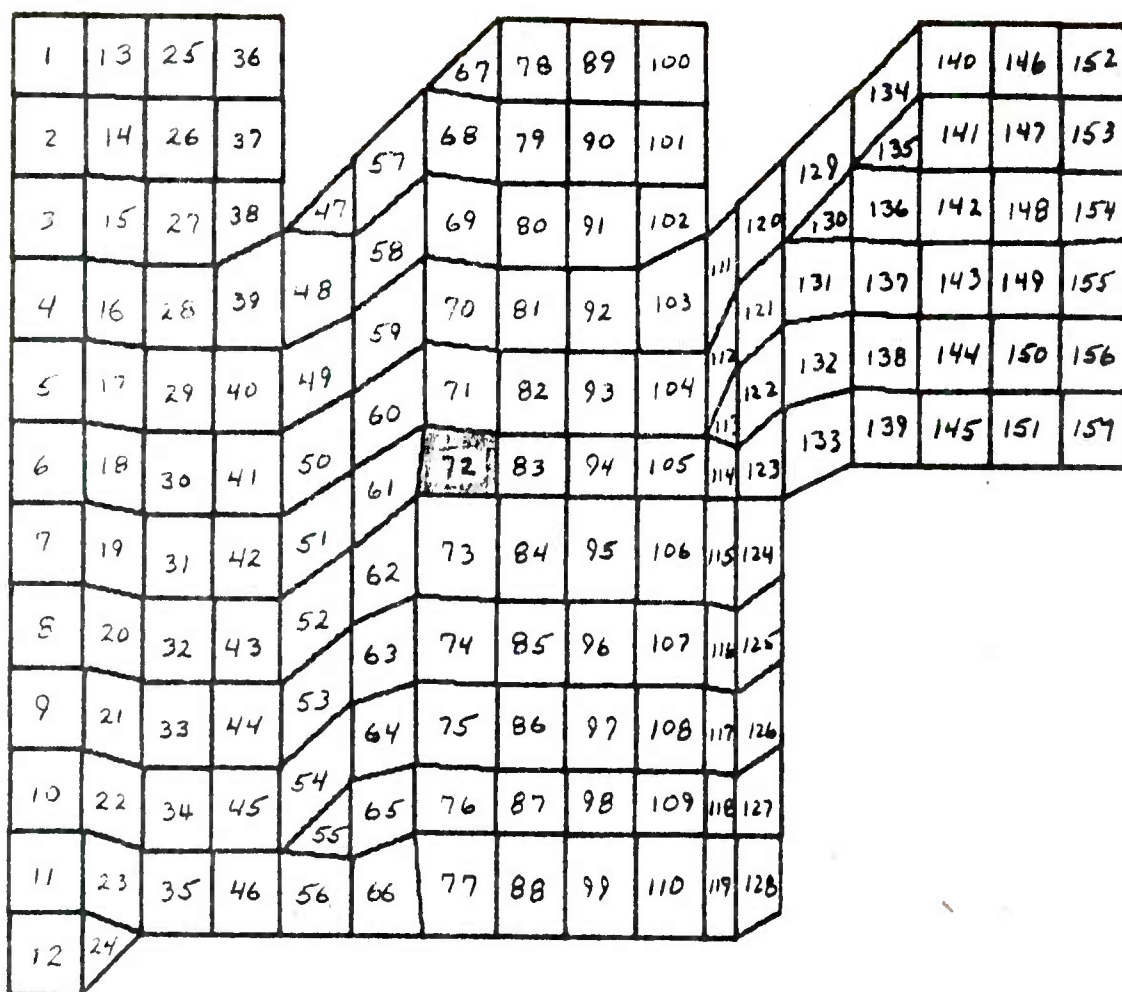


Figure 7. Geometry plot - Run 3.

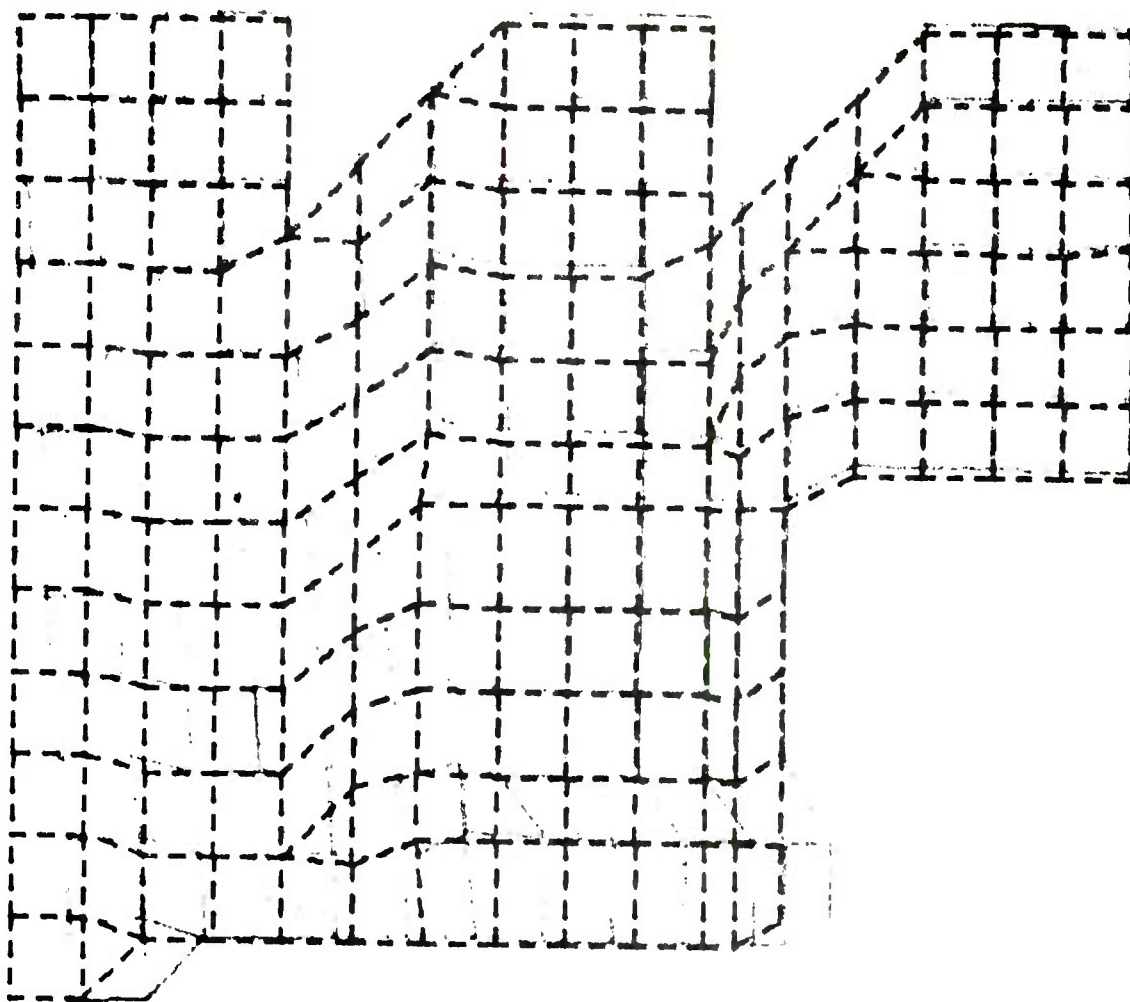


Figure 8. Distortion plot - Run 3.

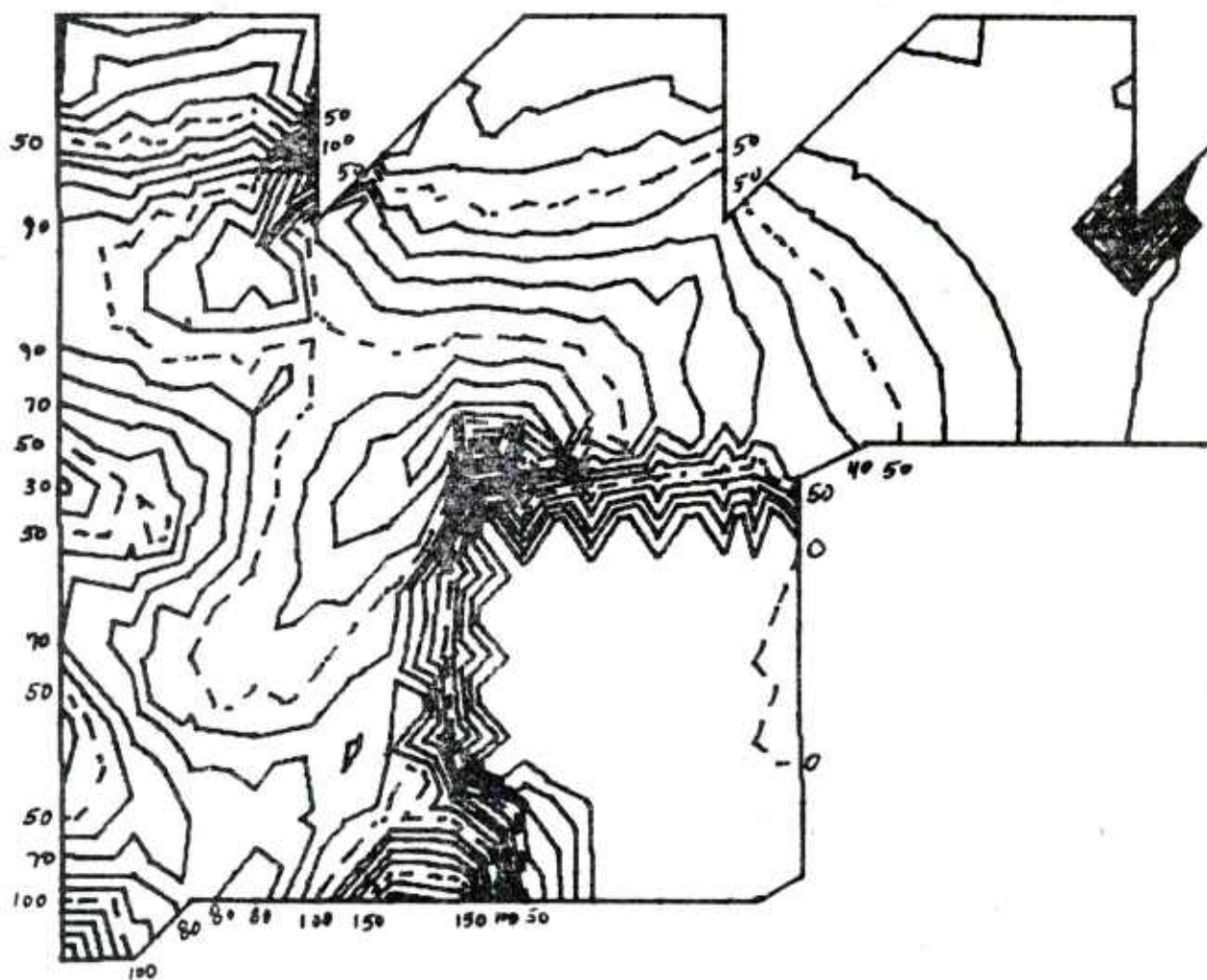


Figure 9. Stress plot - Run 3.

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |         |         |        |        |
|-------------|-------------|------|----------------|---------|---------|--------|--------|
|             | R           | Z    | RR             | ZZ      | TT      | RZ     | MISES  |
| 1           | 2.62        | 0.60 | 3.41           | 3.50    | -4.55   | 6.44   | 13.73  |
| 2           | 2.41        | 0.60 | 4.81           | -29.14  | -14.95  | -7.52  | 32.28  |
| 3           | 2.20        | 0.60 | -10.35         | -90.90  | -41.26  | -16.97 | 76.28  |
| 4           | 1.99        | 0.60 | -30.47         | -119.42 | -60.92  | -8.85  | 79.79  |
| 5           | 1.78        | 0.60 | -44.98         | -117.02 | -68.59  | -7.80  | 65.03  |
| 6           | 1.57        | 0.60 | -45.17         | -90.18  | -65.16  | 10.11  | 42.80  |
| 7           | 1.36        | 0.61 | -30.65         | -30.03  | -46.48  | 12.75  | 27.37  |
| 8           | 1.15        | 0.61 | -33.19         | -25.16  | -47.01  | -18.89 | 37.91  |
| 9           | 0.94        | 0.61 | -61.57         | -85.63  | -78.05  | -23.45 | 45.87  |
| 10          | 0.73        | 0.61 | -84.35         | -117.39 | -103.00 | -6.67  | 30.93  |
| 11          | 0.51        | 0.61 | -92.08         | -117.56 | -115.98 | -7.01  | 27.54  |
| 12          | 0.30        | 0.61 | -74.18         | -103.18 | -142.88 | -17.08 | 66.66  |
| 13          | 0.09        | 0.61 | -1.83          | 4.56    | 2.93    | 4.50   | 9.69   |
| 14          | 2.62        | 0.79 | -0.87          | -44.09  | -11.53  | -7.23  | 40.96  |
| 15          | 2.41        | 0.79 | 2.79           | -93.88  | -28.18  | -24.44 | 95.40  |
| 16          | 2.20        | 0.79 | -6.14          | -114.08 | -42.17  | -27.68 | 106.58 |
| 17          | 1.99        | 0.79 | -19.81         | -104.51 | -48.56  | -14.71 | 78.84  |
| 18          | 1.78        | 0.79 | -28.04         | -75.52  | -46.92  | 3.90   | 41.95  |
| 19          | 1.57        | 0.79 | -43.26         | -42.72  | -43.75  | 1.60   | 2.91   |
| 20          | 1.36        | 0.79 | -51.89         | -45.22  | -45.25  | -23.31 | 40.92  |
| 21          | 1.15        | 0.80 | -49.99         | -78.96  | -53.74  | -32.46 | 62.49  |
| 22          | 0.94        | 0.80 | -55.07         | -106.05 | -67.03  | -21.97 | 59.83  |
| 23          | 0.78        | 0.80 | -56.56         | -113.40 | -80.04  | -22.98 | 63.49  |
| 24          | 0.51        | 0.80 | -67.30         | -132.29 | -116.97 | -36.39 | 86.23  |
| 25          | 0.30        | 0.80 | -1.21          | 5.44    | 9.58    | 2.55   | 10.41  |
| 26          | 0.09        | 0.80 | -0.08          | -58.09  | -8.81   | -1.55  | 54.24  |
| 27          | 2.63        | 0.95 | 12.25          | -105.96 | -22.73  | -26.41 | 114.70 |
| 28          | 2.41        | 0.95 | -3.27          | -108.09 | -33.62  | -44.73 | 121.36 |
| 29          | 2.19        | 0.95 | -14.66         | -84.46  | -33.54  | -22.25 | 73.46  |
| 30          | 1.98        | 0.95 | -21.61         | -68.10  | -33.67  | -6.96  | 43.50  |
| 31          | 1.76        | 0.95 | -34.92         | -53.37  | -34.37  | -10.76 | 26.42  |
| 32          | 1.54        | 0.95 | -41.09         | -53.98  | -34.92  | -24.85 | 46.22  |
| 33          | 1.33        | 0.95 | -40.74         | -73.32  | -39.09  | -31.25 | 63.62  |
| 34          | 1.11        | 0.95 | -40.58         | -94.39  | -46.54  | -26.44 | 68.61  |
| 35          | 0.90        | 0.95 | -33.28         | -124.00 | -60.69  | -23.17 | 90.03  |
| 36          | 0.68        | 0.95 | -1.27          | 6.54    | 13.40   | 0.95   | 12.82  |
| 37          | 0.47        | 0.95 | -3.25          | -59.10  | -6.11   | 1.60   | 54.54  |
| 38          | 0.25        | 0.96 | 2.16           | -151.82 | -34.00  | -15.12 | 141.90 |
| 39          | 2.63        | 1.12 | -12.82         | -98.44  | -27.80  | -61.20 | 132.32 |
| 40          | 2.41        | 1.12 | -2.55          | -61.59  | -14.84  | -22.96 | 67.03  |
| 41          | 2.15        | 1.12 | -11.86         | -65.21  | -21.16  | -17.68 | 58.12  |
| 42          | 1.98        | 1.12 | -21.14         | -66.81  | -22.50  | -19.22 | 48.32  |
| 43          | 1.76        | 1.13 | -27.62         | -57.00  | -23.94  | -26.15 | 55.10  |
| 44          | 1.55        | 1.13 | -28.76         | -66.85  | -26.00  | -29.92 | 65.19  |
| 45          | 1.33        | 1.13 | -27.12         | -82.69  | -30.12  | -26.46 | 70.94  |
| 46          | 1.11        | 1.13 | -14.29         | -97.36  | -37.80  | -14.55 | 78.33  |
| 47          | 0.90        | 1.13 | 17.67          | 93.32   | 44.36   | 1.84   | 66.53  |
| 48          | 0.68        | 1.13 | 15.87          | 16.63   | 23.56   | -60.75 | 105.48 |
| 49          | 0.47        | 1.13 | 4.65           | -69.25  | -8.19   | -34.05 | 90.30  |
| 50          | 0.25        | 1.13 | 1.22           | -59.42  | -7.83   | -26.89 | 73.34  |

CHAMBER PRESSURE=117839

RUN 4

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |        |        |       |
|-------------|-------------|------|----------------|--------|--------|--------|-------|
|             | R           | Z    | RR             | ZZ     | TT     | RZ     | MISES |
| 51          | 2.63        | 1.30 | -7.03          | -57.35 | -10.98 | -26.29 | 66.50 |
| 52          | 2.41        | 1.30 | -12.82         | -54.74 | -12.26 | -28.00 | 64.29 |
| 53          | 2.19        | 1.30 | -15.43         | -57.36 | -13.46 | -29.04 | 66.14 |
| 54          | 2.07        | 1.30 | -14.48         | -64.23 | -14.94 | -26.15 | 67.12 |
| 55          | 1.76        | 1.30 | -12.95         | -72.58 | -16.34 | -22.66 | 70.04 |
| 56          | 1.55        | 1.30 | -7.22          | -74.89 | -19.51 | -11.62 | 65.60 |
| 57          | 1.33        | 1.30 | -8.54          | 5.03   | 10.60  | 1.23   | 17.18 |
| 58          | 1.11        | 1.30 | -0.89          | 24.44  | 22.10  | -29.95 | 57.26 |
| 59          | 0.90        | 1.31 | 13.37          | -23.58 | 13.45  | -46.32 | 88.34 |
| 60          | 0.68        | 1.31 | 9.47           | -52.93 | 2.36   | -37.42 | 87.76 |
| 61          | 0.47        | 1.31 | 5.36           | -53.25 | -0.14  | -33.22 | 80.33 |
| 62          | 0.25        | 1.31 | -0.09          | -51.46 | -2.14  | -32.29 | 75.27 |
| 63          | 2.25        | 1.49 | -3.77          | -49.27 | -2.71  | -31.42 | 71.28 |
| 64          | 2.05        | 1.49 | -4.92          | -50.24 | -2.80  | -28.41 | 67.64 |
| 65          | 1.85        | 1.49 | -3.50          | -53.96 | -2.80  | -21.58 | 63.08 |
| 66          | 1.65        | 1.49 | -1.89          | -57.10 | -3.59  | -9.42  | 56.78 |
| 67          | 1.45        | 1.49 | 0.21           | 0.44   | 12.94  | 2.05   | 13.11 |
| 68          | 1.25        | 1.49 | 0.16           | 0.20   | 13.66  | -0.54  | 13.51 |
| 69          | 1.05        | 1.49 | -6.82          | -1.39  | 13.18  | -12.35 | 27.89 |
| 70          | 0.85        | 1.49 | 3.31           | -15.57 | 14.65  | -35.88 | 67.53 |
| 71          | 0.65        | 1.49 | 12.01          | -38.36 | 11.08  | -40.34 | 85.87 |
| 72          | 0.45        | 1.49 | 10.66          | -47.72 | 7.12   | -37.44 | 86.13 |
| 73          | 0.25        | 1.49 | 7.80           | -45.57 | 6.25   | -36.36 | 82.06 |
| 74          | 2.44        | 1.67 | 4.94           | -41.28 | 6.67   | -33.56 | 74.82 |
| 75          | 2.22        | 1.67 | 4.00           | -38.57 | 8.21   | -28.11 | 66.18 |
| 76          | 2.00        | 1.67 | 4.75           | -39.02 | 10.38  | -19.80 | 58.05 |
| 77          | 1.78        | 1.67 | 3.82           | -40.06 | 14.09  | -8.27  | 51.84 |
| 78          | 1.56        | 1.67 | -0.10          | 1.39   | 14.84  | 1.77   | 14.58 |
| 79          | 1.35        | 1.68 | -1.07          | -6.57  | 13.93  | -1.19  | 18.49 |
| 80          | 1.13        | 1.68 | -0.88          | -14.65 | 13.42  | -12.36 | 32.40 |
| 81          | 0.91        | 1.68 | 2.34           | -24.77 | 13.23  | -27.77 | 58.83 |
| 82          | 0.69        | 1.68 | 8.25           | -36.87 | 12.55  | -35.72 | 77.95 |
| 83          | 0.47        | 1.68 | 12.12          | -42.32 | 12.23  | -38.30 | 85.85 |
| 84          | 0.25        | 1.68 | 12.01          | -38.35 | 13.35  | -38.19 | 83.54 |
| 85          | 2.63        | 1.86 | 11.42          | -30.68 | 16.22  | -33.98 | 73.90 |
| 86          | 2.40        | 1.86 | 12.13          | -25.57 | 20.02  | -26.16 | 61.92 |
| 87          | 2.19        | 1.86 | 13.31          | -25.01 | 24.54  | -16.36 | 53.17 |
| 88          | 1.98        | 1.86 | 9.05           | -26.59 | 32.35  | -5.89  | 52.42 |
| 89          | 1.76        | 1.86 | -0.99          | 2.88   | 16.86  | 1.76   | 16.55 |
| 90          | 1.55        | 1.86 | -2.20          | -12.43 | 13.94  | 0.85   | 23.08 |
| 91          | 1.33        | 1.86 | 0.77           | -24.87 | 12.82  | -10.59 | 38.05 |
| 92          | 1.11        | 1.86 | -1.11          | -31.81 | 11.84  | -24.32 | 57.30 |
| 93          | 0.90        | 1.86 | 4.32           | -37.62 | 13.65  | -29.02 | 69.02 |
| 94          | 0.68        | 1.86 | 10.99          | -40.27 | 15.86  | -35.53 | 81.78 |
| 95          | 0.47        | 1.86 | 13.71          | -31.05 | 20.43  | -37.36 | 80.86 |
| 96          | 0.28        | 1.86 | 17.10          | -18.79 | 27.32  | -31.19 | 68.40 |
| 97          | 2.63        | 2.04 | 21.83          | -12.01 | 34.47  | -21.75 | 56.14 |
| 98          | 2.41        | 2.04 | 24.05          | -12.29 | 41.25  | -11.63 | 51.46 |
| 99          | 2.19        | 2.04 | 15.51          | -17.52 | 52.19  | -2.74  | 60.58 |
| 100         | 1.98        | 2.04 | -1.41          | 4.18   | 18.20  | 0.77   | 17.55 |

RUN 4

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |        |       |
|-------------|-------------|------|----------------|--------|-------|--------|-------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ     | MISES |
| 101         | 1.76        | 2.04 | -4.88          | -13.39 | 14.16 | 1.34   | 24.54 |
| 102         | 1.55        | 2.04 | -5.44          | -43.49 | 7.00  | -4.96  | 46.36 |
| 103         | 1.33        | 2.04 | -8.61          | -32.61 | 11.17 | -22.86 | 54.86 |
| 104         | 1.11        | 2.04 | -2.65          | -39.03 | 14.77 | -18.92 | 57.75 |
| 105         | 0.90        | 2.04 | 4.15           | -42.11 | 18.10 | -30.91 | 76.45 |
| 106         | 0.68        | 2.04 | 10.18          | -22.90 | 28.94 | -31.42 | 70.91 |
| 107         | 0.47        | 2.04 | 25.93          | -6.24  | 43.67 | -20.27 | 56.15 |
| 108         | 0.25        | 2.04 | 40.77          | -0.52  | 54.80 | -13.68 | 55.16 |
| 109         | 2.63        | 2.22 | 41.52          | -2.58  | 61.33 | -7.43  | 58.11 |
| 110         | 2.41        | 2.22 | 25.06          | -12.58 | 72.27 | -1.39  | 73.68 |
| 111         | 2.19        | 2.22 | 6.91           | 31.82  | 36.11 | -17.40 | 40.67 |
| 112         | 1.98        | 2.22 | -8.75          | -36.35 | 14.58 | -18.61 | 54.65 |
| 113         | 1.76        | 2.22 | -14.67         | -44.94 | 13.31 | -12.40 | 54.84 |
| 114         | 1.55        | 2.22 | -15.44         | -53.42 | 13.54 | -28.90 | 76.73 |
| 115         | 1.33        | 2.22 | 2.26           | -15.08 | 37.23 | -18.41 | 56.10 |
| 116         | 1.11        | 2.22 | 43.83          | 4.94   | 63.88 | -2.53  | 52.09 |
| 117         | 0.90        | 2.22 | 59.22          | -1.01  | 71.56 | -4.08  | 67.63 |
| 118         | 0.68        | 2.22 | 74.51          | 12.07  | 83.62 | -11.17 | 70.21 |
| 119         | 0.47        | 2.22 | 29.98          | -14.05 | 80.98 | -5.30  | 82.88 |
| 120         | 0.25        | 2.23 | -5.26          | 19.95  | 26.44 | -6.87  | 31.35 |
| 121         | 2.63        | 2.40 | -4.39          | -0.18  | 25.16 | -22.10 | 47.24 |
| 122         | 2.41        | 2.40 | -15.95         | -42.31 | 13.29 | -20.28 | 59.62 |
| 123         | 2.19        | 2.40 | -31.70         | -80.73 | 1.67  | -37.38 | 96.67 |
| 124         | 2.07        | 2.40 | 18.55          | -1.57  | 77.00 | -9.69  | 72.66 |
| 125         | 1.76        | 2.40 | -5.40          | 5.10   | 18.82 | -3.49  | 21.88 |
| 126         | 1.55        | 2.40 | -6.66          | 8.96   | 21.55 | -6.47  | 26.92 |
| 127         | 1.33        | 2.40 | -11.56         | -1.27  | 20.64 | -18.00 | 42.23 |
| 128         | 1.12        | 2.40 | -10.97         | -23.52 | 18.72 | -24.21 | 56.31 |
| 129         | 0.90        | 2.40 | -12.56         | -68.09 | 8.91  | -21.99 | 78.66 |
| 130         | 0.68        | 2.41 | -2.89          | -1.98  | 14.54 | -2.51  | 17.54 |
| 131         | 0.47        | 2.41 | -2.90          | 1.82   | 16.87 | -3.94  | 19.14 |
| 132         | 0.25        | 2.41 | -7.97          | 0.38   | 17.15 | -8.24  | 26.36 |
| 133         | 2.15        | 2.48 | -9.13          | -5.47  | 18.41 | -15.69 | 37.54 |
| 134         | 1.94        | 2.48 | -8.27          | -22.45 | 17.30 | -19.51 | 48.57 |
| 135         | 1.73        | 2.48 | -1.21          | -41.34 | 17.03 | -11.47 | 55.40 |
| 136         | 1.52        | 2.48 | -0.89          | -3.99  | 13.00 | -1.98  | 16.04 |
| 137         | 1.39        | 2.49 | -3.32          | -3.07  | 14.13 | -4.92  | 19.31 |
| 138         | 1.14        | 2.49 | -4.63          | -3.25  | 15.84 | -9.04  | 25.26 |
| 139         | 0.88        | 2.49 | -5.32          | -8.80  | 16.62 | -13.01 | 32.82 |
| 140         | 0.67        | 2.49 | -2.90          | -18.50 | 17.32 | -13.39 | 38.80 |
| 141         | 0.52        | 2.49 | -0.61          | -27.84 | 18.03 | -6.53  | 41.53 |
| 142         | 0.25        | 2.49 | -0.21          | -7.41  | 11.49 | -2.12  | 16.93 |
| 143         | 2.27        | 2.60 | -0.36          | -5.43  | 13.35 | -5.21  | 19.09 |
| 144         | 2.05        | 2.60 | -1.11          | -6.03  | 14.61 | -8.03  | 23.29 |
| 145         | 1.84        | 2.60 | -0.54          | -9.19  | 15.81 | -10.52 | 28.56 |
| 146         | 1.62        | 2.60 | -0.32          | -14.55 | 16.51 | -9.55  | 31.61 |
| 147         | 1.48        | 2.60 | 0.42           | -18.88 | 17.96 | -4.03  | 32.67 |
| 148         | 0.54        | 2.61 | 0.29           | -10.03 | 10.39 | -0.97  | 17.76 |
| 149         | 0.32        | 2.61 | 2.66           | -8.10  | 12.76 | -2.83  | 18.72 |
| 150         | 2.45        | 2.78 | 8.22           | -7.88  | 15.45 | -6.64  | 23.68 |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES (KPSI) |        |       |        |       |
|-------------|-------------|------|-----------------|--------|-------|--------|-------|
|             | R           | Z    | RR              | ZZ     | TT    | RZ     | MISES |
| 151         | 2.25        | 2.78 | 2.31            | -9.55  | 14.28 | -10.71 | 27.76 |
| 152         | 2.06        | 2.78 | 1.79            | -9.97  | 15.88 | -7.51  | 25.92 |
| 153         | 1.87        | 2.78 | 0.78            | -12.71 | 16.97 | -3.03  | 26.27 |
| 154         | 1.67        | 2.78 | -3.41           | 5.57   | 12.53 | -6.92  | 18.31 |
| 155         | 1.48        | 2.78 | 2.88            | 1.28   | 15.26 | -12.26 | 25.03 |
| 156         | 2.63        | 2.96 | 1.75            | -6.45  | 14.14 | -7.17  | 21.83 |
| 157         | 2.43        | 2.96 | 0.85            | -7.26  | 15.66 | -2.78  | 20.69 |
| 158         | 2.24        | 2.96 | -3.84           | -5.51  | 5.41  | -5.14  | 13.53 |
| 159         | 2.05        | 2.96 | -4.77           | -1.42  | 7.59  | -3.11  | 12.31 |
| 160         | 1.86        | 2.96 | -2.06           | 1.11   | 10.86 | -6.89  | 16.69 |
| 161         | 1.67        | 2.96 | 0.77            | -1.61  | 12.54 | -5.91  | 16.65 |
| 162         | 1.48        | 2.96 | 0.57            | -2.56  | 14.04 | -2.32  | 15.79 |
| 163         | 2.63        | 3.14 | -1.13           | -4.00  | 4.61  | -2.85  | 9.05  |
| 164         | 2.43        | 3.14 | -2.05           | -3.79  | 5.13  | -3.16  | 9.84  |
| 165         | 2.24        | 3.14 | -1.90           | -1.51  | 6.71  | -2.77  | 9.69  |
| 166         | 2.05        | 3.14 | -1.58           | 0.30   | 8.52  | -3.48  | 11.08 |
| 167         | 1.86        | 3.14 | -0.12           | 0.44   | 10.40 | -3.31  | 11.75 |
| 168         | 1.67        | 3.14 | 0.37            | 0.99   | 12.35 | -1.45  | 11.95 |
| 169         | 1.48        | 3.14 | -0.40           | -4.67  | 3.75  | -1.96  | 8.04  |
| 170         | 2.63        | 3.32 | -0.27           | -3.43  | 4.60  | -2.86  | 8.58  |
| 171         | 2.43        | 3.32 | -0.54           | -1.11  | 5.84  | -2.38  | 7.86  |
| 172         | 2.24        | 3.32 | -0.35           | 0.60   | 7.28  | -1.90  | 7.92  |
| 173         | 2.05        | 3.32 | 0.30            | 1.44   | 8.81  | -1.44  | 8.39  |
| 174         | 1.86        | 3.32 | 0.35            | 2.78   | 10.60 | -0.57  | 9.33  |
| 175         | 1.67        | 3.32 | 0.26            | -6.99  | 2.45  | -1.50  | 8.94  |
| 176         | 1.48        | 3.32 | 0.80            | -3.25  | 4.01  | -2.66  | 7.81  |
| 177         | 2.63        | 3.50 | 0.47            | -0.15  | 5.30  | -2.08  | 6.30  |
| 178         | 2.43        | 3.50 | 0.89            | 1.40   | 6.56  | -0.72  | 5.57  |
| 179         | 2.24        | 3.50 | 1.06            | 1.92   | 7.56  | -0.48  | 6.18  |
| 180         | 2.07        | 3.50 | 0.46            | 3.42   | 8.93  | -0.18  | 7.45  |
| 181         | 1.86        | 3.50 | 0.39            | -8.53  | 1.55  | -0.60  | 9.60  |
| 182         | 1.67        | 3.50 | 2.07            | -3.92  | 3.59  | -1.41  | 7.29  |
| 183         | 1.48        | 3.50 | 4.46            | 1.54   | 6.09  | -2.31  | 5.65  |
| 184         | 2.25        | 3.69 | 2.32            | 2.03   | 6.00  | -0.17  | 3.85  |
| 185         | 2.06        | 3.69 | 1.26            | 1.91   | 6.19  | -0.54  | 4.73  |
| 186         | 1.86        | 3.69 | 0.47            | 3.79   | 7.40  | -0.20  | 6.01  |
| 187         | 1.67        | 3.69 | -1.74           | -2.99  | 1.49  | -3.01  | 6.57  |
| 188         | 1.48        | 3.69 | 0.78            | 0.11   | 3.67  | -0.94  | 3.66  |
| 189         | 2.44        | 3.87 | 0.77            | 2.54   | 4.90  | -0.69  | 3.78  |
| 190         | 2.25        | 3.87 | 0.32            | 4.19   | 5.99  | -0.24  | 5.03  |
| 191         | 2.05        | 3.87 | -1.19           | -2.11  | 0.75  | -1.78  | 3.99  |
| 192         | 1.86        | 3.87 | -0.84           | -1.24  | 1.42  | -0.79  | 2.83  |
| 193         | 1.67        | 3.87 | -0.24           | 0.69   | 2.47  | -0.09  | 2.39  |
| 194         | 1.48        | 3.87 | 0.14            | 2.68   | 3.61  | -0.07  | 3.11  |
| 195         | 2.63        | 4.06 | 0.17            | 4.50   | 4.76  | -0.05  | 4.46  |
| 196         | 2.43        | 4.06 | -0.33           | -1.29  | 0.61  | -0.94  | 2.31  |
| 197         | 2.24        | 4.06 | -0.50           | -1.24  | 0.74  | -0.88  | 2.31  |
| 198         | 2.05        | 4.06 | -0.13           | -0.39  | 1.24  | -0.27  | 1.59  |
| 199         | 1.86        | 4.06 | 0.00            | 1.04   | 1.90  | 0.33   | 1.75  |
| 200         | 1.67        | 4.06 | 0.12            | 2.63   | 2.72  | 0.45   | 2.67  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES (KPSI) |       |       |       |       |
|-------------|-------------|------|-----------------|-------|-------|-------|-------|
|             | R           | Z    | RR              | ZZ    | TT    | RZ    | MISES |
| 201         | 1.48        | 4.06 | 0.11            | 4.33  | 3.68  | 0.24  | 3.96  |
| 202         | 2.63        | 4.24 | -0.09           | -1.44 | 0.33  | -0.60 | 1.91  |
| 203         | 2.43        | 4.24 | 0.08            | -0.82 | 0.61  | -0.68 | 1.72  |
| 204         | 2.24        | 4.24 | 0.09            | 0.26  | 1.02  | -0.08 | 0.87  |
| 205         | 2.05        | 4.24 | 0.16            | 1.40  | 1.52  | 0.58  | 1.65  |
| 206         | 1.86        | 4.24 | 0.25            | 2.51  | 2.09  | 0.74  | 2.45  |
| 207         | 1.67        | 4.24 | 0.14            | 3.81  | 2.78  | 0.39  | 3.35  |
| 208         | 1.49        | 4.24 | 0.12            | -2.08 | -0.09 | -0.44 | 2.24  |
| 209         | 2.63        | 4.42 | 0.32            | -0.49 | 0.44  | -0.64 | 1.42  |
| 210         | 2.43        | 4.42 | 0.16            | 1.00  | 0.89  | -0.06 | 0.80  |
| 211         | 2.24        | 4.42 | 0.33            | 1.80  | 1.30  | 0.90  | 2.03  |
| 212         | 2.05        | 4.42 | 0.46            | 2.25  | 1.61  | 0.85  | 2.16  |
| 213         | 1.86        | 4.42 | 0.15            | 3.15  | 2.00  | 0.36  | 2.70  |
| 214         | 1.67        | 4.42 | 0.14            | -2.50 | -0.38 | -0.17 | 2.44  |
| 215         | 1.48        | 4.42 | 0.65            | -0.54 | 0.32  | -0.36 | 1.23  |
| 216         | 2.63        | 4.60 | 1.16            | 2.09  | 1.23  | -0.38 | 1.11  |
| 217         | 2.43        | 4.60 | 0.83            | 2.15  | 1.24  | 1.30  | 2.53  |
| 218         | 2.24        | 4.60 | 0.36            | 1.65  | 0.98  | 0.60  | 1.53  |
| 219         | 2.07        | 4.60 | 0.12            | 2.64  | 1.34  | 0.25  | 2.22  |
| 220         | 1.86        | 4.60 | -0.59           | -2.61 | -1.00 | -0.76 | 2.26  |
| 221         | 1.67        | 4.60 | -0.08           | -0.49 | -0.22 | 1.06  | 1.87  |
| 222         | 1.48        | 4.60 | 0.10            | 1.56  | 0.50  | 0.50  | 1.57  |
| 223         | 2.25        | 4.79 | 0.03            | 2.21  | 0.75  | 0.20  | 1.95  |
| 224         | 2.06        | 4.79 | -0.24           | -0.47 | -0.44 | -0.36 | 0.66  |
| 225         | 1.86        | 4.79 | 0.07            | -0.64 | -0.39 | -0.13 | 0.66  |
| 226         | 1.67        | 4.79 | 0.00            | -0.15 | -0.35 | 0.80  | 1.41  |
| 227         | 1.48        | 4.79 | -0.14           | 1.01  | -0.04 | 0.70  | 1.65  |
| 228         | 2.44        | 4.97 | -0.02           | 1.80  | 0.26  | 0.27  | 1.76  |
| 229         | 2.25        | 4.97 | -0.07           | -0.26 | -0.45 | -0.22 | 0.51  |
| 230         | 2.05        | 4.97 | -0.11           | -0.26 | -0.47 | -0.19 | 0.46  |
| 231         | 1.86        | 4.97 | 0.03            | -0.15 | -0.45 | 0.09  | 0.44  |
| 232         | 1.67        | 4.97 | 0.05            | 0.20  | -0.39 | 0.57  | 1.12  |
| 233         | 1.48        | 4.97 | -0.04           | 0.75  | -0.30 | 0.68  | 1.50  |
| 234         | 2.63        | 5.16 | -0.03           | 1.25  | -0.18 | 0.34  | 1.48  |
| 235         | 2.43        | 5.16 | -0.02           | -0.34 | -0.56 | -0.18 | 0.57  |
| 236         | 2.24        | 5.16 | 0.01            | -0.09 | -0.53 | -0.20 | 0.61  |
| 237         | 2.05        | 5.16 | -0.01           | 0.22  | -0.50 | 0.10  | 0.66  |
| 238         | 1.67        | 5.16 | 0.01            | 0.60  | -0.51 | 0.61  | 1.42  |
| 239         | 1.86        | 5.16 | 0.00            | 0.45  | -0.49 | 0.50  | 1.19  |
| 240         | 1.48        | 5.16 | 0.00            | 0.70  | -0.56 | 0.31  | 1.22  |
| 241         | 2.63        | 5.34 | 0.05            | -0.57 | -0.71 | -0.17 | 0.76  |
| 242         | 2.43        | 5.34 | 0.15            | 0.04  | -0.58 | -0.27 | 0.82  |
| 243         | 2.24        | 5.34 | 0.04            | 0.61  | -0.51 | -0.02 | 0.97  |
| 244         | 2.05        | 5.34 | 0.06            | 0.68  | -0.54 | -0.54 | 1.41  |
| 245         | 1.86        | 5.34 | 0.15            | 0.42  | -0.69 | 0.52  | 1.35  |
| 246         | 1.67        | 5.34 | 0.01            | 0.25  | -0.92 | 0.19  | 1.12  |
| 247         | 1.48        | 5.34 | 0.08            | -0.75 | -0.82 | -0.07 | 0.88  |
| 248         | 2.63        | 5.52 | 0.36            | -0.02 | -0.61 | -0.17 | 0.90  |
| 249         | 2.43        | 5.52 | 0.72            | 1.12  | -0.28 | -0.27 | 1.34  |
| 250         | 2.24        | 5.52 | 0.57            | 0.95  | -0.47 | 0.63  | 1.68  |

RUN 4

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | RR    | ZZ   | STRESSES (KPSI) |      |      | MISES |
|-------------|-------------|------|-------|------|-----------------|------|------|-------|
|             | R           | Z    |       |      | TT              | RZ   |      |       |
| 251         | 2.05        | 5.52 | 0.06  | 0.02 | -1.07           | 0.18 | 1.15 |       |
| 252         | 1.86        | 5.52 | -0.04 | 0.04 | -1.26           | 0.03 | 1.27 |       |



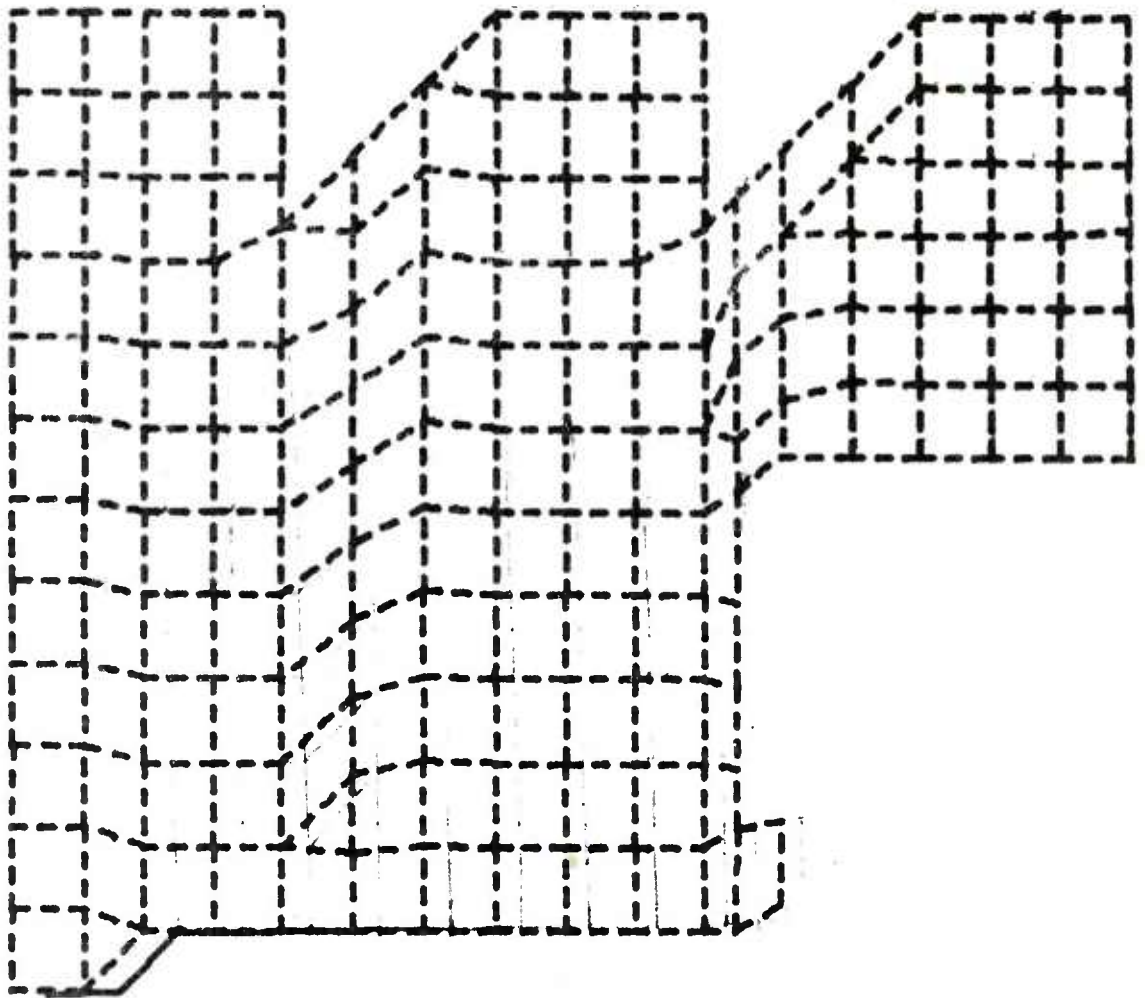


Figure 11. Distortion plot - Run 4.

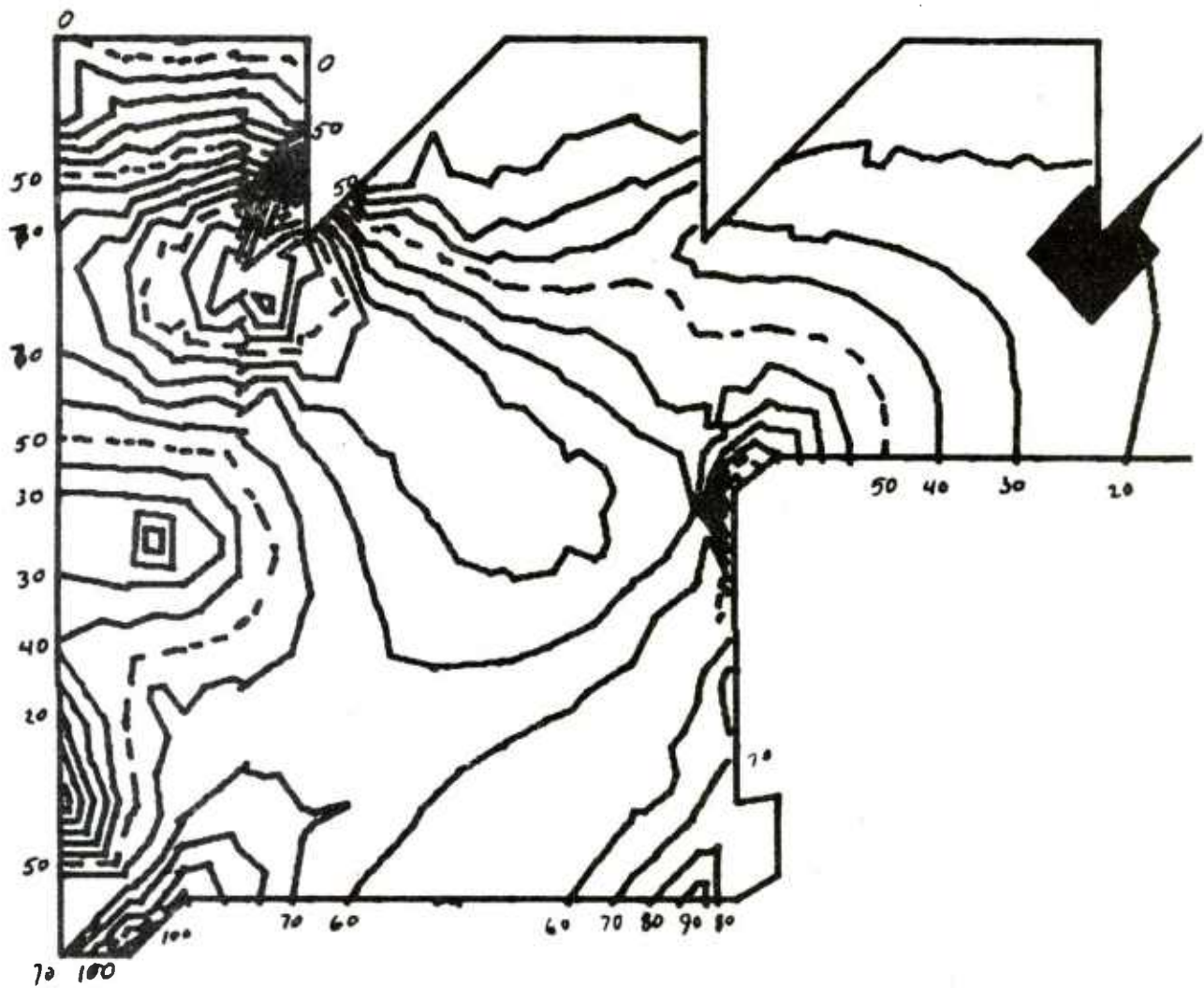


Figure 12. Stress plot - Run 4.

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |         |         |        |        |
|-------------|-------------|------|----------------|---------|---------|--------|--------|
|             | R           | Z    | RR             | ZZ      | TT      | RZ     | MISES  |
| 1           | 2.62        | 0.60 | 3.76           | 3.72    | -4.59   | 6.82   | 14.45  |
| 2           | 2.41        | 0.60 | 6.51           | -29.09  | -14.74  | -6.63  | 33.07  |
| 3           | 2.20        | 0.60 | -6.77          | -91.00  | -40.82  | -16.14 | 78.54  |
| 4           | 1.99        | 0.60 | -25.14         | -119.59 | -60.53  | -8.36  | 83.91  |
| 5           | 1.78        | 0.60 | -38.42         | -117.27 | -68.75  | -7.87  | 70.22  |
| 6           | 1.57        | 0.61 | -38.53         | -90.54  | -66.62  | 9.02   | 47.72  |
| 7           | 1.36        | 0.61 | -25.97         | -80.32  | -50.20  | 10.29  | 28.60  |
| 8           | 1.15        | 0.61 | -32.91         | -24.98  | -53.78  | -22.42 | 46.60  |
| 9           | 0.94        | 0.61 | -66.83         | -85.01  | -88.10  | -26.89 | 50.65  |
| 10          | 0.72        | 0.61 | -94.32         | -116.64 | -115.85 | -9.11  | 27.02  |
| 11          | 0.51        | 0.61 | -104.73        | -116.79 | -130.97 | -8.23  | 26.85  |
| 12          | 0.30        | 0.61 | -84.53         | -102.20 | -160.44 | -17.33 | 75.07  |
| 13          | 0.09        | 0.61 | -1.62          | 5.65    | 3.51    | 5.50   | 11.52  |
| 14          | 2.62        | 0.79 | 0.09           | -43.88  | -10.98  | -5.35  | 40.68  |
| 15          | 2.41        | 0.79 | 4.57           | -94.35  | -27.71  | -22.72 | 95.82  |
| 16          | 2.20        | 0.79 | -3.44          | -114.84 | -41.77  | -26.57 | 108.29 |
| 17          | 1.99        | 0.79 | -16.16         | -105.76 | -48.48  | -14.78 | 82.66  |
| 18          | 1.78        | 0.79 | -23.74         | -77.30  | -47.58  | 1.51   | 46.55  |
| 19          | 1.57        | 0.79 | -39.74         | -44.19  | -45.65  | -4.00  | 8.74   |
| 20          | 1.36        | 0.80 | -51.08         | -44.81  | -48.61  | -31.21 | 54.33  |
| 21          | 1.15        | 0.80 | -52.62         | -76.30  | -58.35  | -39.76 | 72.12  |
| 22          | 0.94        | 0.80 | -59.81         | -102.64 | -72.47  | -26.79 | 60.04  |
| 23          | 0.73        | 0.80 | -61.73         | -110.47 | -86.14  | -25.45 | 61.03  |
| 24          | 0.51        | 0.80 | -72.31         | -129.45 | -125.80 | -36.77 | 84.42  |
| 25          | 0.30        | 0.80 | -1.38          | 7.91    | 10.87   | 3.70   | 12.79  |
| 26          | 0.09        | 0.80 | -0.57          | -57.87  | -8.14   | 0.80   | 53.93  |
| 27          | 2.63        | 0.95 | 12.31          | -106.90 | -22.14  | -24.32 | 114.30 |
| 28          | 2.41        | 0.95 | -2.98          | -109.64 | -33.08  | -43.12 | 121.08 |
| 29          | 2.19        | 0.95 | -12.85         | -87.23  | -32.99  | -21.60 | 76.42  |
| 30          | 1.98        | 0.95 | -17.94         | -72.47  | -33.48  | -9.30  | 51.25  |
| 31          | 1.76        | 0.95 | -30.30         | -56.79  | -34.58  | -18.17 | 39.97  |
| 32          | 1.54        | 0.95 | -38.89         | -52.34  | -35.45  | -36.12 | 64.43  |
| 33          | 1.33        | 0.95 | -41.59         | -66.43  | -39.18  | -40.44 | 74.77  |
| 34          | 1.11        | 0.95 | -42.42         | -87.11  | -45.98  | -30.88 | 68.63  |
| 35          | 0.90        | 0.95 | -33.80         | -117.78 | -58.71  | -23.81 | 85.33  |
| 36          | 0.68        | 0.95 | -1.79          | 10.23   | 15.23   | 1.49   | 15.38  |
| 37          | 0.47        | 0.96 | -5.91          | -57.96  | -5.36   | 3.20   | 52.61  |
| 38          | 0.25        | 0.96 | -3.18          | -153.91 | -34.56  | -12.14 | 139.35 |
| 39          | 2.63        | 1.12 | -14.54         | -100.00 | -26.64  | -58.44 | 129.08 |
| 40          | 2.41        | 1.12 | -2.61          | -65.89  | -13.59  | -20.56 | 68.54  |
| 41          | 2.19        | 1.12 | -9.06          | -73.07  | -20.17  | -18.09 | 67.02  |
| 42          | 1.99        | 1.12 | -14.76         | -64.89  | -21.33  | -26.35 | 65.65  |
| 43          | 1.76        | 1.13 | -21.09         | -53.95  | -20.95  | -41.97 | 79.81  |
| 44          | 1.55        | 1.13 | -29.81         | -53.37  | -21.54  | -40.52 | 75.79  |
| 45          | 1.33        | 1.13 | -26.34         | -69.50  | -22.09  | -27.79 | 66.20  |
| 46          | 1.11        | 1.13 | -11.99         | -90.77  | -26.80  | -12.71 | 75.78  |
| 47          | 0.96        | 1.13 | 19.13          | 95.46   | 48.61   | 6.58   | 67.64  |
| 48          | 0.68        | 1.13 | 14.02          | 15.74   | 26.18   | -57.03 | 99.43  |
| 49          | 0.47        | 1.13 | 2.45           | -73.52  | -5.93   | -30.31 | 89.22  |
| 50          | 0.25        | 1.13 | 0.03           | -69.09  | -6.19   | -23.72 | 77.94  |

RUN 5

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |        |        |
|-------------|-------------|------|----------------|--------|-------|--------|--------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ     | MISES  |
| 51          | 2.63        | 1.30 | -3.91          | -72.44 | -9.48 | -27.70 | 81.53  |
| 52          | 2.41        | 1.30 | -3.68          | -66.31 | -8.98 | -41.61 | 93.88  |
| 53          | 2.19        | 1.30 | -9.35          | -32.14 | -0.86 | -46.95 | 86.01  |
| 54          | 2.07        | 1.30 | -11.46         | -39.27 | 0.77  | -26.34 | 57.83  |
| 55          | 1.76        | 1.30 | -2.79          | -61.40 | 2.31  | -15.63 | 67.03  |
| 56          | 1.55        | 1.30 | -1.40          | -72.26 | 0.03  | -7.45  | 72.74  |
| 57          | 1.33        | 1.30 | -7.39          | 7.70   | 15.37 | 2.94   | 20.69  |
| 58          | 1.11        | 1.31 | -2.27          | 24.98  | 26.03 | -28.09 | 56.03  |
| 59          | 0.90        | 1.31 | 9.63           | -25.68 | 16.76 | -43.54 | 85.06  |
| 60          | 0.68        | 1.31 | 3.95           | -58.63 | 5.34  | -33.23 | 85.54  |
| 61          | 0.47        | 1.31 | -1.39          | -68.77 | 1.25  | -27.41 | 83.54  |
| 62          | 0.25        | 1.31 | -4.92          | -80.84 | -2.76 | -28.04 | 91.06  |
| 63          | 2.25        | 1.49 | 12.52          | -30.75 | 13.36 | -78.92 | 143.51 |
| 64          | 2.05        | 1.49 | 22.06          | 3.32   | 33.92 | -23.82 | 49.16  |
| 65          | 1.85        | 1.49 | 15.26          | -38.71 | 22.77 | -15.08 | 63.70  |
| 66          | 1.65        | 1.49 | 6.37           | -62.01 | 18.24 | -6.08  | 75.76  |
| 67          | 1.45        | 1.49 | 0.25           | 1.91   | 16.74 | 2.66   | 16.39  |
| 68          | 1.25        | 1.49 | -0.34          | 2.18   | 17.82 | 0.10   | 17.05  |
| 69          | 1.05        | 1.49 | -9.01          | -0.02  | 17.39 | -12.12 | 31.31  |
| 70          | 0.85        | 1.49 | -1.46          | -16.08 | 18.59 | -35.06 | 67.80  |
| 71          | 0.65        | 1.49 | 3.55           | -42.24 | 14.57 | -38.07 | 84.09  |
| 72          | 0.45        | 1.49 | -1.98          | -56.05 | 10.55 | -33.23 | 84.08  |
| 73          | 0.25        | 1.49 | -11.11         | -95.47 | 0.39  | -32.61 | 106.82 |
| 74          | 2.44        | 1.67 | 27.09          | 39.47  | 47.95 | -34.42 | 62.33  |
| 75          | 2.22        | 1.67 | 20.64          | -22.81 | 31.03 | -23.39 | 63.95  |
| 76          | 2.00        | 1.67 | 10.72          | -46.10 | 28.82 | -9.50  | 69.68  |
| 77          | 1.78        | 1.67 | -0.34          | 2.53   | 18.41 | 1.98   | 17.82  |
| 78          | 1.56        | 1.67 | -2.34          | -4.99  | 17.85 | -1.33  | 21.76  |
| 79          | 1.35        | 1.68 | -3.57          | -13.46 | 17.57 | -13.17 | 35.70  |
| 80          | 1.01        | 1.66 | -2.78          | -24.84 | 17.42 | -28.72 | 61.77  |
| 81          | 0.89        | 1.66 | -0.59          | -39.27 | 16.71 | -35.76 | 79.38  |
| 82          | 0.69        | 1.68 | -1.76          | -53.29 | 15.19 | -37.25 | 89.33  |
| 83          | 0.47        | 1.68 | -0.52          | -70.36 | 14.81 | -26.64 | 91.17  |
| 84          | 0.25        | 1.68 | 0.92           | 15.55  | 22.33 | -12.21 | 28.40  |
| 85          | 2.63        | 1.86 | 12.55          | -4.97  | 27.45 | -20.51 | 45.30  |
| 86          | 2.41        | 1.86 | 8.65           | -28.29 | 28.28 | -10.38 | 52.89  |
| 87          | 2.19        | 1.86 | -1.25          | 3.92   | 20.40 | 1.67   | 19.79  |
| 88          | 1.98        | 1.86 | -3.06          | -11.36 | 17.81 | 0.26   | 26.04  |
| 89          | 1.76        | 1.86 | -0.90          | -24.27 | 16.96 | -12.05 | 41.45  |
| 90          | 1.55        | 1.86 | -4.32          | -31.75 | 16.33 | -26.85 | 62.51  |
| 91          | 1.33        | 1.86 | -2.37          | -38.95 | 18.19 | -31.39 | 73.96  |
| 92          | 1.01        | 1.86 | 1.91           | -47.91 | 20.18 | -34.08 | 84.92  |
| 93          | 0.89        | 1.86 | 1.65           | -48.09 | 25.30 | -24.16 | 77.21  |
| 94          | 0.68        | 1.86 | 1.03           | 6.14   | 12.94 | -5.18  | 13.70  |
| 95          | 0.47        | 1.86 | 4.49           | -1.44  | 17.07 | -11.22 | 25.41  |
| 96          | 0.25        | 1.87 | 5.52           | -12.62 | 22.14 | -7.55  | 32.83  |
| 97          | 2.63        | 2.04 | -1.51          | 4.97   | 21.69 | 0.67   | 20.77  |
| 98          | 2.41        | 2.04 | -4.89          | -12.85 | 18.05 | 0.85   | 27.83  |
| 99          | 2.19        | 2.04 | -4.92          | -43.57 | 11.31 | -6.43  | 50.09  |
| 100         | 1.98        | 2.04 | -9.24          | -33.56 | 15.49 | -25.68 | 61.51  |

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |        |       |
|-------------|-------------|------|----------------|--------|-------|--------|-------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ     | MISES |
| 101         | 1.76        | 2.04 | -3.07          | -37.79 | 20.71 | -23.22 | 64.92 |
| 102         | 1.55        | 2.04 | 1.08           | -45.65 | 23.42 | -29.09 | 79.16 |
| 103         | 1.33        | 2.04 | 0.96           | -27.80 | 35.72 | -21.70 | 66.69 |
| 104         | 1.01        | 2.04 | 0.15           | 1.69   | 6.77  | -1.83  | 6.80  |
| 105         | 0.89        | 2.05 | 2.34           | -0.24  | 10.00 | -4.97  | 12.61 |
| 106         | 0.68        | 2.05 | 2.94           | -4.13  | 14.21 | -3.63  | 17.21 |
| 107         | 0.47        | 2.05 | 7.81           | 33.99  | 41.21 | -19.88 | 45.96 |
| 108         | 0.25        | 2.05 | -7.24          | -37.59 | 19.40 | -21.03 | 61.37 |
| 109         | 2.63        | 2.22 | -6.79          | -43.15 | 21.09 | -18.29 | 64.16 |
| 110         | 2.41        | 2.22 | -5.55          | -46.05 | 24.40 | -26.08 | 76.09 |
| 111         | 2.19        | 2.22 | -2.73          | -13.34 | 45.33 | -16.99 | 61.64 |
| 112         | 1.98        | 2.22 | 0.15           | 0.40   | 3.97  | -0.51  | 3.81  |
| 113         | 1.76        | 2.22 | 1.20           | -0.16  | 5.93  | -2.09  | 6.62  |
| 114         | 1.55        | 2.22 | 1.78           | -0.98  | 9.43  | -1.52  | 9.71  |
| 115         | 1.33        | 2.22 | -6.06          | 20.68  | 29.90 | -8.01  | 35.20 |
| 116         | 1.01        | 2.22 | -3.94          | 0.74   | 29.66 | -23.76 | 51.84 |
| 117         | 0.89        | 2.23 | -13.65         | -43.38 | 18.35 | -19.53 | 63.28 |
| 118         | 0.68        | 2.23 | -17.50         | -49.89 | 20.78 | -23.35 | 73.41 |
| 119         | 0.47        | 2.23 | -14.74         | -9.58  | 47.51 | -11.15 | 62.88 |
| 120         | 0.25        | 2.23 | -0.18          | -0.13  | 2.17  | -0.04  | 2.33  |
| 121         | 2.63        | 2.40 | 0.23           | 0.24   | 3.46  | -0.64  | 3.42  |
| 122         | 2.41        | 2.40 | 0.75           | -0.39  | 5.47  | -0.43  | 5.43  |
| 123         | 2.20        | 2.40 | -6.25          | 4.81   | 21.26 | -4.25  | 25.08 |
| 124         | 2.07        | 2.40 | -7.51          | 9.51   | 24.47 | -7.25  | 30.42 |
| 125         | 1.76        | 2.40 | -12.76         | -0.74  | 23.95 | -19.00 | 46.19 |
| 126         | 1.55        | 2.40 | -12.65         | -21.95 | 22.93 | -25.23 | 59.95 |
| 127         | 1.33        | 2.40 | -21.98         | -75.44 | 9.50  | -28.58 | 89.35 |
| 128         | 1.01        | 2.40 | -3.40          | -2.68  | 16.37 | -3.10  | 20.15 |
| 129         | 0.89        | 2.41 | -3.28          | 1.55   | 18.99 | -4.69  | 21.86 |
| 130         | 0.68        | 2.41 | -8.90          | 0.40   | 19.51 | -8.98  | 29.52 |
| 131         | 0.47        | 2.41 | -10.38         | -4.91  | 21.30 | -16.82 | 41.34 |
| 132         | 0.25        | 2.41 | -10.40         | -23.03 | 20.23 | -21.54 | 53.76 |
| 133         | 2.15        | 2.48 | -1.47          | -44.03 | 20.59 | -13.42 | 61.45 |
| 134         | 1.94        | 2.48 | -1.01          | -4.96  | 14.53 | -2.42  | 18.33 |
| 135         | 1.73        | 2.48 | -3.67          | -3.63  | 15.90 | -5.66  | 21.88 |
| 136         | 1.52        | 2.48 | -5.17          | -3.21  | 18.01 | -9.92  | 28.13 |
| 137         | 1.31        | 2.48 | -6.14          | -8.75  | 19.07 | -14.12 | 36.15 |
| 138         | 1.01        | 2.48 | -3.42          | -18.99 | 20.16 | -14.69 | 42.57 |
| 139         | 0.89        | 2.49 | -0.82          | -28.91 | 21.29 | -7.29  | 45.37 |
| 140         | 0.67        | 2.49 | -0.19          | -8.99  | 12.68 | -2.52  | 19.38 |
| 141         | 0.46        | 2.49 | -0.29          | -6.07  | 14.98 | -5.99  | 21.50 |
| 142         | 0.25        | 2.49 | -1.24          | -6.03  | 16.58 | -8.88  | 25.74 |
| 143         | 2.27        | 2.60 | -0.57          | -9.10  | 18.12 | -11.28 | 31.03 |
| 144         | 2.05        | 2.60 | -0.27          | -14.80 | 19.06 | -10.30 | 34.41 |
| 145         | 1.84        | 2.60 | 0.51           | -19.11 | 20.92 | -4.36  | 35.48 |
| 146         | 1.62        | 2.60 | 0.38           | -12.04 | 11.35 | -1.14  | 20.37 |
| 147         | 1.48        | 2.60 | 3.19           | -9.05  | 14.27 | -3.27  | 20.98 |
| 148         | 1.01        | 2.60 | 9.53           | -7.64  | 17.65 | -7.50  | 25.86 |
| 149         | 0.89        | 2.61 | 2.87           | -9.39  | 16.40 | -11.31 | 29.72 |
| 150         | 0.75        | 2.61 | 2.11           | -9.99  | 18.11 | -8.08  | 28.14 |

RUN 5

CHAMBER PRESSURE=117839

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |        |       |        |       |
|-------------|-------------|------|----------------|--------|-------|--------|-------|
|             | R           | Z    | RR             | ZZ     | TT    | RZ     | MISES |
| 151         | Ø.54        | 2.61 | Ø.92           | -12.46 | 19.54 | -3.26  | 28.4Ø |
| 152         | Ø.82        | 2.61 | -3.98          | 5.19   | 13.5Ø | -7.96  | 2Ø.48 |
| 153         | 2.45        | 2.78 | 3.16           | 1.41   | 16.86 | -13.1Ø | 27.ØØ |
| 154         | 2.25        | 2.78 | 2.ØØ           | -6.13  | 15.99 | -7.72  | 23.55 |
| 155         | 2.Ø6        | 2.78 | Ø.97           | -6.6Ø  | 17.84 | -2.98  | 22.28 |
| 156         | 1.87        | 2.78 | -4.31          | -6.28  | 5.85  | -5.81  | 15.11 |
| 157         | 1.67        | 2.78 | -5.21          | -1.77  | 8.29  | -3.45  | 13.54 |
| 158         | 1.48        | 2.78 | -2.22          | 1.36   | 11.98 | -7.27  | 17.94 |
| 159         | 2.63        | 2.96 | Ø.84           | -1.Ø2  | 14.Ø1 | -6.24  | 17.84 |
| 16Ø         | 2.43        | 2.96 | Ø.64           | -1.57  | 15.85 | -2.46  | 16.97 |
| 161         | 2.24        | 2.96 | -1.26          | -4.5Ø  | 4.97  | -3.21  | 1Ø.Ø2 |
| 162         | 2.Ø6        | 2.96 | -2.26          | -4.27  | 5.54  | -3.52  | 1Ø.85 |
| 163         | 1.86        | 2.96 | -2.Ø2          | -1.67  | 7.32  | -2.98  | 1Ø.52 |
| 164         | 1.67        | 2.96 | -1.65          | Ø.59   | 9.39  | -3.59  | 11.86 |
| 165         | 1.48        | 2.96 | -Ø.Ø9          | 1.13   | 11.55 | -3.39  | 12.54 |
| 166         | 2.63        | 3.14 | Ø.42           | 2.13   | 13.84 | -1.48  | 12.91 |
| 167         | 2.43        | 3.14 | -Ø.44          | -5.24  | 4.Ø1  | -2.19  | 8.87  |
| 168         | 2.24        | 3.14 | -Ø.25          | -3.8Ø  | 4.97  | -3.16  | 9.4Ø  |
| 169         | 2.Ø5        | 3.14 | -Ø.54          | -1.11  | 6.36  | -2.53  | 8.43  |
| 17Ø         | 1.86        | 3.14 | -Ø.32          | Ø.98   | 8.ØØ  | -1.88  | 8.4Ø  |
| 171         | 1.67        | 3.14 | Ø.38           | 2.15   | 9.74  | -1.36  | 8.94  |
| 172         | 1.48        | 3.14 | Ø.41           | 3.91   | 11.8Ø | -Ø.52  | 1Ø.15 |
| 173         | 2.63        | 3.32 | Ø.3Ø           | -7.81  | 2.55  | -1.67  | 9.88  |
| 174         | 2.43        | 3.32 | Ø.92           | -3.54  | 4.31  | -2.94  | 8.5Ø  |
| 175         | 2.24        | 3.32 | Ø.54           | Ø.Ø6   | 5.76  | -2.2Ø  | 6.67  |
| 176         | 2.Ø5        | 3.32 | 1.Ø2           | 1.9Ø   | 7.18  | -Ø.58  | 5.86  |
| 177         | 1.86        | 3.32 | 1.22           | 2.61   | 8.33  | -Ø.33  | 6.55  |
| 178         | 1.67        | 3.32 | Ø.52           | 4.44   | 9.87  | -Ø.11  | 8.14  |
| 179         | 1.48        | 3.32 | Ø.44           | -9.52  | 1.54  | -Ø.66  | 1Ø.61 |
| 18Ø         | 2.63        | 3.5Ø | 2.31           | -4.24  | 3.84  | -1.56  | 7.91  |
| 181         | 2.43        | 3.5Ø | 4.93           | 2.Ø5   | 6.65  | -2.5Ø  | 5.92  |
| 182         | 2.24        | 3.5Ø | 2.61           | 2.64   | 6.59  | Ø.Ø8   | 3.95  |
| 183         | 2.Ø7        | 3.5Ø | 1.41           | 2.48   | 6.76  | -Ø.44  | 4.96  |
| 184         | 1.86        | 3.5Ø | Ø.53           | 4.73   | 8.13  | -Ø.15  | 6.6Ø  |
| 185         | 1.67        | 3.5Ø | -1.93          | -3.6Ø  | 1.4Ø  | -3.3Ø  | 7.22  |
| 186         | 1.48        | 3.5Ø | Ø.82           | Ø.11   | 3.85  | -Ø.77  | 3.7Ø  |
| 187         | 2.25        | 3.69 | Ø.85           | 3.12   | 5.31  | -Ø.62  | 4.Ø1  |
| 188         | 2.Ø6        | 3.69 | Ø.35           | 5.Ø5   | 6.53  | -Ø.22  | 5.6Ø  |
| 189         | 1.87        | 3.69 | -1.28          | -2.3Ø  | Ø.73  | -1.93  | 4.28  |
| 19Ø         | 1.67        | 3.69 | -Ø.85          | -1.39  | 1.44  | -Ø.83  | 2.98  |
| 191         | 1.48        | 3.69 | -Ø.23          | Ø.78   | 2.57  | Ø.Ø7   | 2.46  |
| 192         | 2.44        | 3.87 | Ø.14           | 3.16   | 3.85  | Ø.Ø7   | 3.42  |
| 193         | 2.25        | 3.87 | Ø.19           | 5.29   | 5.14  | Ø.Ø    | 5.Ø3  |
| 194         | 2.Ø5        | 3.87 | -Ø.35          | -1.4Ø  | Ø.59  | -1.Ø1  | 2.45  |
| 195         | 1.86        | 3.87 | -Ø.52          | -1.34  | Ø.72  | -Ø.94  | 2.42  |
| 196         | 1.67        | 3.87 | -Ø.1Ø          | -Ø.41  | 1.26  | -Ø.24  | 1.59  |
| 197         | 1.48        | 3.87 | Ø.Ø4           | 1.2Ø   | 1.98  | Ø.47   | 1.88  |
| 198         | 2.63        | 4.Ø6 | Ø.14           | 3.Ø4   | 2.87  | Ø.6Ø   | 3.Ø1  |
| 199         | 2.43        | 4.Ø6 | Ø.12           | 5.Ø1   | 3.94  | Ø.31   | 4.49  |
| 2ØØ         | 2.24        | 4.Ø6 | -Ø.Ø9          | -1.55  | Ø.28  | -Ø.64  | 2.Ø1  |

| ELEM<br>NO. | COORDINATES |      | STRESSES(KPSI) |       |       |       |       |
|-------------|-------------|------|----------------|-------|-------|-------|-------|
|             | R           | Z    | RR             | ZZ    | TT    | RZ    | MISES |
| 201         | 2.05        | 4.00 | 0.10           | -0.86 | 0.58  | -0.72 | 1.78  |
| 202         | 1.86        | 4.00 | 0.12           | 0.33  | 1.02  | -0.03 | 0.82  |
| 203         | 1.67        | 4.00 | 0.20           | 1.62  | 1.57  | 0.71  | 1.87  |
| 204         | 1.48        | 4.00 | 0.28           | 2.89  | 2.19  | 0.89  | 2.80  |
| 205         | 2.63        | 4.24 | 0.15           | 4.37  | 2.94  | 0.47  | 3.80  |
| 206         | 2.43        | 4.24 | 0.13           | -2.23 | -0.17 | -0.47 | 2.37  |
| 207         | 2.24        | 4.24 | 0.36           | -0.49 | 0.40  | -0.68 | 1.46  |
| 208         | 2.05        | 4.24 | 0.17           | 1.15  | 0.89  | -0.02 | 0.88  |
| 209         | 1.86        | 4.24 | 0.36           | 2.06  | 1.33  | 1.06  | 2.35  |
| 210         | 1.67        | 4.24 | 0.51           | 2.58  | 1.66  | 1.00  | 2.49  |
| 211         | 1.48        | 4.24 | 0.16           | 3.59  | 2.09  | 0.42  | 3.06  |
| 212         | 2.63        | 4.42 | 0.15           | -2.67 | -0.48 | -0.18 | 2.59  |
| 213         | 2.43        | 4.42 | 0.70           | -0.53 | 0.27  | -0.38 | 1.26  |
| 214         | 2.24        | 4.42 | 1.23           | 2.37  | 1.26  | -0.38 | 1.31  |
| 215         | 2.05        | 4.42 | 0.90           | 2.44  | 1.28  | 1.49  | 2.94  |
| 216         | 1.86        | 4.42 | 0.38           | 1.88  | 0.97  | 0.71  | 1.79  |
| 217         | 1.67        | 4.42 | 0.13           | 2.99  | 1.37  | 0.29  | 2.54  |
| 218         | 1.48        | 4.42 | -0.64          | -2.91 | -1.19 | -0.79 | 2.48  |
| 219         | 2.63        | 4.60 | -0.11          | -0.54 | -0.35 | 1.24  | 2.18  |
| 220         | 2.43        | 4.60 | 0.09           | 1.76  | 0.46  | 0.59  | 1.83  |
| 221         | 2.24        | 4.60 | 0.03           | 2.43  | 0.73  | 0.24  | 2.23  |
| 222         | 2.05        | 4.60 | -0.24          | -0.49 | -0.53 | -0.37 | 0.69  |
| 223         | 1.86        | 4.60 | 0.10           | -0.70 | -0.49 | -0.13 | 0.75  |
| 224         | 1.67        | 4.60 | 0.01           | -0.17 | -0.45 | 0.92  | 1.64  |
| 225         | 1.48        | 4.60 | -0.16          | 1.13  | -0.13 | 0.81  | 1.90  |
| 226         | 2.25        | 4.79 | -0.02          | 2.01  | 0.19  | 0.31  | 2.00  |
| 227         | 2.06        | 4.79 | -0.07          | -0.26 | -0.53 | -0.23 | 0.56  |
| 228         | 1.86        | 4.79 | -0.11          | -0.27 | -0.56 | -0.19 | 0.52  |
| 229         | 1.67        | 4.79 | 0.04           | -0.16 | -0.54 | 0.11  | 0.55  |
| 230         | 1.18        | 4.79 | 0.07           | 0.22  | -0.49 | 0.64  | 1.29  |
| 231         | 2.44        | 4.97 | -0.04          | 0.83  | -0.41 | 0.76  | 1.71  |
| 232         | 2.25        | 4.97 | -0.04          | 1.38  | -0.28 | 0.38  | 1.69  |
| 233         | 2.05        | 4.97 | -0.02          | -0.35 | -0.64 | -0.19 | 0.63  |
| 234         | 1.86        | 4.97 | 0.01           | -0.08 | -0.62 | -0.20 | 0.69  |
| 235         | 1.67        | 4.97 | 0.00           | 0.25  | -0.59 | 0.12  | 0.78  |
| 236         | 1.48        | 4.97 | 0.01           | 0.49  | -0.59 | 0.56  | 1.35  |
| 237         | 2.63        | 5.16 | 0.01           | 0.66  | -0.62 | 0.67  | 1.61  |
| 238         | 2.43        | 5.16 | 0.00           | 0.77  | -0.69 | 0.35  | 1.40  |
| 239         | 2.24        | 5.16 | 0.06           | -0.59 | -0.81 | -0.18 | 0.84  |
| 240         | 2.05        | 5.16 | 0.16           | 0.07  | -0.67 | -0.28 | 0.92  |
| 241         | 1.86        | 5.16 | 0.04           | 0.67  | -0.60 | -0.01 | 1.10  |
| 242         | 1.67        | 5.16 | 0.06           | 0.74  | -0.64 | 0.60  | 1.58  |
| 243         | 1.48        | 5.16 | 0.16           | 0.46  | -0.82 | 0.57  | 1.51  |
| 244         | 2.63        | 5.34 | 0.01           | 0.27  | -1.07 | 0.21  | 1.28  |
| 245         | 2.43        | 5.34 | 0.09           | -0.78 | -0.92 | -0.08 | 0.96  |
| 246         | 2.24        | 5.34 | 0.39           | 0.00  | -0.70 | -0.18 | 1.01  |
| 247         | 2.05        | 5.34 | 0.77           | 1.22  | -0.36 | -0.29 | 1.50  |
| 248         | 1.86        | 5.34 | 0.61           | 1.03  | -0.57 | 0.69  | 1.86  |
| 249         | 1.67        | 5.34 | 0.06           | 0.02  | -1.22 | 0.19  | 1.31  |
| 250         | 1.48        | 5.34 | -0.05          | 0.04  | -1.44 | 0.03  | 1.44  |



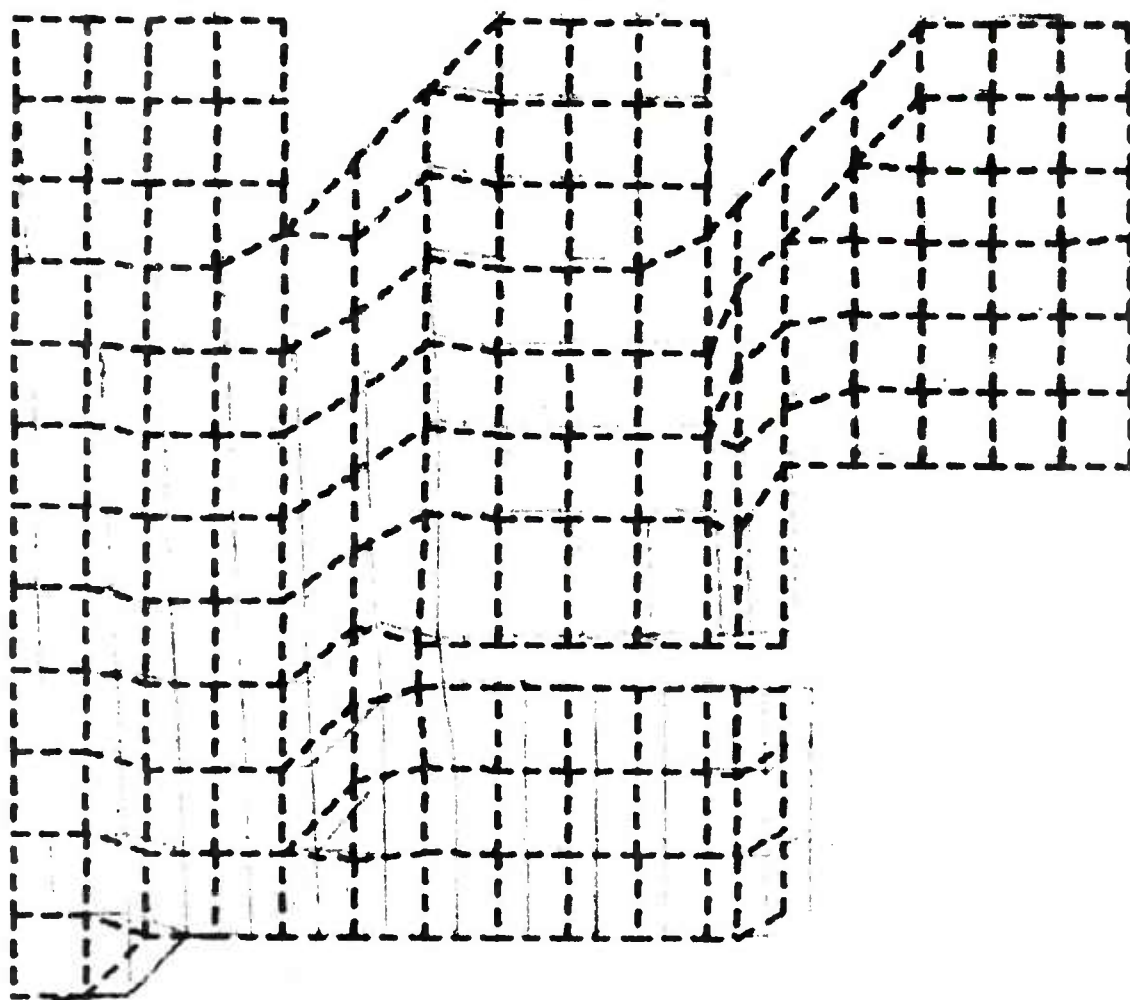


Figure 14. Distortion Plot - Run 5.

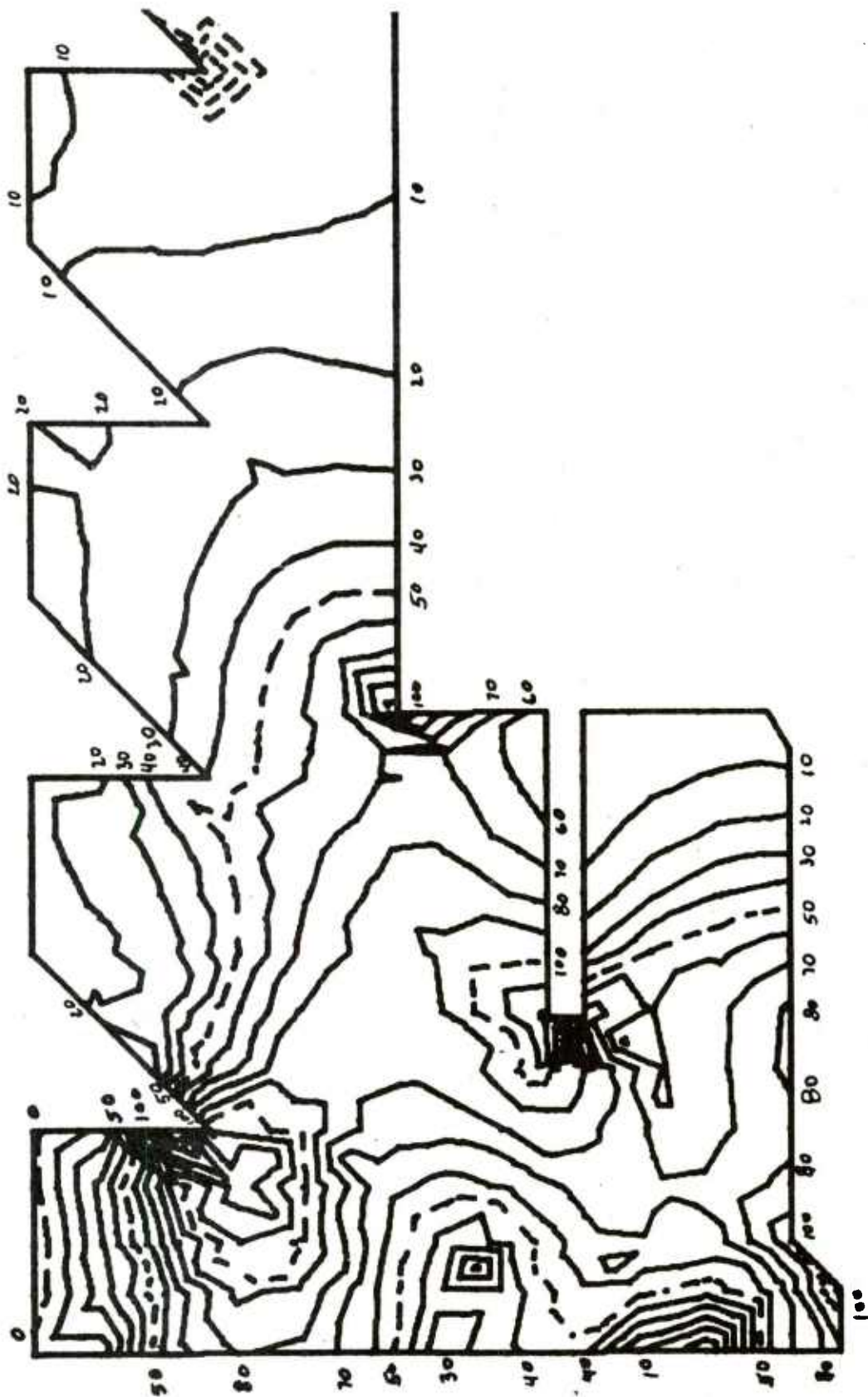


Figure 15. Stress plot - Run 5.

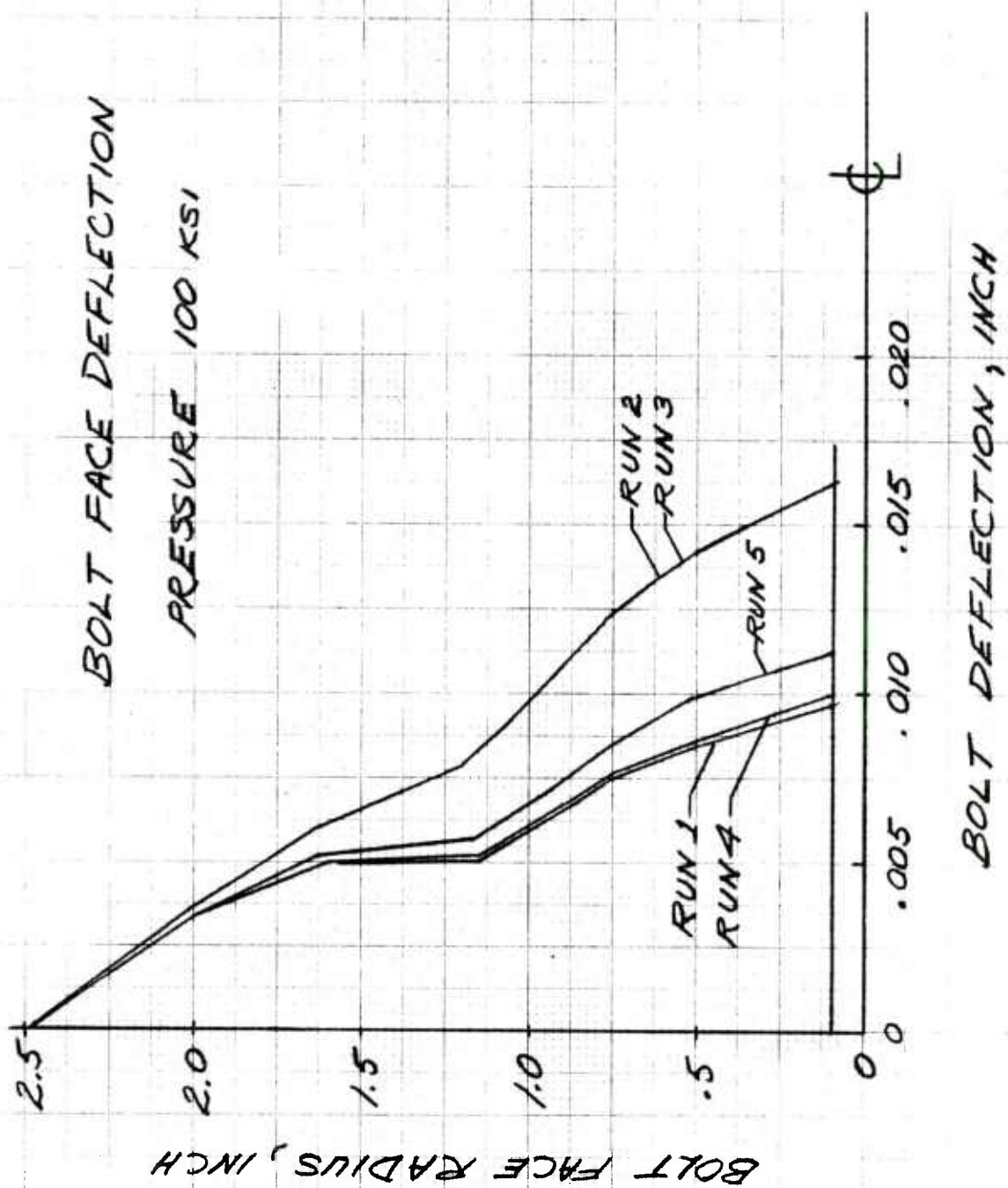


Figure 16. Bolt face deflection.





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